Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.6, No.24, 2015

Teachers' Perception of their preparedness to apply Facilitation Teaching in Secondary School Mathematics instruction by teacher Characteristics

Ng'eno J. K.
Egerton University, Department of Curriculum, Instruction and Education Management, P. O. Box 536 Egerton

Chesimet M. C.
Egerton University, Department of Curriculum, Instruction and Education Management, P. O. Box 536 Egerton

Abstract

This study set out to find out the differences in teachers perception of their preparedness to apply facilitation methods in teaching secondary school mathematics. Facilitation methods allow learners to be actively involved in the teaching and learning of mathematics hence making them be co-creators of knowledge. Facilitation teaching allow learners to form schemes of knowledge by being self-directed and self-driven in inquiry, problem solving, engaging in interactive skills, experimentation and independent study. The study applied *Ex Post Facto* research, Causal Comparative Research Design. There was a population of 1500 mathematics teachers in Rift Valley Province. A sample of 300 mathematics teachers drawn from this population participated in the study. The participants were selected using systematic random sampling and stratified random sampling (stratified by qualification). The data was collected using self-report questionnaire for mathematics teachers. The instruments were validated by experts in the department of Curriculum, Instruction and Education Management. The instruments were pilot tested and reliability coefficient was estimated and found to be 0.83, which is above the required threshold value of 0.70, Cronbach alpha in social science research. The collected data was analysed using both descriptive (means and percentages) and inferential statistics (ANOVA and t-test) to establish differences in teacher preparedness to teach secondary school mathematics using Facilitation approach by Teaching Experience, qualification and Gender. The hypotheses were tested at 0.05 Alpha (α) level. The findings of this study show that teachers perceive themselves to be prepared to apply Facilitation Methods to teach Secondary school mathematics. The findings also indicated a statistical difference in teachers' preparedness to apply facilitation by teaching experience and qualification. There was however no significant difference by Gender. The results would be expected to inform practice and advice policy makers on improvement of teacher training programs and also designing of appropriate in-service training programmes for practising mathematics teachers.

Key Words: Facilitation teaching, Teaching Experience, Qualification, Gender, Mathematics.

Introduction

Teaching methods in mathematics can either be in transmission form or facilitation form. Transmission methods promote expository strategy which assumes that the teacher is the authority and expert of the subject matter (Kiruhi, Githua & Mboroki, 2009). Facilitation methods on the other hand are methods that the learner is the focus of the instructional process. Petty (2004) reported that learning is affected by the opportunities students have to relate incoming information to what they already know and then restructure their existing knowledge or construct new ideas when appropriate. A classroom discourse is central to helping students develop their mathematical understanding of skills.

Transmission teaching approaches are methods in which the learner is passive in the instructional process. The teacher guides, facilitates and supports the schemes used by the learner in seeking new knowledge (Kiruhi, Githua & Mboroki, 2009). The purpose of transmission methods is to transmit information to a more or less passive learner. The transmission model is at its best in conveying facts to be retrieved and procedures to be executed on cue, but it is ill-equipped to teach for commitment to principles and alertness to appropriate occasions for their deployment. Transmission methods include lecture method, demonstration and direct instruction where the teacher is active and students largely passive.

Facilitation teaching allow learners to form schemes of knowledge by being self-directed and self-driven in inquiry, problem solving, engaging in interactive skills, experimentation and independent study. The teachers' responsibility goes beyond the transmission of knowledge to teaching how knowledge is sought, validated and

used as a basis for further learning, forming and modifying goals and ideas and for rational decision making. The teachers' knowledge is not an ingredient in the students' education to be consumed up, but a catalyst promoting the reactions of learning and growth as a result of an encounter between human capabilities and increasing knowledge. The facilitation teacher is one who understands and knows how to manage groups of students to produce high levels of involvement. The instructor and the learner are equally involved in learning from each other (Petty, 2004; Salman,2009; Kiruhi, Githua & Mboroki, 2009).

Effective facilitation teaching methods depend on the teachers' personality. Personal attitudinal qualities and positive attitudes character is of paramount importance. The function of a teacher is to concentrate on creating a classroom climate which facilitates self-initiated learning or the freedom to learn which depends not on appropriate material conditions but also on appropriate teacher attributes. Social constructivism suggests that knowledge is first constructed in a social context where learning is an active process whereby learners discover principles, concepts and facts for themselves (Glasersfeld, 1989). Petty (2004) reports that effective learning takes place when the learner is able to reflect on the acquired knowledge through practice by doing and sharing with others and applying it to relevant situations. Learning of mathematics requires a more active inquiry based process where students are at the centre of instruction with the teacher as an organizer, challenger, and facilitator of students' achievement (Bigelow, 1990). Active learning is a dynamic process that encourages learner participation and involvement in creating new knowledge and its application to novel situations. Activity learning technique is an instructional technique with focus on the learner interacting with the subject matter content through active participation in generating of ideas, rather than being a passive recipient of knowledge (Salman, 2009). It is the means of involving students in practicing important skills and applying new knowledge. Some of the facilitation methods include; cooperative learning, discussion, discovery methods, inquiry learning among others.

Research Methodology

This study used an *ex-post facto* (causal comparative research) research design. *Ex-post fact* research determines and reports the way things are (status quo). The design begins with a noted difference(s) between groups in this case teacher characteristics and look for possible causes for or consequences of this difference. In this study the researcher looked at teacher characteristics and how they influence their perception of their preparedness to teach secondary school mathematics Using facilitation Methods. Fraenkel and wallen (2000) identifies three types of Causal comparative research design; the first type explores the effects caused by membership in a given group, the second explores consequences of intervention and the third explores the causes of group membership. The current study falls into the first category where exploration of effects caused by membership in a given group on teachers' perception of their preparedness to teach secondary mathematics. Samples of 300 respondents were study out of 1500 Mathematics Teachers in Rift Valley Province. The data were analyzed using both descriptive and inferential statistics. The hypotheses were tested using t-test and ANOVA to establish differences by teacher characteristics.

Differences in Mathematics Teachers' Perception of their Preparedness to Apply Facilitation teaching Approaches in Secondary School Mathematics lessons by teacher characteristics

Table 1

Mean Scores on Teachers' Approaches to Teaching

	N	Mean	SD
Develop students' conceptual understanding of mathematics	297	4.1077	.62209
Provide deeper coverage of fewer mathematics concepts	294	3.9184	.87444
Make connections between mathematics and other disciplines	296	3.8818	.90734
Manage a class of students engaged in hands-on/project based work	295	3.6441	.89524
Have students work in cooperative learning groups	298	4.0705	.80721

The results show that teachers perceive themselves to be prepared to use facilitation approach to teaching. Teachers perceive themselves to be good at developing conceptual understanding of mathematics and having students work cooperatively in learning groups. There is however an indication that teachers do not excel in connecting mathematics to other disciplines and in managing a class engaged in hands on activities. The findings show that teachers do not involve learners in hands-on activities yet this is the most suitable approach to leaning mathematics.

Differences in Mathematics Teachers' Perception of their Preparedness to Apply Facilitation teaching Approaches in Secondary School Mathematics lessons by Teaching Experience

The null hypothesis to be tested H_o1: $\mu_1 = \mu_2 = \mu_3 = \mu_4$ against the alternative hypothesis H_A1: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$ at α=0.05.

Teaching approaches can take two forms namely transmission and facilitation teaching. Each of these approaches has its merits and demerits. Transmission is majorly teacher centred while facilitation teaching is majorly learner centred, which involve activity sessions. Table 2 gives a descriptive report of teachers' perception of their preparedness to apply facilitation teaching in secondary school mathematics. The Table provides the mean score of teachers' perception based on their experiences. The results show the mean score of four groups of teachers based on their teaching experience, which include teachers with below five years teaching experience, five to ten years, eleven to fifteen years and over fifteen years teaching experience.

Table 3

ANOVA Results Showing the Difference in Mathematics Teachers' Perception of their Preparedness to Apply Facilitation Methods to Teach Secondary School Mathematics by Teaching Experience

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.378	3	.793	3.307	.021
Within Groups	70.216	293	.240		
Total	72.594	296			

Critical values $F_{(df = 3,293,\ \alpha = 0.05)} = 2.60$

The ANOVA results indicate that the calculated F = 3.307 is higher than the Critical value of F= 2.60 at α =0.021≤ 0.05, level of significance, which indicate that there is a statistically significant difference in teachers' perception of their preparedness to apply facilitation approaches to teach mathematics. Based on these findings the null hypothesis that states, there is no statistically significant different in teachers' perception of their preparedness to apply facilitation teaching approaches in secondary school mathematics lesson by experience that is H_o1: $\mu_1 = \mu_2 = \mu_3 = \mu_4$ at α=0.05 is therefore rejected. The findings show that mathematics teachers are facilitators of learning, however it is shown that teachers who have been in the field for eleven to fifteen years are seen to be more facilitation in their teaching followed by the young teachers. This shows that the group of teachers of eleven to fifteen years teaching experience have settle down to teaching and focus on students 'performance. The younger teachers on the other hand are still trying to prove that they are qualified to teach secondary school mathematics and practice the best approaches they have learned in college. Other studies, Hawkin et al (1998) have reported that teaching experience is related to students' achievement however the relationship may not be linear. They reported that the benefits of experience are reported to level off after five years. This is to say that new mathematics teachers will have gain enough experience after teaching for five years and they can now work at the same level of performance as the older teachers. Other studies has also reported contrary results which show that number of years of teaching is not associated with students' achievement (Hanushek, 1997; Wenglisky, 2002). In this study it is shown that the most experienced teachers perceive themselves to be less facitators than the less experienced teachers. This perception can influence the way mathematics is taught in secondary school which in turn affect students' achievement in the subject.

Post Hoc results which gives the multiple comparisons of the four groups help determine which particular groups differ statistically in their perception of their preparedness to apply facilitative teaching methods. The results show which particular groups differ significantly at α =0.05, significance level. The categories of teachers' experience include; below five years teaching experience, five to ten years teaching experience, eleven to fifteen years and over fifteen years teaching experience.

Table 4

Post Hoc with LSD Results Showing which Particular Pairs of Teaching Experience Differ Significantly At α =0.05 Level Of Significance

(I)Teaching experience	(J) Teaching experience	Mean Difference (I-J)	Sig.
Below five years	five to ten years	.10724	.128
	Eleven to Fifteen years	-.03927	.647
	Over fifteen years	.21767*	.008
five to ten years	Below five years	-.10724	.128
	Eleven to Fifteen years	-.14651	.097
	Over fifteen years	.11043	.191
Eleven to Fifteen years	Below five years	.03927	.647
	five to ten years	.14651	.097
	Over fifteen years	.25694*	.009
Over fifteen years	Below five years	-.21767*	.008
	five to ten years	-.11043	.191
	Eleven to Fifteen years	-.25694*	.009

Critical values $F_{(df = 293,\ \alpha = 0.05)} = 3.84$,

Post Hoc results indicate that there is a statistically significant difference between the teachers with a working experience of over fifteen years with those below five years teaching experience. There is also a statistically significant difference between the group with over fifteen years teaching experience and those with eleven to fifteen years teaching experience. The results indicate that the most experienced teachers are less prepared than the younger teachers. This could be attributed to improved training of teachers on facilitation teaching approaches such as activity methods which is currently championed by mathematics educators.

Differences in Mathematics Teachers' Perception of Their Preparedness to Apply Facilitation Teaching Approaches in Secondary School Mathematics Classroom by Qualification

The null hypothesis to be tested $H_o1: \mu_1 = \mu_2 = \mu_3$ against the alternative hypothesis $H_A1: \mu_1 \neq \mu_2 \neq \mu_3$ at α=0.05.

Secondary school teachers in Kenya have undergone different training programmes, some hold a diploma in education while others hold a university degree or post graduate qualification. All this varied qualification can bring about differences in their classroom practices. Table 5 shows the descriptive results of teachers' preparedness to apply facilitation teaching approaches to the teaching of mathematics. The table provides the means and standard deviations based on teacher qualification. The groups involved are post graduate teachers, graduate teachers and diploma teachers.

Table 5

Descriptive Results Showing the Mean Scores of Teachers' Perception of Their Preparedness to Apply Facilitation Procedures by Experience

Teaching Experience	N	Mean	SD
Post graduate qualification	27	3.9408	.50404
Bachelors degree	194	4.0042	.47627
Diploma	77	3.8386	.52633
Total	298	3.9557	.49563

The findings indicate that teachers with the first degree have a higher mean score (4.00) followed by those with post graduate qualification (3.94) and lastly by the diploma holders (3.84). The findings show that mathematics teachers have high perception of their abilities to apply facilitation methods in the teaching of secondary school mathematics with an overall mean score of 3.96 points. The high mean score of bachelors degree graduate could be explained by their feeling that they are qualified to teach mathematics at secondary school and would apply all available methods without any difficulty. The post graduate teachers though equally qualified feel they can teach more appropriately at a higher level and always look out for new openings hence have no time to prepare or try out new methods. The diploma graduate may feel inadequate to try new approaches because they imagine that they can do better if they go in for a higher qualification. Yara (2009) reported that the attitude of the learners can be influenced by the attitude of teachers and their teaching methods. This shows that the perception teachers have about their preparedness can influence the learning of mathematics at the classroom level. Kolb and Kolb (2008) noted that the use of appropriate teaching methods by science and mathematics teachers plays a key role in helping learners develop their ideas and process skills such as observation, hypothesis, investigating and drawing conclusions. All is only possible when teachers use facilitation methods of teaching. Ogbonnaya (2007) affirms that teaching practice is a critical factor in promoting students achievement in mathematics. Wenglishky (2002) however, notes that teacher practices can either greatly facilitate student learning or serve as an obstacle to it. There is need therefore for teachers to apply teaching approaches that facilitate learning which is what good teaching practice is all about.

Table 6 gives the differences in teachers' perception of their preparedness to apply facilitation approaches in the teaching of mathematics. Analysis of variance has been used to find the differences between the groups. The groups are post graduate teachers, graduate and diploma holders.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.518	2	.759	3.133	.045
Within Groups	71.439	295	.242		
Total	72.957	297			

Critical values $F_{(df = 2,295,\ \alpha = 0.05)} = 3.00$

The findings show that the calculated F = 3.133 is higher than the critical value of F = 3.00 at p = 0.045≤ 0.05 level of significance. These indicate that there is a significant difference in teachers' perception of their preparedness to apply facilitation approaches in the teaching of mathematics. The null hypothesis which states that there is no statistically significant difference in teachers' perception of their preparedness to apply

facilitation teaching approaches to teach secondary school mathematics by qualification that is The null hypothesis to be tested H_o1: $\mu_1 = \mu_2 = \mu_3$ at $\alpha=0.05$ is therefore rejected. The results confirm that there are differences in teachers' perception of their preparedness which results from the difference training backgrounds. These different training backgrounds inform their perception such that the diploma holder feels he/she needs more training while the teachers with higher qualifications are pre-occupied with searching for new openings. These differences may impact on the teachers' classroom practices and even affect students learning.

Post Hoc analysis was run to clearly bring out which particular groups differ significantly than the others. The groups involved are mathematics teachers with following qualifications; post graduate teachers, graduate teachers and diploma holders. The Post Hoc results are presented in Table 7.

Table 7

Post Hoc Results With LSD to Show Which Particular Groups Differed Significantly at α=0.05 Level of Significance

(I) Qualification	(J) Qualification	Mean Difference (I-J)	Sig.
Post graduate qualification	Bachelors degree	-.06335	.531
	Diploma	.10222	.354
Bachelors degree	Post graduate qualification	.06335	.531
	Diploma	.16557*	.013
Diploma	Post graduate qualification	-.10222	.354
	Bachelors degree	-.16557*	.013

Critical values $F_{(df = 295,\ \alpha = 0.05)} = 3.84$

The Post Hoc results show that there is no significant difference between teachers with post graduate qualification and teachers with Bachelors degree. There was also no significant difference between teachers with post graduate and diploma teachers. There was however a statistically significant difference between Bachelors degree holders and diploma holders at $\alpha = 0.05$ level of significance in favour of the degree holders. This could be an indication that degree holders are more confident in their teaching than the diploma holders. The degree graduates feel that they have been exposed to current approaches and act as facilitators of learning. The diploma holders on the other hand though they apply facilitation teaching may feel that more professional training is still required.

Differences in Mathematics Teachers' Perception of Their Preparedness to apply facilitation teaching approaches in Secondary school Mathematics Classroom by Gender

The null hypothesis to be tested H_o1: $\mu_1 = \mu_2$ against the alternative hypothesis H_A1: $\mu_1 \neq \mu_2$ at $\alpha=0.05$.

Gender as a factor in teaching may bring about differences in teachers' classroom practice. The interaction between teachers may differ depending on the gender of the students and this can hinder the way teachers give instruction in class. Table 8 provide the gender mean scores in teachers' perception to apply facilitation approaches to teach secondary school mathematics. The table provides the mean score and standard deviation for each gender.

Table 8

Descriptive Results Showing the Mean Score of Teachers' Perception of Their Preparedness to Apply Facilitation Teaching Approaches by Gender

Gender	N	Mean	SD
Male	229	3.9298	.50379
Female	69	4.0580	.47679

The findings indicate that both the male and female teachers rated themselves highly in terms of their level of readiness to apply all approaches of pedagogy. The female teachers had a higher mean score of 4.05 while the male teachers had a mean score of 3.93; however the difference in the scores is negligible.

Table 9 provides the results for independent sample t test. The findings show whether there is a difference by gender in teachers' perception of their preparedness to apply facilitation teaching approaches in the teaching of secondary school mathematics.

Table 9

Difference in Mathematics Teachers' Perception of Their Preparedness to Apply Facilitation Approaches to Teach Secondary School Mathematics by Gender

	N	df	t	Sig. (2-tailed)
Equal variances assumed	298	296	-1.875	.062
Equal variances not assumed	298	117.482	-1.931	.056

Critical values $t_{(df = 296,\ \alpha = 0.05)} = 1.645$

The t test results indicate that the calculated value of t (-1.875) is higher than the critical value of t (1.645) at $\alpha = 0.05$, level of significance. This results show that mathematics teachers are prepared irrespective of their gender. The null hypothesis that states that there is no statistically significant difference in teachers' perception of their preparedness to apply facilitation teaching approaches by gender that is H_o1: $\mu_1 = \mu_2$ at $\alpha=0.05$ is retained. The results suggest that a teachers' gender does not influence classroom practice in secondary school mathematics lessons. This is to say that once a teacher has undergone some teacher training, they can teach mathematics effectively and gender is not a hindrance. Milton et al (2007) noted that the desired outcome of any mathematics teacher training institution is to graduate teachers who are competent to teach mathematics at secondary school irrespective of their gender.

Summary of Findings

The following are the main findings of the study;

i. There is a statistically significant difference in mathematics teachers' perception of their preparedness to apply facilitation methods to teach secondary school mathematics by teaching experience
ii. There is a statistically significant difference in mathematics teachers' perception of their preparedness to apply facilitation methods to teach secondary school mathematics by qualification

Recommendations

i. A research should be carried out to identify skills gap among mathematics teachers and identify training needs for the teachers.

ii. A class observation research should be carried out to identify which instructional approaches are used by mathematics teachers and establish the reasons why other approaches are not applied.

References

Bigelow, W. (1990). Inside the classroom; Social Vision and Critical Pedagogy. *Teachers College Record, 91, 437-448*

Fraenkel, J. R. &Wallen, N. E. (2000), *How to design and evaluate research in education*.San Francisco, McGraw Hill.

Glassersfeld, E. V. (1991), *Radical constructivism in mathematics education.* Boston. Kluwer Academic publishers.

Hanushek, E. A. (1997). Assessing the effect of school resources on students performance: an update. Educational Evaluation and Policy analysis, 19(2), 141-164.

Kinyua, E. (2001 march 12th). College admission under the microscope: Trainee teachers failed in mathematics and English at K.C.S.E *Daily Nation* pp. 17.

Kolb, A. Y., & Kolb, D. A. (2008). Experential learning Theory: A Dynamic Holistic Approach to management Learning. Education and Development in Armstrong, S. J. And Fukami, C. (eds). *Handbook of Management Learning Education and Development.*London, Sage Publications.

Milton, M., Rohl, M. and House, H. (2007).*Secondary beginning teachers' preparedness to teach literacy and numeracy* ; A survey.

Salman, M. F., (2009). Active learning techniques (ALT) in mathematics workshop; Nigerian primary school teacher's assessment. *International Electronic Journal of Mathematics Education: 4 no. 1 (www,iesme.com)*

Ogbonnaya, U. I. (2007). *The Influence of teachers' Background Professional Development and Teaching Practices on Students' Achievement in Mathematics in Lesotho*. Unpublished M. Ed. Thesis.

Petty, G. (2004). *Formative teaching methods; A practical guide (3rd Ed.).* Nelson Thornes, Cheltherham

Wenglinsky, H. (2002). How school matter: The link between teachers' classroom practices and students' academic performance. Education Policy analysis. Archieves 10(2) retrieved 12, 2006 available http://epaa.asu.edu/epaa/v10n12

Yara, P. O. (2009). Students' Attitude towards Mathematics and Academic Achievement in some Selected Secondary Schools in Southwestern Nigeria. *European Journal of Scientific Research: 36 (3) 336-341.*

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar