Teachers' Attitude towards Teaching Following In-service Teacher Education Program in Kenya

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Abstract

This paper assesses the extent to which teachers' attitude towards chemistry teaching changes following a needs-and participatory-oriented in-service teacher education program in Kenya. Thirty six (36) randomly selected veteran teachers from 36 schools who attended a ten-day in-service program in Kenya. Teachers actively participated in formulation of session objectives and training sessions that involved practical and peer-teaching sessions, and made reflections on each training session. Data were collected using validated questionnaire before start of workshop sessions and at the end of training sessions. Data were analyzed using means, standard deviations, comparison of means using two-sample t-procedures, and effect size based on Cohen's guidelines. From the study findings, there is sufficient evidence to conclude that teachers appear to have a positive change in attitude towards: teaching objectives; teaching strategies; lesson planning; ability to overcome teaching limitations; conducting practical work; and overall teaching of chemistry following in-service program focusing on teaching enhancement. The findings have implications on curriculum for pre-service teacher preparation and in-service professional development of science teachers. The findings also have implications on teachers' classroom practices and instructional supervision in schools.

Key words: Attitude, chemistry, in-service teacher, teaching, teacher education, Kenya

1. Introduction

Chemistry is one of the secondary school science subjects. People rely on science, especially chemistry, in areas such as communication, transport and medicine, among others (Otor, 2010). Chemistry is an experimental science that is activity based (Agogo and Otor, 2013). This calls for enhanced activity-based teaching and learning processes in schools. The current status is that students are usually taught chemistry using theoretical approaches that are inadequate in enhancing student learning about science subjects such as chemistry (Ikeobi, 2010). Practical approaches to science teaching are required to enhance student achievement in the sciences. Teaching chemistry through experimentation enables teachers and students to verify concepts, theories, laws and principles of chemistry in the laboratory. Student achievement in

chemistry may be hindered by inadequate facilities and materials for practical work (Achumugu, 2012), and shortage of qualified chemistry teachers in schools (Fatokun, 2012). This concurs with other studies that found out that inadequate provision of teachers, teaching materials and motivation contributes to students' low achievement in science examinations (Agogo and Onda, 2014; Uchegbu, Anzieh, Mbadiugha, Ibe , and Njoku, 2015).

Students have apprehensions about some chemistry topics such as the "mole concept" and the Periodic Table, partly due to their attitudes towards the topics or the way they are taught in school (Inyega, 2011; Chomchid, Inyega, and Thomson, 2009). Other studies have been conducted on assessment of difficult areas in senior secondary school chemistry syllabus in Nigeria. Correlations between students' perceived difficulty and their achievement in a test and relationship between students set and their perception of difficulties were examined using a difficulty rating scale questionnaire and a chemistry achievement test. The study found out that 42% of the chemistry topics were perceived as difficult by students due to unfamiliarity with or too demanding ideas, confusing language, insufficient explanations and practical work, topics being too mathematical, and lack of interest among both sexes (Uchegbu, Oguoma, Elenwoke, & Ogbuagu, 2016). Another study in Nigeria found out that students perceive 65% of chemistry topics as difficult to comprehend but except for school nature, students' gender and school location have no influence on students' perception of difficulty topics in chemistry (Jimoh, 2010).

One way to address students' apprehensions to some chemistry topics is through in-service programs focusing on improvement of teachers' pedagogical content knowledge in the said topics (Inyega, Thomson, Butler, and Inyega, 2010). There is need to teach chemistry with full students' involvement because chemistry is an experimental science which relies primarily on the relationship between theory and experiment (Ikeobi, 2010). In so doing, students experience the study of chemistry, and acquire desirable practical skills as they observe, handle materials/chemicals, and prepare chemicals/reagents (Ikeobi, 2010). In-service programs to enhance teachers' classroom practices and students' achievement in chemistry are also required (Inyega, Thomson, Butler, and Inyega, 2010).

Laboratory activities enable students to interact with materials and/or with models in order to observe and understand connections between science and the natural world. The activities are importance in science and chemical education. They have a potential of enhancing students' conceptual understanding, motivation and attitude with respect to science learning, problem solving abilities, and understanding of nature of science. For example, students' attitudes towards science and their anxiety levels with respect to science courses affect their learning or achievement in science. Students with positive attitudes towards science or chemistry are likely to be successful in chemistry lessons. To address this, teachers need adequate pedagogical content knowledge to be able to handle various students in a chemistry class. This calls for in-service programs that focus on enhancing teaching-learning processes in the topics that students find difficulties in (Inyega, 2011). Students should be encouraged to develop positive attitudes towards learning about science and helped to decrease anxiety which, as one of the affective dimensions of learning, has a detrimental effect on students' learning and performance in a laboratory and classroom environment. A student anxious about chemistry laboratory work is likely to carry out laboratory activities poorly. The time

required to interact and reflect in chemistry is wasted through anxiety. Students require sufficient time and opportunities for interaction and reflection in chemistry laboratory work (Kurbanoglu & Akim, 2010).
Against this background, an in-service program was conducted for veteran teachers on how to improve on the teaching-learning processes in the topics that students found difficult in (Inyega, 2011). The teachers underwent the training program using the very methods, strategies, and approaches they were expected to apply while teaching chemistry in schools. This research sought to document the extent to which the in-service teachers changed their attitudes towards the teaching of chemistry topics that students perceive to be difficult to comprehend including: "mole concept", organic chemistry, Periodic Table, and chemistry experiments (Inyega, 2011, Chomchid, Inyega, and Thomson, 2009).

2. Method

In-service training workshop for chemistry teachers focused on teaching objectives, strategies and approaches, lesson planning, simple class experiments, rationale for experimental work, and resource materials in chemistry. The Workshop involved discussions and peer teaching sessions aimed at exposing teachers to salient features of classroom practices. Specifically, the study focused on 36 identified veteran science teachers from a representative sample of 36 schools from selected regions in Kenya, attending a ten-day teacher education program. The study sought to find out whether teachers who undergo a participatory professional needs-based in-service training program result in change in attitude towards their pedagogical content knowledge. The study answered the following questions: To what extent do teachers who undergo an in-service training program on pedagogy change their attitudes towards: teaching objectives; teaching strategies and approaches; work planning; ability to overcome teaching limitations; and conducting practical work in chemistry?
Validated in-service training evaluation questionnaire was administered before and at the end of the training sessions to 33 and 36 veteran teachers, respectively. Teachers responded to items in the questionnaires by indicating the extent to which they agreed or disagreed with the written item statement on teaching issues. Scoring was based on a 5- point Likert scale: –2 (Strongly Disagree); -1 (Disagree); 0 (Not Sure); 1 (Agree) and 2 (Strongly Agree). For comparison purposes, the responses were condensed into a rating scale of –1 to +1. A score of –2 or -1 became –1, a score of 0 remained 0 while a score of +1 or +2 became +1 on the condensed scale. On each scale, a negative value indicates a negative attitude towards the issue raised by the questionnaire item, a positive value indicates a positive attitude, and a zero value represents a neutral attitude. Items in the evaluation instruments were grouped into five categories based on the type of attitude to be assessed. The categories include attitude towards: teaching objectives; use of teaching strategies and approaches; work planning; ability to overcome teaching limitations; and conducting practical work in chemistry.
Data were collected and analyzed category-by-category. Means and standard deviations were computed and comparison of means done using two sample t-procedures to determine whether there is a significant change in the teachers' attitude towards teaching and learning of chemistry after undergoing a participatory- and needs-oriented professional development program. The effect size was also computed and interpreted based on Cohen's guidelines.

3. Results

In-service teachers responded to individual statements regarding their opinion towards teaching objectives in chemistry. The results are shown in Table 1.

Table 1: Teachers' Attitude towards Chemistry Teaching Objectives

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.59	.29					
Post-Training Assessment	36	.88	.10					
Comparison of Means				.0513	-5.65	< .001	-1.33	(-.393, -.187)

$t^*_{67, .05} = 2.000$

The result is statistically significant (t= -5.65, p< .001) and based on Cohen's guidelines on effect size, the results are practically important (d= -1.33). This shows that there is a positive change in teachers' attitude towards chemistry teaching objectives after undertaking an in-service program in which they are actively involved.

The study also sought to establish teachers' attitude towards teaching strategies and approaches in chemistry. The results are presented in Table 2.

Table 2: Teachers' Attitude towards Teaching Strategies/ Approaches in Chemistry

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.57	.38					
Post-Training Assessment	36	.92	.08					
Comparison of Means				.065	-5.38	< .001	-1.30	(-.48, -.22)

$t^*_{67, .05} = 2.000$

The result is statistically significant (t= -5.38, p< .001) and based on Cohen's guidelines on effect size, the results are practically significant (d= -1.30). This shows that there is sufficient evidence to support the statement that teachers appear to have a positive change of attitude towards chemistry teaching strategies and approaches following a participatory-based in-service program.

The study also sought to find out whether teachers' attitude towards planning for chemistry teaching changes after undergoing a needs-oriented in-service training program. The results are presented in Table 3.

Table 3: Teachers' Attitude towards Work Planning in Chemistry

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.84	.15					
Post-Training Assessment	36	.99	.03					
Comparison of Means				.026	-5.77	< .001	-1.43	(-.202, -.098)

$t^*_{67, .05} = 2.000$

The result is statistically significant (t= -5.77, p< .001) and based on Cohen's guidelines on effect size, the results are practically important (d= -1.43). This implies that there is sufficient evidence to support the statement that teachers are likely to have a positive change in their attitude towards work planning in chemistry after undertaking a participatory-based in-service course.

The study also sought to establish teachers' attitude towards one's ability to overcome teaching limitations in chemistry. The results are obtainable in Table 4.

Table 4: Teachers' Attitude towards Limitations in Teaching Chemistry

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.08	.71					
Post-Training Assessment	36	.78	.19					
Comparison of Means				.123	-5.69	< .001	-1.38	(-.823, -.454)

$t^*_{67, .05} = 2.000$

The results are statistically significant (t= -5.69, p< .001) and based on Cohen's guidelines on effect size, the results are practically significant (d= -1.38). This indicates that there is sufficient evidence to support the statement that teachers are likely to have a positive change of attitude towards their ability to overcome teaching limitations in chemistry after undergoing an in-service program on the same.

The study further sought to ascertain teachers' attitude towards conducting practical work in chemistry. The results are presented in Table 5.

Table 5: Teachers' Attitude towards Practical Work in Chemistry

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.34	.14					
Post-Training Assessment	36	.78	.19					
Comparison of Means				.041	-10.86	< .001	-2.63	(-.521, -.359)

$t^*_{67, .05} = 2.000$

The results are statistically significant (t= -10.86, p< .001) and based on Cohen's guidelines on effect size, the results are practically significant or important (d= -2.63). This shows that there is sufficient evidence to

support the statement that teachers appear to change their attitudes towards conducting practical work in chemistry after undertaking an evidence-informed in-service training program on practical work in science. The study also sought to determine teachers' attitude towards teaching of secondary school chemistry. The results are shown in Table 6.

Table 6: Teachers' Attitude towards Teaching of Chemistry

	n	μ	σ	SE	t	p	ES (d)	95%CI
Pre-Training Assessment	33	.48	.29					
Post-Training Assessment	36	.87	.09					
Comparison of Means				.051	-7.65	< .001	-1.86	(-.492, -.288)

$t^*_{67, .05} = 2.000$

The results are statistically significant (t= -7.65, p< .001) and based on Cohen's guidelines on effect size, the results are practically significant or important (d= -1.86). This shows that there is sufficient evidence to support the statement that there is a positive change in teachers' attitudes towards teaching secondary school chemistry following in-service professional development that focuses on teaching enhancement.

4. Discussion

All the computed t-values, p< .05, and the standardized mean differences gave a large effect size based on Cohen's guidelines in which an effect size of .8 is considered to be large for a result to be practically significant. It can be argued that the pre-training assessment results show that teachers' attitude towards issues on all the five categories regarding chemistry (teaching purpose, teaching strategies and approaches, work-planning, teaching limitations, and practical work) was fairly positive. This improved positively during and after participatory- and needs-oriented in-service training sessions. Perhaps, this is due to the topic areas covered during the workshop sessions and the participatory approach employed during the training. Bear in mind that needs assessment had been done and the curriculum subjected to stakeholder analysis. Teachers had an opportunity to go through the topic areas and make suggestions at the start of the workshop. Teacher involvement not only validated the funds of knowledge they brought with them but also assured them that their views are valid and valued. Affirmation and validation have important implications not only in buy-in in any project but has an effect on level of participation and/or engagement. It is evident from the findings that there is a positive change in teachers' attitude towards teaching objectives when they

are actively involved in in-service training activities. Teachers not only make sense of teaching purpose but also construct meaningful knowledge on teaching issues in the teaching and learning process and where emphasis should be laid.

The study also found sufficient evidence to support the assertion that teachers appear to have a positive change of attitude towards teaching strategies and approaches following a participatory-based in-service program. This might be attributed to the fact that teachers focused on hands-on, heads-on, and hearts-on activities using the very strategies and approaches they are expected to use when teaching in schools. These three dimensions are linked and aligned with the cognitive, psychomotor and affective domains of learning.

It was also evident from the findings that teachers are likely to have a positive change in their attitudes towards work planning in chemistry after undertaking a participatory-based in-service course. It can be argued that many teachers hardly prepare schemes of work and lesson plans the way they are prepared during pre-service studies. The only time that teachers take teaching preparation and planning seriously is during their teaching practice in schools prior to their graduation. Upon graduation and with experience, many teachers predominantly rely on their lesson notes to serve both as schemes of work and lesson plan. However, during the workshop, the teachers prepared a user-friendly framework to be used in lesson planning. The framework significantly reduced the time teachers spend in lesson preparation and planning. Noteworthy, the teachers' efforts would be rewarded through preparation of samples of the work plan in specific topics of high school chemistry and try them out in order to determine their suitability. This would also determine the workability of the model in the actual classroom situation for adoption and general use.

Another study finding is that teachers are likely to have a positive change of attitude towards their ability to overcome teaching limitations in chemistry after undergoing an in-service program that specifically addresses challenges and provides practical ways of overcoming teaching challenges. Many high school teachers in Kenya are apprehensive to teach topics such as 'the mole concept' and face challenges in making laboratory solutions or improvising teaching materials for science in poorly resourced rural schools. An in-service program that makes teachers aware of the teaching challenges and provides suggestions on how teaching limitations can be overcome, is likely to have a positive impact on not only teachers' attitudes, but also their classroom practices (Inyega, Thomson, Butler, and Inyega, 2010).

The study also found sufficient evidence to support the statement that teachers appear to change their attitudes towards conducting practical work in chemistry after undertaking an evidence-informed in-service training program on practical work in chemistry. Perhaps due to inadequate provision of laboratory equipment, apparatus, and chemicals in schools, many teachers tend to teach chemistry theoretically with occasional teacher demonstration sessions. Before the workshop, teachers indicated that they had difficulties in conducting chemistry practical work in schools. Training sessions were dedicated to practical work and addressed the issue of improvisation using locally available materials where conventional equipment/apparatus may be inadequate and or not available at all. It is most likely that organized peer teaching sessions during the workshop might have also helped teachers to encounter and deal with some teaching challenges in a practical way.

From the study findings, there is also sufficient evidence to support the assertion that teachers have a positive change in attitude towards teaching secondary school chemistry following in-service professional

development programs aimed at enhancing teaching as a whole. This may be attributed to the fact that the in-service curriculum was based on a baseline survey of teachers' pedagogical needs and active involvement of the teachers in workshop activities. In addition teachers' daily reflections on material covered in each session might have contributed positively to the teachers' overall view of teaching chemistry in schools.

5. Conclusion

It is evident from the findings that needs- and participatory-oriented in-service professional development programs for teachers is beneficial and leads to positive change in teachers' attitude towards teaching and learning objectives, use of appropriate teaching strategies and approaches, work planning, ability to overcome teaching limitations, and conducting practical work in chemistry.

6. Recommendations

There is need to prepare a set of relevant activities for in-service training programs such as resource materials on how teachers can cope up with issues that affect effective classroom teaching and learning. Issues to be addressed include: school duties other than teaching; large student/teacher ratio; low morale among fellow teachers; low morale among students; individual differences among students. There is need to focus on handling gifted students in science classrooms to adequately cater for their unique needs to avoid having them being treated as normal students in class. In so doing, many students will be encouraged to pursue science-oriented careers.

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