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SPATIAL LEARNING STRATEGIES AND ATTITUDES OF SOCIAL STUDIES STUDENTS TO SUSTAINABLE DEVELOPMENT ISSUES

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Abstract

Education for Sustainable Development (ESD) aims at promoting not only knowledge but also feelings and values that reflect commitment to its goals. This study investigated the relative effects of concept mapping and framing on attitude towards eight issues of sustainable development as well as the interaction effects of gender and locus of control on the two spatial learning strategies. It adopted a pre-test, post-test, control group quasi-experimental design with one hundred and twenty-two (122) JSS II students from three secondary schools as participants. A researcher-designed Sustainable Development Attitude Questionnaire (SDAQ) and the Rotter's Locus of Control Scale (RLCS) were the main instruments while the Analysis of Covariance (ANCOVA) was used to test seven hypotheses at 0.05. Results revealed a significant main effect of treatment on students'

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attitude towards sustainable development concepts (F (2,109) = 4.1660, p < 0.05). Gender also had a significant main effect on attitude towards the sustainable development issues (F (1,109) = 5.508, p < 0.05), and there was equally a significant interaction effect of treatment and locus of control on the students' attitude (F (2,109) = 3.517, p < 0.05). The study supported the use of spatial learning strategies in promoting ESD and also made some other recommendations.

Keywords: Spatial learning strategies, Concept mapping, Framing, Gender, Locus of control

Backkground to the Study

Researchers and activists in sustainable development (SD) have consistently stressed the importance of education for raising awareness and knowledge about SD issues, developing skills for responding to related challenges, and fostering appropriate values and attitudes for the overall benefits of the individuals, nation-states and the entire humanity (Vanhear, & Pace, 2008; Torbjornsson, Molin, & Kerlberg, 2011; Ogunbiyi & Ajiboye, 2009; Omofonmwan, & Osa-Edoh, 2017). The Bruntland Commission defined sustainable development as human activities that meet the needs of the present generation without compromising the ability of future generations to meet their own needs (United Nations, 1987). In the continued search for ways of actualising the Bruntland's report, local and international efforts have underscored the centrality of education. For instance, the United Nations Conference on Environment and Development (UNCED), in 1992, adopted the Rio Declaration that includes Agenda 21 as a programme of action (Houstsonen, 2004). Education, which includes raising public awareness and training of children and youth in sustainable development issues, is linked to virtually all areas in Agenda 21 (United Nations, 1992; Ogunyemi, 2005).

The place of education in promoting sustainable living was further brought to light when, in December 2002, the United Nations declared a decade of Education for Sustainable Development (DESD) spanning 2005-

2014. More recently, when the Sustainable Development Goals (SDG), designed to offer "better coverage of, and balance between, the three dimensions of sustainable development: social, economic and environmental" (Angelis, n.d: 1), replaced the Millennium Development Goals (MDGs) as from 2015, education was accorded 4th position among the seventeen goals. The UNESCO (2017) argued that education is crucial for the achievement of sustainable development goals. "To create a more sustainable world and to engage with sustainability-related issues as described in the SDGs, individuals must become sustainability change-makers." (UNESCO, 2017: 7). These individuals, according to UNESCO, require knowledge, skills, values and attitudes that empower them to contribute to sustainable development.

It must be stressed, however, that it is not all kinds of education that can lead to the attainment of sustainable development goals. This realisation demands that the contents and methods of education must be put in proper context to ensure that the underlying principles of ESD are not overlooked. Indeed, any education that aims at producing "sustainability change-makers" must be approached in a manner that "empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society for present and future generations" (UNESCO 2017: 7). Therefore, the issue of methodology for developing the required values and attitudes in sustainable development issues, particularly within the school system, requires continuous exploration if any significant impact is to be achieved by the year 2030 when progress in the new SDGs would be evaluated.

The present study was designed within the foregoing context of the search for appropriate methods of fostering positive attitudes towards education sustainable development. Based on the metacognitive theory, which requires learners to reflect on the thoughts behind their actions or inactions (Flavell, 1987), the study explored the relative effects of two spatial learning strategies – concept mapping and framing – on attitudes of junior secondary school social studies students to four sustainable development themes. The SD themes are Environmental Sustainability, Socio–cultural Sustainability, Economic Sustainability, and Political Sustainability. Eight concepts/issues, which are related to the themes, were extracted from the curriculum (NERDC, 2007) for the purpose of the

experiment. These are: malnutrition, preventable diseases, environmental pollution, ozone layer, level of income, unemployment, democracy and rule of law.

Literature Review

Sustainable development is a broad field. Houtsonen (2004) identified three basic elements of the discourse on sustainable development as ecological sustainability, economic sustainability and socio–cultural sustainability. However, Maurice (2008) added two other elements which are political sustainability and resources sustainability. Maurice argued that political sustainability is essential to overall sustainability; that to accomplish sustainable development, people must be in control and conflict must be avoided; and that there is need for people-centred democracy and stable political system to be established. Resources sustainability, according to Maurice, means sustainable use of the resources that are available on the planet Earth. These include energy, air, soil, mineral, water and the living organic material. This study focused on four categories of Sustainable Development which are Environmental, Socio–cultural, Economic and Political Sustainability as earlier alluded.

Nnabuo and Asodike (2013) regarded education for sustainable development (ESD) as a holistic approach for school management and the curriculum, not a separate subject. As they argued, ESD requires reflection on what to teach, and how to teach in order to clarify and extend the ability of students to think for themselves, reflect and debate issues to enable them form their own opinion, and foster learning that emerges from discovery and relevant to the learners' life experiences. Schools were traditionally designed to provide training in basic skills of reading, writing and counting. Modern-day responsibilities of schools, however, include provision of social and civic competences to make them useful adults, preserving social and cultural practices and providing opportunity to participate in healthy games and exercise. Contemporary schools are also seen as agents of change through fostering and disseminating ideas, and all sectors of education (formal, informal and non-formal) are relevant to achieving this goal (Nnabuo & Asodike, 2013).

Social Studies or Citizenship Education is one of the carrier subjects for SD concepts/issues at the school level in many parts of the

world. The school subject focuses on human interactions and problems of human survival in their environment (Ogundare, 2003; Ogunyemi, 2006). It is the study of human activities which require thinking, decision-making, value analysis and inquiry skills. It focuses on human activities in the physical and social environment with emphasis on cognition, functional skills and desirable attitude and action for the purpose of good citizenship (Ogunyemi, 2014). The role of Social Studies is to assist the citizens to make informed judgment about the nature of civil life, politics and government as well as promotion of attitudinal changes in the life of the citizens, with the resultant effect of creating effective citizenry (Sebiomo, 2012).

The goal of education for sustainable development, through social studies education, is therefore that of envisioning the production of new crop of citizens who would serve as drivers of a transformed society and are capable of working to guarantee the future of humanity. It is widely believed that the traditional teacher-dominated conventional teaching methods cannot achieve this goal (Ogunbiyi & Ajiboye, 2009). Rather, the strategies advocated are active learning, critical thinking and reflection by learning to question our current beliefs and recognising the assumptions underlying our knowledge, perspectives and opinions as well as promoting dialogue and negotiation and learning to work together through skill acquisition programmes for present and future generations (Ogundare, 2003; Gillian, Grace, Paul, Lonard, Anthony & Winthrop 2013).

Therefore, the peculiar requirements of education for sustainable development and social studies education demand innovative methods that provide learners with options and critical thinking for actions. Houtsonen (2004) recommended metacognitive strategies which emphasise thinking about thinking to achieve sustainable learning. Under matacognitive strategies, the values of sustainability are taken into account and the students are engaged with highly interactive teaching-learning processes. Vanhear and Pace (2008) and Flint (2013) saw metacognition and sustainable development as parts of a system of values and philosophy development through which humans reason and choose to live together. Metacognition allows people to think and function outside their pre-conception and make them proceed in an integrative systemic way. Since sustainable development connects the presents to the future, it is a philosophical concept which requires teaching strategies that involve thinking at a higher level that is,

thinking about what the students are thinking. For instance, Umholtz (2013) supported the use of metacognitive or constructivist strategies as a way of overcoming "the dissociation students often experience when they are barraged with example after example of environmental abuses and impending catastrophes".

Under the broad group of metacognitive strategies are spatial learning strategies (Clark, 2013; West, Farmer & Wolff, 1991). Among the spatial learning strategies are concept maping and framing which presumed to be relevant to social studies pedagogy and promotion of sustainable development (Ambruster & Gabberandson, 1987). Concept mapping allows students to internalise and graphically analyse concepts in order to achieve meaningful interpretation of issues or phenomena. Novak (1989) conceives a concept map as a diagram showing relationships among sub-concepts that portray meaning. Like in concept mapping, the use of frames is also central to the framing strategy. Chong and Druckman (2007) define framing as "the process by which people develop a particular conceptualization of an issue or reorient their thinking about an issue." This involves frames which, as in the photo frames, define the scope or boundaries for analysing and understanding the issues involved.

Both concept mapping and framing involve a wide range of activities to make learning easier and situate sustainable development issues within a constructivist philosophical framework (Gomes, Dias-Coelho, Calvalheiro & Siqueira-Batista, 2011; Revira, 2016). As averred by Katagall, Dadde, Goudar and Rao (2015), concept mapping is a powerful tool of education in four major respects: as a planned learning strategy; as an instructional strategy; as a strategy for planning curriculum; and as a means of assessing students' understanding of science concepts. Research in political communication has also shown that the way things are presented (framing) influences the choices political actors make (Halahan, 2008; Buckley & Seery, 2016; McEntire1, Leiby, & Krain, 2017). In her study's report, Al Salem (2012) concluded that, overall, parliament members in Kuwait relied mostly on the structural frame, "followed by the political, symbolic, and human resource frame respectively", and that parliamentarians' "use of frames depended on both the political group and the topic of issues" (p. 123). Nevertheless, McEntire, Leiby and Krain (2017) advised that human rights organisations "should be able to use

multiple frames in combination as needed without concern." (p. 1). Thus, both concept mapping and framing could have serious implications for attitude formation in respect of a subject of global importance such as sustainable development.

Attitude is a learned tendency to evaluate people, issues, object or events in a certain way. Such evaluations are often positive or negative, but they can also be uncertain at times (Kendra, 2014). Attitude can be explicit or implicit. Explicit attitudes are those that people are consciously aware of, and that clearly influence people's behaviours and beliefs, while implicit attitudes are unconscious but nevertheless affect people's beliefs and behaviour. It is believed that attitude has powerful effects on behaviour and the influence can also create attitude change through classical conditioning, operant conditioning and observation learning, persuasion and conflicting beliefs (Juarez-Najera, 2015).

Attitude change is one of the indicators for measuring the effectiveness of spatial learning. According to Torbjornsson, Molin and Karlberg (2011), values linked to sustainable development have been formulated by the Earth Charter, the World Summit on Sustainable Development and the Global Scenario Group. Scott and Gough (2004), Ogunyemi and Ifegbesan (2011), Ifegbesan, Ogunyemi and Rampedi (2017), among other researchers, have also stressed the need for change in attitude to improve the quality of human environment and promote sustainable development. Yet, the challenge of conclusive evidence on the potency of the advocated methods for effecting attitude change remains unresolved.

Beside methodological issues, however, gender and locus of control could possibly affect attitude to ESD issues. Gender, in the context of this research, is taken as the biological attribute of being a male or a female. Studies on effects of gender on response to environmental challenges and sustainable development are yet divided in their conclusions. For instance, Sakellari and Skanavis (2013) reported that while "literature research reports that women show stronger environmental concern and attitudes than men and although there has been a growing awareness of the importance of gender in the willingness to act environmentally, we argue that there has been relatively little recognition of its potential in the context of environmentally responsible behavior." (p. 77). Such inconclusiveness

as reported by Sakellar and Skanavis encouraged the present study to consider gender as a likely moderating variable.

Another moderating variable of interest to the study was locus of control (LoC). In line with Griffin's (2014) observation, it could be hypothesised that the attitude an individual puts forward in response to some particular situations, such as sustainable development issues, is a reflection of the dominant influences from within (Internal LoC) or those outside of them (External LoC). Alias, Akasah and Kesot (2012) reported that "civil engineering students indicate that most students tend to have internal locus of control (86%) rather than external locus of control". However, Kaliba, Isabalija, Mbarika, et al. (2011) concluded that low education and religion affiliations were determining factor for high external locus of control and readiness to conjure and believe in mystical powers among small business owners in Uganda. Investigating the source of influence (internal or external locus of control) vis-a-vis attitudinal scores of students under different instructional strategies may therefore provide additional insight into what should be done to address current deficiencies, if any, in education for sustainable development in the present study.

Statement of the Problem

The problem of this study was how to respond to the challenge posed by the need to teach sustainable development concepts and, in the long run, bring about desired responsible behaviour as part of the Junior Secondary School Social Studies programme in Nigeria. The study investigated the relative effects of concept mapping and framing strategies vis-a-vis the conventional lecture method on attitude of students. In addition, the interaction effects of gender and locus of control were also investigated.

Hypotheses

The following null hypotheses were tested in the study

Ho_1: There is no significant difference in the mean post-test attitude scores of students exposed to sustainable development concepts under the different teaching strategies.

Ho_2: There is no significant difference between the mean post-test attitude scores of male and female students exposed to sustainable development concepts under the different teaching strategies.

Ho_3: There is no significant difference between the mean post-test attitude scores of internal and external locus of control students exposed to sustainable development concepts under the different teaching strategies.

Ho_4: There is no significant interaction effect of treatment and gender on the mean post-test attitude scores of students exposed to sustainable development concepts.

Ho_5: There is no significant interaction effect of treatment and locus of control on the mean post-test attitude scores of students exposed to sustainable development concepts.

Ho_6: There is no significant interaction effect of gender and locus of control on the mean post-test attitude scores of students exposed to sustainable development concepts under different teaching strategies.

Ho_7: There is no significant interaction effect of treatment, gender and locus of control on the mean post-test attitude scores of students exposed to sustainable development concepts.

Methodology

The study adopted a pre-test, post-test control group quasi-experimental design. One hundred twenty-two (122) students in their 'intact' classes, drawn from three junior secondary schools II in Oyo State, participated in the experiment. One school from each of the three senatorial districts was randomly selected and assigned to one of three treatment conditions – concept mapping, framing and conventional methods. Three volunteer tutors who were trained for that purpose handled the implementation of the strategies at the school level. The two measuring instruments used were Sustainable Development Attitude Questionnaire (SDAQ) and Rotter's Locus of Control Scale (RLCS). SDAQ contains twenty five (25) items designed by the researchers to elicit information on students' attitude towards sustainable development issues. The RLCS consisted of twenty nine (29) items. Each item had A and B, representing internal locus of control and external locus of control respectively. The instrument was adopted from Rotter (1966) as modified by Orji (1998). The researchers also generated eight teaching materials for each of the three instructional strategies to guide interactions for the eight weeks of the experiment among

the respective groups. The first week involved both the pre-test and teaching in the three groups, while the last week also involved teaching as well as the post-test.

Data collected were analysed using descriptive and inferential statistics. Means and standard deviation scores were used to show estimates of the scores recorded according to treatment groups, gender, and locus of control. The analysis of covariance (ANCOVA) statistic was used to test the seven hypotheses raised with pre-test scores as covariates. All the hypotheses were tested at 0.05, while the multiple classification analysis (MCA) was used to explain the magnitude of post-test attitude scores of the different categories of students. The Sidak post-hoc analysis was used to explain the source and direction of the observed significant effects in respect of the tested hypotheses.

Results

The descriptive findings showed that students taught with the concept mapping strategy recorded the highest mean post-test attitude score of 54.60. The students taught using framing strategy, with the mean post-test score of 53.39, was next while those in the conventional method group recorded the least mean score of 52.87. The findings suggest that the concept mapping strategy group, with the highest mean post-test attitude score, performed best in the post-test attitude scores in sustainable development concepts. This becomes much clearer when the gain scores among the three groups are compared.

Table 1: Pre-test and Post-test attitude scores of students by treatment groups

Treatment Group		Attitude	
		Pre-test	Post-test
Concept Mapping	N	60	60
	Mean	51.17	54.60
	Maximum	5.472	6.076
	Minimum	34	35
	Std. Deviation	61	65
Framing	N	31	31
	Mean	53.10	53.39
	Maximum	6.247	4.104
	Minimum	37	46
	Std. Deviation	66	65
Conventional method	N	31	31
	Mean	58.66	52.87
	Maximum	5.741	6.438
	Minimum	49	37
	Std. Deviation	70	69
Total	N	122	122
	Mean	53.57	53.85
	Std. Deviation	6.485	5.748
	Minimum	34	35
	Maximum	70	69

As could be inferred from Table 1, the concept mapping group had a gain score of +3.43 (i.e. 54.60-51.17), followed by the framing group with +0.29 (i.e. 53.39-53.10) and lastly the conventional group which had -5.79 (i.e. 52.89-58.66).

Table 2: Summary of Analysis of Covariance of Students' Attitude Scores according to Treatment, Gender and Locus of Control

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig. of F
Main Effects	1873.661	1	1873.661	68.374	.000
Covariates (pre-test)	186.271	1	186.271	6.797	.010
Treatment	227.983	2	113.992	4.160	.018*
Gender	150.945	1	150.945	5.508	.021*
Locus of Control (LOC)	58.502	1	58.502	2.135	.147
2 Way Interactions					
Treatment x Gender	53.175	2	26.588	.970	.382
Treatment x LOC	192.780	2	96.390	.783	.033*
Gender x LOC	2.263	1	2.263	.083	.0774
3 Way Interaction					
Treatment x Gender x LOC	25.291	2	12.645	.461	.632
Explained	1010.403	12	84.200	3.073	.001
Residual	2986.941	109	27.403		
Corrected Total	3997.344	121			

** Denotes significant F at .05 level; R Squared = .253 (Adjusted R Squared = .171)*

The findings in Table 2 show the main effect of treatment (teaching strategies) on students' attitude towards sustainable development issues.

The outcome of test of Ho_1 indicates that there is a significant main effect of treatment on attitudes of students towards sustainable development issues ($F_{(2,109)} = 4.160$, $P < 0.05$). This is because the mean post-test attitude scores of the students exposed to the different teaching strategies are significantly different. Therefore, the first hypothesis (Ho_1) which says that there is no significant difference in the mean post-test attitude scores of students exposed to sustainable development concepts under the different teaching strategies is rejected.

The Multiple Classification Analysis (MCA) of the finding on Ho_1 shows that, with the grand mean of 53.520, the students taught with the concept mapping strategy recorded the highest adjusted post-test mean attitude score of 56.79 (i.e. 53.52 + 3.27). The students taught with the framing strategy recorded the next higher adjusted mean post-test attitude score of 55.68 while those in the conventional method category recorded the least adjusted post-test mean attitude score of 53.66. These results reveal that concept mapping strategy recorded the best post-test mean attitude score and, as such, had the greatest potency of enhancing students' attitude towards sustainable development issues. The results further reveal that, while treatment alone accounted for 23.04% $(0.48)^2$ of the variance in the students' attitude scores in sustainable development concepts, the independent and moderator variables jointly accounted for 25.3% $(0.503)^2$ of the variance.

The significant difference in the treatment groups could be traced to the significant difference in the mean post-test attitude scores of students exposed to the pairs of concept mapping strategy and conventional method alone. That is, the difference between the post-test mean scores of the students exposed to concept mapping strategy and conventional method is statistically significant at the .05 level. However, the differences between the mean post-test attitude scores of the students in possible pairs (concept mapping and framing; framing and conventional) are not statistically significant. Using the Sidak post-hoc analysis to determine the source of the significant difference, it was also revealed that concept mapping and conventional methods were the sources of the significant difference.

Table 2 also indicates that there was a significant main effect of treatment on gender ($F_{(2,109)} = 5.508$, $P < 0.05$). On closer examination, it was found that the male students had a mean post-test gain score of

0.85 (55.53-54.68) as against -0.25 (52.23-52.48) recorded by the female. This means that the second hypothesis (Ho_2), which says there is no significant difference between the mean post-test attitude scores of male and female students exposed to sustainable development concepts under the different teaching strategies, should be rejected. In addition, Table 2 reveals that there was an interaction effect between treatment and locus of control (LoC) on students' attitude to sustainable development concepts ($F_{(2,109)} = .783$, $p < 0.05$). The data showed that the Internal LoC group recorded a higher post-test mean gain score (1.38) than the Internal LoC (-0.67). This means that treatment had a significant effect at some point in the experiment on the Internal than the External. Hence, the fifth hypothesis (Ho_5) which states that there is no significant interaction effect of treatment and locus of control on the mean post-test attitude scores of students exposed to sustainable development concepts is rejected. As evident in Table 2, however, the other four null hypotheses (Ho_3, Ho_4, Ho_6, and Ho_7) cannot be rejected. This is because the study did not find a significant main effect of treatment on locus of control as well as any significant interaction effect between treatment and gender, gender and locus of control or treatment, gender and locus of control.

Discussion

Attitude change is the ultimate goal of education for sustainable development (World Economic and Social Survey, 2013). This study has found that the method or strategy used could affect attitudinal response to sustainable development core messages. The position here is supported by the rejection of the first hypothesis (Ho_1). This conclusion agrees with the earlier research of Gomes et al (2011) who stated that attitude is one of the indicators for measuring the effectiveness of spatial learning. The overarching implication of the finding of this study is that both concept mapping and framing strategies were very effective in enhancing students' attitude to concepts of sustainable development within the social studies setting. A plausible explanation for the significant difference is that students were able to organize information visually and were also able to show relationship among different ideas as required by concept mapping and framing strategies. This is in agreement with the conclusions of McKeown (2002) and Ahlberg (2004) who reported that metacognitive strategies

have a lot of potential in influencing attitude of students to areas of learning such as sustainable development.

Another significant finding of the study is that concept mapping and framing strategies enhanced male students' attitude towards sustainable development concepts better than the female. This finding runs contrary to the submission of Sakellari and Skanavis (2013) that evidence from research reports showed that women had stronger environmental concern and attitudes than men. However, the finding of this study agrees with the conclusion of Gaye, Hamide, Ceren and Semra (2007) that male students have better attitude towards sustainable development concepts than their female counterparts. The major significance of the finding of this study on gender is that the treatment was more effective with male students than female in promoting positive attitude to sustainable development concepts.

The third hypothesis (Ho_3), focusing on the Locus of Control, was not rejected on the ground that there was no significant effect of treatment on the two LoC categories (Internal and External). The conclusion is contrary to earlier reports by Grantz (2006) and NCREL (2006) which indicated that students with internal locus of control are better achievers and have better attitude and that metacognitive strategies are the best attitude-changing approaches for promoting sustainable development. However, the deviation from the previous findings may not be too drastic because this study found a significant interaction effect between treatment and LoC; suggesting that treatment might have had significant effect at some point in the experiment on more of the Internals than the Externals (see Ho_5). Hawthorne and Alabaster (2009), while commenting on how to promote environmental citizenship, investigated the combination of the solutions subscales of sense of personal responsibility and other subscales of locus of control. Their research revealed that locus of control exerted a strong influence on behaviour, indicating the importance of a philosophy that recognizes the value of the individual in solving environmental problems. Hence, locus of control, in this study, as in the case of Hawthorne and Alabaster (2009), had a significant mix with spatial learning strategies to improve the attitude of students towards sustainable development issues.

The non-rejection of Ho_4 indicates that there was no significant interaction effect of treatment and gender on the mean post-test attitude

scores of students exposed to sustainable development concepts. This means that, whereas there was a significant difference in the mean post-test attitude scores of male and female students according to the treatment conditions (Ho_2), the moderating influence of treatment in the mean post-test attitude scores of the students by gender was not significant (Ho_4). The finding in this respect agrees with the conclusion of Igwe (2002).

The conclusion on the sixth hypothesis (Ho_6) was that it should not be rejected because there was no significant interaction effect of gender and locus of control on the mean post-test attitude scores of students exposed to sustainable development concepts under different teaching strategies. This implies that the attitudes of male and female students do not vary significantly in both Internal and External LoC groups. This outcome runs contrary to the finding of Woodrow (1990) which revealed that positive attitudes were found to be correlated with an external-oriented locus of control and that locus of control accounts for more variation in attitude than were age, gender and experience. However, the finding of this study corroborates the conclusion of McPherson and Martin (2016) who found no clear statistically significant differences in locus of control orientation as a function of gender.

The conclusion of this study on the seventh hypothesis (Ho_7) was also that the hypothesis should not be rejected because there was no interaction effect of treatment, gender and locus of control on students' attitude to sustainable development concepts. The result indicates that there were no mutual effects on the dependent measures and that treatment was not sensitive to the combined effects of students' gender and locus of control. This conclusion deviates from the results of Jegede, Fan Yum and Tapliin (1999) and Kollmuss and Agyeman (2002) who found significant effects between locus of control, attitude and achievement. The non-significant interaction effect further suggests that the observed differences in the group means were small and could have occurred by sampling error. Also the findings indicate that the treatment did not discriminate between gender or the locus of control categories, and that the teacher could use the treatment on students irrespective of gender and locus of control group in the social studies class.

Conclusion

This study has advanced some evidence in support of the reported potency of the spatial learning strategies in promoting positive attitude toward sustainable development. More specifically, there is sufficient ground to support the use of concept mapping and framing in social studies classes when handling sustainable development issues like malnutrition, preventable diseases, environmental pollution, ozone layer, level of income, unemployment, democracy and rule of law as provided in the junior secondary school curriculum (NERDC, 2007). This experiment relied on specially trained social studies teachers and the findings of its findings may not be unconnected with their training in the philosophy and pedagogy of the innovative strategies. So, to maximize the gains of concept mapping and framing at the classroom level, the capacity of the teachers should be raised through appropriate seminars and workshop. Such re-training opportunities would empower them appreciate and correctly apply the theoretical and pedagogical principles underlying metacognitive strategies which make learners the drivers of their own learning.

Lastly, the findings of this study are not conclusive. More studies are required on its conclusions especially with respect to the four hypotheses (Ho_3, Ho_4, Ho_6 and Ho_7) which were not rejected. The scope for future research may include other variables which could assist to further explore the main effect of treatment on locus of control as well as the interaction effects of treatment and gender, gender and locus of control, and treatment, gender and locus of control.

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