Effects of dialogic peer and teacher guided discourse patterns on students interest in biology in Yola Educational Zone of Adamawa State

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Abstract

This study determined the effects of dialogic, peer and teacher – guided discourse patterns on students' interest in biology. The study also determined the influence of the discourse patterns on male and female students' interest in biology. Three research questions and five null hypotheses, tested at 0.05 level of significance, guided the study. The design of the study was quasi-experimental of non-equivalent comparative group design. A sample of 164 SSII students (94 males and 70 females) from three intact classes in Yola educational zone of Adamawa State participated in the study. The three intact classes were drawn from three Secondary Schools selected through purposive sampling technique. Discourse patterns were randomly assigned to intact classes in the sampled schools. The main instrument used for data collection was a Biology Interest Scale (BIS) which was both face and construct validated. The internal reliability coefficient of BIS was 0.84 established with Cronbach alpha method. The coefficient of stability was 0.75 and 0.75 for the first and second administration of the test respectively determined with test – retest method and calculated using Pearson Product Moment Correlation Method. Mean and standard deviation were used to answer the research questions while ANCOVA was used to test the hypotheses. Result of the study shows that the three discourse patterns enhanced students' interest in biology. There is no significant difference in the mean interest scores of male and female students taught biology using the three discourse patterns. It was recommended among others that three discourse patterns be adopted for effective teaching of biology in Secondary Schools.

Keywords guided discourse patterns, students' interest in biology, cooperative learning strategy

Introduction

Discourse pattern is a talk pattern used to pass information to people. Sadler (2006), Viiri and Saari (2006) defined discourse as verbal expression or conversation, talk or speech. In teaching – learning process, discourse pattern is a way teachers and students converse, talk and express themselves verbally during classroom activities. The implication is that teachers and students use the different discourse patterns in classroom interactions (Ugwuadu, 2011). Krat and Kratcoski (2004) viewed that the discourse and interactions that occur in classrooms form a communicative context for learning. This may however depend on clarity of message and effective use with teaching methods.

Being a talk pattern, the discourse patterns of teachers and students may be of benefit in improving students' interest in biology (Science of life) since literature revealed

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that teachers do not use much of the different discourse patterns in classroom activities (Viiri and Saari, 2006). Interest is a powerful source of human motivation which is capable of arousing and sustaining concentrated effort (Bhatia, 2003). It is a disposition which prompts a person to spontaneous activity e.g. paying attention to school work or any other activity (Dandekar and Makhiji, 2002). Iran-Nejad (1987) and Njoku (2003) opined that interest is a response to liking or disliking of an event, activity, object or person. There are the expressed interest in an activity, tested interest which is interest measured by objective test and inventoried interest which refers to an individual's performance on a large number of activities listed on an interest inventory (Balogun, 1985; Essuman, 1986). Tobias (1995) opined that adapting instructions to sudents' interest may have a positive motivational value for a long period of time which may facilitate students' recall of learned materials.

Literature has however, revealed that students' interest in biology is poor because students perceive many topics in biology as difficult (Viedma, 1977), elusive and confusing (Booth and Sinker, 1987). In view of the foregoing, the different discourse patterns being useful in classroom activities were employed along with inquiry method, an innovative method to determine whether they could improve the persistent low interest of male and female students in biology. The study used the pairing of the different discourse patterns and inquiry method in determining whether interest of male and female students would improve. If the students' interests improve, the strategy could be used with other innovative methods.

Discourse patterns and teachers' methodology are not the same but they are related because discourse patterns are used to implement teaching methodology like lecture, demonstration methods etc. in the classroom. Both of them are used simultaneously and never in isolation during classroom activities.

Three biology topics and three discourse patterns were studied in this paper. The biology topics are; ecological succession, overcrowding and food shortage taken from the National Curriculum for Senior Secondary year two (2008). The topics were chosen not only that they are perceived as difficult and confusing to students, they are also either hurriedly taught or not taught at all by teachers (Okeke and Ochuba, 1986; Booth and Sinker, 1987). The use of the different discourse patterns as main effects may enhance the understanding of the difficult topics.

The three discourse patterns studied included the dialogic, peer and the teacher – guided types. Each of the discourse patterns has its unique characteristics that foster learning. The dialogic discourse pattern is democratic because it involves free dialogue between the teacher and his students during classroom activities (Aggrawal, 2002). In addition, the teacher rewards meaningful contributions through praises and encouragement (Viiri and Saari, 2006). Udeani (1992) found out that teacher dominated classrooms do not offer any higher premium to integrated science students as do the democratic and participatory interaction patterns.

The peer discourse patterns is a cooperative learning strategy in which students work collaboratively in small groups to solve a common problem (Okebukola, 1984; Banu, 1992). Lee (2000) found out that only 11 out of 42 learners spoke during a question and answer discussion in a teacher fronted discussion while 46 out of 46 spoke during group discussion among students showing the effectiveness of cooperative learning strategy.

In the teacher-guided discourse, the teacher directs and guides the students in a classroom talk on a specific problem which may help to increase students' interests in a lesson (Viiri and Saari, 2006).

Ugwuadu (2011) found out that students taught biology using the dialogic, peer and teacher – guided discourse patterns did not differ significantly from one another in their interest; there is no significant difference in the mean interest scores of male and female students taught biology with each of the three discourse patterns. Ugwuadu and Obi (2009) isolated food web, community and ecosystem topics in ecology as difficult topics to students. Okeke (1981) reported that there is total lack of interest in ecology on the part of students in Secondary Schools.

The problem of this study is; what would be the effects of the three discourse patterns – dialogic, peer and teacher-guided discourse patterns on students' interests in biology when teaching the subject with inquiry method? Would the use of the different discourse patterns have influence on interest of male and female biology students? Would there be interaction effect of different discourse patterns in the interest of male and female biology students?

The general purpose of this study was to investigate the effects of dialogic, peer and teacher – guided discourse patterns on students' interest in biology when students were taught with inquiry method. Specifically, the study determined the effects of dialogic, peer and teacher-guided discourse patterns on students' interest in biology.

1. The three discourse patterns on male and female students' interest in biology.
2. Interaction effect between the discourse patterns and male and female students' interest in biology.

Research Questions

This study was guided by the following research questions:

1.   What is the mean interest scores of students taught the biology topics using the dialogic, peer and teacher-guided discourse patterns?

2.   What is the mean interest scores of male and female students taught the biology topics using the dialogic, peer and teacher-guided discourse patterns?

3.   What is the interaction effect of the different discourse patterns on the interest of male and female students taught the biology topics using the three discourse patterns?

Hypotheses

The following null hypotheses were posed to guide the study and tested at 0.05 level of significance:

1   There is no significant difference in the mean interest scores of students taught the biology topics using the three discourse patterns.

2   There is no significant difference in the paired comparison of mean interest scores of male and female students taught the biology topics using dialogic discourse patterns.

3   There is no significant difference in the paired comparison of mean interest scores of male and female students taught the biology topics using peer discourse patterns.

4   There is no significant difference in the paired comparison of mean interest scores of male and female students taught the biology topics using teacher-guided discourse patterns.

5   There is no significant interaction effect between the three discourse patterns and gender on students' interest in biology.

Research Method

The research design adopted for the study was quasi-experimental of non-equivalent comparative group design. The design was adopted because subjects were not randomly assigned to groups instead intact classes were randomly assigned to experimental groups. The study was carried out in Yola educational zone of Adamawa State. The zone was used because the zone has the highest number of coeducational schools.

The population of the study consisted of all Senior Secondary two (SS II) biology students, a total of 10,588 in 20 co-educational schools. SS II students were used because the topic of the study fell under the SS II biology curriculum. Co-educational schools were used because the researcher wanted to find out if the different discourse patterns would have any influence on the interest of male and female students of the same class and school using the biology topics of the study.

The sample of the study was 164 biology students (94 males and 70 females) selected from three different schools by purposive sampling technique. Purposive sampling technique was used because the schools met the research purpose. One intact class of SS II was randomly selected from four classes in each school. Discourse patterns were randomly assigned to the three intact classes.

The main instrument used for data collection was Biology Interest Scale (BIS) which was constructed by the researcher. The BIS contained 40 items developed on four – point scale which the respondents were required to respond by ticking their degree of agreement or disagreement to the items. The 40 items consisted of 20 positive and 20 negative statements which were scored as follows: strongly agree = 4, agree = 3,

disagree = 2, and strongly disagree = 1 for positive statements. The scoring was reversed for negative statements as follows; strongly agree = 1, agree = 2, disagree = 3, strongly disagree = 4.

The draft BIS was given to four experts in Science Education (Biology) and Educational Measurement and Evaluation for face and construct validation. The validators were required to assess the instrument in terms of clarity of expression and suitability of the items (face validation). After face validation, five items that were ambiguous were dropped and the remaining accepted 35 items were subjected to construct validation using factor analysis to compute the factor loading. Trial testing was carried out in one school outside the ones used for the study in order to collect data. Items were selected for use if they were factorially pure by having high loading on one factor only and secondly if the item had a factor loading of 0.30 and above (Nworgu, 2006). At last, 30 items were selected and five items were rejected for not meeting the criteria set.

The selected 30 items were trial-tested and the result was used to calculate the reliability coefficient using Cronbach alpha method which gave an internal consistency reliability coefficient of 0.84 on SPSS computer software. The coefficient of stability of the instrument was 0.75 and 0.75 for first and second administration of the test respectively.

Treatment Procedure

The main teaching method used for the study was inquiry method. Each intact class was differentiated by the discourse patterns randomly assigned to it which the regular biology teachers that served as research assistants used in teaching the group. The reason for teaching one discourse pattern in one school was to avoid contamination of treatment if one school was used for all the treatments. All the research assistants were trained in their respective discourse patterns by the researcher. On the first day of the experiment, the BIS was administered as pre-test on each of the groups in the three schools. The groups were later taught the biology topics used for the study by the trained research assistants. The treatment lasted for six weeks and the last period of the sixth week was used for administering post-test. Some extraneous variables like Hawthorne effect, teacher variable, initial group difference etc. were controlled to prevent them from affecting the study.

Method of data analysis

The data were statistically analyzed and presented in tables according to research questions. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses. The total or overall mean interest score of the respondents was computed and used for analysis. Total mean score below 2.50 relative to the four point scale was regarded as low interest while mean score of 2.50 and above was high interest. Apart from controlling the initial differences across the groups ANCOVA was also used as post-hoc control.

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Results

The first research question sought to determine whether or not there were gains in the students' interest scores after being taught biology topics using dialogic, peer and teacher-guided discourse patterns. Table 1presents the results of the pre-test and post-test administered to the students showing the mean interest gain scores of 1.16, 1.46 and 1.18 for students taught the biology topics using the dialogic, peer and teacher-guided discourse patterns respectively.

Table 1   **Mean interest scores and standard deviation of students taught the biology topics with the three discourse patterns.**

Experimental Groups	Statistic	Pre-interest	Post-interest	Mean gain score
Dialogic discourse pattern	Mean	1.89	3.05	
	N	56	56	1.16
	Standard deviation	0.652	0.773	
Peer discourse pattern	Mean	1.89	3.35	
	N	0.55	55	1.46
	Standard deviation	0.658	0.775	
Teacher-guided discourse pattern	Mean	1.88	3.06	
	N	53	53	1.18
	Standard deviation	0.67	0.795	

Table 2 presents the results of the pre-test and post-test administered to the students showing the mean interest scores by gender. That is, the mean and standard deviation of male and female students exposed to the three discourse patterns.

Table 2   **Mean interest scores and standard deviation of male and female students taught the biology topics using the three discourse patterns**

Experimental groups	Gender of subjects	N	Mean	Standard deviation
Dialogic discourse pattern	Males	32	3.16	.723
	Females	24	2.92	.830
	Total	56	3.05	.773
Peer discourse pattern	Males	32	3.38	.751
	Females	23	3.30	.822
	Total	55	3.35	.775
Teacher-guided discourse pattern	Males	30	3.13	.776
	Females	23	2.96	.825
	Total	53	3.06	.795
Total	Males	94	3.22	.750
	Females	70	3.06	.832
	Total	164	3.15	.780

The results in Table 2 indicate the that males had a post interest mean score of 3.16, standard deviation of 0.723, females had 2.92 and standard deviation of .830. With the peer discourse, males had post interest mean score of 3.38, standard deviation of .751 while females had 3.30 standard deviation of .822. For the teacher-guided discourse pattern, males had 3.13 mean interest score, standard deviation of .776 and females scored 2.96, standard deviation of .825.

The third research question sought to determine whether or not there was interaction effect of the different discourse patterns on the interest of male and female students taught the biology topics using the three discourse patterns. Table 3 presents the results to answer the research question. Post interest mean score of 3.16 and standard deviation of .723 for males, females 2.92 and standard deviation .830 using the dialogic discourse. With peer discourse, male interest mean score was 3.38 and standard deviation of 0.822, while females had 3.30 standard deviation of 0.822. Males had 3.13 mean interest score standard deviation of 0.776 females scored 2.96, standard deviation of 0.825 using teacher-guided discourse patterns. Males seem to have benefitted more than females in the three treatments though slightly.

The results of the analysis of co-variance (ANCOVA) conducted to test the difference in mean interest scores of students taught the biology topics using the three discourse patterns is presented in Tables 3.

Table 3   Analysis of Co-variance (ANCOVA) of students post interest mean score taught the biology topics using the three discourse patterns

Source	Sum of squares	Df	Mean squares	F	Sig.
Corrected model	4.413 [a]	6	.735	1.193	.313
Intercept	159.160	1	159.160	258.206	.000
Pre-interest	.069	1	.069	.112	.739
Experimental	3.193	2	1.596	2.590	.078
Gender	1.118	1	1.118	1.813	.180
Experimental gender	.198	2	.099	.161	.852
Error	96.776	157	.161		
Total	1731.000	164			
Corrected Total	101.189	163			

The results in Table 3 indicate that students taught the three discourse patterns did not differ significantly from one another in their interest. F-value of 2.590 is significant at 0.078 but not significant at 0.05 level of probability. Hence the hypothesis that "there is no significant difference in the mean interest scores of students taught the biology topics using the three discourse patterns" is accepted.

The results of the analysis of co-variance (ANCOVA) of paired comparison of male and female students' post interest mean scores using each of the three discourse patterns is presented in Tables 4, 5 and 6.

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Table 4   **Analysis of Co-variance (ANCOVA) of paired comparison of male and female students' post interest mean scores using dialogic discourse patterns**

Source	Sum of squares	Df	Mean squares	F	Sig.
Corrected model	.826 [a]	2	.413	.683	.509
Intercept	49.422	1	49.422	81.820	.000
Pre-interest	.038	1	0.038	.064	.802
Experimental	.000	0	.821	-	-
Gender	.821	1	-	1.360	.249
Experimental gender	.000	0	.604	-	-
Error	32.014	53			
Total	555.000	56			
Corrected Total	32.839	55			

Table 5 **Analysis of Co-variance (ANCOVA) of paired comparison of male and female students' post interest mean scores using peer discourse patterns**

Source	Sum of squares	Df	Mean squares	F	Sig.
Corrected model	0.070 [a]	2	.035	.056	.946
Intercept	62.042	1	62.042	99.676	.006
Pre-interest	.003	1	.003	0.004	.947
Experimental	.000	0			
Gender	.069	1	.069	.111	.740
Experimental gender	.000	0			
Error	32.367	52	.622		
Total	648.000	55			
Corrected Total	32.436	54			

Table 6   **Analysis of Co-variance (ANCOVA) of paired comparison of male and female students post interest mean scores with teacher-guided discourse pattern**

Source	Sum of squares	Df	Mean squares	F	Sig.
Corrected model	.4450 [a]	2	.225	.347	.708
Intercept	48.249	1	48.249	74.504	.000
Pre-interest	.043	1	.043	.06	798
Experimental	.000	0	.445	.687	.411
Gender	.445	1			
Experimental gender	.000	0	.648		
Error	32.380	50			
Total	528.000	53			
Corrected Total	32.830	52			

The results in Table 4 indicate also that there is no significant difference in the compared mean interest scores of male and female students taught the biology topics with dialogic discourse pattern. F-value of 1.360 is not significant at 0.05 level of significance. The results in Table 5 indicate also that there is no significant difference in the compared mean interest scores of male and female students taught the biology topics with peer discourse pattern. F-value of 0.111 is significant at 0.740 but not at 0.05 level of significance. Finally, the results in Table 6 indicate there is no significant difference in the compared mean interest scores of male and female students taught the biology topics with teacher-guided discourse pattern. F-value of 0.687 is significant at 0.411 but not at 0.05 level of probability.

The results of the analysis of co-variance (ANCOVA) carried out to determine the interaction effect between the three discourse patterns and gender on students' mean interest scores in biology yielded a calculated F-value of 0.161 is significant at 0.852 and not at 0.05 level of significance (see Table 3). Hence the hypothesis that "there is no significant interaction effect of the three discourse patterns and gender on students' interest in biology" is not rejected. Gender did not have influence on male and female students' interest in biology.

Discussion of findings

Research question one on table one and hypothesis one on table three sought to find out the effects of the three discourse patterns on students' interest in biology. The mean gain scores obtained were 1.16, 1.46 and 1.18 using the dialogic, peer and teacher-guided discourse patterns respectively. A test of hypothesis one showed no significant difference in the mean interest scores of the students. The result suggests that the three discourse patterns are equally effective in enhancing students' interest in biology. This is because students showed improved interest after post-test. This finding is in line with Tobias (1995) that adapting instructions to students' interest may have a positive motivational value for a long period of time which may facilitate students' recall of learned materials. In this case, the three discourse patterns being activity – oriented may have appealed to students' interest which resulted in their showing increased interest in the biology topics taught to them.

The result in Table 2 reveals that male students taught the biology topics using the dialogic discourse had an interest mean score of 3.16, females had 2.92, but a test of hypothesis 2 showed that the mean scores had no significant difference. This result for dialogic discourse pattern is similar to that of peer and teacher-guided discourse patterns where the males had the higher interest mean scores than the females but the result was not significant (Tables 2, 4, 5 & 6) showing that both male and female students had equal interests in the biology topics taught to them using the different discourse patterns. These results could be attributed to the characteristics of each of the patterns in fostering learning using dialogic discourse patterns. The findings agree with Udeani (1992) that teacher dominated classrooms do not offer any premium to Integrated Science students as do the more democratic and participatory interaction patterns. Also the result agreed with Viiri and Saari (2006) that teacher discourse

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patterns enable students to perform better with the teacher directing them. The findings also agree with Lee (2000) that 11 out of 42 learners spoke during a question and answer discussion in a teacher – fronted discussion while 46 out 46 spoke during group discussion among students showing the effectiveness of peer discourse. The result is in line with Ugwuadu (2011) that the mean interest scores of male and female students exposed to the three discourse patterns was not significant.

Conclusion and recommendations

The study had shown that the use of the three discourse patterns (dialogic, peer and teacher-guided) in teaching biology enhanced students' interest in the subject. It was found that female as well as male students had equal interest after post-test and therefore gender had no influence on the interest of students in biology when the three discourse patterns were used in teaching them. Following these findings, it can be argued that teachers' inability to use variety of discourse patterns in teaching biology is a much likely cause for the persistent low interest of students in some biology topics since students' interests increased after post-test.

The following recommendations are made from the findings of the study;

1. Since the interest of students improved by the use of the three discourse patterns, teachers should use the different discourse patterns to facilitate their biology teaching.

2. The curriculum of teacher education should include the use of the three discourse patterns in order to popularize the use of the patterns in biology teaching.

3. In-service training, workshops and seminars should be organized so that practicing teachers could embrace the skills of the different discourse patterns for effective teaching of biology.

References

Aggrawal, J.C. (2002). Essentials of Educational Technology Teaching – Learning Innovations in Education, Delhi: Vikes Publishing House PVT Ltd.

Balogun, T.A. (1985). Interest in Science and Technology Education in Nigeria, Journal of the Science Teachers' Association in Nigeria, 23(1 & 2):92 – 99.

Banu, D.P. (1992). The Effects of Cooperative Learning on Students' achievement in Biology, Dougire Journal of Education, 2:48 – 50.

Bhatia, H.R. (2003). A Textbook of Educational Psychology, New Delhi, Rajiv – Ben Publishers Ltd.

Booth, P.R. and Sinker, A. (1987). The Teaching of Ecology in Schools, Journal of Biological Education, 13(4):261 – 268.

Dandekar, W.N. and Makhiji, S.M. (2002). Psychological Foundation of Education, New Delhi: Rajv – Ben Publishers Ltd.

Essuman, J.K. (1986). The Nsukka Interest Profile: Development of a Vocational Interest Inventory for Post University of Nigeria, Nsukka.

Federal Government of Nigeria (2008). National Curriculum for Senior Secondary Schools, Federal Government Printing Press, vol. 3: Science.

Krat, K.B. and Kratcoski, A. (2004). Teacher – Student Interactions in an ubiquitous computing learning within dyads and traids of Interaction. Journal of the Research Centre for Educational Technology, 1(1):306 – 410.

Lee, J.F. (2000). Tasks and Communicating in Language Classroom. New York: McGraw Hill Publishers, Ltd.

Nejad, A.I. (1987). Cognitive and Affective Causes of Interest and Liking. Journal of Educational Psychology 79(2):120 – 130.

Njoku, Z.C. (2003). Development and Preliminary Validation of a scale for the Assessment of Students' Interest in O'Level Practical Chemistry. Journal of the Science Teachers' Association of Nigeria. 38(1 & 2): 64 – 70.

Nworgu, B.G. (2006). Educational Research: Basic Issues and Methodology. (2nd edition) Nsukka. University Trust Publishers.

Okeke, E.A. and Ochuba, C.V. (1986). The level of understanding of selected Ecology concepts among Nigeria School Certificate Candidates. Journal of Science Teachers' Association. 38.

Okeke, E.A.C. (1981). Evaluating High School Biology. Journal of Science Teachers' Association of Nigeria. 19(2):69 – 79.

Okebukola, P.A. (1984). Tackling the problem of large classes in Biology: An investigation into the effects of a cooperative teaching technique. Journal of Science Teachers' Association of Nigeria. 22(2):73 – 76.

Sadler, T.D. (2006). Promoting discourse and argumentation in Science. Journal of Science Teacher Education. 17:323 – 346.

Tobias, S. (1999). Interest and Meta-cognitive word knowledge. Journal of Educational Psychology, 87(3):399 – 405.

Udeani, U.N. (1992). Learning outcomes in Integrated Science as related to teacher and students characteristics and classroom interaction pattern, unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Ugwuadu, O.R. and Obi, C.I. (2009). Isolating topics of High Perceived difficulty in Secondary School Biology in Adamawa State. Journal of Educational Studies. 14(2):172 – 187.

Ugwuadu, O.R. (2011). Effects of Discourse Patterns on Students' Achievement and Interest in Biology, Unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Viedma, M.G. (1977). The Teaching of Ecology in Spain, Journal of Biological Education, 13(1):67 – 68.

Viiri, J. and Saari, H. (2006). Teacher Talk Patterns in Science Lessons: use in Teacher Education, Journal of Science Teacher Education, 17:347 – 365.