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EFFECTIVENESS OF A PROGRAM TO ENRICH LEXICAL CONTENT IN BIOLOGY AT THE SECONDARY LEVEL

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Abstract:-

The purpose of the study was to find out effectiveness of a programme to enrich lexical content in Biology at secondary level. The present study was carried out with students of STD X English Medium CBSE schools studying in the year 2016-17. In the present study the researchers used convenient sampling technique for selecting the sample. The sample for the present study was STD X Students of Bharatiya Vidya Bhavan's School, Nadiad studying in the year 2016-17. The sample size was of 67 students of STD X. The programme was designed to see the effectiveness of the study. The tool used to collect the data was achievement test in Biology. The major finding of the study reveals that programme was found effective to enrich lexical content in Biology for students at STD X.

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1.0 INTRODUCTION:

" The more one considers the matter, the more reasonable it seems to suppose that lexis is where we need to start from, the syntax needs to be put to the service of words and not the other way round." (Widdowson in Lewis, 1993: 115)

Teachers provide the knowledge, develop skills and attitudes among students to learn and modify their behaviour. The students at school learn subjects of different nature. These subjects help them to develop their language ability, scientific attitude, computation, computer literacy and so on.

Science education is the mixture of Physics, Chemistry and Biology. An essential element of science instruction is content literacy. Teachers need to address vocabulary in order to improve literacy specific to science subject. Learning vocabulary during independent reading is very inefficient for students with reading difficulties, vocabulary and word learning skills must be taught. (Jitendra, Edwards, Sacks, and Jacobson, 2004)

Biology is a scientific subject that has its origins in the need of human beings to know more about themselves and the world around them. It is the theory of life, its origins, evolution, forms and conditions. Biological contexts are often complex and studied at various levels, from the individual molecule to global ecosystems. Aspects of biological science range from the study of molecular mechanisms in cells, to the classification and behaviour of organisms, how species evolve and interaction between ecosystems.

Students learning Biology at secondary and higher secondary schools found it difficult. As a result their understanding of the concepts has become minimal. The major reason behind this issue is due to lack of conceptual understanding about biological vocabulary. In order to understand the concepts of any field of knowledge and education, it is necessary to use appropriate languages and specific ways of explaining, relating, representing, debating and communicating them. The practices of reading and writing which are essential to the learning of any discipline cannot be learned until the student experiences situations. (Carlino, 2005). The teachers of Biology had been focused for many years on helping students to utilize their written words in an interpretative way, and not as a labeling system that involves an endless list of processes, structures, and molecules. (Sutton, 2003). Thus, difficulties in learning biology affect students' achievement. In addition, the difficulty makes students less motivated to learn the subject. As a result, it is hard for them to achieve a good result at their studies. These difficulties are caused by misconceptions, finding relation between biology topics and the nature of the topic in general. For example, students do not understand the structure of the chromosome in a cell nucleus and its role in genetic activities (Cimer, 2012; Kubika-Sebitosi, 2007). Therefore, it is hard for the student to learn it since they do not have the skill to learn the specific topics.

There are many research studies that are conducted to find solutions for the difficulty in learning Biology. In order to learn biology effectively, students have to make connections between different topics (Law & Lee, 2004). Further, they have to be able to answer any question within their learning activities. This is the skill to produce and validate ideas (Lawson, 2001, Mumford, 2010). Some students do not have the skills which makes them have trouble studying biology. The student struggle is caused by their inability to describe the concepts of biology and they need skills to learn biology. They have to be trained to think, describe and evaluate concepts. Therefore, they need to think creatively, since creativity is a skill to formulate a problem, find out an answer, evaluate and disseminate it to others (Torrance, 1969). Students who have the skill will have an advantage to understand the concept, because they can evaluate ideas and produce solutions for actual problems.

2.0 Rationale of the Study:

Traditional biology lessons have often begun with teachers presenting students with biology vocabulary words and asking them to write the words, find the definitions in a dictionary or the glossary of the textbook, match the words to definitions, or use the words in a sentence. In this model of instruction, words are often presented in isolation and students are tested on the words alone, without application to concepts.

Earlier those students', who were "taught" this way, remembered how little these practices contributed to their conceptual development. These traditional strategies stem from the assumption that students absorb the meanings of many biology terms simply by writing the words and their definitions. To many English-speaking students biology words seem like a new language, and to English language learners, these words *are* a new language.

The job of biology education is to teach students how to use thematic patterns of biology to communicate meanings, "talking biology" to solve problems in writing or speaking about issues in which biology is relevant.

Students' difficulties in learning biology have been studied by various researchers across the world (Johnstone and Mahmoud, 1980; Finley et al., 1982; Tolman, 1982; Anderson et al., 1990; Seymour and Longdon, 1991; Jennison and Reiss, 1991; Lazarowitz and Penso, 1992; Bahar et al., 1999). Many concepts or topics in biology, including water transport in plants, protein synthesis, respiration and photosynthesis, gaseous exchange, energy, cells, mitosis and meiosis, organs, physiological processes, hormonal regulation, oxygen transport, genetics, Mendelian genetics, genetic engineering, and the central nervous system can be perceived as difficult to learn by secondary school students. Tekkaya et al. (2001) also found that hormones, genes and chromosomes, mitosis and meiosis, the nervous system, and mendelian genetics were considered difficult concepts by secondary school students.

Experiencing difficulties in so many topics in biology negatively affects students' motivation and achievement (Özcan, 2003).

Students' difficulties with many topics in biology have stimulated researchers to investigate why students experience such difficulties and how to overcome these difficulties. There are many reasons why students have difficulties in learning biological concepts (Lazarowitz and Penso, 1992; Tekkaya et al., 2001; Çimer, 2004; Zeidan, 2010). The nature of science itself and its teaching methods are among the reasons for the difficulties in learning science, while according to Lazarowitz

and Penso (1992), the biological level of organization and the abstract level of the concepts make learning biology difficult.

Moreover, overloaded biology curricula, the abstract and interdisciplinary nature of biological concepts, and difficulties with the textbooks are the other factors preventing students from learning 62 Educ. Res. Rev. biology effectively (Chiapetta and Fillman, 1998; Tekkaya et al., 2001). Chiepetta and Fillman (1998) state that overloaded biology curricula may not contribute to students' achievement and lead them to learn the material through memorization. This, of course, prevents meaningful learning. Designing learning environments while ignoring students' interests and expectations causes several learning problems as well as decreasing their interest in biology (Yüzbaşılıoğlu and Atav, 2004; Roth et al., 2006; Zeidan, 2010). Fraser (1998) indicates that there is a close relationship between students' perceptions of their classroom learning environment and their success. Osborne and Collins (2001) also report that students' diminishing interest in learning science was due to the curriculum content being overloaded and not generally related to working life, the lack of discussion of topics of interest, the absence of creative expression opportunities, the alienation of science from society and the prevalence of isolated science subjects.

Another reason reported by many researchers, is that due to the nature of biological science, biology learning is generally based on memorization. Biological science includes many abstract concepts, events, topics and facts that students have to learn. This makes it hard for students to learn them (Anderson et al., 1990; Efe, 2002; Özcan, 2003; Çimer, 2004; Saka, 2006; Durmaz, 2007).

Teachers' styles of biology teaching and teaching methods and techniques may also be factors that affect students' learning in biology (Çimer, 2004). Students are not happy with the way that biology is taught, they may show disinterest in and negative attitudes towards biology and its teaching. From this perspective, there appears to be a clear need for further and deeper insight into the lexical content that may not cause low achievement in biology.

For instance, Phoenix (2000) states that student views of teaching may reflect the ways that they learn best. Indeed, schools that acknowledge the significance of student views have found that these views can make a substantial contribution to classroom management, to learning and teaching, and to the school as a social and learning place (Macbeath et al., 2000).

Stahl (2005) stated, "Vocabulary knowledge is knowledge; the knowledge of a word not only implies a definition, but also implies how that word fits into the world." Consequently, researchers and practitioners alike seek to identify, clarify, and understand what it means for students "to know what a word means." The sheer complexity of vocabulary acquisition, as evidenced by reviewing critical components such as receptive vocabulary versus productive vocabulary, oral vocabulary versus print vocabulary, and breadth of vocabulary versus depth of vocabulary (Kamil & Hiebert, 2005) raise questions worthy of further research.

Academic vocabulary is the language that is used by teachers and students for the purpose of acquiring new knowledge and skills which includes learning new information, describing abstract ideas and developing student‘s conceptual understanding ‘ (Chamot and O‘Malley, 2007 as cited in Herrel, 2004). 2008). Academic vocabulary helps students to convey arguments and facilitate the presentation of ideas in a sophisticated manner. It prepares students for academic success by helping them preview, learn and practice vocabulary from Academic Word Lists (Cummins, 2002, as cited in Zwiers, 2008). According to Cummins (2002, as cited in Zwiers, 2008) the main barrier to student comprehension of texts and lectures is low academic vocabulary knowledge, due to the subtechnicality of the academic language. He points out that academic vocabulary is based on more Latin and Greek roots than the daily spoken English vocabulary. Cummins (2000, as cited in Zwiers, 2008) also states those academic lectures and texts use longer and more complex sentences than are used in spoken English. Cummins (2002, as cited in Zwiers, 2008) suggests 10 that academic vocabulary contributes to the development of Cognitive Academic Language Proficiency (CALP) in ELLs which enables them to apply the language, using abstractions in a sophisticated manner. It also enables them to think and use language as a tool for learning.

Therefore, the aim of the present study is to enrich lexical content in biology to make biology concepts easier to comprehend through various strategies or methods that can make biology learning more effective.

3.0 Statement of the Problem:

The title of the study was

EFFECTIVENESS OF PROGRAM TO ENRICH LEXICAL CONTENT IN BIOLOGY AT THE SECONDARY LEVEL

4.0 Objectives of the Study:

Following were the objectives of the present study.

1. To study the effectiveness of the program to enrich lexical content in Biology at the Secondary Level
2. To study the effectiveness of the program to enrich lexical content in Biology in context to gender (Male and Female)
3. To study the effectiveness of the program to enrich lexical content in Biology in context to learning style (Audio, Visual and Kinesthetic)

5.0 Hypotheses of the Study:

Following were hypotheses of the present study.

1. There will be no significant difference between mean Pre-test scores and Post-test scores of students to enrich lexical content in Biology at the secondary level.
2. There will be no significant difference between mean Pre-test scores and Post-test scores of girls to enrich lexical content in Biology at the secondary level.

3. There will be no significant difference between mean Pre-test scores and Post-test scores of boys to enrich lexical content in Biology at the secondary level.
4. There will be no significant difference between mean Post-test scores of girls and boys to enrich lexical content in Biology at the secondary level.
5. There will be no significant difference between mean Pre-test scores of boys and girls to enrich lexical content in Biology at the secondary level.
6. There is significant difference between the observed frequencies and expected frequencies.

6.0 Variables of the study
The variables of the present study are as below

a) Independent variables
Intervention Programme (Devices to enrich Lexical Content)
Secondary Independent Variable
a) Gender
i. Male
ii. Female

b) Dependent variables
i. Achievement tests (Pre- test and Post- test)
ii. Reaction Scale

7.0 Population of the Study:
The present study was carried out with students of STD X English Medium CBSE schools studying in the year 2016-17.

8.0 Sampling Technique and Sample:
In the present study the researcher used convenient sampling technique for selecting the sample. The sample for the present study was STD X Students of BharatiyaVidya Bhavan's School, Nadiad studying in the year 2016-17. The sample size was of 67 nstudents of STD X.

9.0 Tools for the Study:
Following were the tools used in the present study.
1. Questionnaire
2. Achievement Tests (Pre-test and Post-test)
3. Programme
4. Reaction Scale

10.0 Procedure for the Construction of Tools:
Following was the procedure used to construct tools for the present study.
The researcher constructed Achievement Tests (Pre-test and Post-test). The main aim was to know the achievement of students learning terminology of Biology Concepts. The researcher constructed the Pre-test and Post-test based on Biology concepts from Science and Technology subject of STD X. The tool was given to the experts for their valuable comments and suggestions. After incorporating the comments and suggestions of the experts the tool was modify. The tool was administered on seven Biology teachers of different CBSC Schools to collect their views about students facing problems in learning terminology of Biology concepts. The researcher also constructed Reaction scale to get the reaction of the students about the programme. The reaction scale comprised of both open ended and closed ended items. The five point rating scale was used for closed ended items i.e .Not at all, Rarely, Sometimes, Most of the times and always. The scale was given to the experts for their suggestions and comments. After incorporating their views the researcher modified the tool and implemented at the end of the programme.

11.0 Research Design:
Research Type: The study was quantitative type.
Research Method: The method used for the study was experimental.
Research design: The research design used was single group Pre-test Post-test design.

12.0 Data Collection Procedure:
The researcher had informal talk on Pedagogy used in teaching Science, Classroom interaction and application in daily life with Biology teachers. Then the researcher read the textbooks, magazines, journals to deepen her own understanding of Biology concepts of STD X. The researcher prepared and constructed tools such as teaching learning material such as power point presentation and games or activities, Achievement tests (Pre-test and Post-test) and reaction scale and gave it to the experts for their comments and suggestions. The researcher incorporated their suggestions and comments. After modification the researcher administered the tools. The researcher administered the Pre-test to know the understanding of the selected terms of Biology concepts from Standard Xth. An intervention programme was carried out using Power point presentation and activities to teach selected terminology of Biology concepts on 67 students of STD X of Bharatiya

Vidya School, Nadiad. After implementation of the programme Post-test was administered. The researcher gave reaction scale to know students reactions about the programme.

13.0 Data Analysis

The researcher analyzed the collected data using t-test, Chi square (χ^2) and Content Analysis and interpreted the result.

Hypothesis – 1

There will be no significant difference between the mean achievement scores of pre-test and post-test to enrich lexical content in Biology at Secondary level.

Table 1: Analysis of Pre-test and Post-test- Mean, SD, SE_D, r, df and't' value

Tests	No of Students	Mean	SD	SE_D	r	df	t-value
Pre-test	67	20.05	10.60	0.71	0.961	66	**6.42**
Post-test	67	24.61	5.13				

Interpretation

The computed t value 6.42 is greater than that of the table t value 1.28 at 0.01 levels and 1.64 at 0.05 levels for 66 degree of freedom. The calculated r value is 0.961; hence there is positive high correlation between the mean achievement scores of Pre-test & Post-test.

Therefore, the Null hypothesis that, there will be no significant difference between the mean achievement scores of pre-test and post-test is rejected. It means that, there is significant difference between the mean achievement scores of Pre-test & Post-test. Thus Effectiveness of a program to enrich Lexical content in Biology at the Secondary Level was found effective.

Hypothesis – 2

There will be no significant difference between mean Pre-test scores and Post-test scores of girls to enrich lexical content in Biology at the secondary level.

Table 2: Analysis of Pre-test and Post-test- Mean, SD, SE_D, r, df and't' value

Group	No of Students	Mean	SD	SE_D	r	df	t-value & Signifinace Level
Pre-test	34	20.20	3.12	0.61	0.14	33	**7.40**
Post-test	34	24.72	2.41				

Interpretation

The computed t value 7.40 is greater than that of the table t value 2.44 at 0.01 levels and 1.69 at 0.05 levels for 34 degree of freedom. The calculated r value is 0.145; hence there is positive high correlation between the mean achievement scores of Pre-test & Post-test of girls.

Therefore, the Null hypothesis that, there will be no significant difference between the mean achievement scores of pre-test and post-test of girls is rejected. It means that, there is significant difference between the mean achievement scores of Pre-test & Post-test of girls. Thus Effectiveness of a program to enrich Lexical content in Biology at the Secondary Level was found effective.

Hypothesis – 3

There will be no significant difference between mean Pre-test scores and Post-test scores of boys to enrich lexical content in Biology at the secondary level.

Table 3: Analysis of Pre-test and Post-test- Mean, SD, SE_D, r, df and't' value

Group	No of Students	Mean	SD	SE_D	r	df	t-value & Signifinace Level
Pre-test	33	19.90	3.37	1.1	0.09	32	**4.19**
Post-test	33	24.51	5.70				

Interpretation
The computed t value 4.19 is greater than that of the table t value 2.44 at 0.01 levels and 1.69 at 0.05 levels for 33 degree of freedom. The calculated r value is 0.09; hence there is positive high correlation between the mean achievement scores of Pre-test & Post-test of boys.
Therefore, the Null hypothesis that, there will be no significant difference between the mean achievement scores of pre-test and post-test of boys is rejected. It means that, there is significant difference between the mean achievement scores of Pre-test & Post-test of boys. Thus Effectiveness of a program to enrich Lexical content in Biology at the Secondary Level was found effective.

Hypothesis – 4
There will be no significant difference between mean Post-test scores of girls and mean Posttest scores of boys to enrich lexical content in Biology at the secondary level.

Table 4: Analysis of Pre-test and Post-test- Mean, SD, SE_D, df and't' value

Group	No of Students	Mean	SD	SE_D	df	t-value & Signifinace Level
Boys	33	24.51	5.70	1.07	65	**0.19**
Girls	34	24.42	2.41			

Interpretation
The computed t value 0.19 is smaller than that of the table t value 2.32 at 0.01 levels and 1.64 at 0.05 levels for 65 degree of freedom.
Therefore, the Null hypothesis that, there will be no significant difference between the mean achievement scores of Post-test scores of girls and post test scores of boys is not rejected. It means that, there is no significant difference between the mean achievement scores of Posttest of girls and & Post-test of boys. Thus both the groups of boys and girls are equal even after the intervention programme.

Hypothesis – 5
There will be no significant difference between mean Pre-test scores of boys and mean Pretest scores of girls to enrich lexical content in Biology at the secondary level.

Table 5: Analysis of Pre-test and Post-test- Mean, SD, SE_D, df and't' value

Group	No of Students	Mean	SD	SE_D	Df	t-value & Signifinace Level
Boys	33	19.90	3.37	0.79	65	**0.37**
Girls	34	20.20	3.12			

Interpretation
The computed t value 0.37 is smaller than that of the table t value 1.28 at 0.01 levels and 1.64 at 0.05 levels for 66 degree of freedom.
Therefore, the Null hypothesis that, there will be no significant difference between the mean achievement scores of Pre-test of boys and Pre-test of girls is not rejected. It means that, there is no significant difference between the mean achievement scores of Pre-test of boys and & Pre-test of girls. Thus both the groups of boys and girls are equal before the intervention programme.

14.0 Findings of the Study
After testing the hypotheses, obtained findings are as given below
1. Effectiveness of a program to enrich Lexical content in Biology at the Secondary Level was found effective in teaching Science.
2. Effectiveness of a program to enrich Lexical content in Biology at the secondary level was found effective in girls.
3. Effectiveness of a program to enrich Lexical content in Biology at the secondary level was found effective in boys.
4. The programme to enrich lexical content in Biology at the secondary level was not found effective after intervention programme in Boys and girls.
5. Programme was found to be effective to enrich lexical content in Biology at the secondary level
6. Activities given by researcher were interesting to understand Biology concepts.
7. Majority of the Students were able to correlate Biology concepts with daily.
8. Majority of the Students learned Biology subject comfortably through the program.

9. Learning Biology through different activities has developed the understanding of the Biology of the Students.
10. Learning root words through various activities was interesting and joyful experience for Students.
11. Learning Biology through games is better than learning Science by traditional method.
12. Explanation given by the researcher has facilitated their understanding.
13. Learning Biology through root words helped them in developing scientific attitude.
14. Learning Biology through a programme developed their critical thinking.

15.0 Conclusion:

Thus above study reveals that using various innovative pedagogy difficult learning can also be made easy. Teacher needs to think about various suitable innovative pedagogy and adopt in the teaching learning process to make subject learning interesting, joyful and burdensome.

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