

Use Of Study Guide As Intervention Tool In Enhancing Students' Motivation In Grade 8 Genetics Concepts

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ABSTRACT

Genetics is considered as one of the topics in science that students have difficulty and trouble in understanding. This study used study guide as an intervention tool to address the difficulties of students in learning genetics concepts. The main purpose of this study was to determine the perceptions of students on the effectiveness of study guide in enhancing motivation and learning in genetics lessons. The study used descriptive action research design. The development and evaluation of the study guide focused on the ADDIE Model. The respondents of the study were 75 students of Gingoog City Comprehensive National High School (SY 2015-2016). The study guide is a double-sided A4 size hard copy colored sheets that contains genetics concepts. The concepts were presented in the form of diagram and pictures. The study guide was handed out to students at the beginning of the 4th quarter where genetics lessons are dealt. The respondents answered the survey questionnaire at the end of the lessons. The results of the present study revealed that the students strongly agree that the study guide presented figures/pictures which are colourful and attractive that makes it interesting and provided adequate and comprehensive information. Majority of the students perceived that the study guide helped them when undertaking tests or exam followed by tutorials, reports and assignments. Moreover, students strongly perceived that the use of the study guide is very effective as supplemental tool in learning genetics concepts. The study guide exhibits good features that motivated students to read, learn and understand genetics lessons.

Keywords: *Genetics, study guide, science motivation, learning difficulty*

INTRODUCTION

One of the abstract science concepts students have trouble in understanding is the genetics. It is considered one of the most important and difficult topics in the school science curriculum (Lewis & Wood-Robinson, 2000); Tsui & Treagust, 2004; cited in Ceren, 2008).

Researchers reported several reasons why genetics concepts are difficult for students to learn. Among others are; Knippels, Waarlo, and Boersma (2005) indicated that these difficulties originate mainly from the domain-specific vocabulary and terminology, the mathematical content of Mendelian genetics, the cytological processes, the complex nature of genetics, and the abstract nature of the subject matter.

According to Baker and Lawson (2001), various genetics concepts depend on imaginary (theoretical) ideas constructed in abstract hypothetico deductive conceptual systems. Similarly, Banet and Ayuso (2000) presented that meaningful understanding of genetics is difficult and requires a certain level of abstract thought.

Banet and Ayuso (2000) also criticized the traditional teaching approach and suggested the development of more alternatives. The learning resources must be designed to support the student in the

development of a student-focused learning environment.

Furthermore, Smith and Sims (1992) stressed the availability of instructional techniques and materials could facilitate comprehension of genetics.

Study guide is a form of instructional materials that provide key element in linking resources. It supports students in learning their material, focus their attention in important topics and help them review for quizzes and test (Conderman and Bresnahan, 2010).

Study guides have been advocated in the professional literature for several decades. Herber (1978) cited two purposes of a study guide: to help students discover the important facts or text ideas and to guide students in thinking necessary ideas.

According also to Tutolo (1977), study guide is a teaching aid made by the teacher to be used to assist the student in developing their understanding and enhancing comprehension of a particular textual material.

Gingog City Comprehensive National High School obtained a very low score in genetics concepts in the National Achievement Test (NAT) for Second Year from 2007 – 2009. For this reason, genetics lesson was considered as one of the least mastered skills and competency in second year science of the said school.

In the newly implemented K to 12 curriculum, Genetics lessons in grade 8 are presented in the last quarter in which not all competencies are taught due to time constraint, several school activities and lack of printed resources and materials.

Hence, this study was conducted to design and evaluate the use of study guides that would address learning difficulties in genetics concepts.

Statement of the Problem

The purpose of the study was to design and use study guide in enhancing students' motivation and learning outcomes in genetics concepts.

Specifically, it aims to answer the following questions:

1. What are the least mastered competencies in Grade 8 genetics concepts?
2. Based on the results of the analysis phase, what is the design of the study guide to improve motivation and address the difficulty of students in genetics concepts?
3. How effective is the study guide in improving students' motivation in learning genetics concepts as perceived by the students?

Significance of the study

The use of study guide will provide additional/supplemental tool in learning genetics. The presentation of lessons is designed to suit the level of needs of students. This enhances motivation in reading and learning genetics concepts.

Theoretical Framework

Carnie, (1997) suggested that one of the potential causes of students' low achievement level is that their learning characteristics do not match the design of instructional materials and teaching practices. Therefore, it is essential to consider learners' needs when organizing the content in ways that increase the likelihood of students achieving learning objectives (Zheng and Smaldino, 2003).

Stein, Stuen, Carnine, and Long (2001), also proposed that better design of instructional materials has a positive impact on low performing students. The quality of instructional designs may be improved to a large extent when considering the design principles being used. For this reason we can say that one of the most

important steps in teaching is deliberately designing the instructional methods and materials.

The theoretical perspective on the use of study guide is anchored in experiential learning theory of John Dewey where one learns best when they are personally involved in the learning experience. The use of study guide is hands-on and minds-on learning experience.

The development and evaluation of the study guide was focused on the ADDIE Model. It involved four stages:

Stage 1- Analysis– Needs analysis, Tasks, Participants’ Current Capabilities

Stage II-Design – Learning objectives, Delivery format, Activities

Stage III- Develop- Creation of prototype, Develop course material

Stage IV- Implement- Try out, Tools in Place, Observation

Stage V- Evaluation-Awareness, Knowledge, Behavior, Results

From these frameworks an effective study guide was developed that would integrate various attributes holistically.

REVIEW OF LITERATURE

Genetics is considered one of the most important and difficult topics in the school science curriculum (Tsui & Treagust, 2004 cited in Ceren, 2008). There are several reasons why genetics concepts are difficult for students to learn. Knippels, Waarlo, and Boersma (2005) indicated that these difficulties originate mainly from the domain-specific vocabulary and terminology, the mathematical content of Mendelian genetics, the cytological processes, the complex nature of genetics, and the abstract nature of the subject matter.

A research on the nature of the relation between formal operation thought and genetics problem solving was analyzed by Smith and Sims (1998). These authors emphasized that the availability of instructional techniques could facilitate comprehension of genetics concepts.

McArdle (1991) reported that an efficient instructional design greatly increases students’ success. Up to the present several instructional design models have been developed by different researchers. In general, the processes of instructional design models consist of analysis, designing, development, implementation, and evaluation steps (Dooley, 2005). When undertaking instructional design it is possible to apply a single model, or it is also possible to combine more than one model (Işman, Çağlar, Dabaj, & Ersözlü, 2005).

Carnie (1997) suggested that the potential cause of students’ low achievement level is that their learning characteristics do not match the design of instructional materials and teaching practices. Therefore, it would be very important to consider learners’ needs when organizing the content in ways that increase the likelihood of students achieving learning objectives (Zheng and Smaldino, 2003). The instructional objectives describe skills and knowledge that the learners will have developed, upon completion of the instructional unit (Hashim, 1999).

Many researchers pointed out that efficient teaching and learning of any topic depends on the teaching methods, and that students learn better where more than one teaching method was used (Mahajan and Singh, 2003). Joseph and Gayle (1998) reported that using multiple teaching strategies and methods during instruction increased the cognitive learning of students with different learning styles. Powell and Wells (2002) proposed that using multiple methods provided teachers with flexibility, and enhanced activities to be appropriate for different learning styles.

Stein, Stuen, Carnine, and Long (2001), proposed that better design of instructional materials has a positive impact on low performing students. For this reason we can say that one of the most important steps in teaching is deliberately designing the instructional methods and materials.

Study guide is a form of instructional materials that provide a key element in linking resources. It supports students in learning their material, focus their attention in important topics and help them review for quizzes and tests (Conderman and Bresnahan, 2010). They further emphasized that study guides help students determine how important specific pieces of information are compared to other information provided in the subject.

Khogali et al. (2006) importantly identified that study guides help students to manage their own learning. This is an example of key educational requirement when developing student-focused learning environments. Tincani (2004) also identified that study guide is one of the ten strategies for increasing academic success of students with disabilities.

A study of Maxworthy (1993) in the use of study guides in improving text comprehension revealed that study guides are worthwhile instructional aids and a valuable tool for enhancing instructions.

Moreover, According to Jenkins et al. (2010) student survey summative assessment is an important driver for many students in the management of their learning. Study guide appears to be an ideal resource for students when undertaking summative assessment. The survey further showed that students felt that the study guide was clearly organized and were effective in helping them to learn the material covered in the course. The study also showed that the study guides provide a means for supporting active learning strategies for students within the course.

For this reason, principles of instructional design are considered to prepare material, a study guide to support teaching on genetics concepts which are generally considered as difficult topics.

METHODOLOGY

Research Design

The study used descriptive action research design. This study was designed to collect information about the effectiveness of study guides in learning genetics. The development and evaluation of the study guide focused on the ADDIE Model. It involved five stages: Stage 1- Analysis; Stage II-Design; Stage III-Development; Stage IV- Implement and Stage V- Evaluation.

Respondents

The respondents of the study were 75 students of GCCNHS (SY 2015-2016). It consisted of 38 grade 8 students under Science Technology and Engineering Program (STEP) and 37 students from Special Program in the Arts (SPA).

Instruments

The data was collected through the following instruments; Genetics Achievement Test and Student Perceptions Questionnaires.

The Genetics Achievement Test consisted of 50 questions which represent various topics in grade 8 science genetics concepts. The questions were made by the researcher.

The Student Perceptions Questionnaires (SPQ) consisted of 10 Likert-type items.

Validation and Reliability of Research Instrument

The instruments were validated using the Evaluation Rating Sheets (DepEd- LRMSD) by a group of experts such as: Science education program specialist, Science department head, Science Master Teachers and Math teacher.

Members of the validation group were asked to examine the appropriateness of the questionnaires

by using an expert judgment form (APPENDIX A). The instruments were also shown to students to verify the clarity of the terms used in the study.

Gathering Procedures

The development and evaluation of the study guide focused on the ADDIE Model. It involved five stages: Stage 1- Analysis; Stage II-Design; Stage III- Development; Stage IV- Implement and Stage V- Evaluation.

The analysis stage was the administering the test using the GAT (Genetics Achievement Test). It was used to determine the least mastered skills of the students. The contents and components of the study guide were based on the GAT result.

The design stage involved the following phases: focus group discussions with teachers and selected students to decide for the format, content and design of the study guide. Then, a prototype of the study guide was made.

In the development stage, science experts, teachers and selected students was asked to assess and validate the study guide. Final revisions followed to incorporate the comments and suggestions made during the validation.

In the implementation stage; the study guide was used as a supplemental tool in learning genetics concepts aside from the existing learners' materials. To help students develop their own independent learning, the use of study guide was adopted and linked to daily lecture sessions and activities.

In the evaluation stage, the respondents were required to fill up the survey questionnaire on a Four-point Likert scale. All respondents were asked to check their answers in each item to keep off from missing data.

Scoring and Quantification of Data

The score of each response was based on a Four-point scale that ranges from;

Scale	Mean Range	Descriptive Rating	Interpretation
4	3.50 - 4.00	Strongly Agree	Very Effective
3	2.50 - 3.49	Agree	Moderately Effective
2	1.50 – 2.49	Disagree	Less Effective
1	1.00 – 1.49	Strongly Disagree	Not Effective

Data Analysis

Item analysis was done to establish the least mastered skills of the students. This was the basis of the content of the study guide.

The data was analysed in terms of weighted mean and frequency distribution.

RESULTS AND DISCUSSIONS

Results here are discussed in the order of specific problems.

Problem 1. What are the least mastered competencies in Grade 8 genetics concepts?

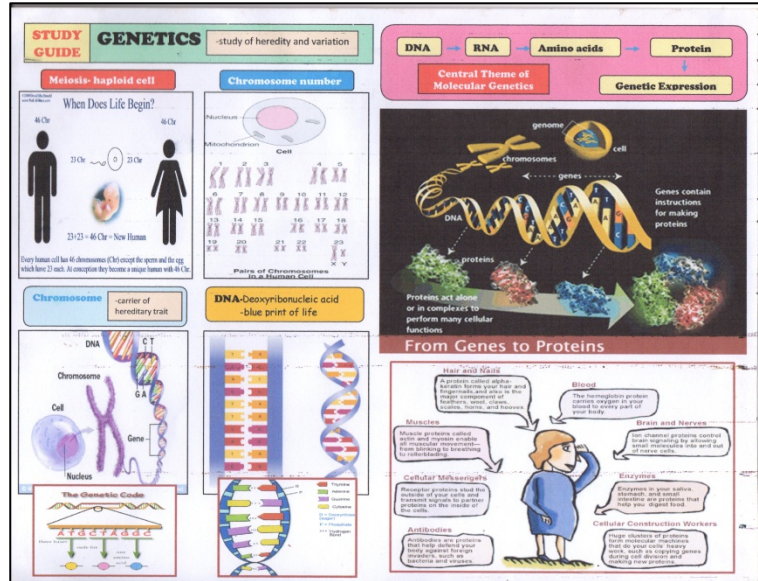
Table 1. Least Mastered Competencies in Grade 8 Science Genetics

Topics	Competencies
Chromosome	Identify what makes up a chromosome.
Cell Cycle	Describe the stages of cell cycle.
Cell Division	Identify the different stages of mitosis and meiosis. Differentiate plant and animal meiosis.
Mendelian Genetics	Explain the Mendelian Principles of Heredity Law of Dominance Law of Segregation Law of Independent Assortment Solve Monohybrid and Dihybrid Crosses
Non-Mendelian Genetics	Explain the Non-Mendelian Patterns of Heredity Incomplete Dominance Codominance Multiple Alleles Sex-Linked Genes
Sex Determination	Describe and explain the gametogenesis process.

Problem 2. Based on the results of the analysis phase, what is the design of the study guide to improve motivation and address the difficulty of students in genetics concepts?

The study guide is a double-sided A4 size hard copy colored sheets that contains genetics concepts. The concepts were presented in the form of diagram and pictures. Statements and phrases are worded concisely and briefly to minimize boredom in reading. The presentations were enhanced with colors that give emphasis on important features or concepts. Below is an example of a study guide.

A



B

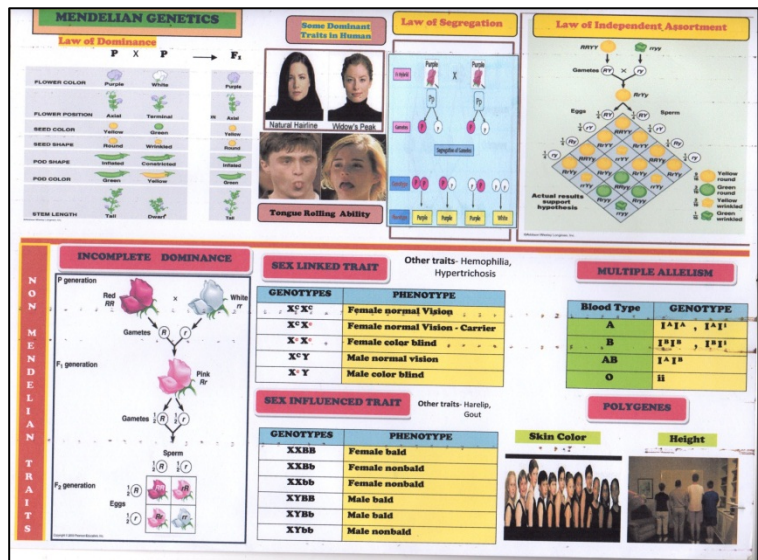


Figure 1. The study guide. A –Front, B-Back.

Problem 3. How effective is the study guide in improving students’ motivation in learning genetics concepts as perceived by the students?

Table 2. Students’ Perceptions on the Effectives of Study Guide in Learning Genetics

Statements	Weighted Mean	Verbal Description	Interpretation
The layout is easy to understand.	3.39	Agree	Moderately Effective
The different colours used make the information easy to follow.	3.79	Strongly Agree	Very Effective
The figures/pictures are colourful and attractive that makes it interesting.	3.85	Strongly Agree	Very Effective
The words and diagrams are clear, readable and easy to understand.	3.57	Strongly Agree	Very Effective
The information provided is logically organized.	3.68	Strongly Agree	Very Effective

The study guide provides adequate and comprehensive information.	3.79	Strongly Agree	Very Effective	
The study guide is handy and convenient to use that facilitates learning anytime and anywhere.	3.71	Strongly Agree	Very Effective	
The study guide motivated me to read and learn.	3.81	Strongly Agree	Very Effective	
The use of study guide is an effective tool on learning genetics concepts.	3.75	Strongly Agree	Very Effective	
Mean	4.70	Strongly Agree	Very Effective	
	Tutorials	Assignments	Tests and Exams	Reports
The study guide helped me when undertaking;	25 %	14 %	39 %	22 %

The results of the present study revealed that the students strongly agree that the study guide presented figures/pictures which are colourful and attractive that makes it interesting with the highest mean value of 3.85. This is followed by statement no. 8, which states that the study guide motivated them to read and learn with a mean value of 3.81.

Students also strongly agree that the study guide contains different colors which make the information easy to follow, the words are clear, readable and easy to understand, the information are logically organized with adequate and comprehensive information and that is handy and convenient to use.

Most importantly, students strongly agree that the use of study guide is an effective tool on learning genetics concepts.

Table 1 further shows that statement no. 1 has the lowest weighted mean 3.39. It implies that students only moderately perceived that the study guide layout is easy to understand.

The overall mean is 3.70 with a verbal description of strongly agree. It indicates that students generally perceived that the use of study guide is very effective.

In addition, majority (39 %) of the students perceived that the study guide helped them when undertaking tests or exam. This is followed by undertaking tutorials, reports and assignments with 25 %, 22 % and 14 % respectively.

The present study runs similarly to the reports of Conderman and Bresnahan, (2010) which emphasized that study guides help students determine how important specific pieces of information are compared to other information provided in the subject.

This also confirms the study of Maxworthy (1993) in the use of study guides in improving text comprehension revealed that study guides are worthwhile instructional aids and a valuable tool for enhancing instructions.

Moreover, According to Jenkins et al. (2010), study guide appears to be an ideal resource for students when undertaking summative assessment. The survey further showed that students felt that the study guide was clearly organized and were effective in helping them to learn the material covered in the course. The study also showed that the study guides provide a means for supporting active learning strategies for students within the course.

This also supports to Conderman and Bresnahan,(2010) which states that study guide supports students in learning their material, focus their attention in important topics and help them review for quizzes and tests.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, students strongly perceived that the use of the study guide is very effective as supplemental tool in learning genetics concepts. The study guide exhibits good features that motivated students to learn and understand genetics lessons. However, there appears to be a need for revision specifically on the layout and inclusion of exercises and formative assessments.

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