

GRAPHIC K TO 12 MODULE IN GENETICS FOR GRADE 10 STUDENTS AT RISK OF DROPPING OUT (SARDO)

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Abstract

This study sought to develop a Graphic K to 12 Module in Genetics for Grade 10 Students who are at Risk of Dropping out (SARDO), for the purpose of increasing their academic achievement. It was conducted among the two national high schools under Cotabato Division. The quasi-experimental design was utilized with pretest-posttest nonequivalent control group design. Purposive sampling was used in determining the sample size of the subjects of the study. The result showed that there was no significant difference between pre-test and post testing of the experimental and control group. It showed that the efficacy of the graphic module is as effective as the contemporary K to 12 module in teaching Genetics. From this result, teachers are encouraged to use the contemporary K to 12 module as an intervention while the graphic K to 12 module can be an effective alternative module for SARDO.

Keywords: Module; Student at Risk of Dropping Out

1. CONTEXT AND RATIONALE

Quality basic education is apparently viewed as any country's pillar of success (Barlongo, 2015). To ensure that all students stay in school until they complete their education is a very important part of basic education (UNESCO, 2008). However, school drop-out crisis has reached a global epidemic and has become a major issue in education around the world (Torres, 2010).

Thus, there is a need to strengthen more the interventions made by the teachers in saving students at risk of dropping out of school should be underscored. Despite of the interventions made such as home visitations and parent-teacher conferences, Dr. Onofre H. Campo High School reported an alarming increasing rate of Students at Risk of Dropping Out for the past three consecutive school years (2016 – 3.9%; 2017 – 6.5%; 2018 – 8.7%) based on the result of the SMEPA. Such problem must be given appropriate solutions.

Research Questions

Specifically, the research sought to answer the following questions:

- What are the achievements of SARDO in Genetics before and after exposure to the alternative K to 12 Module?
- What is the effect size of the academic achievement of the students at risk of dropping out of school?
- Is there a significant difference between pre-test and post-test control group (contemporary module)?
- Is there a significant difference between pre-test and post-test group testing? (Graphic module)?

- Is there a significant difference between the pre-test value stated by the test group (graphic module) and the control group (contemporary module)?
- Is there a significant difference between the post-test value stated by the test group (graphic module) and the control group (contemporary module)?

Innovation and Intervention

This study focused on developing a more doable intervention that addressed the increasing number of SARDO cases in basic education schools.

As observed on the Genetics chapter, the contemporary K to 12 module develops activities that requires the manipulative skills of the students and underscores collaborative approach in learning. Thus, the activities created require the effort of a group of students to attain its objectives. This urged the researcher to create an instructional material that suits to the needs of the SARDO where they can reach the objective of the lesson's activities through their own efforts and time.

Furthermore, this notion rose from the prevailing problem of the Dr. Onofre H. Campo High School where most of the SARDO were engaged to child labor. Hence, the researcher employed the graphic K to 12 Module as an immediate intervention to the SARDO. A module that was aligned to the current curriculum's competency.

2. RESEARCH METHOD

Participants and Data Sources. The subjects of this study were all the Grade 10 students at risk of dropping out in

Dr. Onofre H. Campo High School composed of twelve (12) students and Kisante National High School composed of eighteen (18) students for a total of thirty (30) subjects. The subjects were already pre-identified by the Grade 10 advisers based on the results of their attendance from the first grading to second grading of the current school year and based on their scholastic performance on the previous grading periods.

The researcher made use of purposive sampling in determining the sample size of the subjects of the study.

Data Gathering Methods. The instruments used in this study were the following:

Pre-test and Post-test. The Pre-test and Post-test are competency based specified in the K-12 Curriculum Guide.

In ensuring the validity of the researcher-made tool, this was presented to three (3) content experts in science. The researcher-made tool was piloted to all the Grade 10 students of Dr. Onofre H. Campo High School except for the identified SARDO. The tool was tested for reliability and was found reliable ($KR-20=0.77$) using formula the Kuder-Richardson 20. KR-20 scores range from 0 to 1, where 0 is unreliable and 1 is completely reliable.

Graphic K to 12 Module. The procedure in making and evaluating the efficacy of the module was anchored on the ADDIE Model as described by Becker (2010). It was accorded on the study of Beezly (2011) where it highlighted that the ADDIE Models is an effective model in designing instruction because it is a revelatory program which provides insights into the creation of research-based, engaging and effective learning experiences.

Analysis Stage

The researcher, with the science teachers in the municipality of Makilala convened to discuss on the least learning topics in Biology. It was agreed that the researcher's module topics will be all about Genetics concepts. This was supported by the study of Kilic, Taber and Winterbottom (2016) where they cited in the study of Duncan and Reiser (2007) that genetics is difficult for students to learn because of the invisibility and inaccessibility of genetic phenomena.

Designing Stage

The procedure comprised the following:

1. Studying the Learning Competency described by the K to 12 Curriculum.
2. Budgeting the objectives found in K to 12 Curriculum of the said topics.
3. Writing and constructing of the alternative K to 12 Module in Genetics following the criteria.
4. Validating one of the topics of the alternative K to 12 modules through self, peer and administrative head the test and observation. The validation revealed that the graphic module was rated as excellent. Eight test questions were revised as shown on the reliability test result using Kuder-Richardson Formula 20.

Development Stage

The researcher-made module was composed of a pre-test; discussion through graphic of the following topics: a. Structures of DNA and RNA molecule, b. DNA Replication, c. Transcription, d. Translation and e. Chromosomal Mutations; self-discovery activities on each topic; summary; a posttest and references.

Implementation Stage

Prior to the delivery of the researcher-made module, the 30-item pre-test was employed to all the identified SARDO of Dr. Onofre H. Campo High School and Kisante National High School. Afterwards, fifteen (15) sets of contemporary modules were given to the control group and fifteen (15) sets of the research-made graphic module were given to the experimental group. All the SARDO were given two (2) weeks to read, to analyze and to answer the activities of their respective modules. The 30-item posttest was administered after the given span of time.

However, eight (8) of the thirty (30) students were purposively visited by the researcher in their houses to administer the pre-test and to give the module. This was done since these students were not around during the conduct of this stage.

Evaluation Stage

The results of the pre-test and post-test SARDO tests were analyzed and interpreted to evaluate the effectiveness of the graphic module.

Data Analyses Plan. After the collection of data, it was organized and analyzed accordingly using Mean, Deviation Standard and T-test for the reliability and consistency of the research. The statistical computation in this study was done by using the SPSS 16.0 software and all interpretations of the data output were based on $\alpha = 0.05$ level of significance.

3. RESULTS AND DISCUSSIONS

Achievement of SARDO in science before and after exposure to the Graphic K-12 Module

Presented in Table 1 is the result of the test performed to determine the achievement of the SARDO in the control and experimental group.

Both the SARDO from the control and experimental group show low scores in the pretest with the mean scores of 9.00 and 9.87 respectively, which means that the level of proficiency is developing. A learner at this level has little knowledge and skills and basic understanding, but needs help in terms of related performances. Moreover, the control and the experimental group showed lower standard deviation of 3.29 and 3.09, respectively. This reveals that the scores of the control and experimental groups were closely distributed which implies that they have almost the same scores.

Table 1 Descriptive Statistics of SARDOs performance in science

	Control Pre-Test	Control Post Test	Experimental Pre-Test	Experimental Post Test
Valid N	15	15	15	15
Mean	9.00	11.20	9.87	13.47
Std. Deviation	3.29	2.73	3.09	4.05

On the other hand, both the control and experimental groups consistently indicate higher performance after the intervention with the mean scores of 11.20 (SD=2.73) and 13.47 (SD=4.05), respectively. The level of proficiency of the students who used the contemporary K to 12 module remains the same as developing while the students who were given the graphic K to 12 module is approaching proficiency. Therefore, students in the experimental group had developed basic knowledge, skills and basic understanding in Genetics. The result implies that both the SARDO from the control and experimental groups response positively to the introduced interventions. Although, students in the experimental group indicate slightly higher performance before and after the intervention compared to the students in the control group.

The result was supported by the study conducted by Padmapriya (2015) where the results revealed the effectiveness of self-instructional module on achievement among secondary school students in learning Biology. The same is true on the result of the achievement of the SARDO before and after the intervention was introduced.

Table 2 Basis of Analysis and Interpretations of the Test Scores

Level of Proficiency	Numerical Rating	Qualitative Description
Advanced	24 and above	A student at this level exceeds the basic requirements for knowledge, skills and understanding, and can automatically transfer flexibility through real work. .
Proficient	18 to 23	The learner at this level has developed the basic knowledge and skills and core understanding, and can transfer them independently through authentic performance.
Approaching Proficiency	12 to 17	The student at this level has developed the fundamental knowledge; skills and core understanding with little guidance from the teacher and or with some assistance from the peers, can transfer these understanding through authentic performance tasks.
Developing	6 to 11	The student at this level possesses the minimum knowledge and skills and core understanding, but needs help throughout the performance of authentic task.
Beginning	0 to 5	The student at this level struggles with his/ her understanding, pre-requisites and basic knowledge and or skills have not developed adequate to aid comprehension.

Effect size of the academic achievement of the SARDO

Presented in the table 3 is the statistical analysis of the academic achievements’ effect size of the SARDO

It shows that the academic achievements’ effect size of the control group is 0.791 which denotes as having medium magnitude effect (Cohen 1988). This means that learning took place in the control group after the contemporary module was given although its effectivity based on the scores of the SARDO in the post test is not very high.

On the other hand, it also shows that the academic achievements’ effect size of the experimental group is 1.087 which denotes as having large magnitude effect (Cohen 1988). The result indicates that learning took place

in the experimental group after the graphic module was given where its effectivity as shown on the scores of the SARDO in the post test is very high.

Table 3 Effect size of the Academic Achievement of SARDO using Cohen’s d

		Cohen’s d
Control Pre-Test	Control Post Test	0.791
Exp Pre-Test	Exp Post Test	1.087

Difference of the Achievements of the SARDO in the control group

Presented in the table 4 is the statistical analysis of the academic achievement of the SARDO in the control group using the contemporary K to 12 Module.

It shows that there is a significant difference between the pretest and posttest performance of SARDOs in the control group (t=-3.062, df=14, p<.01). Posttest performance of SARDOs in the control group is significantly higher than their performance in the pretest. The result implies that the use of the contemporary K to 12 modules as an intervention in the control group has significantly improved students’ performance.

The result of the academic achievement of the SARDO shows that the contemporary module of the K to 12 curricula can be used as an intervention for the said students. As cited in a study, modules highly consider the individuality of the learners to develop the specified knowledge and skills based on their own pace and preferred learning environment (Mariani, 2009; Sejpal, 2013).

Table 4 Paired Samples T-Test on the Performance of SARDOs in the Control Group

		T	Df	P	Cohen’s d
Control Pre-Test	Con Post Test	-3.062	14	0.008	0.791
Note: Student’s t-test					

Difference of the Achievements of the SARDO in the experimental group

Presented in the table 5 is the statistical analysis of the academic achievement of the SARDO in the experimental group using the Graphic K to 12 Module.

It reveals that there is a significant difference between the pretest and posttest performance of SARDO in the experimental group (t=-4.209, df=14, p<.01). Posttest performance of SARDO in the experimental group is significantly higher than their performance in the pretest. This further implies that the intervention used in the experimental group has significantly improved students’ performance.

Table 5 Paired Samples T-Test on the Performance of SARDOs in the Control Group

		T	Df	P	Cohen’s d
Control Pre-Test	Con Post Test	-4.209	14	<.001	1.087

Note: Student’s t-test.

The result agrees with the study conducted by Guido (2014) that modular instruction is one of the greatest innovations in the educational system. It is due to the

concrete application of the principle of each variation in which the student can proceed at a pace appropriate to his or her skills (Naval, 2014).

Difference of the Pre-Test Achievement of the SARDO in the experimental group and control group

Presented in the table 6 is the test result performed to determine the achievement of the SARDO in the pre-test.

The result shows that there is no significant difference between the pretest performance of SARDOs in the control group and experimental group ($t=-0.743$, $df=28$, $p >.05$). The result indicates that the pretest performance of SARDOs in the two groups is relatively similar prior to the conduct of the experiment. It can be gleaned from the data that subjects in the experimental and control groups have little knowledge on the selected topics in Genetics of the study.

These findings will confirm the common view that Genetics is one of the most challenging content areas in science as mentioned in the study of Topcu and Pekmez (2009) on the Turkish Middle School Students' Difficulties in Learning Genetics Concepts affirms that one of the most challenging fields in science is Genetics.

Table 6 Independent Samples T-Test Between Pretest scores of SARDOs performance in the pretest

	T	Df	P	Cohen's d
Pretest	-0.743	28.00	0.464	0.271

Note: Student's t-test.

Difference of the Post-Test Achievement of SARDO in the experimental group and control group

Presented in the table 7 is the test result performed to determine the achievement of the SARDO in the post-test.

The result shows that there is no significant difference between the posttest performance of SARDOs in the control group and experimental group ($t=-1.797$, $df=28$, $p >.05$). The posttest performance of SARDOs in the two groups is relatively similar after the conduct of the experiment. This means that both modules have increased the academic achievement of the SARDO. Thus, the result indicates that the interventions used in the two groups are effective in producing significant improvement on SARDOs performance in teaching Genetics even the competencies included are difficult. Thus, both two strategies are effective as an intervention. However, the result of having no significant difference on the academic achievement of the SARDO on both the graphic and contemporary K to 12 modules reveals that these modules are the same in its approach in learning which can be done by an individual student. In general, the result affirmed that the contemporary K to 12 modules can be used as a collaborative and self-discovery approach in teaching while the researcher made graphic K to 12 modules can be used as an effective self-discovery approach in teaching the SARDO.

This agrees on the findings of the study Barbasan (2017) which concludes that the academic achievement of the group who are introduced to modular approach improves as attested in the post-test mean scores as well as the mnemonic strategy. The pre-test mean scores were very low, however after conducting the experiment, the

modular approach and the mnemonic strategy groups have been satisfactory in solving word problems.

Table 7 Independent Samples T-Test Between Posttest scores of SARDOs performance in the posttest

	T	Df	P	Cohen's d
Posttest	-1.797	28.00	0.083	0.656

Note: Student's t-test.

4. FINDINGS AND CONCLUSION

On the basis of the research findings, the following conclusions were drawn.

1. Both the contemporary K to 12 module and graphic K to 12 modules are effective as an intervention in teaching Genetics to Grade 10 SARDO as shown in the result of their achievement.
2. The efficacy of the graphic module is as effective as the contemporary module in teaching Genetics.

5. RECOMMENDATION

1. Teachers are encouraged to use the Contemporary K to 12 modules as an intervention to SARDO while the graphic K to 12 modules can also be used as an alternative module to those SARDO, particularly those who are visual learners.
2. Since the topics included in the graphic module are considered as one of the least learned competencies in Biology, for the better improvement of the graphic module design, it is recommended to create a graphic module on different topics of different levels of difficulty from easy topic to difficult topics to see the difference in the Contemporary K to 12 Module.
3. Further studies will link to this research in making graphic module in the other competencies in science aside from Genetics that appropriately addresses the needs of the SARDO.

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