Development of the Hormone System Material Module as an Effort to Introduce Low Sugar, Salt and Fat Foods to Class XI High School Students

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Article Info

Abstract

This Research and Development (R&D) study aimed to describe the validity, practicality, and effectiveness of the hormone system material module to promote low-sugar, low-sodium, and low-fat diets to the eleventh-grade students of senior high school. The samples consisted of 17 students of XI IPA (Eleventh-grade majoring in Natural Science) at SMA Negeri 7 Prasetya Gorontalo. The findings revealed that the validity test obtained a value of 88% with very valid criteria;the practicality test obtained student activity scored 88% with excellent criteria, learning implementation scored 96,6% with excellent criteria, student response questionnaires scored 83% with excellent criteria; and the effectivennes test based on the pre-test and post-test of students learning outcomes obtained a sifnificance value of 0,000 and the n-gain value obtained an average value of 0,70 with high criteria. Therefore, it can be concluded that the modules developed were suitable for use in the learning process.

Keywords:

Validity, effectiveness, practicality, module, low-sugar,low-sodium, low-fat.

INTRODUCTION

Healthy food contains substances the body needs, such as carbohydrates, proteins, fats, minerals, and vitamins. It is free from germs, hazardous materials, contaminants and food additives that are not allowed, such as formaldehyde, borax, etc. Some of the commonly consumed healthy food groups include fruit, whole grains, and dairy which of course do not contain added sugar, sodium, or saturated fats (Drewnowski, 2020). According to Saparinto (in Nursiah, 2006), food comes from biological sources and water, both processed and unprocessed for human consumption in the form of food and drinks. These foods and beverages have specific criteria or standards, commonly known as standardization of food quality.

Nowadays, Western culture has heavily influenced various aspects of life and Eastern values, including changes in food consumption patterns. We all know that people's food consumption patterns are now more likely to consume fast food or what is known as fast food. According to Dingman *et al* (2014) increased consumption of fast food can affect health as fast food contains more nutrients such as calories, saturated fat, sugar and sodium.. When consumed daily in large quantities, it can cause obesity and degenerative diseases, including diabetes mellitus, heart disease, stroke, hypertension and cancer (Hermina, 2007).

Degenerative disease is a chronic disease that significantly affects a person's quality of life. This degenerative disease is caused by disruption of the balance of the body's metabolism due to unbalanced nutritional consumption, namely consuming too much food that is high in sugar, salt and fat, which causes the risk of obesity and diabetes mellitus (Galuh, 2018). Some common disorders include obesity and diabetes mellitus, according to Bray (2017) obesity is defined as a chronic and recurrent disease caused by several factors characterized by an increase in body fat that can increase dysfunction in adipose tissue and abnormal fat mass resulting in metabolic imbalances and chemical compounds in the body, while diabetes mellitus is characterized by an increase in blood glucose levels caused by damage to insulin secretion and insulin action. According to Guyton and Hall (2006), the hormone insulin has an essential effect on the metabolism of carbohydrates, fats and proteins. This hormone lowers blood levels of glucose, fatty acids, and amino acids and promotes storage of these nutrients.

According to Soekirman (in Arlius, 2017), ignorance about the importance of balancing the body's metabolism and the content of nutrients in food occurs not only in adults but also in adolescents, especially students. This is proven by the large number of students who still frequently consume fast food so that it affects their eating habits which become unhealthy. To overcome this, it is best to disseminate information about healthy food by introducing food sources low in sugar, salt and fat through learning using various media, one of which is a module.

The results of interviews with biology teachers at Prasetya 7 Public High School, Gorontalo City, stated that the hormone system material was still sourced from makeshift learning resources; not many learning media introduced more about the hormone system and its relationship with body metabolism related to nutritional intake and low sugar food needs: salt and fat. As a result, students need to gain further knowledge about the need for good nutrition for the body. Based on this, it is necessary to develop modules that can be studied at school or independently at home; as said by Yuliyana et al. (2018) that a module is a learning resource created for students so that they can learn on their own and not depend on the guidance of educators. Modules are also structured to provide the information necessary for learners to acquire and assess knowledge and skills that require learners to actively interact with learning materials, not just passively read the material (Dick et al, 2001). The information packaged in the module contains material on hormones as regulators of the body's metabolism associated with the

introduction of foods low in sugar, salt and fat. The aim of developing this module is for students to understand the importance of healthy food low in sugar, salt and fat.

RESEARCH METHOD

Research and development, adapted by Sugiyono (2018), is the type of research used in this study. On the topic of hormone system material, POE (Predict, Observe, & Explain) oriented learning devices will be designed in this study. This research adapts Sugiyono's methodology (2018), which includes material analysis, information gathering (literature study), learning device design, learning tool validation, learning tool revision, learning tool validation, small-scale trials, and manufacturing learning tools that meet valid criteria, practical, and are effective. The even semester of the 2021/2022 school year was used for this research. The research was conducted at SMA Negeri 7 Prasetya Gorontalo, at Jl. Budi Utomo, Kota Tengah District, Gorontalo City. This research involved 17 students in SMA Negeri 7 Prasetya, Gorontalo City.The research instruments used are validation sheets, learning implementation sheets, student activity sheets, stude nt response questionnaires, and pre-test and post-test questions. Validation was carried out by two expert validators, namely lecturers in the biology department at Gorontalo State University.

Table. 1 Validation Criteria

Activity (%)	Criteria
86 – 100	Excellent
76 – 85	Good
60 – 75	Saticfactory
55 – 59	Poor
≤ 54	Very Poor

(Source: Yazid, 2016)

$$\text{Validation } = \frac{\text{The sum of Total Scores of All Validators}}{\text{Maximum Score}} \times 100$$

Table. 2 Categories of Student Activity Assessment

Activity (%)	Criteria
0-20	Very Poor
21-40	Poor
41-60	Saticfactory
61-80	Good
81-100	Excellent

$$\text{Student Activity} = \frac{\sum \text{Score obtained}}{\sum \text{Maximum score}} \times 100$$

Table. 3 Learning Implementation Assessment Category

Activity (%)	Criteria
0-20	Very Poor
21-40	Poor
41-60	Saticfactory
61-80	Good
81-100	Excellent

$$\text{Implementation of Learning} = \frac{\sum \text{Score obtained}}{\sum \text{Maximum score}} \times 100$$

Table. 4 Student Response Criteria

Activity (%)	Criteria
0-20	Very Poor
21-40	Poor
41-60	Saticfactory
61-80	Good
81-100	Excellent

$$\text{Student Response Criteria} = \frac{\sum \text{Student answer score}}{\sum \text{Maximum score}} \times 100$$

Table. 5 Interpretation of Student Response Questionnaire Scores

Activity (%)	Criteria
0,70 < N-gain	High
0,30 ≤ N-gain ≤ 0,70	Medium
<0,30	Low

RESULT AND DISCUSSION

Result

Module Validity Results

Module validation is carried out to consult the product being developed with expert validators, namely lecturers and practitioner validators, namely school teachers. Validation is carried out to determine the advantages and disadvantages of the product being developed for further improvement. This validation stage uses a validation instrument that assesses several aspects. Based on the assessment presented in Table 6, it can be seen that the validator results by two expert validator lecturers obtained an average score of 82% and 90% with the criteria of feasible and very feasible than the results of the practitioner validator by one teacher obtained an average value of 93% with the criteria very worth it.

Table. 6 Results of Validity Analysis

| Validator	Average Percent Validation	Criteria
Expert Validator I	82%	Good
Expert Validator II	90%	Excellent
Practitioner Validator	93%	Excellent

Module Practicality Analysis

Practicality aims to see whether the products developed are practically used in the learning process. Analysis of the practicality of the module includes assessing student activities, the implementation of learning, and student responses. The results of the practicality analysis are presented in Table 7.

Table. 7 Module Practicality Analysis Results

Valuation Analysis	Average Percentage	Criteria
Student Activity	88%	Very Good
Implementation of Learning	96,6%	Very Good
Student Response	84%	Very Good

Module Effectiveness Analysis

The results of the analysis of the effectiveness of the module consist of the results of the assessment of the pre-test and post-test items presented in Figure 1, the results of the t-test, which obtain a significant value of 0.000 <0.005, and the value of the n-gain test results which obtain an average of 0.70 which means presented in Table 8
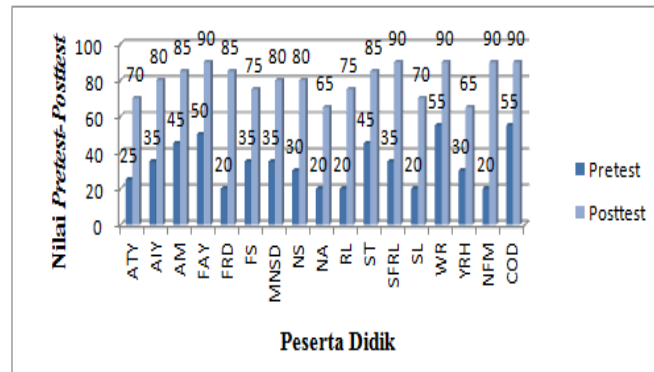
Picture 1. Pre-test and post-test values (Source: *Data Primer, 2022*)

Table. 8 N-gain Test Results

N-Gain Value	Category
0,70	High

Discussion

Module validation is carried out to consult the developed product with expert validators, namely lecturers and practising validators, namely school teachers. This is in line with what was stated by Sari (2014) that a validator is an expert in a field/science in providing an assessment of an assessment instrument. Validation is carried out to determine the advantages and disadvantages of the product being developed for further improvement. This validation stage uses a validation instrument containing about 15 aspects of the assessment.

Based on the assessment of the three validators, an average percentage rating of 88% was obtained with very feasible or very valid criteria by the validator. According to Trianto (2010), valid means that the assessment has provided accurate information about the teaching materials being developed, namely modules. After going through the revision process based on input and suggestions from expert validators to perfect the developed module so that it can be tried out in learning, this value is the final value. This is by what Idellisa (2017) stated that the criteria for a suitable module are those that fulfil the didactic, construction, and technical aspects.

Practicality aims to see whether the products developed are practically used in the learning process. Practicality refers to the condition of the developed learning modules that can be used easily by students so that learning becomes interesting, meaningful, fun, and valuable and can increase students' creativity. The practicality analysis of the module includes assessing student activity, the implementation of learning, and student responses.

Based on the data analyzed on the results of the student activity assessment, scores were obtained in the range of 74-100 in the sound and perfect categories. This shows that student activity is perfect when learning takes place, as was stated by Abimayu (in Muliadi, 2014) that student involvement in learning can take the form of physical involvement, such as demonstrating instructions from the teacher as well as mental involvement, which includes intellectual involvement such as discussing with friends—and emotional involvement such as appreciation of feelings, values, attitudes, and so on.

The results of the implementation of the learning carried out by the teacher obtained perfect criteria when the learning took place. The activeness of the teacher in the learning process is, of course, to foster more lively learning activities. This is in accordance with what Mcneill & Knight (2013) stated that the role of teachers and students is very important in the process of learning science, one of which is learning biology. The average acquisition for all aspects of the assessment of learning effectiveness is 96.6%, where learning implementation is excellent if the learning device reaches the assessment criteria. According to Havis (2012), the implementation of learning is categorized as practical if the indicators filled by the observer are stated to be good.

Assessment of student responses using a response questionnaire instrument with eight aspects of assessment. Students are not only given "Yes" and "No" statements to assess each aspect but are presented with a score range of 1-4 to make the assessment results more effective. The student response questionnaire analysis results gave a positive response to the developed module. Six students gave excellent responses in the 87% -100% score range, and 11 students in the 73% -85% score range. The positive responses indicated that students felt interested in additional information about low-sugar, salt and fat foods related to the material on the hormone system.

According to Arifin (2013), the module's effectiveness can be seen from several components: one of the learning outcomes of students who can exceed the KKM or the minimum completeness criteria set by subject teachers at school. Based on the analysis of learning outcomes using pretest and post-test sheets on the material module of the hormone system as an effort to introduce low-sugar, salt, and fat foods, it was found that in the pretest results, all students scored below the KKM, namely the value range of 20-55. Then the post-test results showed that 13 students showed an increase in scores that reached and exceeded the KKM score (75) with a range of 75-90, while four students still got scores below the KKM, namely between 65 and 70. Based on the t-test analysis for assessing learning outcomes based on the pretest and post-test, students obtained a significance value of $0.000 < 0.05$. When analyzed, this value is significant and can be continued to the n-gain value test. Furthermore, after the t-test analysis was carried out to assess significance, the n-gain test analysis was carried out to see the increase in learning outcomes of students who obtained an average data of 0.70 with high criteria.

Based on the three descriptions of the analysis of learning outcomes, it can be concluded that the material module on the hormone system as an effort to introduce low-sugar, salt and fatty foods is considered adequate for use in learning because it can improve student learning outcomes with the hope that this module can add information and knowledge about healthy food what we consume. As for the statement, according to Hobri (2010), a learning module can be practical if 80% of students who take part in learning can achieve a predetermined reference value.

CONCLUSION

Based on the results of the research and discussion regarding the development of the hormone sistem material module as an effort to introduce low-sugar, salt and fat foods to high school students, it can be concluded that the validity of the developed module is declared valid based on the assessment of the three validators with an average acquisition of 88% the criteria are very feasible or very valid so that they can be used in learning, the practicality of the developed module is considered practical for use in learning seen from the results of student activities with an average acquisition of 88% perfect criteria, the results of learning implementation with an average acquisition of 96.6% perfect criteria, as well as the results of student responses with acquisition average 83% perfect criteria, the effectiveness of the developed module seen from students' learning outcomes cannot be assessed as effective because only one limited trial was carried out. However, the module is feasible for use in learning. The assessment results were significant using the t-test of 0.000 <0.05 and an increase in learning outcomes using the n-gain test with an average acquisition of 0.70 with high criteria.

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