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THE INFLUENCE OF LEARNING MODEL AND IQ ON KNOWLEDGE OF A BALANCED NUTRITION HEALTHY EATING

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Abstract The objective of this investigation is to evaluate how learning methods and IQ influence understanding of a healthy, well-balanced and nutritious diet. It employed an experimental research approach, applying a level 2x2 treatment design. The outcomes of the experiment (1) indicate a contrast in the enhancement of students' comprehension when exposed to a jigsaw cooperative learning pattern versus a guided inquiry learning pattern, based on the $F_{(OA)}$ value of 50.109 and a p-value of 0.000, which is less than 0.05. (2) There is an interaction between the learning model (factor A) and IQ (factor B) towards increasing knowledge of a healthy, nutritious and balanced diet based on the value of $F_{(OAB)} = 18.12$ and p-value = $0,000 < 0,05$. (3) Variances arise in the academic aptitude of learners who possess exceptional cognitive aptitude and are exposed to a well-balanced and nutrient-dense meal plan using the jigsaw cooperative learning style versus the guided inquiry learning approach. Statistical findings, as denoted by $Q_{hitung} = 3.10$, exceeding the value of $Q_{tabel (0,05;4;30)} = 2.89$, validate this statement. (4) there is no difference in the knowledge of students who have a low IQ with the cooperative learning type of jigsaw and guided inquiry learning models based on the value of $Q_{count} = 0.47 < Q_{tabel (0,05;4;30)} = 2,89$.

Keywords: learning model; IQ; healthy diet; balanced nutrition



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INTRODUCTION

Adolescents are a transitional group from children to adults and are a group that is vulnerable to changes in the surrounding environment, especially the influence on food consumption problems. The habits of teenagers towards food are very diverse, such as not caring about food, forgetting when to eat because of busy activities, overeating, following trends with fast food and so on, not paying attention to the nutritional adequacy they need (Maharibe, 2014).

The 2019 Riskesdas recorded adolescents aged 13 to 15 years in West Java province 17.45% short, 6.13% thin, 11.96% fat, 4.89% obese (Badan Penelitian dan Pengembangan Kesehatan Jawa Barat, 2019). In school children aged 13-15 years, nutritional problems are more related to risky eating patterns, namely the habit of snacking, skipping meals which is generally breakfast so that it increases the frequency of snacks accompanied by consumption of high calories, high sugar and high fat (Lani, 2017).

Good nutritional knowledge does not mean that someone will apply it in everyday life (Mayang Sari & Rafiony, 2020). What's more, the condition of

teenagers who are easily influenced by their surroundings because they lack knowledge of a healthy, nutritious and properly balanced diet.

Quality and nutritious food is food that is consumed according to nutritional needs, not excessive and not lacking. Everyone has different nutritional needs, depending on age and activity (Syafira, 2015), because of the influence of advertisements on social media and print media, even public figures are competing to provide tips on managing their diet and not a few teenagers do it, but the information on a healthy, nutritious and balanced diet that is provided is not necessarily correct and can be applied to everyone. Therefore, the function of education for a healthy, nutritious and balanced diet is very important, good knowledge is expected to equip them to practice good nutrition and health.

Many factors influence the practice of balanced nutrition, including gender, age, socioeconomic status, place of residence, habits, family, knowledge and attitudes towards balanced nutrition (Arisman, 2004). A school-based knowledge program on healthy, nutritious and balanced eating patterns can take advantage of peer pressure in

controlling eating behavior (Rubai, Nabawiyah, & Mada, 2018). Adolescents with good knowledge of nutrition can help make them aware and provide an understanding that daily food consumption is closely related to health and the process of growth and development (Sulistyoningsih, 2011).

The Ministry of Health through PMK No. 41 of 2014 recommends inclusion in Natural Sciences and Sports and Health Physical Education (Kementerian Kesehatan, 2014). The aim of incorporating healthy, nutritious, balanced diets in Physical Education, Sports and Health (PJOK) subjects is to increase the active role of the education sector in socializing healthy, nutritious and balanced diets for adolescents.

The level of intelligence or intelligence (IQ) of an individual determines the level of individual knowledge in studying a learning material. The brain develops very well during prenatal and early postnatal. the period of birth, which is considered the most vulnerable in terms of environmental exposure is closely related to cognitive function as an important part of awareness in learning and school achievement such as working memory and attention developing across

childhood and adolescence (Dadvand et al., 2015).

One way to assess children's cognitive development in adolescence is by individual intelligence tests (IQ tests). Intelligence is defined as a form of a person's ability to acquire knowledge, learn and understand, apply knowledge to solve problems, and think abstractly (Sari, 2010). Intelligence is closely related to individual cognitive abilities such as thinking, remembering, reading, learning, problem solving and using language. Intelligence can be measured using a psychometric tool commonly referred to as an IQ test (Wasserman, 2012).

One way that is often used to express the level of intelligence is to translate the results of intelligence tests into numbers that can be used as an indication of the position of a person's level of intelligence when compared relative to a norm. Traditionally, the normative number of intelligence test results is expressed in the form of a ratio (quotient) and is named IQ (intelligence quotient) (Arifin, 2008).

Intelligence plays a role in the ability of students to absorb new information or knowledge and make it the basis for processing problems and

efforts to solve them (Binet, 1905; Zeidner, 1995; Zenderland, 1998); (Pratama, 2015). In adolescents, they are able to react to the intellectual stimulation given, or carry out learning tasks that demand intellectual abilities (Marinda, 2020). The intelligence quotient (IQ) possessed by a child at this time is sufficient to become the basis for giving various skills or knowledge that can develop his mindset and reasoning power. So, it is hoped that with the right intellectual stimulation, a child will have good knowledge of a healthy, nutritious, balanced diet.

Learning is an educational interaction that occurs intentionally in achieving certain goals (Sulaiman, 2014). The success of learning is largely determined by the learning model designed by the teacher, the right learning model according to the conditions of the students, will make students more receptive to the material presented by the teacher (Lahir, Ma'ruf, & Tho'in, 2017). According to Joice&Wells; (Aulia, Akbar, & Yulati, 2017) The learning model is a conceptual framework that is used as a guide in carrying out learning that is arranged systematically to achieve learning objectives related to syntax, social

systems, reaction principles and support systems, a learning model is a plan or a pattern used as a guide in planning learning in the classroom.

There are so many learning models, but in this study only 2 learning models will be used, namely the jigsaw cooperative learning model and the guided inquiry learning model. The cooperative model has the significance of group learning (Suprijono, 2016); (Supriyanto, 2020), where students study together, contribute ideas and are responsible for achieving learning outcomes (Funay, 2020).

Cooperative learning is not the same as just learning in groups, there are elements in cooperative learning that distinguish it from group divisions that are carried out at random. The cooperative learning model will equip students with independence, creativity and direct involvement in the learning process and will stimulate students so that they want to be actively involved in the learning process.

Jigsaw is a type of cooperative learning developed by Elliot Aronson's. This learning model is designed to increase students' sense of responsibility towards their own learning as well as the learning of others (Pastika, 2016).

Students not only learn the material provided, but they must also be ready to provide and teach the material to their group. The guided inquiry learning model is a teaching model that emphasizes the process of discovering concepts and relationships between concepts where students design their own experimental procedures (Sukma, Laili Komariyah, 2015).

According to Dewi, 2013; (Cahyadi, Hariyanto, & Kartiko, 2021), The guided inquiry learning model emphasizes the process of discovering a concept so that a scientific attitude emerges in students and can be designed for use by the teacher according to the level of students' intellectual development. The teacher helps students to develop their mastery of concepts and critical thinking skills. One of the high-level thinking that students must have is a critical thinking process because students will train to analyze and solve problems so that students become active and learning becomes student-centered. students are mostly based on the results of their own efforts on the basis of the knowledge students have.

The guided inquiry model with problems and methods sourced from the teacher, whose solutions are completed

by students is the inquiry model that will be used in this study, but that does not mean that the teacher is in full control of the problems and methods, in this case the teacher only provides full guidance to the participants. students so that it is easy to formulate problems that lead to learning topics so that students can determine their own solutions to the problems discussed.

Based on the background above, the researcher intends to find out the increase in the knowledge of students who have high IQ and low IQ about a healthy, balanced nutritional diet using the jigsaw type cooperative learning model and the guided inquiry learning model. Therefore the researcher drew the title in this study "Effectiveness of Learning Models and IQ on Increasing Knowledge of Healthy Eating Patterns in Grade VII Students of SMPN 15 Depok".

METHOD

This study aims to determine the effect of learning models and IQ on knowledge of a healthy balanced nutritious diet. This research was conducted at class VII SMPN 15 Depok. This study used an experimental research method with a treatment design by level 2x2.

- A₁B₁: The guided inquiry learning model group with the high IQ group
- A₁B₂: The guided inquiry learning model group with the low IQ group
- A₂B₁: Cooperative learning jigsaw learning model group with high IQ group
- A₂B₂: Cooperative learning jigsaw learning model group with low IQ group

The target population in this study were all 288 grade VII students at SMPN 15 Depok. The sampling technique used in this study was simple random sampling. Based on the results of data processing that has been done, the results for each group with high IQ and low IQ are 27% x 110 students = 29.7, then rounding is done to 30 students. As many as 30 students for the high IQ group and 30 students for low IQ, so the total sample is 60 students.

The data analysis technique was two-way analysis of variance (ANAVA) and continued with the Tukey test at a significant level of $\alpha = 0.05$. To test the normality of the data, using the Kolmogorv-Smirnov test and homogeneity test using the Levene test.

RESULT AND DISCUSSION

Data collection began by dividing students into two groups of the

dependent variable, namely knowledge of a healthy, balanced nutritional diet, which was then carried out with a pretest. After that, the groups were divided into 4 (four) groups based on independent variables and attribute variables, namely the independent variables were learning models: the Jigsaw cooperative learning model and the guided Inquiry learning model, while the attribute variables were: high IQ and low IQ. After completing the treatment, the four groups were given a posttest regarding knowledge of a healthy, balanced nutritional diet.

Table 1.
Recapitulation of Knowledge Value of Healthy, Balanced Nutritional Eating Patterns of Students in All Groups

		A		B	
		Pretest		Posttest	
		A1	A2	A1	A2
B	Sum	1056	1096	1456	1318
	Sample	15	15	15	15
	average	70,4	73,1	97,1	87,9
	Variant	120,4	71,9	3,9	15,1
1	St. Dev	10,1	8,5	2	3,9
	Sum	960	1176	1040	1154
	Sample	15	15	15	15
	average	64	78,4	69,3	79,6
2	Variant	166,9	46,4	67,8	24,1
	St. Dev	12,9	6,8	8,2	4,9
	Sum	2016	2623	2136	2512
	Sample	30	30	30	30
T	average	67,2	87,7	71,2	83,7
	Variant	140,6	114,4	71,1	36,6
	St. Dev	11,9	10,7	8,4	6,1

HYPOTHESIS TEST

Differences in increasing knowledge of healthy, nutritious and balanced eating patterns between the jigsaw learning type cooperative learning model and the guided inquiry learning model

The results of the two-way analysis of variance (ANOVA) show that the value of $F(OA) = 50.109$ with $p\text{-value} = 0.000 < 0.05$. This result indicates that H_0 is rejected, then H_a is accepted. Which means that there is a difference in the increase in knowledge of healthy, nutritious and balanced eating patterns of students who are given the Jigsaw cooperative learning model and the guided inquiry learning model.

The Interaction Between Learning Models and IQ To Increase Knowledge of Healthy, Nutritious And Balanced Diets

The interaction between the learning model and IQ on increasing knowledge of a healthy, nutritious and balanced diet can be seen from the results of the two-way analysis of variance. The results in the ANOVA calculation table above show that the $F(OAB)$ value = 18.12 with a $p\text{-value} = 0.000 < 0.05$. This means that H_0 is rejected and H_a is accepted. Therefore, it can be concluded that there is an interaction between the learning model (factor A) and IQ (factor

B) towards increasing knowledge of a healthy, nutritious and balanced diet.

In addition, based on the results of the data analysis, it can be seen that the influence of the learning model and IQ variables on increasing knowledge of a healthy, nutritious and balanced diet is $RSquared = 0.729 \times 100 = 72.90\%$. The interaction between the learning model and IQ in its effect on increasing knowledge of a healthy, nutritious and balanced diet can be visualized in a line like the following figure 1:

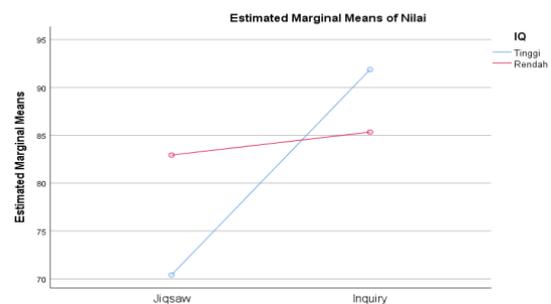


Figure 1. Interaction Between Learning Model and IQ

Differences in Increasing Knowledge of a Healthy, Nutritious and Balanced Diet by Using the Jigsaw Type Cooperative Learning Model and by Using the Guided Inquiry Learning Model in Groups of Students with High IQs

The results of the study prove that students who have a high IQ make a difference in increasing knowledge of healthy, nutritious and balanced eating patterns with learning models. This is

evidenced by the results of further tests using the Tuckey test, the results of which can be seen in table 2 below:

Table 2.

Comparison of Groups A₁B₁ and A₂B₁
Groups being compared

n	k	dk	Q _{hi}	Q _{tab}
30	2	0,05	3,10	2,89

$\alpha=0,05$

Differences in Increasing Knowledge of a Healthy, Nutritious and Balanced Diet by Using the Jigsaw Type Cooperative Learning Model and by Using the Guided Inquiry Learning Model in Groups of Students with Low IQ

The results of the study prove that students who have low IQ do not make a difference in increasing knowledge of healthy, nutritious and balanced eating patterns with learning models. This is evidenced by the results of further tests using the Tuckey test, the results of which can be seen in table 3 below:

Table 3.

Comparison of Groups A₁B₂ and A₂B₂
Groups being compared

n	k	dk	Q _{hi}	Q _{tab}
30	2	0,05	0,47	2,89

$\alpha=0,05$

A summary of the results of the follow-up test with the Tukey test for the

2 groups of data being compared can be seen in table 4 below:

Table 5.

Summary of Tukey Test Calculation Results

Groups being compared	dk;m;n	Q _{hitung}	Q _{tabel} $\alpha =$
A ₁ B ₁ or A ₂ B ₁	0,05;2;30	3,10	2,89
A ₁ B ₂ or A ₂ B ₂	0,05;2;30	0,47	2,89

DISCUSSION

Differences in Increasing Knowledge of a Healthy, Nutritious and Balanced Diet Between the Jigsaw Cooperative Learning Model and the Guided Inquiry Learning Model.

The results of hypothesis testing have proven that there are differences in increasing knowledge of healthy, nutritious and balanced eating patterns between children who study using the cooperative learning type jigsaw learning model and children who learn with the guided inquiry learning model.

One of them is research conducted by Yuli and Riandi (2015), the results show that the application of the Argument Driven Inquiry learning model can significantly improve students' mastery of concepts compared to guided inquiry learning.

The cognitive aspect that improves the most is the C2 aspect

(understanding) both in classes that use Argument Driven Inquiry learning and in classes that use Guided Inquiry learning and mastery of concepts that increases the most in convection material both in classes using Argument Driven Inquiry learning and in class using Guided Inquiry learning.

There is also research conducted by Sari et al (Annafy et al., 2021), where the results of the research show that: 1) guided inquiry learning can be used to train students' science process skills. This term is proven by the percentage increase in students' science process abilities from the first meeting to the third meeting and if it is categorized in the science process skills criteria it is good enough, 2) thorough learning has a significant effect on students' critical thinking abilities.

Therefore, the most fundamental difference in this study is that the cooperative learning model has the advantage of increasing learning motivation, reducing disruptive behavior and being very helpful for weak students. Because of the cooperative learning type jigsaw learning model, students learn by forming small groups. In that group students can sharpen each other, care for

each other in solving the problems given by the teacher.

While the guided inquiry learning model has weaknesses, namely: Students must have mental readiness and maturity, students must be brave and willing to know their surroundings well, the process in the inquiry method is too concerned with understanding processes, pays little attention to the development of attitudes and skills for students.

Interaction Between Learning Models and IQ on Increasing Knowledge of Healthy, Nutritious and Balanced Diets

The results of the two-way analysis of variance (ANOVA), the interaction between the learning model and IQ on increasing knowledge of a healthy, nutritious and balanced diet show that the F value = 18.15 with p-value = 0.002 < 0.05 so that H_0 is rejected and H_a is accepted. So, it can be concluded that there is influence the interaction between learning models (factor A) and IQ (factor B) on increasing knowledge of a healthy, nutritious and balanced diet. This is in accordance with the opinion of Erlina (2019) which states that: a student is said to learn if a process occurs within him that results in a change in behavior.

Intellectual intelligence is the ability needed to carry out various mental activities of thinking, reasoning and solving problems (Dwijayanti, 2009). Intellectual intelligence as an ability that consists of three characteristics, namely: a) the ability to direct thoughts and direct actions, b) the ability to change the direction of action when the action has been done, and c) the ability to self-criticize.

To find out the level of one's intellectual intelligence, an intelligence test results are needed (Dwijayanti, 2009). The results of this test are widely known as Intelligence Quotient or abbreviated as IQ (Baharuddin, 2007).

In the learning process at school, many people argue that in order to achieve high achievement in learning, a person must have a high Intelligence Quotient (IQ), because intelligence is a potential provision that will facilitate learning so as to produce optimal learning achievement (Gusniwati, 2015).

Various kinds of learning models, problem-based learning models were chosen as one of the models used by the teacher. This model requires the teacher's active role as a facilitator in the classroom. Students can use their ability to analyze various kinds of problems in

their daily lives. Therefore, the problem-based learning model is expected to be an interesting learning model to study and later it is hoped that it can increase student motivation and achievement (Gunawan, Lilik Kustiani, 2018). Thus, it can be seen that, there is an interaction between the learning model (cooperative learning type jigsaw and guided inquiry) with IQ towards increasing knowledge of healthy, nutritious and balanced eating patterns.

Differences in Increasing Knowledge of a Healthy, Nutritious and Balanced Diet by Using the Jigsaw Type Cooperative Learning Model and by Using the Guided Inquiry Learning Model in Groups of Students with High IQs

There is a difference in increasing knowledge of healthy, nutritious and balanced eating patterns by using the cooperative learning type jigsaw learning model and the guided inquiry learning model for groups of students who have high IQ. When looking at the comparison of average scores in groups of high IQ students using the cooperative learning type jigsaw learning model ($\bar{X} = 97,1$) higher than those who have high IQ using the guided inquiry learning model

(\bar{X} = 87,5) knowledge of a healthy, nutritious and balanced diet.

Based on this, it can be said that students who have a high IQ can be provided with a cooperative learning type jigsaw learning model because this learning model can increase learning motivation, reduce disruptive behavior and is very helpful for weak students (Syarifuddin, 2011). In order to achieve maximum results, five elements of the jigsaw cooperative learning model must be applied, namely as follows (Amri, 2010): 1) Positive interdependence, 2) Individual responsibility, 3) Face to face, 4) Communication between members and 5) Evaluation to Group Process.

IQ and learning models are two of several factors that influence student learning outcomes (Gunawan, Lilik Kustiani, 2018). IQ is the innate factor of each student, mapping of the level of the student's IQ is needed to determine the student's initial ability to accept learning. While the learning model is needed as a way for students to be interested in their interests, and able to accommodate the abilities of students who have low IQ, so that students who have both low and high IQ are able to be motivated in learning. This is because the learning model prioritizes cooperation and the role of

each student in the class to jointly analyze and solve daily problems (Veriansyah, 2018). So that from these two interrelated factors the results of knowledge of an optimal healthy, nutritious and balanced diet will be achieved by each student.

Thus, it can be seen that after applying the cooperative learning type jigsaw learning model to groups of students who have high IQs it is more effective to increase knowledge of healthy, nutritious and balanced eating patterns, compared to groups of students using guided inquiry learning models.

Differences in Increasing Knowledge of a Healthy, Nutritious and Balanced Diet by Using the Jigsaw Type Cooperative Learning Model and by Using the Guided Inquiry Learning Model in Groups of Students with Low IQ

There is no difference in increasing knowledge of healthy, nutritious and balanced eating patterns by using the cooperative learning type jigsaw learning model and the guided inquiry learning model for groups of students who have low IQ. If you look at the comparison of the average scores in groups of low IQ students using the cooperative learning type jigsaw learning model (\bar{X} = 78) it is lower than those who have low IQ using the guided

inquiry learning model ($\bar{X}= 80$) towards knowledge of healthy, nutritious and balanced eating patterns

The student learning process must integrate skills, knowledge and attitudes (Zeidan, A. H., & Jayosi, 2015). Science Process Skills (KPS) is an important indicator in transferring knowledge needed to solve problems and be able to gain experience in experiments (Wulandari, E., Suliyannah, & Rohmawati, 2017). Students' Science Process Skills (KPS) can be trained and developed through a learning model that has a significant influence on students' Science Process Skills, namely guided discovery. This model invites students to participate actively in learning and improve learning outcomes. Guided discovery is an example of constructivism learning.

The very diverse abilities of students are determined by differences in students both general and specific. The general difference between students is their activity in ways that humans do in general, such as paying attention, observing, responding, remembering, thinking and feeling. The special differences between students are intelligence and talent. In fact, the learning that is being carried out now

pays less attention to these factors (Gembong, 2010). Delivery of learning by using the cooperative learning type jigsaw learning model will guide students' way of thinking in understanding a concept both for students who have medium and low IQ. students who have moderate and low IQ need a stage that can help their way of thinking in understanding a concept being studied.

CONCLUSION

1. There are differences in knowledge of healthy, nutritious and balanced diets between the jigsaw type cooperative learning model and the guided inquiry learning model.
2. There is an interaction between the learning model and IQ on knowledge of a healthy, nutritious and balanced diet
3. There are differences in knowledge of healthy, nutritious and balanced diets between the cooperative learning type jigsaw learning model and the high IQ guided inquiry learning model.
4. There is no difference in knowledge of healthy, nutritious and balanced eating patterns between the cooperative learning type jigsaw

learning model and the low IQ guided inquiry learning model.

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