

# The Relationship Between Soil Transmitted Helminth (STH) Infection and Learning Achievement Based on Nutritional Status of Elementary School 100906 Students in Manompas Village, Muara Batang Toru District, Tapanuli Regency South of North Sumatra Province

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## ABSTRACT

Soil Transmitted Helminths (STH) are intestinal parasitic worms that cause infection in humans, which are transmitted through soil. Worms cause decreased health conditions and the productivity of the sufferer. The purpose of this study was to determine the relationship between Soil Transmitted Helminth infection and student achievement based on nutritional status in children.

This research was conducted using a combination method (mixed methods research design). Quantitative research used a cross sectional design, while qualitative research was conducted to explore in-depth information from the head of the puskesmas, the principal, the homeroom teacher (teacher), the parents of students, and students of SDN 100906 Manompas. Examination of stool samples using the Kato Katz method was carried out at the Parasitology Laboratory of the Faculty of Medicine, Andalas University in June – November 2020. The population in this study were all children of SDN 100906 Manompas, with 60 samples that met the inclusion and exclusion criteria selected by simple random sampling. Data were analyzed using Chi square test.

The results showed that the percentage of male and female students from all classes infected with STH was the same (50.0%) with the mean

age of the infected students ( $9.35 \pm 1.82$ ) years. Type STH with mild category *Ascaris lumbricoides* percentage (20%), compared with *Trichuris trichiura* (10%). Students infected with STH at the most were with moderate achievement (50.0%) and students infected with STH at the most were with low nutritional status (62.5%). The results of statistical tests using Chi square showed that there was no significant relationship between STH infection and learning achievement with  $p$  value = 0.340, and there was a significant relationship between STH infection and nutritional status with  $p$  value = 0.034 ( $p < 0.05$ ).

The conclusion of this study is that there is no significant relationship between STH infection and learning achievement and there is a significant relationship between STH infection and nutritional status. There are other factors that affect learning achievement apart from STH infection.

**Keywords:** STH, Learning Achievement, Nutritional Status

## INTRODUCTION

Soil Transmitted Helminths (STH) are intestinal parasitic worms of the nematode class that can cause infections in humans that are transmitted through soil, humans are hosts for several intestinal nematodes, and

most of these nematodes cause health problems in Indonesia in the form of helminthiasis<sup>1</sup>. This disease is a major problem in tropical climates, especially in areas with low economies that have limited access to water and sanitation and low hygiene<sup>2</sup>. A tropical climate and high humidity support the development of intestinal worms, especially STH such as roundworms (*Ascaris lumbricoides*), worms whipworm (*Trichuris trichiura*), hookworm (*Necator americanus* and *Ancylostoma duodenale*), threadworm (*Strongyloides stercoralis*)<sup>1</sup>.

STH infections are often found singly or in combination. The degree of influence depends on the severity of the infestation, the type of worm. STH infection rarely results in death, but can cause digestive disorders, malabsorption and food metabolism disorders which will lead to nutritional deficiencies. School-age children are the age group that suffers the most from helminthiasis because they often come into contact with the soil which is a place for worms to grow and develop. This is in accordance with the WHO report (2019)<sup>4</sup> that helminth infections can be transmitted through the soil. Another trigger factor for worm infection is the weather factor, namely the rainy season which makes the soil moist so that the worm eggs become infective and can stick to the child's fingernails<sup>5</sup>.

Nutritional status is influenced by the balance between the intake of micronutrients and macronutrients. Several studies have shown that there is a reciprocal relationship between nutritional status and various infectious diseases. A poor nutritional state will cause the immune system to decrease and interfere with immune function, thereby increasing the risk of contracting infectious diseases. A worm *A. lumbricoides* will take carbohydrates 0.14 grams / day and protein 0.035 grams / day, so that children can suffer from malnutrition due to nutritional deficiencies which can also cause anemia.

Chronic infection of *T. trichiura* can show symptoms of anemia directly by sucking blood  $\pm 0.005$  cc per day/head.

Based on the initial survey conducted by the researchers at SDN 100906 Manompas and SDN Tarapungraya, 10 people each had their feces examined. Of the 10 children at SDN 100906 Manompas, 7 (70%) people were infected with STH worms, from the data 5 of them had learning achievements below the average value. while out of 10 children at SDN Tarapungraya only 2 (20%) were infected with STH. From these data, it can be seen that STH worm infections are more common in children at SDN 100906 Manompas compared to SDN Tarapungraya. Based on the above background, it is important to conduct this research to find out "The relationship between Soil Transmitted Helminth infection with learning achievement and nutritional status in SDN 100906 children in Manompas Village, Muara Batang Toru District, South Tapanuli Regency, North Sumatra Province in 2020"

## LITERATURE REVIEW

Soil Transmitted Helminths (STH) is a group of intestinal parasitic worms of the nematode class that can cause infection in humans through the soil in their life cycle, humans are the host for several intestinal nematodes, and most of these nematodes cause health problems in Indonesia in the form of helminthiasis<sup>1</sup>. Worms are an endemic and chronic disease caused by parasitic worms with a high prevalence, not deadly but undermining the health of the human body, resulting in a decrease in nutritional conditions and public health<sup>9</sup>.

Symptoms caused by patients are usually caused by adult worms and larvae. Disturbances caused by larvae can occur while in the lungs. There will be small bleeding in the alveolar walls in susceptible people and pulmonary disorders with cough, fever, and eosinophilia will occur. Adult worms usually cause mild infection symptoms, for example, sometimes

sufferers experience mild intestinal disorders such as nausea, decreased appetite, diarrhea and constipation<sup>1</sup>.

Transmission usually occurs feco-oral with the entry of infective worm eggs into the mouth of the sufferer. These worms need clay to thrive. Eggs that have been fertilized with feces come out and fall to the ground, these eggs then develop into an infective form within 3 weeks at an optimal temperature of 250C-300C. Fertilized eggs can survive under a suitable environment although they are very susceptible to drought and ultraviolet (UV) light.

## MATERIALS & METHODS

This research is a mixed methods research design, namely research that combines quantitative and qualitative research methods, this research is sequential in nature where researchers observe research subjects and look for data related to research without giving treatment and sequentially in stages (not sequentially). simultaneously) 11. Quantitative research used a cross sectional design, while qualitative research was conducted to obtain in-depth information to the head of the puskesmas, school principal, homeroom teacher

(teacher), parents, and students of SDN 100906 Manompas.

## Statistical Analysis

Quantitative data analysis with Bivariate Analysis Test was used to test the hypothesis of the dependent relationship with the independent variable. The statistical method used to see the significance and magnitude of the relationship between the variables was then carried out the chi square test. Data analysis was qualitative research, data collection was carried out in natural settings (natural conditions), primary data sources, secondary data and data collection techniques through observation (observation).), Indepth Interview (in-depth interview), and FGD.

## RESULT

### Quantitative Research Results

#### A. Univariate Analysis

#### 1.1 Infection Frequency Distribution Soil Transmitted Helminths based on Student Class, Type of STH, and Level of Infection at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.1 Distribution of the frequency of infection incidence by class, type, and level of STH infection

Variable	STH infection (n = 16)		Non-Infectious STH (n = 44)		Total (n = 60)	
	f	%	f	%	f	%
<b>Class</b>						
Class 1	1	6.2	9	20.4	10	16.7
Grade 2	3	18.8	5	11.3	8	13.3
Grade 3	4	25.0	8	18.3	12	20.0
4th grade	5	31.2	5	11.3	10	16.7
Grade 5	1	6.2	9	20.4	10	16.7
Grade 6	2	12.6	8	18.3	10	16.7
<b>Types of STH Infection</b>						
<i>Ascaris lumbricoides</i>	10	16.7	0	0	10	16.7
<i>Trichuris trichiura</i>	4	6.7	0	0	4	6.7
<i>A. lumbricoides</i> & <i>T. trichiura</i>	2	3.3	0	0	2	3.3
<b>STH Infection Rate</b>						
There isn't any	0	0	44	100	44	73.3
Light	16	100	0	0	16	26.7

Based on Table 1.1 the highest percentage of STH infections occurred in grade 4 students (31.2%), while grade 1 and grade 5 students were mostly uninfected (negative) with STH percentage (20.4%). The highest percentage of STH infections was *Ascaris*

*lumbricoides* (16.7%) compared to *T. trichiura* (6.7%) and Mix Infection (*A. lumbricoides* and *T. trichuria*) (3.3%). The percentage of infection rate at most was in the mild category, namely 100%.

## 1.2 Frequency Distribution of Learning Achievement at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.2 Distribution of the frequency of learning achievement in students

Learning achievement	STH infection		Non-STH Infection	
	f	%	f	%
Well	8	0.0	8	63.6
Enough	8	0.0	6	36.4
Total	6	00.0	4	100.0

Based on Table 1.2 learning achievement in the good and moderate categories is the highest in non-STH-infected children with percentages (63.6%) and (36.4%), respectively, compared to only 8 (50) STH-infected students (50%) with good and sufficient learning achievement.

## 1.3 Frequency Distribution of Nutritional Status of Students at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.3 Distribution of the frequency of nutritional status among students

Nutritional status	STH infection		Non-STH Infection	
	f	%	f	%
Thin	10	62.5	4	9.1
Normal	5	31.2	30	68.2
Fat	0	0	7	15.9
Obesity	1	6.3	3	6.8
Total	6	100.0	4	100.0

Based on Table 1.3, the percentage of students with underweight nutritional status was higher in children who were infected with STH (62.5%) compared to those who were not infected with STH (negative) with

a percentage (9.1%). The percentage of STH-infected students (positive) with normal nutritional status was obtained with a percentage (31.2%) while those who were not infected with normal nutritional status obtained a percentage (68.2%).

## B. Results of Bivariate Analysis

### 1.4 The Relationship between STH Infection and Learning Achievement at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.4 Analysis of the relationship between STH infection and learning achievement

Variable	Learning achievement				p value
	Well		Enough		
	f	%	f	%	
STH infection	8	50.0	28	63.6	0.340
Non-Infectious	8	50.0	16	36.4	

Based on Table 1.4 the percentage of learning achievement in the good category was higher for non-STH-infected students (63.6%), compared to only 8 (50.0%) students who were infected with STH (positive). Statistically, the difference was not significant, namely 0.340 ( $p > 0.05$ ).

### 1.5 Relationship of STH Infection with Nutritional Status at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.5 Analysis of the relationship between STH infection and nutritional status

Variable	Nutritional status								p value
	Thin		Normal		Fat		Obesity		
	f	%	f	%	f	%	f	%	
STH infection	10	62.5	5	31.2	0	0	1	6.3	0.034
Non-Infectious	4	9.1	30	68.2	7	15.9	3	6.8	

Based on Table 1.5 the percentage of nutritional status in the underweight category was higher in STH-infected students (62.5%), compared to non-STH-infected students (9.1%). Statistically, the difference was significant, namely 0.034 ( $p < 0.05$ ).

### 1.6 Relationship of STH Infection with Learning Achievement and Nutritional Status in Elementary School 100906 Manompas Students, Muara Batang Toru District, South Tapanuli Regency in 2020

Table 1.6 Analysis of the relationship between STH infection with learning achievement and nutritional status

Variable		Nutritional status				p value
		Good nutrition		Malnutrition		
		f	%	f	%	
Infection group learning achievement	Well	3	27.3	8	72.7	0.026
	enough	5	100	0	0	
Non-infectious group learning achievement	Well	0	0	28	100	0.000
	Enough	16	100	0	0	

Based on Table 1.6, the percentage of students with good academic achievement with good nutritional status in the non-infected STH group was higher (72.7%),

compared to students with good academic achievement with good nutrition (27.3%). Statistically using the Chi-square test there is a relationship between learning achievement and nutritional status in the STH infected group ( $p$  value = 0.026). The percentage of students with good academic achievement with nutritional status is more or less higher (100%) compared to students with good academic achievement with good nutritional status (0%). Statistically, using the Chi-square test, it was found that there was a relationship between learning achievement and nutritional status in the non-STH infection group ( $p$  value = 0.000).

## Qualitative Research Results

### 1.7 Characteristics of Informants in Research

Qualitative data collection in this study was carried out using in-depth interviews with informants who were considered to know about STH infection with learning achievement and nutritional status in the Elementary School 100906 Manompas environment which was included in the work area of the Hutaraja Health Center.

Table 1.7 Characteristics of Research Informants

No	Code Informant	Age (Years)	Education	Work	Information
	(1)	(2)	(3)	(4)	(5)
1	IF 1	50	University	Civil servant	Head of Hutaraja Health Center
2	IF 2	48	University	Civil servant	Head of SDN 100906 Manompas
3	IF 3A	45	University	Civil servant	Class I SDN 100906 Manompas
4	IF 3B	30	University	Civil servant	Class II SDN 100906 Manompas
5	IF 3C	29	University	Civil servant	Class III SDN 100906 Manompas
6	IF 3D	35	University	Civil servant	Class IV SDN 100906 Manompas
7	IF 3E	32	University	Civil servant	Class V SDN 100906 Manompas
8	IF 3F	40	University	Civil servant	Class VI SDN 100906 Manompas
9	IF 4A	41	Senior high school	Housewife	Guardian of SDN 100906 Manompas
10	IF 4B	35	Senior high school	Housewife	Guardian of SDN 100906 Manompas
11	IF 4C	39	Senior high school	Housewife	Guardian of SDN 100906 Manompas
12	IF 5A	7	Elementary	Student	Class I students at SDN 100906 Manompas
13	IF 5B	8	Elementary	Student	Class II students of SDN 100906 Manompas
14	IF 5C	9	Elementary	Student	Class III students at SDN 100906 Manompas
15	IF 5D	10	Elementary	Student	Class IV students at SDN 100906 Manompas
16	IF 5E	11	Elementary	Student	Class V students of SDN 100906 Manompas
17	IF 5F	12	Elementary	Student	Class VI students of SDN 100906 Manompas

Based on Table 1.7 the characteristics of the informants consist of the head of the Hutaraja Health Center, the Head of Elementary School 100906 Manompas, Class 1 to Class 6 Guardians, Student Guardians who are represented by 3 people, and Shiva each 1 representative from class 1 to class 6 with various backgrounds. background found in the research area.

## **DISCUSSION**

Based on Table 1.5 the percentage of learning achievement in the good category was higher for non-STH-infected students (63.6%), compared to only 8 students (50.0%) with STH infected (positive) with good learning achievement. Statistically, the difference was not significant, namely 0.340 ( $p > 0.05$ ). According to the researcher's assumption, STH infection does not fully affect student achievement. There are other factors that affect student achievement apart from STH infection, such as environmental, family, interest, and social and economic factors. Learning activities are said to be successful if they can achieve optimal results. In order to know learning outcomes can be achieved optimally, it is necessary to have an assessment or evaluation. After an assessment or learning evaluation is held, learning achievement will be obtained. School-age children infected with STH may experience decreased physical and intellectual health. This is caused by a condition of malnutrition, where the worms take nutrients that are important for the body such as protein, carbohydrates, and iron<sup>13</sup>. Worms will inhibit elementary school children from attending lessons because children will feel tired, decreased concentration power, dizziness and cause lazy learning and often do not attend school, so it has a bad impact on children's learning achievement (Joko, 2008)<sup>14</sup>.

STH worm infection can affect the intake, digestion, absorption, and metabolism of food. In elementary school age children and toddlers, helminth infections can cause loss

of nutrients in the form of calories and protein, and can also hinder physical development, intelligence, learning abilities, and interfere with health. In adults this disorder will reduce work productivity and can reduce body resistance, look tired, lethargic, lazy to eat, and thin. In elementary school children, worms will hinder in following lessons because children will feel tired quickly, decreased concentration power, lazy to study and dizzy<sup>15</sup>.

Based on Table 1.6, it was found that 8 students (72.7%) with good academic achievement were undernourished in the STH-infected group, and 3 (27.3%) students with good academic achievement had good nutritional status in the STH-infected group. Analysis using the Chi-square test showed that there was a relationship between learning achievement and nutritional status in the STH-infected group ( $p$  value = 0.026). In the non-infectious group, as many as 28 students (100%) with good academic achievement had poor nutritional status and 16 students (100%) with moderate academic achievement had good nutritional status. The results of statistical tests using the Chi-square test showed that there was a relationship between learning achievement and nutritional status in the non-STH infection group ( $p$  value = 0.000). According to the researcher's assumptions, individual nutritional status is influenced by nutritional fulfillment, infectious diseases in children, poor hygiene, demographic location or place of residence can have an impact on the nutritional status of individuals. So that it can cause poor nutritional status, while nutrition is a very important requirement in helping the process of growth and development in children, considering the benefits of nutrition in the body can help the process of growth and development of children, and prevent the occurrence of various diseases due to malnutrition in the body.

The fulfillment of nutritional needs in children is expected that children can grow quickly according to their growing age and

can improve the quality of life and prevent morbidity and mortality. While nutrition is a very important requirement in helping the process of growth and development in children, considering the benefits of nutrition in the body can help the process of growth and development of children, as well as prevent the occurrence of various diseases due to malnutrition in the body. The fulfillment of nutritional needs in children is expected that children can grow quickly according to their growing age and can improve the quality of life and prevent morbidity and mortality. While nutrition is a very important requirement in helping the process of growth and development in children, considering the benefits of nutrition in the body can help the process of growth and development of children, as well as prevent the occurrence of various diseases due to malnutrition in the body. The fulfillment of nutritional needs in children is expected that children can grow quickly according to their growing age and can improve the quality of life and prevent morbidity and mortality.

According to the results of questions and answers with students of Elementary School 100906 Manompas regarding personal hygiene behavior and the behavior of maintaining the cleanliness of the food they consume. There are still many students who do not maintain their hygiene which is a risk factor for worm infection, including poor nail hygiene, finger nail biting habits, not using footwear, and lack of hand washing habits. STH can cause various adverse effects. STH causes disturbances in various tissues and organs of the body caused by worms taking nutrients from the human body. STH can cause impaired physical growth, intellectual and cognitive function of children, besides that STH can also cause anemia and malnutrition in children. In addition, the importance of maintaining cleanliness in food, Based on Table 1.6 the percentage of students with good academic achievement with poor nutritional status in the STH infection group was higher

(72.7%), compared to students with good academic achievement with good nutrition (27.3%). Statistically using the Chi-square test there is a relationship between learning achievement and nutritional status in the STH-infected group ( $p$  value = 0.026), the percentage of students with good academic achievement with poor nutritional status in the non-STH-infected group is higher (100%) good learning achievement with good nutritional status (0%). Statistically, using the Chi-square test, it was found that there was a relationship between learning achievement and nutritional status in the non-STH infection group ( $p$  value = 0.000). According to the researcher's assumption that there is a variety of parental education, education is usually associated with knowledge about hygiene and will affect the growth, development, and formation of children's hygiene practices. Lack of education among parents, especially mothers, increases the risk of worm infection in children because parents with a high level of education certainly have better knowledge in terms of clean and healthy living behavior than those with a low level of education. If a mother has a good education, especially in the health sector, of course she will understand healthy life and know how to provide good nutrition for her family 18.

Between poor nutritional status and infectious diseases influence each other, making it difficult to identify the main cause<sup>19</sup>. Factors that affect the nutritional status of school-age children are direct and indirect factors. Direct factors that cause malnutrition are infection and food intake. Meanwhile, indirect factors include parenting, food availability and health services. This happens because of poverty, lack of knowledge and skills of parents due to economic status.

Worm infections in elementary school children will hinder them from attending lessons because they get tired easily, lose concentration, are lazy to study and get dizzy. If the concentration of learning

decreases, it can cause a decrease in learning achievement. This affects the potential of human resources<sup>20</sup>. This is possible because worm infection is closely related to the patient's personal hygiene, for example the habit of washing hands before and after eating, washing hands after defecation, cutting nails once a week, bathing twice a day, and so on.

## CONCLUSION

1. There was no significant relationship between STH infection and learning achievement at Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency ( $p > 0.05$ ).
2. There was a significant relationship between STH infection and the nutritional status of Elementary School 100906 Manompas, Muara Batang Toru District, South Tapanuli Regency in 2020 ( $p < 0.05$ ).
3. There is a relationship between learning achievement and nutritional status in the STH-infected group ( $p$  value = 0.026) and there is a relationship between learning achievement and nutritional status in the non-STH-infected group ( $p$  value = 0.000).

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## REFERENCES

1. Sutanto I, Ismid IS, Sjarifuddin PK, Sungkar S, (2011). editor. Textbook of Medical Parasitology: Nematodes. 4th Edition. Jakarta: Faculty of Medicine, University of Indonesia;. p.6-47
2. Dunn JC, Turner HC, Tun A, Anderson RM. (2016). Epidemiological surveys of, and research on, soil-transmitted helminths in Southeast Asia: A systematic review. International Journal. Biomed Central Parasites and Vector. DOI 10.1186/s13071-016-1310-2pp
3. Simarmata, N. Suardana, AAPCP, (2013). The relationship between learning motivation and anxiety in sixth grade elementary school students in Denpasar ahead of the National Examination. Journal of Psychology Udayana, 1(1), 203-212.
4. WHO. (2019). Soil-transmitted helminth infections - Key Facts. 2019.
5. Wardani, SK. (2016). Comparison of the profile of IL-5 levels and the number of eosinophils in farmers infected with Soil Transmitted Helminth in Sumberagung Hamlet, Papar District, Kediri Regency. Journal of Bioscience. Vol.18, no.1, pp. 1-3.
6. Seja, IA (2015). Identification of Soil Transmitted Helminthes Eggs on Fingernails of Students at SDN 24 Batang Tabu Lubuk Begalung Padang. Andalas University Padang Research Journal. 2(0), 11-112
7. Rosali, A., Rini, EA, & Masrul, M. (2013). Relationship between diarrhea and nutritional status of children under five in Lubuk Buaya Village, Koto Tengah District, Padang City. Andalas Health Journal, 2(3), 11-115.
8. Natadisastra, D. (2009). Medical Parasitology Judging from the Body Organs Attacked. (Print 1). Jakarta: EGC, pp. 72-85.
9. Zulkoni, A. (2011). Parasitology For Public Health Nursing and Environmental Engineering. First print. Yogyakarta: Nuha Medika.
10. Soedarto. (2016). "Medical Parasitology", Second Edition. Surabaya: CV. Sago Seto.
11. Sugiyono. (2018). Qualitative Research Methods. Bandung : Alfabeta
12. Arisman, MB. (2010). Textbook of Nutrition Science in the Life Cycle. Ed 2. Jakarta: EGC Medical Book Publisher. pp. 205-32.
13. Lobato L., A. Miranda, IM Faria, J. M Bethony, and MF Gazzinelli. (2012). Development of cognitive abilities of children infected with helminths through health education. Rev. soc. Bras Med. Trop.,45(4):514-519.
14. Joko, Wibowo,. R. (2008). Relationship between Soil Transmitted Helminths Infection and Learning Achievement of Elementary School Children 03 Pringapus, Semarang Regency, Central Java (Doctoral dissertation, Faculty of Medicine).

15. Wibowo, J. (2008). The Relationship between Soil Transmitted Helminths Infection and Learning Achievement of Elementary School Children 03 Pringapus, Semarang Regency, Central Java. UNDIP Faculty of Medicine. Semarang
16. Almatsier, S. (2009) Basic Principles of Nutrition. Edition 7. PT Gramedia Pustaka Utama: Jakarta
17. Mahmud MA, Spigt M, Bezabih AM, Pavon IL, Dinant GJ, Velasco RB. (2013). Risk factors for intestinal parasitosis, anemia, and malnutrition among schoolchildren in Ethiopia. *Pathogens and Global Health* 107(2): 58-65.
18. Sharman, JL, Spedding, M., & Cgtp Collaborators. (2013). The Concise Guide to Pharmacology 2013/14: G protein coupled receptors. *British journal of pharmacology*, 170(8), 1459-1581.
19. Pohan, CA, Ward, M., Kouzekanani, K., & Boatright, C. (2009). The Impact of Field Placement Sites on Preservice Teachers' Beliefs about Teaching Diverse Students. *School-University Partnerships*, 3(1), 43-53.
20. Handayani, L., Nyoman, N., Dantes, N., & Suastra, IW (2013). The Influence of Independent Learning Model on Independent Learning and Science Learning Achievement of Class VIII Students of SMP N 3 Singaraja (Doctoral dissertation, Ganesha University of Education)

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