Human Digestive System: Gender-Based Contextual Teaching and Learning

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Abstract: The human digestive system is one of the materials taught to junior high school students. This research purpose was to determine the gender-based contextual (CTL) effect on biology students cognitive learning outcomes. This research used quasi-experimental design with pretest-posttest nonequivalent control group design. Data analysis used descriptive statistical and inferential statistics. The analysis results show that there was significant effect of using the CTL learning model on students' cognitive learning outcomes on the human digestive system material with sig value was 0.000>0.05. Regarding gender, there is no significant effect on cognitive learning outcomes on the human digestive system material with sig value was 0.764>0.05. There is no significant effect of the interaction of learning models and gender on cognitive learning outcomes on the human digestive system material with sig value was 0.960>0.05. Thus, the CTL learning model can improve the cognitive learning outcomes students who have gender characteristics.

Keywords: human digestive system, contextual teaching and learning, cognitive learning outcomes, gender.

Abstrak: *Sistem pencernaan manusia merupakan salah satu materi yang diajarkan kepada siswa SMP. Tujuan penelitian ini adalah untuk mengetahui pengaruh model pembelajaran Contextual Teaching and Learning (CTL) berbasis gender terhadap hasil belajar kognitif siswa biologi. Penelitian ini menggunakan eksperimen semu dengan desain pretest-posttest nonequivalent control group design. Analisis data menggunakan analisis statistik deskriptif dan statistik inferensial. Hasil analisis menunjukkan bahwa terdapat pengaruh yang signifikan penggunaan model pembelajaran CTL terhadap hasil belajar kognitif siswa pada materi sistem pencernaan manusia dengan nilai sig. 0,000 < 0,05. Terkait jenis kelamin, tidak terdapat pengaruh yang signifikan terhadap hasil belajar kognitif pada materi sistem pencernaan manusia dengan nilai sig 0,764 > 0,05. Tidak terdapat pengaruh yang signifikan interaksi model pembelajaran dan gender terhadap hasil belajar kognitif pada materi sistem pencernaan manusia dengan nilai sig 0,960 > 0,05 Dengan demikian, model pembelajaran CTL dapat meningkatkan hasil belajar kognitif siswa yang memiliki karakteristik gender.*

Kata kunci: *sistem pencernaan manusia, pengajaran dan pembelajaran kontekstual, hasil belajar kognitif, gender.*

▪ **INTRODUCTION**

The human digestive system is one of the materials taught to junior high school students. The purpose of studying the human digestive system is so that students can understand the material taught, come up with ideas, and be able to express opinions so that students' cognitive learning outcomes can improve. Students' cognitive learning outcomes are fundamental aspect of classroom to routines, patterns of actions, values, understanding, attitudes, appreciation, skills wherewith the occurrence of a change in the way of thinking and acting, in order to have the students' intelligence development in shaping a better life (Suprijono, 2009; Alanazi, 2017; Bustami et al, 2021). The cognitive learning outcome of students is an achievement of one's abilities based on the

learning process so that changes in attitudes, knowledge, and skills can be measured or observed for helping students to achieve successful performances (Ramadhan et al, 2017; Gunes, Katircioglu & Yilmaz, 2015; Ramalingam, Ramalingam & Chinnavan, 2014; Sabtiawan, Yuanita & Rahayu, 2019). The role of student cognitive learning outcomes according to Rosyida, et al (2016) is that with cognitive learning outcomes, students can know the shortcomings, make improvements to achieve better student cognitive learning outcomes, and become an evaluation for teachers in designing learning plans, using models or methods, and can know whether or not a teacher achieves the learning goals to be achieved.

Hendriawan (2014) and Algani & Eshan, (2019), the main problem in formal education today is still low absorption of students, which is evident from the average cognitive learning outcome of relatively low students. According to Facts according to Dewi (2018), the average grade VIII A student grade is 55 out of 20 students and class VIII B obtained an average score of 50 out of 20 students. Furthermore, research conducted by Sumiati, et al (2018) found that as many as 198 students who showed cognitive learning outcomes in biology subjects, especially the human digestive system, were still low which showed 32.00% of students who got more cognitive learning outcomes than KKM. The same thing is also shown based on observations that have been made at State Junior High School 2 Sungai Tebelian students' cognitive learning results on the daily replay value of digestive system material obtained with an average value of 68 and also the results of observations that have been done at State Junior High School 5 Tebelian River on the daily route of human digestive system material obtained with an average value of 66 So that students' cognitive learning outcomes are still categorized as low.

Factors causing low cognitive learning outcomes of students according to (Fauji, 2015: Fadillah, et al, 2016; Naimnule, et al. 2016; Oh, Maeng & Son, 2020; Añino, Merino, Miyara, Perassi, Ravera, Pita & Waigandt, 2014; Çepni & Keleş, 2006) that teachers often apply lecture methods, and teacher-centered learning activities, the students tended to be passive, where teachers who play an active role in learning activities that will have an impact on learning outcomes that are less satisfactory so that there are still some students who still interact less with their friends (Masrida et al. 2016). Other factors that also affect the low cognitive learning outcomes of students according to (Masrida, et al 2016 and Sumiati, et al 2018) state that biology subjects, especially the human digestive system, are often considered elusive and boring subjects because they are only rote, causing students to show low motivation, independence, and activeness in constructing knowledge during the learning process and materials that are Accepted by students unable to be stored in long-term memory or low student memory ability.

According to Khairunnisa and Nining (2017), stated that students' cognitive learning outcomes about the material of the human digestive system owned by each student are different, although the problems faced are the same. This difference inability is due to several factors. One of the factors that influence our gender differences (Zhou et al, 2017; Tsai et al, 2018; Ghasemi et al 2019; Rosén et al, 2022). Gender differences are often found at every level of education, especially in SMP Negeri 2 Sungai Tebelian and SMP Negeri 5 Sungai Tebelian. Gender is a term used to describe the difference between men and women socially that is seen when viewed from the values and

behavior of students in Widiawati (2016). According to Indrawati & Nurfaidah, (2016) and Hodiyanto, (2017) stated that male students are a more developed left brain so that they are better able to think logically, think abstractly, and think analytically, while female students are more developed right brain, so tend to be artistically active, holistic, imaginative, thinking intuitive. These differences will cause differences in emotional, behavioral, thinking patterns, and intelligence that can affect students' cognitive abilities (Apriyono, 2016).

This can be seen from the differences in emotional, behavioral, thinking patterns and intelligence shown by male and female students are different because they are caused by daily activities between male and female students. Thinking patterns and intelligence are very influential in studying the material of the human digestive system (Apriyono, 2016). Based on the above exposure, it can be concluded that gender differences can affect the critical thinking skills and cognitive learning outcomes of students. According to Bustami et al (2018), stated that students' critical thinking skills and cognitive learning outcomes can be improved through a variety of innovative learning, namely by involving students directly in the learning process or student-centered, collaborating, and self-learning in the learning process. Innovative learning is learning that requires a learning model in the teaching and learning process. The learning model is the Contextual Teaching and Learning (CTL) learning model (Haerazi et al. 2019; Lestari et al. 2021). The CTL learning model according to Rokhma (2014), states that students are not just objects but able to act as subjects, with encouragement from teachers, students are expected to be able to construct lessons in the minds of students themselves, so students not only memorize facts but students are required to experience them themselves and students are also able to master thinking skills in the learning process. Research conducted by Susialita (2016) revealed that the CTL learning model allows students to connect students' academic thinking with the context of daily life to find new goals through experiences in everyday life and classroom learning so that the need to apply such models that can improve students' cognitive learning outcomes. Based on this background, researchers are very interested in researching the influence of gender-based CTL learning models on students' cognitive learning outcomes on human digestive system materials.

- **METHOD**

This study was conducted using a pretest-posttest non-equivalent control group design factorial version 2 x 2. CTL learning models and conventional learning as the first factor, and male and female students are the second factor. The population in this research was all students of class VIII of State Junior High School 2 Sungai Tebelian and students of class VIII of State Junior High School 5 Sungai Tebelian both male and female students numbering 94 students. The sample in this study was a student of class VIII A as an experimental class and VIII B as a control class of State Junior High School 2 Sungai Tebelian. The samples in this study were conducted with saturated sampling techniques. Saturated sampling was a sampling technique when all members of the population are used as samples.

The instrument used was a multiple-choice test question. The multiple-choice tests used amounted to 20 questions. This tool was used to obtain data on the cognitive learning ability of grade VIII students in the material of the human digestive system in

Junior High School. The test has been validated by content, construct, and empirical. Validation of contents and constructs is done by 3 validators. Empirical validation is conducted in field trials. The test results showed valid and reliable results.

Data is analyzed using descriptive statistical analysis and inferential statistics. The data of the results of the study begins by conducting a prerequisite test in the form of normality tests and homogeneity tests. The Kolmogorov-Smirnovsample test and the homogeneity test used the Formula One Way Anova, followed by a covariance (anakova) analysis at a significant level of 0.05 and a follow-up LSD test. All data analysis is assisted by SPSS version 18

▪ **RESULT AND DISSCUSSION**

The results of the descriptive analysis are done to find out the average on pretest and posttest values. Pretest and posttest were followed by 45 students in the experimental class and 49 students in the control class. The following descriptive analysis results on students' cognitive learning outcomes can be seen in Table 1. Based on Table 1 it is seen that the average pretest grader score of experiment students was 35.40 with the highest score of 50, the lowest score of 20, while the average posttest score was 76.80 with the highest score of 90, the lowest score of 60. The control class obtained a pretest average value was 36.35 with a top value of 50, a low of 20. The posttest obtained an average was 63.31. High 70, lowest value 50. The average score of students' cognitive learning outcomes in the experimental class increased was 41.40 while for the control class increased was 26.96.The results of the study concluded that learning using the CTL learning model can improve students' cognitive learning outcomes.

Table 1. Students' cognitive learning outcome scores

Score	Experiment Class		Control Class	
	Pretest	**Posttest**	**Pretest**	**Posttest**
Highest Score	50	90	50	70
Lowest Score	20	60	20	50
Average Score	35.40	76.80	36.35	63.31
Category	Very low	Good	Very low	Enough
Increased	41.40		26.96	

The results of this study are in line with research by Hutama (2015), Setyawan & Leonard (2017), Wulandari (2018), Lotulung et al. (2018); Tamam et al. (2021), and Suryawati & Osman (2018), which shows that the CTL learning model is more influential on students' cognitive learning outcomes than conventional learning. Furthermore, Ridwanulloh et al (2016) and Kistian (2018), found that learning using contextual teaching and learning (CTL) learning models is better when compared to using conventional learning models. The influence of the CTL learning model is better than conventional learning because the CTL learning model has several advantages over conventional learning.

The normality test results on students' cognitive learning outcomes are obtained from pretest and posttest results. The results of the normality test showed that both the pretest and posttest results had a probability value (Sig) greater than alpha 0.05. With the results of the pretest normality test, sig 0.175>0.05 and the posttest result was Sig

0.106>0.05. The results concluded that the research data were both pretest and posttest normal distribution. The results of the homogeneity test on students' cognitive learning outcomes obtained sig. (2-tailed). For pretest experimental class students and control class students was 0.283>0.05 then the pretest data is homogeneous and on sig posttest data. (2-tailed) 0.170>0.05 means homogeneous posttest data. So, the results of the analysis with SPSS Version 18 prove that the data for each test are all declared homogeneous.

The results showed that the CTL learning model had a significant effect on students' cognitive learning outcomes. Data has a Probability (Sig) value. Smaller than alpha 0.05, Sig. 0.000. So it can be concluded that the CTL learning model has a significant effect on students' cognitive learning outcomes. A summary of the hypothesis test can be seen in Table 2.

Table 2. Anacova results influence CTL learning model

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3348.766[a]	4	837.192	15.158	.000
Intercept	30415.480	1	30415.480	550.683	.000
Cognitive pretest	31.283	1	31.283	.566	.454
Model	3194.416	1	3194.416	57.836	.000
Error	4915.670	89	55.232		
Total	476879.000	94			
Corrected Total	8264.436	93			

Based on, gain index calculations showed that there were differences in group students' cognitive learning outcomes between CTL learning models and conventional learning. Seen in the gain value in the conventional class is lower, which was 0.42 compared to the higher gain value in the CTL class which was 0.64. Summary results related to average values based on the gain index calculation can be seen in Table 3.

Table 3. Summary of gain index calculations

Model	Average Value		Difference	Gain	Category
	Pre-Cognitive	Post-Cognitive			
Conventional	36.35	63.31	26.96	0.42	Enough
CTL	35.40	76.80	41.40	0.64	high

Cognitive learning outcomes in experimental classrooms have improved because the CTL learning model has several advantages in its learning syntax, especially in constructivism activities, finding information, asking questions, learning society, modeling, reflection, and authentic assessment so that student-centered learning, thus students will be more active in the learning process and can improve students' cognitive learning outcomes. Nurjanah (2015), states that the CTL learning model is a learning model that emphasizes full student engagement to be able to find the concepts learned a The stages in the application of CTL learning models can make students more active and dare to perform so that the learning process will be more meaningful and each student can master the subject matter well because of the fun learning process. This

proves that the application of CTL learning models can improve students' cognitive learning outcomes significantly and can connects with real situations.

Regarding the influence of gender on students' cognitive learning outcomes, children's results showed that gender had no significant effect on students' cognitive learning outcomes. Gender has a probability value (Sig). Greater than alpha 0.05, Sig. 0.764. So, it can be concluded that gender has no significant effect on students' cognitive learning outcomes. A summary of children's results on the cognitive learning outcomes of students can be seen in Table 4.

Table 4. Children's results influence gender on students' cognitive learning outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3348.766[a]	4	837.192	15.158	.000
Intercept	30415.480	1	30415.480	550.683	.000
Cognitive Pretest	31.283	1	31.283	.566	.454
Gender	5.017	1	5.017	.091	.764
Error	4915.670	89	55.232		
Total	476879.000	94			
Corrected Total	8264.436	93			

The results were in line with Avila et al (2017) and Hadi et al (2015), who also found that there was no significant gender influence on students' cognitive learning outcomes. This happens because the CTL learning model can instill problem-solving habits, critical thinking, creativity, and independence. Explore the potential of students based on the experience they have to be connected with the knowledge to be learned. Following the constructivist theory that in constructing knowledge students do not depart from the "blank mind", students must know what is to be known called preliminary knowledge (Susiloningsih, 2016).

The results of the gain index calculation showed that the cognitive learning outcome of male students was 0.56 higher than female students at 0.51. So it can be concluded that the cognitive learning outcomes of male students are better than the cognitive learning outcomes of female students although there are no significant differences. A summary of the calculation of gain index calculation based on gender can be seen in Table 5.

Table 5. Summary of gain index calculation based on gender

Gender	Average Value		Difference	Gain	Category
	Pre Cognitive	Post Cognitive			
Female	36.18	68.74	32.56	0.51	Enough
Male	35.50	71.15	35.65	0.56	Enough

Regarding the interaction of CTL learning models and gender to students' cognitive learning outcomes, the results showed that there was no significant influence on the interaction of learning models with the gender on students' cognitive learning outcomes. This is evidenced by the interaction of models and genders that have Sig

values was 0.960 and greater than alpha 0.05. So it can be concluded that the increase in the average value of students' cognitive learning outcomes is no different in each class interaction model of learning with gender (Table 6).

Table 6. Children's results interact with learning and gender models to student cognitive

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3348.766[a]	4	837.192	15.158	.000
Intercept	30415.480	1	30415.480	550.683	.000
Cognitive pretest	31.283	1	31.283	.566	.454
Model * Gender	.138	1	.138	.002	.960
Error	4915.670	89	55.232		
Total	476879.000	94			
Corrected Total	8264.436	93			

This is in line with Rahmawati (2018), stating that the contextual approach provides opportunities for students to actively discuss in study groups involving peers. These learning groups will shape the learning community. Furthermore, research according to Pradana & Endryansah (2014) and Surya, Putri & Mukhtar, (2017), reveals that CTL is a learning model that emphasizes the process of full student engagement, to be able to find the material studied and connect it to everyday life situations.

However, Table 7 of gain index calculations showed that the class interaction of CTL learning models with gender had an average score of better student cognitive learning outcomes was 0.64 for male gender and 0.63 for female gender compared to the average value of cognitive learning outcomes of conventional classroom interaction students with male gender was 0.46 and female gender 0.40. It can be concluded that the class interaction of CTL with gender is better than the class interaction of conventional learning models with gender.

Table 7. Summary calculation of gain index based on learning model

Model	Gender	Average scores		Difference	Gain	Category
		Pre Cognitive	Post Cognitive			
Conventional	Female	36.90	62.00	25.10	0.40	Low
	Male	35.55	65.20	29.65	0.46	Enough
CTL	Female	35.36	76.56	41.20	0.63	High
	Male	35.45	77.10	41.65	0.64	High

The results of the analysis concluded that the application of CTL learning models is more capable of improving students' cognitive learning outcomes than conventional learning. In addition, the CTL learning model is also able to equalize students' cognitive learning outcomes without being gender-based.

The results of the gain index calculation showed that the class interaction of CTL learning model with gender had an average value of better cognitive learning outcomes was 0.64 for male gender and 0.63 for female gender compared to the average value of cognitive learning outcomes of conventional class interaction with male gender which was 0.46 and female gender was 0.40. The results of the gain index calculation related to cognitive learning outcomes showed that the combination of CTL learning models

with gender was not real, but different in the combination group of conventional learning with gender. Seen at the percentage rate of the female student gain index value was 0.40 with less category and the value of male students was 0.46 with enough categories. The results concluded that classes with the CTL learning model were better able to improve cognitive learning outcomes in students based on gender than conventional learning classes with gender.

This is in line with Avila et al (2017) research, which found that there were no differences in cognitive learning outcomes in the interaction of learning and gender models. Furthermore, Darmawan et al. (2018) also stated that there was no influence of the interaction of learning models and sex differences on the achievement of metacognitive skills and cognitive learning outcomes of students. So it can be concluded that there is no influence on the interaction of models with gender.

▪ **CONCLUSION**

Based on the analysis of data it can be concluded that there is a significant influence on the use of the CTL learning model on students' cognitive learning outcomes on human digestive system materials. There was a significant difference in students' cognitive learning outcomes between experiment classes and control classes on the material of the human digestive system. This is evidenced by the results of hypothesis tests that show that sig values. (2-tailed) < the value was α 0.000 < 0.05. Regarding gender, there was no significant influence on cognitive learning outcomes on the material of the human digestive system. This is evidenced by the results of hypothesis tests that show that sig values was 0.764 > 0.05. There was no significant influence on the interaction of learning and gender models on cognitive learning outcomes on the material of the human digestive system. This is evidenced by the results of hypothesis tests that show that sig values. (2-tailed) > α was 0.960>0.05. Thus, the results of this study provide recommendations so that teachers can apply the CTL learning model to students who have different gender characteristics in biological learning to improve students' cognitive learning outcomes

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