Contextual teaching learning in human digestive system: The contribution of critical thinking skills

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ABSTRACT

Critical thinking skills and students’ understanding are the supporting factors in students’ learning success. This research aimed to determine the contribution of critical thinking skills for the understanding on human digestive system concepts when contextual teaching and learning (CTL) was implemented. The samples were 45 students consisting of public junior high schools 2 and 5 class VIII A at Sungai Tebelian. The instrument of critical thinking skills were essay test totaling of 6 items and to measure the understanding on human digestive system concepts, 20 items of multiple choices test were used. Research data were analyzed using a simple regression correlation analysis. The results showed a significant correlation of critical thinking skills to the understanding of human digestive system concepts. The regression equation of the correlation between the two variables was $Y = 0.736X + 22.861$. The correlation coefficient was 0.640, with the contribution the critical thinking skills to human digestive system concepts of 41.00%. These results showed that there was a significant correlation between critical thinking skills and human digestive system concepts when CTL was implemented in learning. Thus, biology teachers need to develop students’ critical thinking skills through the implementation of CTL in learning.

Keywords: Correlation, Contextual learning, Critical thinking skills, Human digestive system

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INTRODUCTION

The education quality can determine the progress of a nation. Education quality can be seen from the quality of students who can develop themselves in facing the industrial revolution era 4.0 (Shahroom & Hussin, 2018). It is a topic of discussions about the internet, digitalization, and intelligent knowledge systems that need skills (Roblek, Meško, & Krapež, 2016; Muhuri, Shukla, & Abraham, 2019). One of the skill is higher-order thinking skills, namely critical thinking skills (Setiawan, Dwi & Budhi, 2017; Bustami, Syafruddin & Afriani, 2018; Ichsan, Sigit & Miarsyah, 2019).

The critical thinking skills are the skills to think through problem-solving with curiosity, has the characteristics of interrogative and skeptical thinking, dare to take risks, dare to decide and carry out and can function effectively in almost all aspects of life and other work (Mahanal, Shila & Zubaidah, 2018; Cansoy, Parlar & Polatcan, 2018). Critical thinking skills are an essential element for students in learning (Mundilarto & Ismoyo, 2017). It can be used as a basis for the analysis of arguments, specific reasons that support the assumptions or conclusions they obtain, and insights on each meaning and interpretation to develop logical reasoning in each student (Bustami & Corebima, 2017; Rosidin Kadaritna & Hasnunidah, 2019).

The critical thinking skills has one of the most important aspects to be empowered because of the understanding domain development and can affect student achievement (Warni, 2018; Amin, 2020) especially the human digestive system concepts (Mardiah, Putra, & Winarti, 2018; Bustami, Riyati, & Julung, 2019). The human digestive system is a material that is contextual and universal in natural science (Biology). It is subject matter at the level of junior high school education consisting of facts, concepts, principles, and procedures that are systematically organized about humans and their surroundings (Mahmudah, Tindangen, & Lumowa, 2018; Bustami et al., 2019). The learning process of natural sciences (Biology) in junior high schools requires critical thinking skills, metacognitive skill, and conceptual understanding (Bustami et al., 2019; Lestari, Ristanto, & Miarsyah, 2019), especially students achievement. The achievement is a person’s ability in the learning process to change attitudes, knowledge, and skills that can be produced and measured or observed (Ramadhan, Mahanal & Zubaidah, 2017). The achievement will be able to make students to think more to make improvements in achieving better students’ conceptual understanding results (Rosyida, Zubaidah & Mahanal, 2016).

The critical thinking skills correlate with students’ understanding (Moslemi, Ghomi & Seyed, 2016; Mahanal et al., 2018). The critical thinking skills can help students to think by bringing up creative ideas to be able to understand the material well, express opinions, and improve students’ achievement. This is because there was a correlation between critical thinking skills and students’ understanding. Several research results have revealed a correlation between critical thinking skills and concepts understanding. Critical thinking skills have a significant correlation with students’ understanding, including the acquisition of concepts and student achievement (Mite & Corebima, 2017; Siburian, Corebima, Ibrohim & Saptasari, 2019). Therefore, it is necessary to improve critical thinking skills and understanding with various learning variations (Mundilarto & Ismoyo, 2017; Wahyuni & Setiawan, 2019).

Critical thinking skills and students’ understanding can be improved through an innovative learning variety. It can directly involve students in the learning process or become student-centered, collaborate, and learn independently in the learning process as well as learning that requires a learning approach in the teaching and learning process. One of learning approach is a CTL (Bustami et al., 2018).

CTL is a learning approach that not just act as an object but also as a subject in constructing knowledge so that students can construct knowledge themselves. Students are not just memorizing facts, listening, or taking notes. Students are required to experience it themselves and encouraged to carry out hands-on experiences, so they can master the thinking
skills in the learning process (Rokhma, 2014; Lestari, Amelia, & Marianingsih, 2017). The CTL learning approach allows students to connect their academic thinking with the context of everyday life to find new goals through daily life experiences and learning in the classroom. So the need to apply these approaches can improve students’ critical thinking skills and understanding, especially the human digestive system concepts (Susialita, 2016). CTL learning is very suitable for the material of the human digestive system because it is directly related to real concepts in everyday life.

On the other hand, the research results indicate that CTL learning influences students’ understanding of materials and critical thinking skills. The implementation of CTL learning improved students’ writing skills (Satriani, Emilia, & Gunawan, 2012). Furthermore, the CTL learning affected students’ understanding of biology concepts (Abadiyah, Juanengsih, & Fadlilah, 2017; Wuryaningrum, Sartono, & Dewahrani, 2018; Yulinda, & Ilma, 2018), towards students’ achievement on natural science (Suryawati & Osman, 2018). Finally, the research results of Bustami et al. (2018) revealed that CTL learning improving students’ critical thinking skills in learning environmental pollution.

Based on these problems, it is necessary to conduct research related to the contribution of critical thinking skills to understand human digestive system concepts at the implementation of CTL learning. The implementation of CTL is because previous research only looked at the effect of CTL learning on critical thinking skills and understanding of the human digestive system concepts, not yet showing the correlation of critical thinking skills to the understanding of the human digestive system concepts. Critical thinking skills significantly affect students’ understanding of the material being taught, especially the human digestive system concepts. Therefore, this research is needed on the contribution of critical thinking and understanding of the human digestive system concepts. This research was to determine the contribution of critical thinking skills and understanding of the human digestive system concepts students in eight grade of junior high school through CTL learning. This research was expected to give contribution to the school to apply active learning, including the use of CTL in improving critical thinking and understanding on the human digestive system concepts.

METHODS

Research Design

This research was correlational research to uncover the contribution of critical thinking skills as a factor influencing students’ understanding on human digestive system concepts by implementing CTL learning. This research used a one-group posttest only design, adopted from the research of Siburian et al., (2019) and Setiawan, Zubaidah & Mahanal, (2020). The one-group posttest only design can be seen in Table 1.

Table 1.
One-Group posttest only design.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>O₁</td>
</tr>
</tbody>
</table>

Note: X: learning with CTL learning, O₁: Posttest score from the experimental class.

Population and Samples

This research was conducted after an experiment (O₁) was the posttest. The research was conducted for a month. The population were all eighth-grade (VIII) students of 2 public junior high schools and 5 public junior high schools in Sungai Tebelian, West Kalimantan, Indonesia totaling 94 students. Each school consisted of 2 classes. Sampling in this research was carried out with a random sampling technique. 22 students from class VIII-A in 2 public junior high
schools, VIII-A in 5 public junior high schools, 23 students at Sungai Tebelian, West Kalimantan, Indonesia, which totaling of 45 students who were taught using the CTL learning.

**Instrument**

The instrument to measure critical thinking skills was the essay test totaling of 6 items, and to measure understanding on human digestive system concepts multiple-choice test comprising 20 items was used. The essay test was developed based on the indicators of Ennis (2009), namely formulating a problem, making deduction and induction, giving arguments, evaluating, deciding, and implementing. The multiple-choice test was developed based on the indicators of Bloom's taxonomy (Anderson & Khrathwohl, 2001) of remembering (C1), understanding (C2), applying (C3), and analyzing (C4). Indicators' lattices of critical thinking can be seen in Table 2, and understanding the human digestive system concepts can be seen in Table 3.

**Tabel 2.**

Indicators lattices of critical thinking on human digestive system.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Indicators of Critical Thinking</th>
<th>Test Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluating</td>
<td>When we consume fruits that are not washed clean, of course, these fruits will contain dust, dirt, and bacteria that are harmful to our digestive organs. Explain what you think if we consume fruits that contain dust, dirt, and bacteria that continuously enter the digestive organs, then what will you feel?</td>
<td></td>
</tr>
<tr>
<td>Induction</td>
<td>Look at the picture on the bottom! Based on this picture, try to conclude which organs do not undergo digestion and have different functions from other organs?</td>
<td></td>
</tr>
<tr>
<td>Giving arguments</td>
<td>Why do humans who consume excessive food feel too much pain in the stomach organs? Give your reasons for the event and connect it with digestion!</td>
<td></td>
</tr>
</tbody>
</table>

Describe the digestive organs in humans

Describe and observe the digestive mechanism in humans

There are two digestive mechanisms, namely mechanical digestion and chemical digestion. Mechanical digestion is digestion carried out by teeth to change the shape of abundant foods into smaller ones. Whereas chemical digestion is the digestion carried out by enzymes to change complex molecules in the food to be more straightforward. Make 3 problem statements
The disorders or diseases of the digestive system are often experienced by humans, one of which is diarrhea. Give 4 ideas to avoid diarrhea!

1. Keep a balanced diet and avoid consuming too much spicy food or food that is difficult to digest.
2. Make sure to wash your hands before eating and after using the toilet to prevent the spread of disease-causing pathogens.
3. Maintain a regular eating schedule to help regulate the digestive system.
4. Drink plenty of water to keep the digestive system hydrated.

Describe information about diseases or disorders in the human digestive system and efforts to maintain the human digestive system's health.

Deciding and implementing

Explain how you think the food digestion process from the entry of food into the oral cavity to enter the stomach!

The instrument was previously validated. The validity result shows that valid essay test questions were 6 out of 10 questions, and valid multiple-choice test questions were 20 out of 40 questions. The reliability test results using the ANATES V4 program showed the reliability coefficient of multiple-choice questions was 0.90, and essay questions were 0.86 with very high-reliability categories so that it could be used as a research instrument.

Tabel 3.
Indicators Lattices of Conceptual Understanding on Human Digestive System.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Cognitive (C)</th>
<th>Test Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students can mention the canines tooth total in healthy children</td>
<td>C1</td>
<td>The digestive organ parts that are directly related to the ventriculus is...</td>
</tr>
<tr>
<td>2</td>
<td>Students can mention the stomach part that is directly related to the esophagus</td>
<td>C1</td>
<td>a. Pharynx</td>
</tr>
<tr>
<td>3</td>
<td>Students can mention the digestive tract in humans</td>
<td>C1</td>
<td>b. Larynx</td>
</tr>
<tr>
<td>4</td>
<td>Students can mention the motion that pushes food on the esophagus</td>
<td>C1</td>
<td>c. Colon</td>
</tr>
<tr>
<td>5</td>
<td>Students can mention that gastric pains can lead to other diseases</td>
<td>C1</td>
<td>d. Esophagus</td>
</tr>
<tr>
<td>6</td>
<td>Students can explain teeth that are suitable for cutting and biting teeth which help in the food mechanically digestion</td>
<td>C2</td>
<td>Marasmus disease is a form of malnutrition that is often found in toddlers. The following is the characteristic of Marasmus’s disease, namely...</td>
</tr>
<tr>
<td>7</td>
<td>Students can explain the name of the digestive organs in the mouth that serves as a food location regulator</td>
<td>C2</td>
<td>a. Crooked feet</td>
</tr>
<tr>
<td>8</td>
<td>Students can explain the muscles type that function to open and close the anus</td>
<td>C2</td>
<td>b. Distended stomach</td>
</tr>
<tr>
<td>9</td>
<td>Students can explain the food digestion process derived from the stomach and acidic atmosphere to be neutralized</td>
<td>C2</td>
<td>c. Old face</td>
</tr>
<tr>
<td>10</td>
<td>Students can explain the characteristics of the Marasmus disease</td>
<td>C2</td>
<td>d. Muscle does not develop properly</td>
</tr>
<tr>
<td>11</td>
<td>Students can detect the tooth enamel part</td>
<td>C3</td>
<td>The following is the tooth structure picture.</td>
</tr>
<tr>
<td>12</td>
<td>Students can detect the tooth pulp part</td>
<td>C3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Students can sort the results of the mechanical and chemical digestion process</td>
<td>C3</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Students can determine the bacteria that help the decay process in the large intestine</td>
<td>C3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Students can sort the food digestion process from protein groups after being bounced</td>
<td>C3</td>
<td></td>
</tr>
</tbody>
</table>
Procedure

The procedures in this research consisted of three steps. The first step was to give the learning process with the implementation of CTL learning. CTL learning has been 7 characteristics, namely constructivism, inquiry, asking questioning, learning community, modeling, reflection, and authentic assessment. Learning was done as much as 4 time meetings on biological material. The second step was to give a post-test to determine the value of students' critical thinking skills and understanding on human digestive system concepts. The third step was conducting correlational analysis to reveal the correlation between critical thinking skills and conceptual understanding of the human digestive system at the implementation of CTL learning. Flowcharts research procedures can be seen in Figure 1.

**Figure 1.** Research procedures.
Data Analysis Techniques

The data analysis was performed by descriptive analysis and inferential analysis. The descriptive analysis aims to determine the average value of critical thinking skills and understanding human digestive system concepts. The inferential analysis aims to answer the research hypothesis. Hypothesis testing begins with a prerequisite test in the form of a normality test and a homogeneity test. The normality test used the Kolmogorov-Smirnov, and the homogeneity test used One Way Anova. Data analysis related to the correlation of students’ critical thinking skills to human digestive system concepts using simple regression.

RESULTS AND DISCUSSION

Descriptive analysis was carried out to find the average in the posttest scores. Based on the detailed analysis results in Table 4 showed that the average value of critical thinking skills is 74.80, with the highest value of 85, and the lowest of 60. The average value of students' human digestive system concepts is 76.80, with the highest value of 90, and the lowest of 60.

Table 4.
The value of students critical thinking skills and human digestive system concepts.

<table>
<thead>
<tr>
<th>Value</th>
<th>Critical Thinking</th>
<th>Human Digestive System Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest value</td>
<td>85.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Lowest value</td>
<td>60.00</td>
<td>60.00</td>
</tr>
<tr>
<td>Average value</td>
<td>74.80</td>
<td>76.80</td>
</tr>
<tr>
<td>Category</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

Descriptive analysis results showed that CTL learning can improve students’ critical thinking and conceptual understanding of the human digestive system concepts. The results of this research are in line with previous studies, which revealed that CTL learning could improve critical thinking skills (Komalarasi, 2012; Bustami et al., 2018) and conceptual understanding (Abadiyah et al., 2017; Suryawati & Osman, 2018; Supianto, 2019). Increased critical thinking skills and understanding on human digestive system concepts are due to CTL learning characteristics that can increase critical thinking skills and conceptual understanding. CTL stages such as the invitation and exploration stage, explanation and solution stage, and taking action can improve critical thinking (Bustami et al., 2018) and conceptual understanding (Suryawati & Osman, 2018; Supianto, 2019).

The data of normality test results for the critical thinking skills and human digestive system concepts were summarized in Table 5. Based on Table 5, a significant value (sig: 0.216) of students’ critical thinking skills and human digestive system concepts is higher than the alpha value (α: 0.05), so the data is normally distributed.

Table 5.
The results of normality in students critical thinking and human digestive system concepts.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Sig.</th>
<th>Alpha (α)</th>
<th>Sig. &gt; α</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking skills</td>
<td>0.216</td>
<td>0.05</td>
<td>0.216&gt;0.05</td>
<td>Normally</td>
</tr>
<tr>
<td>Human digestive system concepts</td>
<td>0.106</td>
<td>0.05</td>
<td>0.106&gt;0.05</td>
<td>Normally</td>
</tr>
</tbody>
</table>

The results of the homogeneity test for students’ critical thinking skills and human digestive system concepts are presented in Table 6. The results of the homogeneity test in Table 6 obtained was sig. > 0.05. This shows that the data on students’ critical thinking skills and human digestive system concepts have homogeneous variants.
**Table 6.**
The results of homogeneity in students critical thinking and human digestive system concepts.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Sig.</th>
<th>Alpha (α)</th>
<th>Sig. &gt; α</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking skills</td>
<td>0.760</td>
<td>0,05</td>
<td>0.760&gt;0.05</td>
<td>Homogeneity</td>
</tr>
<tr>
<td>Human digestive system concepts</td>
<td>0.170</td>
<td>0,05</td>
<td>0.170&gt;0.05</td>
<td>Homogeneity</td>
</tr>
</tbody>
</table>

Based on the correlation analysis results of critical thinking skills in students’ understanding of the human digestive system concepts obtained an F value of 29.866 with a significance level of 0.000<0.05, so the null hypothesis can be concluded as rejected, and the research hypothesis is accepted. Thus, there is a correlation between critical thinking skills and students’ understanding on the human digestive system concepts. The ANOVA summary of the correlation analysis results of critical thinking skills on students’ understanding of the human digestive system concepts is summarized in Table 7.

**Table 7.**
The summary of anova results correlation of critical thinking skills to student human digestive system concepts on the ctl learning.

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1462.105</td>
<td>1</td>
<td>1462.105</td>
<td>29.866</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>2105.095</td>
<td>43</td>
<td>48.956</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3567.200</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The contribution amount made by the critical thinking skills on students’ human digestive system concepts is 41.0%, which is described in Table 8.

**Table 8.**
The summary of regression of the correlation of critical thinking skills to student human digestive system concepts on the ctl learning.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. an error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.640</td>
<td>.410</td>
<td>.396</td>
<td>6.997</td>
</tr>
</tbody>
</table>

Based on the regression test results obtained by the regression line equation, \( Y = 0.736X + 22.861 \). The correlation coefficient is 0.640, so it can be concluded that the correlation of critical thinking skills on students’ human digestive system concepts with the implementation of CTL is strong. The summary of the regression coefficients of critical thinking skills on students’ human digestive system concepts with the implementation of CTL learning is outlined in Table 9.

**Table 9.**
Regression coefficient of correlation critical thinking skills and students human digestive system concepts on the ctl learning.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>22.861</td>
<td>9.925</td>
<td></td>
<td>2.303</td>
</tr>
<tr>
<td>Critical Thinking Skills</td>
<td>.736</td>
<td>.135</td>
<td>.640</td>
<td>5.465</td>
</tr>
</tbody>
</table>

The results of this research are in line with the research of Idayanti (2017), who showed a significant correlation of critical thinking skills with an understanding on human digestive system concepts from class XI science students of state high schools in Pinrang Regency, Indonesia. The correlation coefficient was 0.64. Based on the regression test results obtained by the regression line equation, that was \( Y = 0.736X + 22.861 \). The contribution made by critical
thinking skills to students’ human digestive system concepts was 41.00% and classified in the medium category, while 59.00% were other factors besides critical thinking skills.

This research results showed that the implementation of CTL learning is proven to have the potential to make a significant contribution to critical thinking skills, which eventually can increase understanding on human digestive system concepts. During the CTL learning process, it appears that students were enthusiastic about asking questions, giving arguments, deduction, induction, evaluating, deciding, and implementing so that they can increase the students’ understanding of the digestive system material. The activities learning from CTL such as constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment are believed to improve critical thinking skills, which ultimately affect students’ achievement. Critical thinking skills could also provide appropriate direction in thinking and working, and help in determining the correlation of something with others more accurately in learning that will affect student understanding (Malahayati, Corebima & Zubaidah, 2015).

The critical thinking skills can emerge students when they are involved in building fundamental knowledge, finding information, and asking questions so that students can solve problems encountered in the learning process. Critical thinking skills are included in CTL learning activities so that CTL learning can help students connect the material with real-life situations. It can also make students actively participate to discover and transform complex information into other situations as well as relate it to everyday life situations (Pradana & Andryansah, 2014; Surya, Putri & Mukhtar, 2017).

Furthermore, contextual learning could provide opportunities for students to improve, expand, and apply their knowledge and skills in various activities both in school and daily life (Bustami et al., 2018). CTL learning requires students to experience rather than memorize, think, and be active. As a result, they can build knowledge based on their own experiences. The same thing was that CTL learning makes experiences more relevant and helps students build their knowledge in their lives (Wakijo & Siti, 2016). So, it can be understood that CTL learning has the potential to empower critical thinking skills so that an increase will follow it in students’ human digestive system concepts.

However, some obstacles at the time of the research were: a) there were still some students found when the learning process took place less seriously, and students were still late when the learning process had begun. b) there are still some students who rely on friends who are smarter and more diligent in doing the group assignments given by the teacher. Furthermore, the weaknesses of this research were: a) at the first meeting, students were unfamiliar with the CTL learning. b) there was a commotion at the first meeting due to a lack of control from the teacher.

CONCLUSION

Based on the results and discussion, it can be concluded that there was a significant correlation of critical thinking skills to the understanding of human digestive system concepts at the implementation of the CTL learning, which produces an F value of 29.866. A significance value was 0.000 at the 0.05 level, and the contribution of critical thinking skills to understanding on human digestive system concepts was 41.00%. Critical thinking skills have been able to affect students’ conceptual understanding, even though there are several obstacles and weaknesses in learning the material of the human digestive system. Therefore, the teacher can develop students’ critical thinking skills so that understanding of human digestive system concepts can be improved, mainly through CTL learning.

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