

ANALYSIS OF STUDENTS' UNDERSTANDING OF DIGESTIVE ORGANS THROUGH STUDENTS CENTERED CLASSES

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Abstract

The aim of this research is to confirm patterns of understanding of science highschool students, and how such understandings changed through a program in which students had to draw digestive organs. This lessons were designed students-centered and bidirectional communication between students or students and teacher. In the 1st lesson of 'drawing digestive organs', the students were asked to write and draw all the digestive organs they knew on a piece of paper to see how much they knew. In the 2nd lesson, the students were put into groups and asked to do the same job they had done separately in the 1st lesson on a larger piece of paper. In the 3rd lesson, the students corrected their mistakes using the given biology books, and in the 4th lesson, each group presented their work. The initial test showed that students differed a lot-some could remember most of the correct facts about the organs' structure and function, while others couldn't recall anything about such things. Even after the students centered and bidirectional communication program ended, there were some students still having the misconceptions of digestive organs unchanged.

Keywords: digestive organ, misconception, bidirectional communication, students centered program

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1. Introduction

From a constructivist point of view, knowledge is not found, but rather is formed voluntarily by the learner.[1] In other words, when a student begins a new study, he/she is not seen as starting with no background knowledge at all but rather as building up knowledge and experience and giving new meanings to them.[2] If learning is something achieved through positive understanding and activities as mentioned, the amount of preparation and positive attitude of the learner must be taken into consideration before learning new scientific concepts or carrying out activities.

A positive attitude towards the study can lead to a voluntary study habit, and have a positive effect on the results of the study.[3]

The innate curiosity of students declines due to classes that cannot promote exploration and research. As students enter advanced courses, classes are more getting text-book centered and scientific experiments(or demonstrations), which guide the students to solve problems using acquired knowledge, are more getting rarer. In studies like science, which is required hand operated domain such as experimenting or manipulating activity, the ability to feel and work by hand must be considered as important learning readiness. Also, such manipulating activity should not be limited as a skill practise - it should be a main activity that accompanies active participation and thinking processes.[4]

How students' understandings of digestive organs change through students centered classes has not been studied so far. Thus, it is meaningful to study and analyze patterns of understandings of digestive organs and build a basis of a method to find and correct misconceptions.

2. Object

- (1) What is the awareness of digestive organs in science high school students like?
- (2) How does the awareness of digestive organs change through student centered activities?

3. Methodology

1) Activity: Drawing Digestive Organs[5]

1st lesson: understanding of background knowledge of digestive organs (per person) - classification of misconceptions and perception types

2nd lesson: understanding digestive organs through group activity - supplement of wrong or incomplete knowledge through group discussions

Students actively communicate with each other.

3rd lesson: correction of data using biology related books (in groups) - data confirmation and correction
 4th lesson: Presentation of findings(in groups) - internalization through data preparation and presentation
 evaluation(individual) - analysis of how much concepts have taken root

II) Data Analysis

Data: initial test, subjects of discussion during group activities, interviews, handouts, final test

Subject of analysis: types of initial concepts, exploration of the change of each pattern, analysis of how much concepts have taken root

interview method: questions based on unclear responses or contents of submitted material

III) Subject

143 Students from H Science High School in Seoul

Period: August to October, 2005

4. Results

(1) Number of students with misconceptions

<Table 1> Number of students who were found to have misconceptions

Organ	mouth	esophagus	stomach	small intestine	Large intestine	liver, gall bladder	pancreas
No, of students	0	1	1	12	91	25	17

(total : 143)

It was found that 1 student had misunderstandings of the esophagus, 1 had that of the stomach, 12 had that of the small intestine, 91 had that of the large intestine, 25 had that of the liver and gall bladder, and 17 had that of the pancreas. It can be seen that there were especially misunderstandings of the large intestine, liver, and gall bladder.

(2) Types of Misconceptions shown on the initial test

I) esophagus: not shown - no connection between mouth and stomach

II) stomach: stomach located next to the esophagus like a lump

III) Small Intestine

- no idea (3 Students - 2%)

- no connection with other organs (5 Students - 3.4%)

- anus located at the end of the small intestine (3 Students - 2%)

- location of large and small intestine exchanged (1Students - below 1%)

IV) Large Intestine

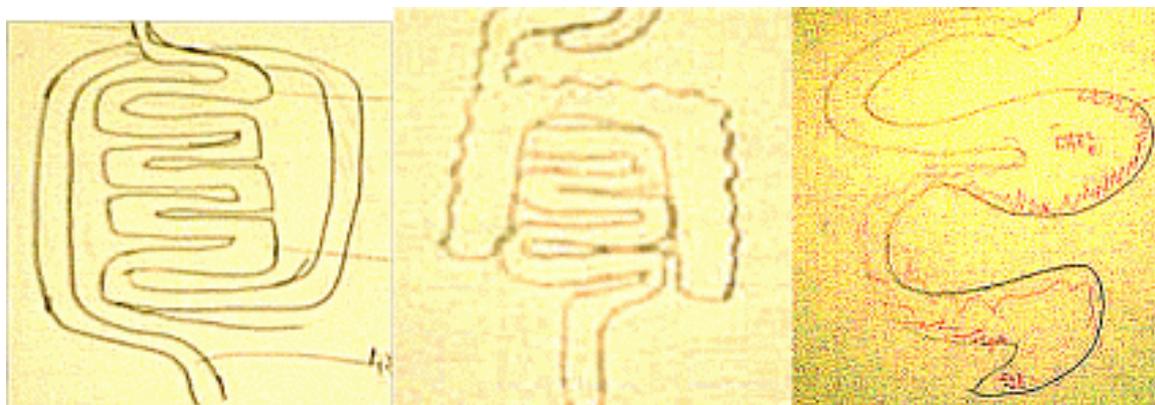


Fig 1. Various type of misconception about large intestine

<Cases where the large and small intestines are connected>

- Cases where the large and small intestines are accurately drawn but connected in a wrong place - 23 Students (16%)
- Cases where the large and small intestines are connected in a direct line- 37 Students (25.9%)
- <Cases where the large and small intestines are not connected>
- Cases where the large intestine is shown as a \cap around the small intestine - 10 Students (7%)
- Cases where the location or the connection between the two intestines are unclear - 10 Students (7%)
- <other>
- Cases where the small and the large intestine are placed right and left, the large intestine connected to the stomach, or not drawn at all - 4 Students(2.8%)
- V) Liver, gall bladder
 - liver and gall bladder not shown - 19 Students(13.3%)
 - others : confusion between gall bladder and pancreas, misplaced gall bladder - 6 Students(4%)
- VI) pancreas
 - no pancreas - 12 Students(8.4%)
 - others : confusion between the gall bladder and the pancreas, misplaced pancreas - 5Students(3.5%)

(3) Discussions made during group work in the 2nd class

I) mouth, esophagus

- the location and shape of the salivary glands
- are the teeth digestive organs?
- the thickness and length of the esophagus

II) Stomach

- what is the size and direction of the stomach?
- are there wrinkles on the stomach?

III) small intestine

- the function and thickness of the small intestine
- the boundary and connection of the small and the large intestine
- the arrangement of the small intestine - is the small intestine horizontally piled, or vertically piled?
- the location and function of the duodenum
- the arrangement of the large and the small intestine - is the small intestine on the left, and the large intestine on the right?

IV) Large Intestine

- is the large intestine a digestive organ?
- the location of the cecum
- the length and thickness of the large intestine
- which direction does the large intestine cover the small intestine? (clockwise/counterclockwise)

V) Liver, Gall Bladder, Pancreas

- is the liver a digestive organ?
- where are the liver, gall bladder, and the pancreas located?
- how big are the liver and the pancreas?
- where is bile released?
- which part of the duodenum are the pancreas, liver, and gall bladder connected to?

(4) Errors shown after confirmation through books, on the 3rd and 4th classes

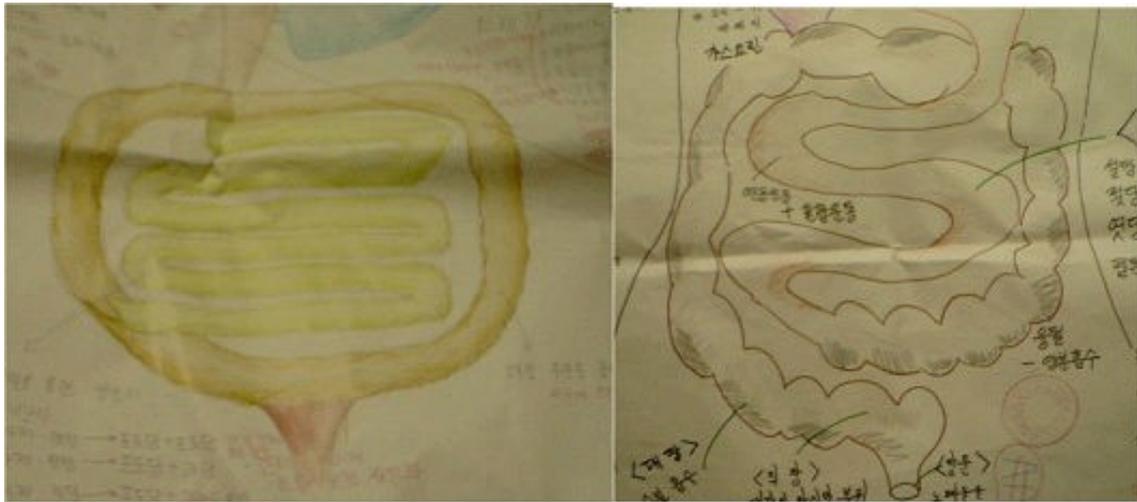


Fig 2. Errors shown after 3rd and 4th classes

directions of the large intestine

- counter-clockwise(5 groups -20 students)
- circle(1 group -3students)

* Realization of misconceptions through the instructor's indication

(5) Misconceptions shown on the progress test

In the final progress test, no misconceptions of the mouth, esophagus, stomach, liver, gall bladder, and pancreas were shown. However, there were a minority of students who did not have proper concepts of the small intestine, and many students believed that the large intestine covered the small intestine in a counterclockwise direction. It is easy to say that many students have misconceptions about the large intestine.

<Table 2> Misconceptions shown on the final progress test

Organ	Mouth	Esophagus	Stomach	Small Intestine	Large Intestine	liver, gall bladder	pancreas
No. of students with misconceptions	0	0	0	6	22	0	0

<small intestine>

Not connected to the large intestine or unclear : 5 Students
 could not draw digestive organs: 1 Student

<large intestine>

the direction in which the large intestine covers the small intestine
 counter clockwise : 10 Students.
 circle :10 Students
 misplaced the appendix : 2 Students

5. Conclusion

There were a diversity of students from nothing to remember to everything to know correctly about the digestive organs. Most students had known the characteristics of the large intestine incorrectly. This is probably because students relied just on their memory to learn, and never had a chance to draw and confirm. It is possible to say that most students were able to understand the correct structures and functions of digestive organs after students centered drawing activity. However, some students, even though they were told to draw the exact structure using books, produced drawings in which the large intestine was round or covering the small intestine in counter-clockwise direction-which shows that their misconceptions did not change.

6. References

- [1] Driver, R.(1983). The pupil as scientist? Milton Keynes: The Open University Press.
- [2] Ausubel, D. P.(1968). Educational psychology: cognitive view. New York: Holt, Reinhart, and Winston.
- [3] Oliver, W. H., Pettus, W. C. and Hedin, B. A.(1990). Three studies of factors affecting the attitudes of blacks and females toward the pursuit of science and science-related careers, *Journal of Research in Science Teaching*, 27(4), 289-314.
- [4] Hong J., Sim J.(2006), The Analysis of the Themes and Contents on the Activities in Text-book of Professional Development Program for Secondary Biology Teachers by Frameworks which is Centered on Manipulating Activity, *The Korean Journal of Biological Education*, 34(1).
- [5] Chung W., Lee K., Yu B., Hong J., Kim J.(2002). *highschool Biology I* , (co) Kyohaksa.