Picture representation of biology prospective teachers practical work based on gender

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Abstract. In practical work, biology prospective teachers often draw the picture which is resulted of their observation about object or phenomena. This study objectives is to describe picture representation of biology prospective teachers practical work on plants anatomy topic based on gender. The research method is a descriptive. The study involves 33 biology prospective teachers of one university in Bandung. The research instrument used rubric of picture assessment and guidance interview. The data were obtained and analyzed qualitatively. The results show that the picture representation of biology prospective teachers generally can be categorized as less category (52%). In five aspects of picture assessment, only completeness aspect of picture that can be categorized as sufficient category, the other aspects of picture can be categorized less. Completeness aspect is drawing the picture with complete information. The other aspects of picture involve authentic, details, proportional size, and the accuracy of picture. Based on gender, the results show that there are difference between male and female of their picture representation. Male can be categorized very less category, whereas female can be categorized less category in the picture representation.

1. Introduction

Learning science cannot be separated from the practical work, this is because the practical work has a very important role to improve learning outcomes. Practical work allows student to be able to understand a concept directly through observation, try, experiment so and do it improve their understanding of certain concepts [1]. In order practical work can takes place well, it students showed have good laboratory skills.

One important aspect of prospective teacher in practical work is observation. Observation is the ability to use the senses of sight, smell, hearing, taste, and touch to observe an object or phenomena, as well as using of relevant facts and adequate observations [2]. To obtain the relevant facts based on observations of objects or phenomena, it is necessary to have ability good representation. Representation ability is an ability form to be able to present, symbolize, or represent something in a special way [3]. Representation is illustration of the relationship between objects and symbols [4]. Representation serve as a tool to use by
individuals to organize and make the situations more meaningful [5]. Representation is ability which should have to be able to interpreting and applying concepts in solving the problems well [6].

Representation can be presented in a format such as verbal, picture, graphic, and mathematics [7]. In biology learning, there are many contains materials that are abstract and difficult to learn. The concepts of biology not only include words, sentences, descriptions, but also contains picture and other visual media [8]. Picture has an important role in facilitating student to understand scientific concepts [8]. Based on above statement, it is important to student have a good representation of picture in order to assist students in understanding the biology concepts. Biology is more preferred by female student than male student. This is consistent with the data in the field of biology prospective teacher at Indonesia University of Education in the last five years shows that the biology more demand by female students than male students.

This research will help lecturers to see the ability of male and female students in the picture representation of practical work so that will it improve practical work process to help students to construct their knowledge.

2. Method
This research method is descriptive. In this study, biology prospective teachers do practical work and observation about object or phenomena about plant anatomy topic. Students draw the picture was resulted of their observation and pictures collected. This study involves 33 biology prospective teacher at one university in Bandung. The data in this study were analyzed based on students' ability to draw the picture was resulted of their observation about objects or phenomena about plant anatomy topic. Plant anatomy topic were analyzed in this study includes the concept of meristem, the epidermis, and parenchyma tissue. The research instrument used the rubric of picture assessment and interview guidance. The rubric of picture assessment includes five aspects: (1) authentic aspect, is drawing the picture that can describe the observed object as the real object, (2) details aspect, is drawing the parts of picture, (3) proportional size aspect, is drawing with the suitable size of the object, (4) completeness aspect, is drawing the picture with complete information, and (5) the accuracy aspect, is drawing suitable concepts. Interview guidance were used to analyzed biology prospective teachers difficulties in drawing. The data were obtained and categorized to five categories based on category of picture that made by biology prospective teachers. Scores have been obtained in the form of a percentage will be interpreted into categories [9] are presented in Table 1.

Table 1. Categorization of biology prospective teachers picture representation.

| Percentage   | Category     |
|--------------|--------------|
| 86-100%      | Very Good    |
| 76-85%       | Good         |
| 60-75%       | Sufficient   |
| 55-59%       | Less         |
| ≤54%         | Very Less    |

3. Result and discussion
The results show that the picture representation of biology prospective teachers generally can be categorized to less category (52%). The percentage of the five aspects of picture assessment was presented in figure 1.
Figure 1. Distribution of the percentage picture representation on five aspects of picture assessment.

Figure 1 shows that the highest percentage is the completeness aspect (63%), meanwhile the lowest percentage was the accuracy aspect (45%). These results mean that biology prospective teachers easiest to draw the picture with complete information and be most difficult to draw the picture that accuracy aspect. Biology prospective teachers stated that they tend get difficult because less understanding of the concept being studied, that because plant anatomy is learning about the inside part structure of plant [10]. Because of that, the accuracy aspect of picture was lowest than the other aspects in biology prospective teachers pictures.

Based on gender, the results show that there are differences between male and female in their picture representation. Generally, male students nearly has lowest percentage than female students in all aspect except in accuracy aspect of picture representation. The percentage of the all five aspects of the picture assessment based on gender was presented in figure 2.

Figure 2. Distribution of the percentage of picture representation on five aspects assessment based on gender.

Figure 2 shows that male can be categorized very less category (50%), while female can be categorized less category (61%) in their picture representation. Female to draw better than male, however male excelled in the intellectual organization of space [11]. Female student prefer to draw plant (flowers),
animals, [12,13] nature, and physical appearance, meanwhile male tend to choose content such as sports, mechanical objects, and humour [11]. Plant anatomy directly consist of content which is preferred by female students so that they have picture representation better than male students.

Based on subject material, the result show that there are differences percentage of students picture representation. The percentage of the five aspects of the picture assessment based on subject material was presented in figure 3.

![Figure 3](image_url)

**Figure 3.** Distribution of the percentage of picture representation on five aspects assessment based on subject material.

Figure 3 shows the result based on subject material that generally, parenchyma tissue nearly for all categories is lowest except details aspect and meristem tissue for all categories is highest except details and accuracy aspect. Epidermis tissue is highest in details and accuracy aspect of biology prospective teachers picture. As stated before that biology prospective teachers tend get difficult for understanding plant anatomy topic so that may be on of the factor that affect the less of their picture representation, especially on parenchyma tissue. Students stated that they tend get difficult to draw the complex picture such as in parenchyma tissue topic. Based on the results of previous study, it’s known that biology student generally can’t understanding about plant tissue system and especially xylem well [14].

Based on gender for all three-subject material, the result show that there are differences percentage of students picture representation. The percentage distribution of picture representation was presented in figure 4.

![Figure 4](image_url)

**Figure 4.** Distribution of the percentage of picture representation for all three-subject material based on gender
Figure 4 shows that female tend to has the highest picture representation than male. Female students for all subject material get highest picture representation than male students. Based on interview, biology prospective teachers stated that they are get difficult to draw an object if the concept studied was complicated. In classroom, there are differences between male and female such as laboratory equipment, male tend to use laboratory equipment while female usually recording data or reading the instruction in laboratory groups [15]. There are differences motivation between female and male students, female students tend to have the highest motivation than male [16]. Female tend to engaging in academic material, attentive in class, exerting more to academic effort, and more participation in the classroom than male [17]. Because that, so female students has the highest picture representation than male students.

4. Conclusion
Based on the research findings, it is found that the picture representation of biology student generally can be categorized less category. In five aspects of picture assessment, only completeness aspect of picture that can be categorized sufficient category, the other aspects of picture can be categorized less. Based on gender, the results show that there are difference between male and female of their picture representation. Male can be categorized very less category, whereas female can be categorized less category in the picture representation. In this study, biology prospective teachers tend difficult to draw complex picture that was parenchyma tissue. The level of complex picture in this study for three-subject material that was difficult to draw by students sequentially were parenchyma, epidermis, and the last meristem tissue.

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References
[1] Duda 2010 Vox Edukasi 1 2 29-39
[2] Rustaman N 2007 Keterampilan Proses Sains (Direktori File Universitas Pendidikan Indonesia)
[3] Goldin G A 1998 Journal of Mathematical Behavior 17 2 137-165
[4] Hwang et.al. 2007 Educational Technology & Society Journal 10 2 191-212
[5] Kaput J 1998 Journal of Mathematical Behaviour 17 2 256-281
[6] Kohl B P and Noah F D 2005 Physical Review Special Topics-Physics Educations Research 1 010104
[7] Prain V and Waldrip 2008 Canadian Journal of Science, Mathematics, and Technology Education 8 1 5-24
[8] Cheng M and Gilbert J 2015 International Journal of Science Education 37 1 136-161
[9] Purwanto 2009 Prinsip-Prinsip dan Teknik Evaluasi Pengajaran (Bandung: Remaja Rosdakarya)
[10] Murti S, Muhibuddin and Numrialiah C 2014 Jurnal Biologi Edukasi 6 1 1-8
[11] Oluwemi A M 2010 Gender and Behaviour 8 2 3168-3198
[12] Iijima M, Arisaka O, Minamoto F and Arai Y 2001 Hormones and Behaviour 40 99-104
[13] Turgeon, S M 2008 Personality and Individual Differences 45 527-532
[14] Suprapto P K 2012 Disertasi (Bandung: Universitas Pendidikan Indonesia)
[15] Tobin K 2015 Handbooke Pengajaran dan Pembelajaran Sains (Bandung: Nusa Media)
[16] Duckworth AL and Seligman MEP 2006 Journal of Educational Psychology 98 1 198-208
[17] Slavin R E 2008 Psikologi Pendidikan: Teori dan Praktik (Jakarta: PT Indeks)