

CHAPTER I

INTRODUCTION

1.1. Background

The development of the era demands a change in almost all areas, with no exception in education. Changes in the field of education not only occur due to the demands of the times but also due to the weaknesses and problems in implementing it. The demands of the times caused a huge change in way of teaching and learning, especially in understanding Biology. Tremendous development of technology became useful aids and tools for better understanding in Biology. However, despite its rapid development, the quality of Indonesian student's education is still unsatisfactory, considering the result of *Trends in International Mathematics and Science Study* (TIMSS) and *Programme International for Student Assessment* (PISA) in 2015 which placed Indonesia's science education respectively in rank 45 and 62 out of 48 and 72 countries participated (OECD, 2016).

Interesting fact was, despite low performance in science, student's engagement in learning science was quite good especially in girls (OECD, 2016). One possible cause might be the effect of engaging learning environment such as learning supported by the use of visual media. Visual media in teaching and learning Biology itself served as useful aid to explain biological phenomenon and processes which could not be seen by eyes. Other than positively affecting cognitive knowledge, several studies was supported the idea of visual media improve student engagement, depend on its content and the way it delivered (Hunt

et al., 2016; Meo *et al.*, 2013; Zepke & Leach, 2010), and the activity in which the students are involved (Shernoff & Csikszentmihalyi, 2009).

Visual literacy competencies are essential for 21st century learners and must be supported across the higher education curriculum (Lowe, 2000). Visual literacy could define as ability of students both to *interpret* visual representations that are provided by instructors and also to *create* visual representations on their own (Schönborn & Anderson, 2010). Visually literate scholars usually have a good visual memory and strong intuitive-associative thinking, which both useful in understanding visual messages (Alkali & Hamburger, 2004). As for teacher, the ability to master representation is an important factor in teaching biological material because it will be able to convey complex material in a simpler way (Mulyani, 2017).

Prensky (2001) defined people this day as digital natives or in specific scope of education means students live in a visually rich, screen-based world. They regularly encounter and create meaning and knowledge of Biology through images and visual media. However, living in image-rich world does not mean students naturally possessed naturally sophisticated visual literacy. Considine *et al.* (2009) indicate that these students are lack the critical engagement with media to allow them to have ability to “interrogate media texts along with the context in which they are both created and consumed”.

Lowe (2000) argued that compared to science literacy which now gravely concerned, visual literacy somehow neglected by teacher. Part of the reason is that teachers generally assume that pictures are self-explanatory and always function to make their subject matter easier. Unfortunately, comprehension of the

specialized pictures used in technical fields requires knowledge and skills far beyond those required for everyday pictures. Another research by Barger (2016) found out in classroom, visual approaches to learning are encouraged, but no class time is spent developing the skills needed to engage in visual learning.

Studies on visual literacy have been done in recent years especially on undergraduate student. Brumberger (2011) examining student interpretation of visual material refutes the argument that students have any particular skill in visual literacy. Her study demonstrates that so called digital natives students are, in fact, not particularly adept at visual communication, and that they need to be taught how to interpret visual images. Bell (2013) tested Introductory Biology Courses students if there were any significant differences on the visual literacy learning outcomes of students who used digital activities on a computer and who used traditional drawing activities for learning. He discovered no other significant differences in learning outcomes between the two groups and drawing by hand was more beneficial for learning biological images. Research by Fibriana *et al.* (2017) using Picture and Picture model was performed on undergraduate students while learning genetic transfer in Microbiology course. Preliminary result before treatment showed students have poor visual literacy where they exhibited the evidence of visualization difficulties that affect their ability to interpret and learn from picture presented. Difficulty in interpreting visual cues and symbolism, integrating knowledge as well as expressing knowledge visually also experienced by Molecular Biology Students in explaining amino acids structure (Mnguni, 2016). Furthermore, research on biology teacher candidates in the mastering

visual representation in a phanerogamae botanical course was relatively low (Mulyani, 2017).

Considering the situation in undergraduate students, improvement in visual literacy skills in high school is necessary. While visual literacy research started to be encouraged in undergraduate, same research in high school especially in Biology lesson in Indonesia somehow rare. Major researches mainly are focus on science literacy. Although ability of reading graph, diagram etc. are mention in science literacy component, a depth research focusing mainly on visual literacy of students in learning Biology is needed, because many concepts in Biology were abstract and could only explained in visual forms.

While talking about visual literacy one always could relate it to prior knowledge (Whitacre & Saul, 2016). Prior knowledge construct by many ways. It could be formed by study skills or patterns of effort and techniques used by students outside of class to learn course material and prepare for exams (Schutte, 2013; Husmann *et al.*, 2015; McGuire 2015). Students with good study skills actively involve in their own learning process, plan and monitor the task they are focusing on, their own study attitudes and the task and the study attitudes fits together (Zimmerman & Martinez-Pons, 1986). Therefore, student's study skills could promote student's academic performance (Quinco-Cadosales, 2013).

Since student's prior knowledge might affect student's understanding of biological images (Dwyer, 1972), some misconception might occur due differences in interpretation of images. Many studies have been reporting students various misconceptions about Cell Biology (Lewis *et al.*, 2000; Clark & Mathis, 2000; Atilboz, 2004; Kruger *et al.*, 2006; Saka *et al.*, 2006; Gropengieber, 2008).

Cell Biology is one of the most important areas in Biology and understanding the structure and functioning of Cells is basic to all level Biology studies. Understanding the basic Concepts of Cell Biology is essential for the efficient scientific literacy of citizens in the modern world (Venville *et al.*, 2005). Therefore improving student's visual literacy especially about Cell topics is essential for student before continue to more advance topic.

Student prior knowledge also could be formed by different learning styles and different media exposure they achieved, which in turn affects the social constructions of knowledge (Prensky, 2001). The educational world is acknowledging the importance of understanding the student's different learning style preferences and their role in attaining academic success (Williamson & Watson, 2007; Sternberg *et al.*, 2008). Some researches showed some teachers do not understand their students learning preference or students do not even understand their own learning styles (Taiyeb & Nurul, 2015; Nurlia *et al.*, 2017; Bire *et al.*, 2014). This situation might be resulting teacher centered classroom learning. Understanding the learning styles is important to the teachers so they will be able to effectively engage in transferring knowledge and skills. Understanding learning styles make students able to control internal and external stimuli, thereby could motivate students, improve attitude and can strengthen the meaningfulness of what they learn (Bostrom & Lassen, 2006; Sarabdeen, 2013).

Apparently, both student's study skills and learning style are related to their gender and learning outcome (Ozsoy *et al.*, 2009). In some researches revealed that female students are more successful academically than male students and they have better study skills (Hong & Lee, 2000; Houtte, 2004; Tinklin,

2003). In some biology related education major, such as medicine, pharmacy, dentistry, health service management and nursing, as individual, female students preferred using aural learning style, while male students preferred using kinesthetic learning style (Sarabi-Asiabar *et al.*, 2015). But, as a whole, the most preferred learning styles in both male and female was multi-model learning style (James *et al.*, 2011; Murphy *et al.*, 2004; Slater *et al.*, 2007; Dobson, 2010).

According to all explanations, to improve Biology learning quality, it is necessary to carry out research on student's visual literacy, learning styles, study skills in high school. The research was also necessary because it consistent with preliminary research in Al-Azhar Medan highschool. The result showed that some students find it hard to understand some of biological images, especially related to biological process. Further, measurement of student's learning styles and study skill were never done formally by school, although some teacher asked verbally to students some of its component. Also result of brief interview with teacher and students showed some students seem does not have regular habit in studying biology, reviewing material only if test due date was close, might be one of the cause of students find it hard to understand some biology topics. Student's visual literacies skills also never measure by school formally. Student's visual literacies skills especially in cell organelle and cell transport topics in particular, never done by teacher, although some questions related this matter asked by teacher in their test. For all those reasons, therefore, it is necessary to perform the research regarding this matter.

1.2. Problem Identification

1. Despite tremendous development technology in learning, the quality of science education still unsatisfactory
2. The low capability of students interpreting representative visual image related Biology
3. Misconception might occur due to differences in interpretation of images.
4. Research focusing student's visual literacy skills in learning Biology in high school is rare
5. Visual literacy skills barely recognize and taught in learning, because some teacher thought images are self-explanatory
6. Some teachers do not understand their students learning preferences and barely applied it in learning

1.3. Problem Limitations

1. student's visual literacy skills that would be measured is about cellular biology topic, particularly about cell organelles and cell transport system
2. Student's visual literacy skills would be measured according to The Visualization Blooming Tool by Arneson and Offerdahl (2018)
3. Student's learning styles would be measured according to Flemming's VARK theory of learning styles
4. Gender in this research was student's sex as in male and female

1.4. Research Questions

1. Is there any significant relationship between student's learning styles and student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool

2. Is there any significant relationship between student's study skills and student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
3. How many contribution student's learning styles gave to student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
4. How many contribution student's study skills gave to student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
5. How many contribution student's learning styles and student's study skills gave to student's visual literacy skills in learning cellular biology topic of Al-Azhar Medan Highschool
6. Is there any significant difference between male and female students in visual literacy skills
7. Is there any significant difference between male and female students in learning styles
8. Is there any significant difference between male and female students in study skills

1.5. Research Objectives

1. To find out if there is any significant relationship student's learning styles and student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool

2. To find out if there is any significant relationship between student's study skills and student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
3. To find out the contribution of student's learning styles to student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
4. To find out the contribution of student's study skills to student's visual literacy skills in learning cellular biology topic in Al-Azhar Medan Highschool
5. To find out the contribution of student's learning styles and student's study skills to student's visual literacy skills in learning cellular biology topic of Al-Azhar Medan Highschool
6. To find out if there is any significant differences of male and female in visual literacy skills
7. To find out if there is any significant differences of male and female in learning styles
8. To find out if there is any significant differences of male and female in study skills

1.6. Research Significant

Theoretically this research is benefit to

1. Indonesia's education, by improving the quality of Biology learning
2. As reference source to get the idea of visual literacy, learning styles and study skills
3. Enrich the knowledge related to visual literacy, learning style and study skills

Practically this research is benefit to:

1. Biology teachers, to find help them find solution in improving student's visual literacy and to help them whether have to consider gender difference in picking out the best method in learning
2. Researchers, as source of information and considering matter if they want to further research related to visual literacy.