Analysis of Science Motivation Based on Learning of Conventional, Realistic and Hybrid Image In Chemistry

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Abstract. Learning outcomes are a description of the development of student knowledge starting from the learning process to the end of the education program when students graduate. This study aims to analyse the differences in student scientific motivation from the aspects of self-efficacy, responsibility and student curiosity in learning chemistry (used a conventional, realistic and hybrid image). The sample of this research was 100 students from high school were surveyed in the Pekanbaru. This study used a science motivation questionnaire with variables of self-efficacy, responsibility and anxiety. The research data were analysed using SPSS by looking at the frequency with which students answered each item of questioner. The results showed that students had high motivation from the self-efficacy aspect. Students also have a sense of responsibility to learn well in the teaching and learning process. And have a high sense of anxiety.

1. Introduction
Chemistry learning is an important starting point in developing a conceptual understanding and forming a positive image of chemistry. Developing conceptual understanding according to scientific consensus is one of the important goals in studying science [14]. Unfortunately, chemistry learning strategies have not adopted much of the progress of chemistry education research [13]. Learning that is verbalism, algorithmic, and marshals of evident is still predominantly carried out which contributes to the low understanding of chemical concepts. Techniques for organizing knowledge in the mind, and the existence of knowledge are essential for the formation of new knowledge.

Motivation has a very important role in the learning process. Without motivation, it is impossible for students to have a desire to learn. A change in motivation in the learning process will also change the form, shape and learning outcomes. Motivation can be increased by creating a friendly learning atmosphere so students get an excitement to study or get what their needs. This is accordance to the opinion of [4], learning motivation is a mental strength that encourages the learning process. Students’ motivation to learn can be weak. Lack of motivation to learn will debilitate learning activities.

Teachers need to change the way of teaching and learning in order to attract students to understand and achieve an established standard of thinking skills. [12] Suggested that students’ willingness to accept change must be taken into account because student readiness is a driving force for implementing change effectively. The effectiveness of changes in education plays an important role in achieving a goal. A new paradigm in science learning including chemistry learning where students are not only required to learn more about the concepts and principles of science verbally, memorize, introduce formulas, and recognize terms through a series of verbal exercises, but students also provide more experience for students to better understand and guide students to use their thinking and be able to apply their chemical knowledge in their daily life [6].
In science and science education, visualization has a significant role. In science education, visualization or more precisely visual representation is a visual sign that is static and dynamic [3] that provides scientific understanding and knowledge transfer [5]. In this study, textbook images as a type of ER (external visual representation) are of particular concern. [2] Have defined images as "important vehicles for the transmission of (transformative) information." Some examples of images that are divided into three groups in this study. There are a conventional images, realistic images and hybrid images as in the following figure 1,2, and 3.

![Realistic images of tyndal effect](image1.png)

**Figure 1.** Realistic images of tyndal effect

![Conventional images of acid base](image2.png)

**Figure 2.** Conventional images of acid base

![Hybrid images of chemical reactions](image3.png)

**Figure 3.** Hybrid images of chemical reactions

Several studies suggest that applying a new learning model will motivate students to learn chemistry. Motivation to learn chemistry can affect student learning outcomes of chemistry. [1] stated that students’ motivation to learn chemistry can affect students’ chemistry learning outcomes. [8] stated too that learning motivation has a great influence on science learning.

Motivation is perceived as an internal state and can be recognized as a psychological process determining the intensity, direction, and persistence of learning-related behavior. Hopefully, students motivated for chemistry and related topics were more likely to show career aspirations in STEM (Science, Technology, Engineering and, Mathematics) as a plausible study choice and follow up career [11].
Several studies that have been carried out have formulated the concepts of motivation in students when participating in learning. [10] Describe a further structuring of external motivation, including external regulation, introjection, and integration. In education, motivation most of the time cannot be answered from the context of education and activity which that leads to the concept of situational motivation as motivation towards specific activities where students are involved 'here and now' [7]. The Situation of motivation Scale consisting of four subscales-intrinsic motivations, identified regulation, external regulation, and motivation were was developed by [7]. [7] Also concluded that situational motivation is related to academic activities related to general motivational orientation in the school context.

This study aim to analyzing the level of student science motivation from the aspects of self-efficacy, responsibility and student anxiety from learning based on understanding Chemistry images in books text

2. Methodology
This study used a structured survey approach involving high school students in Pekanbaru using a science motivation questionnaire of students based on learning of conventional, realistic and hybrid images of chemical topics. The sample of this research is 100 person of high school students in Pekanbaru.

The strength of a study lies in the research instrument and the method of collecting research data. This research instrument uses comprehension questions prepared by the researcher and questionnaire item that have been adapted from scientific motivation research [9]. The student's science motivation instrument is as follows in table 1.

| Item          | Number of items |
|---------------|-----------------|
| Responsibility (RE) | 5 items         |
| Self-efficacy (SE)   | 5 items         |
| Anxiety (AN)         | 5 items         |

Data analysis was made based on the students' science motivation sub-variables (responsibility, self-efficacy and anxiety). The data obtained through questions of understanding then the researcher makes the respondent's answer in the form of scoring. In this study, researchers analyzed the data by looking the descriptive results in the form of averages and standard deviations.

3. Result And Discussion

3.1. Responsibilities
Motivation from the aspect of student responsibility is designed to see the level of student motivation related to chemistry learning which can provide a sense of responsibility for learning chemistry properly which is carried out while participating in chemistry learning in schools. The items in this variable were 5 question items that were stated to the students. Analysis of the level of student science motivation in the aspect of personal motivation relevance is explained by looking at the mean and standard deviation of the analysis results. The results of the analysis can be seen in table 2

| No | Item                                                                 | Mean | SD  |
|----|----------------------------------------------------------------------|------|-----|
| 1  | If I am having trouble learning chemistry, I try to figure out why | 4.24 | .664|
| 2  | I put enough effort into learning chemistry                         | 4.47 | .637|
| 3  | I use strategies that ensure I learn chemistry well                 | 4.03 | .768|
It is my fault if I do not understand the chemistry ideas.

I prepare well for the chemistry assessments (both internal and external)

| No | Item                                                                 | Mean | SD  |
|----|----------------------------------------------------------------------|------|-----|
| 4  | It is my fault if I do not understand the chemistry ideas.           | 3.81 | .848|
| 5  | I prepare well for the chemistry assessments (both internal and external) | 4.23 | .697|
|    | Total                                                                | 4.1544 | .48775|

Based on the results of the analysis, it shows that students' perceptions of motivation related to responsibility in chemistry learning with the item stating that students are trying to understand learning well are at the highest mean, namely 4.47 with a standard deviation of 0.637. relates to student personality with a mean of 4.15 with a standard deviation of 0.486, this shows that the level of student motivation is at a high stage.

3.2 Self-Efficacies

Motivation from the self-efficacy aspect of students is designed to see the level of motivation in learning chemistry which can give a sense of wanting to produce something from learning chemistry properly which is carried out while participating in chemistry learning in schools. The items in this variable were 5 question items that were stated to the students. Analysis of the level of student motivation in the aspect of motivation to succeed is explained by looking at the average and standard deviation of the results of the analysis. The results of the analysis can be seen in table 3.

| No | Item                                                                 | Mean | SD  |
|----|----------------------------------------------------------------------|------|-----|
| 1  | I expect to do as well as or better than other students in chemistry course. | 3.97 | .716|
| 2  | I am confident I will do well on the written and practical chemistry assessments | 3.86 | .711|
| 3  | I believe I can master the knowledge and skills in the chemistry course | 3.85 | .718|
| 4  | I am confident I will do well in the chemistry assessments | 3.81 | .735|
| 5  | I believe I can earn ‘excellence’ grades in the chemistry course. | 3.89 | .734|
|    | Total                                                                | 3.8759 | .55958|

Based on the results of the analysis, it shows that the students' perceptions of motivation related to wanting to succeed in chemistry lessons with the item stating that my students are trying to do better than other students in learning chemistry is at the highest mean, namely 3.97 with a standard deviation of 0.716. There is also the total student perception of motivation which is related to the wish to succeed students with a mean of 3.87 with a standard deviation of 0.559, this indicates that the level of student motivation is at a high stage.

3.3 Anxieties

Motivation from the aspect of student curiosity is designed to see the level of motivation in learning chemistry which can provide a sense of curiosity from learning chemistry properly which is carried out while attending chemistry lessons at school. The items in this variable were 5 question items that were stated to the students. Analysis of the level of student motivation in the aspect of curiosity motivation is explained by looking at the average and standard deviation of the results of the analysis. The analysis results can be seen in table 4.
Table 4. Motivation science of Anxiety

| No | Item                                                                 | Mean | SD   |
|----|----------------------------------------------------------------------|------|------|
| 1  | I am nervous about how I will do in chemistry assessments.           | 3.43 | .901 |
| 2  | I become anxious when it is time to sit a chemistry assessment       | 3.56 | .859 |
| 3  | I worry about failing chemistry assessments                          | 4.27 | .674 |
| 4  | I am concerned that the other students are better in chemistry.     | 3.66 | 1.073|
| 5  | I hate taking chemistry assessments                                  | 2.15 | .802 |
|    | Total                                                                | 3.4127 | .51075|

Based on the results of the analysis, it shows that students’ perceptions of motivation related to curiosity to success in chemistry lessons with the item stating that students are worried about failing in chemistry assessments are at the highest mean, namely 4.27 with a standard deviation of 0.674. There is also a total student perception of motivation which is related to student curiosity with a mean of 3.41 with a standard deviation of 0.511, this indicates that the level of student motivation is at a high stage.

4. Conclusion

In this study, learning based on images in chemistry textbooks is divided into three contexts, namely conventional, realistic and hybrid images which provide good motivation for learning. The motivation analysed in this study is motivation from the aspect of students’ sense of responsibility when participating in learning, self-efficacy and curiosity. The results of the analysis showed that the students’ motivation from the three sub-variables analysed showed high motivation. The average shows that the student wants to be successful in learning chemistry. Therefore, the teacher should vary the learning with something creative so that students will be more motivated in every learning class.

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