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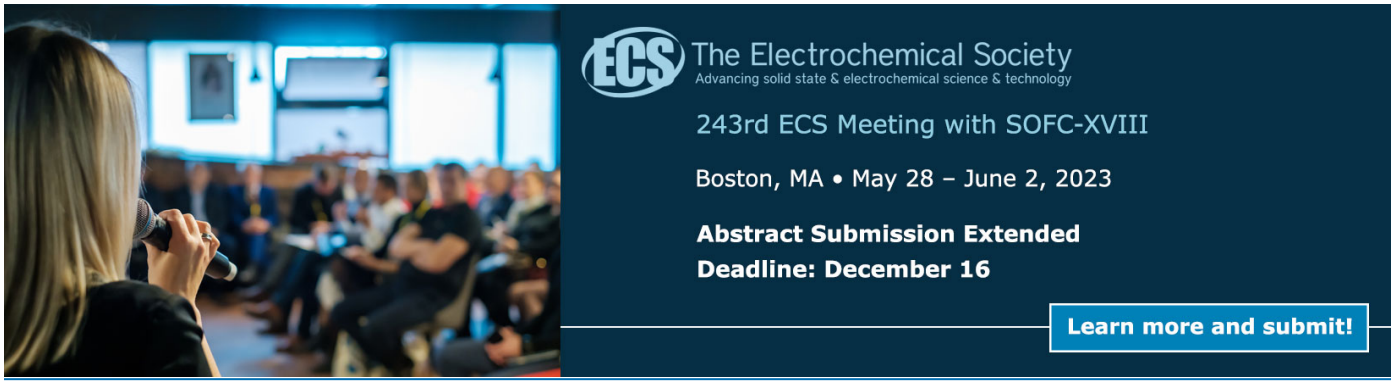

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Profile of misconception in particulate level of acid basic subjects

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Abstract. The misconception is a mistake in building conceptions based on accepted theory. Undetected misconceptions can prevent students from understanding concepts at the next level. This study aimed to determine the profile of misconceptions experienced by the participants did at level particulate on acid-base material. Students' misconceptions are detected by using the *three-tier multiple-choice test* and interview questions. This type of research is quantitative descriptive with the subjects trying 230 students of science class grade 2. The study was conducted at SMA Pangudi Luhur Don Bosko Semarang, SMA Negeri 1 Ungaran, and SMA Negeri 2 Demak. The results showed the general misconception in the acid-base material is 40% in SMA Negeri 1 Ungaran, 43% in SMA Negeri 2 Demak, and 43% in SMA Pangudi Luhur Don Bosko Semarang. Positive misconceptions in SMA Negeri 1 Ungaran, SMA Negeri 2 Demak, and SMA Pangudi Luhur Don Bosko Semarang are respectively 10%, 8%, and 12%. Negative misconceptions in SMA Negeri 1 Ungaran, SMA Negeri 2 Demak, and SMA Pangudi Luhur Don Bosko Semarang are respectively 9%, 2%, and 6%. High-level misconceptions in SMA Negeri 1 Ungaran, SMA Negeri 2 Demak, and SMA Pangudi Luhur Don Bosko Semarang are respectively 24%, 30%, and 25%. The misconception profile of students at the particulate level in Acid-base learning in SMA Negeri 1 Ungaran, SMA Negeri 2 Demak, and SMA Pangudi Luhur Don Bosko Semarang were 39%, 48%, and 56% respectively. Based on the results of the analysis of research data it can be concluded that there are misconceptions about acid-base strength, the concept of pH, and the calculation of pH. This is because the item uses levels of evaluation and analysis at the particulate level.

1. Introduction

Chemistry is one of the groups of Natural Sciences that studies the composition, structure, nature, and changes of matter relating to natural phenomena and includes facts, concepts, principles, laws, and processes of discovery. Chemistry contains many concepts that are abstract and difficult to imagine by students. A comprehensive understanding of concepts in Chemistry becomes very important so that students do not interpret their concepts that are difficult following the preconceptions they have [1]. The pre-owned concept of learners clicking the Chemical concept is a factor that has a significant influence on the emergence of misconceptions of learners. The misconception is experienced by students when students have an understanding of concepts that are not by existing scientific explanations [2].

Misconception can be caused by conditions that include pre-concept learners' wrong, wrong intuition of the learner to the concept, the concept described *reasoning* of incomplete causing the reasoning to be one and the low-level thinking skills of learners. The emergence of misconceptions in students shows

the ability of students to connect their knowledge in 3 levels of representation, namelymacroscopic, microscopic, and symbolic. Giving knowledge at three levels of representation simultaneously can make students increasingly experience misconceptions [3]. Explanation of concepts in a macroscopic and symbolic manner without paying attention to microscopy can also make students become misconceptions. Explanation of the concept of Chemistry must be progressive, coherent, preceded by observations macroscopically, then explained more microscopically, then clarified visually and symbolically [4].

Misconception at the particulate level becomes very crucial to discuss because it will affect students' understanding at the next level. This is because understanding at the particulate level that tends to be left behind can cause students to experience difficulties in developing understanding concepts and can also lead to misconceptions [5]. The conceptual error that occurs in students comes from the inability of students to visualize structures and processes at the microscopic level [2].

Chemical material one of them is a sour base is one material that tends to be difficult for students to understand. It is because the topic of acid-base is a solid material that is conceptually and in need of understanding must be integrated with many introductory concepts such as chemical formulas, stoichiometry, equilibrium, chemical bonds and others [6]. The abstractness of acid-base solder can be reduced by explaining the particulate level. Explanation of the particulate level is needed to minimize the conceptual errors experienced by students. Based on this description and some of the results of the research that supports it, it is expected that students' misconceptions at the particulate level for acid-base material can be detected as early as possible.

2. Methods

The purpose of this study was to determine how the profile of student misconceptions at the level of particulate acidic material through the *blended learning* model. The research conducted is *descriptive quantitative*. The research was carried out in the Sublime High School of Don Bosko Semarang, Ungaran High School 1, and SMA Negeri 2 Demak in the academic year 2018/2019.

The instruments used in this study were *three-tier multiple-choice* diagnostic test questions, questionnaire sheets, and interview sheets. Diagnostic tests are used to detect students' misconceptions with questions at the first level, reasons at the second level, and beliefs at the third level. The interview interface is used to determine students' understanding of the material. The diagnostic test questions are calculated for reliability using the *Kuder Richardson* 21 formula (KR-21) and its validity using the product-moment formula. The instrument used was validated by the expert team to determine the feasibility of the instruments used. Data and research results obtained from the qualitative and interview questionnaire is used to help interpret the quantitative data and research results of the *three-tier* diagnostic test question *multiple choice.*

Classification understanding concept on detection instrument for student misconception modified to be eight classification interpretation of understanding concept [7] as shown in table 1:

Table 1. Classification of conceptual understanding interpretations.

Possible Student Combination Answers			
Level 1	Level 2	Level 3	Category
Right	Right	Sure	Understand the concept
Right	Right	Not sure	Understand the Concept of Confidence or Chancy
Right	Wrong	Not sure	Don't know the concept
Wrong	Right	Not sure	Don't know the concept
Wrong	Wrong	Not sure	Don't know the concept
Wrong	Right	Sure	Negative Misconceptions
Right	Wrong	Sure	Positive Misconceptions
Wrong	Wrong	Sure	Misconception

3. Results and discussion

The profile of students' understanding is measured using a combination of answers contained in the question. The profile of students ' overall understanding is divided into (1) understanding the concept, (2) positive misconceptions, (3) negative misceptions, (4) high level of misception, (5) luck or lack of confidence, (6) not understanding the concept. The percentage of classical misconception is a combination of positive misconceptions, negative misconceptions, and high misconceptions. The results of the research conducted at 3 different schools showed that the highest classical misconceptions at SMA Pangudi Luhur Don Bosko Semarang and SMA Negeri 1 Ungaran were in the microscopic representation of particulate levels while in the SMA Negeri 2 Demak showed classical misconceptions high in macroscopic representation. The overall misconception profile and SMA Pangudi Luhur Don Bosko Semarang, SMA Negeri 1 Ungaran, and SMA Negeri 2 Demak can be seen in Figure 1.

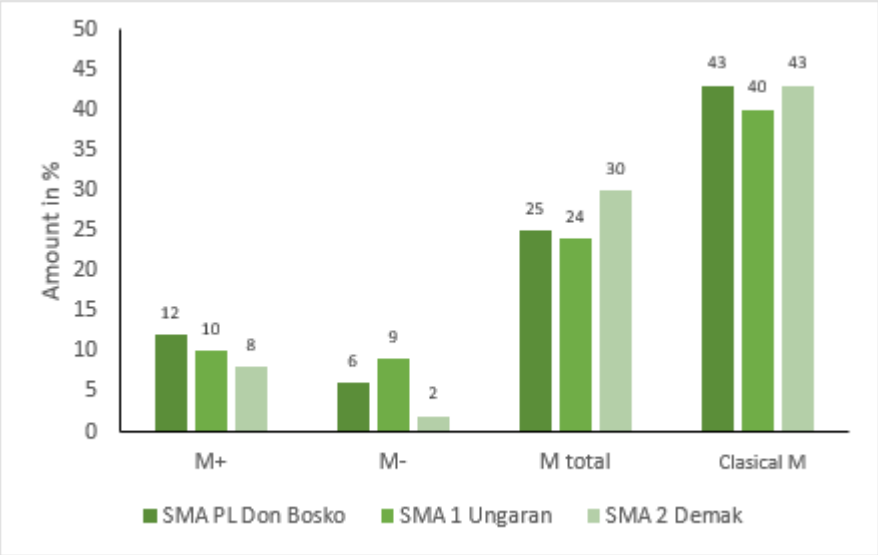

Figure 1. Overall misconception profile chart.

The percentage of classical misconceptions in students at SMA Pangudi Luhur Don Bosko Semarang as a whole is 43%. A percentage of classical misconceptions with details of 12% positive misconceptions, 6% negative misconceptions, and 25% high-level misconceptions. SMA Pangudi Luhur Don Bosko Semarang shows the highest percentage of classical misconception in microscopic representation, which is 56% while symbolic representation is 53%, and macroscopic representation is 19%. The microscopic representation which has the highest percentage has details of 26% in positive misconception, 5% of negative misconception, and 25% of high misconception. The classical misconception profile of each representation at SMA Pangudi Luhur Don Bosko Semarang compared to SMA N 1 Ungaran and SMA N 2 Demak can be seen in Figure 2.

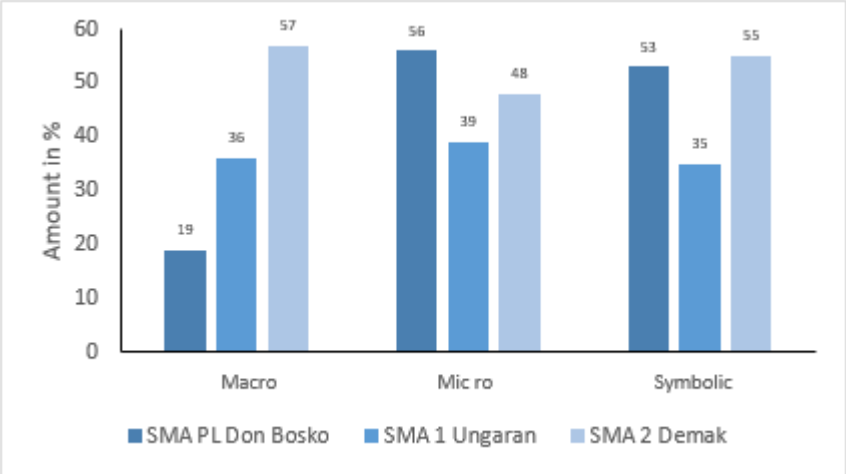

Figure 2. Classical misconception profile diagram on multi-representation.

The percentage of classical misconceptions in students in SMA N 2 Demak as a whole is 40 %. A percentage of classical misconceptions with details of 8 % positive misconceptions, 2% negative misconceptions, and 30 % high-level misconceptions. SMA Negeri 2 Demak shows the percentage of classical perceptions of the representations that are microscopic is 48%, while symbolic representations are 55 %, and macroscopic representations is 57%. The microscopic representation that has the highest percentage has details of 24% on positive misconceptions, 9% negative misconceptions, and 24 % high-level misconceptions.

The percentage of classical misconceptions in students in SMA N 1 Ungaran as a whole is 43%. A percentage of classical misconceptions with details of 10% positive misconceptions, 9% negative misconceptions, and 24 % high-level misconceptions. SMA N 1 Ungaran showed the highest percentage of misconceptions classical microscopic representation 39%, meanwhile symbolic representation of 35%, and macroscopic representation 36%. The microscopic representation which has the highest percentage has details, namely 8.5% on positive misconceptions, 7.5% negative misconceptions, and 37% high level misconceptions. The highest misconception is that multiple representations in each school are different. SMA Pangudi Luhur Don Bosko Semarang and SMA Negeri 1 Ungaran show that the highest classical misconception is on microscopic representation. Demak High School 2 shows that the highest classical misconception is in the macroscopic representation. The profile of misconceptions at the particulate level in each school can be seen in Figure 3.

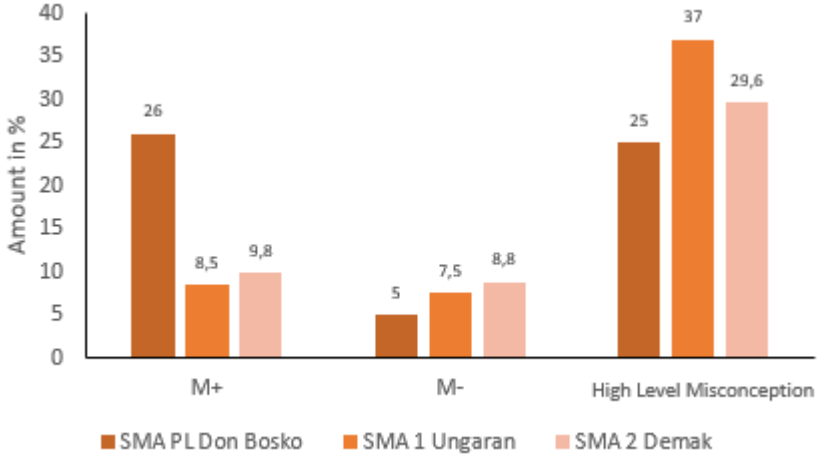

Figure 3. Misconception profile diagram at particulate levels.

Learners experience misconceptions in microscopic representation at the particulate level. Learners experience a misunderstanding of the concept of pH, strength of the acid-base, equilibrium of acid-base ionization. students experience errors when calculating the pH value of acid solutions that have a very small concentration. Students do not realize that acid can't have a pH of 8. This happens because students only work on the problem by using it for strong acids but do not consider the presence of water molecules in the solution. Errors in understanding students also occur in the concept that strong acids and strong bases in the liquid phase can be perfectly ionizing, whereas the ones that can perfect ionizing are strong acids and strong bases in the solution phase.

Students do not understand that the easier an acid or base solution is to ionize the stronger the acid or base. Understanding errors occur because students have an understanding that the strength of acids and bases is only influenced by pH values. This also makes students experience misconceptions regarding the concept of pH. There are still students who think that stomach acid with pH 3 is stronger than gastric acid with a pH of 1.5. This wrong understanding can be caused because students have an understanding of the concepts of acidic and basic pH mixed.

Students in SMA Negeri 2 Demak experience the most misconceptions in macroscopic representation. Misconceptions on the macroscopic representation experienced are related to analyzing experimental results regarding the concept of pH using pH routes. Students do not even understand how to find the pH range by using a pH route from several acid-base indicators. This is what underlies the misunderstanding of students regarding the concept of pH relating to pH routes and acid-base indicators.

Errors in understanding microscopic representations show that students have incomplete understanding up to the particulate level. Understanding of students at the particulate level that is not intact can cause students difficulties in developing conceptual understanding and can cause errors at the macroscopic and symbolic level of representation. This is consistent with the results of research [2] which reveal that many conceptual errors that occur in clams originate from the inability of students to visualize structures and processes at the microscopic level. Understood incomplete at the microscopic level can cause learners difficulty in solving the problems related to mathematical calculation on the symbolic level [2]. Students who have high conceptual understanding tend to have a low level of misconception [8].

4. Conclusion

This study concludes that the profile of the misconceptions of students at SMA Pangudi Luhur Don Bosko Semarang and SMA Negeri 1 Ungaran have similar results, namely the highest classical misconception at the particulate level, microscopic level. The misconception profile of students at the particulate level in Acid-base learning in SMA Negeri 1 Ungaran, SMA Negeri 2 Demak, and SMA Pangudi Luhur Don Bosko Semarang were 39%, 48%, and 56% respectively. Based on the results of the analysis of research data it can be concluded that there are misconceptions about acid-base strength, the concept of pH, and the calculation of pH. This is because the item uses levels of evaluation and analysis at the particulate level.

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