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ARTICLE

Description of Student Learning Difficulties in Material Colligative Properties of Solutions at MAN 2 Padang City, West Sumatera, Indonesia

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ABSTRAC

This research is a type of descriptive research. This study aims to determine the percentage (%) of students' learning difficulties and to describe the factors that cause learning difficulties experienced by students in the colligative nature of solutions, class XII MIPA 5 at MAN 2 Padang City in the 2022/2023 academic year, a total of 33 people. This research was conducted using a diagnostic test instrument in the form of valid objective questions and tested for reliability. In addition, this study also gave a questionnaire to students to find out the factors that cause learning difficulties experienced by students, both from internal factors and external factors. Data analysis used is descriptive analysis. The results of this study indicate that students experience learning difficulties in the material colligative properties of solutions in class XI MIPA 5 at MAN 2 Padang City which is in the high category of 61% and the factors that cause learning difficulties are seen from internal factors, namely interest (46.2 %), aptitude (52.3%), and student's motivation in learning material colligative properties of solutions (46.1%), and study habits (60.6%). From external factors, namely on the aspect of teacher teaching (68.1%), chemistry study time (68.1%), on the aspect of school facilities (53.8%). As well as family environment (50.0%) and social environment (74.7%).

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1. Introduction

Learning is basically a business process carried out by someone to get something so that new behavior is formed towards a better direction. In fact, students are often not ableto achieve their learning goals or do not get changes in behavior as expected. This shows that students experience difficulties in achieving learning outcomes[1,2].Meanwhile, each student in achieving learning goals has different abilities. There are students who can achieve it without difficulty, but there are also many students who experience difficulties. Learning difficulties are failures inachieving learning objectives which are characterized by low learning achievement (the value obtained by students is less than eighty). So, participants are said to have learning difficulties if the students concerned areunable to achieve their learning goals and their learning outcomes are low[3,4].

One of the high school (SMA) subjects that is considered difficult by students is Chemistry. This is because Chemistry contains many abstract andcomplex concepts (Source). One of the chemical materials that has an abstract and complex concept is colligative properties of solutions. This material discusses vapor pressure lowering, boiling point elevation, freezing point depression and osmotic pressure.

Based on the information obtained from the class XII chemistry teacher at MAN 2 Padang City, it can be seen that the material on colligative properties of solutions is quite difficult for students to master compared to other material in odd semesters. Most of the students obtained daily test scores below theKKM on colligative properties of the solution.

Based on the average daily test results, class XII MAN 2 students in Padang City have not been able to reach the Minimum Requirement Criteria (KKM) standard on colligative properties of the solution on daily tests. This fact identifies that students experience learning difficulties so that student learning outcomes become less than optimal. Efforts to find out the learning difficulties of students in terms of mastery of concepts and abilities in solving problems in colligative nature of the solution material is by giving a diagnostic test, while to find out the causes of learning difficulties from the psychological factors of students in the aspect of interest and motivation and school factors in the method aspect teaching teachers used questionnaires / questionnaires.

Based on the description above, to reveal the learning difficulties of class XII students at MAN 2 Padang City, a study was carried out entitled "Description of Student Learning Difficulties in Material Colligative Properties of Solutions at MAN 2 Padang City". The results of the research are expected to serve as a reference in finding the right solution to help students overcome their learning difficulties.

2. Methodology

The type of research used is descriptive research. The population in this study were all students of class XII MIPA at MAN 2 Padang City, while the sample in this study were students of class XII MIPA 5 at MAN 2 Padang City, totaling 33 people. MAN 2 Padang city is located at

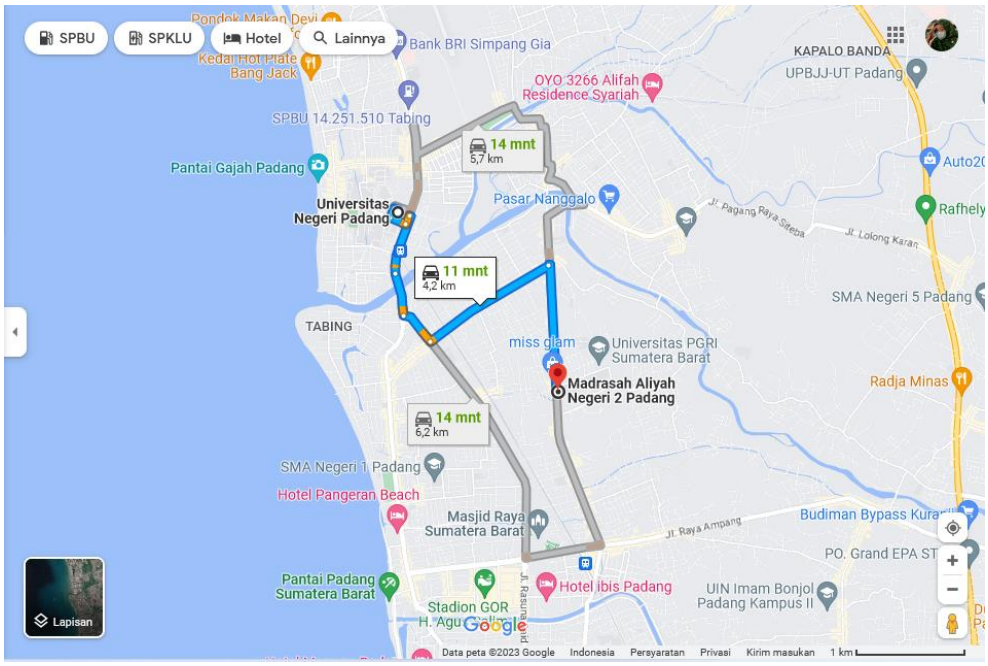

Figure 1. Located MAN 2 Padang City in Padang City

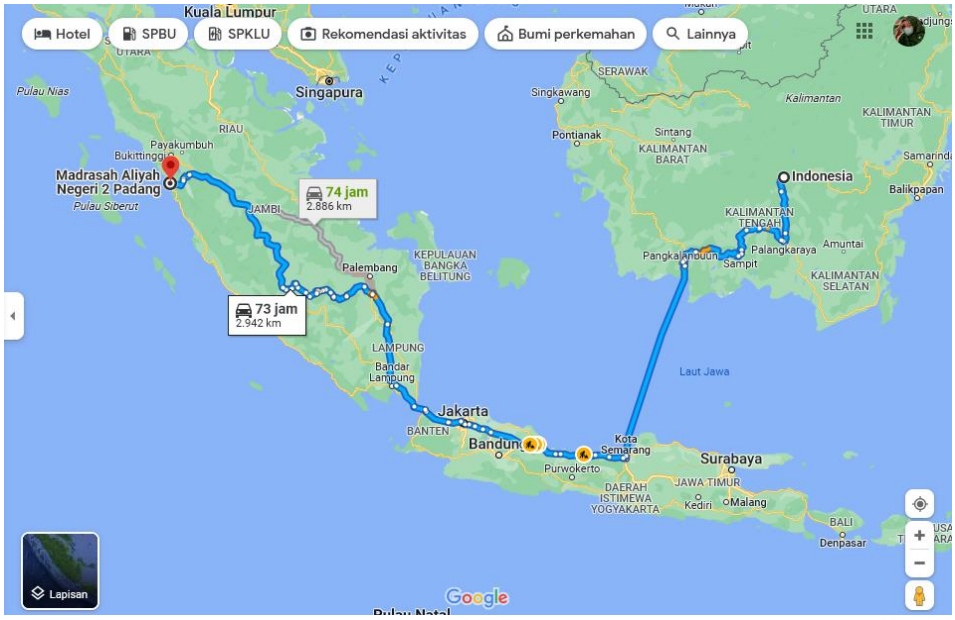

Figure 2. Located MAN 2 Padang City in Indonesian

Schematic of research are as follows:

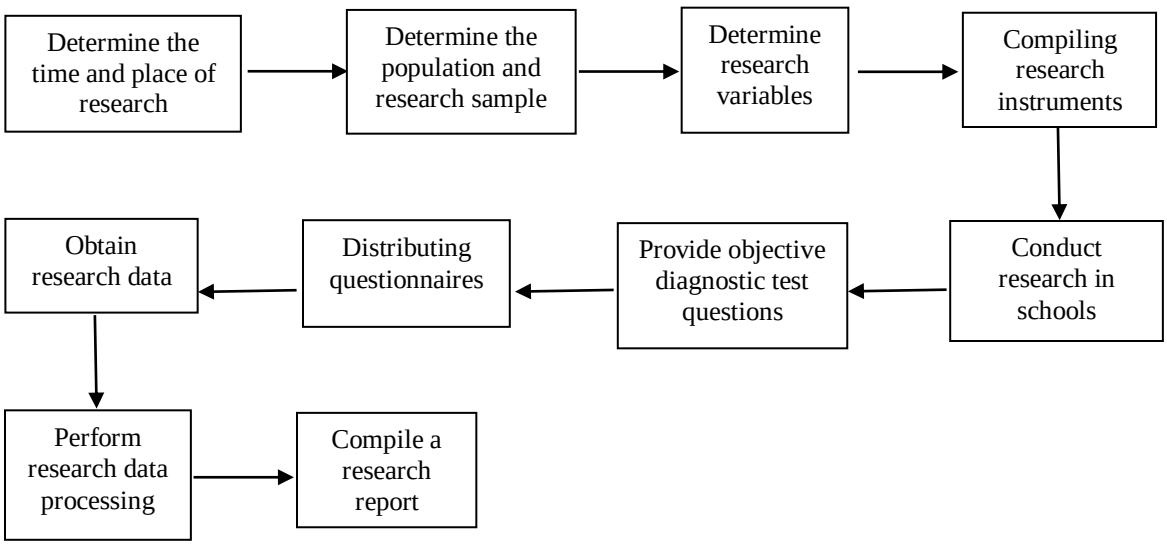

Figure 3. Schematic of Research

This research was conducted on the 4th of February 2023. The sampling technique was purposive sampling. The research instrument used was a diagnostic test in the form of objective questions and questionnaires. The data analysis technique used in this study is descriptive qualitative analysis by determining student learning outcomes and the level of student understanding to determine students' learning difficulties[15]. The percentage (%) of learning difficulties can be determined by the formula:

$$P = \frac{total\ score}{maximum\ score} \times 100\%$$

$$\%K = 100\% - P$$

Information :

P = percentage of students who do not experience learning difficulties for each indicator item %K

%K = percentage of students who experience learning difficulties for each indicator item.

The percentage of learning difficulties can be interpreted according which can be seen below

Criteria	Percentage (%)
Very high	81-100%
Tall	61-80%
High enough	41-60%
Low	21-40%
Very low	0-20%

Closed questionnaire data analysis was carried out by comparing the total score obtained by respondents with a score of 100% so that the results can be expressed in percent. Data is processed using formulas

$$P = \frac{\sum F}{\sum N} \times 100\%$$

Information:

P : Percentage

$\sum F$: Score of respondent's answer :

$\sum N$: Total score [5,6]

3. Results and Discussion

3.1 Research Results

Description of Research Data

Based on research that has been conducted on 33 students in MIPA 5 at MAN 2 Padang city or the 2022/2023 academic year, two data were obtained, namely in the form of a diagnostic test and questionnaire data. Furthermore, in collecting the questionnaire, students filled it out by ticking one of the options in the questionnaire. This questionnaire was given with the aim of knowing the causes of learning difficulties experienced by students as well as internal and external factors. Internal factors consist of aspects of students' interest in the material colligative properties of solutions, students' aptitude in material colligative properties of solutions, student motivation, and students' study habits in material colligative properties of solutions. Likewise with external aspects which also consist of aspects of teacher teaching, study time, school facilities, family environment and social environment. Each aspect of this questionnaire consists of several indicators which in turn each indicator consists of several question items that must be answered by students.

Results of Analysis of Student Answers to Diagnostic Test Questions

Data analysis in determining the percentage of students' learning difficulties on diagnostic test questions in the form of a description of the colligative nature of the solution material was given to students who had studied the material, namely class XII MIPA 5 MAN 2 Padang City. Material colligative properties of the solution consists of the concept of prerequisites and the concept of

colligative properties of solutions. The level of learning difficulties experienced by students is determined by giving 24 objective questions. The research results obtained are presentedin the form of a table of the percentage of student answers for each question.

Table 1. Percentage of Student Answers for Each Question

Draft Prerequisites andNature Concept colligative Solution	TP	M	P	TP	M	P	% Difficulty (TMK+M)	Category
	Total score per-indicator			Percentage per-indicator (%)				
Trait concept solution colligative (Molality)	5	27	36	7.58	40.91	54.55	48.48%	Enough tall
Draft precondition (Molarity)	24	27	22	36.36	40.91	33.33	77.27%	Tall
Trait concept solution colligative (Mole Fraction)	15	22	16	22.73	33.33	24.24	56.06%	Enough tall
Draft precondition (Solution Electolyte)	6	37	27	9.09	56.06	40.91	65.15%	Tall
Draft precondition (Solution non Electolyte)	14	22	24	21.21	33.33	36.36	54.55%	Enough tall
Draft precondition (Degrees Ionization)	42	15	9	63.64	22.73	13.64	86.36%	Very tall
Draft precondition (Solution Volatile)	29	23	5	43.94	34.85	7.58	78.79%	Tall
Trait concept solution colligative (Decrease steam pressure)	35	19	13	53.03	28.79	19.70	81.82%	Very tall
Trait concept solution colligative (The factor van't hoff)	32	18	8	48.48	27.27	12.12	75.76%	Tall
Trait concept solution colligative (Point increment boil)	51	13	6	77.27	19.70	9.09	96.97%	Very tall
Trait concept solution colligative (Decrease freezing point)	42	20	6	63.64	30.30	9.09	93.94%	Very tall
Trait concept solution colligative (Pressure osmotic)	35	8	12	53.03	12.12	18.18	65.15%	Tall
% Difficulty concept of colligative properties of solutions							61%	Tall

48% with a fairly high category. So that the level of learning difficulty obtained in thecolligative nature of the solution material is equal to 61% in the high category

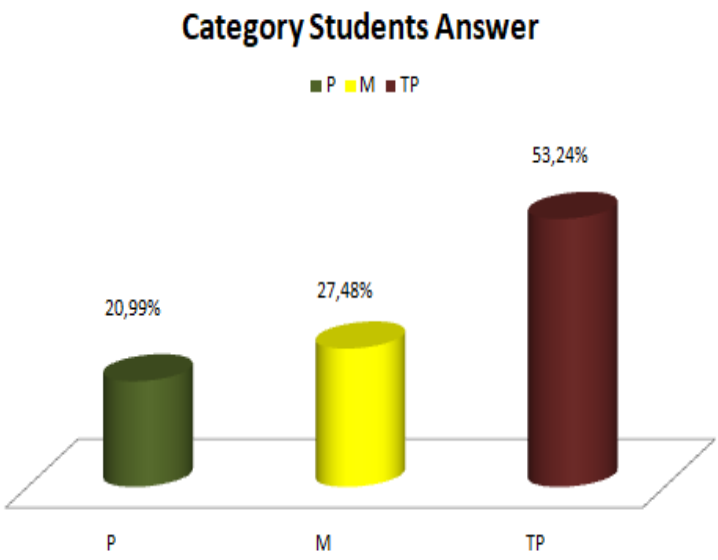

Figure 4. Persentage of Students Answer Categories

Using the average percentage of each category of responses based on the notion of completeness colligative properties received by students in Table 6. See the bar graph in Figure 2. When compared to students who understand (20.99%), there are more students who do not understand and have misconceptions (80.72%).

For the prerequisite concept in learning the colligative nature of the solution, the highest is the degree of ionization material, the percentage of learning difficulty is 86.36% in the very high category, the percentage of learning difficulty in volatile solution material is 78.79% in the high category, the percentage molarity material is the learning difficulty was 77.27% in the high category, the percentage of learning difficulty in electrolyte solution was 65.15% in the high category and finally, in the non-electrolyte solution material, the percentage of learning difficulty was 54.55% in the fairly high category. based on Table 6 it can be concluded that students in class XII MIPA 5 MAN 2 Padang City have difficulty learning about colligative properties of solutions.

Results of Analysis of Student Answers on Questionnaire Sheets

Based on the data in Table 1, it can be seen that 61% of students had difficulty learning chemistry inthe colligative properties of solutions. The questionnaire was administered to find out the causes of learning difficulties from internal and external factors which consisted of 28 questions representing all aspects. The results of calculating the percentage distribution of students' questionnaire sheet answers can be seen in Appendix 10. Then the results of the dispersion analysis can be seen in Appendix 11 and can be seen in Table 2 below.

Table 2. Results of Analysis of Questionnaire Sheets for the Causes of Student Learning Difficulties

Factor	Aspect	Items	Amount Score	Category Answer Questionnaire	Persentage	
					Per-item	Per-aspect
Factor Internals	Interest	1	63	Don't agree	47.7	46.2
		2	54	Don't agree	40.9	
		3	66	Don't agree	50	
	Talent	4	66	Don't agree	50	52.3
		5	72	Don't agree	54.5	
	Motivation	6	48	Don't agree	36.4	46.1
		7	67	Don't agree	50.8	
		8	67	Don't agree	50.8	
		9	61	Don't agree	46.2	
	How to learn	10	88	Don't agree	66.7	60.6
		11	72	Don't agree	54.5	
Faktor External	Method teach teacher	12	91	Don't agree	68.9	68.1
		13	95	Don't agree	72	
		14	94	Don't agree	71.2	
		15	96	Agree	72.7	
		16	97	Agree	73.5	
		17	66	Don't agree	50	
	Time study	18	76	Agree	57.6	57.6
	Facility school	19	63	Don't agree	47.7	53.8
		20	91	Don't agree	68.9	
		21	59	Don't agree	44.7	
	Environment family	22	61	Don't agree	46.2	50.0
		23	53	Don't agree	40.2	
		24	61	Don't agree	47	
		25	88	Don't agree	66.7	
	Environment Social	26	81	Don't agree	61.4	74.7
		27	112	Don't agree	84.8	
		28	102	Don't agree	78	
Average						56.6

Based on the data in Table 2. It shows that the factors that cause students' learning difficulties in the material colligative properties of solutions are internal factors, namely due to the lack of interest of students in material colligative properties of solutions, lack of talent and lack of motivation to study material colligative properties of solutions and poor study habits, such as not repeating lessons after the lesson is over and students study only when there is a test. Whereas the external factors in terms of the teacher's way of teaching are influenced by the teacher's way of teaching which is too fast, unclear, only using the lecture method which makes learning monotonous and boring, and the teacher does not use interesting media in learning. Furthermore, on the aspect of study time, namely short chemistry hours, it becomes difficult for students to understand the material colligative properties of solutions, on aspects of the

school environment, namely dirty classrooms, on aspects of the family environment, the atmosphere at home is busy making it difficult to concentrate on studying at home, and on aspects of the social environment influenced by the influence of peers. The indicator that was least implemented by class XII MIPA 5 MAN 2 Padang City students was in the motivational aspect of 46.1% with the criterion of disagreeing. as well as on aspects of the social environment influenced by the influence of peers. The indicator that was least implemented by class XII MIPA 5 MAN 2 Padang City students was in the motivational aspect of 46.1% with the criterion of disagreeing. as well as on aspects of the social environment influenced by the influence of peers. The indicator that was least implemented by class XII MIPA 5 MAN 2 Padang City students was in the motivational aspect of 46.1% with the criterion of disagreeing

3.2 Discussion

Lowest Student Learning Difficulty on Questions

The colligative nature of this solution consists of 24 questions in which there are prerequisite concepts and the concept of colligative properties of the solution in the questions given, of all the questions given to students, the highest percentage (%) of learning difficulties is obtained, namely 96.97%, namely in the questions numbers 19 and 20.

From the research data it is known that the concept of colligative properties of solutions (boiling point elevation) is categorized as a very high level of difficulty with a difficulty percentage of 96.97%. Based on the results of the students' answers, it can be seen that there are still many students who do not understand the concepts and misconceptions in this material, this material consists of 2 questions (19 and 20). Students experience difficulties in finding the increase in the boiling point of a solution. As shown in the following figure.

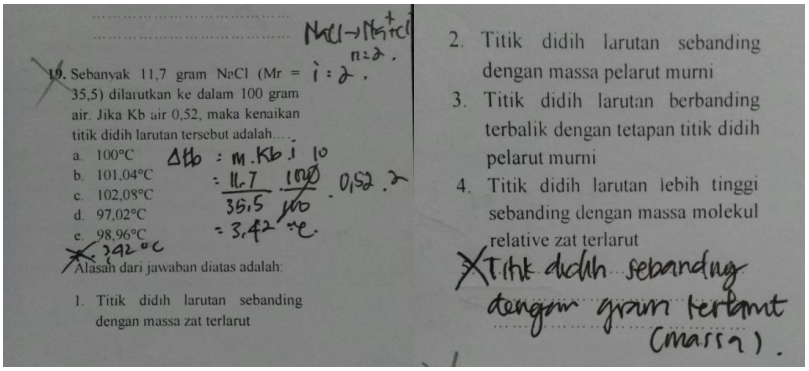

Figure 5. Answers of students who do not understand the concept of question number 19

In the student's answer to question number 19 it can be seen that the student did not provide an answer according to the answer key. Students are wrong in giving answers and reasons contained in the questions regarding the calculation of boiling point elevation. Based on the results of the students' answers are classifiedas not understanding the concept.

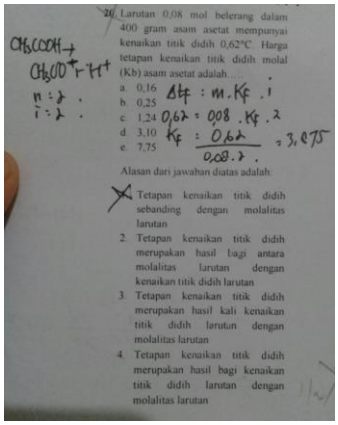

Figure 6. Answers of students who do not understand the concept of question number 20

In the student's answer to question number 20 it can be seen that the student did not give an answer according to the answer key. Students are wrong in giving answers and reasons contained in questions regarding the calculation of water vapor pressure. Based on the results of the students' answers are classified as not understanding the concept

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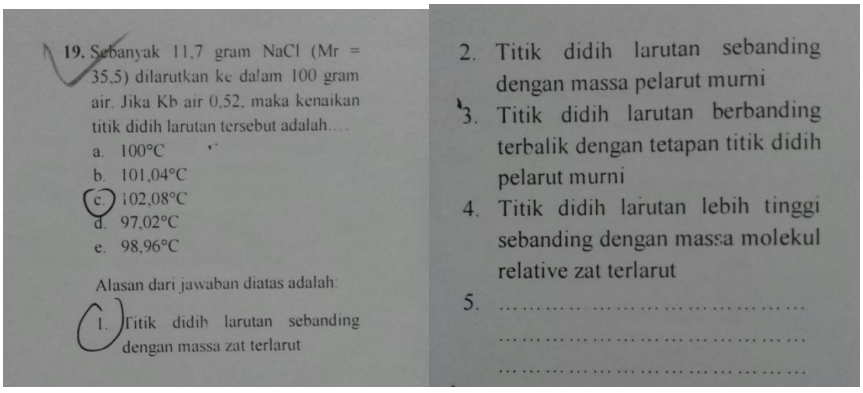

Figure 7. Answers of students who understand the concept of question number 19

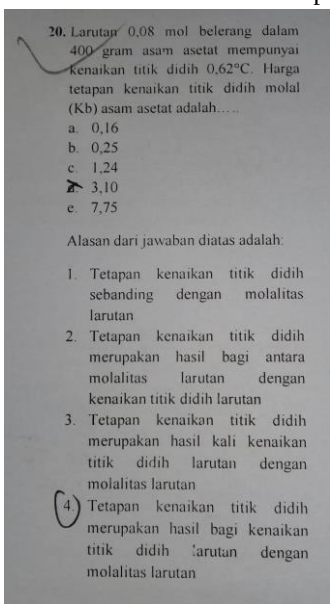

Figure 8. Answers of students who understand the concept of question number 20

In Figures 3 and 4 you can see the answers of students who are in accordance with the answer key, the answers of students who are in accordance with this answer key are categorized as students who understand the concept. However, not many students were able to answer questions 19 and 20 correctly.So that the level of not understanding and misconceptions that occur in students is higher than those who understand the concept.

Causes of Learning Difficulties from internal and external factors

To find out the causes of learning difficulties experienced by students, that can be seen from the internal and external factors obtained from Sispa's answers to the questionnaire. Judging from the internal factors, namely interest (46.2%), talent (52.3%), and students' motivation in learning the material colligative properties of the solution (46.1%), and study habits (60.6%). From external factors, namely on aspects of teacher teaching (68.1%), chemistry study time (68.1%), on aspects of school facilities (53.8%). As well as family environment (50.0%) and social environment (74.7%).

4 Conclusion

Student learning difficulties in material colligative properties of solutions in class XII MIPA 5 MAN 2 Padang City are at the high category level, which is equal to 61%. With the highest percentage of learning difficulties found in the concept of colligative properties of solutions (boiling point elevation) of 96.97% in the very high category. Factors that cause learning difficulties can be seen from internal factors, namely interest (46.2%), talent (52.3%), and student motivation in learning material colligative properties of solutions (46.1%), and study habits (60.6 %). From external factors, namely on the aspect of teacher teaching (68.1%), chemistry study time (68.1%), on the aspect of school facilities (53.8%). As well as family environment (50.0%) and social environment (74.7%).

Acknowledgements

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LETTER OF ACCEPTANCE (LoA)

No. 269/Cs-KIPILorg/2023

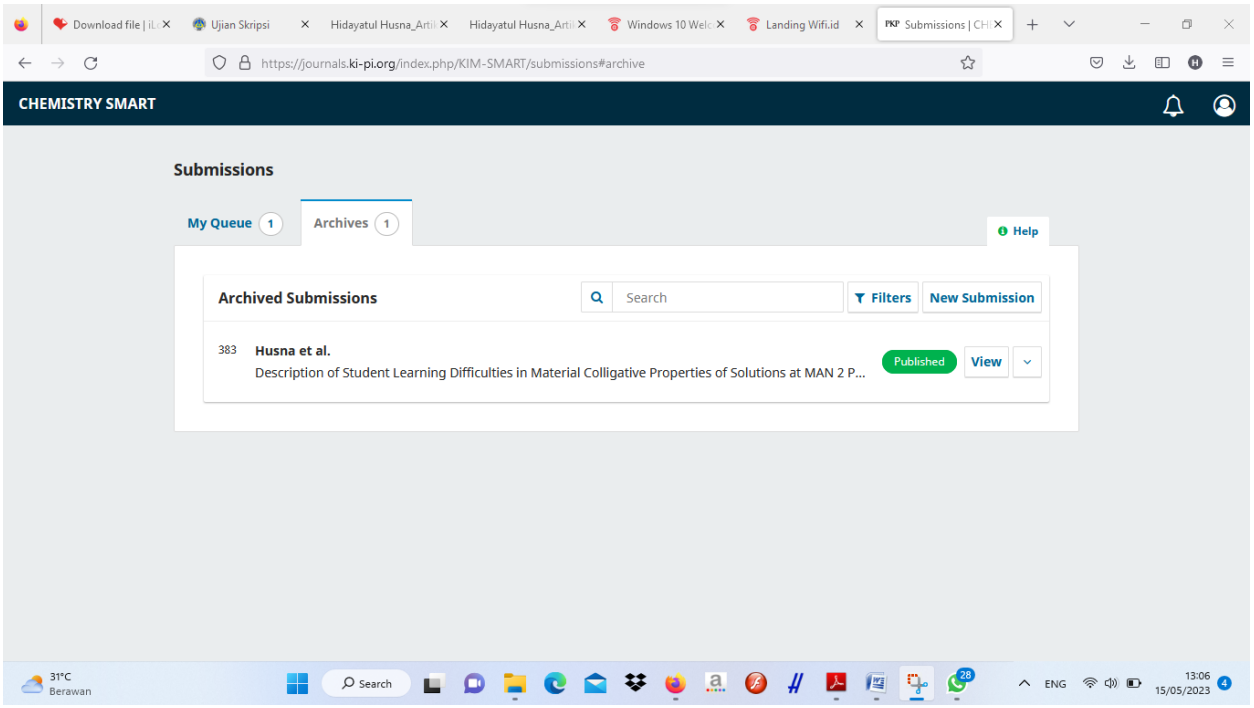
The Editor in Chief of Chemistry Smart Journal has been received the article:

In the name of	***:Hidayatul Husna[a], RahadianZainul[b]***
Title	***:Description of Student Learning Difficulties in Material Colligative Properties of Solutions at MAN 2 Padang City, West Sumatera, Indonesia***
Outcomes	
Institution	***:UniversitasNegeri Padang, Indonesia***

And pleased to inform you that the article has completed its review, and **will be published in the Chemistry Smart** Volume 2 Number 1 of 2023 (issn 2830-6198). Thus this letter of statement is prepared to be used properly.

Padang, Maret 2023
Signed below,

Editor In Chief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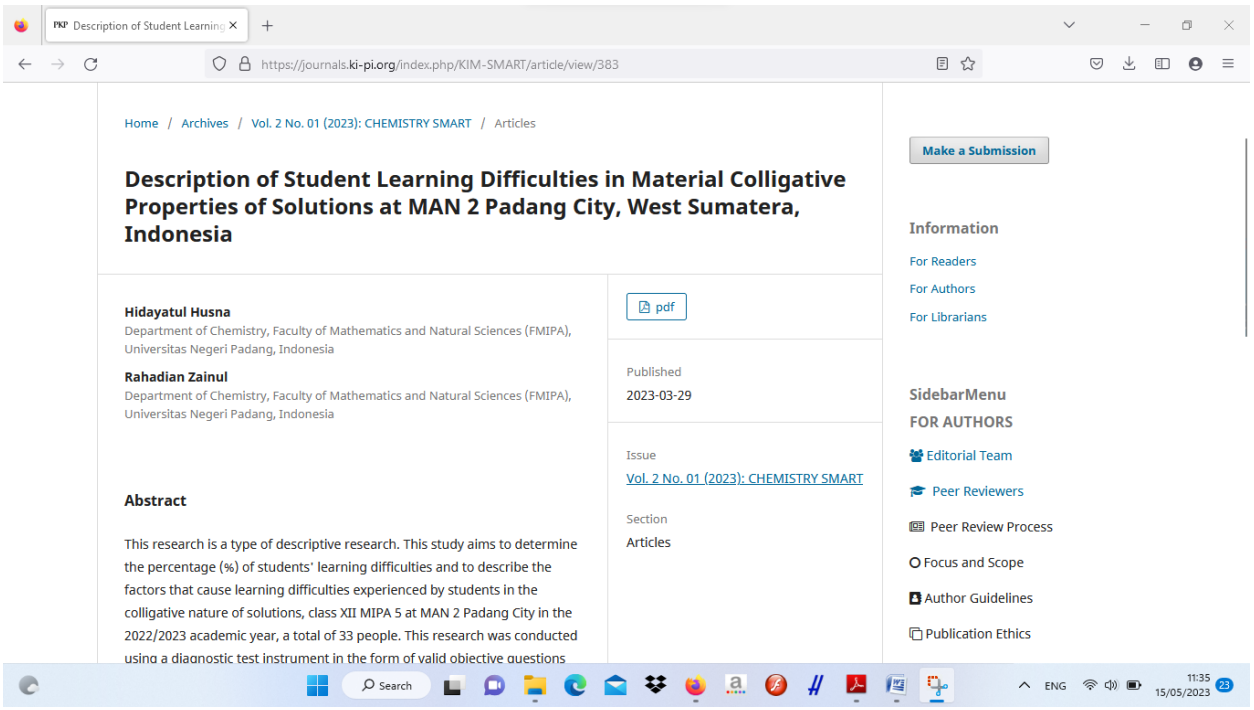
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Description of Student Learning Difficulties in Material Colligative Properties of Solutions at MAN 2 Padang City, West Sumatera, Indonesia
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Abstract
This research is a type of descriptive research. This study aims to determine the percentage (%) of students' learning difficulties and to describe the factors that cause learning difficulties experienced by students in the colligative nature of solutions, class XII MIPA 5 at MAN 2 Padang City in the 2022/2023 academic year, a total of 33 people. This research was conducted using a diagnostic test instrument in the form of valid objective questions
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