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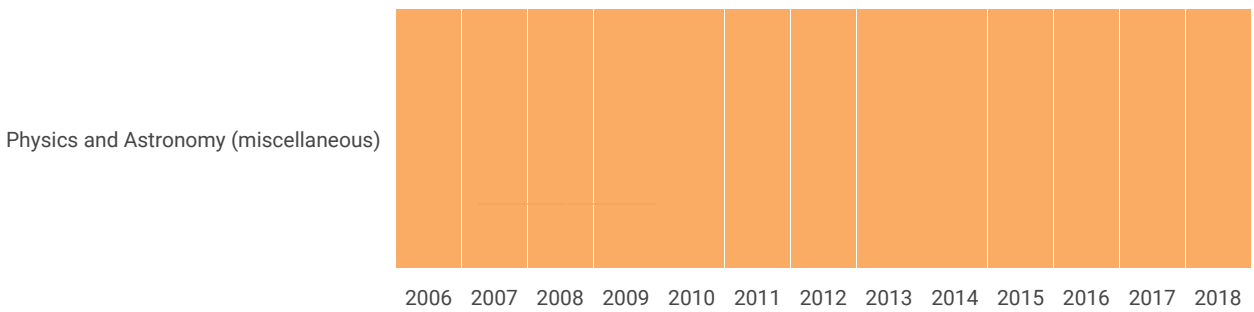

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A need analysis to optimization computer laboratory in chemistry learning process according to chemistry teachers and natural science students in 3T regions

A need analysis to optimization computer laboratory in chemistry learning process according to chemistry teachers and natural science students in 3T regions

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Abstract. The aims of this descriptive research were identifying optimization level of chemistry teachers and students in the utilization and using computer laboratory commonly used for computer based national test, and learning style of science students in 11th grade at Senior High School while chemistry learning process in 3T regions. The participants consisted of 8 chemistry teachers and 82 natural science students in 3 Bangkalan sub-district of Bangkalan Regency, East Java Province. Data collection was conducted by giving a close-ended questionnaire which consists of 23 statements for chemistry teachers and 18 statements for science students with 4 alternative respons option (very appropriate to very inappropriate). The data was analyzed by percentage formula. The results showed that chemistry teachers have not optimized the using computer laboratories in chemistry learning. The student participants, who have visual and kinesthetic style learning, have never used computer laboratory facilities that available in schools for the benefit of learning chemistry.
Keywords: *optimization computer laboratory, chemistry, learning style*

1. Introduction

3T is an acronym for the regions in Indonesia that are lagging behind, foremost, and outermost. 3T refers to a district area where the region and its people are less developed compared to other regions on a national scale in Indonesia [1]. The determination of an area as 3T can be viewed from various aspects, such as the community's economy, human resources, facilities and infrastructure, regional financial capacity, accessibility, and regional characteristics. Bangkalan Regency, East Java Province, is one of the areas designated as 3T by the Government of Indonesia. Nevertheless, Bangkalan Regency has potential that can be developed especially in the aspects of facilities and infrastructure for the education sector, namely the existence of a computer laboratory.

Computer laboratory is a place equipped with computers (internet network or not) for using pedagogy in the schools [2]. The utilization and using computers in learning can create a more interesting learning environment and increase the student's learning achievement [3], effective [4], and time-efficient [5]. Indonesia's government supports the utilization and using computers in the learning by implementation computer based national test (UNBK). So that why, every of schools has to hold a computer laboratory. The number of state and private senior high schools in Indonesia that have computer laboratories is 10,605 of 13,692 [6]. Bangkalan District has been running 100% for implementation of UNBK [7]. This condition will give a positive impact on student learning

outcomes. The fact shows that Bangkalan Regency is categorized as low for chemistry subjects in UNBK 2018/2019 [7].

The reports shows that 12 of 15 senior high school in Bangkalan District got low mark from standard national of value of chemistry subjects [7]. It can be caused by other factors, namely the characteristics of chemistry learning that need to understand 3 levels of representation (macroscopic, symbolic, and sub-microscopic) during the learning process [8]. Macroscopic representations of chemical phenomena that can be observed directly using the five senses. Atoms, molecules, ions, and structures are representations of the sub-microscopic level [9]. Symbolic representations relate to the use of symbols to express formulas, algebraic equations, and graphs. Understanding the 3 levels of representation can be learned theoretically in the classroom or empirically in the chemistry laboratory. Almost all of contents of chemistry is obtained based on experimental results.

Students can confirm information learned from the teacher or textbook by practical activities. Practical activities can provide real experience and training for students to develop skills in analyzing, evaluating, and designing experiments [10]. The presence or absence of the implementation of its is decided by teacher to the one of learning methods in order to achieve the learning objectives. The teachers need to consider students' learning style in the process planning of the learning [11] and characteristics of the topic to be learned. According to Legendre & Legendre [12], learning style is defined as a person's style to acquire and process new knowledge, solve problems, and think and act while learning. Some students learn through watching (visual), hearing (auditory), and experiencing (kinesthetic). Students who have a visual learning style tend to use pictures, images, colors, videos, diagrams, and maps to organize, store and communicate information to the others. Auditory learners learn by listening to the informant (someone who gives information, like as friends, teachers, lectures, and the others). Students who prefer physical (using the body and sense of touch) to learn and understand the information is categorized as kinesthetic learners. Most people are not aware of students' learning style preferences. Therefore it is important to analyze the needs of teachers and students before deciding on the right learning methods.

Needs analysis is done to determine the problems that exist in the environment, find out the difference in status in the field with what should be there, and determine the right solution based on the potential that is owned [13]. Analysis of needs for instructional learning purposes can be done on teachers and students [14]. In research and development, the analysis of the needs of teachers and students is the first and second sub stages of the define stage in the 4-D model. This stage is needed as a material consideration to choose the type of media development that suits the needs of teachers and students. The purpose of this study was to identify (1) optimization level of chemistry teachers and students in the utilization and using computer laboratory commonly used for UNBK, (2) learning style of science students in 11th grade at Senior High School while chemistry learning process in the 3T area, namely Bangkalan Regency.

2. Research method

2.1. Research design

A descriptive study was adopted for this research by qualitative approach. It was done by the level analysis of optimization in using computer laboratory to chemistry learning process. The purpose of this research are identifying (1) optimization level of chemistry teachers and students in the utilization and using computer laboratory commonly used for UNBK, (2) learning style of science students in 11th grade at Senior High School while chemistry learning process.

2.2. Participants

There were two types of participant in this research, called chemistry teachers and science students in the senior high school at Bangkalan Regency. There were 8 chemistry teachers and 82 science students with varying schooling in 3 Bangkalan sub-district of Bangkalan Regency, East Java. All of this

participant was taken by purposive sampling. This study was conducted on 15th – 25th September 2019.

2.3. Data collection

Data collection was conducted by giving a close-ended questionnaire which consists of 23 statements for chemistry teachers and 18 statements for science students with 4 alternative respons option (very appropriate to very inappropriate) [15]. The instruments for chemistry teachers were constructed based on indicators of professionalism [16] and competency standards of chemistry teachers [17]. Three indicators are included media learning, the implementation of practical activities, and the utilization and using technology in learning process. Meanwhile, instruments for students are arranged based on the characteristics of students' visual, auditory, and kinesthetic learning styles (adapting to [18] instruments), and utilization and using computers in learning. Both instruments are equipped with a suggestion column related to the chemistry learning process expected by chemistry teachers and students. Both of these instruments must have been validated before being used.

2.4. Data analysis

Types of the results to the questionnaire are quantitative and qualitative data. Quantitative data were obtained by responses to the each statements and suggestion part as a qualitative data. All of this types was analyzed by percentage. The formula of percentage for each response of chemistry teachers or students in one indicator is:

$$\% = \frac{\text{Score that obtained in one indicator}}{\text{maximal score that obtained in one indicator}} \text{ x } 100 \quad (1)$$

Futhermore, the percentage was calculated using this formula for material that chosen:

$$\% = \frac{\text{number of subject matters that chosen by teachers}}{\text{total subject matters}} \text{ x } 100 \quad (2)$$

3. Results and Discussion

3.1. Results

3.1.1. Chemistry teachers' responses to questionnaire

The results of the chemistry teacher's needs analysis questionnaire were divided into 2 parts, namely (1) learning media, the implementation of practical activities, and the utilization and using technology in the chemistry learning process, and (2) the selection of subject matters that require utilization and using computer laboratory. The results of data analysis in section 1 are presented in table 1.

Table 1. Result of chemistry teachers' responses.

Participants	Learning Media	Implementation of practical activities	Utilization and Using of Technology in Chemistry Learning Process
Teacher 1	55	56.82	50
Teacher 2	65	45.45	50
Teacher 3	65	70.45	70
Teacher 4	45	54.55	50
Teacher 5	60	61.36	70
Teacher 6	50	68.18	80
Teacher 7	45	61.36	80
Teacher 8	50	59.09	80

The questionnaire given to the chemistry teacher was also supplemented with requests for advice on practical-based subjects that could utilize a computer laboratory if it was not possible to do it in a chemical laboratory. Some subjects chosen by 8 chemistry teachers were presented in the form of a pie chart as in figure 1.

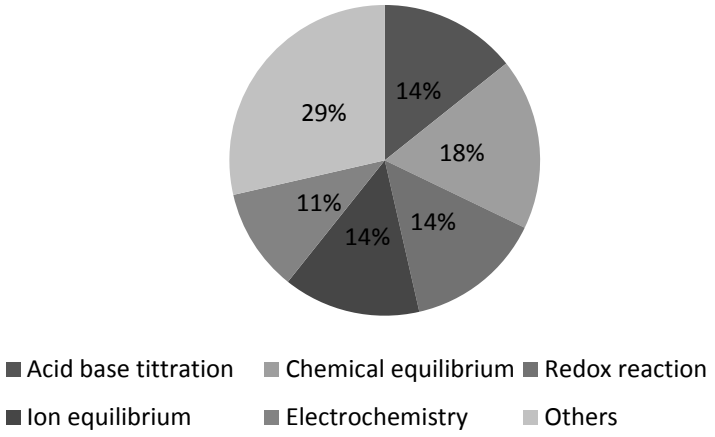

Figure 1. Percentage of practical-based chemistry subjects that can utilize a computer laboratory.

3.1.2. Science students' responses to questionnaire

The results of science students' responses needs analysis questionnaire included some aspects, such as learning style of science students while chemistry learning process and utilization and using of computer laboratory. The questionnaire for identifying students' learning style is presented in table 2 and the results of this parts is shown in figure 2.

Table 2. Questionnaire to identify students' learning style.

No	Types of Learning Style	Statements for Identifying Students' Learning Style in Chemistry Learning
1	Visual	I prefer to write chemistry notes in the form of pictures and arrows rather than text
2		I remember contents of chemistry topic when writing them
3		I prefer to do chemistry task in a quiet place
4		I have difficult to understand the chemistry teacher's explanation when a friend asks me to talk
5	Auditory	I write chemistry notes about contents of chemistry topic neatly
6		I feel tired to write chemistry notes
7		I understand the chemistry explained by the teacher better than read the books by self
8		I can explain to my friends that my teachers has told about contents of chemistry topic
9	Kinesthetic	I like the lab work in the chemistry laboratory rather than studying the theory
10		I like chemistry labs by trial and error rather than following established work procedures
11		I like to study chemistry which provides an opportunity to do my own practical
12		I feel bored studying chemistry that only listens to the teacher's explanation

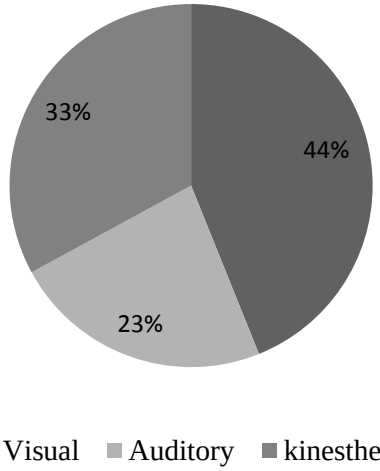

Figure 2. Percentage of number of students with 3 types of learning styles.

The number of statement items to students for the utilization and using technology indicator is 5. The sound of the statement is presented in table 3.

Table 3. Questionnaire to Analysis Level Optimization.

No	Statements for The Analysis of Utilization and Using Technology in Chemistry Learning
1	I once used internet services provided at school for the process of chemistry learning
2	I like chemistry learning with ICT based
3	I once used a computer laboratory at school for the sake of studying chemistry
4	I find it easier to understand chemistry by involving three-dimensional (3D) animation rather than two-dimensional (2D)
5	I once did a computer / laptop-assisted chemistry lab simulation

Based on 82 students' responses to the 5 statements, only 53.1% made use of technology in the chemistry learning process.

3.2. Discussion

The results of data analysis contained in table 1 shows that all chemistry teachers use learning media to transfer knowledge to students. Interactive learning media can make students find ways of learning that are useful and fun [19]. Interactive learning media is a two-way learning media and involves students more in the learning process. Based on each statement delivered to the learning media indicator, 68.75% of teachers stated that they often use power points as technology-based learning media. The teacher mentions that the power point is used as a media tool for students' presentations to their friends. Other friends listened and asked questions about the presentation. Such a learning atmosphere is only suitable for students with an auditory learning style. As shown by figure 2, students in the 3T area generally have a visual and kinesthetic learning style that is preferred to see and act.

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students in the 3T area generally have a visual and kinesthetic learning style that is preferred to see and act.

Learning styles of students play an important role for effectiveness in the learning process. Learning methods implemented by teachers need to be synchronized with the learning styles of students in order to achieve a learning goal [12]. The purpose of learning chemistry is different for each subject. Almost all chemical contents are obtained based on the results of experiments. Therefore, the chemistry learning process cannot be separated from practical activities.

Based on the results of data analysis contained in table 1, it shows that the implementation of practical activities has not been carried out optimally (close to 100%). About 87.5% of teachers agree that the obstacle in carrying out practical activities lies in the allocation of less time. Another factor that triggers the practical is not implemented is the lack of chemical laboratory assistants, tools and chemicals that are lacking because of the high operational costs. These results are also in line with the results reported by Solikhin [20].

Problems that arise in the process of chemistry learning related to the implementation of practical activities can be overcome by the potential that exists in schools such as the use of computer laboratories. The government policy to implement UNBK can be utilized by chemistry teachers for the chemistry learning process. Based on the results of the analysis table 1 shows that the school provides a computer laboratory. However, 25% of teachers stated that they had never used a computer laboratory for the chemistry learning process. These results are also in line with the response of students who state that they have never used a computer laboratory in schools for the benefit of chemistry learning.

Computer laboratories can be used by chemistry teachers as an alternative place to carry out practical activities [21]. Practical activities can be done by using applications that are embedded on a computer server or every personal computer (PC) such as a virtual laboratory. The existence can also accommodate 3 types of student learning styles because virtual laboratories provide features with higher interactivity than power points. Based on figure 1, the teacher suggests that for 5 chemistry subjects that can utilize computer laboratories such as acid-base titration, ionic equilibrium, chemical equilibrium, electrochemistry, and redox reactions.

4. Conclusion

Based on the objectives of this study it can be concluded that chemistry teachers have not optimized the using computer laboratories in chemistry learning and student participants have never used computer laboratory facilities that available in schools for the benefit of chemistry learning. Overall, students in the 3T area have visual and kinesthetic learning styles so that why the selection of instructional media should be adjusted to the learning styles of students.

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