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Qualitative Analysis of Physics Learning Problems in High School Based on Students' Intrinsic and Extrinsic Factors

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Abstract
This study aims to analyze the problems in Physics learning at SMAN 1 Punggur. This study is a qualitative research with a grounded theory design focusing on intrinsic and extrinsic factors that influence student understanding. The informants of the study were students and physics teachers at SMAN 1 Punggur. Intrinsic factors include motivation and interest in learning, students' initial abilities, conceptual difficulties, students' practical skills, understanding of abstract concepts, problem-solving skills, collaboration and communication skills. While extrinsic factors include teacher learning strategies, limited facilities and infrastructure, and use of technology in learning. Data collection techniques used in this study were student questionnaires and in-depth interviews with students and teachers. The results of the analysis showed that the problems of physics learning at SMAN 1 Punggur lie in intrinsic factors, namely low motivation and interest in learning, conceptual difficulties, and problem-solving skills.

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1. Introduction

Education functions to develop abilities and shape the character and civilization of a dignified nation in educating the nation's life. Physics can be interpreted as a science that studies natural events that are physical in nature and can be studied by observation, experimentation and theory. The results of physics can be expressed in the form of facts, concepts, principles, laws and theories. The science of physics is taught through learning activities at school through learning activities at school through a series of activities designed to support the internal learning process of students [1], [2].

Education is identical to the learning process, where education is identical to the learning process. The learning process produces a change in the individual that involves changes in several aspects. Changes in behavior in learning include three domains as stated by Bloom, namely the cognitive domain, the affective domain, and the psychomotor domain [3], [4]. Thus, a person is said to experience the learning process if there is an increase in behavior in terms of cognitive, affective and psychomotor in that person. Learning is a process of change within an individual that results in changes in behavior as a result of interaction with others and the environment based on certain practices and experiences [4], [5].

In every lesson students' experiences an obstacle or what is known as learning difficulties; this difficulty caused by the many concepts in the material, making it difficult for students to understand the concept as a whole. However, this learning difficulty can be minimized, among others, by making students aware of the learning goals that come from themselves not from the demands of others [6], [7]. According to Djaramah [8], [9], [10] learning difficulties are a condition of students who cannot learn properly caused by certain obstacles or disturbances in the learning process so that students cannot get the desired learning outcomes. [11] said that learning difficulties are defined as a condition in which a student finds it difficult to study lessons because it is caused by obstacles both from outside and from within the student. So, what is meant by learning difficulties are things that can cause failure or disruption in the student learning process. Learning difficulties in students are indicated by the existence of specific obstacles to achieving learning outcomes, which can be psychological, sociological, and physiological in nature so that it can result in the learning outcomes obtained being below what they should be [12], [13], [14]. In addition, if a student faces failure or is unsuccessful, it means that there are difficulties experienced during learning. Learning difficulties are caused by two factors, namely internal (intrinsic) and external (extrinsic) factors [15], [16]. On intrinsic factors, students often show low interest in learning physics. This is shown from the results of interviews and questionnaires distributed to students at SMA N 1 Punggur, which show that students feel afraid, not confident, and have difficulty understanding physics concepts. Preliminary data shows that most students consider physics as a difficult subject, even tends to be unpleasant. This is reinforced by the results of the physics teacher interview, which states that most students are less active in participating in learning.

One of the internal factors that influence the student learning process is motivation. Motivation is one of the factors that influence the activities that are being carried out by an individual. As stated by [17], [18] motivation is a driving force from within students to carry out certain activities in order to achieve a goal in learning science. [19], [20] explained the results of his research on factors that affect student learning achievement including students' intellectual abilities, students' learning styles, and students' learning motivation. However, the results showed that intellectual ability and learning motivation were positively correlated with learning achievement. Research from [21] corroborates that an active learning environment can motivate students to study harder. An active learning process supports an active learning environment. Research from [17], [22] supports the theory that student motivation levels are important for learning. The initial challenge for a teacher is to generate learning motivation from students. Learning motivation is a very important affective component because learning motivation underlies the process of conceptualizing a material, critical thinking, strategies in learning, and success in learning. The research concludes that it is the last factor that determines the level of student achievement.

In addition, extrinsic factors in physics learning at school include teacher learning strategies, utilization of technology in learning and facilities and infrastructure available at school [23]. Teachers tend to use the lecture method more often and less utilize technology or interactive learning media. Supporting facilities such as laboratories are still limited, and learning strategies have not fully adapted to the needs of students. Teachers also stated that limited time and curriculum demands make it difficult to consistently implement innovative learning approaches. Therefore, every teacher can make effective learning strategies to improve the quality of learning and teachers can also utilize the technology and infrastructure available to facilitate interaction between teachers and students in structured learning management, so that students are optimally inspired to achieve achievement in learning [23], [24] . Teachers not only function as teachers but must also function as educators, mentors, trainers and directors for their students in learning which will ultimately produce achievements in the form of optimal learning outcomes.

The novelty of this research is to use a data triangulation approach by combining data from student questionnaires, student interviews, and teachers, to see the problem from many angles. By looking at the real conditions in schools not only based on theory, but also based on field facts. Also, focus on physics learning by emphasizing intrinsic and extrinsic aspects in a balanced manner, not just from the student or teacher side. Based on the results of data triangulation (student questionnaires and student and teacher interviews), it was found that students were less motivated and less interested in learning physics and had difficulty in understanding physics problems. One other obstacle that makes it difficult for students to understand physics problems is that students are less active in solving a given problem. This will be a topic in the problem that will be explored more deeply to find out physics learning problems in high school based on students' intrinsic and extrinsic factors.

2. Methods

The type of research used in this qualitative research is grounded theory. The students who became the sample in this study amounted to 32 people consisting of 24 female students and 8 male students. The selection of this method is based on the researcher's curiosity to conduct a more in-depth analysis of physics learning problems at school. In qualitative research, grounded theory does not depart from theory to produce new theories but seeks to find theories based on empirical theory, not building theories in a logical deductive manner. Therefore, grounded theory releases theory and researchers go directly to the field to collect data. In other words, grounded theory research moves from data to concepts.

Data were collected using non-test techniques, namely open questionnaires, to capture students' perceptions of physics learning based on intrinsic and extrinsic factors. As well as in-depth interviews with students and physics teachers, to explore more contextual and subjective information about physics learning problems at school. The instrument was prepared based on indicators of learning problems that have been identified previously (in Table 1), and validated simply before being used in the field. Furthermore, the data were analyzed through stages: (1) open coding: identifying and categorizing raw data into initial categories, (2) axial coding: connecting the categories found to find causal or structural relationships, (3) selective coding: compiling a main thematic narrative from interconnected dominant categories to produce core findings, (4) data validation: validation was carried out using source triangulation techniques, namely comparing results from student questionnaires, student interviews, and teacher interviews, to ensure consistency and validity of the data. Score criteria with average answer score is veri high, high, medium, low, and very low.

Table 1. Physics Learning Problems

Dimension	Indicator
Intrinsic	Student's initial ability
	Conceptual difficulties
	Motivation and interest in learning
	Students' practical skills
	Understanding of abstract concepts
	Students' problem-solving ability
	Collaboration and communication skills
Extrinsic	Teacher learning strategy
	Limited facilities and infrastructure
	Technology utilization in learning

3. Results and Discussion

This study analyzes physics learning problems in terms of two main factors, namely intrinsic factors (originating from within students) and extrinsic (originating from outside students). Data were obtained through the distribution of questionnaires, student and teacher interviews and data triangulation analysis of 32 students of class XI IPA 3 SMA Negeri 1 Punggur. The following data are the results obtained from distributing questionnaires in Table 2.

Table 2. Student Questionnaire Result

Aspects Measured	Average Score	Max Score	Scale Classification	Category Classification	% Achievement
Students' initial ability	3,71	5	>3,40 – 4,20	High	74,20
Conceptual difficulties	3,40	5	>2,60 – 3,40	Medium	68,00
Motivation and interest in learning	3,33	5	>2,60 – 3,40	Medium	66,60
Teacher learning strategy	3,70	5	>3,40 – 4,20	High	74,00
Student practical skills	4,09	5	>3,40 – 4,20	High	81,80
Understanding of abstract concepts	3,75	5	>3,40 – 4,20	High	75,00
Limited facilities and infrastructure	3,60	5	>3,40 – 4,20	High	72,00
Students' problem solving ability	3,40	5	>2,60 – 3,40	Medium	68,00
Technology utilization in learning	3,93	5	>3,40 – 4,20	High	78,60
Collaboration and communication skills	3.56	5	>3,40 – 4,20	High	71,20
Overall Average					72,02

Table 2 shows the intrinsic and extrinsic problems can be identified. The intrinsic factors observed were students' initial abilities, conceptual difficulties, motivation and interest in learning, practical skills, understanding of abstract concepts, problem solving ability, collaboration and communication skills. By obtaining an average score of intrinsic factors: 3.60 (high category). Meanwhile, the extrinsic factors observed were teacher learning strategies, limited facilities and infrastructure, utilization of learning technology. By obtaining an average score of extrinsic factors: 3.74 (high category). From the source triangulation data, namely by comparing the results of student questionnaires, student interviews and teacher interviews, the following results are obtained in Table 3.

Problems come not only from intrinsic factors, but also from extrinsic factors. Questionnaire data shows that the average score of intrinsic (3.60) and extrinsic (3.74) aspects is in the high category. However, the results of data triangulation revealed that students still have low learning motivation, lack of confidence, and difficulty understanding physics concepts. Although the extrinsic aspect was rated “quite good” quantitatively, qualitatively it turned out that many students felt bored, less interested, and lacked understanding of the meaning of physics learning, because the learning approach did not evoke active participation. Of these two factors, although quantitatively high, qualitatively there are crucial problems that need to be addressed.

Table 3. Triangulation Tabulation Data

Indicator	Questionnaire	Teacher interview	Student interview	Data source triangulation results
Students' initial ability	Initial ability of students in the high category	Initial ability of students in the high category	Initial ability of students in the high category	Initial ability of students in the high category
Conceptual difficulty	Conceptual difficulties in students in the medium category	Conceptual difficulties in students in the low category	Conceptual difficulties in students in the low category	Conceptual difficulties in students in the medium category
Motivation and interest in learning	Students' motivation and interest in learning in the medium category	Students' motivation and interest in learning in the low category	Students' motivation and interest in learning in the low category	Students' motivation and interest in learning in the low category
Teacher learning strategies	Teacher learning strategies implemented in the high category	Teacher learning strategies implemented in the high category	Teacher learning strategies implemented in the high category	Teacher learning strategies implemented in the high category
Student practical skills	Student practical skills in the high category	Student practical skills in the medium category	Student practical skills in the high category	Student practical skills in the high category
Abstract concept understanding	Understanding of abstract concepts in the high category	Understanding of abstract concepts in the high category	Understanding of abstract concepts in the high category	Understanding of abstract concepts in the high category
Limited facilities and infrastructure	Existing facilities and infrastructure in the high category	Existing facilities and infrastructure in the medium category	Existing facilities and infrastructure in the high category	Existing facilities and infrastructure in the high category
Students' problem solving ability	Students' problem solving ability in the high category	Students' problem solving ability in the medium category	Students' problem solving ability in the medium category	Students' problem solving ability in the medium category
Utilization of technology in learning	Utilization of technology in learning is in the high category	Utilization of technology in learning is in the medium category	Utilization of technology in learning is in the high category	Utilization of technology in learning is in the high category
Collaboration and communication skills	Collaboration and communication skills of students in the high category	Collaboration and communication skills of students in the high category	Collaboration and communication skills of students in the high category	Collaboration and communication skills of students in the high category

The crucial physics learning problems experienced by students of SMAN 1 Punggur from the triangulation of data sources come from intrinsic factors such as conceptual difficulties that are quite dominant, especially in understanding abstract physics concepts such as force, motion, and energy. Problem-solving ability is still in the moderate category which shows a lack of critical and logical thinking skills. Motivation and interest in learning are low which results in many students feeling less interested and not understanding the relevance of physics in everyday life.

In the aspect of conceptual difficulties, one way to help students overcome conceptual difficulties is to provide contextual problems that require the application of physics concepts in real situations [25], [26]. Teachers as educators are able to create approaches that emphasize understanding of concepts rather than just memorizing formulas and teachers can also use contextual problem solving in applying physics concepts, which allows them to see the relevance and usefulness of physics material in everyday life. Contextual problem solving helps students connect physics concepts with real-world situations, which improves their understanding [27].

In the aspect of problem solving ability in students must be addressed immediately, especially if the difficulty is related to students' problem solving difficulties in problems. One of the ways that teachers can do is to carry out a diagnosis that aims to identify the types and causes of problem solving difficulties in students. This is supported by research conducted by [28], [29], who stated that teachers must take diagnostic actions to students to find out the difficulties experienced by students so that these difficulties can be followed up with appropriate treatment. The solution to overcome students' problem solving difficulties is that teachers must be brave enough to apply new methods to improve learning that has not been maximized. The method must be effective which is certainly adapted to the conditions of students so that students can learn well. According to [30], providing more opportunities in problem solving will make students more experienced in solving physics problems.

Furthermore, in the aspect of interest and motivation to learn. Interest is one of the internal factors that influence students' learning activities and readiness, interest is a feeling of pleasure and interest in an activity or object. An interested person will automatically pay attention to activities or objects that make him interested, without any external coercion [31]. Motivation is also an internal factor that affects learning activity and readiness, motivation is an encouragement that comes from internal and external students in learning so that behavior changes. One way to help students overcome motivation and interest in learning is to use the problem based learning model with a STEM approach which can be used as an alternative to increase student interest in learning physics.

4. Conclusion

Based on the results of the triangulation of data sources that have been described, the researcher can draw conclusions about the problems of physics learning in high schools based on intrinsic and extrinsic factors of students show that student learning difficulties at SMAN 1 Punggur are caused by intrinsic factors of students where the intrinsic factors come from aspects of conceptual difficulties, students' problem solving ability, and motivation and interest in learning. In the aspect of conceptual difficulties and students' problem solving ability are in the moderate category. While in the aspect of motivation and interest in learning is in the low category.

Suggestions that can be formulated in this study are to overcome conceptual difficulties in students, it can be done by providing contextual problems that require the application of physics concepts in real situations. Teachers as educators are able to make approaches that emphasize understanding of concepts rather than just memorizing formulas and teachers can also use context-based problem solving (Contextual Problem Solving) in applying physics concepts, which allows them to see the relevance and usefulness of physics material in everyday life. To overcome students' problem solving ability, teachers must be brave enough to apply new methods to improve learning that has not been maximized.

The method must be effective which is certainly adapted to the conditions of students so that students can learn well. Providing more opportunities in problem solving will make students more experienced in solving physics problems. To overcome low student motivation and interest in learning, teachers can use the Problem Based Learning model with a STEM approach which can be used as an alternative to increase student interest in learning Physics.

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