**TEACHERS ACCIDENTALLY MISTAKES IN SOLVING PHYSICS PRBOLEMS: TEACHERS DIDAKTOGENIC**

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**Abstract**

There are many studies was conducted to analyze the relation between teacher’s knowledge and student’s achievement. But, none of the study that discuss about teachers accidentally-mistakes in solving physics problem. The aim of this study is to describe didaktogenic or the teacher’s mistake which accidentally happened that can cause students misconception based on gender. The participants of the study were 6 man teachers and 6 woman teachers who represented six subdistrics in Pontianak City. They were asked to assess about several physics problems with answer, correct and incorrect. Three concepts in the study were Newton’s First Law, Newton’s Second Law, and Newton’s Third Law. There were eight questions that represented the concepts. Results reveals that most of teacher’s comments have didactogenic both men and women. There are five (5) men and four (4) women have didactogenic on Newton’s First Law, All participants on Newton’s Second Law, six (6) men and five (4) women on Newton’s Third Law. According to the results of this study, the man teachers have more didaktogenic than woman teachers. Incorrect answer can make teachers do more didactogenik than correct answer. This study recommands in order to analyze cause and impact of teachers didaktogenic, and how to decrease it.

**Keywords:** Teachers Didaktogenic, Newton’s Law

1. **Introduction**

Teacher quality is one of the fundamental factor that give many influences on students achievement $\left[1\right]$. Teacher ability on class management can improve students achievement $\left[2\right]$. On the contrary, “bad teacher” can decrease students motivation $\left[3\right]$. Teachers must have good conceptions when teaching on the class $\left[4\right]. $Teacher who do a mistake on teaching show negatif impact for students achievement $\left[5\right]$. However, many studies found that many teachers have mistakes on any concepts $\left[6\right]$.

When doing a mistakes on describing a concepts, teacher also create student misconceptions $\left[7\right]$. Students misconceptions has negatif influence on students motivations $\left[8\right]$. Not only teacher, textbook also can cause students misconceptions $\left[9\right]$ $\left[10\right]$. Because of that, a teacher must has good understanding about the concept, studying from the book or others reference.

Teachers mistakes has happened on almost the subject, especially in physics. On this subject, there are many teachers mistake even they have misconceptions, such as Newton’s Law$ \left[11\right]$, object’s moving $\left[12\right]$, simple pendulum $\left[13\right]$ and astronomy $\left[14\right]$. Its difficult to find teachers mistakes on physics, because subject or partisipants on many studies are not teacher. Most of them are just pre service teachers that from college environtment such as on study of optice geometry $\left[15\right]$ static electric $\left[16\right]$, nature of matter $\left[17\right]$, simple electric circuit $\left[18\right]$, electric current $\left[19\right]$, electric field $\left[20\right]$, Newton’s Law $\left[21\right]$, astronomy $\left[22\right]$ $\left[23\right]\left[24\right]$ and heat and temperature $\left[25\right]$.

The study of teacher mistake or misconceptions on phyics educations its just a few, because of an opinion that theacher has manage the concepts correctly $\left[26\right]$. Beside of that, the best method to describe teachers mistake is still not found. The method like diagnostic test, one tier $\left[27\right]$, two tier $\left[28\right]$ $\left[29\right]$, three tier $\left[30\right]$, four tier $\left[31\right]$, open ended questions $\left[32\right]$, and interview $\left[33\right]$ are not effective. Because, those method just used to pre service teacher and student, not to native teacher. Researcher think and worried that teacher are not cooperative when they know as a participant on the study. Because of that, the best method to describe teachers accidantally mistakes is needed.

On of the method that can use to describe teachers mistakes is ask them to assess students answer about any concepts $\left[34\right]$. In this method, teachers will don’t know that they are as a participant or subject on the study. This study apply this method, and ask the teacher to asses several problems with answers that maked by researcher. Teacher will write their conceptions about any problems that given. There are a possibility, teacher will doing accidantally mistakes. This accidanttally mistakes (on understanding and describing a concept) can cause student misconceptions. The term of this condition is called teachers didactogenic. Research question in this study are:

1. What is the type of phycics teacher didactogenics on force and motion?
2. How is physics teacher didactogenik based on gender?

**Didaktogenic and misconceptions**

Teachers can make an accidantally mistakes when teach any subject on the class. The accidantally mistakes can called teacher didactogenik. Didactogenik is an accidantally mistake that doing by writer or teacher when describe a concept and can make reader or student have misconceptions $\left[34\right]$. Altough, most of the Pre service teacher accidantally mistake are about s understanding and describing a concepts. Term of misconceptions is not used, because it has negatif sense for teacher or any professional program (writer, lecture, docktor, etc).

In physics, there are some study that found teacher and writer accidantally mistake. The accidantally mistake is unconsistently on predict $\left[35\right]$. On the third Newton’s Law, teacher didn’t write negative mark (-) when describing the formula $\left[36\right]$. On textbooks, “Ref $\left[10\right]$” found that any writers had done accidantally mistakes in electric current and magentic field that can create misconceptions. Misconception is a condition when someone or students have different conceptions that allowed by the scientist or professional in a field $\left[37\right]$. Term of misconception is also used to describe incorrect convictions about a concept based on th experience $\left[38\right]$. Misconceptions also have negative impact on students achievement $\left[8\right]$. Then, misconceptions is a conceptions that different with scientist and has negative impact on student achievement.

1. **Method**

This study is qualitatif research that focus on teachers accidantally mistake that repsresented by their comment on several physics problems. They ask to assess any several physics problems about force and motion. The comments of teacher become data in this study. Population in this study is all physics teachers on senior high school in six subdistrict Pontianak City. Total of the teacher cannot be determined, because not all the teacher has been record on Educational Official Pontianak. Just 58 teachers that record on this departement.

Purposive sampling is used on this study. It is non probability sampling, where the quantity of sample is not considered. In purposive sampling, sample that selected based on particular criteria $\left[39\right]$. Partisipant on this study was 12 physiscs teachers that represented six (6) subdistrics on Pontianak City. The criteria on this sampling was all the senior high school physics teachers from private or national school that teaching minimal one (1) year in six subdistrics.

Instrument of this study is a sheet of obeservation heading of teacher comments about several physics problem with answer. The instrumen was adapted from the study that doing by $\left[27\right]$. There are two (2) procedures of this study, planning and implementation.:

**Planning Phase**

The stages of this phase are (1) collecting the information about teachers didactogenik (2) Searching the question that will be adopt. (3) doing and answering the questions (4) Testing the validity of instrument (5) Testing the reability of instrument.

**Implementation Phase**

The stages of this phase are (1) asking 12 teachers to assess the several problems with answers about force and motion (2) analyze comments of the teachers (3) drawing the result of this study.

1. **Results**

Data was analyzed to describe teachers didactogenik about force and motion (Newton’s Law) based on gender. Table 1 show the number of men teachers who have didactogenik and table 2 women teachers. Every table shows teachers didactogenik on four concepts.

Tabel 1 Men teachers who have didaktogenic on every concepts.

|  |  |  |  |
| --- | --- | --- | --- |
| TeacherCode | First Newton’s Law | Second Newton’s Law | Third Newton’s Law |
| Item 3 | Item 4 | Item 5 | Item 6 | Item 1 | Item 2 |
| NH | 1 | 1 | 1 | 1 | 1 | 0 |
| AK | 1 | 1 | 1 | 0 | 1 | 0 |
| SM | 1 | 0 | 1 | 0 | 1 | 0 |
| HY | 0 | 0 | 1 | 0 | 1 | 0 |
| KS | 1 | 0 | 1 | 1 | 1 | 0 |
| RV | 1 | 0 | 1 | 0 | 1 | 0 |
| Total | 5 | 2 | 6 | 2 | 6 | 0 |

Tabel 2 Women teachers who have didaktogenic on every concepts.

|  |  |  |  |
| --- | --- | --- | --- |
| TeacherCode | First Newton’s Law | Second Newton’s Law | Third Newton’s Law |
| Item 3 | Item 4 | Item 5 | Item 6 | Item 1 | Item 2 |
| RN | 0 | 0 | 1 | 1 | 1 | 0 |
| RS | 1 | 1 | 1 | 0 | 1 | 0 |
| LS | 1 | 0 | 1 | 0 | 1 | 0 |
| ET | 1 | 1 | 1 | 0 | 0 | 0 |
| SR | 1 | 1 | 1 | 0 | 1 | 0 |
| NU | 1 | 0 | 1 | 0 | 0 | 0 |
| Total | 5 | 3 | 6 | 1 | 4 | 0 |

**First Newton’s Law**

On first newton’s law, item 3 and 4 there are five (5) men teachers have didaktogenic. Two (2) teachers have incorrect conceptions and three (3) teachers give unconsistence comment. There are seven (7) comments show didaktogenic. One of the comment is “term of stop must be described, indeed the plan will stop moving if the machine is turned off”.

There are three (3) teachers give unconsistence comment, show that they are hesitant to write the concept of first newton’s law. It can cause student misconceptions. For example, item 3 a teacher said “this objek will stop moving, it’s caused by the machine is turned off and this object stay on the space far away from gravitation force”. His impression shows that force is a property of an object, an object has force and when it runs out of force it stops moving. But, on item 4 shows that his impression contrast with their impression on item 3. They think that although an object lost of the force, they still move.

On the same concepts, therea are five (5) women teachers have didaktogenic. Three (3) teachers have incorrect conceptions and two (2) teachers give unconsistence comment. There are eight (8) comments show didaktogenic. One of the comment is “when an object lost their force, this object will stop immediately because (∑F=0)”. There are two (2) teachers who give unconsistence comment. One of the comments shows that when an object lost their force, this object will stop immediately (item 3), but on another (item 4) their impression show that it is not necessarily the resting object lost their force.

Based on the result, on first newtons’s law, the number of teachers didaktogenic from men and women teachers are same (five men teachers and five women teachers). But, there is a different thing from the number of incorrect conceptions and unconsistence comments from men and women teachers. The teachers who have incorrect conceptions think that “when an object lost their force, it will stop moving immediately”.

**Second Newton’s Law**

On second newton’s law, item 5 and 6, all participants (six men teachers) has didaktogenic. Two (2) teachers have incorrect conceptions and so do teachers give unconsistence comment. There are eight (8) comments show didaktogenic. Most of participants think that “the motion of an object is always in the direction of the net force applied to the object”. One of the comments that contain didaktogenic is

“The diagram is incorrect, it must be:”

FAndi

ffriction

A

B

v

From this comment, we know that its impression show that the motion of an object is always same with the direction of the net force.

There are two (2) teacher give unconsistence comment. For the example, item 5 “the motion of the ball is slowed down by friction force and after move on several time, the ball stop at B, and the diagram is

A

B

ffriction

FAndi

v

From the diagram, we know that the teacher think the direction of the net force same with the direction of an object. But, on item 6, his/her impression show that the direction of the net force is not always same with the direction of an object.

On the same concepts, there ara six (6) women teachers have didaktogenic. Most of them give unconsistence comments and one (1) teacher has incorrect conceptions. There are seven (7) comments show didaktogenic from women teachers. One of these comments is “Andi give the force to the ball that is bigger than the friction force, so the ball move to B and the diagram is:

FAndi

A

B

Almost the participant (5 women teachers) give unconsistence comments. Thir impression is the direction of the net force always in the direction of the motion of an object (item 5). But, on the another (item 6) they think contrast from before. Based on the result, all participan has didaktogenic in second newtons’s law. But, there is a different from amount of teachers incorrect conceptions and unconsistence comments. Teacher who have incorrect conceptions think that “the motion of an object is always in the direction of the net force applied to the object”.

**Third Newton’s Law**

On third Newton’s Law, item 1 and item 2, all men teachers has didaktogenic. They have incorrect coneptions about this concepts. They think that large objects exert a greater force than small objects and agree with the ansewr that given to them although the answer describe incorrect concepts.

On the same concepts, there are four women teachers who have didaktogenic. They have incorrect coneptions. One of the comments is “based on second newtons law, mass is comparable with force. So, the force exert by Andi is greater than the force exert by tube”

Based on the result, there are the different number of men and women teachers that have didaktogenic about this concepts, six (6) men teachers and four (4) women teachers. The didaktogenic about third newtons law from all participant is large objects exert a greater force than small objects

1. **Discussion**

This study aim to describe physics teachers didaktogenic based on gender about force and motion. Data was obtained based on teachers comments about several physics problem with answer that maked by researcher. In this study, three concepts that investigated are first newton’s law, second newton’s law and third newton’s law.

There are five (5) men teachers and so do women teachers have didaktogenic on fiest newton’s law. They think that Force is a property of an object.  An object has force, and when it runs out of force it stops moving. “Ref. $\left[40\right]"$ found similar result about teachers conceptions, their impression is motion is force, no motion no force. It cause students misconceptions $\left[38\right] $because the teachers accidantally mistakes or teachers didaktogenic.

On the second newton’s law, all participant have didaktogenic. They impression is the motion of an object is always in the direction of the net force applied to the object. This result is same with $\left[41\right]$ and $\left[42\right]$. Teachers think the direction of the net force is same with the direction of an object motion. It is caused by the impression about intrinsic force that make objeck alway move based on the direction force act on the object $\left[27\right].$

On the third newton’s law, there are six (6) men teachers and four (4) women teachers have didaktogenic. They impression is large objects exert a greater force than small objects. It is similar with $\left[42\right]$ who found same teachers conceptions is like that.”Ref. $\left[44\right]$” also found 75% from the sample (teachers) that think large object exerts greater force.

There are some reasons why teachers have didaktogenic.”Ref. $\left[27\right]" $said that because of the immpression of active force or impetus. The immpetus can make an object always move. The teacher is confused to decide a pair of force. As an addiotional, he said that interaction factor from the example of event, such bigger object will show greater force. Teachers also think that force is property of an object that appear from the interaction of two object $\left[45\right]$ and often associate a concept to another concepts $\left[46\right]$. Other reason is teacher feel difficulty to determine the direction of force that different with the direction of an object $\left[41\right]$. Teacher also dont know about the meaning of term net force $\left[46\right]$.

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