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Fotonovela with Cognitive Conflict Approach as Media to Discloses The Easy and Difficult Remedied Misconception

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Abstract

This research is attempted to identify the students' misconception on the concept of straight-line kinematics using *Certainty of Response Index* (CRI) and interview. From the results of data analysis shows that students have misconceptions related to the concept of straight-line kinematics. The use of the *Certainty of Response Index* (CRI) model test in this study is very helpful for the researcher to know the misconception experienced by the students. Implementation of fotonovela media with cognitive conflict approach can decrease the proportion of students experiencing misconception on the concept of kinematics of straight motion, ie from 41.38% to 26.57%. Thus there is an increasing proportion of the decline in the number of students who experienced misconception as much as 14.81%. Based on the result of pre-test and post-test can be known that concepts on the material kinematics straight motion that easy and also difficult tobe remedied.

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INTRODUCTION

Children generally have knowledge of physics called preconceptions (the initial concept) before entering the class (Rositasari et al, 2014). Teachers must know the initial concept (preconceptions) that exist in students (Setyadi & Komalasari, 2012) because the preconceptions of the students are not necessarily true and in accordance with real experience. Correct understanding of a matter is still often mixed with misconceptions and allegations (Aviyanti & Utama, 2011). In this conditions, if new concepts are directly incorporated into the student's cognitive structure there will be a mixing of old concepts (which are not necessarily true) and new concepts that may also not be properly understood to make misconceptions that lead to misconceptions (Khotimah et al, 2014). Misconception is a concept that different from that of scientists. Misconception is one of the most important factors that prevent students' learning significance (Janah, 2017). One of the most common concepts of physics is a misconception of straight-line kinematics. Mufarridah (2015) stated that misconceptions of straight-line kinematics experienced by 20% of the tenth grader sciences 2 the state senior high school 2 Bontang. Mukti et al. (2010) which stated that 7.2% concept of straight-line kinematics material is written in a potentially misconceptions handbook. Mudjiarto (2005) stated that class of X SMA in Bandung have misconceptions of straight-line kinematics above 10%. Pujianto et al. (2013) found that 50% of the students' of straight-line kinematic conceptions of one high school in Palu lead to misconceptions.

The material of straight-line kinematics is the initial material learned in the tenth grade so that it becomes the basic material for the students before studying other physics materials. The misconceptions of straight-line kinematics must be remedied because misconceptions do not only affect the concepts that being studied, but also influence the concepts to be studied thereafter because the concepts in physics are interconnected with one another (Kamilah & Suwarna, 2016). The technique used to track students' misconceptions is by multiple choice test using Certainty of Response Index (CRI) model. CRI can describe students' beliefs (responses) to the truth of the response alternative (Haris, 2013). The next step is to conduct an interview. Interviews were conducted to reveal the students' reasons for answering the given question (Fauziyah et al, 2016).

The solution to overcome misconceptions is to provide remediation. Remedial misconceptions can be done using a medium but the development of various types of media and teaching material are common and often used in the form of textbooks or modules with many characteristic contains writing or explanation with the sentence and slightly accompanied the image tend to make learners bored and less motivated (Puspitorini et al., 2014). Teachers as facilitators and motivators are required to present interesting material for students, this could be new sentence that explain one of the way to make student interested is using comic. Comic selected as a medium of learning because the comic is one of the popular reading teens (Ani, 2012). Comics as learning materials in learning can improve students' conception of the material so that the learning result is complete because there is motivation that arises from within the students to understand the deeper matter (Zain et al, 2013). Therefore, if the comic is used in learning process it will be an interesting learning media but this comic media has a weakness that is not all teachers can make comics, the process of making comics takes a long time and the comic images are still abstract (Rahayu et al., 2013).

Media that resembles comics or pictorial stories using photographs instead of illustrations one of them is fotonovela media (Kirova & Emme, 2008). Fotonovela uses images with high realities of photographs according to their original state so they are very representative and suitable to present a fact. The use of this medium should be guided by the facilitator in the discussion process (Nurhaida et al, 2010). Fotonovela in this study used a cognitive conflict approach as a plot of the story. The

cognitive conflict approach can enhance conceptual understanding and reduce the misconception and incomprehension of student concepts (Sukariasih, 2016; Adnyani, 2013). Photographs in fotonovela with cognitive conflict approach displays facts in the form of demonstrations, natural occurrences or experimental data that contradict students' incorrect conceptions and theories. Furthermore, students will face conflict situations that can change their cognitive structure. The correct change of cognitive structure is not easy, in this case it takes the interaction between teachers and students to train the correct concepts in the use of fotonovela cognitive conflict approach. Ultimately, students can evaluate for themselves conceptions that need to be improved and which should be changed.

METHOD

This study is research and development method. The preliminary research stage is done by tracking misconceptions begun by asking students to do the pretest as a misconception identification stage. Identification of misconceptions used multiple choice test shaped CRI. CRI is the test model used to describe students' beliefs (responses) to the answers to the answers (Rahmawati et al, 2017). Based on the tabulation of data for each student and for each item of test questions guided by the CRI multiple choice test, students with misconceptions can be identified.

The next step is to conduct a clinical interview of some students to understand the deep misconception. Interview guides are based on student responses in answering tests and are intended to track students' consistency of answers. Through interviews students can raise the reasons for their choice of choices based on the concepts they already have (Taufiq, 2012). After the identification of misconceptions, further remediation of misconceptions experienced by students using fotonovela media cognitive conflict approach. At the end of the learning is given post test misconception of students on the concept of straight-line kinematics and then the data obtained is tabulated to be analyzed related to changes in understanding the concept and effectiveness of fotonovela media cognitive conflict approach in remediating student misconception.

RESULT AND DISCUSSION

Physics learning media developed in the form of fotonovela cognitive conflict approach. This instructional media is a book that contains the materials contained in photos and text, illustrations, graphs, and quizzes. The steps of making this media as follows:

Media creation design

Design of fotonovela media development with cognitive conflict approach used clear plan table format and goal setting. The media creation plan is shown in Table 1.

Table 1. Design of Fotonovela

Plan Design	Goal Setting
What will be told in fotonovela	Learn to reference framework
Who are the characters of the story	Rofiq (teacher class), Ismi, Rahma and Cahyo
When is the time period presented in this story	Morning
Where the events are told happen	In the classroom
Why take this story	In order for students to be motivated to learn the terms of reference

How to order the story	• Beginning from physics learning activities in class when taught by Mr. Rofiq • Mr. Rofiq asked his students whether two people on a pickup truck were silent or moving? • Students respond

Making storylines and fotonovela characters

Preparation of the storyline and character characters provide an understanding of the storyline fotonovela by setting the story line that uses cognitive conflict approach and the message will be delivered through the media fotonovela. The next step is to compose the characters of characters who will become player fotonovela.

Making *Storyboard*

Making scenarios that are made into storyboard (word balloon) tailored to the material to be delivered. The dialog word balloon and the narrative text that created must be short and easy to understand and in accordance with the displayed scene image. Table 2 shows the storyboard format fotonovela.

Table 2. Fotonovela Storyboard Format

Serial number of images	Picture Scene	Word Balloon Dialog	Narrative Text (Speaker)	Location Settings
1	Mr. Rofiq sit in front of the class	• Mr. Rofiq: Assalamu'alaikum warahmatullahi wabarakatuh		In front of the class
2	The students answered their greetings		Wa'alaikum salam warahmatullahi wabarakatuh	In each seat
3	Mr. Rofiq brings physics books	• Mr. Rofiq: Today entered all?		In front of the class

Photo Shoot

The next step is to do a photo shoot with the cast. This capture uses digital cameras with video techniques. The technique of video can facilitate the researchers in choosing the appropriate scene with the storyline. The video capture technique was using screen capture from gome player shown in Figure 1.

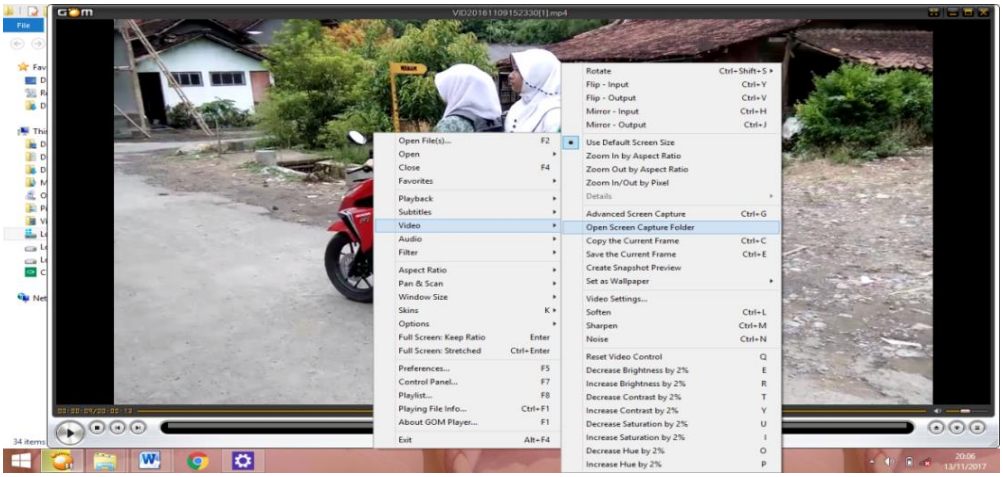

Figure 1. Shooting from Gom Player

Preparation of Fotonovela

Computerized fotonovela compilation with comic life deluxe 1.3.5 program. This program provides several facilities in making fotonvela. The photos are directly inserted into the frames already available on the page. Frames inserted in the page match to the storyboard. Next put the word balloon and narrative text on each photo based on the storyline as shown in Figure 2.

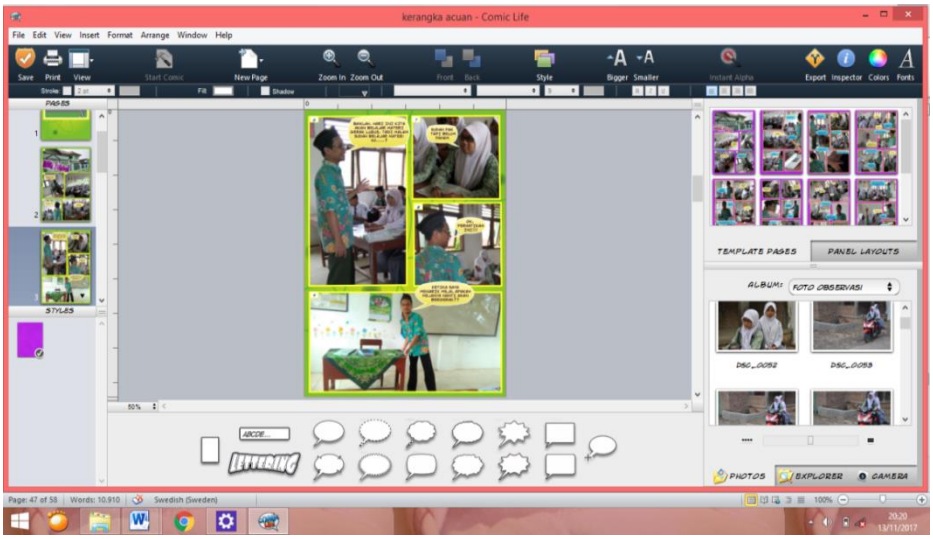

Figure 2. Fotonovela Making with Comic Life.

Photo Selection

Digital cameras make it easy to create good images, but sometimes there are images that are less quality. This is why we should take some photos for a scene and do a selection of photographs or photos taken in the video. After that the photo is arranged in order of storyboard.

Editing

Fotonovela then be changed to image. The type of image is JPEG because the resolution is larger than other types, so that when enlarged the picture will not break. Once changed in JPEG then it were editted by photoshop as shown in Figure 3.

Figure 3. Editing Using Photoshop

Printing

Once edited use photoshop then fotonovela is ready to print. Printing using A4 sized paper cut into two pieces. Diagram 1 presents the percentage of student misconceptions level on the concept of straight-line kinematics on each question in sequence from concept questions number 1 to number 15 on pre test I, pre test II, post test I and post test II.

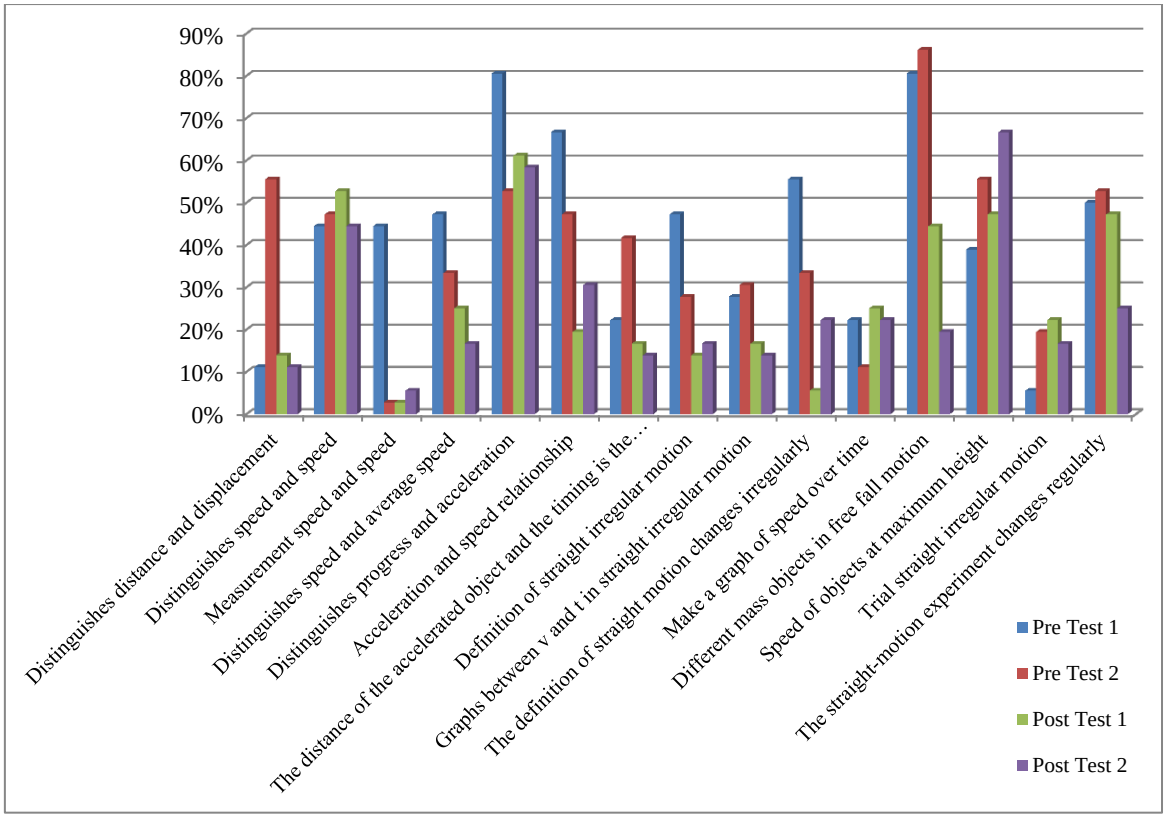

Diagram 1. Percentage diagram of misconception of each question

Provision of treatment in the form of learning process using fotonovela cognitive conflict approach as a medium of learn to remediate student misconceptions, giving a positive influence to students. Data of post-test result that students' misconception still exist in all sub material but with percentage smaller than before that is average 41,38% become 26,57% and decreasing equal to 14,81%. The percentage of physics concepts in kinematics motion straight that easy and difficult to remediate on each item based on diagnostic and interview tests: The concept of distance and displacement. Misconception of distance and displacement concept is 38,89% while after remediation equal to 12,5% and decrease 26,39%. The concept of speed and velocity. Misconception about the concept of speed and velocity is about 45.83% while after remediation became 48.61%. On this concept experienced an increase of 2.78%. The concept of measuring the speed and velocity of an object. Misconception about the concept of speed measurement and the velocity of an object is about 23.61% while after remediation became 4.17% and a decrease of 19.44%.

The concept of speed and average velocity. Misconceptions about the concept of speed and average velocity is about 35.33% while after remediation became 20.83% and a decrease of 14.5%. The concept of acceleration and progress. Misconceptions about the concept of acceleration and progression is about 55.57% while after remediation became 27.77% and a decrease of 27.8%. The concept of the relationship between acceleration and velocity. Students experience misconceptions about the concept of the relationship between acceleration and velocity is about 56.94% while after remediation became 25% and a decrease of 31.94%.

The concept of distance of the accelerated object and the same time. Misconceptions about the concept of distance of the accelerated object and the same time equal to 31.94% while after remediation became 15.28% and the decrease of 16,66%. The concept of Regular Straight Motion (GLB). Misconception about the concept of GLB is 37.5% while after remediation became 18.67% and a decrease of 18.83%. The chart of concept between v and t on a regular straight motion. Misconceptions about the concept of graph between v and t on a regular straight motion of 29.17% while after remediation became 15.28% and a decrease of 13.89%. The Concept of Motion Straight Changed Regularly (GLBB). Misconceptions to the concept of GLBB is about 44.45% while after remediation became 13.89% and a decrease of 30.56%. The concept of a graph velocity versus time. Misconception about the concept of time-velocity graph is 16.65% while after remediation is 23.61%. In this concept experienced an increase of 6.96%.

The concept of free falling motion. Misconceptions to the concept of Free Fall Movement is about 83.33% while after remediation became 31.94% and a decrease of 51.39%. The concept of speed and acceleration of the object when it reaches its maximum height. Misconceptions about the concept of speed and acceleration of objects when reaching a maximum height is about 47.22% while after remediation became 56.94% In this concept experienced an increase of 9.72%. The concept of uniform straight motion experiments. Misconceptions for a regular straight-motion experiment were 12.5% while after remediation became 19.44% and a decrease of 6.94%. The concept of straight motion changes irregularly experiments. Misconception of straight-motion experiments was changed regularly by 51.39% while after remediation by 36.11% and a decrease of 15.28%. Furthermore, the change of students' concept before and after remediation is shown in Table 3.

Table 3. Student Concept Changes Before and After Remediation

Material Concepts	**Conception Change**	
	Before Remediation	**After Remediation**
1) Distance and displacement	(a) Distance is equal to displacement	(a) An object moving from the starting point to the end point and returning to the starting point again then the total distance is zero

2) Speed and velocity	(a) The speed is equal to the velocity	(a) If two objects are at a distance of s and at the same time both approach each other. In the middle of the road they passed each other so they both had the same velocity
	(b) A speedometer is used to measure velocity	(b) A speedometer is used to measure velocity
	(c) Average speed is equal to average velocity	(c) How to find the average speed and velocity equal to the distance divided by time
3) Acceleration	(a) Progress equals acceleration	(a) If two objects are running in opposite directions with the same speed and time then when passing in the middle of the acceleration path they are the same. (b) When there is object A and object B move with the same progression and time object B is greater than at object A then distance of object A is bigger than object B
	(b) The object in silence has zero acceleration	(c) If a car that is at rest has zero speed then its acceleration is also zero.
4) Regular Straight Motion	(a) Regular straight motion is a straight motion with the distance only determined by time	(a) Regular straight motion is the motion of an object in a straight-line path with constant acceleration. Students assume that the zero is equated to a constant (fixed). (b) Regular uniform motion having a constant velocity is indicated on a band with a tight drip spacing and then stretchable
	(b) The regular straight motion graph is shown with horizontal horizontal (a-t) relationship graph and relationship graph (v-t) shown with upward graph	(c) The relationship between x, v, and a on t in the regular straight motion is the time-position graph (x-t) with a linear horizontal line in the direction of that time is a regular perpendicular motion graph
5) Straightforward Changed Motion	(a) The uniformly perpendicular motion is a straight-line motion with the same velocity at all times	(a) The straight motion of an object with a constant acceleration is an uniformly straight motion (b) The uniformly perpendicular motion experiment is shown only on the bands with a dripping distance of oil droplets and then stretching because the acceleration is constantly

		changing while the tape with the oil droplet spacing then closes together is not an uniformly perpendicular motion experiment
	(b) Graph of the relationship between the distance to the time that is uphill and then horizontal	(c) The time-velocity graph (*v-t*) if the graph rises always means increasing its velocity
6) Free Falling Motion	(a) In the event of free fall, objects with a larger mass fall faster than objects with a lighter mass	(a) objects with greater mass will reach the ground first in a vacuum, and objects lose mass when inside a vacuum tube
	(b) An object thrown up has zero acceleration at its highest point	(b) When an object is thrown up it at the highest point has zero acceleration

CONCLUSION

Student misconceptions of straight-line kinematics can be reduced using fotonovela media with cognitive conflict approach, but some other concepts still remain wrong until the end of the remediation activity. A CRI-type diagnostic test can be used to identify easy and difficult to remediate concepts. The decrease of misconception by 14.81% indicates that fotonovela media with cognitive conflict approach can be used to uncover easy and difficult to remediate misconceptions.

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