The influence of intuition and communication language in generating student conceptions

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Abstract. This research aims to describe the influence of intuition and communication language in generating student conceptions. The conception diagnostic test is used to reveal student conception. The diagnostic test results described and communication language profiled by giving instruction to students to make sentences using physics quantities. Sentences expressed by students are reduced and profiled potential effects. Obtained information that (1) Students generalize non-scientific experience (based on feeling) into the physics problem. This process caused misconception. Communication language can make the students difficult to understand the concept because of the difference meaning of communication and physics language.

1. Introduction

Conception be seen as an idea of a fact or personal beliefs and develop through experience [1][2]. Conception she or he has, based on experiences in everyday life, instruction, media and so on[1]. conception can develop when making predictions about the situation ("What would happen if ...?") or to explain a phenomenon[3]. Idea helds before instruction is called preconception [4]. Physics concept has been recognized by humans since they first interact with nature. The five senses of human beings made observations of nature. The process of human communication with nature producing experience which is the early foundation of knowledge. The resulting experience is very powerful in influencing the human conception of reading a physical event. Conception arises from experience, or other interaction that involves feelings known by intuition.

Other paragraphs are indented Intuition is explained simply with the rules of "More A-More B" dan "Same A-Same B" [5]. On motion of free fall, for example, children and many adults claim that full Matchbox will hit the ground first in comparison with Matchbox partially filled Matchbox. However, when experiments do, it is clear that the box reaches the ground at the same time, this example is the application of the rules "More A-More B" [5] . Examples of applications ""Same A-Same B" is comparing two water tube, the tube is heated, while the other is not heated [5]. Children and many adults claim that because of the volume of the tube A increases, the weight of A is also increasing. Students equate the amount of weight with volume. Intuition is something that is clear and obvious, or easily accessible, and does not require further evidence, that argument is very simple and not challenging [6]. The term intuition is defined as define intuitions as mental representations of facts that appear to be self-evident [7]. Intuition as form of perception [6]. Intuition is a form of a clear

perception of an event, without the need for further evidence. Generalizing an event led to the strengthening of intuition. Intuition can produce the right decision or not. Intuition tend to promote feelings of the decision making process. Intuition is the instinct of human beings coming from within him so that every individual has the potential to use intuition to make decisions. In physics, intuition was first used by philosophers to read natural phenomena.

Intuitions that arise from the students became the subject of the research in this paper. The student experience (within the family and the community) would provide a major influence on the intuition that is raised by the students. By knowing the student experience that led to intuition, the misconceptions can be reduced. In addition through the experience of everyday life, conception can also arise from the learning experience at school and learning resources. The learning experience at school must involve interaction with the component (1) source of teaching, (2) lecturer, (3) friends, and (4) family and community. The interaction of two or more components can also occur and can lead to the conception of the student.

Interaction is certainly involve passive and active communication involving language. Sources of teaching has an important role in generating student conception. The resulting conception can be correct or incorrect, depending on the validity of the source and the ability of students to represent concepts that come from various sources. The development of technology, was able to create a new environment, which is a social networking environment. These developments have an impact on the interaction with teaching resources, which was previously one-way turn out to be two-way, with the involvement of a friend, even lecturers.

The use of language is important, both written and verbal. By using the language, the interaction between the source and the recipient can be established. Understanding the language between the source and the recipient of the key to successful transfer of knowledge and information. In physics, the mathematical language used to represent the concept. The use of the language of mathematics must be consistent and provide valid information, since it has a clear meaning and definition.

To represent the language of mathematics, the language of communication played a role in the birth of the conception of physics. Communication language must be obtained from interaction with professors, teachers, friends, family, and community. Language communications obtained from interaction with the community become important observation in this paper. Physics, like other natural sciences, involves observing nature, measure observation, and synthesize the results with theory, all activities inevitably involves oral and written communication in everyday language [8].

Communities and families is one of learning resources directly obtained by the student. The proportion of students interact with the family and community using the everyday language, of course, greater than the interactions that occur in the classroom. The use of everyday language a bit much also involve physical quantities such as speed, distance and force. Clarification of the use of Physical quantities in the communication can provide information about the causes of conception. based on exposure that have been presented, it is necessary to described the influence of intuition and communication in generating student conception.

2. Methods

in this research, the steps are as follows: (1) the student is given a diagnostic test that can reveal student conception. The tests used are added level of certainty and argumentation to reveal the involvement of intuition in generating conception, this test used to reveal "More A-More B" misconception (2) To determine the effect of the language of communication, students are asked to make sentences using physical quantities, and provide an explanation of the meaning of physical quantities used. Physical quantities that are used in a sentence, among others; position, distance, displacement, speed, velocity, gravity, the speed of gravity, gravity, mass, and weight. Students are also asked to write down the difficulties found at the time of composing sentences. Unstructured interviews were also conducted to multiply the depth of student conceptions. Research conducted on students of sixth semester 2016/2017 fulfilled. research sample number is 16 students. The sentence

made by the students profiled as a starting material interview. Interviews conducted only on students who made the unusual sentence. Reduction is carried out to obtain a profound conclusion.

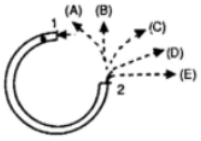
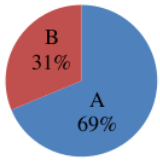
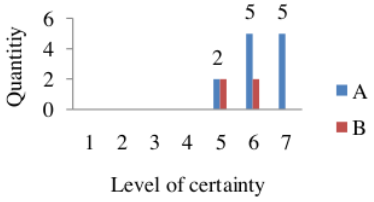
3. Results and discussion

The results presented in two parts; the first part describes the results of the diagnostic test and the description of the conception that gives rise to intuition, the second part describes the communication language written by the students. The concepts discussed in the second part are the concept of speed and velocity, acceleration, and force.

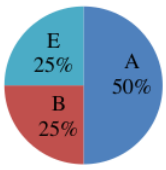
3.1. Diagnostic Test Description

The selected diagnostic test used the FCI test [9] number 10, 23 and test questions from [5] modified with a degree of certainty under the following categories: Tests designed to diagnose misconceptions caused by intuition use. The student's answer profile on each question is as follows: (7) certainly, (6) Almost certainly, (5) Partly certain, (4) Most guess the answer, (1) Overall guess the answer. Students who chose the answer did not agree with the scientist's agreement with the level of certainty 7, concluded experiencing conception. The students are asked to write an argument for their choice of answers. Profile of student answers and level of certainty are described in table 3.1.

Table 3.1 Profile of student answers and level of certainty

Diagnostic Test 1
A ball enter the chanel at “1” and exit at “2”. Which of the path representations would most nearly correspond to the path of the ball as it exits the channel at “2” adn roll across the table top.

Percentage of answer choices 
Quantitiy of the level certainty 
Diagnostic Test 2
Two bottles, one full of water, and the other Half of it, are held at the same hight (15 m) above the ground. In the same manner. They are both dropped at a certain point in time. Based on this condition: A. The full-filled two times faster than the half-filled bottle. B. The half-filled two times faster than the full-filled. C. The full bottle faster than the half-filled bottle but less than two times. D. The half-filled bottle faster than The full-filled but less than two times. E. The full-filled bottle has the same time as the half-filled bottle.

Percentage of answer choices



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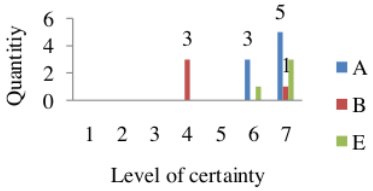
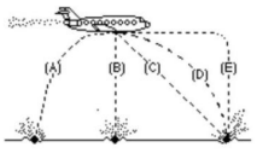
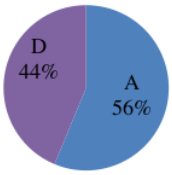


Diagnostic Test 3



A bowling ball drops accidentally from the cargo plane when the plane flies in a horizontal direction (Notice Pictures).
Which option best describes the ball path after leaving the ship viewed from an observer dwelling on the surface of the earth?

Percentage of answer choices



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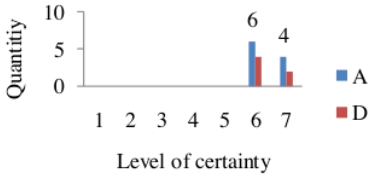
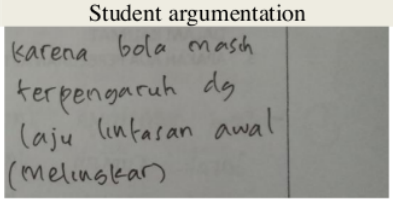
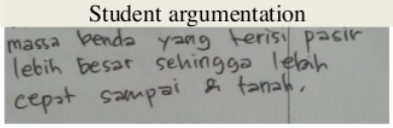
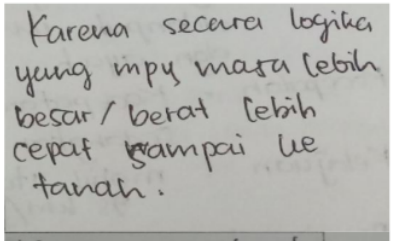
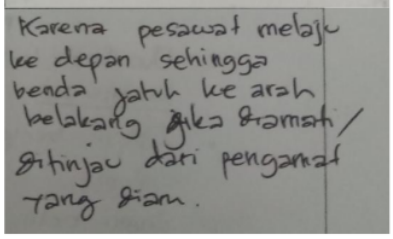
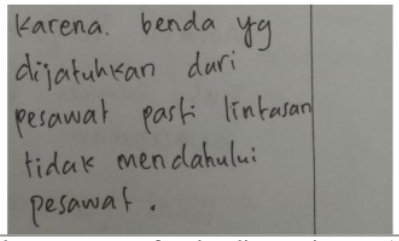


Based on the indicators set out in the methods section, we describe the findings of misconceptions. Diagnostic test 1 shows that 69% of students have chosen answer A with five students choose level certainty 7. Diagnostic test 2, there is 50% have chosen answer A with five students with level certainty 7, and 25% students have chosen answer B, one student with the level of certainty 7. In the diagnostic test 3, found 56% of students have chosen answer A, four students with level of certainty 7 (Table 3.1). Students' argumentation profile presented. A sample student argumentation profile described in Table 3.2.

Table3.2 Examples of student arguments

No.	Student argumentation	Description
1.		"Because the ball is still affected by the initial (circular) trajectory." Explanation after the clarification: The student has a conception that the initial trajectory (circular shape) affects the ball path after that.

No.	Student argumentation	Description
2.	 	"The mass of objects (bottles) filled with sand is bigger, so more quickly to the ground." "Because logically having a bigger / heavier period gets to the ground." Explanation after the clarification: Students have a conception of objects that have a larger mass will be faster.
3.	 	"Because the plane is moving forward so that the object falls backward if observed from a silent observer." "Because the object dropped from the plane must pass the path does not precede it." Explanation after the clarification: Students have a conception with full confidence that objects that fall from the plane will not fall in front of the plane, would fall behind it.

Student argument for the diagnostic test 1 (Table 3.2) gives information that the initial track conditions affect the motion of the object. Intuition arises because the students are less appropriate in generalizing. For example, if we are accustomed to riding a motorcycle when leaving from home to campus it will feel heavy when leaving from home to campus by foot. The role "Same A-Same B" appears in this condition. The lack of precise in generalizing becomes the forerunner to the emergence of misconceptions. The students' argument for diagnostic test 2 gives information that students have the conception that a bigger mass of the object more faster than a small mass. The rules of "More A-More B" appear in this case, the experience becomes one of cause misconceptions. The interview results provide information that students have more painful experiences of falling objects with a bigger mass than a small mass.

To overcome this misconception, The mathematical language of Newton's law of gravity gives equation:

$$g = G\frac{M}{R^2} \quad (1)$$

If the object is at the height (r) of the earth's surface , equation (1) becomes:

$$g = G\frac{M}{(R+r)^2} \quad (2)$$

Given the values of $G = 6.674 \times 10^{-11}$ Nm^2/kg^2, $M = 5.9742 \times 10^{24}$ kg, and R = 6.378,1 km obtained gravity acceleration as shown in Table 3.3

Table 3.3 Acceleration of gravity for r = 10 - 100000 m

r (m)	*g (m/s^2)*

r (m)	*g (m/s^2)*
10	9.80
100	9.80
1000	9.80
5000	9.79
10000	9.77
50000	9.65
100000	9.50

Up to 5000 m, gravitational acceleration tends to be constant (9.8 m / s2). Based on equation (2) the mass of the bottle does not affect, so the travel time of both bottles is the same t.

$$t = \sqrt{\frac{2h}{g}}. \quad (3)$$

The student argument about diagnostic test 3 gives information that the falling object from the plane is unlikely to fall in front of the plane, must fall behind it. This conception arises because the student positioned the reference point as himself, not the observer on the earth. Experience also plays a role in the rise of this conception. For example one of the students mentioned that once dropped a book while riding a motorcycle that was speeding, the book fell behind the rider. This experience is used as a basis by students to strengthen the concept. Limitations Students in illustrating the events in the test matter correctly become the initial problem, then generalizing the experience that is less in line with the problems posed causing misconceptions.

3.2. Section Create sentences

In this section will be described some sample sentences made by students, and used in everyday life. Students are required to make sentences with basic words displacement & distance, speed & speed, acceleration, and style. Examples of sentences made by students are described in Table 3.4.

Table 3.4 Sentences made by the students

Communication language (sentences made by students)	Description
Bahasa: “Saya pindah kosan satu bulan yang lalu” In English: "I moved away one month ago" Bahasa: Jarak dari kampus ke rumah saya 75 km In English: Distance from campus to my house is 75 km	The word "move" and "distance" (In "bahasa" displacement have the basic word “pindah” and other form “perpindahan”) in physics have the same meaning, ie change of position and length of track. The use of language communication can be used to strengthen the concept of physics. Misconceptions are less arise from it
Bahasa: Dari rumah ke kampus saya mengendarai sepeda motor dengan kecepatan 60 km / jam In English: From home to campus I ride a motorcycle with a speed of 60 km / hour Bahasa: saya “ngelaju” dari ponorogo ke kampus In English:	The concept of velocity commonly used in everyday communication, but in its use, the term speed is seldom used. In the communication language, the terms of speed and velocity are equated. In the local language, there is a word that is close to the speed "ngelaju" (local language) but has a different meaning to the speed. When viewed from its application, the language of communication will make it difficult for students to understand the concept of speed and velocity. If students feel the concept of speed and velocity are

I went from ponorogo to campus	the same, the misconception can arise.
Bahasa: Waktu di sma saya tidak masuk kelas akselerasi In English: When I was in high school I was not in an accelerated class	Akselerasi dalam bahasa komunikasi tidak berbeda dengan bahasa fisika.
Bahasa: Gaya berpakaian orang barat berbeda dengan orang indonesia In English: Western dressing style is different from the Indonesian people	In the communication language, the force associated with the style, design of certain clothing and maybe culture.

Not every language used in communication has the same meaning as the language of physics. Student difficulties in understanding the concept of physics can arise because of this factor. Introducing the language of physics needs to be emphasized in every lesson. This description is preliminary information and will be researched and explored in more detail. Misconceptions may arise when less appropriated generalizations are made, such as equalizing speed with speed.

4. Conclusion

It can be concluded that not all incorrect conception are misconceptions. Misconceptions arise because students generalize experiences that involve feelings with the reviewed physical events. The rules of "More A-More B" and "Same A-Same B" provide clear limits on misconceptions. In identifying misconceptions not enough by looking at the incorrect answers, the use of appropriate diagnostic tests, deeper information is needed to identify the misconceptions. Interviews are the most accurate method for identifying misconceptions, but they take a long time.The diagnostic test of two tiers (Table 1.1) comes with a brief argument to be an alternative solution.It is found the meaning of words in different communication languages with a potentially inhibiting physics language In understanding concepts. Misconceptions may arise when students generalize a language of communication that has a different meaning from the language of physics.Increasing research required on this topic.Instructional development to uncover misconceptions has been widely practiced [10-14]. This study is expected to help other researchers in categorizing misconceptions.

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