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Facilitating of fourth grade students problem solving skills on gravity Y Gumala<sup>1\*</sup>, A Suhandi<sup>1,2</sup>, E Syaodih<sup>1,3</sup>, B Maftuh<sup>1</sup>, N Hermita<sup>4</sup> and A Samsudin<sup>2</sup> <sup>1</sup>Program Studi Magister Pendidikan Dasar, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung 40154, Indonesia <sup>2</sup>Departemen Pendidikan Fisika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No.

229 Bandung 40154, Indonesia <sup>3</sup>Departemen Pendidikan Guru Anak Usia Dini, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung 40154, Indonesia <sup>4</sup>Prodi Pendidikan Guru Sekolah Dasar, Universitas Riau, Pekanbaru, Indonesia \*yosigumala@student.upi.edu Abstract. This research determinations to designate students' Problem-solving skills on gravity toward elementary level through experiential learning.

The indicators of problem-solving skills applied in this research were the indicators definite to the problem-solving skills on impulses and attractions. A descriptive-qualitative design has already been fulfilled to collect data from fourth-grade elementary students' in one of school in Bandung Barat Regency (41 participants: 9-10 years old). The instrument which is developed formed essay with the interview process.

The result shows that every characteristic of problem-solving skills has been developed and described such as identification, arguments hypothesis, analysis synthesis and alternate solution. To summarize, the experiential learning is able to designate the 4th-grade elementary students' problem-solving skills on force and changing. 1.

Introduction It is important to make children who preserve up with change, have critical

thinking, are creative, find operative solutions to the problems that they appear and underwrite to the humanity them conscious in. This will be conceivable through making children gain problem-solving skills at an early age. As a single of the proficiency, which persons essential throughout their lives and they need to increase it from early ages, problem-solving has also been preserving its implication at the existing time.

It is specified that the education of a problem-solving skill condensed to the primary school students as from young ages, has been touching, constructively, their problem-solving skills throughout their lives [1,2]. Gravity is usually introduced to children as an explanation for why things fall to the ground. Gravity is a force among two objects of mass that marks the objects appeals each other.

Mathematically, Newton discloses that the gravitational force ( $F$ ) is comparative to the invention of the mass ( $m$ ) of both objects and contrariwise comparative to the square of the space ( $r$ ) between these objects [3]. (1) Research (children ages 4-13) asked them why things fall. Nearly all of their responses could be summarized in three categories: a) the object was not held; b) the object was heavy; and c) the object International Conference on Mathematics and Science Education (ICMScE 2018) IOP Conf. Series: Journal of Physics: Conf. Series 1157 (2019) 032041 IOP Publishing doi:10.1088/1742-6596/1157/3/032041 2 was pulled by the attractive force of the Earth (i.e., Gravitation).

Between ages 7 and 10, the great majority of children responded that objects fall because they are not held up by something [4]. The literature results have shown the adjustments associate the suggestion of the problem solvingskill with the state of being prosperous with one of the thinking skills were correlation and causality.

this is the basis of how students solve problems Interactive process especially in concept focus using visualizations facilitated student to engage their mental process in thinking [5]. The main reason researchers and teachers are fascinated by student alternative conceptions is that research suggests, they interfere with subsequent learning [6].

Consequently, from the fact of sight of making cognizance, emphasizing the problem solving-skill at the fourth grade primary schools in Bandung Barat Indonesia, this paper prerequisites to be carried out. 2. Method This research procedure a qualitative-descriptive method that purposes to understanding by students on gravity without giving treatment to the research subjects then the results are obtainable in a forthright and straight way.

The subjects of this research are 41 students of 4th-grade student's elementary school,

Bandung Barat Regency, West Java. The instruments that used in this research are data collection and interviews. The data collection have indicator choices which each problem represents each indicators that will be used to measure students' how they can use problem-solving on gravity conception. The test result obtained and then analyzed each question by looking at the answers. 3. Result and discussion 3.1.

**Problem-solving skill review** There are several things that are developed in increasing the aptitude of the student in elementary school in problem-solving skills. Based on the test results about the gravity given to students there is an error to give answering and provide alternate solution answering the given problems. The results of the outline of student test results can be seen in table 1. Table 1. Recapitulation of student test of problem solving-skill on gravity.

**Problem Solving Indicators Category (%) Correct Incorrect Identification 66 34 Argument hypothesis 60 40 Analysis-synthesis 54 46 Alternate solution 43 57 Mean 55.75 44.25**  
This table shows the recapitulation of students' test of problem-solving skill on gravity with some indicators that measure the concept of gravity effect. The research results indicate that it is direct in science on how students solve problems in Bandung Barat elementary school.

This can be seen from the percentage that indications the average of students who answered incorrectly with a percentage of 44,25% incorrect to analysis answer and only 55.75% percentage student convey alternate solution. For the first indicator of identifying the problem of the gravity the average percentage of students who answered correctly is 66% greater than the students who answered correctly on how to give alternate solution is 43%. 3.2.

**Problem-solving skill indicators** The following is an example of an instrument to measure student problem solving on gravity. International Conference on Mathematics and Science Education (ICMScE 2018) IOP Conf. Series: Journal of Physics: Conf. Series 1157 (2019) 032041 IOP Publishing doi:10.1088/1742-6596/1157/3/032041 3 Indicator : Identification Question : In the morning Yosi asked his mother to move the cupboard that was in her mother's room.

Yosi strained to push the cupboard to shift it, but apparently, the cabinet did not move in the slightest. To ask for help to encourage others also cannot because at home Yosi was desolate, his sisters are in school. What is the problem that Yosi cannot move the cabinet? Answer : Yosi's thrust force cannot defeat the maximum static frictional force between cabinets and floors as a result of cabinets having large masses Figure 1. Identification on problem-solving skill.

In this study as a consequence of student response, it is assumed that students have some errors in identifying gravity. Students sometimes cannot communicate the problems prearranged and defined. These are the reasons that basis of error identification. For example, the biggest error in this study is how the relationship between mass on the object and the force particular.

Another misconception is about the relationship on how big the force is to make things move. However, in identifying indicators it is perceived that if students are specified the opportunity to ask questions and explain what problems they are certifying, their problem-solving skills can be developed. Reading thoughtfully every sentence in the instructions can make it easier for students to identify problems.

This should not even be disregarded when students try to solve problems. It also develops student problem-solving skills. Students' understanding of gravity, should with reverence to functional complications in physics [7]. Indicator : Argument hypothesis  
Question : If you are requested for an opinion to assistance Yosi in resolving the problem, what kind of resolution would you ask for him to solve the problem he faced?  
Answer : Yosi was tested to remove the entire cabinet to reduce the weight Figure 2.  
Argument hypothesis on problem solving-skill.

In this stage, the students elaborate in providing arguments on how the problem should solve. Each encountered and in certain on their knowledge of information and abilities appropriate to the situation, composed with the ability and desire to practice that knowledge in the problem-solving.

Thus, there is some difficulty which must be viewed as problems for students; these are general problems for which a creative method of the highest order is requisite. Studies have recognized that expending problemsolving strategies complemented to a precise task increases individuals' efficiency and level of accomplishment of the assignment [8] However, there will be other different circumstances for which only a few students will have the required information and skills to response, and so for other, these will be viewed as problems.

Indeed, almost any situation could be categorized as a problem for some, depending on their maturity, experience, knowledge. Others have informed that students' reasoning capability can expect their problem-solving presentation [9]. International Conference on Mathematics and Science Education (ICMSce 2018) IOP Conf. Series: Journal of Physics: Conf.

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Indicator : Analysis synthesis Question : Explain why you are recommending a solution as above? Answer : If the weight of the cabinet is compressed then the friction between the cabinets with the ground is also reduced so that the cabinet will be easier to be pushed Figure 3. Analysis-synthesis on problem-solving skill.

This stage students contribute the reason of the problem that has been analyzed. Students deliver explanations with data, facts or prior knowledge about a concept they recognize. A problem involves the problem solver to mark a common sense of a problem condition and to make a conclusion about a path to resolution, which points a distinct toward the chosen goal [10].

Allowing to the results of the study, it was seen that the personal perceptions of students concerning problem-solving skills and their preparedness and purpose perceptions of the problem-solving process. There was an affirmative relation between the solving of a problem designed in agreement with the regular life of primary education students and their conceptual changes [11].

In general, the problems students come upon in regular life and the school environment become more compound when the phase, position and environmental influences of personalities change [12]. Indicator : alternate solution Question : If after the insides of the cabinets are delivered apparently the cabinet inactive cannot be removed, what kind of alternate solutions that you will recommend to Yosi so he can change the cabinet Answer : If the weight of the cabinet is abridged then the friction among the cupboard with the floor is also reduced so that the cabinet will be easier to be hard-pressed. Figure 4. Alternate solution on problem solving.

A dissimilarity has been made between problems and alternate solution. It is observed by the encountered as an inadequate, unhinged or disturbing situation which can be resolved by an existing practice within an existing example. It is also supposed to be solvable.

By contrast, a problem may not be solvable either unconditionally, or to a degree, and its resolution may involve, at the very least, the development of new techniques or the raising of a new hypothesis. It is possible also for many conditions to be supposed as either problem by any particular encountered, depending upon such factors as the previous knowledge, maturity and the context in which the 'problem' is embedded.

Depending upon the awareness of the situation as a problem, achievement in dealing with it will depend upon the student knowledge and experiment. Students often have

struggle reasoning about abstract ideas, especially when they must separate between concrete, observable processes and unobservable properties [13]. It can be definite that problem-solving effects learning and is partial by learning.

Students who are prosperous in their sequences learn new concepts and change problem-solving skills while they are resolving the problems they happenstance. In addition, some research suggests that analogizing the reasoning concepts could be developed during the representations exploration process of concepts [14,15]. 4.

Conclusion It was determined to allow to the results obtained from the study that student in elementary school (Bandung Barat Indonesia) perceptions of the wide-ranging problem-solving progression were at a International Conference on Mathematics and Science Education (ICMScE 2018) IOP Conf. Series: Journal of Physics: Conf. Series 1157 (2019) 032041 IOP Publishing doi:10.1088/1742-6596/1157/3/032041 5 medium level.

However, it was seen that the readiness and purpose perceptions of the students with affections to problem-solving were at a low level. It is therefore thought that it is needed to observe the factors that affect the willingness and purpose of the students; more comprehensive studies need to be conducted Acknowledgment This work was financially supported by "Hibah PTUP – Penelitian Terapan Unggulan Perguruan Tinggi" Kementerian RISTEK DIKTI, Republik Indonesia's research grants in the fiscal year 2018.

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