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CONTENT

Authentic Assessment in Physics Learning Using Physics Chess Game for Senior High School

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***Abstract*—Authentic assessment is an assessment of the existing curriculum 2013 include an assessment of attitudes (affective), knowledge (cognitive), and skills (psychomotor). In practice, teachers find it difficult to assess because many aspects are assessed. This article aims to help teachers take students' score includes assessment of attitudes (affective), knowledge (cognitive), and skills (psychomotor). Physics chess game becomes the media in making the value of the students. Physics chess game is a game that uses chess board that contains questions of physics. So, using a chess game physics, teachers can get the value of the attitude (affective), the value of knowledge (cognitive), as well as the value of the skills (psychomotor) students.**

***Index Terms*—affective, authentic assessment, cognitive, curriculum 2013, physics chess game, psychomotor**

I. Introduction

Learning is "a changed behavior" or behavior changes. Learning is a process of interaction of learners with educators and learning resources in the learning environment [1].

In 2013, the Ministry of Education and Culture of Indonesia implementing the curriculum 2013 as a guide in the learning process. One of the most emphasized in the curriculum 2013 is an assessment. In curriculum in 2013, the assessment focused on authentic assessment where the assessment includes an assessment of attitudes (affective), knowledge (cognitive), and skills (psychomotor). The previous curriculum, authentic assessment has been applied, but more focused on cognitive assessment.

In the process of studying physics, students have difficulty. The difficulty in studying physics, students due to the physics of matter are solid, memorizing, and counting, as well as the learning physics in the classroom is not contextual. Students do not like physics, due to the physics learning in the classroom teachers do not pay attention to the students [2]. And it makes the students feel bored in physics.

Almost everyone knows chess, not least the students. Weapons of chess is mainly about strategy, with emphasis on the middle game. Strategy means abstract thinking and planning, as opposed to tactics, which are the individual operations used to implement the strategy. Tactics are specific, the strategy is general. Tactics tend to be immediate, strategy long-term [3]. In physics chess game, we ignore the rules of chess in general. However, students are still required to have a good playing strategy. Students must be able to think critically in doing physics problems in a short time.

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II. Theory

In each lesson, the teacher always assessing student learning outcomes. Assessment is the process of collecting information or data used to make decisions about learning. Assessment includes gathering evidence about the achievement of learners [4].

The assessment standards of education are the criteria on the mechanisms, procedures and instruments of assessment of learning outcomes of students [5]. Educational assessment as a process of collecting and processing information to measure achievement of student learning outcomes include authentic assessment, self-assessment, assessment-based portfolios, quizzes, daily tests, midterm exam, final exam, a test level of competence, examination quality level of competence, national exams, and school exam [6].

Authentic assessment is a form of assessment that requires students to show attitude, using the knowledge and skills gained from learning in performing tasks in real situations [7]. Authentic assessment invites the students to use academic knowledge in the real-world context for meaningful goals [8]. Some characteristics of authentic assessment of which is as follows:

1. Assessment is part of the learning process.
2. Ratings reflect the outcome of the learning process in real life.
3. Using various instruments, measurement, and methods appropriate to the characteristics and essence of the learning experience.
4. Assessment should be comprehensive and holistic covering all aspects of the learning objectives [9].

Authentic assessment in curriculum 2013 focused on science through capability-based assessment be output through the process, portfolio and output assessment completely and thoroughly [10].

Assessment attitude (affective) is an assessment conducted to measure the level of achievement of competence attitudes of learners that include aspects of receiving or giving, respond, assess or appreciate, organize or manage, and character [6]. Affective assessment directs the behavior of individuals with values

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that are considered good and have been introduced earlier [11]. Affective categorized as important is honesty, integrity, fairness, and freedom [12].

The Cognitive assessment conducted to measure the achievement indicators of learning outcomes in terms of intellect, the ability to dig and process information or knowledge [13]. In cognitive the assessment, the tools to retrieve data that is an oral test and a written test that includes memorizing, understanding, applying, synthesizing, and evaluating the material [14].

Skills competency assessment is conducted teacher assessment to measure the level of achievement of competence skills of learners that include aspects of imitation, manipulation, precision, articulation and naturalization [6].

Chess is a game that many peoples like it. Chess is a game of skill played by two people on a board of sixty-four squares. The board is the same one use for checkers [15]. Leonard Barden said that chess is also played a great deal in school [16]. For the student, chess has many benefits. Al Lawrence said on his book, chess players improved test scores, critical-thinking skills, problem-solving abilities, social skills, and self-confidence [17]. Based on Al Lawrence's book, chess is a game that is suitable to be applied in the classroom. With the benefits of chess by Al Lawrence's book, chess can be a motivator for students in the learning, especially physics lesson.

Why had physics? Many students feel physics is a difficult lesson. Student difficulties in learning physics one of which is the lack of ability of students in solving physics problems, both to solve the problem through practicum physics or mathematical calculation. Sometimes, the one who possess all the necessary skills, may feel that such problem is not attractive enough to them, and the tedious calculations involved do not allow their "creativity" (genius?) to shine through [18]. In solving physics problems, students are required to creativity. Where the students feel that physics is a difficult lesson, and ultimately make the students will not to study physics.

In Indonesia, physics become subjects who had the lowest score on the national examination. Based on the national exam in 2012, the average value of physics is the lowest value when compared with the subjects of biology, chemistry, and mathematics [19] (Fig. 1).

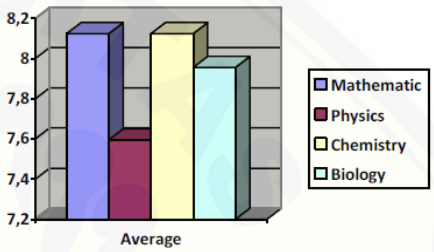

Figure 1. The average of national exam in Indonesia

TABLE I. VALUE OF NATIONAL EXAM IN INDONESIA

City / Province	Mathe- matics	Physics	Chemistry	Biology
Jakarta	8.23	7.88	8.32	7.89
West Java	8.56	8.01	8.62	8.29
Central Java	8.38	7.78	8.62	8.39
Yogyakarta	7.74	7.14	8.08	7.78
East Java	8.86	8.46	8.86	8.64
Aceh	8.31	7.77	8.10	8.12
Riau	8.17	7.73	8.46	7.70
Jambi	8.23	7.51	8.18	8.16
Lampung	8.42	7.99	8.42	8.40
Bali	9.12	8.60	8.81	8.61
South Sumatera	8.44	7.93	8.43	8.36
West Kalimantan	7.65	6..75	7.75	7.65
Central Kalimantan	7.49	6.91	7.65	7.60
South kalimantan	8.12	7,37	8.38	7.48
East Kalimantan	7.82	7.19	8.07	7.76
North Sulawesi	8.59	8.10	8.46	8.10
Central Sulawesi	8.16	7.30	8.29	7.96
South Sulawesi	8.59	7.61	8.48	8.18
Southeast Sulawesi	8.44	7.75	8.16	7.90
West Nusa Tenggara	8.31	7.88	8.36	7.86
East Nusa Tenggara	7.55	6.50	7.69	7.35
Papua	7.84	7.53	7.97	7.70
Bengkulu	8.34	8.31	8.25	8.22
North Maluku	7.92	7.71	8.05	7.92
Bangka Belitung	7.68	7.24	8.24	7.95
Gorontalo	7.08	6.62	7.71	7.45
Banten	8.02	7.85	8.02	7.84
Riau Island	7.76	7.02	8.08	7.87
West Sulawesi	8.19	8.00	8.15	7.83
West Papua	7.74	7.44	7.79	7.72

Besides in Indonesia, the students in Nigeria was also felt that physics is difficult subjects. Based on the research that has been done by Stella Y. Erinosho in Nigeria, there are several reasons students feel the physics is difficult subjects [20].

TABLE II. PREDOMINANT REASONS FOR STUDENTS FINDING PHYSICS DIFFICULT

Category of Reason	Responses (%)
Nature subject:	
1. To many formulas/laws/content to memorize	35
2. Theoretical	43
3. Problems not easy to solve	45
4. Too much hard/ difficult formulae/ laws/ concept/ contents	46
5. Content not easily understood	41
6. To many calculations	47
7. Physics not enjoyable	27
Teaching/teacher	
1. Constructing meanings of teaching concepts	42
2. Too little practical work	39
3. Teacher not helpful/friendly	22
4. Worked examples simpler than class exercise	37
Curriculum/assessment	
1. Textbooks not easy to follow	19
2. Examination questions hard	36
3. Syllabus too wide	23

III. INSTRUCTIONAL DESIGN OF PHYSICS CHESS GAME

Physics chess game is a game about physics problem using chessboard, but in this game we ignore the rules of chess in general. In the chess there will be questions and answers, as shown in the Fig. 2.

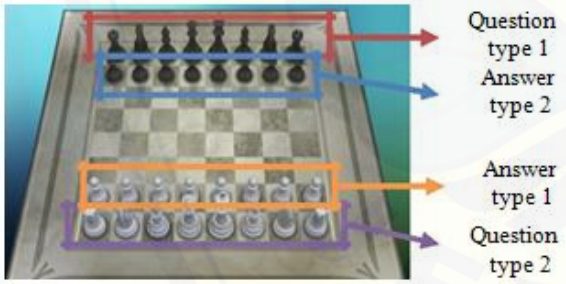

Figure 2. Design of physics chess game

A. How to Play

In the classroom, students are divided into small groups of four students. Each group is required to bring chess and each group will play the game of chess physics 2 times where every game progresses there are 2 students play while two other students will assess students who are playing. Teachers provide questions and answers for each student each group. Each student attaching questions and answers on a piece of chess as shown in the Fig. 2, the design of this physics game of chess. Keep in mind that physics is a game of chess, we ignore the rules of chess in general.

After preparation is complete, students can start this physics chess game. Each group decides who will start the game first. Once completed is determined, the students elected to start the first game could be giving out a question that has been affixed to the chess pieces. Other students had to answer questions given to provide answers also already affixed at chess, and will continue alternately.

For example, there are students A, B, C, D in group 1. Group 1 agreed that student A and B will start the game, students C and D will assess student A and B. Student A asking questions type 1 to students B. Student B answered questions type 1 which has been given by running a chess piece that has been attached to the correct answer according to student B. The game continues until the question of type 1 and type 2 run out and apply to other groups with a theme or subject the same to classmates.

B. How to Take Assessment

In physics chess game, there are three assessments will be performed, ie assessment attitude (affective), knowledge (cognitive), skills (psychomotor).

For assessment of attitudes, data retrieval using assessment between student. In a group, when students A and B play physics chess game, the students C and D will assess students' attitudes toward A and B as well as students C and D play physics chess game, student A and B to be assessed.

While for the assessment of knowledge, chess amount obtained is the value obtained by the students. When students submit questions for the student A and student B and student B answer correctly, then the chess piece that contains questions from students A belong to B. But if the students B answered incorrectly, then the chess student B which contains the answers submitted become the property of the student A. After the game is completed, the number of chess pieces owned by each student into the student's final grades to the formula:

$$Value = \frac{a}{b}$$

where a is number of chess pieces acquired and b is the number of questions given to each student.

For skills assessment, data collection is using performance assessment. On a question that sticks to chess, there will be problems where students have to solve with simple practice. On this simple practice, students are required to be able to finish and find answers in a short time. So students have to really understand the concept of the material test.

IV. DISCUSSION

The emphasis on curriculum 2013 is an authentic assessment. Where the authentic assessment there are three domains that should be assessed, the attitude (affective), knowledge (cognitive), and skills (psychomotor). In practice, both teachers and students having problems. Many teachers who have difficulty in assessing as many are to be assessed, given in the previous curriculum are not much considered. For students, students demanded more active and capable of self-learning. Because in the learning process, teacher as a mediator.

Physics became one of the subjects that are considered the most difficult by students. Many reasons that make students consider physics is difficult, one of which is a test that is considered difficult. Students feel too much formula to be done to resolve the matter.

Therefore, in this paper, we want students to feel happy with physics, especially when examinations. In physics chess game, students are required to solve the problems of physics in a short time. Not only able to do it, but students are also assessed regarding his attitude and there are some physical problems that must be done with simple practice. Besides the students do not feel bored, students are also trained to be able to assess his objective, as well as help teachers take their students grades. And of course with physics chess game, the teacher will be easier to take the data value of students.

V. Conclusion

Authentic assessment is an assessment outlined in the implementation of the curriculum 2013. There are many aspects that must be achieved and assessed. It is certainly enough to make teachers and students find it difficult.

Physics chess game became one of the innovations in making the student's assessment. With the physics chess game, is expected to complete the students are motivated to learn about physics as well as to increase student's creativity in solving problems of physics. Thus, physics is no longer a difficult subject for students, and no longer be subject to the lowest value on the national exam. Because physics is always related to everyday life, so it is necessary for students to know and understand about physics.

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