

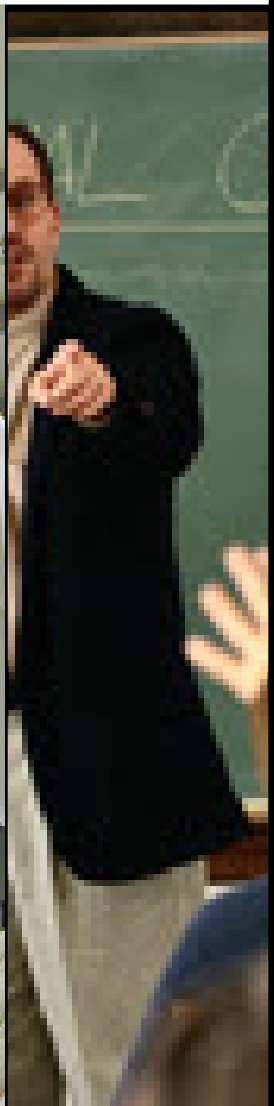
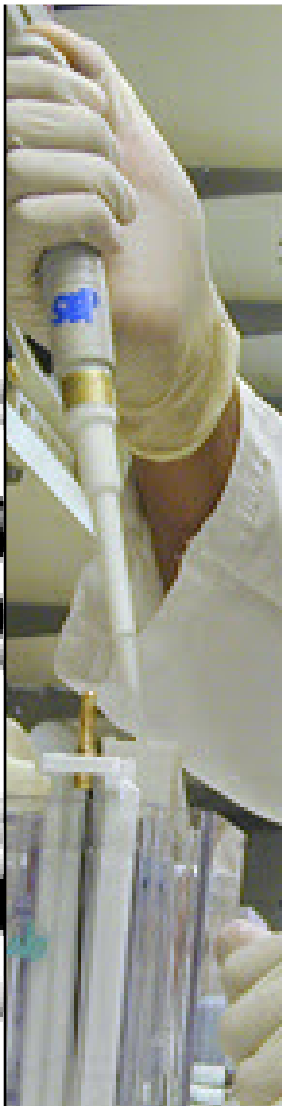
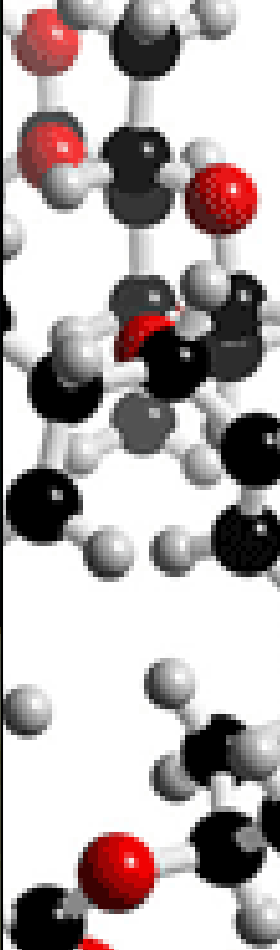
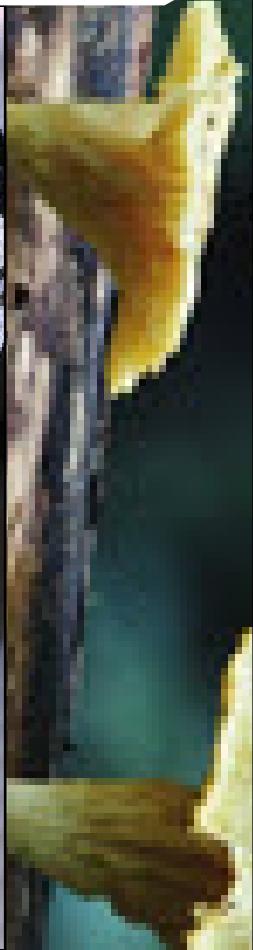
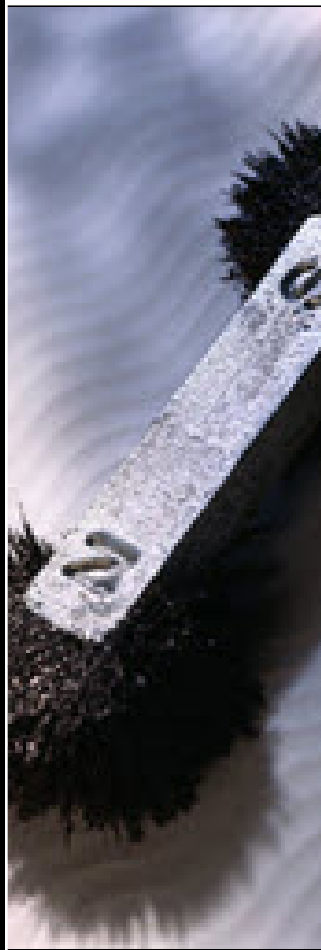


Proceeding

The 4th International Seminar on Science Education

Bandung, 30 October 2010

“Curriculum Development of Science Education in 21st Century”



Science Education Program
School of Postgraduate Studies
Indonesia University of Education

ISBN: 978-979-99232-3-3



Proceeding

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“Curriculum Development of Science Education in 21st Century”

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School of Postgraduate Studies
Indonesia University of Education
Bandung, 2010

Foreword of Chair of Science Education Program

The fourth International Seminar of Science Education is conducted to fulfill annual agenda of the School of Graduate Studies, Indonesia University of Education.

The seminar theme “Curriculum Development of Science Education in the 21st Century” is chosen emerge from many problems of science education in Indonesia. One of them is the overstuffed condition of science curriculum that affected from rapid development of information in this era. Besides, there are challenges of Indonesian people in facing against global competition. To win the competition they have to think critically. Therefore many messages have to cover by science curriculum caused it overloaded and difficult to be implemented.

We are not able to overcome the problem ourselves. We need input of information and experience from many researchers all over the world. Therefore this seminar hoped to be an exchange experience to solve the problem and lead to the discovery of science curriculum to enhance Indonesian science education quality.

I would like to express my special gratitude to Prof Dr Bruce Waldrup from Monash University, Australia; Prof Dr Russell Tytler from Deakin University, Australia; and Dr. Benny H.W.Yung from The University of Hongkong; who are specially come here to be key note speakers. Thank you for sharing the result of your latest result with us.

Finally I would like to thank to the committee who have been working hard to prepare the seminar and publish the proceedings. Last but not least thank you for all speakers and participants of your contribution today.

Bandung, 31 October 2010
Chair of Science Education Program
School of Postgraduate Studies
Indonesia University of Education,

Prof.Dr.Liliasari,M.Pd



“Curriculum Development of Science
Education in 21st Century”

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PROCEEDING
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The Development of “Educative Game Kit” Based Puzzle and Card Game for Learning of Science-Physics in Elementary School

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Abstracts:

Educative game equipment based puzzle and card game is a children game intended to be designed for learning need. These equipments as a part of the various educative game equipments have been developed by the outhor which is in long term discoursed for supporting of “Educative Park” designing. This stage, the package of those equipments are crateded in the form of “Educative Game Kit”. The development of these equipments is done through the research series that outhor do with help of his undergradute students, in local and national research, such as competitive grant, national strategic grant, also development research of regency/town education potential conducted in 2006, 2007, 2008, and 2009. The type of the research is R & D. The population and sampel of them is the student K3-5 of goverment elementary school 27 of Mataram. Results: there are various educative game equipments based puzzle game i.e. crossword puzzle, one-way puzzle, and mission puzzle, based card game i.e. pair card and *kuartet* card. From their implementation, they show largely positive responds of stake holders. Based on questionnaire and observation, the students show high motivation for study, show development and reinforcement of positive character e.g. work cooperatively and has no weary in study. While, the teachers and parents of the students, highly support the use the kit of educative game equipments and the development of “Educative Park” in elementary school level in the future.

Keywords: educative game kit, educative game equipment, educative park.

INTRODUCTION

In Act No. 2 of 2003 on National Education System, among others, stated that education is a conscious effort to prepare students through counseling, teaching, and / or training for its role in the future (Department of Education, 2003:3) . National Education functions to develop capabilities and improve the quality of life and human dignity of Indonesia in order / effort to achieve national goals, namely, (as set forth in paragraph IV of the Constitution of 1945): (a) to protect the people of Indonesia and the entire country of Indonesia; (b) promote the general welfare, (c) intellectual life of the nation, and (d) participate in implementing world order

While in Government Regulation No. 19 year 2005 on National Education Standards, chapter 1, article 1, paragraph 8 states that the meaning of the standard of means and infrastuctures is the standard of national education relating to the minimum criteria of learning class, places for sport exercise and praying, library, laboratories,

workshops, playground, place of creation and recreation, and other learning resources, necessary to support the learning process, including the use of information and communication technology. With regard to this rule, the provision of a playground, creating, playing, and learning resources are included in an important element supporting the learning process

With regard to education defined above, Mulayasa (2005) states that to create learning being effective, creative, and fun, should not deter the classical learning that is limited by four walls of the classroom, but recommended that the learning process was done by varying circumstances, for example in the laboratory, school yard, gardens, and so on, even the learning strategies also need to be varied to avoid feeling bored students. Science and technology are always actively developed along with advances in scientific research or through theoretical studies so that more and more quantity of scientific information. Meanwhile, the formal allocation of study time provided for students has not changed, this causes a gap ratio of the amount of scientific information and the allocation of study time, that is too much material for students to master in a relatively short time

Behavior and teachers' teaching styles can produce an important difference in student learning process (Centra and Potter; McDaniel; Wentzel), in Marie et al (2006). Monotonous style of teaching tends to bring up the attitude of the self-bored students. John Dewey in his constructivism theory says that should be in the learning process of a knowledge not given to students as a whole, but students must be involved in the process of preparing or constructing of knowledge, anonymous 1 (1999). While other theorists, Rutherford and Ahlgren, argues that students already have their own ideas in almost every issue, anonymous 2 (1999)

The above statement is also supported by Bruner (without year), namely that learning is an active process, students develop new ideas or concepts based on current knowledge and past it has. Students select and transfer information, develop hypotheses, and make decisions, then put it into the cognitive structure, or schema or mental model.

George (no year): In a constructivist learning assumes that learners construct knowledge based on interaction with the environment. He argues that there are four assumptions epistemology, namely: 1) physically knowledge is formed by students who are engaged in active learning, 2) symbolically knowledge constructed by learners who make representations of their action, 3) socially knowledge is constructed by learners who spread understanding to other students, and 4) theoretically knowledge is constructed by learners who try to explain to those who do not understand.

While Bruner in Huitt (2003) put forward three principles of constructivist learning, namely that learning: 1) must be associated with the experience and context so that learners are motivated to learn, 2) should be structured in such a way that can be easily mastered by the student (spiral organization) , and 3) should be designed for the extrapolation of facility and or fill in the gaps

Referring to the above understanding of constructivism, science should not be transferred from teachers to students in an intact form. Learners need to build themselves a knowledge by involving each other's experiences. Learning is the result of the learner's own efforts.

Basic education is general education 9 years and held for 6 years in primary school and 3 years in junior high school or equivalent education, (Husain, 1995). So if it is assumed children enter elementary school at age 6 years old, the age of the child's basic education is 6 to 15 years old, which is still classified as childhood

It is inevitable that childhood is a period that can not be separated from the "play". A model of learning that "serious" is not easy to apply in childhood, especially for children at primary school level. In one day, serving time for the children of this stage is used more to play, even when they are at school, always try to find a gap of time to play because it has become their characteristic

Based on the rationale above, it is through this writing offered a concept of the development of educational game kit, a package of vehicle or other means that are specifically designed for fun-based learning, intended that the students are intrinsically interested and have a high curiosity about science so that finally they have a high motivation to learn. It should be emphasized that the implementation is based on play activities and not learning activities, particularly in the supplemental or enrichment learning. So in this process, children have a motivation to play, but, because every game is always loaded with scientific material, so the game being educative.

The idea of designing a variety of educational games has been pioneered by the author since 2001. Quite a lot of writing and research that has been and is being conducted by the author and some studies are assisted by his undergraduated students. Educational games that have been developed, among others, based on card games, like dominoes, playing card, quartet, mached card, and a picture card (puppet), also based on puzzle game, like the crossword puzzle, one-way puzzle, mission puzzle, multi-mission puzzle , parallel puzzle, poster puzzle, and games based on snakes ladders, monopoly,

simple folding comics, science dictionary, pocket books, and scrabble. All of the educational games are proven to improve cognitive understanding, foster positive attitudes, and increase the psychomotoric liveliness of the students in learning science subjects of physics both for elementary and junior high students.

Jean Piaget (in Darmodjo.dkk, 1992) classifies the levels of intellectual development of children as follows: sensory motor stage (0-2 years); preoperational stage (2-7 years); concrete operational stage (7-11 years); and formal operational stage (11-14 + years). Children in elementary education at the stage of preoperational and concrete operational, until the formal operational. At elementary school age, students will think on the basis of concrete/real experience. His ability to think a bit abstractly always be preceded by concrete experience. Understanding of space has evolved so as to understand the events that happened the past (e.g. history), understanding the map of the city, the sky with stars. Towards the end the elementary education, the child is at the end of the concrete operational stage. At this stage, they have to understand about multiplication, division, substitution, analysis (to isolate) and synthesis (incorporation). They also have had skill to write and correspond, and eventually they begin to think a simple abstract such as to understand the concept of weight, force, and space

Meanwhile, at the age of junior high school, namely in the formal operational stage, children have started to think abstractly, especially in children smart. The ability to think abstractly is to include all the capabilities in the previous operational phase, plus the ability to integrate within the new structure of thinking. For example, the ability to give reasons without observing the object in a concrete first. He can draw conclusions from the various possibilities that exist without any real observation and deductive thinking they can make a hypothesis. Can think reflectively (think back to what had been thought) and is also called evaluative thinking. Can control the variables of various influencing variables. For example, he was given the task to investigate what factors are affecting the frequency of pendulum swing in variety of the weight and the length of the string pendulum. The expected response is: the height of pendulum when it is released, the force given, the length of string, and the weight pendulum.

In accordance with the title, then will be discussed how to develop a kit of educational games for learning science (physics) for elementary students. The educational game in question is based on card games and puzzles. Finally, a little discussed the relevance of these kits in support of the development "Educational Garden" at the elementary school level.

METHOD

Given this educational game kit as a result of several studies, the method in this study will be presented in general. The process of developing this tool broadly covers the process of preliminary studies, planning, product manufacture, limited testing, and revision of the tools. As the population are students of SDN 27 Mataram, while the sample was Grade 3, 4, and 5. The instrument of the researchs includes the kit of educational games and a number of evaluation tools, such as writing test, questionnaires for students, teachers, and parents, observations pages, and interview guides for teachers and parents.

RESULTS

Designing educational games for learning is basically quite easy, but keep in mind the following points: 1) select the type of game that has been popular for children, or at least easy to understand and play, 2) use ingredients that are not harmful both physically and chemically, 3) use the shape and / or coloring system of interest, 4) adjust the presentation stage of child development, 5) use pictures of attractive and relevant, 6) use the curriculum as a guide the loading of materials, 7) complete with usage guide, 8) setting the game in such a way as to be used "independently"

With the above matters, it is expected that the resulting instrument of educational games will be a medium of learning in accordance with the pillars of learning theory and can give a maximum contribution in realizing the vision of our country's national education department. The Settings tool of educational games supported with an interesting coloring and accessories are expected to directly support the establishment of active learning, innovative, creative, effective, efficient, and joyful or AICEEJ.

Educative games in the kit:

1. Educative game based card:

Card quartet consists of a number of sets of cards with each set of cards consists of 4 pieces commensurate card. The number of sets of cards are not certain, can be customized to the needs, and there is no index to reveal the sequence level. By substituting these counterparts with information of physics, then the card becomes a tool of learning media physics card shaped quartet.

Matched card is simpler than the above quartet card because this card only consist of a set of cards which each set consists of two matching cards. The equivalent amount in a set of these cards are free, there are no special provisions, so in a set can be

made with an equivalent amount according to need. By substituting these counterparts with information of physics, then this card game becomes a tool of learning media shaped physics matched cards.

2. Educative game based Puzzle:

Puzzle is a game of construction through the activities of installing or match boxes, or certain forms and eventually come into a certain pattern. If the box or that particular form laden with scientific concepts, then the puzzle has become one of the tools of learning and innovative media-based active learning, creative, effective, and fun.

Crossword puzzle: Referring to the definition above, it is analogous to the crossword puzzle in common meaning. So as a means of learning media, crossword puzzle consisting of boxes or a particular form that contains information on science and should be drawn to certain rules, can be flat or declining, and between words and the other one can intersect. As a guide, provided a number of questions or statements while in part to find the answers or the equivalent of the above statements provided letters affixed to the small boxes to be assembled into an answer or an equivalent statement. Secondary guides can also be installed floor plan of this Crossword Puzzle.

One-way puzzle: it is basically the same as Crossword puzzle. The difference is that group of questions or statements are correlated one-one with the answers or statements that can be either words or phrases. Group of questions or statements are posted on the main board in every cell, while the answers, word, or phrase placed at the bottom of the secondary board shaped small boxes. But this installation are not absolute, this means that the installation can be exchanged or also can be random. At the top of the secondary board is mounted pieces of the picture and if all of that particular secondary board is set up properly then it will form a certain pattern. The patterns can be images or specific staining system, but the most important thing is that the staining or image must attract students' attention.

Mission puzzle: As the name implies, this puzzle has a specific mission. Basically this type of puzzle design can vary highly depend on the creativity of its designer. Same with the two previous types, this puzzle consists of two parts, the main board and the secondary board. At first glance this puzzle similar puzzle Oneway but more complex rules of the game, namely to acquire its mission, users (students) should be able to pass through obstacles in the form of finding a suitable answer to the question or statement that matches the statement given in stages

Educative Game Kit.

Some of educative game equipments consisting of the game based card (two types) and based puzzle (tree types) are boxed as a unity. This collection of the various educative game equipments being a unity placed in a special box is then called as the "Kit of Educative Game" of "Educative Game Kit".

The results of the implementation of "educative game kit":

In all of the researchs, the results of questionnaires and observations, show that 100% of students responded very positively to the use of educational games. The result of tests show an increase in students' skills in science-physics after the play equipments in the kit. The observations indicates the existence of enthusiasm and high motivation of students in using the tools of the game kit. The teachers of the scholl, showing excessive enthusiasm so that they attempt to use tools that exceed the target time and target of the study itself. The teachers and parents , strongly agree that the kits of educational games will support the development of "Educative Park" at the school level.

CONCLUSION.

The design of educational games have a strong normative basis, such as Goverment Role number 19 in 2005, namely the need of means and infrastructure should be a place to play, create and recreation, and alternative learning resources for students, especially at the level of basic education. Second, there is support for a fundamental theory of learning such as constructivism theory advanced by John Dewey and J. Bruner, since the implementation of educational games for real involves students in building knowledge. The design of the tool in the kit game educational game is basically very simple, that is by changing the charge or fill the tool with a materials science and done a role modivication of the game, then the tools of this game has turned into a very popular medium of learning for students , especially students in elementary education. Third, the implementation of this tool, "educative game kit", especially in the supplemental or enrichment learning, will add hours of learning of students, but students themselves do not realize it. The limited scale test results show that the use of educational games kit is able to enhance students' understanding of learning materials, especially in the sciences-physics, improve motivation and learning interest of students, received a very positive response from students, teachers, and parents of the students, and they also support the development discourse "Education Park" at the school level. Finally, the motto of the

implementation of this tool there are two, namely: learning while playing (for formal learning) and play while learning (for supplement learning)

Suggestion:

The results of this study still has limitations as a Research and Development (R & D), especially at this stage of field trials have not yet reached trial in a broad scale. This is related to time constraints which still more and more devoted to the production process of the equipment educational games. This happens because the production activities require equipment that is still relatively difficult to find (must go through the ordering process) and also involves carpentry experts who were also still have constraints in the production process. In other words, the development of this tool still needs to be improved in both quality expert validation and pilot scale and quantity of research cycles, which would certainly impact the quality of educational game tool design itself.

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