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Play-Based Learning to Enhance Critical Thinking Capabilities

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The aim of this study was to test whether play-based learning with the focus on analysis, synthesis, and evaluation could enhance students' critical-thinking capabilities. Subjects from two elementary schools were collected using cluster sampling (N = 61; with 27 receiving treatment and 34 not receiving treatment). In the pre-experiment the experiment group received treatment with the critical-thinking capabilities indicators being: (a) able to differentiate relevant and irrelevant information, (b productive in coming up with a solution, (c) able to deduct swiftly and accurately, (d) able to identify the truth of new information, and (e) able to ask complex questions. The results of the t-test showed a difference in the critical-thinking capabilities between the experiment group and the control group. It could be concluded that physical and health education through play-based learning using measurable principles could enhance students' critical-thinking capabilities.

Keywords: learning through play activities, critical thinking

Penelitian ini menguji apakah pembelajaran melalui aktivitas bermain yang menekankan analisis, sintesis, dan evaluasi, mampu meningkatkan kemampuan berpikir kritis siswa. Dengan *cluster sampling* diperoleh subjek dari dua sekolah dasar (N = 61; 27 dikenai perlakuan dan 34 tanpa perlakuan). Melalui eksperimen semu diberikan perlakuan terhadap kelompok eksperimen yang indikator kemampuan berpikir kritisnya adalah: a) mampu membedakan informasi yang relevan dan tidak relevan, (b) produktif dalam memberikan solusi, (c) mampu menyimpulkan dengan cepat dan tepat, (d) mampu mengidentifikasi kebenaran informasi baru, dan (e) mampu bertanya hal-hal kompleks. Hasil *t-test* menunjukkan ada perbedaan kemampuan berpikir kritis antara kelompok ekperimen dan kelompok kontrol. Dapat disimpulkan bahwa pembelajaran pendidikan jasmani, olahraga, dan kesehatan melalui aktivitas bermain yang berdasarkan kaidah-kaidah terukur mampu melatih anak meningkatkan kemampuan berpikir kritisnya.

Kata kunci: belajar melalui aktivitas bermain, berpikir kritis

According to Law Number 20/2003 (Kemendikbud, 2011a) regarding the National Education System, Chapter X Article 37:1, concerning curriculum,

> "…the elementary and intermediate education should have ten educational subjects, one of it being the Physical and Sports Education. It is an educational subject taught at schools starting from elementary schools until senior high schools. Sports education is physical and sports education conducted as part of the managed and continuous educational process in order to achieve knowledge, personality, skill, health, and physical fitness"

Government Regulation Number 3/2005 regarding National Sports System also stated that Physical and Sports Education, in the curriculum pararelly stated as Physical, Sports, and Health Education (PSH-E), is basically an educational learning process that uses physical activites to achieve a holistic change in the individual's quality, physically, mentally, and emotionally. (Kemdikbud, 2011b, appendix)

In the National Education Ministry Regulation Number 22/2006 it was stated that:

> "Physical, Sports, and Health Education is an integral part of education as a whole, with the goal of developing the aspect of physical fitness, movement skills, critical-thinking capabilities, social abilities, rational thinking, emotional stability, moral conduct, healthy life pattern aspects, and clean environment introduction through physical, sports, and health activities chosen and planned systematically in order to achieve the goal of national education."
> (Kemdikbud, 2011c, Chapter I, Article 1: 11).

Schematically, the goal of PSH-E consists of three domains as a unity, which are as follows in Figure 1.

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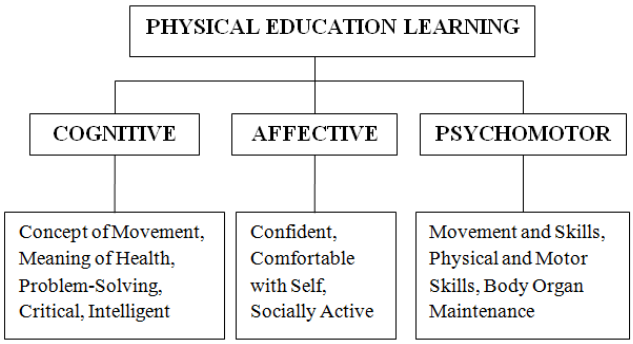

Figure 1. The domains of physical, sports, and health education learning

Meanwhile, the areas of PHS-E consist of seven aspects as follows:

a) Games and sports including: traditional sports, games, movement exploration, locomotoric and non-locomotoric skills and manipulation, athletics, kasti, rounders, kippers, soccer, basketball, table tennis, field tennis, badminton, martial arts, and other activities.

b) Developmental activities including: mechanics of body stance, physical fitness components, body posture, and other activities.

c) Gymnastic activities including: basic simple dexterity, dexterity without tools, dexterity with tools, floor gymnastics, and other activities.

d) Rhytmic activities including: free movement, morning gymnastics, physical health gymnastics, aerobics, and other activities.

e) Water activities including: water games, water rescue, water movement skills, swimming, and other activities.

f) Outdoor activities including: picnic or recreation, environment introduction, camping, adventuring, and mountain climbing.

g) Health including: healthy living culture education in daily lives, especially related to the care of the body to keep healthy, taking care of the healthy environment, prefer healthy food and drink, preventing and treating injuries, managing break and rest time, and being active in first aid and school health unit activities. The health aspect is an individual aspect, implicitly inside all the other aspects.

To improve the condition of PSH-E, a developmental step and policy would be needed into a real, effective, and consistent educational unit level. One of the breakthroughs that can be conducted is by creating a superior learning model that is possible to be implemented in most educational unit levels. The author was interested in conducting the playing activities based learning in order to increase the students' critical thinking capabilities.

The goal of this study was to find out whether play-based learning with the focus on analysis, synthesis, and evaluation could enhance students' critical-thinking capabilities. The hypothesis of this research was: play-based learning focusing on analysis, synthesis, and evaluation could enhance students' critical-thinking capabilities.

The lack of critical thinking education can lead children to the habit of doing activities without knowing the goal and reason of the activities. This habit can often be seen in children with minimal or no critical thinking education at all. In traditional educational settings, which were mostly orthodox in nature, good students were those who simply accept what is conveyed by teachers or parents. A healthy growing child likes to move, is always active and having something to do. Matters with "activity" attracts children attention. Children happily joins a lot of activities even though the attention is not yet focused on a particular one for a longer period.

This fact should get the attention of teachers at school and parents at home. Children should be given a lot of chances to move, act, and do activities. If the "activity" is not well provided or guided, then there is a high chance that the child is just acting randomly without a particular purpose. A study showed that there is a positive correlation between physical activities and cognitive ability (Sibley & Etnier, 2003).

The term critical thinking is often likened to convergent thinking, logical thinking, and reasoning. Consequently, the description of the nature of critical thinking was also varied. Numerous definitions of critical thinking have been stated, one of it was the definition by Paul and Elder (2009), that critical thinking is an individual's method to enhance the quality of his/her thinking using a systematic thinking process and producing intelectual thinking strength in proposed ideas. Critical thinking is a diciplined thinking process used by a person to evaluate the validity of a statement, idea, argument, research, and other similar concepts.

Critical thinking capabilities can help humans in making correct decisions based on thorough, systematic, and logical efforts, as well as considering other viewpoints. It is not just teaching the capabilities that should be conducted, but also teaching the nature, attitude, value, and character that support critical thinking. In relation to the previous point, Filsaime (2008) explained that in order to increase and improve the thinking strength in students, the passive teaching-learning style must be changed into the active teaching-learning style. There are various types and forms of physical activities that can be used as a media for PSH-E in schools, such as

playing or games. Students train numerous skills in playing, and the skills can be used in everyday life. Indicators used in this study were: (1) the ability to differentiate between relevant and irrelevant information; (2) the productivity in giving solutions; (3) the ability to deduct swiftly and accurately; (3) the ability to identify the truth of new information; and (5) the ability to ask complex questions (see Table 1).

The term 'playing' is often used in the world of children, such as an activity conducted as entertainment. People often define playing as an entertainment that is physical in nature and non-competitive, even though playing is not always physical in nature. Playing can encourage students to be active both physically and psychologically, meaning that playing can train students to think and act with the hope of obtaining something that is beneficial for them. Playing in children have an important characteristic in the progress of daily life development.

In the Indonesian Language Dictionary, playing was defined as doing something to have fun (Depdiknas, 2008). Bodrova & Leong (2005) suggest that quality plays are associated with well developed-memory skills, language development and ability to regulate their behaviour. Play allows young children to explore, identify, negotiate, take risks and create meaning which will improve their intellectual and cognitive skills and consequently leading to improve school adjustment and academic learning. By playing, children will have extra-experience in other activities, such as communication skills, thinking ability, socialization, cooperation, respect to others, and sportsmanship. Based on the definitions, playing has an important role in the learning process, each fulfilling the other. Students train various skills in playing. The learning skills can be used in practice in everyday lives. Many authors consistently report that the many hours spent for physical education in school did not have any negative effects to the more "academic" lessons, even it could enhance academic performances **(**Hillman, Castelli, & Buck, 2005; Coe, Pivarnik, Womack, Reeves, Malina, 2006; Donnelly, et al., 2009).

Critical thinking learning is one of the methods that focuses on the aspects of reasoning abilities in the process. The learning activity must be conducted by both teachers and students in order to effectively and efficiently achieve the learning goal. According to Hickson and Fishburne (2010, p.4), "...in the PSH-E learning, the most important things were explanation, feedback, demonstration, and students being able to enjoy the learning process." Meanwhile according to Silverman (1991), the learning process is considered to be effective if: (a) Teachers being able to plan and manage the learning process properly; (b) Teachers being able to anticipate situations in class; (c) Teachers being aware that each student has different abilities and able to use the information in the planning and monitoring; (d) Teachers should master information in planning; (e) Teachers should have the knowledge, knowing when to use the knowledge, and using the correct teaching style; (f) Teachers being able to give explanations and demonstrations accurately and correctly; (g) Teachers managing enough training time for students; (h) Teachers being able to maximize the time allocation during training of the students; (i) Teachers being able to minimize the incorrect time for students exercising; (j) Teachers being able to minimize idle students during waiting for their turn in exercising

In order to achieve the goal of PSH-E, Annarino, Cowel, and Hazelton (1980, pp. 9-14) stated eight important basics in the program, as follows. PSH-E is (1) an unseparatable part of the educational program as a whole, managed by the related school, (2) must provide balanced experience in order to stimulate physical, psychomotoric, cognitive, and affective domain growth and development, (3) is based on the students' focus or interest, integrity, usage, and talent, (4) PSH-E provide experiences related to the basic domains of life, appropriate with the students' maturity, (5) PSH-E is integrated with the close community it served, (6) PSH-E if supported by providing enough facilities, tools, and leadership would push and provide the students with a wide opportunity to do activities, (7) PSH-E cooperates with the guidance program in school, and (8) PSH-E develop and push professional growth, and the well-being of the related teachers.

Research results of the teaching process showed that there were three important points to be noted in order that the PSH-E be effective, meaning that the students will have high movement skill with positive attitude towards physical activities. The three points include: "(1) Students need accurate and sufficient practical training; (2) The practical training should have a high rate of success; (3) The environment should be instructured to grow the condusive learning atmosphere" (Mutohir, 2002, p.24).

The playing activities in the learning process must be designed as important and positive activities. Through interesting games, a student will join the learning process with a happy feeling. Playing is very important for the physical, cognitive, emotional, and social development of children. As stated by Mosston & Ashworth (2008: 47), "the intentionally designed decision-making experience in physical education has the ability to actively

Table 1
Indicators of Critical-Thinking and Cognitive Level in Playing Activities

No.	Playing Type	Critical-Thinking Capabilities Indicators	Thinking Concept
1.	*Magic Carpet* or *Folding Carpet*	Able to differentiate between relevant and irrelevant information	Synthesis
		Able to identify the truth of new information	Evaluation
		Able to ask complex questions	
2.	*Spider Web*	Able to deduct swiftly and accurately	Analysis
		Able to ask complex questions	Synthesis
			Evaluation
3.	*Star*	Able to differentiate between relevant and irrelevant information	Analysis
		Able to deduct swiftly and accurately	Synthesis
		Productive in coming up with solutions	Evaluation
4.	*Running* Pingpong	Productive in coming up with solutions	Synthesis
		Able to identify the truth of new information	Evaluation
5.	*Hullahoop*	Able to identify the truth of new information	Synthesis
		Productive in coming up with solutions	Evaluation

encourage students to think (cognitive domain) when they act (physical domain) and interact with others (social domain) while training fair play (ethical domain) and self-control (emotional domain)."

Good playing is playing which is beneficial, with numerous basic life skills (communication skills, thinking ability, socialization, cooperation, respect, and sportsmanship). Aside from having a beneficial effect for the students, playing should prioritize safety for the students, making them having fun, relaxed, instead of increasing the feeling of being pressured in the PSH-E process. The following are several points that must be noted by teachers or tutors: (1) the playing activities should be appropriate with the age of the students under guidance; (2) the preparation process for the playing activities should be prepared thoroughly and properly; (3) the process should be safe in the implementation; (4) every student should be active in the activities; (5) the activities have clear goals and are beneficial; (6) the activities do not cause long-lasting fatigue and were able to make the students relaxed. As Mosston and Ashworth report:

> "Experience in making decisions that were well-planned in a physical education program could actively challenge children to think (cognitive track), to move (physical tract), to interact with other children (social tract), to exercise fair play (ethical tract), and to be self restrained (emotional tract)". (Mosston & Ashworth, 2008, p.47)

Method

A pretest-posttest experimental design with experiment and control group was used in this study. Students in the experiment group was subjected to the treatment of play-based learning to enhance critical-thinking capabilities, while the control group was subjected to traditional learning, similar to the kind of learning they did on a daily basis. Data analysis was conducted using *t*-test and MANOVA (Multivariate Analysis of Variance), using the PASW Statistics (Predictive Analytics SoftWare) 18 program. The research design is pictured in Table 2.

The population in this study were students of class IV-VI (8-12 years old) SDN Sumobito I and SDN Sumobito III who were participating in the physical and health education class. In this study, the samples were collected by cluster or group sampling. Which class would be used as samples was conducted by lottery, resulting in class IV SDN Sumobito I as the control group (N = 34) and class IV SDN Sumobito III as the experiment group (N = 27). The study was conducted on two different schools, roughly one kilometers apart.

Data collection for the critical-thinking capabilities was conducted using the critical-thinking capabilities instrument developed by the first author. Arikunto (2006: 168) stated that "a good instrument must fulfill two important requirements, which were being valid

Table 2
Pretest-Posttest Experimental Design

Groups	*Pretest*	*Treatment*	*Posttest*
Experiment Group	O_1	X	O_2
Control Group	O_3	Y	O_4

Note.
O_1 *pretest* of experiment group's critical-thinking capabilities
O_2 *posttest* of experiment group's critical-thinking capabilities
O_3 *pretest* of control group's critical-thinking capabilities
O_4 *posttest* of control group's critical-thinking capabilities
X Play-based learning to enhance critical-thinking capabilities
Y Traditional learning

and reliable". The validity used in this study was content validity and construct validity. Content validity is an estimated validity through the testing of the test's items, using rational analysis or professional judgement. In order to fulfill content validity, a test must be comprehensive and only consists of relevant and non-deviative items, true to the test's boundaries and goals. After being constructed with experts, the instrument was tested. The validity test was conducted by correlating the item score with the total score using the Pearson Product Moment correlation, also known as inter-item-total-correlation, after the data was collected and tabulated. The level of validity was shown by the correlation coefficient (0-1). The higher the correlation, the more valid an instrument is, and vice versa (see Table 3, Maksum, 2012).

Testing results (N = 73) using the class IV students as respondents, reveals the validity of the 12 items as shown in Table 4. Table 4 reveals the value of r_{table} using $df = n - 2$ ($df = 73 - 2 = 71$) and a significance level of 5 %, resulted in .232. Considering that $r_{stat} > r_{table}$, then the instrument items were valid. If the validity score of every item in the critical-thinking capabilities instruments is higher than r_{table} (.232), the instrument can be considered to be valid.

The reliability score can be obtained using the Alpha Cronbach's method (internal reliability), measured based on the Alpha Cronbach's scale of 0-1.

Table 3
Validity Level

Validity Level	Correlation Coefficient
Very High	.80 – 1.00
High	.70 – .79
Moderate	.50 – .69
Low	.00 – .49

Source: Maksum, 2012: 116

Results and Discussion

The descriptive statistics of the results of the experiment were summarized and can be seen in Table 6. Even though there were increases in the average in both groups' total score, the experiment group's score showed a significant increase in the students' critical-thinking capabilities between pretest and posttest.

In order to find out more regarding the difference between the experiment group and the control group, data analysis was conducted using the Independent Sample *t*-test (testing the variance similarity using Levene's Test, $p > .05$ in all cases). In general, there were significant differences between the experiment group and the control group's post-test results [t = 2.542; p = .014 (< .05)]. While the pretest did not show signficant difference between the experiment group and control group [t = 1.401; p = .166 (> .05)].

On Table 8, the statistical difference of pretest and posttest data on the experiment group was analyzed using paired samples *t*-test for the critical-thinking capabilities total score; results showed that there were significant differences on the critical-thinking capabilities before and after the treatment of play-based learning [t = - 10.498; p = .000 (<.05)], with an increase of 19.61%. Even though the control group also showed an increase in the critical-thinking capabilities score [t = - 2.612; p = .013 (<.05)], the increase was only 3.03%.

In general, the research results showed that there were significant differences between the experiment group and the control group's critical-thinking capabilities score, with the experiment group being subject-

Table 4
Critical-Thinking Capabilities Instrument Validity Values

Indicator	Question Number	Correlation Coefficient	Validity Level	Value of r_{tabel} $df=n-2$	Information
Able to differentiate between relevant and irrelevant information	5	1.000	Very High	.232	Valid
Productive in coming up with solutions	4	.511	Moderate	.232	Valid
	10	.503	Moderate	.232	Valid
	12	.758	High	.232	Valid
Able to deduct swiftly and accurately	1	.805	Very High	.232	Valid
	2	.667	Moderate	.232	Valid
	3	.534	Moderate	.232	Valid
	6	.616	Moderate	.232	Valid
Able to identify the truth of new information	7	.829	Very High	.232	Valid
	9	.672	Moderate	.232	Valid
Able to ask complex questions	8	.695	Moderate	.232	Valid
	11	.756	High	.232	Valid

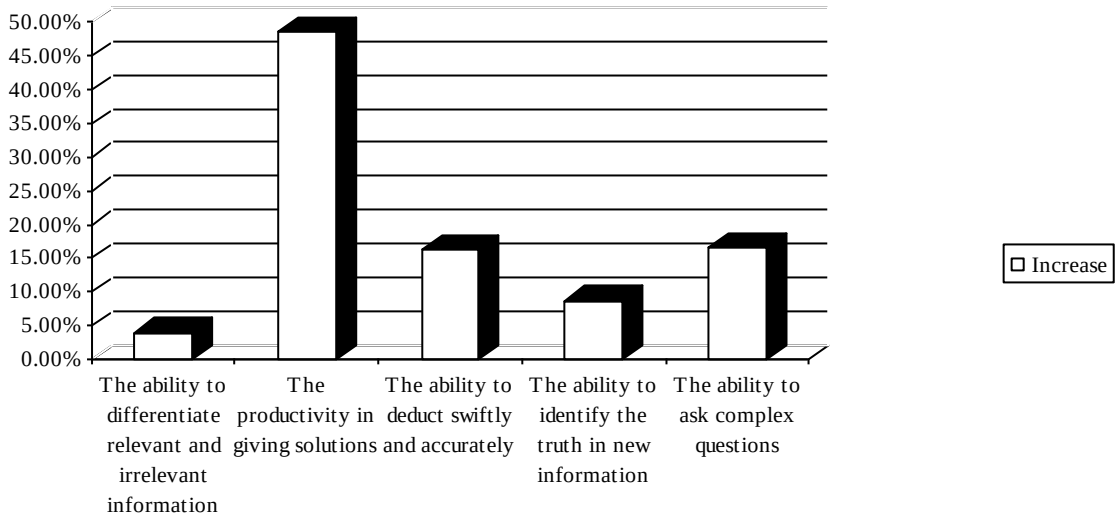

Figure 2. Increase in critical thinking indicator chart

ed to the treatment of play-based learning focused on analysis, synthesis, and evaluation. In order to test which indicators experienced enhancements on the treated group, the Multivariate Analysis of Variance (MANOVA) procedure was used, with the results shown in Table 9.

The research results showed that only the indicator of productivity in coming up with solutions and the indicator of ability to deduct swiftly and accurately had differences in the experimental group. The indicator of ability to differenciate relevant and irrelevant information, ability to identify the truth of new information, and ability to ask complex questions did not differ in the experimental group. Though there were no differences when seperated, but if not seperated, an increase was detected (see Figure 2).

Figure 2 reveals that the productivity indicator in coming up with solutions had the highest increase of 48.63%, followed by the ability to ask complex questions with 16.47% increase and then the ability to deduct swiftly and accurately with 16.23% increase. Even though the indicator of the ability to differentiate relevant and irrelevant information and the ability to identity the truth of new information did not have any difference in the pre-test and post-test, there was still an increase of 16.47% and 8.73% respectively, while the ability indicator to differentiate relevant and irrelevant information had a 4.00% increase. This is caused by the fact that the types and forms of playing activities focused more on problem solving,

Table 5
Critical-Thinking Capabilities Instrument Reliability Score

Cronbach's Alpha	*N of Items*
.719	12

Table 6
Critical-Thinking Capabilities Pretest and Posttest Results

	Group	*N*	*Pretest (M)*	*Pretest (SD)*	*Posttest (M)*	*Posttest (SD)*
Total Score	Experiment	27	28.333	4.930	33.889	4.353
	Control	34	30.088	4.801	31.000	4.452
Able to differentiate between relevant and irrelevant information	Experiment	27	3.704	.465	3.852	.362
	Control	34	3.765	.654	3.588	.701
Productive in coming up with solutions	Experiment	27	5.407	1.338	8.037	1.126
	Control	34	5.941	1.301	6.853	1.184
Able to deduct swiftly and accurately	Experiment	27	11.407	2.693	13.259	1.701
	Control	34	12.059	2.173	12.706	1.915
Able to identify the truth of new information	Experiment	27	4.667	1.359	5.074	1.412
	Control	34	5.235	1.350	5.118	1.320
Able to ask complex questions	Experiment	27	3.148	1.586	3.667	1.819
	Control	34	3.088	1.712	2.735	1.377

Table 7
Independent Sample t-test

	Experiment-Control Group	*T*	*p-value*
Critical-Thinking Capabilities	*Pretest*	1.401	.166
	Postest	2.542	.014

Table 8
Paired Sample t-test

	Pre-Post	*T*	*p-value*
Critical-Thinking Capabilities	Experiment	-10.496	.000
	Control	-2.612	.013

Table 9
MANOVA Test Results

Indicator	*F*	*p-value*
Able to differentiate between relevant and irrelevant information	1.705	.197
Productive in coming up with solutions	61.075	.000
Able to deduct swiftly and accurately	9.129	.004
Able to identify the truth of new information	1.167	.285
Able to ask complex questions	1.247	.269

therefore students tend to conduct thinking capabilities to come up with solutions, being able to deduct swiftly and accurately.

Empirical testing results showed that the playing activities based learning focusing on analysis, synthesis, and evaluation could increase students' critical thinking capabilities significantly. This means that playing activities based learning focusing on analysis, synthesis, and evaluation had an effect on students' critical thinking capabilities. This was in line with the statement of Gokhale (1995, p. 25), "...that critical thinking includes the concepts of analysis, synthesis, and evaluation." Several studies reveal that children cognitive abilities are important factors in child development, because cognitive abilities can confirm the existing knowledge and add new information to the existing knowledge structure. It is also interesting to take note of a neurological aspect reported by Lester and Russell:

> "While research on brain development is in its infancy, it is believed that play shapes the structural design of the brain. We know that secure attachments and stimulation are significant aspects of brain development; play provides active exploration that assists in building and strengthening brain pathways. Play creates a brain that has increased "flexibility and improved potential for learning later in life" (Lester & Russell, 2008, p. 9).

Results also showed that the experiment group had higher critical thinking capabilities compared to the control group that did not receive the treatment. This means that the playing activities based learning treatment had a positive effect on the students' critical thinking capabilities. Several psychology experts stated that playing has a very high effect on the development of the children's mind, with intelligence being one of the factors. Intelligent children are more active compared to less intelligent children and are more fond of intellectual or stimulating activities. Research and evidence all point to the role of play in children's development and learning across cultures (Shipley, 2008). Many believe that it is impossible to disentangle children's play, learning and development.

Conclusion and Suggestions

Critical-thinking is one of the important issues in education, and teachers are demanded to be able to continuously develop critical-thinking capabilities in students. This study focused on the effectiveness of play-based learning focused on analysis, synthesis, and evaluation to enhance students' critical-thinking capabilities. The results of this study supported the results of previous researches that stated that critical-thinking can be enhanced with play-based learning method.

Simultaneous physical, social, and intellectual stimulations could yield enhanced neurological performances by sending relevant impulses to the brain, which in turn create adaptative neural networks and healthy cognitive development **(**Sattelmair & Ratey, 2009**).**

Cognitive learning focuses in teaching an educational subject into the mind of the students, forming a particular knowledge structure. The main goal is to form new knowledge and make use of the previously formed knowledges into playing situations, including the cognitive domain, which in turn send the playing appearances into the psychomotoric domain.

Playing has an important role in critical thinking learning process, and both are fulfilling each other's roles. Students learn various abilities and skills in playing, so the learned abilities can be practiced in everyday life. Through playing activities based learning in PSH-E, the role of teachers and students change. Students become more responsible, motivated, and satisfied. The education process becomes relevant and authentic, which should be continued in the future through a same method, creating students with high thinking capabilities.

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