

Scientific Approach in Physical Education

Can it Improve Concentration and Spatial Intelligence of Senior High School Students in the Mountainous Area?

Beltasar Tarigan, Herman Subarjah, Kurnia E. Wijaya and Iqbal Gentar Alam
*Faculty of Sport and Health Education, Universitas Pendidikan Indonesia,
Jl. Dr. Setiabudhi No. 229, Bandung, Indonesia
beltasartarigan@upi.edu*

Keywords: Scientific Approach, Concentration, Spatial Intelligence, Mountainous Area.

Abstract: The purpose of this research is to analyze the influence of scientific approach in physical education towards the concentration and spatial intelligence of senior high school students in the mountainous area. The methods of the experiment used were Pre-test and Post-test designs. The population was the students of Senior High School 1 Lembang, with 2 groups, 36 students were taken as samples through simple random sampling technique. The instruments used were concentration test and spatial intelligence test. The data was processed by independent t-test with the level of trust 0,05. The result of independent t-test in the component of concentration shows that $t = 2.879$, Sig 0,005, so H5 accepted. The spatial Intelligence components show that $t = 3.894$, Sig 0,000, so H6 accepted. Conclusion: A scientific approach in physical education done 3 times a week can increase the concentration and spatial intelligence of senior high school students living in the mountainous areas. Meanwhile, if it is done only once a week, it will be lower.

1 INTRODUCTION

Physical education and sports are essentially parts of the efforts in supporting the achievement of the national education goals. Physical education in the 20th century emphasized more on the aspects of physical fitness, moving skill, knowledge, and social (Abduljabar, B. 2011); Gu, X., Solmon, M.A., and Zhang, T. 2014). The fact is that on the field, the students feel that the physical education learning is not that attractive and it feels like kind of monotonous, so that it feels boring. One of the reasons of why it feels boring is that because the teachers are still implementing the conventional learning approach, with one of its characteristics are the teachers seem authoritative and all the learning process is designed by the teachers, without involving the students. This fact is supported by an argument that says that in its implementation, the old curriculum (conventional) is kind of static and strict because of those people who implement it on field. (Beyer, L. E. and Apple, M. W. (eds). 1998); Cook-Sather, A. 2009b); Grumet, M. R. 1990). In overcoming the condition of physical education learning at school these days, a new way of learning is needed, especially those related to the right model

application and learning approach, so that it can increase the students' creativity, concentration, and intelligence. Related to it, the government had made a policy to implement the 2013 curriculum in the new semester of 2014, for all education units, starting from the elementary schools, junior high schools, and senior high schools. One of the things that are emphasized in the curriculum is that the approach model, known as Scientific and consists of Problem Base Learning approach, Base Learning Project and Discovery Learning. Through these three approaches, the students are expected to develop the aspects of creativity, concentration, and intelligence. This is supported by the experts who have confirmed that intelligence can be affected by the environmental factors (Diamond, M., and Hopson, J. 1998); Lucas, A., Morley, R., Cole, T. 1998); Neisser, U., Boodoo, G., Bouchard, T., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D., Loehlin, J., Perloff, R., Sternberg, R. and Urbina, S. 1996); Nisbett, R. E. 2009), as a nature carried from birth (Eysenck, H. 1994); Herrnstein R.J. and Murray C. 1994); Jensen, A. R. 1980); Jensen, A. R. 1998). On the contrary, Multiple Intelligence theory as the combination of intelligence of an inherited potential and skills that can be developed in several ways through the relevant experiences

(Gardner, H. 1983). Meanwhile, the factors of sense and intelligence are affected by the independent system, in which the type and quality of the information received by the sensory system (sense) determine someone's intelligence (Gardner, H. 1993). Related to the increase of the body endurance, the serum calcium level is related positively to the lower leg muscles, but the decrease of the serum calcium level is not necessarily followed by the weakening of the leg muscles on football athletes (Yusni, Amiruddin, A Purba, and B Tarigan. 2017). So, aside from exercising often, in maintaining and improving the body's ability, supply of healthy and adequate food is also needed.

In the physical education using the scientific approach, students are trained to analyze and to make decisions to do some moves in accordance with the condition that's happening during the game. The experts have predicted that the approach with the scientific ethics is the best way to be implemented today and in the future (Zeigler. E F. 1980); Bacanak, A and Gökdere, M. 2009); Hurd, P.D. 1998). The combination of movement done can help improve the memory, instruction, and sequential skills. Creating the movement can also improve the students' confidence, which is a very important thing in the learning process (Gilbert, A.G. 1992). An interesting, fun, and challenging physical education activity and sports can help improve the students' creativity, concentration, and intelligence. Through a regular and measured physical education activity and sports, a kid will be able to maintain their physical endurance and concentration level longer than those who do not exercise regularly (Niels Egelund. www.health.detik.com). Physical education programs should help cultivate awareness, affect the attitude, and identify the alternatives, so that individuals can make a choice about information selection and the change of behaviour to achieve the best physical and mental health level (Misner, J. E. 1984). Other researchers have also highlighted and identified the role of physical activity and endurance, also the mental health of the school-age children, that has the implication towards the public health which is an important factors in the kids' life (Blair, S.N., Cheng, Y., and Holder, J.S. 2001); Fogelholm, M. 2010). Meanwhile, principally in every endurance program, there is an idea that we educate teenagers to be fit and stay fit and active for their whole life (Corbin, Charles B, Welk, G. J. 2014). Therefore, students who exercise regularly with the scientific approach at school or through their own awareness off-school can help improving their brains' performance.

2 METHOD

The method used in this research is experiment, a research that involves experiment/giving treatment to several students to obtain data as the effect of the treatment given, and those are concentration and intelligence. The data was obtained through concentration test and spatial intelligence test, and then compared them with the control group. In accordance to the variables that were about to be researched, then the research design that used would be the Randomized Control-Group Pre-test – Post-test Design, because there were two groups in this design: control group and experimental group. The experimental group got the physical education learning treatment that used scientific approach and the control group with the conventional approach. The main purpose of this research is to reveal the effect of physical education and sports on the improvement of students' concentration and spatial intelligence and to test which approach is the most effective one in improving the two components that become the dependent variables.

The instruments used in obtaining the data in this research are: first, to get information about the students concentration level by spreading the concentration test and then verifying the data; second, to get the information about the students' spatial intelligence by spreading questionnaires about spatial intelligence and then verifying the data.

2.1 Population and Sample

The population was junior high school students from 6 different classes, consisted of 180 students. The samples were some of those consisted in the population that were considered as being able to represent the whole research population, therefore the technique of sample selection had to be in accordance with the general natures of the research's purpose. The samples used were 10 % of the population of those junior high school students. The sample determination technique used was the Simple Random Sampling technique. 40 students were chosen randomly, 20 students got the scientific treatment and the other 20 got the conventional approach.

2.2 Analysis

We analyzed the data within these steps:

- The normality used was Kolmogorov-Smirnov on p-value > 0.05. The homogeneity test used was Levene Test on p-value > 0.05.

- The analysis of hypothesis number 1 to 2 used Paired Sample T-Test and number 3 used Independent T-Test on p-value > 0.05.

3 RESULTS AND DISCUSSION

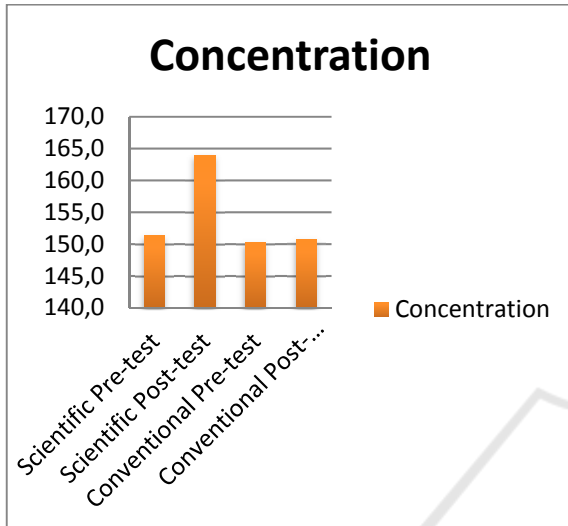


Figure 1: The difference between scientific and conventional towards the concentration of the students in the mountainous area of lembang.

Based on the data presented on Graphic 1, it shows that the experimental group with the scientific approach in the area of Lembang generated the concentration pre-test result of 5459 with the average of 151.39, whereas the post-test result was 5905 with the average of 164.03. The control group with the conventional approach in the area of Lembang generated the concentration pre-test result of 5411 with the average of 150.31, whereas the post-test result was 5425 with the average of 150.69.

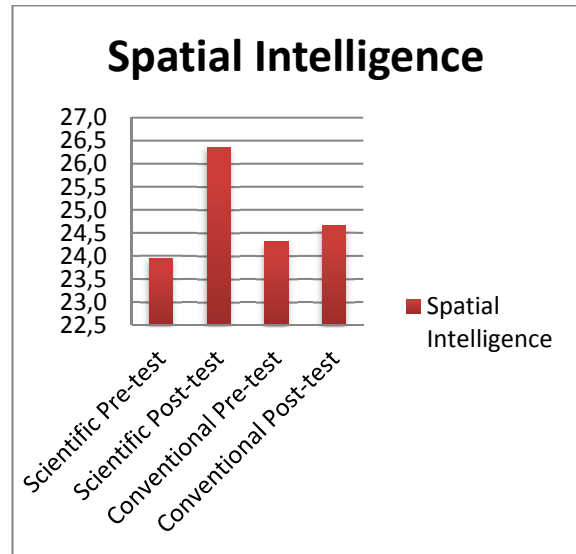


Figure 2: The difference between the scientific and conventional approach towards the spatial intelligence of students in the mountainous area of lembang.

The data presented on Graphic 2 shows that on the experimental group with the scientific approach in the area of Lembang, the result of the spatial intelligence pre-test was 862, with the average of 23.94, whereas the post-test result was 949 with the average of 29.36. The control group with the conventional approach in the area of Lembang got the spatial intelligence pre-test result of 857 with the average of 24.31, whereas the post-test result was 888 with the average of 24.67.

Table 1: Paired tests of concentration and spatial intelligence in the mountainous area of lembang.

Concentration		
Group	T	Sig. (2-tailed)
Scientific	-3.011	.005
Conventional	-0.555	.582
Spatial Intelligence		
Group	T	Sig. (2-tailed)
Scientific	-9.005	.000
Conventional	-0.794	.432

The data processing and analysis on table 1 show that physical education done on the mountainous area with the scientific approach has influence towards the students' improvement of concentration and spatial intelligence. Through the scientific approach, the students were asked to be able to improve their skills and abilities, thinking, curiosity and the ability to think or understanding quickly. Learning, thinking, having creativity and intelligence do not only involve

the brain, but also physical process as a whole. Sensation, movement, and brain function can unite in physics as a whole (Hannaford, C 2005). In line with it, the experts argue that some theories about intelligence, compared to the traditional learning method, creates positive effects on the students' success and attitude on science as a school subject (Özdemir, P., Güneysu, P. and Tekkaya, C. 2006). The learning process in scientific approach encourages the students to study actively through their active participation in the physical education, alone with the concepts and principles, and the teachers encourage the students to have experience and do some experiments that make it possible for them to discover some principles for themselves (Suprihatiningrum, J. 2013). Students who learn with the learning strategy based on Multiple Intelligence Theory got better score than those who learn through the traditional learning (Abdi, A., Laei, S., and Ahmadyan, H. 2013).

Meanwhile, the physical education done in the mountainous area using the conventional approach didn't affect the students' concentration and intelligence improvement. The learning process emphasizes more about the mastery of technique first through repetition before stepping into the real games. In the process of mastering the skills, the students are never given chances to think critically like how to do a right and great technique. It happens because all process and steps are all managed by the teachers. The result is, the students will only do what their teacher ask them to and there is no tolerance to do the alternative steps in solving problems. It causes the students to be easily bored and tired, and so that it cause them to lose creativity. Other experts advise to diagnose and promote intelligence sistematically to supply the students with knowledge and experience from double intelligence and to use it in the teaching practice in the future (Elena, R., Carlín, T., and Castillo, C. (n.d.). This is because the students who learn by the Multiple Intelligence learning approach experience significant improvements on the terms of achievements and attitude towards science compared to the traditional approach (Kaya, O. N. 2007).

Table 2: Independent sample t-test on concentration and spatial intelligence on the mountainous area of lembang.

Paired Sample t Test	T	Sig. (2-tailed)
Concentration	2.879	.005
Spatial Intelligence	3.894	.000

Based on the data managing and analysis in Table 2, it shows that physical education on the mountainous area that uses the scientific approach has

better effects on the students concentration and spatial intelligence compared to the conventional approach. Therefore, the teachers have to master the scientific approach in physical education. To improve the students' interest, motivation, and creativity, the physical education learning model and process should make the students to be more active and creative, as well as getting challenges in the physical education activities (Gu, X and Chang, M and Solmon, A M. 2016). About spatial intelligence, it is discovered that physical education that is done with playing approach has a better effect on the students' spatial intelligence compared to the conventional approach (Tarigan, Beltasar. 2014); Tarigan B, Habibudin T and Ikbal Gentar Alam IG. 2016). Furthermore, the experts state that scientific approach has a significant effect on the students' concentration (Tarigan, Beltasar. 2015). It is supported by the experts' arguments that state, "...children with good spatial thinking abilities have better performance in geography, and this spatial intelligence is correlated with all kinds of intelligence, aside from musical intelligence..." (Klonari, A., and Likouri, A. A. (n.d.). In order to achieve the physical education learning quality that is useful for the students' concentration and spatial intelligence, these principles in the learning activity are needed: (1) centered on the students, (2) developing the students' creativity, (3) creating a fun and challenging condition, (4) consisting of value, ethics, esthetics, logic, and kinesthetics, and (5) offering various learning experience through the application of several strategies and methods through fun, contextual, effective, efficient, and meaningful learning (Hosnan, M. 2014).

4 CONCLUSIONS

Physical education that was done three times a week in the mountainous area using the scientific approach, affected the improvements of students concentration and spatial intelligence, whereas the physical education using the conventional approach that was done once a week didn't have any effects on the improvements of students' concentration and intelligence. Physical education that was done on the mountainous area with the scientific approach had a better effect on students' concentration and spatial intelligence, compared to the conventional approach.

REFERENCES

- Abdi, A., Laei, S., Ahmadyan, H. 2013. The Effect of Teaching Strategy Based on Multiple Intelligences on Students' Academic Achievement in Science Course. *Universal Journal of Educational Research*, 1(4), 281–284.
- Abduljabar, B. 2011. *Modul Pedagogi Olahraga*. Bandung: FPOK UPI.
- Bacanak, A., Gökdere, M. 2009. Investigating level of the scientific literacy of primary school teacher candidates. Amasya University, Turkey. *Asia-Pacific Forum on Science Learning and Teaching*, 10 (1), Article 7, p.1 (Jun. 2009)
- Beyer, L. E., Apple, M. W. (Eds) 1998. *The Curriculum: Problems, Politics, and Possibilities*. Albany, NY: SUNY Press.
- Blair, S. N., Cheng, Y., Holder, J. S. 2001. Is physical activity or physical fitness more important in defining health benefits? *Medicine and Science in Sports and Exercise*, 33(Supplement), 379–399.
- Cook-Sather, A. 2009b. *Learning from the Student's Perspective: a Sourcebook for Effective Teaching*. Boulder, CO: Paradigm.
- Corbin, C. B., Welk, G. J. 2014. Youth Physical Fitness. *Joperd*, 85(2), 24–31.
- Diamond, M., Hopson, J. 1998. *Magic trees of the mind: How to nurture your child's intelligence, creativity, and healthy emotions from birth through adolescence*. New York: Dutton.
- Elena, R., Carlin, T., Castillo, C. (n.d.). A Mexican Study of Multiple Intelligences for Pre-Service Teachers of English as a Foreign Language Un Estudio de inteligencias múltiples con futuros docentes de inglés como lengua extranjera mexicanos, 170–189.
- Eysenck, H. 1994. *Manual for the Eysenck personality questionnaire (EPQ-R Adult)*. Educational Industrial Testing Service.
- Fogelholm, M. 2010. Physical activity, fitness and fatness: Relations to mortality, morbidity and disease risk factors. A systematic review. *Obesity Reviews*, 11(3), 202–221.
- Gardner, H. 1983. *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Gardner, H. 1993. *Multiple Intelligences: The Theory in Practice*. New York: Basic Books.
- Gilbert, A. G. 1992. *Creative dance for all ages: A conceptual approach*. Resto, VA National Dance Association.
- Gu, X, Chang, M, Solmon, A M. 2016. Physical Activity, Physical Fitness, and Health-Related Quality of Life in School-Aged Children. *Journal of Teaching in Physical Education*, 2016, 35, 117 -126.
- Gu, X., Solmon, M. A., Zhang, T. 2014. Understanding middle school students' physical activity and health-related quality of life: an expectancy-value perspective. *Applied Research in Quality of Life*, 9(4), 1041–1054.
- Grumet, M. R. 1990. Voice. the search for a feminist rhetoric for educational studies. *Cambridge Journal of Education*, 20(3), 277–282.
- Hannaford, C. 2005. *Smart Moves: Why Learning is not all in your head* (2nd Ed) Salt Lake City, UT: Great River Books
- Herrnstein R. J., Murray C. 1994. *The Bell Curve: Intelligence and Class Structure in American Life*. New York: Free Press.
- Hosnan, M. 2014. *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia.
- Hurd, P. D. 1998. Scientific literacy: New minds for a changing world. *Science Education*, 82(3), 407-416.
- Jensen, A. R. 1980. *Bias in mental testing*. New York: Free Press.
- Jensen, A. R. 1998. *The g factor: The science of mental ability*. Westport, USA: Praeger/Greenwood.
- Kaya, O. N. 2007. Comparing Multiple Intelligences Approach with Traditional Teaching on Eight Grade Students' Achievement in and Attitudes toward Science. *American Educational Research Association*, 1–13.
- Klonari, A., Likouri, A. A. (n.d.). The Relation of Multiple Intelligences and Spatial Perception with Performance in Geography Education, 359–362.
- Lucas, A., Morley, R., Cole, T. 1998. Randomised trial of early diet in preterm babies and later intelligence quotient. *British Medical Journal*, 317, 1481-1487.
- Misner, J. E. 1984. Are We Fit to Educate about Fitness? *Journal of Physical Education, Recreation and Dance*, 55(9), 26–40.
- Neisser, U., Boodoo, G., Bouchard, T., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D., Loehlin, J., Perloff, R., Sternberg, R., Urbina, S. 1996. Intelligence: Knowns and unknowns. *American Psychologist* 51, 77–101.
- Niels Egelund. Jalan Kaki atau Bersepeda ke Sekolah Tingkatkan Konsentrasi Selama 4 Jam. Tersedia dari www.health.detik.com.
- Nisbett, R. E. 2009. *Intelligence and how to get it: Why schools and cultures count*. New York: W W Norton and Co.
- Özdemir, P., Güneysu, P., Tekkaya, C. 2006. Enhancing learning through multiple intelligences. *Journal of Biological Education*, 40(2), 74–78.
- Suprihatiningrum, J. 2013. *Strategi Pembelajaran*. Yogyakarta: AR- Ruzz Media
- Tarigan, B. 2014. *Pengaruh Pendidikan Jasmani Dan Olahraga Terhadap Kreativitas Dan Kecerdasan Spasial (Spatial Intelligence) Pada Siswa Sekolah Menengah Umum*. UPI Bandung.
- Tarigan B, Habibudin T, Ikbal Gentar Alam IG. 2016. The Influence of a Games Approach in Physical Education on Senior High School Students' Creativity Level and Spatial Intelligence. Serials Publications. *Man In India*, 96 (11): 5071-5077
- Tarigan, B. 2015. *Pengaruh Pendekatan Saintifik Dalam Pembelajaran Pendidikan Jasmani Dan Olahraga Terhadap Kreativitas, Konsentrasi, Kebugaran Jasmani Dan Kecerdasan Spasial (Spatial Intelligence) Pada Siswa Sekolah Dasar*. UPI Bandung.

- Yusni, Amiruddin, A Purba, B Tarigan. 2017. Essential Role of Serum Calcium for Muscle Strength in Football Athletes. *IOP Conf. Ser.: Mater. Sci. Eng.* 180 012186.
- Zeigler. E. F. 1980. Application of a Scientific Ethics Approach to Sports Decisions. *QUEST*, 1980, 32(1), 8-21.

