INTERNATIONAL SEMINAR
October 19, 2013

MSCEIS 2013

official website: seminar.fpmipa.upi.edu

Proceeding

Section:
Biology and Biology Education

International Seminar on
Mathematics, Science, and Computer Science Education

organized by:
Faculty of Mathematics and Science Education
Indonesia University of Education

supported by:
SEAMEO QITEP in Science
Himpunan Sarjana dan Pemerhati Pendidikan IPA Indonesia

ISBN 978-602-95549-2-2

MSCEIS 2013

ISBN 978-602-95549-2-2

Proceeding

International Seminar on Mathematics,
Science and Computer Science Education
2013

Turning Dreams into Reality: Current Trends in Mathematics,
Science and Computer Science Education

Head of MSCEIS : Dr. Sufyani Prabawanto, M.Ed.
Secretary : Didik Proyandoko, S.Pd., M.Si., Ph.D.
Treasure : Dr. Wawan Setiawan, M.Kom.
Secretariat : Yayan Sanjaya, S.P., M.Si., Ph.D.

Editors:
Prof. Dr. Rr. Hertien K. Surtikanti, M.Sc.E.S.
Prof. Dr. Anna Permanasari, M.Si
Prof. Dr.Munir, MIT
Drs. Turmudi, M.Ed., M.Sc., Ph.D.
Dr. Ida Kaniawati, M.Pd
Dr. Diana Rochintaniawati, M.Ed.
Dr. Stanley Dewanto
Dr. rer.nat. Mufti Petala Patria, M.Sc.

Published by:
Faculty of Mathematics and Science Education
Indonesia University of Education
Jl. Dr. Setiabudhi No. 226 Bandung 40154 West Java, Indonesia
Official website: http://fpmipa.upi.edu

PREFACE

The Seminar under the theme "Turning Dreams into Reality: Current Trends in Mathematics, Science and Computer Science Education" is conducted by Faculty of Mathematics and Science Education, UPI at October 19, 2013. The aim of the seminar is to provide a forum where teachers and researchers can exchange didactical, pedagogical, and epistemological ideas on mathematics, science, and computer science education which is expected to stimulate research in those areas. The seminar also provides an exceptional opportunity for all participants to contribute to the world of mathematics, science, and computer science education.

Some of outstanding scientists and educators from Germany, Australia, Hongkong, Malaysia, Singapore, Netherland, and Indonesia joined in this seminar made the seminar trully international inscope. There were 485 participants, had many fruitful discussions and exchanges that contributed to the success of the seminar. 157 papers discussed in the parallel session. The papers were distributed in 6 fields. 46 papers in mathematics or mathematics education, 19 papers in physics or physics education, 23 papers in chemistry or chemistry education, 25 papers in biology or biology education, 9 papers in computer science or computer science education, and are 18 papers in science education. Of the total number of presented papers, 157 included in this proceeding.

Genereus support for the seminar was provided by SEAMEO QITEP in Science and Himpunan Sarjana dan Pemerhati Pendidikan IPA Indonesia. The support permited us to gave an opportunitiy for a significant number of young scientists and persons from many universities and other institutions brought new perspectives to their fields.

All in all, the seminar was very seccessfull. We expect that these future seminar will be as stimulating as this most recent one was, as indicated by the contribution presented in this proceeding.

Chief of Organizing Committee ,

Dr. Sufyani Prabawanto, M.Ed.

ISBN 978-602-95549-2-2

TABLE OF CONTENT

ISBN 978-602-95549-2-2
MSCEIS 2013
Proceeding

ISBN 978-602-95549-2-2
MSCEIS 2013
Proceeding

ISBN 978-602-95549-2-2
Proceeding MSCEIS 2013

THE CREATIVE THINKING SKILLS OF STUDENT TO RECYCLING GARBAGE THROUGH PROBLEM SOLVING METHOD

Baiq Fatmawati

Program of Biology Education, STKIP Hamzanwadi-Selong

Article Info
Article history:

Keywords :
Creative thinking
Recycling garbage Problem solving
.

ABSTRACT

Biology as the compulsory subject at the junior and senior high school is usually given as recitative learning. It is eventually presented verbally and the subject matters have not been related to the various problems of the daily and social lives. To make the process of the teaching and learning more meaningful, it should be initiated by asking some challenging questions about particular phenomenon by assigning the students to do certain activities, then focusing on collecting and utilizing evidences. In other words, the lesson should not be merely delivered directly and emphasizing on memorizing. The role of the teacher in teaching and learning process is adapting and making the process meaningful and effective in order the students learn by constructing their own knowledge, learning by experiencing, and learning by solving problems in team-work. This research was focused to measuring the ability creative thinking to recycling garbage of the female and male students through problem solving as a method in teaching and learning process. The Sample of this research was the tenth grade students of the senior high school (SMA 1 Sikur). Data was collected using creative thinking test which consists of six questions. The result showed on creative thinking of female students is 2,2% and male student 0,02%. Based on the data, it can be asserted that creative thinking can be trained through various methods; one of them is problem solving method.

CorrespondingAuthor:
Baiq Fatmawati
STKIP Hamzanwadi-Selong
f_baiq@yahoo.com

1. INTRODUCTION

The purpose of education is to educate the children and lead them to be aware of the essence of environment and consider about how to manage it in a good manner. It means that they should be assigned with the concept which apt to the advance of science and technology. Science is a concept of learning about nature and it has a close relationship with the human life. In this case, it is necessary to have the society who understand the concept and the principles of science, who live harmonically with the nature, who recognize the variety of the nature, who apply the knowledge and the way of thinking on science for the social and individual purpose, and who give a priority to the science competency which is needed by all members of society in order that it is beneficial to cope the problems in daily lives (Rutherford & Ahlgren, 1990). Rustaman (2002) explains that to face the challenge in facing the dynamic of life, it is necessary to prepare the quality human resource physically and mentally on the way of their thinking as well as their behavior toward the environment.

It is a fact that living in the world is always included with problems, it is therefore needed such ideas to solve the problems. One should be creative to search the ideas to solve the problem, in this respect, students at the university should be assigned a skill especially the thinking skill in order they are able to solve the problems which exist around them. Teacher should teach the students the thinking skill to help them being able to solve their own problems. One of the real phenomena the students usually face is the problem of the environment which related closely to the learning that is the pollution of the environment especially the problems of litter either the organic or inorganic which is accessed from the human activities. If people can think creatively, litter should be able to be reused or recycled in order it can give special contribution.

Creative thinking is a skill to seek all kinds of possibility that is able to solve a problem and as the ways someone approach to solving the problems, seeking for various alternative of solving a problem and applying it to solve the problems which is not rigid to one solving a problem. However, learning biology in schools often given as recitative learning, verbal and less related with problem in students' real life, whereas the final purpose in learning is producing the individuals whose knowledge and skills and capable to apply the subject matter they have learned to solve a problem which are faced later in their community.

Fatmawati (2013), reveals her finding on identifying the creative thinking skill of male and female students to solve a problem about contamination of environment (organic and inorganic garbage). Based on result of data analysis, it was obtained that male student is more creative than female student. The result of male students' creative thinking is: the flexibility was 34,7%, the fluency was 34,7%, and the originality was 7,2%, while female student is: the flexibility was 45,5%, the was 45,5%, and the originality 4,4%.

To train life skill in community, school need to do an orientation of curriculum to yield productive citizen (Rustaman, 2006). Teaching thinking skill explicitly which is combined with the content of subject matter based on curriculum, can assist the students to be creative and critical thinker (Sutrisno, 2008). Creative thinking skill of someone can be trained through various methods of learning which indicated the character of constructivism, one of them is the Problem Solving method.

Basically, Problem Solving is implemented through systematic procedure of actions in several steps for the beginner (novice) to solve a problem, because the subject matter that is learned is solve a problem procedure and orienting at process. The intended process is not seen as acquisition of information happened in one way from outside into himself (student), but as giving of meaning by student to his own experience (Wena, 2011). The aim of applying problem solving method is to cultivate what is thought by the students in responding a problem which is given by the teacher in the classroom (Roestiyah, 2008). Based on the above description, a research question is formulated as: "*Can applying problem solving method increase creative thinking skill of male and female student?"*

2. METHOD

The design of this research is pretest-posttest control group design (Borg., et al., 2003) at student class X (ten) SMAN 1 Sikur. Sampling is simple random sampling so obtained class X2 as samples; they were 20 female and 13 male student. The procedure of research: 1) teacher gave test (pretest) to student about ways to solve problem of garbage organic and inorganic, 2) during twice meeting, students studied about waste by applying problem solving method, and 3) teacher gave posttest with the same problem at the time of pretest. The 6-items of creative thinking test area bout an analysis of garbage organic picture. To know the improvement of creative thinking skills of male and female student, this study apply gain (d) formula (Savinem & Scott, 2002) as follows:

$$g = \frac{(s\,post - s\,pre)}{(s\,max - s\,pre)}$$

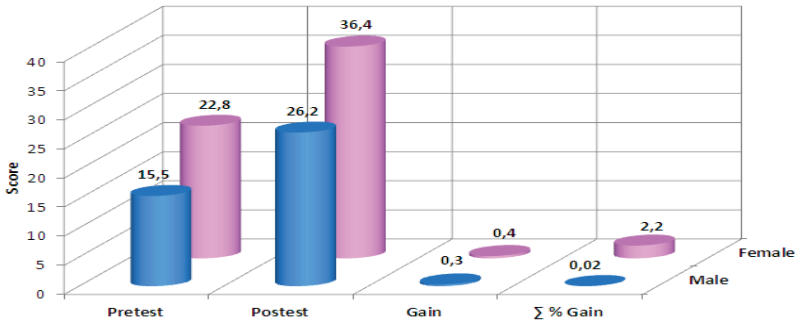
Ket: g = gain score
S_{post} = posttest score
S_{pre} = pretest score
S_{max} = maximum score

3. RESULT AND ANALISYS

The result of the research after applying problem solving as learning method is: a) the improvement of creative thinking of male and female, and b) difference indicators of creative thinking between male and female. The following results are third of the research findings:

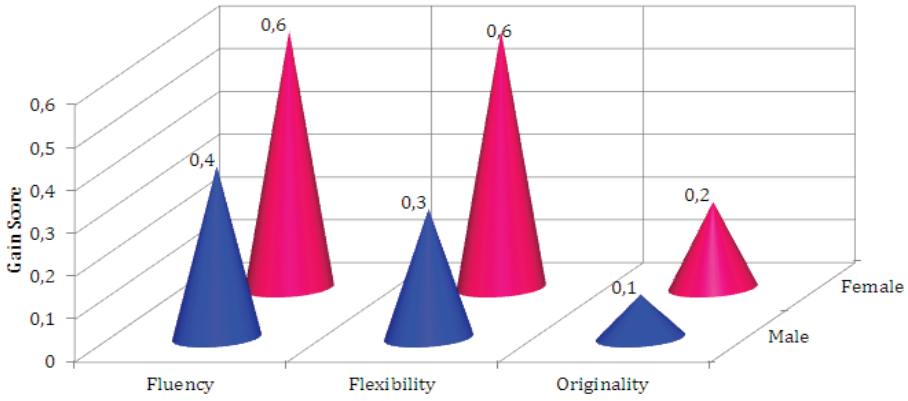
a. The improvement of creative thinking; result of creative thinking test was from male and female student pretest and posttest, the gained score of creative thinking of female students is higher (0,4) than male students (0,3) (*see picture 1*). Research about creativity at male and female student has also been done by Basu, et.,al. (2011), he reveals that in academik creativity of female student is higher than male student which has been measured in verbal and non verbal. Mean score for creativity for verbal of female student is 59,00 and male student 51,00. While mean score of creativity for non verbal of female student is 64,00 and male student is 57,00.

ISBN 978-602-95549-2-2 MSCEIS 2013 Proceeding



Picture 1: Improvement of Creative thinking

b. Difference indicators of creative thinking; analysis result for three indicators of creative thinking indicators that is fluency, flexibility and originality obtained result that is female student is higher than than male student (*see picture 2*). The same result told by Pathak (2013) is expressing that indicator of creative thinking of male student is less compared to female student at mathematics study, score indicator of creative thinking of male student is: fluency (55,18), flexibility (40,72), and originality (18,14). And score indicator of creative thinking of female student is: fluency (67,39), flexibility (50,11), and originality (24,69).



Picture 2: Difference Indicators of Creative Thinking between Male and Female Student

Based on result of Aziz (2010) research at 82 students having degree of creativity. Female student having higher degree (53%) than male students (47%). Cramond, et.al (Azis, 2010) states that from various researchs about creativity, it was found an existence of relation between difference of gender with level of creativity either in the form of quantity and aquality. Result of analysis to research journals from the year 1958-1998 found existence of good difference at aspect fluency, flexibility, originality, and elaboration. Female tends to be higher at the aspects of fluency, originality, and elaboration, while at the aspect of flexibility male tends to be higher. Brizendine in Azis (2010) an expert of neuropsichiatry and special clinic director of studies function of female brain explain that it is true that in structure there are differences between male and female brains, this things causes at difference both in way of thinking, the way of looking into something, the way of communicating, and so forth.

Based on data above, problem solving method significantly gives an impact to creative thinking skillof student and this proves that creative thinking skill of student which can be trained through a method of learning. The result of research about problem solving method at group of mathematics and science, proves that at group of science obtains higher level average value (2,07) compared to group of mathematics (1,20) (Hezarjaribi & Nasrollahi; 2012). Rustaman (2007), reveals that problem solving method is a teaching method to support student to find and solve the problems. Problem Solving method is not merely simply teaching method but also a thinking method, because in problem solving similar to other other methods, it can be applied by starting on finding the data until concluding the data (Mulyono, 2012).

Learning biology must be oriented to supply skills of applyng lesson content in life. In order to become more meaningful, learning process should be applied by starting from challanging question about a phenomenon, then assigns student to do an activity, focus on gathering and utilizing evidences,

ISBN 978-602-95549-2-2
MSCEIS 2013
Proceeding

not simply forwarding the information directly and emphasising at memorizing (Depdiknas, 2002; Lawson, 1995).

4. CONCLUSION

Creative thinking skills of students can be trained through study methods. One of them is by applying problem solving method. Applying problem solving method as learning method of content in inorganic and organic garbage gives impact to Creative thinking skills of male and female student, after giving creative thinking test, it indicates that female student (0,4) is higher on the way of thinking compared to male student (0,3). The indicator of creative thinking skills shows that female student obtained score: fluency (4,9), flexibility (4,4), and originality (4,2). While male student obtains score: fluency (4,6), flexibility (4,2), and originality (1,8). Therefore, it can be concluded is that female student more creative compared to male student.

REFERENCES

[1]. Aziz, R. (2010). *Mengapa perempuan lebih kreatif*?. [On Line]. Tersedia di http://www.uin-malang.ac.id/. [14 Maret 2013].
[2]. Basu, N., Nadeem, N.A., &Wani, T.A. (2011). A Comparative Study of Creative Potential and Study Habits of Academically Gifted Male and Female Students**.** *European Journal of Education and Learning*. [On Line]. Vol.10Tersedia:www.BellPress.org. [30 Juli 2013].
[3]. Borg, W.R., *et.al*.(2003). *Educational Research an Introduction*; Seventh Edition. New York: Longman Inc.
[4]. Depdiknas. (2002). *Kurikulum Berbasis Kompetensi*. Jakarta: Poskur Balitbang Depdiknas.
[5]. Fatmawati, B. (2013). "Identifikasi Kemampuan Berpikir Kreatif Siswa Dalam Mengatasi Permasalahan Pencemaran Lingkungan". Makalah Seminar Nasional Pendidikan Dan Penelitian Biologi. UPI – Bandung, 28 Juni 2013.
[6]. Hezarjaribi, H.A.Nand Nasrollahi, M.A. (2012). "A Comparative Study between Using Problem-Solving and Traditional Teaching Principles on Educational Progress and Students Retention"**.** *International Conference on Management and Education Innovation.*Vol.37, 309 – 313. IACSIT Press, Singapore.
[7]. Lawson, A.E. (1995). Science Teaching and The Development of Thinking. Wadswort: California.
[8]. Mulyono. (2012). *Startegi Pembelajaran Menuju Efektivitas Pembelajaran di Abad Global*. Malang: UIN-MALIKI Press.
[9]. Pathak, N. (2013). "A Comparative Study of Creativity among Under-Graduate Mathematical Gifted Boys and Girls". *Indian Journal of Applied Research*. Volume: 3. (5), 185-187.
[10]. Roestiyah. (2008). *Strategi Belajar Mengajar*. Jakarta: Rineka Cipta.
[11]. Rustaman. N.Y. (2002). Pandangan Biologi Terhadap Proses Berpikir Dan Implikasinya Dalam Pendidikan Sains.**"**Pidato Pengukuhan Jabatan Guru Besar Tetap Dalam Bidang Ilmu Pendidikan Biologi Pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam Universitas Pendidikan Indonesia, 17 Oktober 2002**".** Departemen Pendidikan Nasional Universitas Pendidikan Indonesia.
[12]. _____. (2006). *Penilaian Otentik dan Penerapannya dalam Pendidikan Sains*. Makalah seminar Nasional II HISPIPAI. Bandung, 22 – 23 Juli.
[13]. _____. (2007). Strategi Pembelajaran Biologi. Jakarta: Universitas Terbuka.
[14]. Rutherford F.J, &Ahlgren A. (1990).*Science for All America*. Oxford University Press, New York.
[15]. Savinem, A & Scott, P. (2002). *The Force Concept: A Tool For Monitoring Student Learning*. Physics Education. 39 (1), 45-42.
[16]. Sutrisno, J. (2008). *Menggunakan Keterampilan Berpikir untuk Meningkatkan Mutu Pembelajaran*. [On Line]. Tersedia di http://joko.tblog.com/. [07Februari 2010].
[17]. Wena, M. (2011). *Strategi Pembelajaran Inovatif Kontemporer*. Jakarta: Bumiaksara
.

ISBN 978-602-95549-2-2 MSCEIS 2013 Proceeding