



[HOME](#)

[I-CONBEC 1](#)

[I-CONBEC 2](#)

[I-CONBEC 3 ▾](#)

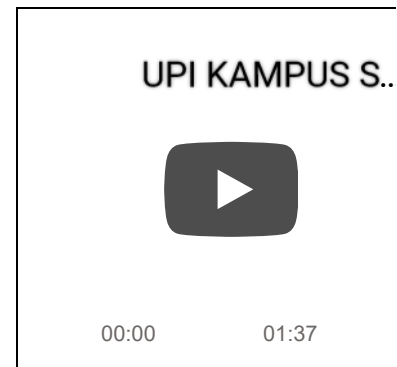
[I-CONBEC 4 ▾](#)

[REGISTRATION](#)

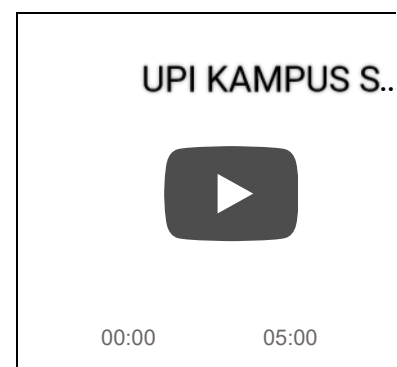
[THE WRITING PROCEDURE](#)

PROCEEDINGS I-CONBEC 3

VIDEO UPI KAMPUS SERANG



ICONBEC 2



PENDASAUD 3

Please accept our apology for the delay of ICONBEC Proceedings. Herewith, please find the our e-book proceedings available as the attached file. If there is something wrong occurred with regard to your identity or your article, we would like to hear your complain by sending us an email.

In addition, For those who want to have a printing book edition, please reconfirm your order by replying this e-mail identifying yourself: Name, Affiliation, and Address.

Please accept our apology once again for the delay on this. Any additional information or assistance you may need, please feel free to contact us.

Best Regards,

ICONBEC 3 Committee

PROCEEDINGS The 3rd International Conference on Basic Education and Early Childhood CONTENTS

Copyright

Schedule

Organizing Committee

Table of Contents

Articles in the conference

Keynote Address

Executive Function to Enhance School Readiness in Early Childhood

Jiraporn Chano

The Necessity of Enhancing the Role of Ho Chi Minh City Female Intellectuals in Social Sciences in the Context of the Asean Community Vision 2025

Phan Thi Hong Xuan

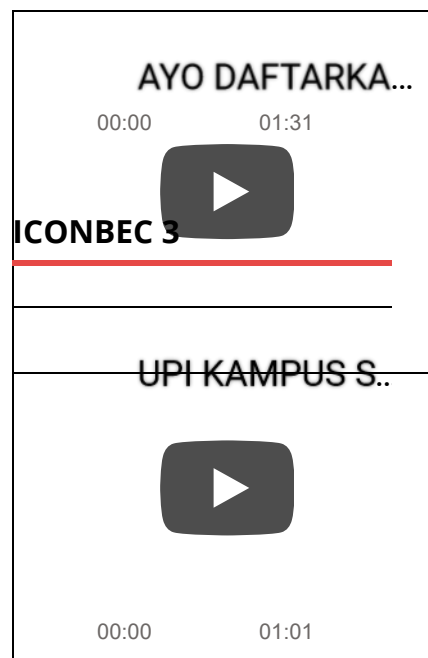
Oral Presentation

Development of Learning Experience Package for Enhance Executive Function in Emotional Control for Children with Risk of Attention Deficit Hyperactivity Disorder

Oranoot Youngcharoen and Jiraporn Chano

Participation of Educational Management for the Pre-School : A Case Study in Tambol Nafai, Chaiyaphum

Piangkae Poophayang, Narasak Poophayang and Sanchai



GALLERY



June 2020

M	T	W	T	F
1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
29	30			

Rampeiphat

Development of Health Promotion Model for Disabled People by the Participation of the Community

Duanpenporn Chaiphugdee

The Development of Learning Experience Package for Enhance Executive Function in Self Inhibitory and Working Memory for Preschool Children with Risk of Attention Deficit Hyperactivity Disorder

Supaporn Tongsadee and Jiraporn Chano

English Competency Levels of UPI-Serang Students

Herli Salim, Jiraporn Chano, Molraphaporn Boontra, Patama Bunchoo, Dwi Kurniasih, Mia Komariah, and Anggun Murdaningsih

Lesson Study in Indonesia: Pitfalls and Prospects

Tatang Suratno

Strategies and Approaches to Communities in the Sukamulya Village in an Effort to Create Conflict Resolution

Ade Lina Sugiarti, Bunyamin Maftuh and Elly Malihah

Instructional Design Development Addie Based Model on STEM (Science, Technology, Engineering, and Mathematics) in Primary School

Nina Indriani and Asep Herry Hernawan

The Implementation of Neuroscience Learning to Develop Motoric Skills at Kindergarten

Novfitri Kurniawati, Mustaji and Sri Setyowati

Information Literacy of the Student in Pendidikan Guru Sekolah Dasar, Fakultas Ilmu Pendidikan Universitas Pendidikan Indonesia

Alpin Herman Saputra, Rahman and Mubiar Agustin

The Use of Storytelling to Improve the Spiritual Intelligence of Early Childhood (An Action Research on Early Childhood B1 TK Pertiwi, Serang City, Academic Years 2017/2018)

Firman Robiansyah, Susilawati and Widjojoko

Increasing the Resources of Rural Farmers Through Program of Pondok Pesantren Petani Nusantara in Paledah, Padaherang-Pangandaran

Cucu Widaty, Siti Komariah and Wilodati

Gender Differences on Student's Consumptive Behavior by Online Shopping in Indonesia University of Education

Elga Desmaryanti, Siti Komariah and Wilodati

Algebraic Thinking in Solving Mathematical Problem

Destri Astrianingsih and Wahyudin

**Development and Validation of the Learning Process
Instrument: Story Reading Through Big Book Toward
Visual Perception and Linguistic Awareness**

**Ayundha Nabilah, Vismaia S. Damaianti and Mubiar
Agustin**

**Conception of PPG (Program Profesi Guru) Students of
Elementary School about the Form of Liquids**

Rifa Kurnia Agriyana

**A Case Study: An Analysis of Errors IN Solving Problems
about Fractions by 5th Grade Students**

Dian Fauziyyah and Wahyudin

**Transformation Values of Local Advantage of *Kawin
Bajapuik* in Minangkabau Pariaman Community (Case
Study of Nagari Lubuk Alung, Kec. Lubuk Alung, Kab.
Padang Pariaman, West Sumatera)**

Rani Kartika, Siti Nurbayani, Siti Komariah

**Curriculum can be Out of Date: The Study of Curriculum
Competency for Media Literacy**

Mujahidil Mustaqim

**Exploring a Child Friendly Atmosphere: An Analysis of the
Physical Play Ground Environment in Junior Primary
Education in Namibia**

Amadhila Elina P. and M.Solehuddin

**Implimentasi Pendidikan Multikultural dalam
Pembelajaran IPS di Sekolah Dasar**

Susilawati

**Efektivitas Konseling Kognitif Perilaku untuk Mereduksi
Perilaku Agresif Peserta didik**

(Penelitian Eksperimen Kuasi terhadap Peserta didik)

David Sumando

**Student's Ecoliteracy Improvement in Planting Organic
Vegetables through Project Based Learning Model on
Elementary Social Studies**

Ratna Sugiharti, Nana Supriatna and Cepi Riana

**Finding the Area of Triangle and Rectangle:
Phenomenology Studies in Elementary School**

Wahyuni and Suryadi D

**Effect of Cooperative Learning Type Think Talk Write on
Skill Writing Description by Using Media Image in Basic
School**

Asep Nurhuda, Rahman and Ernawulan Syaodih

**Implementation of Learning Comic Fabel Media as
Environmental Education Supplements Student in
Elementary School**

Candra Dewi

The Analysis of Mathematical Representation Ability on the Square and Rectangle Topic in Elementary School

Laely Farokhah

Effectiveness of Discovery Learning Model to Increase Critical Thinking Skills

Ivayuni Listiani

Students' Learning Obstacles on Ratio Conception in Elementary School

Ummu Fauzi Saja'ah and Didi Suryadi

Thematic Learning: Using Cooperative Learning (STAD Type) at Fourth Grade of Elementary School

Irmawanty and Yudi Juniardi

Influence of Pop-up Book on Students' Reading Interest in Primary School

Sri Rahmawati, Rahman and Wahyu Sopandi

Factors Affecting Change of *Ngangkat Tuo Teganie* System in the Indegenous Peoples Kerinci

Pretty Eristia Arinda, Karim Suryadi, and Yadi Ruyadi

Pembelajaran IPS dengan *Discovery Learning* di Sekolah Dasar

Rizki Ramadhan and Nana Supriatna

Analysis of Fairy Tale Learning on the Students' Language Skills in 2nd Grade Primary School

Maya Kuswaty

Hypothetical Learning Trajectory of Negative Numbers Based on Theory of Didactical Situation

Wanti Afriyanti and Didi Suryadi

Perceptions of Gender Awareness in Woman`S Career Development

Riztiary Pranacita, Siti Nurbayani K, Siti Komariah

The Application of Serial Picture Story Technique to Improve Student's Storytelling Skills in Language

Learning (Classroom Action Research in First Grade of SD Labschool UPI's Student)

Iis Husnul Hotimah, Mia Komariah, and Anggun

Murdaningsih

Pengembangan Repertoar Musik melalui Adaptasi Rumus Phytagoras

Yulianti Fitriani, Novi Listiyani, Walianah and Agniya

Rachmawati Salya

Investigating on the Quality of Early Childhood Education: Joyful Learning in Indonesian Schools

Yena Agustin

The Effect of Role Playing Method on Social Skills on IPS Learning

Ami Roni Fahmy Ramdhany dan Disman

The Implementation of Interactive Read Aloud in Teaching English to EFL Young Learners

Hani Maruta Saarah, Sri Setyarini and Iyen Nurlaelawati

E-Learning Berbasis Edmodo sebagai Media Pembelajaran di Era Digital

Vivi Rulviana

How to Use an *Open-Ended* Approach in Mathematical Creative Thinking Ability in Elementary Schools?

T Romadhona, Turmudi and E Syaodih

Pendekatan Multikultural dalam Pembelajaran Pendidikan Kewarganegaraan untuk Membina Karakter Mahasiswa sebagai Upaya untuk Menangkal Tantangan Global

Darmawan

Penerapan Model *Experiental Learning* pada Pembelajaran IPS di Sekolah Dasar

Ita Rustiati Ridwan

The Influence of “Problem Posing” Learning Model to Activities and Learning Outcomes in Social Studies for 4th Grade Student of Elementary School

Angga Setiawan, Ketut Prasetyo, and Muhammad Turhan Yani

The Effect of Cooperative Learning with the Teams Games Tournament (TGT) and the Student Teams Achievement Division (STAD) Toward Comprehension of Social Studies Concept Reviewed from Student’s Self-Efficacy.

Resha Nursetiawati, Sapriya and Ernawulan Syaodih

Learning Writing Narrative with Emotional Intelligence-Oriented Sociodrama Method

Wahyu Winarto, Isah Cahyani and Prana Dwija Iswara

Penerapan Model Inkuiri Berbasis *Concept Mapping* dalam Pembelajaran IPA di Sekolah Dasar

Naniek Kusumawati

Mengembangkan *Self Concept* Siswa SD terhadap Pembelajaran Pendidikan Kewarganegaraan (PKn) melalui Model *Concept Attainment*

Edwar Arapik

The Analysis of Factors Causing Deviant Behavior in Pondok Pesantren

Renggi Anggraini, Karim Suryadi and Siti Komariah

**The Implementation of Cognitive Research Trust 1
Breadth Thinking Method in the Learning of Narrative
Writing**

Mentari, Isah Cahyani, and Ernawulan Syaodih

**The Influence of Cooperative Learning Type STAD to
Ability Concept Comprehension and Skills
Communication of Primary School Students (Quasi
Experiment Research in Social Studies)**

Dita Hardiyanti, Sapriya and Disman

**Peningkatan Keterampilan Berbicara Menggunakan
Metode *Komedi Wicara* pada Siswa Kelas Empat SDN
Neglasari Kecamatan Curug Kota Serang**

Supriyati

**Implementation of Mind Maps Method for Improving the
Ability of Reading and Writing Elementary Students**

Teguh Oscar Madya Putra, Isah Cahyani and Udin Saud

**Pengaruh Pendekatan Saintifik dengan Model *Discovery
Learning* terhadap Keterampilan Berpikir Kritis dan
Memecahkan Masalah Siswa Sekolah Dasar**

Karlina Wong Lieung, Nasution and Turhan Yani

**Etnomatematika Sunda: Aplikasi Bangun Datar Segi
Empat dan Persegi Panjang pada Permainan Engklek**

Reni Retna Ayu

Analisis Life Style in Diversity of Profession

Fani Julia Putri, Achmad Hufad, Wilodati

**A Survey on Thai Students on Implementing English
Learning Strategies**

**Songsak Phusee-orn, Jiraporn Chano, Gin Gin Gustine and
Henna Marini**

**Meningkatkan Minat Baca Siswa melalui Gerakan
Literasi Sekolah Berbasis Media Buku Besar (Big Book)**

Encep Supriatna

**Education Systems of Natural Based School to Grow the
Echological Awareness of Students**

Kuswanto, Pupun Nuryani, Babang Robandi

**Rancangan Kegiatan Pembelajaran yang Menyenangkan
Berbasis Literasi untuk Meningkatkan Pemahaman
Membaca dan Ketrampilan Menulis Siswa Sekolah Dasar**

Herli Salim dan Tri Ilma Septiana

**The Effect of Using Google Maps Media on Students
Spatial Thinking Skills**

Nuryani Desi Safitri, Enok Maryani and Ernawulan Syaodih

**Pattern of Parenting in Family Manhaj Salaf to Form
Qur'ani Generation**

Atik Purwasih, Siti Komariah and Siti Nurbayani

Pemahaman terhadap Perkembangan Gerak Anak Para Calon Guru Pendidikan Anak Usia Dini (Mahasiswa Tingkat Akhir Jurusan PAUD) UPI Kampus Serang

Budhi Tristyanto

The Implementation of Literature Based Learning on Local Wisdom to Develop Character of Primary School Student Grade 3

Cerianing Putri Pratiwi

The Influence of Lectora Inspire Media to a Thematic Learning Achievement in Elementary School

Fauzatul Ma'rufah Rohmanurmeta

Empowerment of Teaching Material Development Capability for Primary School Teacher Candidates Through Project Work Approach in the Course of Science Learning Development

Pinkan Amita Tri Prasasti

Math Learning Through Ethnomathematic Approach as Effort to Increase the Quality of Student Learning of Primary School

Octarina Hidayatus Sholikhah

Social Competency of Student Mental Retardation in Basic School (Case Study in SDN Kedungputri 2)

Melik Budiarti

The Effectiveness of my Country Theme Flanel Books Activity to Stimulate Early Children's Cognitive and Fine Motor Development

Reny Dwy Rahayu, Mustaji, Rachma Hasibuan

The Implementation of Indonesian Learning Assisted Audio Media for the Ability of Listening Children's Story in the Third Grade Students

Henry Kusuma Widyaningrum

The Role of Local Wisdom Material Subjects Sociology in Building the Character of Learners

Anggia Amanda Lukman, Siti Komariah, Wilodati

Application of Value of Cultural Local Culture Gurindam Twelve Karya Kiya Ali Haji as Representation Education Based on Ethnopedagogi

Lisken Sirait, Siti Komariah and Siti Nurbayani K

The Effect of Concept Mapping Model on Critical Thinking Skill Students in Primary School

Nur Fadillah, Bunyamin Maftuh, and Ernawulan Syaodih
Contribution of Learning Environment as an Effective

Motivation

Retno Friethasari, Sofyan Sauri and Babang Robandi

E-Book Proceedings is Here

SEMINAR NASIONAL PENDASAUD 3
PENDIDIKAN DASAR DAN ANAK USIA DINI 3
Universitas Pendidikan Indonesia Kampus Serang

TEMA: **SEKOLAH RAMAH ANAK**

Speakers:

- Imad Basri, M.A, Ph.D (Universitas Negeri Makassar)
- Prof. Dr. Hj. Enok Maryani, M.S (Universitas Pendidikan Indonesia)
- Muhammad Nur Rizal, Ph.D (Universitas Gajah Mada)
- Novi Poespita Chandra, Ph.D (Universitas Gajah Mada)

Tanggal Penting:

- 1 Batas Akhir Pendaftaran: 3 Oktober 2017
- 2 Batas Akhir Pengiriman Abstrak: 4 Oktober 2017
- 3 Berita Penerimaan Abstrak: 7 Oktober 2017
- 4 Pelaksanaan Seminar: 14 Oktober 2017
- 5 Batas Akhir Artikel Penuh: 10 Nopember 2017

Informasi lebih lanjut: pendasaud.conference



ICONBEC-3

EFFECTIVENESS OF DISCOVERY LEARNING MODEL TO INCREASE CRITICAL THINKING SKILLS

Ivayuni Listiani

ivayuni@unipma.ac.id

Teacher Education Study Program Primary School, FKIP University PGRI Madiun

Abstract

The purpose of this research is to know the effectiveness of learning model of Discovery Learning on improving students' critical thinking skill. The subjects of the study were the students who followed the lecture of problematic learning in SD which was divided into 2 classes, namely experiment and control class. Data collection uses integrated critical thinking skills tests with mastery of elementary school learning. Data analysis used mean difference test and normalized gain scores. The results showed a significant difference between students' critical thinking skills in the experimental class and control class. Improvement of critical thinking skill of experiment class student is higher than control class student. The highest increase occurred in the indicator ability to conclude by 56% in the experimental class and 43% in the control class. This suggests that the use of learning discovery learning model is effective in supporting the learning process, so that the mastery of concept and critical thinking skills is better.

Keywords: *Discovery Learning Learning Model, Critical Thinking Skills.*

INTRODUCTION

Learning in essence includes aspects of processes, products, and attitudes. However, if observed, learning in Indonesia tends to emphasize only the product aspect, where facts, laws, and theories get a dominant portion, while aspects of process and attitudes get less attention. This implies the still low learning outcomes at various levels of education. The low learning outcomes are also caused by the difficulty of understanding abstract concepts. Abstract concept in a concept that is difficult to visualize or display the process directly through real laboratory activities though. This then led to the emergence of new innovations in learning.

Learning activities emphasize more on direct delivery to improve competence so that students are able to think critically and systematically in understanding the concept, so that students gain a correct understanding. A correct understanding of the lesson is very influential on student learning outcomes. Science learning is still verbal, students seem passive and receive knowledge in accordance with what is given, teaching and learning process is still centered on lecturers. When the teacher gives the opportunity to ask or answer the students just silence because they are confused what to ask and answer. Lecturers more often use the teaching pattern by presenting the materi and solving the problems.

The use of learning models can stimulate students' thoughts, feelings, interests, and interests in such a way that the learning process can take place. The researchers found that there are different ways in which students process information that is unique. Some are easier to process visual information, others are easier with audits, and others will understand easily or better if done with practice. Gunawan (2008) found that the increased mastery of student concepts that follow interactive multimedia learning is better than students who follow conventional learning. In addition to mastering the concept, the use of learning models is also expected to improve students' critical thinking skills.

Skill of thinking or ability to do the thinking process in relation to teaching and learning process is a learning result that is classified as hidden or ability difficult to observe. Wellington (Wahidin, 1996) states that training students' thinking skills is more relevant than simply transferring knowledge from the teacher to his students. Critical thinking skills include one of the



ICONBEC-3

highest-order thinking skills. Essential thinking skills are essentially problem solving skills. According to Ennis (1996), critical thinking is the ability of reasoning and reflective thinking that is directed to decide the things that are convincing to do. Critical thinking is a sensible and reflective thinking that is focused on making decisions about what is done or is believed. It makes sense to think based on facts to make the best decisions. Reflective means seeking consciously and decisively the best possible solution.

Critical thinking as one of the higher-order thinking processes can be used in the formation of a student's IPA conceptual system so it is one of the high-level conceptual thinking processes (Liliasari, 2002). Critical thinking is an important aspect of modern education so that educators are interested in developing critical thinking for students. Critical thinking skills need to be developed within the students because through the critical thinking skills the student can more easily understand the concept, sensitive to the problems that occur so as to understand and solve problems and be able to apply the concepts in different situations. With good critical thinking skills can provide a good recommendation to perform an action. The essence of critical thinking is an attitude used to judge something (Ennis, 1996).

The development of critical thinking skills has long been noted as the primary goal of education. However, studies on students' thinking ability reveal that critical thinking skills do not develop without effort explicitly and deliberately implanted in their development (Zohar, 1994). A student will not be able to develop his critical thinking skills properly if not trained to think critically in the field of study he studies (Meyers, 1986).

METHODOLOGY

The research was conducted by using quasi experiment method (Quasi experimental research). This method is used because many of the research subjects that can not be controlled or controlled (Darmadi, 2011: 37). The purpose of quasi-experimental research is to find cause-and-effect relationships by giving certain treatments to two experimental groups that are specific treatment in the experimental group and without performing a particular treatment for the control group. The design of this study can be seen in the following table:

Table 1.1 Research Design Posttest Only Control Group Design

Group	Treatment	Post Test
Experiment (R)	X	T ₂
Control (R)	-	T ₂

Information:

X : The treatment given to the experimental group is the use of the learning model of Discovery Learning

T₂ : The final test given to the experimental group and the control group

R : Random assignment (random group selection)

The population in the study were all students of 4th Semester of PGSD Study Program of Universitas PGRI Madiun. The sampling technique using cluster random sampling taken from students of 4th semester of PGSD Study Program of Universitas PGRI Madiun consisting of 2 classes, that is class 4B as experiment class with 4D class as control. The independent variable in this research is the Discovery Learning model. The dependent variable is the student's critical thinking skill.

Data collection techniques used in this study using test methods and non-test methods. The test method is used to obtain science process skill data. Questions in the test can be either written or oral test. The tests used in the form of objective tests are multiple choice and essay. Non-test method using documentation, observation, interviewing is done by collecting data, taking notes and reviewing existing documents that have relation with research object (Riduwan, 2004). The data collected by this technique is student value data.



ICONBEC-3

Instrument of student critical thinking skill assessment is essay test, which is used in the form of objective test. Problem test used before used to retrieve research data, tested in advance to know the quality of the question. The feasibility of the instrument used in this study is conducted test of feasibility tested with statistics include validity test, reliability test, differentiation test, difficulty index test.

The purpose of this study was to determine the level of significance of the effectiveness of learning using the learning model of Discovery Learning in the science concept course on students' critical thinking skills. The requirement of statistical data to be tested using paired t-test is the data distribution must be normal and homogeneous. The prerequisite test was performed before the equilibrium test with the t-test, the preliminary test using the Kolmogorv-Smirnov test used for the normality test whereas in the homogeneity test the Levene's test was used.

RESULT AND DISCUSSION

Critical thinking skills of the students are assessed from the initial test answers and the final test after following the lesson. Indicators of critical thinking skills assessed include: the ability to discover similarities and differences, the ability to give reasons, the ability to make conclusions, the ability to use acceptable principles. The result of a skill assessment is a score that is then searched for percentage. The average score of the initial test, the final test and the normalized gain of critical thinking skill in the experimental class and control class can be seen in table 1.

Table 1. Description of Student Critical Thinking Skills Score

	Experiment Class			Control Class		
	T _{early}	T _{end}	<g> %	T _{early}	T _{end}	<g> %
N (number of student)	32	32		32	32	
Average	36,5	68,1	50,9	37,1	59,5	36,5
Standard Deviation	11,3	13,3	15,5	9,8	11,8	13,1
Maximum	56	92	82	52	88	75
Minimum	12	40	25	12	40	13

Normality and homogeneity test results show the distribution of normal distributed data, the variance of both classes is also homogeneous. Parametric statistic test (t-test) was then performed. Result of t test show value t count equal to 3,96 and t table at level of trust 0,05 equal to 2,04. From these results it can be concluded that there is a significant difference between improving the critical thinking skills of the experimental class and the control class. The percentage improvement of critical thinking skills of the experimental class is greater than the control class. This suggests that learning by using the learning model of Discovery Learning can improve students' critical thinking skills. Percentage of average score achievement of initial test, final test and N-gain critical thinking skill between experiment class and control class is presented in figure 2.

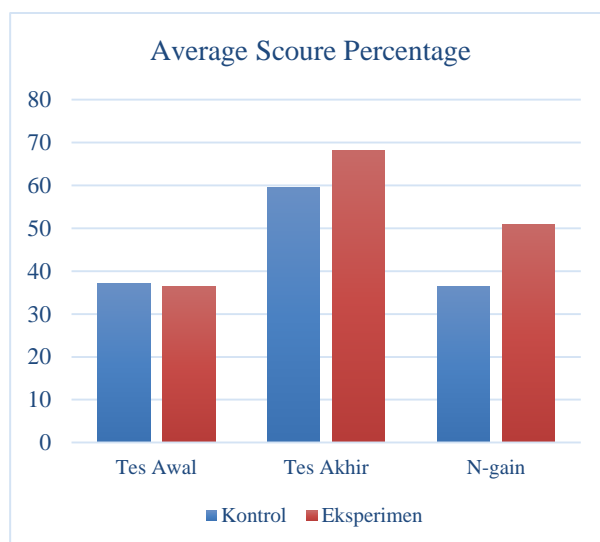


Figure 2. Average Scoring Achievement Initial test, Final test and N-gain Critical Thinking Skills.

There are four indicators of critical thinking skills used in this research, namely: ability to find similarities and differences (KBKr1), ability to give reason (KBKr2), ability to make conclusion (KBKr3), and ability to use acceptable principle (KBKr4). Each indicator is analyzed for achievement based on initial test score, final test, and normalized gain. The percentage improvement of students' critical thinking skills on each experimental class indicator and control class is presented in Figure 3.

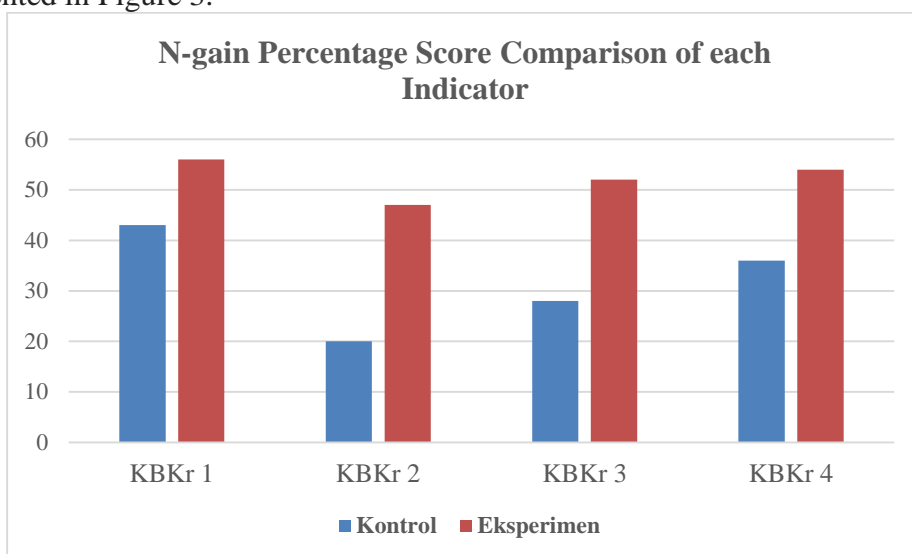


Figure 3. N-gain Percentage Score Comparison of Each Indicator of Second Class Critical Thinking Skills.

Based on the analysis on each indicator it can be seen that the highest increase in both classes occurred on the same indicator, that is the ability to make conclusions, with each gain of 56% in the experimental class and 43% in the control class, both of which are in the medium category. The highest increase in the indicators draws conclusions, is an implication of logical reasoning ability that also develops. Increasing the ability of logic inference and finding the next concept can be used by students to improve their ability in drawing a conclusion from a problem.

The lowest gain of N-gain in both classes also occurs in the same indicator, ie the ability to use acceptable principles. In the experimental class the increase was 47% (medium category), while for control class only 20% (low category). A substantial increase in this indicator indicates that students who are learning to use interactive multimedia are better able to use the principles



ICONBEC-3

that exist in the concept of science. The lesson plans were developed involving students to gain experience, and conduct experiments that allowed them to discover the principles themselves.

The learning process by which students are directly involved in finding themselves a concept is expected to give better results. Some of the advantages that can be gained from learning this invention include: 1) the knowledge can last longer and more memorable than the knowledge learned in other ways; 2) Discovery learning results have a better transfer effect than other learning outcomes. In this case the concepts and principles that one has owned will be more easily applied in new situations. 3) discovery learning can improve students' reasoning and the ability to think freely (Dahar, 1996).

The substantial increase in the indicator's ability to use this principle is easy to understand because of the initial framework of thinking that is already present in every student. In learning there is a tendency for students to retain the frame of mind until they have a rational explanation or picture that will lead to the reinforcement of the frame of mind if it is correct, and a paradigm shift in a more appropriate direction if pre-existing frameworks are less precise (Gunawan, 2012).

CONCLUSION

The results showed that students' critical thinking skills taught by the Discovery Learning model are higher than those conventionally taught. Indicators of ability to make conclusions have increased greater than other indicators. This is due to, among other things, the characteristics of the Discovery Learning model of learning that gives students the opportunity to practice making estimates and independently trying to prove the truth of their estimates before giving conclusions from a data or problem.

SUGGESTION

Based on the results of research that has been done then the application of the model of Discovery Learning can serve as an alternative model in developing innovative and creative learning in achieving learning objectives. The highest and lowest increases in the two classes occurring on the same indicator, are interesting things that need to be explored further.

REFERENCES

- Cheng, K., dkk. (2004). "Using Online Homeworks Systems Enhances Student. Learning of Physics Concept in an Introductory Physics Course". *American Journal of Physics*. 72 (11) 1447-1453.
- Costa, A. (1988). *Developing Minds A Resource Book For Teaching Thinking*. Viginia: Association For Supervision and Curriculum Development.
- Dahar, R.W. (1996). *Teori-teori Belajar*. Jakarta : Erlangga.
- Ennis, (1996). *Critical Thinking*. New Jersey : Prentice Hall, Uper Saddle River.
- Finkelstein, *et.al.* (2005). "When Learning About the Real World Is Better Done Virtually: A Study of Subtituting Computer Simulations for Laboratory Equipment". *Physics Education Research*. APS (1) 1 – 8.
- Gunawan. (2008). "Model Pembelajaran Berbasis Multimedia Interaktif Untuk Meningkatkan Penguasaan Konsep Calon Guru Pada Materi Elastisitas". *Jurnal Penelitian Pendidikan IPA*. Vol. 2 No. 1, 11 – 21.
- Gunawan & Liliarsari, (2012). "Model Virtual Laboratory Fisika Modern untuk Meningkatkan Disposisi Berpikir Kritis Calon Guru". *Jurnal Ilmiah Cakrawala Pendidikan*, LPPMP UNY. Juni 2012, Th. XXXI, No. 2.185– 199.
- Kozma, R. B. (1991). "Learning with Media". *Review of Educational Research*. 61: 179-211.
- Liliarsari, (2002). *Pengembangan Model Pembelajaran Kimia Untuk Meningkatkan Strategi Kognitif Mahasiswa Calon Guru Dalam Menerapkan Berpikir Konseptual Tingkat*



ICONBEC-3

- Tinggi*. Laporan Penelitian Hibah Bersaing IX Perguruan Tinggi Tahun Anggaran 2001-2002. Bandung: FPMIPA UPI.
- Meyers, C. (1986). *Teaching Students Think Critically*. London : Jossey-Bass Publishers.
- Sugiyono. (2008). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
- Sumaji, dkk., (1998). *Pendidikan Sains yang Humanistik*. Yogyakarta : Kanisius.
- Wahidin, D. (1996). Berpikir Kreatif dan Perkembangannya dalam Pengajaran IPA. *Khazanah Pengajaran IPA* 1 (2) : 23-31.
- Zacharia, Z. & Anderson, O.R. (2003). The effects of an interactive computer-based simulation prior to performing a laboratory inquiry-based experiment on students' conceptual understanding of physics. *American Journal of Physics*, 71(6), 618–629.
- Zohar, A., (1994). The Effect of Biology Critical Thinking Project in The Development of Critical thinking. *Journal of Research in Science Teaching* 31 (2): 163-196.