



International Journal of Advanced Engineering Research and Science

(IJAERS)

An Open Access Peer Reviewed International Journal



Journal DOI: 10.22161/ijaers

Issue DOI: 10.22161/ijaers.5.6

AI PUBLICATIONS

Vol.- 5 | Issue - 6 | Jun, 2018

editor@ijaers.com | <http://www.ijaers.com/>

FOREWORD

I am pleased to put into the hands of readers Volume-5; Issue-6: 2018 (June, 2018) of “**International Journal of Advanced Engineering Research and Science (IJAERS) (ISSN: 2349-6495(P) | 2456-1908(O)**”, an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers. Now journal has also been indexed in **Qualis (Interdisciplinary Area) (Brazilian system for the evaluation of periodicals, maintained by CAPES)**.

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Swapnesh Taterh

Editor-in-Chief

Date: June, 2018

Editorial/ Reviewer Board

Dr. Shuai Li

Computer Science and Engineering, University of Cambridge, England, Great Britain

Behrouz Takabi

Mechanical Engineering Department 3123 TAMU, College Station, TX, 77843

Dr. Gamal Abd El-Nasser Ahmed Mohamed Said

Computer Lecturer, Department of Computer and Information Technology, Port Training Institute (PTI), Arab Academy For Science, Technology and Maritime Transport, Egypt

Dr. Ram Karan Singh

BE.(Civil Engineering), M.Tech.(Hydraulics Engineering), PhD(Hydraulics & Water Resources Engineering),BITS- Pilani, Professor, Department of Civil Engineering,King Khalid University, Saudi Arabia.

Dr. A. Heidari

Faculty of Chemistry, California South University (CSU), Irvine, California, USA

Dr. Swapnesh Taterh

Ph.d with Specialization in Information System Security, Associate Professor, Department of Computer Science Engineering, Amity University, INDIA

Dr. Ebrahim Nohani

Ph.D.(hydraulic Structures), Department of hydraulic Structures,Islamic Azad University, Dezful, IRAN.

Dr. Dinh Tran Ngoc Huy

Specialization Banking and Finance, Professor, Department Banking and Finance, Viet Nam

Dr.Sameh El-Sayed Mohamed Yehia

Assistant Professor, Civil Engineering (Structural), Higher Institute of Engineering -El-Shorouk Academy, Cairo, Egypt

Dr.AhmadadNabihZaki Rashed

Specialization Optical Communication System,Professor,Department of Electronic Engineering, Menoufia University

Dr. Alok Kumar Bharadwaj

BE(AMU), ME(IIT, Roorkee), Ph.D (AMU),Professor, Department of Electrical Engineering, INDIA

Dr. M. Kannan

Specialization in Software Engineering and Data mining

Ph.D, Professor, Computer Science, SCSVMV University, Kanchipuram, India

Dr. Sambit Kumar Mishra

Specialization Database Management Systems, BE, ME, Ph.D, Professor, Computer Science Engineering Gandhi Institute for Education and Technology, Baniatangi, Khordha, India

Dr. M. Venkata Ramana

Specialization in Nano Crystal Technology

Ph. D, Professor, Physics, Andhara Pradesh, INDIA

DR. C. M. Velu

Prof. & HOD, CSE, Datta Kala Group of Institutions, Pune, India

Dr. Rabindra Kayastha

Associate Professor, Department of Natural Sciences, School of Science, Kathmandu University, Nepal

Dr. P. Suresh

Specialization in Grid Computing and Networking, Associate Professor, Department of Information Technology, Engineering College, Erode, Tamil Nadu ,INDIA

Dr. Uma Choudhary

Specialization in Software Engineering Associate Professor, Department of Computer Science Mody University, Lakshmanagarh, India

Dr. Varun Gupta

Network Engineer, National Informatics Center , Delhi ,India

Dr. Hanuman Prasad Agrawal

Specialization in Power Systems Engineering Department of Electrical Engineering, JK Lakshmi Pat University, Jaipur, India

Dr. Hou, Cheng-I

Specialization in Software Engineering, Artificial Intelligence, Wisdom Tourism, Leisure Agriculture and Farm Planning, Associate Professor, Department of Tourism and MICE, Chung Hua University, Hsinchu Taiwan

Dr. Anil Trimbakrao Gaikwad

Associate Professor at Bharati Vidyapeeth University, Institute of Management , Kolhapur, India

Dr. Ahmed Kadhim Hussein

Department of Mechanical Engineering, College of Engineering, University of Babylon, Republic of Iraq

Mr. T. Rajkiran Reddy

Specialization in Networking and Telecom, Research Database Specialist, Quantile Analytics, India

M. Hadi Amini

Carnegie Mellon University, USA

Dr. N. S. Mohan

Professor, Department of Mechanical & Manufacturing Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education. Manipal, India

Dr. Zafer Omer Ozdemir

Energy Systems Engineering Kırklareli, Kırklareli University, Turkey

Bingxu Wang

2721 Patrick Henry St Apt 510, Auburn Hills, Michigan, United States

Dr. Jayashree Patil-Dake

Sr. Assistant Professor, KPB Hinduja College of Commerce, Mumbai, India

Dr. Neel Kamal Purohit

Associate Professor, Accountancy & Business Statistics, S.S. Jain Subodh P.G. College, Rambagh, Jaipur, India

Mohd Muntjir

Digital Repository Universitas Jember

Ph.D., Information Technology Department, College of Computers and Information Technology, Taif University, Kingdom of Saudi Arabia

Xian Ming Meng

Ph.D, Vice-Chief Engineer, Senior Engineer, China Automotive Technology & Research Center No.68, East Xianfeng Road, Dongli District, Tianjin, China

Herlandí de Souza Andrade

Professor, Business Management, Financial Management and Logistics and in the Specialization Course in Innovation and Entrepreneurship Management at FATEC Guaratinguetá, Centro Estadual de Educação Tecnológica Paula Souza – CEETEPS

Dr. Payal Chadha

Adjunct Assistant Professor, Business Management, Accounting, Finance, and Marketing for Undergraduate Students University Of Maryland University College Europe, Kuwait

Ahmed Moustafa Abd El-hamid Elmahalawy

Computer Science and Engineering Department, Menoufia University, Al Minufya, Egypt

Prof. Mark H. Rummeli

Professor, School of Energy, Soochow University & Head of the characterisation center, Soochow Institute for Energy Materials Innovations (SIEMES), Suzhou, Jiangsu Province, China

José G. Vargas-Hernández

Research professor, University Center for economic and Managerial Sciences, University of Guadalajara Periférico Norte 799 Edif. G201-7, Núcleo Universitario Los Belenes, Zapopan, Jalisco, 45100, México

Dr. Eman Yaser Daraghmi

Assistant Professor, Ptuk, Tulkarm, Palestine (Teaching Artificial intelligence, mobile computing, advanced programming language (JAVA), Advanced topics in database management systems, parallel computing, and linear algebra)

Sr No.	Detail with DOI
1	<p><u>Distance Analysis of Multimodal Transportation Based on Traveling Salesman Problem with Particle Swarm Optimization Method</u> Author: Omer Faruk Cansiz, Samed Göçmen  DOI: 10.22161/ijaers.5.6.1 <p style="text-align: right;">Page No: 001-006</p> </p>
2	<p><u>Analysis of induced drag and vortex at the wing tip of a Blended Wing Body aircraft</u> Author: Pedro Paulo Santos Rodrigues da Cunha, Pedro Mariani Souza, Letícia Campos Valente, Gabriel Maertens Vaz de Mello, Pedro Américo Almeida Magalhães Junior  DOI: 10.22161/ijaers.5.6.2 <p style="text-align: right;">Page No: 007-009</p> </p>
3	<p><u>Polyethyleneglycol nanoparticles adsorbed to glycine as a bioengineered neomaterial for application in inflammatory processes</u> Author: Paulo Celso Leventi Guimarães, Eduardo Luzia França, Adenilda Cristina Honório rança, Ricardo Bentes de Azevedo, Paulo Cesar Morais, Sebastião William da Silva  DOI: 10.22161/ijaers.5.6.3 <p style="text-align: right;">Page No: 010-016</p> </p>
4	<p><u>Feasibility and Environmental Sustainability of a 103.5 kWp floating Photovoltaic Electrical System with a Case Study in a Hydroelectric Power Plant, Santa Clara Hpp, Located in the South of Brazil Region</u> Author: Kleber Franke Portella, Rodrigo Paludo, Gelson Luiz Carneiro, Júlio Werner Yoshioka Bernardo, Marianne Schaefer França Sieciechowicz, Mariana D'Orey Gaivão Portella Bragança, Nicole Machuca Brassac de Arruda, Emerson Luiz Alberti, Augustus Caesar Fr  DOI: 10.22161/ijaers.5.6.4 <p style="text-align: right;">Page No: 017-027</p> </p>
5	<p><u>Monitoring of water Quality in the São João River Hydrographic Basin in the Municipality of Porto Nacional - Tocantins</u> Author: Rilben Ribeiro Sepúlveda Pereira Moraes, Angelo Ricardo Balduino, Diogo Pedreira Lima, Polyana Lopes da Silva  DOI: 10.22161/ijaers.5.6.5 <p style="text-align: right;">Page No: 028-032</p> </p>
6	<p><u>Proposal of the use sodium silicate as a corrosion inhibitor in hydrostatic testing of petroleum tanks using seawater</u> Author: Fernando B. Mainier, Anne Aparecida Mendes Figueiredo, André Armando M. de Alencar Junior, Brígida Bastos de Almeida  DOI: 10.22161/ijaers.5.6.6 <p style="text-align: right;">Page No: 033-038</p> </p>
7	<p><u>Feasibility Analysis of the Solar Energy System in Civil Construction</u> Author: Allef Facundes Cerqueira, Angelo Ricardo Balduino, Diogo Pedreira Lima  DOI: 10.22161/ijaers.5.6.7 <p style="text-align: right;">Page No: 039-044</p> </p>

8	<p><u>Evaluation of Groundwater Prospect in a Clay Dominated Environment of Central Kwara State, Southwestern Nigeria</u> Author: Bawallah M.A., Adebayo A, Ilugbo S.O., Olufemi B., Alagbe O.A., Olasunkanmi K.N  DOI: 10.22161/ijaers.5.6.8</p> <p style="text-align: right;">Page No: 045-056</p>
9	<p><u>Characterization of the Use and Occupation of Soil on Rural Properties Using Remotely Piloted Aircraft Systems - RPAS</u> Author: Ivan Carlos Bertoldo, Francisco Nogara Neto, Gean Lopes da Luz, Sideney Becker Onofre  DOI: 10.22161/ijaers.5.6.9</p> <p style="text-align: right;">Page No: 057-063</p>
10	<p><u>Developing Multi Linear Regression Models for Estimation of Marshall Stability</u> Author: Omer Faruk Cansiz, Dilay Duran Askar  DOI: 10.22161/ijaers.5.6.10</p> <p style="text-align: right;">Page No: 064-067</p>
11	<p><u>An analysis of rainfall based on entropy theory</u> Author: Vicente de Paulo Rodrigues da Silva, Adelgicio Farias Belo Filho, Enio Pereira de Souza, Célia Campos Braga, Romildo Morant de Holanda, Rafaela Silveira Rodrigues Almeida, Armando César Rodrigue s Braga  DOI: 10.22161/ijaers.5.6.11</p> <p style="text-align: right;">Page No: 068-075</p>
12	<p><u>Photocatalyical and Thermal Properties Consideration of nanocomposites preparation of La2Ti2O7-Zeolite-MCM-41</u> Author: Nasim Mahdian  DOI: 10.22161/ijaers.5.6.12</p> <p style="text-align: right;">Page No: 076-083</p>
13	<p><u>Removal of vegetation in the state of Mato Grosso: a perspective based on the actions of IBAMA between 1998 and 2016</u> Author: R. Miranda, M. Avila, L. Vieira, R. Ribeiro, T. Jacobson, L. G. Oliveira  DOI: 10.22161/ijaers.5.6.13</p> <p style="text-align: right;">Page No: 084-090</p>
14	<p><u>Evaluation of the Stiffness Effect of Pipe Supports in Relation to Static and Dynamic Loads in a Flexibility Analysis</u> Author: Pedro Américo Almeida Magalhães Junior, Tiago Martins Portela  DOI: 10.22161/ijaers.5.6.14</p> <p style="text-align: right;">Page No: 091-094</p>
15	<p><u>Experimental Design and Optimization of Conical Horn of Ultrasonic Amplitude</u> Author: Djo Bakadiasa Kabongo, YA Gang  DOI: 10.22161/ijaers.5.6.15</p> <p style="text-align: right;">Page No: 095-099</p>
16	<p><u>Measurement of a superficial texture by applying the alpha parameter on the profile P, for measuring a manual transmission gear</u> Author: Saraiva Q. M., Magalhães Junior P.A.A.</p>

	 DOI: 10.22161/ijaers.5.6.16		<i>Page No: 100-103</i>
17	<u>Epidemiological Profile of Precocious Neonatal Mortality in the Period 2008 to 2015 in Porto Velho, Rondonia, Brazil</u> <i>Author: Marcuce Antonio Miranda Dos Santos, Dorisvalder Dias Nunes, Maria Ines Ferreira de Miranda, Luiz Carlos Cavalcanti de Albuquerque, Leonardo Severo da Luz Neto, Bianca Cristina Martins Nunes, Marta Gabriela Barbosa Sobreira Luz</i>	 DOI: 10.22161/ijaers.5.6.17	<i>Page No: 104-110</i>
18	<u>Simulation Mechanism with 2 Degrees of Freedom</u> <i>Author: Túlio Pinheiro Duarte, Weslei Patrick Teodósio Sousa, Bruno Rodrigues Castro, Tarcísio Flávio Umbelino Rego, Fernanda Silva Machado, Pedro Américo Almeida Magalhães Junior</i>	 DOI: 10.22161/ijaers.5.6.18	<i>Page No: 111-116</i>
19	<u>Productiveness Evaluation of a Machine Tool Manual Setup Compared with Automated CNC Machine</u> <i>Author: Santos Diego Barbosa Pratis, Magalhães Junior Pedro Américo Almeida, Martins Paulo Sérgio, Miranda Brendo Felipe da Silva, Pereira Gustavo Amaral, Batista Josiel Augusto Vieira</i>	 DOI: 10.22161/ijaers.5.6.19	<i>Page No: 117-119</i>
20	<u>Analysis of Elastic Recovery in The Process of Bending Sheets of Duplex Steel SAF 2205 via Experimental Method and Numerical Simulation</u> <i>Author: Aderci de Freitas Filho¹²⁵, Valmir Sales, Pedro Américo Almeida Magalhães Júnior, Carlos Trivellato de Carvalho Filho, Alysson Lucas Vieira</i>	 DOI: 10.22161/ijaers.5.6.20	<i>Page No: 120-125</i>
21	<u>Conjectures of Mathematical Logic and Educational Games for Basic Education Based on the Guidelines of NCP, NCG and NBC</u> <i>Author: Antônio Lemos Régis, Raimundo Josedi Ramos Veloso, Fabrício Moraes de Almeida</i>	 DOI: 10.22161/ijaers.5.6.21	<i>Page No: 126-130</i>
22	<u>Practical Based Learning (PBL) for Academic, Technological and Scientific Education in Engineering Courses - Case Study</u> <i>Author: João Fernando Zamberlan, Gil Eduardo Guimarães, Gustavo Corbellini Masutti, Rodrigo Fernando dos Santos Salazar</i>	 DOI: 10.22161/ijaers.5.6.22	<i>Page No: 131-134</i>
23	<u>Design and Development of a Magnus Hydrokinetic Rotor</u> <i>Author: Rodrigo Paludo, Rodrigo C. Quadros, Gelson L. Carneiro, Paulo C. Moro, Tiago Francesconi, Paulo C. Pereira, Ricardo L. da Luz, Eduard N. Stutz, Carlo G. Filippin</i>	 DOI: 10.22161/ijaers.5.6.23	<i>Page No: 135-145</i>
24	<u>Perspective of Environmental Services and Management in the Amazon Region, Pará-Brazil</u>		

	<p>Author: Marcelo Augusto Machado Vasconcelos, Paulo Celso Santiago Bittencourt, Cassiano Moraes Guerreiro, Paulo Alves DeMelo, Francivaldo AlvesNunes</p> <p>crossref DOI: 10.22161/ijaers.5.6.24</p> <p style="text-align: right;">Page No: 143-147</p>
25	<p><u>Power Flow Calculations by Deterministic Methods and Artificial Intelligence Method</u></p> <p>Author: Meriem Fikri, Touria Haidi, Bouchra Cheddadi, Omar Sabri, Meriem Majdoub, Abdelaziz Belfqih</p> <p>crossref DOI: 10.22161/ijaers.5.6.25</p> <p style="text-align: right;">Page No: 148-152</p>
26	<p><u>Proximate Analysis of Seed Extracts and Methanol Content of Juice of Some Grape Varieties in Turkey</u></p> <p>Author: Ozcan Baris Citil, Yener Tekeli, Aydin Akin, Fatih Sevgi, Tuba Tekeli</p> <p>crossref DOI: 10.22161/ijaers.5.6.26</p> <p style="text-align: right;">Page No: 153-157</p>
27	<p><u>Soybean Breeding Aiming at increasing Productivity and Root-Knot Nematode Resistance</u></p> <p>Author: Osvaldo Toshiyuki Hamawaki, Raphael Lemes Hamawaki, Ana Paula Oliveira Nogueira, Jacqueline Siqueira Glasenapp, Cristiane Divina Lemes Hamawaki, Makyslano Rocha Resende, Tuneo Sedyama, Marcio Pereira</p> <p>crossref DOI: 10.22161/ijaers.5.6.27</p> <p style="text-align: right;">Page No: 158-165</p>
28	<p><u>Experimental Planning Factorial: A brief Review</u></p> <p>Author: Magno de Oliveira, Valéria MM Lima, Shizue Melissa A. Yamashita, Paula Santos Alves, Augustus CaesarFranke Portella</p> <p>crossref DOI: 10.22161/ijaers.5.6.28</p> <p style="text-align: right;">Page No: 166-177</p>
29	<p><u>Double-Display Media in Geometrical Optics Learning in Vocational High School</u></p> <p>Author: Dendik Udi M., Sutarto, Imam Mudakir</p> <p>crossref DOI: 10.22161/ijaers.5.6.29</p> <p style="text-align: right;">Page No: 178-181</p>
30	<p><u>Performance of Reference Evapotranspiration Estimation Methods at the Southern Paraná, Brazil</u></p> <p>Author: Luis Miguel Schiebelbein, André Belmont Pereira</p> <p>crossref DOI: 10.22161/ijaers.5.6.30</p> <p style="text-align: right;">Page No: 182-190</p>
31	<p><u>Appliance of Textbook Basic on Process Image of Human Respiratory System against High School Student's Critical thinking Ability</u></p> <p>Author: Eva Laila Widita, Jekti Prihatin, Imam Mudakir, Sutarto, Indrawati</p> <p>crossref DOI: 10.22161/ijaers.5.6.31</p> <p style="text-align: right;">Page No: 191-194</p>
32	<p><u>Effect of "AERBETON" on the Mechanical and Physical Properties of Concrete</u></p> <p>Author: Ali I. Tayeh</p> <p>crossref DOI: 10.22161/ijaers.5.6.32</p> <p style="text-align: right;">Page No: 195-199</p>

33	<p><u>Comparative Analysis of three Growth Medium for Arthrospira platensis Cultivation based on Lab-Scale Results</u></p> <p>Author: Fernando Caixeta, Monica Hitomi Okura, Marlei Barbosa, Lucia Helena Pelizer</p> <p> DOI: 10.22161/ijaers.5.6.33</p> <p style="text-align: right;">Page No: 200-207</p>
34	<p><u>Network Data Security for the Detection System in the Internet of Things with Deep Learning Approach</u></p> <p>Author: Kalubi Kalubi Deiu-merci, Mayou</p> <p> DOI: 10.22161/ijaers.5.6.34</p> <p style="text-align: right;">Page No: 208-213</p>
35	<p><u>Factorial Economic Planning Applied to Agricultural Experimentation</u></p> <p>Author: Adriana Cioato Ferrazza, Beno Nicolau Bieger, Gean Lopes da Luz, Cristiano Nunes Nesi, Cristiano Reschke Lajús, Márcio Antônio Fiori</p> <p> DOI: 10.22161/ijaers.5.6.35</p> <p style="text-align: right;">Page No: 214-221</p>
36	<p><u>Selective and Simultaneous Removal of Ni (II) and Cu (II) Ions from Industrial Wastewater Employing a Double Ni-Cu-Ion Imprinted Polymer</u></p> <p>Author: Morlu Stevens, Bareki Batlokwa</p> <p> DOI: 10.22161/ijaers.5.6.36</p> <p style="text-align: right;">Page No: 222-230</p>
37	<p><u>Family Health Strategy and More Doctors Program in Rural Area of Porto Velho, Brazil: A Qualitative Analysis under the Nurse's Perspective</u></p> <p>Author: MarcuceAntonio Miranda dos Santos, Leonardo Severo da Luz Neto, Luiz Carlos Cavalcanti de Albuquerque, Helio Franklin Rodrigues de Almeida, Solange Alves da Silva Costa, Daiane Regine Lira Corrêa, Daniele Lopes Aguiar</p> <p> DOI: 10.22161/ijaers.5.6.37</p> <p style="text-align: right;">Page No: 231-240</p>
38	<p><u>Experimental Determination of the Convective Coefficient of Heat Transfer Using the Global Capacitance Method</u></p> <p>Author: Fernanda da Silva Machado, Thaís Roberta Campos, Túlio Pinheiro Duarte, Felipe Raul Ponce Arrieta, Pedro Américo Almeida Magalhães Júnior</p> <p> DOI: 10.22161/ijaers.5.6.38</p> <p style="text-align: right;">Page No: 241-245</p>

Appliance of Textbook Basic on Process Image of Human Respiratory System against High School Student's Critical thinking Ability

Eva Laila Widita¹, Jekti Prihatin², Imam Mudakir³, Sutarto⁴, Indrawati⁵

¹ Faculty of Teacher Training and Education, The University of Jember, Indonesia
Email: evalailawidita4@gmail.com

² Faculty of Teacher Training and Education, The University of Jember, Indonesia
Email: jekti.fkip@unej.ac.id

³ Faculty of Teacher Training and Education, The University of Jember, Indonesia
Email: imam_mudakir@yahoo.com

⁴ Faculty of Teacher Training and Education, The University of Jember, Indonesia
Email: sutarto.fkip@unej.ac.id

⁵ Faculty of Teacher Training and Education, The University of Jember, Indonesia
Email: indrawatisutarto@gmail.com

Abstract— Study in 21st century having much transformation in science and technology. An effective knowledge is a knowledge that includes student's ability in understanding study subject. Therefore, to support an optimum study process there is a need of a text book. Therefore, Process Image (PI) is a series of pictures/diagrams in a shape of object in an order that have a differences in situation, position, shape and combination in a whole and certain complexity. Study in Biology especially in a main study of human respiratory system is a study that have the most complexity. This happened because the study subject is abstract in a process that can't be seen directly because it is inside human body. Objective of this research is to knowing the effectivity of textbook basic on process image. Human respiratory system processing subject against high school student's ability in criticism. Subject of the research is students in XI Science 3 in Senior High School of Arjasa 2017/2018 academic Period. Data collecting technique is performance test. The results showing that textbook basic on process image on student's ability to critical thinking in a good criteria

Keywords— Textbook, process image, human respiratory system, critical thinking.

I. INTRODUCTION

Progress in science and technology require human skill, one of the methods is using a good textbook. Basic on the research results of 10 Senior High School in Jember (5 school in Jember regency and 5 school in Jember City) that textbook with much sentences doesn't support them to train and develop thinking analyzing skill. This result is

supporting Tania *et al.*, (2015) statement, that ever textbook existed is not good enough to support students study activity.

Lack of thinking skill is shown by a low score on student's study result. This can be seen from the average score from Jember Regency and Bondowoso Regency (5 schools from Jember Regency and 5 schools from Bondowoso Regency) in the human respiratory system subject academic year 2016/2017 the score is 56,6 or below the minimum score of 80. Lack of processing and thinking skill caused by student and teachers that too much rely on subject presentation (Bannert, *et al.*, 2015). Therefore, it is vital that good study activity can improve student's ability to thinking and processing subject.

A good learning activity is an activity that able to teach the student how to use their cognitive ability, so students able to evaluate the methods of their studies as an appliance of high-level thinking ability. Basically, high-level thinking ability is one of Critical Thinking Ability. Critical Thinking is a directed and clear process that used in mental activity such as analyzing assumption, taking decisions, problem-solving, and doing scientific research (Johnson, 2011: 183). Critical thinking ability can be used by student in analyzing skill and in understanding certain concept in a subject. Ennis (2011) states that, Critical Thinking skill can be used by the student in analyzing, evaluating information, logic thinking, and deciding certain actions. Other than that Critical Thinking can be a tool that stimulates students to think and helps students to get a better study result (Choy and Chech, 2009). Critical Thinking Ability capable to get someone to prepare in realistic career life. A study that orientates on developing

student’s Critical Thinking Ability is relevant to be applied basic on process image.

The process image is series of pictures that visualize certain situation (thing, phenomenon or genesis) through pictures, different phase/series in position, situation, form either its coherent combination and a whole, so it helps the readers understand it (Sutarto: Widita, 2017). Usage of process image help students in analyzing a genesis or problem with more detail because in Process Image there are different phases in a genesis. This caused Process image’s role in learning can create student’s creativity and interest in understanding such complex concept (Yusmar, 2017). This process image appropriate to use specially in Biology subject that categorized as a difficult subject.

Learning Biology is supposed to be applied with appropriate approach and methods. This is because of many difficult concepts in Biology subject. While learning Biology a teacher is supposed to know that Biology is more than just fact and concept, because in Biology there are compilations of a process and a concept that can be applied also developed in real life. The main subject respiratory system is a subject that has high complexity. This is because the subject is abstract that the all process cannot be directly seen (inside the human body). Human Respiratory System subject is about organ structure, mechanism and also respiration dysfunctional (breathing) that less effective if presented with lecture method and memorizing. The Process Images textbook subject can be interpreted as a medium that used to help students understanding a Biological (genesis, thing, or phenomenon) genesis. Basically, in stimulating student’s memory, there is a need for effective hints (Allan et al., 2001). Because of that, with the usage of Process Images textbook, this process can enhance student’s critical thinking ability.

II. METHODOLOGY

This kind of research is still a prototype (Research and Development). This research method is a (mixed methods) composed of quality and quantity method. Prototype research is a developing research method that used to design a new product or new procedure, then systematically tested in the field and perfected high quality and effective criteria. The product of this research is Process Image textbook in Senior High School Respiratory System subject. Developing research Biology textbook is using developing model Sugiyono (2011) that composed in phases such as Introduction, Design, and Develop. The research design is performance test of critical thinking ability. Assessment is taken while the student is in study activity with assessment indicator such as analyzing; answering and questioning; consider relevant sources;

making hypothesis; definition; and reviewing. This design is used to know the effectiveness of this textbook. Subjects of the research are students in XI SCIENCE 3 in Senior High School of Arjasa, Jember academic period of 2017/2018. Analysing technique that used to know the effectiveness of textbook basic on Process Image against Critical Thinking ability using critical thinking formula (Watson, 2008). Basically textbook basic on Process Image of Human Respiratory System is effective if the minimum critical thinking criteria are “good”.Therefore the formula to calculate critical Thinking ability is:

$$Cs = \frac{C}{N} \times 100$$

Information:

- Cs = Critical Thinking Score
- C = Critical Thinking
- N = Total score

Criteria Assessment of Critical Thinking Percentage can be seen in Table 1

Average Critical Thinking Indicator	Critical Thinking Category
20 ≤ P < 36	Bad
36 ≤ P < 52	Not Enough
52 ≤ P < 68	Good Enough
68 ≤ P < 84	Good
84 ≤ P ≤ 100	Vey Good

III. RESULTS

Collecting data method that is used to measure the effectiveness of textbook on process image is performance test. This assessment is executed when students had a study session in class, students are being tested with some indicator such as analyzing, answering and questioning; consider the relevant source; making hypothesis; making definition, and reviewing. Study session in class is done with dividing students into some group, then students are asked to explain Process Images in the book without teacher involvement and make presentation the subject in front of the class.

The result of this research is a quantity and quality data that is analyzed descriptively then interpreted according to the chosen criteria. Based on Table 2. we can notice that the average critical thinking ability of XI SCIENCE 3 against textbook basic on Process Image Human Respiratory System subject is 83,46 % that interpreted as “Good”.

Table.2: Average Percentage of Student’s Critical Thinking in XI SCIENCE 3 and XI SCIENCE 5 in Highschool of Arjasa

Component Aspect	XI SCIENCE 3		Interpretation
	Every Aspect Average	Value	
Analysing	4,21	84,2	Very good
Answering and Questioning	4,26	85,2	Very good
Considering Relevant Source	4,13	82,6	Good
Making Hypothesis	4,18	83,6	Good
Definitioning	4,21	84,2	Very good
Reviewing	4,05	81	Good
Total score	25,04	500,8	-
Value (%)	-	83,46	Good

Based on Table 2, there is a result that student’s Critical Thinking ability is affected by textbook based on Process Image human respiratory system subject. Results of the both class XI SCIENCE 3 aquired in a good criteria with a conclusion that textbook basic on Process Image in human respiratory system subject can enhance student’s Critical Thinking ability. Percentage of Student’s Critical Thinking ability Histogram can be seen in Table 1.

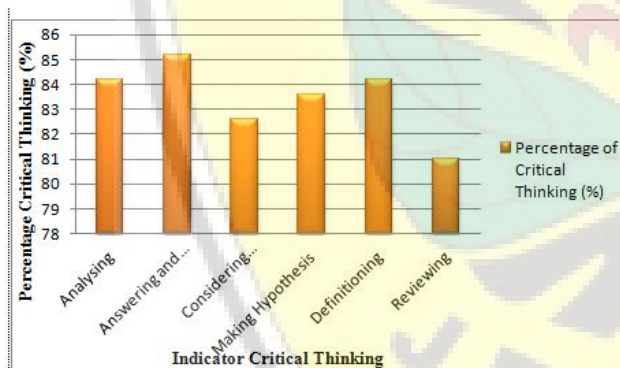


Fig 1: Average Percentage of Critical Thinking Histogram in Senior High School of Arjasa

IV. DISCUSSION

This Research is a research and development method. The objective of this research is to know the effectiveness of textbook basic on process images with human respiratory system against student’s critical thinking ability. There is a need for a field test of the effectiveness using Process Images textbook as the main study source.

Measurement in Critical thinking criteria (*Performance Test*) Students in XI SCIENCE 3 can be seen on Tabel 2 in order 83,46 % with criteria of “good”. In measuring critical thinking ability student is tasked to

analyzing, answering and questioning, considering the relevant source, making a hypothesis based on a literature, make definition, and reviewing is also affected by learning process that forced them to be able to discuss things in a group and understanding also solved a few problems. Critical thinking measurement is done by measuring process through discussion. This makes student able to reconstruct their knowledge and build a presentation model that used from previous study group from solving problems. This is alike with the statement of Tan et al., (2013) states that discussion in learning can be done with a group of students discussing a natural phenomenon, explaining and propose some possibilities of answers than the problems is presented as a relevant solution. Because of that Process Images study can actually affect student’s critical thinking ability. This is alike with Livingston (1997) states that high-level thinking ability (critical thinking ability) can be practiced through group discussion, thinking training, and evaluation of behavior.

Critical thinking ability of student has a big connection with intelligent and also processing process image information. Gardner states (Hadywinoto dan Setiabudi, 2003:52) that intelligence is used to solve problems. This means everyone has a different level of intelligence. In learning process, it creates an ability to think critically in the performance of brain to process information. Therefore, students ability to think is stimulated so they can develop their critical thinking ability. In learning Biology specially human respiratory system textbook basic on Process Image, brain have a role to invite students to optimize their brain memory capacity through freeing students to make their own concept, using variations of pictures and attractive colour, and giving the students to give brain a chance to transfer memory to long-term memory saving. This is a like with Craig state (2007) that studies using picture component, colour, writing, and diagram caused brain to be used in different situation in facilitating their ability to critical thinking.

Commonly, brain (*cerebrum*) composed in two part that called right hemisphere and left hemisphere that connected with corpus callosum (Chambell and Reece, 2008; Kalat, 2010; Pinel, 2009). In left brain have a role in the ability for verbal/writing (verbal), language, logic, math, number, and intelligence. In right brain it’s role is responsible for picture, music, global understanding, creativity, and visual (Albrechth, 2013; Corballis, 2014; Long et al., 2012). In the right brain, it has holistic and intuitive cognitive style in the left brain it has analitical and rational cognitive style (Dehaene et al., in Supradewi, 2010). From the explanation above it is important to keep brain having a balance performance. Balance in the right brain (right hemisphere) and left brain (left hemisphere is needed in the learning process.

V. CONCLUSION AND SUGGESTIONS

From the results and explanations above we can conclude that textbook basic on Process Images is effective against student's critical thinking ability with a "good" criteria.

From the result of research, researchers suggest for a further research for a greater good this developing research can be done on a large scale, so the textbook effectiveness is undoubted.

ACKNOWLEDGEMENTS

The author would like to thank the Faculty of Teacher Training and Education (FKIP) of Jember University.

REFERENCES

- [1] Albertch, K. 2013. "Star Trek" Character as Cognitive Archetypes?. <https://www.psychologytoday.com>. (diakses 21 Mei 2018).
- [2] Allan, K., Wolf, H. A., Rosenthal, C. R. and Rugg, M. D. 2001. The Effects of Retrieval Cues on Post-retrieval Monitoring in Episodic Memory. *Brain Research* 12: 289-299.
- [3] Bannert M, et al. 2015. Shortand longterm effects of students' self-directed metacognitive prompts on navigation behavior and learning performance. *Computers in Human Behavior*. 293-306.
- [4] Campbell, N. A., and Reece, J. B., J. B. L..2008. *Biology*. Jakarta: Erlangga.
- [5] Choy,C. & Chech, K.P. 2009. Teacher perception of Critical Thinking Among Students and its Influence on Higher Education. *International Journal of Teaching and Learning in Higher Education*. 20(2), 298-206.
- [6] Clément, P. and Carvalho, G., 2007. Biology, Health and Environmental Education for better Citizenship: teachers' conceptions and textbook analysis in 19 countries. *Journal Proceedings WCCES XIII (World Council of Comparative Education Societies)*. Sarajevo, CD-Rom, 15 pp.
- [7] Corballis, M. 2014. Left Brain, Right Brain: Facts and Fantasies. *Plos Biology*, 12(1):1-6
- [8] Craig, D. 2007. Applying Brain-Based Learning Principles to Athletic Training Education. *Journal of Flagstaff*. Northen Arizona University. 6(3): 130-141.
- [9] Ennis, R.H. 2011. *The Nature Of Critical Thinking: An Outline of Critical Thinking Disposition & Abilities*, Emiritius Professor, University of Illionis.(Online),(http://faculty.education.illinois.edu/rhennis/documents/TheNatureofCriticalThinking_51711_000.pdf), accessed 20 May 2018.
- [10] Johnson, D. W., &Johnson, R. T. 2001. *Learning together and alone: Cooperative,competitive, and individualistic learning*. Boston: Allyn & Bacon
- [11] Kalat, J. W. 2010. *Biopsikologi*. Jakarta: Salamba Humanika
- [12] Livingston, J. A. 1997. Metacognition: an Overview, (Online), (<http://www.gse.buffalo.edu/fas/shuell/cep564/Metacog.htm>, diakses 20 Mei 2018).
- [13] Long, D. L. Johns, C. L., and Jonathan, E. 2012. Hemispheric Differences in the Organization of Memory for Text Ideas. *Brain & Language*, 123 (2012):145-153.
- [14] Pinel, J. P. J. 2009. *Biopsikologi*. Yogyakarta: Pustaka Pelajar.
- [15] Supradewi, R. 2010. Otak , Musik, dan Proses Belajar. *Buletin Psikologi*.18 (2):56-58
- [16] Tan, S. K., Chong, Y. H., and Shuhui, T. 2013. Teaching school science within the cognitive and affective domains. *Journal Asia-Pacific Forum on Science Learning and Teaching*. Vol: 14 (3): 2-3
- [17] Tania, L and Fadiawati, N. 2015. The Development of Interactive E-Book based Chemistry Representations referred to the Curriculum of 2013. *Jurnal Pendidikan IPA Indonesia*.4(2): 164-169.
- [18] Taufiq, M., N. R dan Widiyatmoko, A. 2014. Pengembangan Media Pembelajaran IPA Terpadu Berkarakter Peduli Lingkungan Tema Konservasi Berpendekatan Science-edutainment. *Jurnal Pendidikan IPA Indonesia JPPII*. Vol. 3(2):140-145.
- [19] Watson, G. & Glaser, E. M. (2008). *WatsonGlaser Critical Thinking Appraisal: Short Form Manual*. USA: Pearson Education, Inc.
- [20] Yusmar, F., et al. 2017. A Concept: Enhancing Biology Learning Quality by Using Procces Image. *Journal of Pancaran* . DOI 10.25037Bakken, J. P., & Simpson, C. G. 2011. Mnemonic strategies: success for the young-adult learner. *The Journal of Human Resource and Adult Learning*. 7 (2).