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“Building the Nation Character through Humanistic Mathematics Education”

Presented by :



Yogyakarta, July 21-23 2011

Department of Mathematics Education
Faculty of Mathematics and Natural Science
Yogyakarta State University



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PROCEEDING

**International Seminar and the Fourth National Conference on
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**Department of Mathematics Education,
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Yogyakarta State University**

July, 21-23 2011

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Paper Reviewers :

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19. Dr. Dhoriva Urwatul Wutsqo (*Yogyakarta State University*)
20. Dr. Heri Retnawati (*Yogyakarta State University*)

**Department of Mathematics Education
Faculty of Mathematics and Natural Science
Yogyakarta State University
2012**

Preface

Assalaamu'alaikum Warahmatullaahi Wabarakatuh.

First of all, we would like to say alhamdulillah, thank to Alloh SWT, the most gracious and the most merciful, therefore the proceeding of The Fourth National Conference on Mathematics Education can be finished successfully. The conference was held on 21 – 23 July, 2011 for the cooperation of Universitas Negeri Yogyakarta (Yogyakarta State University) and Indonesian Mathematical Society (IndoMS). It is an honor for us to be entrusted by IndoMS and UNY to organize The Fourth National Conference on Mathematics Education. The theme of the conference was “Building the nation character through humanistic mathematics education” and the aims were to be a forum for researchers, lecturers, teachers, students, and people who were care in mathematics education to share positive, constructive and creative ideas in relation to the development of the nation character through humanistic mathematics education.

We are very happy and proud, because we have seven invited speakers in their expertise, three invited speakers are from abroad (Prof. Christa Kaune, Germany; Prof. Isoda Masami, Japan; and Prof. Dr. Noor Azlan bin Ahmad Zanzali, Malaysia) and four invited speakers are from Indonesia (Dr. Ary Ginanjar Agustian, Prof. Jozua Sabandar, Ph.D., Prof. Dr. Sutarto Hadi, and Dr. Marsigit). We also very happy since we have numerous participants who are come from all parts of Indonesia and also from Malaysia. Alhamdulillah, there were 83 papers related to mathematics education that have been presented on parallel session of this conference.

We are very grateful to all reviewers who have been dedicated to review the articles of the proceedings. The reviewers are: Prof. Yaya S. Kusuma, M.Sc., Ph.D. (UPI Bandung), Prof. Jozua Sabandar, M.A., Ph.D. (UPI Bandung), Turmudi, M.Sc., Ph.D. (UPI Bandung), Prof. Sutarto Hadi, M.Sc., Ph.D. (UNLAM), Prof. Dr. Ahmad Fauzan (UNP), Dr. Rahmah Johar (UNSYIAH Aceh), Dr. Abdurrahman As'ari, M.A. (UM), Dr. Cholis Sa'dijah (UM Malang), Dr. Yansen Marpaung (USD Yogyakarta), Sukirman, M.Pd. (UNY), Dr. Marsigit, M.A. (UNY), Dr. Hartono (UNY), Dr. Djamilah B.W., M.Si (UNY), Dr. Sugiman (UNY), Dr. Ali Mahmudi (UNY), Dr. Agus Maman Abadi (UNY), Dr. Jailani (UNY), Dr. Dhoriva Urwatul Wutsqo (UNY) and Dr. Heri Retnawati (UNY).

The proceeding contains as many as 84 articles. The author of the article came from several institutions, namely: UNY, UTM Malaysia, UPI, UNJ, UNNES, UM, Unsyiah Kuala, PPs UNY, Sekolah Pascasarjana UPI, PPs UNJ, S2 Pengajaran Matematika ITB, UNIMED, UNHALU, UNSRI, UNRAM, Universitas Negeri Gorontalo, UNILA, UNS, Univeritas Tadulako, UIN Syarif Hidayatulloh Jakarta, STAIN Tulungagung, UII, UNISBA Bandung, USD Yogyakarta, Universitas Muhammadiyah Purworejo, STIKOM Surabaya, Universitas Muhammadiyah Bengkulu, Universitas PGRI Adi Buana Surabaya, UKSW Salatiga, Universitas PGRI Palembang, Universitas Widyadarma Klaten, STKIP Siliwangi Bandung, Universitas Veteran Bangun Nusantara Sukoharjo, STKIP Sebelas April Sumedang, SMA N 4 Tasik Malaya, Universitas Siliwangi Tasikmalaya, Universitas pelita Harapan Tangerang, SMA Lentera Harapan Lampung, UNIROW Tuban and IKIP PGRI Semarang.

We hope that the proceeding be useful, not only for the authors, but also can enrich the creative and innovative ideas that can support the advancement of mathematics education, especially in Indonesia.

Yogyakarta, May 2012
Chairman of the Committee
Dr. Ali Mahmudi

CONTENTS

Cover				i
Publishing Statement				ii
Paper Reviewers				iii
Preface				iv
Contents				v
Code	Name	Institution	Title	Page
U - 1	Noor Azlan Ahmad Zanzali	<i>Faculty of Education Universiti Teknologi Malaysia Email: azanzali@utm.my</i>	Improving The Quality Of The Mathematics Education: The Malaysian Experience	M - 1
U - 2	Christa Kaune ¹ , Edyta Nowinska ²	¹ <i>Institut für Kognitive Mathematik, Universität Osnabrück, Germany,</i> ² <i>Institute MATHESIS, Pyzdry, Poland</i>	Development Of Metacognitive And Discursive Activities In Indonesian Maths Teaching A Theory Based Analysis Of Communication Processes	M-23
U - 3	Marsigit	<i>Faculty of Mathematics and Science, Yogyakarta State University</i>	Developing The Attitude And Creativity In Mathematics Education	M-34
U - 4	Sutarto Hadi	<i>Department of Mathematics Education, Lambung Mangkurat University, Banjarmasin</i>	Developing The Nation Character Through Realistic Mathematics Education	M-65
U – 5	Masami Isoda	<i>University of Tsukuba, Japan</i>	Problem Solving Approaches in Mathematics Education as a Product of Japanese Lesson Study	M-77
P – 1	Abd. Qohar	<i>Mathematic Department, State University of Malang, Indonesia</i>	Mathematical Communication: What And How To Develop It In Mathematics Learning?	1
P – 2	Anggit Prabowo Marsigit Atmini Dhoruri	<i>Yogyakarta State University E-mail: anggit_191085@yahoo.com</i>	Improving The Understanding Of The Arithmetic Concept Through Realistic Mathematic Education (RME)	13
P – 3	Rustanto Rahardi	<i>Faculty of Science and Mathematics Malang University Jl. Semarang 5 Malang, e-mail: rustanto_r@yahoo.com</i>	Valsiner's Zone Theory As The Teachers' Zone Of Proximal Development	25
P – 4	Budi Mulyono	<i>Mathematics Education Department Sriwijaya University email: boedy_moe@yahoo.com</i>	Traditional Teaching About Angles Compared To An Active Learning Approach That Focuses On Students Skills In Seeing, Measuring And Reasoning, Including The Use Of Dynamic Geometry Software: Differences In Achievement	37
P – 5	Theresia Kriswianti Nugrahaningsih	<i>Department of Mathematics Education Widya Dharma University Klaten e-mail: kriswianti_th@yahoo.com</i>	Using Metacognition In Learning Mathematics Toward Character Building	47
P – 6	Dasa Ismailmuza	<i>Departement of Mathematics Education Tadulako University Palu, Central Sulawesi, e- mail: dasaismaimuza@yahoo.co.uk</i>	Creative Thinking Ability on Mathematics of Junior High School in Palu Based on School Levels	59
P – 7	Destiniar	<i>Department of Mathematics Education PGRI University of Palembang e-mail:</i>	Effect of Contextual Learning Ability Against Students Understanding Math Concepts SMP	65

		<i>destiniarpagri@yahoo.co.id</i>		
P – 8	Supriyono	<i>Department of Mathematics Education Muhammadiyah University of Purworejo</i>	Developing Mathematical Learning Device Using TTW (Think- Talk-Write) Strategy Assisted By Learning CD To Foster Mathematical Communication	73
P – 9	Nila Kesumawati	<i>Departement of Mathematics Education, PGRI University of Palembang email: nilakesumawati@yahoo.com</i>	Development Mathematical Problem Solving Problems At Junior High School	85
P – 10	Dodi Syamsuduha	<i>SMA Negeri 4 Kota Tasikmalaya e-mail: disyamsu@yahoo.com</i>	Pengaruh Pembelajaran Kooperatif Berbantuan Program <i>Geometer's Sketchpad</i> Terhadap Peningkatan Kemampuan Berpikir Kritis Matematik Siswa SMP	95
P – 11	Kms. Muhammad Amin Fauzi	<i>FMIPA Universitas Negeri Medan e-mail : amin_fauzi29@yahoo.com</i>	Peningkatan Kemampuan Koneksi Matematis Dan Kemandirian Belajar Siswa Dengan Pendekatan Pembelajaran Metakognitif Di Sekolah Menengah Pertama	109
P -12	Gelar Dwirahayu	<i>Department of Mathematics Education Faculty of Tarbiya and Teachers Tratinig State University of Islamic Syarif Hidayatullah Jakarta gelardr@yahoo.com</i>	Implementation Of Character-Building Education In Mathematics Teaching And Learning To Create Of Human Character	123
P – 13	Iis Margiyono ¹ , Helti Lygia Mampouw ²	^{1,2} <i>Program Studi Pendidikan Matematika FKIP, ²Pusat Studi Pendidikan Sains, Teknologi dan Matematika, Universitas Kristen Satya Wacana, Jl. Diponegoro 52-60 Salatiga 50711, Indonesia E-mail: h.mampouw@gmail.com</i>	Deskripsi <i>Pedagogical Content Knowledge</i> Guru Pada Bahasan Tentang Bilangan Rasional	133
P – 14	Kariyam Perdana, R.B.	<i>Department of Statistics Islamic University of Indonesia e-mail: kariyam@uii.ac.id</i>	Factor Analysis Of Ordinal Data Based On Weighted Ranking And Its Application To Reduce Perception Variables To Math Lessons Of Senior High School Student	145
P – 15	Syahrir	<i>Departement of Mathematics Education Teachers' Training College of Mataram</i>	Effects of the Jigsaw and Teams Game Tournament (TGT) Cooperative Learning on the Learning Motivation and Mathematical Skills of Junior High School Students	155
P – 16	Musthofa	<i>Department of Mathematic Education, Yogyakarta State University</i>	Some Creative And Easy Methods To Calculate A Multiplication Of Two Numbers	167
P – 17	Oktavianus Adi Nugraha ¹ , Sundo Nurbono ¹ , Dimas Adi Nugroho ¹ , Handita Sari ² , Kriswandani ³	<i>Mathematics Education Study Program Education and Teaching Faculty Satya Wacana Christian University</i>	Effort To Improve Student Achievement In Learning Through The Development Of Function Composition Method Of Discussion On The Approach To Contextual Teaching And Learning (CTL) In Class Xi IPA 1 Salatiga Christian Senior High School 1	173
P – 18	Ilfi Norman, Zaid Zainal Abidin, Md. Nor Bakar	<i>Universiti Teknologi Malaysia</i>	Secondary School Students' Abilities Through Problem Posing Activities	187
P – 19	Kodirun	<i>Mathematics Department of</i>	Developing Students Ability To Write	199

		<i>Faculty of Mathematics and Natural Sciences of University of Haluoleo Kendari</i> Email: kodirun_zuhry@yahoo.co.id	Mathematical Proof By Polya Method	
P – 20	Yusuf Hartono	<i>Department of Mathematics Education Sriwijaya University</i> e-mail: y.hartono@unsri.ac.id	Mathematics Learning Within Culture And Nation Character: Using Traditional Dance In Learning The Concept Of Symmetry At Grade IV Primary School	207
P – 21	Bambang Priyo Darminto	<i>Mathematics Education Department, Muhammadiyah University of Purworejo</i> e-mail: darmintobambangpriyo@yahoo.co.id	Developing Cultural And Character Nations Values Through Mathematics Learning	215
P – 22	Umy Zahroh	<i>Department of Mathematics Education, State Islamic College (STAIN) of Tulungagung Mayor</i>	The Influence Of Edutainment Method Towards The Mathematics' Learning Achievement Of The Sixth Grade Students Of SDN I And SDN II Tanjungsari Boyolangu Tulungagung	223
P – 23	Abdul Muin	<i>Department of Mathematics Education, Syarif Hidayatullah State Islmic University Jakarta</i> e-mail: muinfasya@gmail.com	The Situations That Can Bring Reflective Thinking Process In Mathematics Learning	231
P – 25	Adi Nur Cahyono	<i>Department of Mathematics, Semarang State University,</i> Email: adinegara@staff.unnes.ac.id	MatriksMovie: Building The Nation Character Through Movie-Based Realistic Mathematics Education	239
P – 25	Aning Wida Yanti	<i>Department of Mathematics Education, State University of Malang</i> aning.widayanti@yahoo.co.id	Learning Mathematics To Grow Metacognitive Ability In Understanding And Mathematic Problems Solving On Limit	251
P – 26	Asep Ikin Sugandi	<i>STKIP Siliwangi Bandung</i> Email : asepikinsugandi@yahoo.co.id	Developing National Character Through Mathematics Instruction Via Mathematics Instruction With Problem-Based Learning In Jigsaw Typed Cooperative Setting	263
P – 27	Darmawan ¹ Iwan Pranoto ²	¹⁾ <i>Teacher in Majalengka State High School 1 - Student of Master of Mathematics for Teaching, Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology,</i> Email: darma_grp@yahoo.co.id ²⁾ <i>Lecturer in the Math Department, Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology,</i> Email: pranoto@itb.ac.id	On The Teaching Of Analyzing The Effects Of Parameter Changes On The Graph Of Function	275
P – 28	Dylmoon Hidayat Ismail Daniel	<i>Department of Mathematics Education, Universitas Pelita Harapan, Tangerang</i> email: dylmoon.hidayat@uph.edu and Sekolah Lentera Harapan, Lampung	Mathematics Teachers' Performance In Teaching Using English At Secondary National Plus Schools	283

		<i>email:ismail.ladde@gmail.com</i>		
P – 29	Hapizah Trimurti Saleh	<i>Department of Mathematics Education, University of Sriwijaya Inderalaya Ogan Ilir, e-mail: hapizah_piza@yahoo.com</i>	Developing The Teaching Module Of Initial Values And Boundary Problems For Students Of Mathematics Education Program	291
P – 30	Herry Agus Susanto ¹⁾ Bambang Suharjo ²⁾	¹⁾ <i>Veteran Bangun Nusantara University of Sukoharjo</i> ²⁾ <i>Muhamadiyah University of Gresik</i> E-mail : <i>herrysanto_62@yahoo.co.id</i>	Mathematics And Mathematics Education Values In Forming Someone's Character	299
P – 31	Hongki Julie	<i>Sanata Dharma University hongkijulie@yahoo.co.id</i>	Development Guided Reinvention Principle In Pmri Approach In Use The Teacher Guide In Elementary School	311
P – 32	Iwan Gunawan ¹⁾ Iwan Pranoto ²⁾	¹⁾ <i>Student of Master of Mathematics for Teaching, Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology, Email: i_gun78@yahoo.com.</i> ²⁾ <i>Lecturer in the Math Department, Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology, Email: pranoto@itb.ac.id</i>	An Instruction Idea Connecting Integral Concepts In Senior High School With Irregular Area Measurement In Elementary School	321
P – 33	Kadir Eny Wulandari	<i>Department of Mathematics Education FITK, Universitas Islam Negeri Syarif Hidayatullah Jakarta e-mail: dirsai@yahoo.com</i>	The Implementation Of Multiple Intelligences Based Learning To Improve Students' Learning Activities, Response, And Learning Outcome In Mathematics	333
P – 34	Lia Kurniawati	<i>Departement of Mathematics Education, UIN Syarif Hidayatullah Jakarta</i>	Developing Mathematical Reflektive Thinki NG Skills Through Problem Based Learning	335
P – 35	Mimih Aminah Jozua Sabandar	<i>STKIP Sebelas April Sumedang e-mail: mimih.aminah@yahoo.co.id Indonesia University of Education (UPI)</i>	The Potency Of Metacognitive Learning To Foster Mathematical Logical Thinking	345
P – 36	Mujiyem Sapti Suparwati	<i>Department of Mathematics Education, Muhammadiyah University of Purworejo e-mail: saptimoedji@yahoo.com</i>	An Experiment Of Mathematics Teaching Using SAVI Approach And Conventional Approach Viewed From The Motivation Of The Students Of Sultan Agung Junior High School In Purworejo	357
P – 37	Mustamin Anggo	<i>FKIP Universitas Haluoleo Kendari</i>	The Metacognitive Process Of Teachers College Students In Solving Mathematical Problems	367
P – 38	Nyimas Aisyah	<i>Department of Mathematics Education Sriwijaya University Km. 32 Indralaya Ogan Ilir email nys_aisyah@yahoo.co.id</i>	Values Implemented By Secondary Teachers In Mathematics Problem Solving	377
P – 39	Rasiman	<i>Department of Mathematics Education, Faculty Mathematics and Natural Sciences Education IKIP PGRI Semarang</i>	Leveling Of Students Critical Thinking Abilities In Mathematics Problem Solving In Line With Gender Differences	391
P – 40	Sudirman	<i>Department of Mathematics State University of Malang</i>	Penginvestigasian Objek Fungsi Sebagai Hasil Pengkapsulan Proses: Suatu Studi	401

		e-mail : sudirman_um@yahoo.co.id	Kasus Untuk NURI	
P – 41	Supratman	Mathematics Education Courses And Pedagogy Faculty Of Education, University Of Siliwangi Tasikmalya e-mail: Supratman_Id@yahoo.com	The Influence Of The Use Of E-Book And E-Learning Base In Students Achievement	415
P – 42	Tedy Machmud	Department of Mathematics Education Gorontalo State University e-mail: tedy_m@ung.ac.id	Scaffolding Strategy In Mathematics Learning	429
P – 43	Tjang Daniel Chandra	Department of Mathematics State University of Malang e-mail : tjangdanielchandra@yahoo.co.id	Integrated Mathematics Teaching as an Effort to Teach Mathematics More Interesting	441
P – 44	Sri Hastuti Noer	Mathematics Education Lecturer in FKIP, Lampung University Email: hastuti_noer@yahoo.com	Character Development In Mathematics Problem-Based Learning	449
P – 45	Winda Ramadianti	Yogyakarta State University Email: winda.ramadianti@gmail.com	Improving Student's Motivation To Learning Math By Cooperative Learning Technique Make A Match	457
P – 46	Abdur Rahman As'ari	Department of Mathematics Education, Faculty of Mathematics and Natural Sciences, State University of Malang	Membangun Karakter Pebelajar Unggulan Melalui Pembelajaran Matematika	467
P – 47	Gaguk Margono	Universitas Negeri Jakarta, Kompleks UNJ Rawamangun Jakarta g_margono@yahoo.com	Internal Consistency Reliability Of Instruments Measuring Students Satisfaction As An Internal Customer (Application Of Factor Analysis)	479
P – 48	Sri Subarinah	Study Program of Mathematics Education, FKIP Universitas Mataram Email: s.subarinah@gmail.com	Creating Joyful Atmosphere In Mathematics Learning For Elementary School Students By Implementing Kopermatik Aids	493
P – 49	Ali Mahmudi	Department of Mathematics Education Faculty of Mathematics and Natural Science Yogyakarta State University email: ali_uny73@yahoo.com	Developing Students' Character Through Mathematics Teaching And Learning	503
P – 50	Atmini Dhoruri R. Rosnawati, Ariyadi Wijaya	Department of Mathematics Education, Yogyakarta StateUniversity e-mail: atmini_uny@yahoo.co.id	Developing Mathematics-Students Worksheet Based On Realistic Approach For Junior High School In Bilingual Program	511
P – 51	Elly Arliani	Faculty of Mathematics and Sciences, Yogyakarta State University arliani_elly@yahoo.com	Developing Teacher's Character Through Lesson Study Activities	519
P – 52	I Nengah Parta	Jurusan Matematika FMIPA UM Email: nengahparta@yahoo.com	Developing Mathematics Teaching Material "Investigative" for Pre-Service Mathematics Teacher	527
P – 53	Hasratuddin ¹	¹ State University of Medan Email: siregarhasratuddin@yahoo.com	Improving Student's Emotional Intelligence By Mathematics Learning ²	539
P – 54	Ratu Ilma Indra Putri	Department of Mathematics Education, Sriwijaya University	Improving Mathematics Communication Ability Of Students In Grade 2 Through	547

		<i>e-mail:ratu.ilma@yahoo.com</i>	PMRI Approach	
P – 55	Cholis Sa'dijah	<i>Department of Mathematics State University of Malang e-mail: lis_sadjahi@yahoo.co.id</i>	Students' Achievement In Developing Instructional Material Of Junior High School Mathematics In English Through Implementation Of Peer Assesment In Cooperative Setting	557
P – 56	Retno Subekti	<i>Department of Mathematics Education FMIPA UNY retnosubekti@uny.ac.id</i>	Developing Students' Entrepreneurial Spirit Through The Subject Ilmu Hitung Keuangan	567
P – 57	Achmad Mudrikah	<i>Nusantara Islamic University (UNINUS) Bandung</i>	Developing Teaching Materials By Using Computer-Assisted Problem-Based Learning	575
P – 58	Yumiati	<i>Mathematics Education Studies Program, Department of Mathematics and Sciences Education Universitas Terbuka e-mail: yumi@ut.ac.id</i>	The Implementation of Generative Learning With Open-Ended Approach to Improve Mathematics Student Achievements On Muhammadiyah 44 Pamulang	585
P – 59	Kadir	<i>Department of Mathematics Education FITK, Universitas Islam Negeri Syarif Hidayatullah Jakarta Jl. H. Juanda 95, e-mail: dirlsal@yahoo.com</i>	A Pedagogical Value From Mathematical Mistakes	597
P – 60	Toto Subroto	<i>Indonesia University of Education Magister Student's Dr. Setiabudhi 229 Bandung, email: totosubroto@gmail.com</i>	The Use Of Cabri 3D Software As Virtual Manipulation Tool In 3-Dimension Geometry Learning To Improve Junior High School Students' Spatial Ability	609
P – 61	Turmudi	<i>Mathematics Education Department of UPI Email: turmudi_ah@yahoo.com Dwi Haryanto SMP Lab School of UPI, Bandung</i>	Creating And Solving Model Of Linear Equation Through The Balance At Junior Secondary Class	619
P – 62	Yansen Marpaung	<i>Department of Mathematics Education, University of Sanata Dharma, e-mail: yansenmarpaung@gmail.com</i>	PMRI and Metacognitive Scaffolding	631
P – 63	Ary Woro Kurniasih	<i>Department of Mathematics Semarang State University Kampus Sekaran, Semarango, e- mail:aryworo@staff.unnes.ac.id</i>	Identification Critical Thinking Stages Of Students' Mathematics Education Study Program FMIPA UNNES For Solving Mathematics Problems	639
P – 64	Evi Suharyanti ¹ , Theofelus Galih S. ¹ , Margi Rahayu ¹ , Kriswandani ²	<i>S1 faculty of Mathematic majoring teaching qualification and knowledge Satya Wacana Christian University Email : kriswandani@staff.uksw.edu</i>	Reforming Mathematic Through The Concept Of <i>Cooperative Learning</i> By Using The Technique Think-Pair-Share Focusing On Cube And Cuboid To Improve The Study Result And Activity Of Students From Banyubiru 1 State Middle School Class Of Viie In Semarang District On Their Second Semester Year Of 2010/2011	651
P – 65	Iwan Junaedi	<i>Department of Mathematics Education, Semarang State University Email: iwan_jun@staff.unnes.ac.id</i>	Improving The Quality Of Learning In Geometry Transformation Course To Encourage Students Learning Independence Through The Lesson Study Approach	663
P – 66	Lathiful Anwar	<i>Universitas Negeri Malang</i>	Supporting Student's Thinking In Addition Of Fraction From Informal To More	675

			Formal Using Measuring Context	
P – 67	Dian Armanto Max Stephens	<i>Department of Mathematics Education, The State University of Medan and The University of Melbourne (Australia) e-mail: armanto_dian@yahoo.com ; m.stephens@unimelb.edu.au</i>	Developing Learning Trajectory For Enhancing Students' Relational Thinking	689
P – 68	Anton Noornia	<i>Jurusan Matematika FMIPA Universitas Negeri Jakarta</i>	Cooperative Learning With Metacognitive Approach To Enhance Mathematical Critical Thinking And Problem Solving Ability, And The Relation To Self- Regulated Learning	711
P – 69	Hardi Suyitno	<i>Jurusan Matematika FMIPA Universitas Negeri Semarang hhardisunnes@yahoo.com</i>	Value's of Mathematics Education and Citizenship Education	723
P – 70	Warli	<i>Departement of Mathematics Education, UNIROW Tuban Email: warli66@gmail.com</i>	Improving Students' Creativity In The Proving The Validity Of Arguments Through Learning Strategy "What's Another Way"	737
P – 71	Abdulloh Jaelani	<i>Department of Mathematics Educatio, University of PGRI Adi Buana Surabaya abdjae@yahoo.co.id</i>	Building Character Education In Learning Mathematic	749
P – 72	Supriyono	<i>Department of Mathematic Education, Muhammadiyah University of Purworejo</i>	Developing Mathematical Learning Device Using Think Talk Write Strategies Assisted Learning CD To Forcer Mathematical Communication	759
P – 73	Dina Ladysa, Sindi Amelia, Bobbi Rahman	<i>Study Programme of Mathematics Education, Postgraduate Programme, Indonesia University of Education (UPI) Email : smansa.dina@yahoo.com, achacia88@yahoo.com, bob_by04@yahoo.co.id</i>	Pre-Service Teachers' Views Toward Mathematics Anxiety	771
P – 74	Djamilah Bondan Widjajanti	<i>Department of Mathematics Education Yogyakarta State University Email : Dj_bondan@yahoo.com</i>	Managing Students' Math-Anxiety Through Humanistic Mathematics Education	777
P – 75	Euis Setiawati	<i>Mahasiswa S3 Program Studi Pendidikan Matematika Sekolah Pascasarjana Universitas Pendidikan Indonesia</i>	Hambatan Epistemologi (<i>Epistemological Obstacles</i>) Dalam Persamaan Kuadrat Pada Siswa Madrasah Aliyah	787
P – 76	Farida Nurhasanah	<i>Department of Mathematics Education, Sebelas Maret University email:f4121da_n@yahoo.com</i>	Junior High School Students' Abstraction In Learning Geometry	801
P – 77	Kadir	<i>Department of Mathematics Education at Haluoleo University, Kendari</i>	The Use Of Coastal Potency In Learning Mathematics To Enhance Social Skills Of Junior Secondary School Students	813
P – 78	Nurina Happy, Endang Listyani	<i>Universitas Negeri Yogyakarta</i>	Improving The Mathematic Critical And Creative Thinking Skills In Grade 10 th SMA Negeri 1 Kasihan Bantul On Mathematics Learning Through Problem-Based Learning	823
P – 79	Rahmah Johar	<i>Department of Mathematics</i>	Development Of Learning Material Of	835

		<i>Education, Syiah Kuala University Banda Aceh e-mail: rahmah_johar@yahoo.com</i>	<i>Pakem-Plus For Mathematics Lesson At Elementary School</i>	
P – 80	Risnanosanti	<i>Department of Mathematics Education, Muhammadiyah University of Bengkulu Bali Street, email: rmosanti@yahoo.com</i>	<i>The Effect Of Mathematics Self-Efficacy Toward Mathematical Creative Thinking Ability Of SMA Students In Bengkulu City</i>	847
P – 81	Rusgianto H.S	<i>Mathematics Education Department, Faculty of Mathematics and Sciences State University of Yogyakarta</i>	<i>The Relationship Between Reasoning, And Emotional Intelligence In Social Interaction With Mathematics Achievement</i>	857
P – 82	Yani Ramdani	<i>Universitas Islam Bandung</i>	<i>Enhancement Of Mathematical Reasoning Ability At Senior High School By The Application Of Learning With Open Ended Approach</i>	865
P – 83	Kamaliyah Rita Novita	<i>Bilingual Master Program on Mathematics Education Sriwijaya University, Indonesia Padang Selasa 524 Palembang, email: kamaliyah_kamaliyah@yahoo.co.id</i>	<i>Guided Reinvention In Proving The Sum Of The Angles Of Triangle</i>	881
P – 84	Sanni Merdekawati, Himmawati Puji Lestari	<i>Universitas Negeri Yogyakarta</i>	<i>Developing Student Worksheet In English Based On Constructivism Using Problem Solving Approach For Mathematics Learning On The Topic Of Social Arithmetics</i>	895
P – 85	M.J. Dewiyani S	<i>Undergraduate Program of Information System, STIKOM Surabaya email : dewiyani@stikom.edu</i>	<i>Solving Problems In Mathematics Using The Personality Types As A Means Of Developing The Nation's Character</i>	905
P – 86	Edy Tandililing	<i>Jurusan PMIPA FKIP UNTAN Pontianak</i>	<i>The Enhancement of Mathematical Communication and Self Regulated Learning of Senior High School Students Through PQ4R Strategy Accompanied by Refutation Text Reading</i>	917

Managing Students' Math-Anxiety Through Humanistic Mathematics Education

Djamilah Bondan Widjajanti

Department of Mathematics Education

Yogyakarta State University

Email : Dj_bondan@yahoo.com

Abstract

Prior to the national examination, there are many students and/or their parents often anxious excessively. Especially for math class, students often feel anxious not only at the time of the exam, but also long before the exam. Actually, not all anxiety is bad. Anxiety, within certain limits, can be managed so that it will turn into an intrinsic motivation that can help students perform better.

There are several reasons why students have anxiety about math. One of the reasons is an authoritarian teacher. Another reason of anxiety for students to learn mathematics is from the students themselves, such as low self-esteem or lack of confidence. Low self-esteem or lack of confidence can be generated by previous negative experiences when they learned mathematics.

There are many studies showing a negative correlation between mathematics anxiety and mathematics learning achievement. The question then is: what can be done by a math teacher to help students manage their anxiety? One possible way, teachers can help students to manage their anxiety by implementing humanistic teaching and learning. This paper will discuss how to manage the anxiety of students in learning mathematics through a humanistic mathematics education.

Key words: math-anxiety, humanistic mathematics education.

I. INTRODUCTION

Prior to the national examination, there are many students, or their parents, or both, who often feel anxious excessively, worrying whether the students will be successful in the exam or not. Excessive anxiety is unfortunate, because it can make the students unable to concentrate during the exam, or even worse, it can cause the students to get sick. A little anxiety about exam was reasonable, but if it is excessive, it should be taken care of.

In the case of math class, students are often anxious not only at the time of the exam, but also long before the exam. Sometimes students are anxious about math lessons for many things. For example, students are anxious to meet the teacher because they did not do the homework, students are anxious if the homework they did is wrong, students are anxious if they are asked questions from the teachers, students are anxious if they cannot recall specific mathematical formula, students are anxious if they are unable to draw the correct geometric shapes, students are anxious if they do not understand what is explained by the teacher, students are anxious when asked to do the

problems in front of the class, students are anxious to be scolded by the teacher, student anxious if the teacher suddenly administer a quiz or a test, and so on.

Actually, not all anxiety is bad. Anxiety, within certain limits, can be managed so that it will turn into an intrinsic motivation that can help the students perform better. The question is: what can be done by a math teacher to help the students manage their anxiety? One possible answer is that teachers can help students to manage their anxiety by implementing a humanist learning mathematics. After all, what causes many students anxious about math is most likely due to the negative experiences they had when they were studying mathematics.

Therefore, it is the task of mathematics teachers to implement the teaching and learning method that can minimize the anxiety of students. One way is by implementing humanistic mathematics learning, i.e. learning that can manage the anxiety of students in learning mathematics. What is the meaning of the humanistic mathematics learning? Why is learning math that is humanist believed to be able to help students manage their anxiety?

This paper will discuss how to manage the anxiety of students in learning mathematics through a humanistic mathematics education. There are three sub-topics to be discussed, namely: (1) the anxiety of students in learning mathematics, (2) humanistic mathematics education, and (3) the management of student's anxiety in learning mathematics.

II. DISCUSSION

1. Students' Anxiety in Learning Mathematics

Mathematics education experts have long assumed that the affective factors are as important as the cognitive factors in teaching and learning mathematics. According to McLeod (1992), "A variety of large-scale studies provide a substantial amount of data that indicate there is good reason to be concerned about affective factors." One among the many factors considered to influence the affective student learning outcomes in mathematics is anxiety (Chamberlin, 2010). Anxiety is an affective factor that should be considered in the teaching-learning process because it has correlation with learning achievement.

Anxiety has many definitions. Sometimes it is interpreted similar to panic or fear. As Hart (McLeod, 1992) point out, "Anxiety has sometimes been characterized as fear,

a “hot” emotion, and sometimes as dislike, an attitude.” More specifically, Rubinsten and Tannock (2010) state, “Math anxiety, defined as a negative affective response to mathematics”. While Warren (Strawderman, 2011) describes anxiety as “an adverse reaction to mathematics.” Richardson and Suinn define mathematics anxiety as “feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations” (Peker, 2009).

There are several reasons why students have anxiety about math. Skemp (1971) mentions one of the reasons is an authoritarian teacher. Authoritarian teacher who is likely to impose his will to the students. Authoritarian teacher can make students feel uncomfortable, or even frightened, in the classroom. However, the authoritarian teacher may now not as much earlier times.

Another reason of anxiety for students to learn mathematics is from the students themselves, such as their low self-esteem or lack of confidence. Low self-esteem or a lack of confidence can be influenced by previous negative or bad experiences when they learned mathematics (Fulya, 2008). For example, students may have such a bad experience as when they got a zero score in a test, got scolded by the teachers, scolded by their parents at home, or laughed at by their friends. Feelings of inferiority can also be experienced by the students because they consider themselves not smart or talented in mathematics.

There are several symptoms that may indicate whether a student is anxious or not when s/he is following a math lesson or when s/he is taking a math test. In general, the anxiety may be accompanied by a variety of physical symptoms, such as headache, stomach ache, diarrhea, need to urinate, sweat a lot, temporary inability to hear, stammering speech, or bursting into tears. More specifically, symptoms of math anxiety on a student can cause him/her to forget all the formulas, make him/her slow to do the calculations, or unable to answer any questions from the teacher even though the questions are actually the easy ones.

What are the consequences of the students' anxiety disorder on math lessons? There are many studies showing a negative correlation between anxiety toward mathematics and mathematics learning achievement (Rubinsten and Tannock, 2010). This means that the more anxious a student, the lower academic achievement s/e will

get. Khatoon & Mahmood (2010) find a significant negative correlation ($r = - 0.48$) between math anxiety and math achievement. Zakaria and Nordin (2008) also reveal a low ($r = - 0.32$) but significant ($p < 0.05$) negative correlation between mathematics anxiety and achievement and also a strong ($r = - 0.72$) significant ($p < 0.05$) negative correlation between mathematics anxiety and motivation. The Karimi and Venkatesan research results (2009) show that mathematics anxiety has significant negative correlation with mathematics performance. Sherman and Wither (2003) examined the causal relationship between math anxiety and math learning achievement. They state that “...the data do not support the hypothesis that mathematical anxiety causes a lack of mathematical achievement, but that either the lack of mathematical achievement causes mathematical anxiety, or there is a third factor which causes both.”

Paying attention to the negative relationship between math-anxiety and mathematics achievement as mentioned above, mathematics teachers should put serious consideration to this problem. Giving a little anxiety to the students might be needed, but before that a teacher must be prepared to anticipate the variety of possible responses from students.

2. Humanistic Mathematics Education

One of the key figures in the humanistic learning theory is Carl Rogers. According to Rogers (Patterson, 1977) there are two kinds of learning, namely rote-learning and experiential-learning. Most learning happens in the class is rote learning. On this kind of learning, the material has no personal meaning for the student, does not involve feelings or the personal emotion. Experiential-learning, on the other hand, is the type of learning which makes a difference to the person in behavior, attitude, and personality. It is learning which leads to the individual becoming a more fully functioning person. Such learning involves certain principles which relate to the theory of human nature and human behavior.

Rogers abstracted a number of principles in learning (Zimring, 1999). These principles are: (1) Human beings have a natural potential for learning; (2) Significant learning takes place when the subject matter is perceived by the student as having relevance to his/her own purposes; (3) Learning which involves a change in self-organization—in the perception of oneself—is threatening and tends to be resisted; (4) Those learning which are threatening to the self are more easily perceived and

assimilated when external threats are at a minimum; (5) When the threat to the self is low, experience can be perceived in differentiated fashion and learning can proceed; (6) Much significant learning is acquired through doing; (7) Learning is facilitated when the student participates responsibly in the learning process; (8) Self-initiated learning which involves the whole person of the learner —feeling as well as intellect—is the most lasting and pervasive; (9) Independence, creativity, and self-reliance are all facilitated when self-criticism and self-evaluation are basic and evaluation by others is of secondary importance; (10) The most socially useful learning in the modern world is the learning of the process of learning, a continuing openness to experience and to incorporate into oneself the process of change.

Noting the principles of learning by Rogers above, it can be concluded that basically in the process of learning the most important thing is the involvement of students in a responsible and thorough learning process in both cognitive and affective aspects. Therefore, in a process of teaching and learning, affective aspects need attention as well, and these aspects are as important as the cognitive aspects, so that there is a change in students as a result of their learning.

In general, learning is a process of interaction which involves students, teachers, learning resources, and specific learning environment. Learning can also be interpreted as the educational assistance provided by the educators to the students so that they can learn the material well. In order to provide assistance as needed by every learner, an educator must understand the needs of individual learners.

In reality, the needs of learners are neither singular nor simple. While the basic needs are the same, as the need for safety, need for comfort, need for attention, and need for values, it is actually not the same level for every need. Therefore, it should be the teachers, especially teachers of mathematics, who must pay attention to the type and level of needs of every student in his/her class. Humanistic mathematics learning is expected to facilitate the needs of various students.

In principle, a humanistic mathematics education is mathematics education that takes into account the human sides of all educational actors. These sides are the involvement of human brain and emotions in each learning activity while considering that every man is unique. Therefore, mathematics teachers must always pay attention to the diversity of their students. Also, math teachers are required to implement the

teaching and learning of mathematics that is able to humanize human beings.

According Tennant, (<http://vismath8.tripod.com/tennant1/>), “Humanistic mathematics is a philosophy of teaching and learning which attempts to explore the human side of mathematical thought and to guide students to discover the beauty of mathematics.” Through humanistic mathematics learning, students are introduced to mathematics in ways that they can receive. Math teachers are required to carry out the learning that makes every student feel comfortable, happy, and feel the need for math, but at the same time they also feel challenged to learn mathematics. It is important to provide challenges to students because the presence of the challenge will stimulate students to think harder. However, teachers must be careful with the challenges that they gave. The challenge must not be too complicated so that it can still be carried out by the students. Otherwise, it would make the students anxious in math class, and disturb the learning spirit.

Quoting Haglund, Siswono (2007) states there are 10 kinds of the characteristics of humanistic learning mathematics, namely: (1) Placing a student as an inquirer instead of just receiving facts and procedures, (2) Giving students the opportunity to help each other in understanding the problem and more in-depth solution, (3) Learning various ways to solve the problems, not only with the algebraic approach, (4) Demonstrating the historical background of mathematics as an invention or from a human endeavor, (5) Using issues of interest and open questions (open-ended problems) in the exercises, (6) Using a variety of valuation techniques, not only assessing students based on their ability to recall procedures alone; (7) Developing an understanding and appreciation of the great mathematical ideas that shape history and culture; (8) Helping students see mathematics as a study of patterns, including the aspects of beauty and creativity; (9) Helping students develop attitudes of confident, independent, and curious, and (10) Teaching materials that can be used in everyday life, such as in science, business, economics, or engineering.

From the characteristics of humanistic learning mathematics as expressed by Haglund above, it is known that learning will take place in humanistic learning when it is able to treat students as human beings, that human beings can learn, can find something, can solve the problem, can work together, and can appreciate the beauty and usefulness of mathematics. Of course such a humanistic learning is not easy. The

teachers should really get to know their students, prepare what materials to learn, and plan a learning scenario in detail.

Since each student can learn and work together with one another, then the teacher should provide an opportunity for it, for example by giving group assignments and require students to discuss. Since each student has the potential to find something, then the math should not be given to students entirely in the form of ready-made materials. There are certain parts that could be handed over to the students to "find something".

Since each student has the ability to solve problems, although the speed and level may vary, it is the duty of teachers to provide troubleshooting problems that can be used as a means for students to learn to solve problems. Since each student can appreciate the beauty and usefulness of mathematics, the mathematics teachers must often show its beauty and usefulness to students, for example as part of the motivation at the beginning of the lesson.

It would be better for mathematics teachers if they could identify students who experience anxiety in the classroom, to explore what causes the anxiety, and then provide assistance as needed. Humanistic learning will make the teacher-student relationships and student-student relationship very harmonious. With a harmonious relationship, each student will enthusiastically welcome their math lessons. Thus, there will be no excessive anxiety. Without excessive anxiety, it can be expected that the students' performance can be further optimized. Recognizing the differences in each individual, then the teacher of mathematics should not require all students to learn mathematics with the same speed, method, and comprehension. Teachers of mathematics must always remember that their duty is to guarantee the right of every student to be able to learn optimally in an atmosphere that does not make the students anxious too much. The study result by Mora and Pinto (2003) indicates the usefulness of these humanistic activities as key elements in fostering the type of meaningful contextual interaction that promotes high motivation and selective attention.

3. Management of Students' Anxiety in Learning Mathematics

Basically, in learning mathematics students need to get a challenge to grow its ability to think critically and creatively. The teachers can design variety of tasks, which will be completed independently or as a group, and which contains a challenge for the students. Because most students have a humane tendency or interest to learn something

meaningful to him/her, then the tasks assigned by the teacher should be meaningful tasks. The teachers can use the Contextual or Realistic approach to design tasks that are meaningful.

In order for the learning process that takes place can reduce the student's math anxiety, the meaningful tasks should also be stratified. If it is identified that a student or a group of students begin feel uncomfortable with the math lesson, the teacher must be able to intervene on time and on target. To be able to intervene in a suitable time and well targeted, a teacher really needs to hone its sensitivity in observing students who are studying. A sensitive teacher will know when and to whom s/he must give assistance or guidance.

In essence, to be able to manage the students' anxiety well, a teacher must be ready to challenge but also ready to provide assistance. Assistance should be on time and targeted, because otherwise, it will make the class uncomfortable for some students. To add more the convenience of students in learning mathematics, teachers must be able to demonstrate to the students the beauty of mathematics, the use of mathematics and that mathematics can be learned by anyone and can also be studied with fun.

Teachers should appreciate the human side of students who are studying, namely that students were diverse, so that the teacher must be very clever to bridge the diversity. Studying in groups can be a solution, but teachers should not force a student to be in the group that s/he does not like. Teachers must also be able to appreciate the feelings of students and not to scold him/her if s/he is wrong or obtain low achievement. Teachers must ensure that none of the students ridicules other students during the lesson. Teachers should also be able to continuously demonstrate the beauty and usefulness of mathematics so that students will be enthusiastic in learning mathematics.

III. CONCLUSION AND SUGGESTION

Paying attention to the reasons why students are anxious about math lessons and their tests, and noticing a negative relationship between math anxiety and learning achievement, it can be concluded that teachers should be able to design and implement a humanistic learning, i.e. the learning process that humanize humans. In essence, to be able to manage the anxiety students well, a teacher must be ready to give challenge but also ready to provide assistance.

Some tips to math teachers so that the mathematics teaching and learning activities

take place in humanistic ways are: (1) Recognize the advantages and disadvantages of each student, for both cognitive and affective aspects; (2) Prepare a learning scenario that allows all students to be engaged in learning activities; (3) Treat students as human beings. Never make students shy in front of the other students. Also, never humiliate the students; (4) Bring yourself to all students. Build good and harmonious teacher-student relations as well as student-student relations; (5) From time to time, give students the opportunity to make mistakes and learn from those mistakes; (6) Always be prepared to provide assistance at the right time and to the right target.

To make students comfortable in learning mathematics, it is recommended to the teachers of mathematics to always: (1) Demonstrate the beauty of mathematics; (2) Highlight usefulness of mathematics; (3) Emphasize that mathematics can be learned by anyone and that learning mathematics is fun.

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