

ISBN : 978 - 602 - 432 - 004 - 2

Prosiding

SEMINAR NASIONAL KIMIA DAN PENDIDIKAN KIMIA 2016

SINERGI RISET KIMIA DAN PENDIDIKAN KIMIA DALAM
MENINGKATKAN DAYA SAING BANGSA BERBASIS
SUMBER DAYA ALAM SUMATERA UTARA

Hotel Madani - Medan
30 - 31 Mei 2016

THE
Character
UNIVERSITY



Kerjasama :
Pascasarjana Pendidikan kimia
Universitas Negeri Medan
dengan
Pascasarjana Ilmu Kimia
Universitas Sumatera Utara

Prosiding Seminar Nasional Kimia Dan Pendidikan Kimia 2016

“Sinergi Riset Kimia Dan Pendidikan Kimia Dalam Meningkatkan
Daya Saing Bangsa Berbasisi Sumber Daya Alam Sumatera Utara”

Hotel Madani Medan, 30 - 31 Mei 2016

Kerjasama :

Pascasarjana Pendidikan Kimia
Universitas Negeri Medan (UNIMED)
Dengan
Pascasarjana Ilmu Kimia
Universitas Sumatera Utara (USU)

Reviewer:

Prof. Dr. Ramlan Silaban, M.Si
Prof. Dr. Basuki Wirjosentono, M.S., Ph.D
Prof. Dr. Albinus Silalahi, M.S
Prof. Dr. Retno Dwi Suyanti, M.Si
Prof. Drs. Manihar Situmorang, M.Sc., Ph.D
Prof. Dr. Harry Agusnar, M.Phil
Dr. Mahmud, M.Sc
Dr. Ir. Nur Fajriani, M.Si
Dr. Saronom Silaban, M.Pd
Dr. Murniaty Simorangkir, M.Si
Dr. Ajat Sudrajat, M.Si

Editor :

Vivi Purwandari, S.Si., M.Si
Ahmad Nasir Pulungan, S.Si., M.Sc
Lisnawaty Simatupang, S.Si., M.Sc
Junifa Layla Sihombing, S.Si., M.Sc
Dina Grace Aruan, S.Pd., M.Pd
Dra. Ani Sutiani, M.Si
Drs. Jamalum Purba, M.Si
Dra. Ratu Evina Dibyantini, M.Si
Drs. Bajoka Nainggolan, M.Si
Drs. Marudut Sinaga, M.Si
Dra. Anna Juniar, M.Si
Dra. Khalida Agustina, M.Pd

 **UNIMED PRESS**
2016

THE
Character
UNIVERSITY

KATA PENGANTAR

Puji syukur kita panjatkan kehadirat Tuhan Yang Maha Esa, karena atas Karunia dan Rahmat-Nya Prosiding Seminar Nasional Kimia dan Pendidikan Kimia 2016, yang telah diselenggarakan pada tanggal 31 Mei 2016 di Hotel Madani Medan Sumatera Utara dengan tema” **Sinergi Riset Kimia Dan Pendidikan Kimia Dalam Meningkatkan Daya Saing Bangsa Berbasis Sumberdaya Alam Sumatera Utara**”, dapat diselesaikan. Ucapan terimakasih kami sampaikan kepada seluruh pihak yang telah membantu dalam penyusunan prosiding ini.

Seminar Nasional Kimia dan Pendidikan Kimia adalah seminar tahunan yang diselenggarakan oleh Program Pascasarjana Kimia Departemen Kimia FMIPA USU dan Program Pascasarjana Pendidikan Kimia Unimed. Melalui seminar ini diharapkan berbagai hasil penelitian, ide dan pemikiran peneliti di bidang kimia, praktisi kimia an pendidikan kimia. Seminar ini juga diharapkan dapat menjadi wadah bagi peneliti, akademisi, pemerintah dan *stake holder* lainnya untuk bekerjasama dan sharing terkait peran strategis kimia dan pendidikan kimia dalam upaya mempersiapkan dan meningkatkan daya saing generasi penerus dalam pembangunan bangsa Indonesia. Makalah yang termuat dalam prosiding ini terdiri dari makalah dari *keynote Speaker*, makalah utama bidang kimia yang mencakup bidang Kimia Analitik, Kimia Organik dan Anorganik, Kimia Fisik dan Polimer, Biokimia dan Bioteknologi dan Pendidikan kimia.

Alakhir kata kami mengucapkan terima kasih kepada semua pihak yang telah membantu dalam penerbitan prosiding ini dan semoga Prosiding ini dapat bermanfaat baik untuk kalangan kimiawan, pengguna ilmu kimia dan pemerhati pendidikan kimia maupun pembaca lainnya.

Medan, Agustus 2016

Tim Editor

THE
Character Building
UNIVERSITY

KATA SAMBUTAN KETUA PANITIA

Salam sejahtera bagi kita semua..

Puji syukur ke hadirat Allah SWT, atas segala karunia dan rahmat-Nya yang telah dilimpahkan kepada kita semua, sehingga kita dapat bertemu, berbagi pengetahuan dan pengalaman serta berdiskusi dalam kegiatan Seminar Nasional Kimia tahun 2016 ini. Seminar ini diawali dengan alm. Bapak Drs. Rahmat Nauli, M.Si selaku ketua panitia, untuk itu marilah kita bersama-sama mendoakan almarhum agar dapat diterima disisi Allah SWT. Amiiin.

Seminar Nasional Kimia ini adalah seminar tahunan yang terselenggara berkat kerjasama Pascasarjana Pendidikan Kimia UNIMED dengan Pascasarjana Ilmu Kimia dan Departemen Kimia FMIPA USU. Tema Seminar kita tahun ini adalah **“Sinergi riset kimia dan pendidikan kimia dalam meningkatkan daya saing bangsa berbasis sumber daya alam sumatera utara”**. Melalui seminar ini diharapkan dapat terpublikasi berbagai hasil penelitian, ide dan pemikiran para ilmuwan dibidang kimia, praktisi kimia, pendidikan kimia dan menjadi media bagi peneliti, pemerintah dan stake holder lainnya untuk bekerjasama dan sharing terkait peran strategis kimia dan pendidikan kimia dalam upaya mempersiapkan dan meningkatkan daya saing generasi penerus dalam pembangunan bangsa Indonesia. Untuk mencapai tujuan tersebut, panitia telah mengundang para peneliti, pendidik, mahasiswa, dan pemerhati bidang kimia dari berbagai instansi di wilayah tanah air. Undangan tersebut telah ditanggapi oleh hadirnya 150 orang peserta dari berbagai kalangan dimana 89 peserta mempresentasikan makalahnya. Sebagai pemakalah kunci, Prof. Dr. Toto Subroto, MS (Unpad), Prof. Dr. Ramlan Silaban, M.Si (UNIMED), Prof. Basuki Wirjosentono, Ph.D (USU), Prof. Dr. Anna Permanasari, M.Si (UPI), Muhammad Marto Prawiro, MS., Ph.D (ITB/HKI), Abun Lie (PT. Ecogreen Oleochemical), Suwidji Wongso Ph.D (PT. Angler BioChemLab).

Dengan ucapan yang tulus, panitia menyampaikan terima kasih pada pemakalah kunci, peserta pemakalah, peserta non pemakalah, juga segenap undangan kami atas peran sertanya dalam seminar ini. Panitia telah berupaya mempersiapkan sebaik-baiknya, namun apabila terdapat kekurangan pada pelayanan kami, baik dalam penyediaan fasilitas, penyampaian informasi, maupun dalam memberikan tanggapan, kami mohon dimaafkan. Akhir kata, kami sampaikan selamat berseminar, kiranya kita semua dapat memperoleh manfaat bersama dari seminar ini.

Wassalamualaikum Wr.wb.

Medan, Agustus 2016
Ketua Panitia,

Vivi Purwandari, S.Si., M.Si

SAMBUTAN DIREKTUR PASCASARANA UNIMED

Puji syukur kehadirat Tuhan yang Maha Esa, berkat rahmat dan kasihnya kita dapat mengikuti kegiatan Seminar Nasional Kimia dan Pendidikan Kimia yang diselenggarakan atas kerjasama Pascasarjana Program Studi Pendidikan Kimia Universitas Negeri Medan dengan PascaSarjana Ilmu Kimia Departemen Kimia, FMIPA Universitas Sumatera Utara Medan. Kami mengucapkan selamat datang kepada seluruh peserta seminar dan semoga kegiatan ini memberikan kontribusi positif bagi pengembangan ilmu kimia dan pendidikan kimia. Kegiatan seminar ini juga menjadi wadah bagi para akademisi, peneliti, industri, stakeholder, dan para guru untuk saling dapat bertukar pengalaman dan ilmu. Penyelenggaraan seminar ini begitu penting bagi kami mengingat Unimed saat ini sedang menuju pada *Character Building University* yang bersinergi dengan visi menjadi universitas yang unggul dibidang pendidikan, rekayasa industri, dan budaya.

Senar Nasional Kimia tahun 2016 merupakan kegiatan ilmiah tahunan yang diselenggarakan oleh Pascasarjana Unimed dan USU, dan pada tahun ini Unimed menadi *host* dalam kegiatan ini. Senar Nasional Kimia tahun 2016 ini bertema **“Sinergi riset kimia dan pendidikan kimia dalam meningkatkan daya saing bangsa berbasis sumber daya alam sumatera utara”**. Kami telah mengundang para peneliti, pendidik, industri, mahasiswa, dan pemerhati bidang kimia dari berbagai instansi di wilayah tanah air. Undangan tersebut telah ditanggapi oleh hadirnya 150 orang peserta dari berbagai kalangan dimana 89 peserta mempresentasikan makalahnya. Kegiatan Seminar ini menghadirkan *keynote speaker* Prof. Dr. Toto Subroto, MS (Unpad), Prof. Dr. Ramlan Silaban, M.Si (UNIMED), Prof. Basuki Wirjosentono, Ph.D (USU), Prof. Dr. Anna Permanasari, M.Si (UPI), Muhammad Marto Prawiro, MS., Ph.D (ITB/HKI), Abun Lie (PT. Ecogreen Oleochemical), Suwidji Wongso Ph.D (PT. Angler BioChemLab). Saya selaku Ketua/direktur Pascasarjana Unimed mengucapkan terimakasih yang sebesar- besarnya kepada seluruh panitia yang telah bekerja keras untuk terselenggarakannya kegiatan Seminar ini.

Akhir kata, semoga apa yang menadi tujuan dan harapan pada kegiatan Seminar Nasional Kimia dan Pendidikan Kimia ini dapat terwujud.

Hormat Saya,
Direktur Pascasarjan Unimed,

Prof. Dr. Bornok Sinaga, M.Pd

THE
Character Building
UNIVERSITY

SAMBUTAN KETUA PROGRAM STUDI MAGISTER PENDIDIKAN KIMIA PROGRAM PASCASARJANA UNIVERSITAS NEGERI MEDAN

Yang saya hormati dan saya muliakan :

Bapak Gubernur Sumatera Utara, Bapak Rektor Universitas Negeri Medan beserta jajarannya, Bapak Rektor Universitas Sumatera Utara beserta jajarannya, Bapak Walikota Medan, Bapak Kordinator Kopertis Wilayah I, Ketua Himpunan Kimia Indonesia (HKI), Bapak Ibu Pimpinan PTN/PTS, Dekan dan Wakil Dekan, Direktur dan Wakil Direktur Pascasarjana, Ketua dan Sekretaris Jurusan, rekan Ketua dan Sekretaris Prodi, Kepala Laboratorium, para Guru Besar, Bapak Ibu *Keynote Speaker*, para Pemakalah, mahasiswa S1, S2 dan S3, Panitia Pelaksana Seminar, peserta para Undangan, para sponsor, serta hadirin sekalian.

Selamat pagi dan Salam Sejahtera untuk kita semua

Segala Puji dan Syukur saya panjatkan kepada Tuhan atas berkat dan karuniaNya, Seminar Nasional Kimia dan Pendidikan Kimia Tahun 2016, Selasa tanggal 31 Mei 2016 di Hotel Madani Medan, yang terselenggara atas kerjasama Program Pascasarjana Pendidikan Kimia UNIMED dengan Pascasarjana Kimia USU dapat terlaksana dengan baik. Ini tentu tidak luput dari dukungan semua pihak terlebih Rektor UNIMED dan Rektor USU, Direktur Pascasarjana UNIMED dan Dekan FMIPA USU, sehingga kami Ketua dan Sekretaris Program Studi beserta mahasiswa-nya melanjutkan niat baik membangun negeri ini dari Sumatera Utara melalui thema ***“Sinergi Riset Kimia dan Pendidikan Kimia Dalam Meningkatkan Daya Saing Bangsa Berbasis Sumber Daya Alam Sumatera Utara”***.

Pelaksanaan seminar nasional ini kami lihat sangat mendukung Visi Prodi Magister Pendidikan Kimia Pascasarjana Unimed ***“Menjadi program magister pendidikan Kimia yang bermutu dan bergengsi akademis tinggi untuk membentuk kepribadian, pengembangan ilmu kimia/sains dan pengembangan teknologi”***. Thema seminar ini juga sangat sinergi dengan Roadmap penelitian yang kami susun sebagai aktualisasi dan penguatan semboyan Unimed sebagai ***“Character Building University”***, karena manusia yang berdaya saing akan tercipta jika memiliki karakter dan budaya yang baik, dan ini kami kerjakan sesuai motto Unimed ***“Kerjakan sesuatu dengan ikhlas dan benar”***.

Pada kesempatan ini, kami menyampaikan terima kasih kepada Bapak Gubernur Sumatera Utara, Bapak Rektor UNIMED, Bapak Rektor USU, Bapak Walikota Medan, Bapak Direktur Pascasarjana Unimed dan Ibu Dekan FMIPA USU, para Panitia yang sangat gigih, para Pemakalah, para mahasiswa serta hadirin. Terkhusus ucapan terima kasih kami kepada para Pemakalah Utama : Bapak Muhamad Martoprawiro, M.S., Ph.D. (ITB, Bandung, Ketua HKI), Prof. Dr. Anna Permanasari, M.Si. (UPI Bandung), Bapak Abun Li (PT Ecogreen Oleochemical, Batam), Bapak Prof. Dr. Toto Subroto, M.S. (Unpad, Bandung), Bapak Suwiji Wongso, Ph.D (PT Angler BioChemLab, Surabaya), Bapak Prof. Drs. Basuki Wirjosentono, Ph.D. (USU, Medan), juga kepada para sponsor. Kami mohon maaf bilamana ada kekurangan dan kesalahfahaman yang kami lakukan. Kami berharap agar kegiatan Seminar Nasional kerjasama USU dan UNIMED dapat terlaksana secara berkala dan kualitasnya semakin meningkat.

Medan, 31 Mei 2016,
Ketua Prodi Magister Pendidikan Kimia,

Prof. Dr. Ramlan Silaban, M.Si.

SAMBUTAN REKTOR UNIVERSITAS NEGERI MEDAN

Yang saya hormati :

Bapak Gubernur Sumatera Utara, Bapak Rektor Universitas Sumatera Utara, Bapak Ibu Wakil Rektor, Dekan dan Wakil Dekan, Direktur dan Wakil Direktur Pascasarjana, Ketua Himpunan Kimia Indonesia (HKI), Ketua dan Sekretaris Jurusan, Ketua dan Sekretaris Prodi, Kepala Laboratorium, para Guru Besar, Bapak Ibu Keynote Speaker, para Pemakalah, mahasiswa, Panitia, peserta serta hadirin sekalian yang tidak dapat saya sebutkan satu persatu.

Assalamualaikum Wr. Wb.

Patutlah kita bersyukur kehadiran Allah SWT, atas berkat dan rahmatNya, terlaksananya Seminar Nasional Kimia dan Pendidikan Kimia Tahun 2016 hari ini Selasa tanggal 31 Mei 2016 di Hotel Madani Medan, yang terselenggara atas kerjasama Program Pascasarjana Pendidikan Kimia UNIMED dengan Pascasarjana Kimia USU. Menurut laporan Panitia, ini adalah kegiatan seminar bersama yang kedua dan yang pertama dilaksanakan tanggal 19 Mei 2015 yang lampau di tempat ini juga. Untuk itu, secara pribadi, saya menyampaikan Selamat kepada kedua Program Studi atas kegigihannya untuk melaksanakan Seminar Nasional ini.

Para kimiawan yang saya muliakan, Tema Seminar tahun ini adalah **“Sinergi Riset Kimia dan Pendidikan Kimia Dalam Meningkatkan Daya Saing Bangsa Berbasis Sumber Daya Alam Sumatera Utara”** Kami melihat hal ini sangatlah sesuai dengan kebutuhan pembangunan daerah ini ke depan, terlebih menghadapi tantangan regional dan global, khususnya MEA yang sudah dimulai. Bapak ibu dosen dan mahasiswa pascasarjana kimia dan pendidikan kimia sudah selangkah lebih maju untuk memikirkan potensi daerah kita, terlebih menggali sumber daya alam yang selama ini belum digunakan secara optimal. Melalui seminar ini, kami berharap, bapak ibu dapat bertukar pikiran untuk mensinergikan hasil-hasil penelitian di kampus dengan kebutuhan masyarakat dan berkolaborasi dengan stakeholder dan industri.

Bapak Ibu Panitia Seminar, para mahasiswa dan dosen pascasarjana kimia di USU dan UNIMED, kami melihat bahwa baik thema, makalah para nara sumber utama (*keynote speaker*), makalah presentasi oral maupun poster, sudah dikemas dengan bagus dan semuanya mendukung Visi UNIMED **“Menjadi universitas yang unggul di bidang pendidikan, rekayasa industri dan budaya”**, khususnya arah pembangunan UNIMED tahun 2017 **“Unimed sebagai pusat inovasi pendidikan yang mendukung perencanaan, pelaksanaan, pengendalian, penjaminan mutu dan pembudayaan produk-produk pendidikan tingkat nasional berbasis riset”**.

Bapak, Ibu serta hadirin yang saya hormati, kami berharap agar kegiatan ilmiah tingkat pascasarjana seperti ini hendaknya dijadikan sebagai budaya akademik terjadwal guna mendukung pencapaian kompetensi mahasiswa di level 8 ataupun level 9 sesuai KKNI, bahkan sangat berkontribusi pada peningkatan nilai akreditasi institusi (AIPT) maupun akreditasi program studi merujuk standar yang ditetapkan oleh BAN PT Kemristekdikti. Akhirnya, saya ucapkan selamat dan terima kasih kepada seluruh Panitia atas terselenggaranya kegiatan ini.

Medan, 31 Mei 2016,
Rektor UNIMED,

Prof. Dr. Syawal Gultom, M.Pd.
NIP. 196202031987031002

SAMBUTAN REKTOR UNIVERSITAS SUMATERA UTARA

Assalamualaikum Wr. Wb.

Pertama- tama marilah kita panjatkan puji syukur ke hadirat Allah SWT yang telah melimpahkan berbagai kenikmatan kepada kita sekalian. Salah satu nikmat yang sekarang kita rasakan adalah nikmat kesehatan sehingga kita dapat menyelenggarakan seminar nasional ini.

Selanjutnya perkenankan saya menyampaikan penghargaan kepada Ketua Panitia beserta seluruh jajaran kepanitiaan Seminar Nasional Kimia dan Pendidikan Kimia 2016 yang telah mempersiapkan terselenggaranya seminar nasional ini. Adapun dari rancangan kegiatan seminar ini ikut melibatkan pihak-pihak yang tidak saja berasal dari lingkup akademik tapi juga dari lingkup industri. Hal ini sangat penting untuk saya sampaikan mengingat Sekolah Pasca Sarjana Ilmu Kimia pada khususnya dan Universitas Sumatera Utara pada umumnya sedang berupaya untuk menuju *National Achievement Global Reach* yang merupakan satu langkah dari program strategis USU dalam mewujudkan visi USU sebagai *University of Industry*.

Secara khusus perkenankan pula saya sampaikan terima kasih kepada Prof. Dr. Toto Subroto dari UNPAD, Prof. Dr. Anna Permanasari dari UPI, Muhammad Marto Prawiro dari ITB yang berasal dari kalangan akademisi dan Bapak Abun Lie dari PT. Ecogreen Oleochemical dan Bapak Suwidji Wongso dari PT. Angler BioChemLab yang berasal dari kalangan industri dan telah berkenan menjadi *keynote speaker* pada seminar nasional ini.

Seminar nasional dengan tema "**Sinergi Riset Kimia dan Pendidikan Kimia Dalam Meningkatkan Daya Saing Bangsa Berbasis Sumber Daya Alam Sumatera Utara**" tentu saja akan bermanfaat bagi pengembangan ilmu kimia dan bidang ilmu terkait lainnya. Pengembangan tersebut tentu saja baik ditinjau dari sisi materi, penelitian maupun teknologi pembelajarannya dan pembentukan karakter yang mencerminkan sifat-sifat pada ilmu kimia itu sendiri. Kita telah paham bahwa pemahaman terhadap ilmu pengetahuan dan teknologi akan dicapai manakala pemahaman terhadap ilmu dasarnya sangat memadai. Oleh karena itu penelitian Bidang kimia dan teknik pembelajarannya perlu dilakukan terus menerus agar aplikasi pada bidang-bidang tersebut dapat dipahami oleh pembelajarannya. Seminar nasional ini harus mampu mendorong para peneliti dan praktisi pendidikan bidang kimia untuk dapat meramu bidang ini, sehingga mudah dipahami oleh siswa di dalam kelas, mampu melakukan penelitian, dan mengimplementasikan terapannya pada teknologi yang sesuai.

Akhirnya saya mengucapkan terima kasih atas partisipasinya dalam seminar yang diselenggarakan oleh Pasca Sarjana Ilmu Kimia USU dan Pasca Sarjana Pendidikan Kimia Unimed dengan harapan semoga memberikan pencerahan bagi kita khususnya yang selalu terlibat dalam penelitian, pembelajaran dan aplikasi bidang Kimia dalam kehidupan kita masing- masing.

Medan, 31 Mei 2016,
Rektor USU,

Prof. Dr. Runtung Sitepu, S.H., M.Hum

DAFTAR ISI

KATA PENGANTAR	i
SAMBUTAN KETUA PANITIA	ii
SAMBUTAN DIREKTUR PASACBSARJANA UNIMED	iii
SAMBUTAN KETUA PROGRAM STUDI S2 PENDIDIKAN UNIMED	iv
SAMBUTAN REKTOR UNIMED	v
SAMBUTAN REKTOR USU	vi
DAFTAR ISI	vii
<u>MAKALAH KIMIA</u>	
<i>Aktivitas Antidiabetes Ekstrak Etanol Daun Sirih dan Isolasi Senyawa Bioaktiv</i> Abdul Malik	1
<i>Karakterisasi Arang Hasil Karbonisasi Kulit Buah Durian</i> Abdul Gani Haji, Ibnu Khaldun, dan Nina Afriani	7
<i>Analisis Kualitatif Nanosilikon dari Pasir Kuarsa</i> Andriayani, Saur L. Raja dan Amir Hamzah	14
<i>Penentuan Kadar Kalsium Dan Magnesium Dalam Klorofil Pewarna Alami Daun Suji Bentuk Suspensi Dan Ekstrak Kering Dengan Metode Spektrofotometri Serapan Atom</i> Anny Sartika Daulay	21
<i>Pemanfaatan Limbah Tandan Kosong Kelapa Sawit Sebagai Bahan Pengisi Pembuatan Busa Poliuretan</i> Barita Aritonang, Basuki Wirjosentono, Thamrin, dan Eddiyanto	26
<i>Functionalisation of Cyclo Natural Rubber With Maleic Anhydrate By Using Benzoyl Peroxide</i> Boy Chandra Sitanggang, dan Eddyanto	32
<i>Pengaruh Variasi Berat Trinatrium Trimetafosfat Terhadap Derajat Substitusi Pati Sukun Termodifikasi Dengan Metode Ikatan Silang</i> Cut Fatimah Zuhra , Mimping Ginting dan Marpongahtun	37
<i>Sintesis Senyawa Kalkon (E)-1-(4-Klorofenil)-3-(Isopropilfenil)Prop-2-En-1-On Dan Uji Toksisitasnya</i> Eti Meirina Brahmana	41
<i>Preparasi Zeolit Alam Sarulla Kecamatan Pahae Kabupaten Tapanuli Utara Propinsi Sumatera Utara Sebagai Bahan Pengisi Dalam Aplikasi Nanokomposit Busa Poliuretan</i> Fransiskus Gultom, Basuki Wirjosentono, Thamrin, Hamonangan Nainggolan and Eddiyanto	45
<i>Pengujian Aktivitas Bakteri Selulitik Dan Bakteri Lipolitik Dalam Upaya Penurunan Kadar TSS Limbah Cair Kelapa Sawit</i> Gimelliya Saragih dan Debora Cyntia Ananda Samosir	54
<i>Pemanfaatan Ekstraksi Daun Pepaya (Carica papaya) Sebagai Bioinsektisida Ramah Lingkungan berbasis Potensi Lokal Masyarakat Kabupaten Deli Serdang Sumatera Utara</i> Hamidatun Nisa,Ugi Fitri Hardiyanti, Dahlena Pulungan, Drs. Jasmidi,M.Si	60
<i>Studi Daya Serap Film Kitosan-Mikrokristal Selulosa Alang-Alang (Imperata Cylindrica) Sebagai Adsorben Logam Kadmium (Cd) Menggunakan Metode Adsorpsi-Filtrasi Kolom</i> Hartika Samgrycye Siagian, Ribu Surbakti dan Darwin Yunus Nasution	66
	vii

<i>Analysis Of Sodium Benzoate In Seasoning Powder And Soy Sauce In Noodle</i> Herbet Erikson Manurung	80
<i>Studi Perbandingan Kadar Logam Arsenik (As) Dan Besi (Fe) Pada Air Zamzam Yang Diperdagangkan Dan Air Zamzam Mekkah Melalui Metode Inductively Coupled Plasma – Mass Spectrometry (Icp-Ms)</i> Junaidi Caisaria, Zul Alfian, Harry Agusnar	84
<i>Catalytic Hydrocracking Minyak Biji Alpukat menjadi Bahan Bakar Cair menggunakan Katalis ZnO/ZAA</i> Junifa Layla Sihombing, Ahmad Nasir Pulungan, Sobhan, Ary A. Wibowo, dan Hafni Indriati Nasution	89
<i>Pembuatan Dan Karakterisasi Film Nanokomposit Polivinil Alkohol/Nanokristal Selulosa Yang Diisolasi Dari Pelepah Nipah (Nypa Fruticans)</i> Kasrawati, Darwin Yunus Nasution, Thamrin	96
<i>Preparasi Abu Vulkanik Gunung Sinabung Sebagai Bahan Dasar Pembuatan Adsorben Berbasis Silika Dan Karakterisasinya</i> Lisnawaty Simatupang, Siti Rahmadani	106
<i>Studi Pengaruh Penambahan Zeolit Terhadap Konsentrasi Fosfat Tersedia Di Dalam Tanah</i> Martina Nadapdap, Harlem Marpaung, Jamahir Gultom	112
<i>Komposisi Asam Lemak dan Posisi Asam Lemak Omega-3 dalam Minyak Ikan</i> Maruba Pandiangan	120
<i>Preparasi Dan Karakterisasi Karbon Nanotube Dengan Metode Chemical Vapour Deposition</i> Masdania Zurairah Sr	129
<i>Analisis Komponen Kimia, Uji Aktivitas Antibakteri Dan Uji Antioksi dan Minyak Atsiri Daun Bunga Tahi Ayam (Tagetes Erecta L)</i> Mimpin Ginting, Denny Anta Pinem. Cut Fatimah Zuhra	133
<i>Analisa Komposisi Mineral (Na, Mg, K, Ca) Air Zamzam Dibandingkan Dengan Air Minum Komersial Le Minerale Menggunakan Metode Inductively Couple Plasma-Mass Spectrometry (Icp-Ms)</i> Misri Yanty Lubis	140
<i>Validasi Metode Analisis Cannabinol Dari Sampel Rambut Menggunakan Teknik GCMS</i> Muhammad Taufik, Harlem Marpaung, Jamaran Kaban, Basuki wirjosentono	145
<i>Aktivitas Antidiabetes Ekstrak Daun Ranti Hitam (Solanum Blumei Nees Ex Blume) Pada Tikus Putih Yang Diinduksi Aloksan</i> Murniaty Simorangkir dan Arfan Hutapea	152
<i>Pengaruh Variasi Penambahan Ragi Pada Pembuatan Bioetanol Dari Limbah Bonggol Pisang (Musa paradisiaca)</i> Nurfajriani, Lenny SL Siahaan	155
<i>Studi Perbandingan Pelarut Pada Proses Sonikasi Untuk Analisis Kadar Metamfetamin Dalam Rambut Pengguna Sabu-Sabu</i> Nur Asyiah Dalimunthe, Zul Alfian, Basuki Wirjosentono, Harlem Marpaung	158
<i>Perancangan Vaksin Virus Papilloma Manusia Tipe-16 Berbasis Epitop dengan Berbantuan Immunoinformatika</i> Opik Taupiqurrohman, Muhammad Yusuf, Sukma Nuswantara, dan Toto Subroto	166
<i>Pengaruh pH Pada Adsorpsi Timbal (Pb) Oleh Selulosa Limbah Serat Buah Kelapa Sawit Mini Plant PTKI Medan</i> Pevi Riani, Mhd. Ikhwannuddin Al Hakim, T.M.C. Imam, Dela Syahrana	172
<i>Penyisihan Total Organic Carbon (TOC) dalam Limbah Cair PKS Menggunakan Proses Adsorpsi dengan Adsorben Bentonit yang Termodifikasi</i> Ratni Dewi, Ratna Sari, Syafruddin	176
<i>Sintesa Lapisan Paduan Nikel Kobal Secara Elektrodeposisi Dengan Penggunaan Magnet</i> Ridwan, Yusrini Marita, Nurdin,	180

<i>Konversi Minyak Jelantah Menjadi Gliserol Sebagai Bahan Baku Pembuatan Poliuretan</i> Ricky Andi Syahputra dan Anny Sartika Daulay	185
<i>Modifikasi Dan Karakterisasi Membran Polisulfon-Polietilen Glikol (Peg) Dengan Penambahan Bentonit Alam Bener Meriah Sebagai Filtrasi Air Sungai</i> Roby Pahala Januario Gultom, Basuki Wirjosentono dan Thamrin	189
<i>Uji Aktivitas Antioksidan Dari Flavonoid Total Daun Benalu (Dendrophthoe Pentandra (L) Miq) Dari Pohon Glodokan (Polyalthia Longifolia)</i> Rumondang Bulan , Aliyah Fahmi	202
<i>Pra-Rancangan Pabrik Pembuatan Propilen Oksida Dari Etilbenzen, Udara Dan Propilen Dengan Hasil Samping Stiren Kapasitas Produksi 30.000 Ton/Tahun</i> Setiaty Pandia, Rondang Tambun, Melisa, dan Wayan Arifin.	210
<i>Senyawa Isoflavonoid Dari Daun Coleus Atropurpureus Benth</i> Sovia Lenny dan Lamek Marpaung	214
<i>Sintesis dan Karakterisasi Poly Asam Laktat Berbasis Bahan Alam Menggunakan Katalis Timah (II) Oktoat</i> Suryani, Harry Agusnar, Basuki Wirjosentono, Teuku Rihayat , Ade Rizky Nugroho	218
<i>Pembuatan Polyurethane/Bentonit/Kitosan Nanokomposit</i> Teuku Rihayat , Satriananda, Zaimahwati dan Fitriani	223
<i>Modifikasi Serbuk Pulp Tandan Kosong Sawit Dengan Anhidrat Acetat</i> Vivi Purwandari	228

MAKALAH PENDIDIKAN KIMIA

<i>Implementasi model cooperative problem based Learning dalam meningkatkan hasil belajar Dan menumbuhkembangkan karakter Siswa pada materi stoikiometri</i> Ajat Sudrajat	233
<i>Penerapan Model Problem Based Learning Dan Inquiry Untuk Perbaikan Pembelajaran Kimia Terapan</i> Anna Juniar dan Pravil Mistryanto Tambunan	239
<i>Penerapan Teknik Probing Untuk Meningkatkan Prestasi Belajar Siswa Pada Materi Kelarutan Dan Hasil Kali Kelarutan Di Sman 3 Pekanbaru</i> Atika Ramadani, Betty Holiwarni, Sri Haryati	245
<i>Kelayakan Bahan Ajar Kimia-Tauhid Berdasarkan Kriteria Badan Standar Nasional Pendidikan (Bsnp) Dan Respon Siswa</i> Ayi Darmana, Manaon Batubara	250
<i>Meningkatkan Pemahaman Konsep Kimia Dengan Menggunakan Media Video Pembelajaran Di SMK Negeri 1 Stabat Kelas Xi Av.2</i> Chairiah , Lamtiar Ferawaty Siregar, Husuwatul Masyithah	256
<i>Perbedaan Hasil Belajar Dan Aktivitas Siswa Melalui Media Puzzle Dan Kartu Soal</i> Desy Rahmayanti Hasibuan dan Jasmidi	262
<i>Pengaruh Pendekatan Saintifik Dengan Menggunakan Media Macromedia Flash Terhadap Hasil Belajar Siswa Pada Materi Hdirolisis Garam Kelas Xi IPA</i> Dina A Hasibuan, Tiara D Sibarani, Nurmalia Yusuf, Nurhalimah Sitorus, Ramlan Silaban	267

<i>Pengaruh Penerapan Strategi Pembelajaran Dan Multimedia Terhadap Hasil Belajar Dan Karakter Siswa</i> Dyna Grace Romatua Aruan dan Ramlan Silaban	271
<i>The implementation of contextual teaching and learning with multimedia to improve communicative And Increase student's achievement in Hydrocarbon</i> Ervi Luthfi Sheila Wannu Lubis, Ramlan Silaban, Suharta.	276
<i>Perbedaan Hasil Belajar Yang Menggunakan Pembelajaran Kooperatif Tipe Nht Dan Pembelajaran Ekspositori Pada Pokok Bahasan Koloid Di Sman 2 Kejuruan Muda</i> Fretty Nafartilova Hutahaean, Lia Nova Sari, Fridawati Siburian	280
<i>Hasil Belajar Kimia Dengan Pembelajaran Menggunakan Metode Snowball Throwing Dan Drill Di Sma Pada Pokok Bahasan Koloid</i> Gaung Atmaja, Albinus Silalahi.	283
<i>Perbandingan Hasil Belajar Siswa Dengan Model Group Investigation Dan Model Jigsaw</i> Herry Purwanto Panjaitan dan Kawan Sihombing	288
<i>Analisis Pembelajaran Lintas Minat Kimia Di Kelas X Dan XI IIS SMAK Bintang Laut Bagansiapiapi-Riau</i> Heru Christianto, Ramlan Silaban, Mastiur Verawaty Silalahi, Nurwahyuningsih MA	291
<i>Penerapan Media Puzzle Dengan Model Pembelajaran Berbasis Masalah Pada Topik Rumus Kimia</i> Khalida Agustina	295
<i>Implementasi Model Pembelajaran Problem Based Learning (Pbl) Dengan Metode Percobaan (Eksperimen) Terhadap Hasil Belajar Siswa Kelas X Sma Pada Pokok Bahasan Redoks</i> Kristina M. Sianturi Anna Juniar	306
<i>Penerapan Strategi Pembelajaran Aktif Tipe Everyone Is A Teacher Here (Eth) Untuk Meningkatkan Prestasi Belajar Siswa Pada Pokok Bahasan Hidrokarbon Di Kelas X SMA Negeri 2 Tambang</i> Lestari Wulandari, Susilawati dan Abdullah	312
<i>Pengaruh Strategi Pembelajaran Aktif Tipe The Power Of Two Terhadap Aktivitas Belajar Siswa Pada Mata Pelajaran Kimia Di Sekolah Menengah Atas Negeri 2 Siak Hulu Kabupaten Kampar</i> Lia Gusparina Dewi, Yuni Fatisa	315
<i>Pengaruh Kemampuan Matematika Dan Jenis Media Terhadap Prestasi Belajar Kimia Siswa Pada Pokok Bahasan Hasil Kali Kelarutan</i> Lia Nova Sari, Fretty Nafartilova H, Fridawati Siburian	318
<i>Penerapan Model Pembelajaran Kooperatif Three-Step Interview Untuk Meningkatkan Prestasi Belajar siswa Pada Pokok Bahasan Hidrokarbon Di Kelas X SMA Negeri 1 Kampar Timur</i> Hendra Eka Putra, Muhammad Baidhawi, Elva Yasmi Amran, Susilawati	323
<i>Efektifitas Penggunaan Media Macro Media Flash Pada Materi Pembelajaran Sistem Kaloid Terhadap Hasil Belajar Kimia Siswa Melalui Pendekatan Scientific</i> Nurhalimah Sitorus, Tiara Dewi S, Nurmala Yusuf3, Dina. A. Hsb, Ramlan Silaban	327
<i>Penerapan Model Problem Based Learning Terhadap Peningkatan Hasil Belajar Reaksi Redoks</i> Nurlela Ramadani Marpaung, Melinda G. Siahaan, Bambang E.P. Purba, Risma Siahaan	332
<i>Efektifitas Penggunaan Media Macromedia Flash Pada Materi Pembelajaran Asam Basa Terhadap Hasil Belajar Kimia Siswa Melalui Pendekatan Scientific</i> Nurmala Yusuf, Nurhalimah Sitorus, Dina A Hsb, Tiara. D. S, Ramlan Silaban	339

<i>The Implementation Of Inquiry Strategy Based On Collaborative To Wards The Student Achievement In Teaching Buffer Solution</i> Nurul Wahidah Nasution, Retno Dwi Suyanti	343
<i>Penggunaan Kombinasi Metode Student Teams Achievement Division (Stad) Dan Structure Exercise Methode (Sem) Terhadap Hasil Belajar Siswa Pada Pokok Bahasan Struktur Atom</i> Nurwayuningsih.MA, Ratu Evina Dibyantini, Heru Christianto, Mastiur Verawaty	348
<i>Inovasi Bahanajar Kimia Lambang Unsur Dan Persamaan Reaksi SMK Kelas X Semester I Dan Implementasinya</i> Putri Junita Sari Nst, Albinus Silalahi, Marham Sitorus	352
<i>The Effectiveness Of Teaching To Induce The Conceptual Change (M3pk Simson Tarigan) To Increase Student's Achievementand Characters On Teaching Acid Base Solution</i> Rabiah Afifah Daulay, Simson Tarigan	358
<i>Differences In Learning Outcomes Between Using Model Pbl And Tsts On Hydrocarbons</i> Ratu Evina Dibyantini, Muntaharrahi Melati Putri Harahap	366
<i>Penerapan Model Pembelajaran Kooperatif Tipe Two Stay Two Stray (Tsts) Untuk Meningkatkan Prestasi Belajar Siswa Pada Pokok Bahasan Struktur Atom Dan Sistem Periodik Unsur Di Kelas XI IPA SMA Negeri 2 Tambang</i> Rizki Armelizha, M. Baidhawi, R. Usman Rery, Susilawati	372
<i>The influence of critical thinkin development using chemistry module to increase students' achievement in buffer solution topic grade XI RSBI SMA Negeri 1 Berastagi Year 2011/2012</i> Romaito Junita Siregar, Yunia Rizki, Iis Siti Jahro	376
<i>Implementasi Bahan Ajar Inovatif Kimia Larutan Berdasarkan Kurikulum 2013 Terintegrasi Pendidikan Karakter</i> Salim Efendi, Ramlan Silaban, Iis Siti Jahro	382
<i>Penerapan kombinasi model pembelajaran kooperatif tipe stad dengan nht Terhadap hasil belajar</i> Sapnita Idamarna Daulay, Ani Sutiani	389
<i>Pengembangan Media Ular Tangga Pada Materi Koloid Untuk Kelas XI Sekolah Menengah Atas</i> Sri Adelila Sari, Siti Nur Arisa, dan Ibnu Khaldun	394
<i>Effect Of Pbl Using Molymod Made Of Plasticine Towards Students' Achievement In The Hydrocarbon Topic</i> Sri Rahmania, Wesly Hutabarat	400
<i>Aplikasi Pembelajaran Kemampuan Berfikir Kritis Berbasis Internet Terhadap Hasil Belajar Pada Materi Hidrokarbon Untuk Mahasiswa Teknik Industri Universitas Prima Indonesia</i> Sri Wahyuni Tarigan	406
<i>Efektivitas Pendekatan Sainifik Bermediakan Macromedia Flash Terhadap Hasil Belajar Kimia Siswa Pada Pembelajaran Kelarutan Dan Hasil Kali Kelarutan Di Kelas XI SMA</i> Tiara Dewi Sibarani, Dina A.Hsb, Nurhalimah S, Nurmala Y, Ramlan Silaban	413
<i>Penerapan strategi pembelajaran berbasis sains teknologi masyarakat Pada materi pelajaran minyak bumi di SMU Advent Purwodadi</i> Winny Reveline Pesik, Srini M. Iskandar	420

<i>Penerapan Strategi Pembelajaran Aktif Tipe Everyone Is A Teacher Here (Eth) Untuk Meningkatkan Prestasi Belajar Siswa Pada Pokok Bahasan Kelarutan Dan Hasil Kali Kelarutan Dikelas XI IPA SMA Negeri 10 Pekanbaru</i> Yelniati, Susilawati dan Sri Haryati	425
<i>Analisis materi ajar kimia pada Prodi D-III Keperawatan Akademi Keperawatan Binalita Sudama Medan Tahun Ajaran 2015/2016</i> Yogi Chandra, Eriyani	429
<i>Efektifitas Pembelajaran Multimedia Komputer Dalam Meningkatkan Hasil Belajar Kimia Siswa Pada Pengajaran Sifat Koligatif Larutan</i> Yohan Aji Pratama, Gorat Victor Sibuea, Melisa	438
<i>The Influence Of Critical Thinking Development Through Chemistry Module To Increase Studen's Achievement Grade Xi On The Topic Solubility And Solubility Product</i> Yunia Rizki, Romaito Junita Siregar	443
<i>Penerapan media susun pasang dalam proyek pembelajaran kimia untuk meningkatkan penguasaan konsep sistem koloid siswa kelas XI IPA-1SMA Negeri 3 Rantau Tahun Pelajaran 2014/2015</i> Zulfan Mazaimi	448



THE
Character Building
 UNIVERSITY

The logo of Universitas Negeri Mediaman is a circular emblem with a scalloped border. It features a central sun-like symbol with rays, a green floral motif, and a red flame-like element. The text "UNIVERSITAS NEGERI MEDIAMAN" is written around the top inner edge, and "UNIMED" is at the bottom. Two small decorative symbols are on the left and right sides.

PENDIDIKAN KIMIA

THE
Character Building
UNIVERSITY

EFFECT OF PBL USING MOLYMOD MADE OF PLASTICINE TOWARDS STUDENTS' ACHIEVEMENT IN THE HYDROCARBON TOPIC

Sri Rahmania¹, Wesly Hutabarat^{2*}

¹Department of Chemistry, Postgraduate Program State University of Medan, Medan

² Department of Chemistry, Faculty of Mathematics and Basic Science State University of Medan

*Email: barathuta@gmail.com

Abstract

Problem based learning methodology using molymod made of plasticine as media was conducted to knowing the improvement of senior high school students' achievement in hydrocarbon topic in experimental class and control class that taught with direct instruction model in SMA Negeri 16 Medan. The samples were divided into two class based on purposive sampling technique. The kind of this research is experimental research. First, pretest was given to both of class. In experimental class was taught by problem based learning using molymod made of plasticine and in control class was taught by direct instruction model using molymod made of plasticine. The last, post test was given to each class. The hypothesis is tested by using t-test and obtained that t_{count} is higher than t_{table} , so that H_a was accepted and there were significant difference of students' achievement taught by problem based learning using molymod made of plasticine which were higher than direct instructional model.

Keyword: Problem Based Learning, Molymod, Plasticine, Student's achievement, Hidrocarbon

I. INTRODUCTION

Learning is a working process which is done by someone to gain a new change of behavior completely as the result of experience itself in interaction with the environment meanwhile teaching is a professional activity that requires high level skills. The teachers act as facilitators, mediators and counselors. The other responsibility of the class teacher is to help students attain maximum achievement in their learning tasks. Several competences are expected of the teacher in order to achieve this goal. One of the competencies is teachers' ability using appropriate instruction strategies.⁴

Chemistry as branch of science is highly important in modern societies because of its requirements as a prerequisite to the study of many other science oriented courses. It thus appears that for a nation to develop science and technology, teaching and learning chemistry needs to improve. It is therefore that performances in chemistry and in science generally should be of high grades.¹

But apparently the result of observation of students' understanding in chemistry topics is still low, it seen from the results of interviews and observations during Experience Field Program in SMA N 2 Kisaran and the observation in SMA N 16 Medan which is the student considers that chemistry is hard to understand, complicated, too much rote, a lot of material, dull and uninterested. From that, seen that a gap between teachers and students, the teacher as a teacher only to deliver the material without seeing aspects of the students, such as interest, understanding, difficulty, and so forth. And from the students, they see the teacher as an addition to the burden for them, even as the enemy. Of course students do not have a strong interest and motivation to learn the material being taught, so do not be surprised if they have low achievement of chores and daily tests. It is suitable with the phrase that the beliefs of someone about his/her ability was very influential on the ability itself.¹⁰

That condition above demands hard work from various parties, especially the teachers as educators who deal directly with students. Teachers are required in designing creative learning process, the selection of learning resources, media and learning methods that appropriate to the topic being taught and should be able to maintain student interest in learning, steady their motivation and lead the process of learning occurs naturally follow from the experience. Teachers have to be wise and creative in determining the appropriate model for learning, so that learning process can take place effectively and efficiently. Thus the thing that we often encounter in which the students as a generation of country feel very tired, not interested, and under estimate in chemical class can be overcome.²

Without creativity and innovation it is just make decreases of students' interest inquired for the material being taught and understand it. It means, teacher should keep student's interest and motivate to learn in different ways of teaching, using varies teaching method combined with teaching media or another learning method in improving students achievements and motivations.³

Gallagher et al (1998) said that PBL is able and need to include experiment as a tool to solve problem. Problem based learning has been used by experts in chemistry learning and its derivations such as biochemistry

by Dods (1996), learning complex chemical synthesise of natural products by Cannon and Krow (1998), Yu Ying (2003) in electrochemistry learning and Liu Yu (2004) in analytical chemistry learning.⁷

According to Ward (2002) Problem Based Learning (PBL) is one of innovative learning that able to give active learning condition to students. PBL is one of learning model that involve students to solve a problem through some steps of scientific method so that students can learn the knowledge that relate with the problem and at the same time, have skill to solve the problem.¹² Then Fogarty (1997) stated that PBL is an instruction approach by making confrontation to the students with simple problem, formed *ill-structured*, or *open ended* through stimulation in learning.⁶

In model problem based learning can use learning media as helping tools in learning and teaching process. Through learning media, teacher can give subject matter which is abstract become concrete so that it is easy to be understand by students and able to vanish verbalism.⁷

Hydrocarbon is one of the ranges of chemical studied in organic chemistry. It is one of main subject that important to learn because the concepts in hydrocarbon topic will still be used as a basic to learn the next matter that is petroleum and have related with organic chemistry in third class of high school second semester. Therefore, it needs an easy way, interesting and effective to deliver hydrocarbon topic by involving students using appropriate methods and media.⁵ Hydrocarbon which is abstract can be understood easily if this matter is explained through media. One of the media that can be used to make students easily to comprehend for abstract concept is a molecular model or *molymod*.

Molymod is a tool to illustrate the shape of a molecule. It usually made of plastic in form of balls that connected by a bars. The balls are as atom of an element meanwhile the bars is as the bonding of the elements. The balls have different color to difference the types of atom and the position of atom which one is as central and which one is as bonding atom. Molymod can overhaul according to the shape of the molecule that is desired. Molymod has been proved that able to increase the students' comprehension to the concept which related with molecule.

In fact, the prices of molymod which is able to make students more comprehend in hydrocarbon topic is not cheap and difficult to buy because it doesn't sell commercially in shop or book store. Plasticine as one of media can be used to submitte molymod. Beside the prices are cheaper than the real molymod, it is easy to buy and get because it sells commercially. Plasticine is clay that is used to by children to play and can be used repeatedly because it will not be solidify. Plasticine is included to clay and it usually sell in store toy with is colorful and easy to form.¹¹

II. METHODOLOGY

Population And Sample. This research had done in SMA Negeri 16 Medan on May 2014 at X IA academic year 2013/2014. Population in this research is all class of X IA that consist of 4 class with the average 41 students where population taken random sampling. The samples are divided by two classes consist of one class as experiment class taught by problem based learning using molymod made of plasticine and another as control class taught by direct instruction using molymod made of plasticine. Initial activity of this research got 41 samples that have the homogeneous pretest and normal distributed. Pretest done by 20 items had valid and reliable. Pretest purposed the initial ability of each class and the result analyzed manually. Both of the class sample got different treatment. Experimental class 1 taught by problem based learning using molymod made of plasticine and Experiment class 2 (control class) taught by direct instruction using molymod made of plasticine. The research was done 3 meetings then give the postest.

Data Analysis of Research Instrument. Test instrument that used in this research was prepared as many as 30 questions in the form of multiple choice questions with 5 options before carrying out research which is firstly the test instrument was measured the validity, realibility, level of difficulty and the distinguish test and the test result that can be described as below:

Validity of Test. Validity refers to the extent to which a test actually measured, what it is supposed to measure. Validity of item test is done by using formula of Correlation Product Moment Formula with certainty if $r_{\text{count}} > t_{\text{table}}$ in significance level, $\alpha = 0,05$ with the number of students (N) = 30 students where $r_{\text{tabel}} = 0.361$, the item test is stated valid and conversely if $r_{\text{count}} < t_{\text{table}}$, the item test is stated invalid. Based on validity table shows that from 30 questions that tested there is 21 questions is valid. The valid questions have the opportunity to use as research instrument, while invalid questions can't be used as research instrument.

Reliability. Reliability is the stability, regularity of a measurement so it give the consistency result when it used. Reliability test is determined with using formula of Kuder and Richardson (KR-20). r_{count} value was obtained in consultation with $r_{\text{tabel}} \alpha = 0.05$ and the criteria was $r_{\text{count}} > r_{\text{tabel}}$. Based on data test reliability and calculation of test reliability entirely the reliability of test instrument (r_{count}) is 0.913, if compared with $r_{\text{table}} = 0.361$, $r_{\text{count}} > r_{\text{table}}$, so that the test instrument in this research is reliable.

Difficulty Index. Good questions are not too difficult and not too easy. Based on calculation of difficulty index and table of difficulty index. From the question which has been valid, there are 4 questions that

categorized difficult ($P = 0.0-0.3$) while questions that categorized medium ($P = 0.31-0.7$) is 11 item, Questions that categorized easy ($P = 0.7-1$) is 12= 6 questions.

Discrimination Index. The ability of instrument test to distinguish between smart students and less intelligent students could be measured from discrimination index of instrument test. Based on calculation of discrimination index for the question which has been valid, there is 1 question that categorized *excellent* ($D = 0.71-1.00$), questions that categorized *good* ($D = 0.40-0.70$) is 13 questions. Questions that categorized *sufficient* ($D = 0.21-0.40$) is 6 questions, and questions that categorized *Poor* ($D = 0.00-0.20$) is 1 questions.

III. RESULT AND DISCUSSION

Description Data of Research Result. According to the test validity results that have been validated by expert validator and question validation by students (empirically), showed that the 30 questions of instrument tests gained as much as 21 questions are valid and 9 are invalid. But the instrument test utilized in this research is 20 questions of multiple choices with 5 options. Control and experiment classes were given pretest before learning treatment and post test were given after learning treatment process which are PBL using molymode made of plasticine in experiment class and direct instruction using molymod made of plasticine in control class. Data of the research was obtained from pre-test and post-test.

Table 1. Result of Average Pre – Test and Post – Test from Sample Class

Data	Sample Class	
	Experiment Class	Control Class
Pretest		
Average (\bar{x})	33.05	33.05
Standard deviation (S)	7.24	7.15
Variance (S^2)	52.35	51.10
Posttest		
Average (\bar{x})	87.93	69.27
Standard deviation (S)	6.52	9.05
Variance (S^2)	42.47	81.95

Pre-test aims to know initial capability of students on hydrocarbon topic as the material to be taught. Post-test aims to know the learning outcomes of each class (samples) after given different treatment. Value of pre-test and post-test also aims to find out how much increasing of students achievement before and after given the treatment of each sample (control class and experiment class).

Before hypothesis data is done, all data must be fulfilling requirement of normal distributed and homogeneity distributed. To fulfill the requirement, normality test and homogeneity test were done to the data results as follow :

Normality Test of Data. Normality test that used is Chi Square (χ^2) with significance level (α) = 0.05. Testing criteria that used is if value of Chi Square count (χ^2) < Chi Square table, so the data is normally distributed. After do calculation, the normality of data obtained as follows:

Normality Test of Pre Test in Experiment class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with db = 5. With Chi Square criteria $(X^2)_{\text{count}} < (X^2)_{\text{table}}$. Based on the results of calculation for pre test in experiment class, got $X^2_{\text{count}} = 2.04$ while X^2_{table} at $\alpha = 0.05$ db = 5 are 11.07, obtained that $X^2_{\text{count}} < X^2_{\text{table}}$, so the pretest data is distributed normally.

Normality Test of Pre Test in Control class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with db = 5. With Chi Square criteria $(X^2)_{\text{count}} < (X^2)_{\text{table}}$. Based on the results of calculation for pre test in control class, got $X^2_{\text{count}} = 3.40$ while X^2_{table} at $\alpha = 0.05$ db = 5 are 11.07, obtained that $X^2_{\text{count}} < X^2_{\text{table}}$, so the pretest data is distributed normally.

Normality Test of Post Test in Experiment class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with db = 5. With Chi Square criteria $(X^2)_{\text{count}} < (X^2)_{\text{table}}$. Based on the results of calculation for post test in experiment class, got $X^2_{\text{count}} = 10.87$ while X^2_{table} at $\alpha = 0.05$ db = 5 are 11.07, obtained that $X^2_{\text{count}} < X^2_{\text{table}}$, so the posttest data is distributed normally.

Normality Test of Post Test in Control class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with db = 5. With Chi Square criteria $(X^2)_{\text{count}} < (X^2)_{\text{table}}$. Based on the results of calculation for post test in control class, got $X^2_{\text{count}} = 5.76$ while X^2_{table} at $\alpha = 0.05$ db = 5 are 11.07, obtained that $X^2_{\text{count}} < X^2_{\text{table}}$, so the posttest data is distributed normally.

Normality Test of Gain in Experiment class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with db = 5. With Chi Square criteria $(X^2)_{\text{count}} < (X^2)_{\text{table}}$. Based on the results of calculation for gain in experiment class, got $X^2_{\text{count}} = 5.32$ while X^2_{table} at $\alpha = 0.05$ db = 5 are 11.07, obtained that $X^2_{\text{count}} < X^2_{\text{table}}$, so the gain data is distributed normally.

Normality Test of Gain in Control class. Normality test is used Chi Square in significance level of $\alpha = 0.05$ with $db = 5$. With Chi Square criteria $(X^2)_{count} < (X^2)_{table}$. Based on the results of calculation for gain in control class, got $X^2_{count} = 2.10$ while X^2_{table} at $\alpha = 0.05$ $db = 5$ are 11.07, obtained that $X^2_{count} < X^2_{table}$, so the gain data is distributed normally

Tabel 2. Normality Test of Research Data

Data Source	Class	χ^2_{count}	χ^2_{table}	Distribution
Pre-Test	Experiment	2.04	11.07	Data normally distributed
	Control	3.40		
Post-Test	Experiment	10.87		
	Control	5.76		
Gain	Experiment	5.32	11.07	
	Control	2.10		

Based on table 2. known that the data obtained in this research is normally distributed.

Homogeneity Test of Pretest. Homogeneity test was done by using F test at significance level $\alpha = 0.05$ and $db (40.40) = 1.69$. The data was homogen with criteria $F_{count} < F_{table}$. Based on the research results, obtained the $F_{count} = 1.02$, so it can state that pretest data of the sample is homogen because $F_{count} < F_{table} (1.02 < 1.69)$.

Homogeneity Test of Posttest. Homogeneity test was done by using F test at significance level $\alpha = 0.05$ and $db (40.40) = 1.69$. The data was homogen with criteria $F_{count} < F_{table}$. Based on the research results, obtained the $F_{count} = 0.52$, so it can state that posttest data of the sample is homogen because $F_{count} < F_{table} (0.52 < 1.69)$.

Homogeneity Test of Gain. Homogeneity test was done by using F test at significance level $\alpha = 0.05$ and $db (40.40) = 1.69$. The data was homogen with criteria $F_{count} < F_{table}$. Based on the research results, obtained the $F_{count} = 0.46$, so it can state that gain data of the sample is homogen because $F_{count} < F_{table} (0.46 < 1.69)$.

Tabel 3. Homogeneity Test

Data	Value of Homogeneity Test		Explanation
	F_{count}	F_{table}	
Pre-Test	1.02	1.69	Sample come from a homogeneous population
Post-Test	0.52		
Gain	0.46		

Based on table 3. known that the sample used in this research came from a homogeneous population.

Normalized gain. To calculate the student's learning outcomes, used the gain normalization or g factor. Calculation shows that average normalized gain in experiment class is 0.82, while normalized gain that obtained in control class is 0.53. It seen that student's learning outcomes in experiment class is higher than control class. Percent effectiveness of teaching hydrocarbon by problem based learning using molymod made of plasticine in experiment class is 82%, while percent effectiveness in control class is 53%.

Hypothesis Testing. Hypothesis testing is are quirement that is used to determine whether the H_a in the research accepted or rejected. The data that used in this hypothesis take from normalized gain data from experiment class and control class. Hypothesis testing is performed using one side t-test, that is right side at the significance level (α)= 0.05, with testing criteria: H_a will receive if $t_{count} > t_{table}$.

Table 4. Hypothesis Test for Gain

Data Class		T_{count}	T_{table}	Explanation
Experiment class	Control Class			
$\bar{X}_1 = 0.82$	$\bar{X}_2 = 0.53$	11.02	1.471 (interpolation)	Ha Received
$S = 0.09$	$S = 0.14$			
$S^2 = 0.01$	$S^2 = 0.02$			
$n_1 = 41$	$n_2 = 41$			

From Table 4 and the data calculation of t_{count} for post test data is 10.71 that value is higher than $t_{table} = 1.473$ (obtained through interpolation). So $t_{count} > t_{table} (10.71 > 1.473)$ and t_{count} for gain data is 11.02 and $t_{table} = 1.473$. H_a is received with requirement $t_{count} > t_{table}$. Based on hypothesis test can conclude that there are significant

difference of students achievement taught by problem based learning using molymod made of plasticine than instruction using molymod made of plasticine. From the data in learning process, problem based learning using molymod made of plasticine benefits that can be derived from the result of this study are as follows:

1. The process of learning becomes more relax and fun because the learning process do as a teamwork and playing
2. Capable of appraehing the kinds of complex problem
3. Increase students" comprehend deeply

There are some things that need to be considered in the application of the problem based learning using molymod made of plasticine. Based on the experience of researcher should be noticed that

1. Require more time and effort in designing and implementing learning
2. Need helping worksheet to show form and characterictic of molymod.
3. The molymod that can be form using plasticine is limited
4. Teacher must involve in teaching and learning process and active to see each of group.

Result data of research after analyzing proved that problem based learning using molymod made of plasticine was able to improved students achievement than taught by direct instruction using molymod made of palsticine. This can be seen in the difference of students" achievement from two class of sample. In experiment class the average of pre-test is 33.05 ± 7.24 and average of post-test is 87.93 ± 6.52 with percent effectiveness is 82% meanwhile in control class the average of pre-test 33.05 ± 7.15 and post-test is 69.27 ± 9.05 have percenteffectiveness is 54%. Data of the research was obtained from pre-test, post-test and % effectivity was showed in figure 1.

The hypothesis test of the results were $t_{\text{count}}(10,71) > t_{\text{table}}(1.473)$ in posttest and $t_{\text{count}}(11.02) > t_{\text{table}}(1.473)$ in Normalized gain test. The calculation result shows that H_a is received and H_o is rejected, it means that the student's achievement that taught by problem based learning using molymod made of plasticine is significant higher than direct instruction using molymod made of plasticine in topic Hydrocarbon linear with Wina Sanjaya (2009) that problem based learning can use learning media as helping tools in learning and teaching process and Septiani (2009) that molymod can make students more comprehend about the structure of molecules.

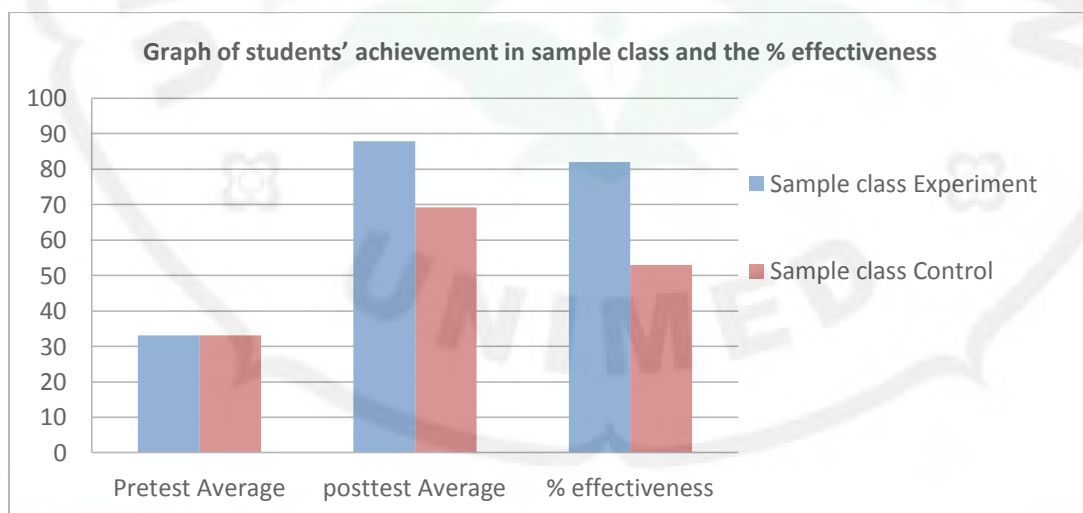


Figure 1. Graph of students" achievement in sample class and the % effectiveness

The shape of molecule and even the characteristic of molecule reality especially for student which learn by visual and kinesthetic. Molymod has been proved that able to increase the students" comprehension to the concept which related with molecule

The steps of problem based learning using molymod made of plasticine successfully make the teaching and learning process be something different than before (commonly). The several excess of the problem based learning using molymod made of plasticine so that more effective at improving student achievement that are, students are able to understand and remember the lessons easier. It could be happen because in problem based learning, the problem that they solved were from their life and the molymod made of plasticine make the learning process become more fun and relax.

IV. CONCLUSION

Based on result research and data collection, can be concluded that The student's achievement that taught by problem based learning using molymod made of plasticine is significant higher than direct instruction using molymod made of plasticine in topic Hydrocarbon which is proved by the calculation of average normalized gain achievement of students taught by problem based learning using molymod made of plasticine in the hydrocarbon topic is 82% while average normalized gain achievement of students taught by direct instruction using molymod made of plasticine is 53%. It showed there was percent difference of students' achievement between experiment class and control class as much as 29%. Further work need to be done to observe more about problem based learning using molymod made of plasticine, to be more concerned about student's motivation, interest and characters' development in this study to get better results.

REFERENCE

- Aluko, K.O., 2008. Teaching Chemistry in Secondary Schools : A Case for Cooperative Instruction Strategy. *Ethiop. J. Educ. & Sc.* **3(2)**:32-38
- Ambrose, S.A., Bridges, M.W., Dipietro, M., Lovett, M.C., Norman, M.K., & Mayer, R.E., 2010. How Learning Works: Seven Research-Based Principles Smart Teaching. *Jossey-Bass Publishers*. San Fransico
- Conole, G. And Fill, 2005. Pedagogical Review of Learning Activities and UseCases. <http://www.elframework.org/refmodels>
- Eilks, I. and Hofstein, A., 2013. Teaching Chemistry-A Studybook : A Practical Guide and Textbook for Students Teachers, Teacher Trainees and Teachers. *Sense Publishers*. Rotterdam
- Fadhilah, Nur. Haryono. Utomo, S.B., 2013. Penerapan Model Pembelajaran Peer Tutoring Dilengkapi Lingkaran Hidrokarbon Untuk Meningkatkan Rasa Ingin Tahu Dan Prestasi Belajar Kimia Pada Materi Pokok Hidrokarbon Siswa Kelas X-6 SMA N 3 Boyolali Tahun Pelajaran 2012/2013. *Jurnal Pendidikan Kimia*. **2(4) : 51-57**, ISSN 2337-9995
- Fogarty, R. 1997. Problem Based Learning and Other Curriculum Models for the Multiple Intelligences Classroom. *Hawker Brownlow Education*. Australia
- Gallagher, S. and Stepien, W. 1998. „Content Acquisition in Problem-Based Learning: Depth Versus Breadth in American Studies“ in Fogarty, R. (ed.) Problem Based Learning: A Collection of Articles USA. *Skylight Training and Publishing Inc*. USA
- Jesus, K.D., 1995. A Problem Based Approach to Organic Chemistry. *Journal of Chemical Education*. **72(3)**: 224-226
- Khoo, H.E., 2005. Teaching Biochemistry to Medical Students in Singapore-From Organic Chemistry to Problem-Based Learning. *Ann Acad Med Singapore*. **34(6)**: 79C-83C
- Mahajan, D.S., 2005. University Students' Performance In Organic Chemistry At Undergraduate Level: Perception of Instructors From Universities in The Sadc Region. *Chemistry*. **14(1)** : 25-36
- Septiani, Dewi, 2009. Penggunaan Molymod Dari Tanah Liat Untuk Meningkatkan Pemahaman Siswa Tentang Konsep Bentuk Molekul Pada Mata Pelajaran Kimia Kelas XI IPA Semester Ganjil SMAN 1 Mancak Tahun Pelajaran 2009/2010. <http://wijayalabs.blogdetik.com/2009/07/10/contoh-proposal-ptk/>
- Sirhan, G., 2007. Learning Difficulties in Chemistry : An Overview. *Journal of Turkish Science Education*. **4(2)** : 2-20
- Wang, X. 2005. An Exploration of Problem Based Learning Teaching in Organic Chemistry. *The China Paper*. China
- Ward, J.D. and Lee, C.L., 2002, A Review of Problem Based Learning. *Journal of Family and Consumer Science Education*. **20(1)**: 16-26
- Wina, S., 2010. Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. *Kencana*. Jakarta