PREFACE

On behalf of the organizing committee, we were delighted to welcome you all to the 6th Annual International Seminar on Trends In Science and Science Education (AISTSSE) 2019, hosted by the Faculty of Mathematic and Natural Sciences, Medan State University, Indonesia. As the year comes to the second decade of 21st century, there have been changing in whatever field of human endeavor affecting science and science education that create paradigm shift and in practical routine. The key question of this conference is then, whether and to what extend the Institution of science and science education develop, implement, manage, and accommodate pre-service training programs to prepare lectures and students learn that reflect the roles and competencies as required in this era; what trends and policy shifted in science and science education that shape and have strong impact on the direction of the institutions. The theme of this exciting forum is “Trend Science Education in Industrial Revolution 4.0”, which embraces six main topics, including:

1. Fundamental and applied research in mathematics including basic mathematics, applied mathematics and statistic
2. Fundamental and applied research in physics including theoretical physics and computation, geophysics, material science and technology
3. Fundamental and applied research in biology including fundamental biology, applied biology and biotechnology
4. Fundamental and applied research in chemistry including instrumentation, basic chemistry, and applied chemistry
5. Science education

AISTSSE 2019 was conducted to provide a forum for researcher, academicians, teachers, school principals, government agencies, consultants to share their insights related to the Trends In Science and Science Education. For this conference, we invited six plenary speakers with solid expertise from different countries and regions. We are extremely grateful to:

1. Prof. Dr. Syawal Gultom, M.Pd (Universitas Negeri Medan, Indonesia)
2. Prof. Mauro Mocerino (Department of Chemistry, Curtin University of Technology, Perth, Australia)
3. Prof. Dr. G. Sudarsanam Sri Venkateswara University, India
4. Assoc. Prof. Dr. Tossawat Seetawan (Faculty of Science and Technology, Sakon Nakhon Rajabhat University – Thailand)
These speakers presented different lines of trends in science and science education. In addition, we reviewed and selected abstracts for concurrent session of presentations. We believe that we can learn plenty of things from different presenters. This year's conference is attended by participants coming from different countries and regions in and beyond Indonesia. Selected papers will be published in indexed journal. The conference is not able to come into a reality without whole hearted support from many parties. Therefore, on behalf of the committee, I would like to take this opportunity to extend my appreciation to the Rector of Medan State University, the Dean of the Faculty Mathematics and Natural Sciences, the invited plenary speakers, paper presenters, delegates and guests, and participants that have supported us to host this conference. In addition, my sincere thanks go to my organizing team and student volunteers for un-tiring efforts to make this conference as a memorable one. I wish all the presenters and participants a fruitful and memorable experience at the 6th AISTSSE 2019 in Medan. Last but not least, it is a pleasure to inform you that we are going to make this AISTSSE into annual international conference, proudly hosted by the Faculty of Mathematics and Natural Sciences, Medan State University. Welcome to Nice, and enjoy the program and the seminar!

Editors of AISTSSE 2019

Dr. Martina Restuati, M.Si
Prof. Dr. Herbert Sipahutar, MS., M.Sc.
Dr. Juniastel Rajagukguk, M.Si
Assalamu 'alaikum wr. wb.

First of all, let us thank Allah, the Almighty, for blessing and guiding us into the right path, and for granting all means and opportunities together here to attend this very meaningful occasion. On behalf of the Medan State University, we are greatly honored and pleased to welcome you all to the 6th Annual International Seminar on "Trends in Science and Science Education" has become an issue which is dynamic, progressive and always worth discussing. Science and Science Education professors, teachers, experts and practitioners have always been very keen on conducting both academic discussions and researches in order to find new ideas, strategies, methods, approaches and paradigms in Trends in Science and Science Education in Indonesia.

However, plenty of the people practicing in Trends in Science and Science Education in Indonesia are not aware of them. Many issues concerning Trends in Science and Science Education still remain unclear and need to be disclosed. To raise awareness of the paradigms in Trends in Science and Science Education in Indonesia, Faculty of Mathematics and Natural Sciences of Medan State University holds this conference to offer you a unique opportunity to share ideas and experiences and to discuss evolving paradigms in Trends in Science and Science Education in Indonesia, which we definitely hope to result in the improved Trends in Science and Science Education in Indonesia.

We would also like to extend our gratitude especially to Prof. Dr. Syawal Gultom, M.Pd (Universitas Negeri Medan, Indonesia), Prof. Mauro Mocerino (Curtin University of Technology, Perth, Australia), Prof. Dr. G. Sudarsanam (Sri Venkateswara University, India), Assoc. Prof. Dr. Tossawat Seetawan (Faculty of Science and Technology, Sakon Nakhon Rajabhat University – Thailand) who have accepted our invitation to become the invited speakers of today's Conference. Finally allow me on behalf of the big family of Medan State to wish you a fruitful and pleasant international conference.

Rector of UNIMED

Dr. Syamsul Gultom, SKM., M.Kes.
ORGANIZING COMMITTEE

Chairman:
Prof. Dr. Herbert Sipahutar, MS., M.Sc.

Secretary:
Dr. Juniastel Rajagukguk, M.Si

Treasurer:
Dra. Ani Sutiani, M.Si.

SCIENTIFIC COMMITTEE

1. Prof. Dr. Syawal Gultom, M.Pd (Indonesia)
2. Prof. Mauro Mocerino (Australia)
3. Prof. Manihar Situmorang, M.Sc, Ph.D (Indonesia)
4. Prof. Takahiro Asami (Japan)
5. Prof. Dr. Dian Armanto, M.Pd, M.Sc (Indonesia)
6. Prof. Dr. Herbert Sipahutar, M.Sc (Indonesia)
7. Prof. Kenji Matsumoto (Japan)
8. Prof. Dr. Bornok Sinaga, M.Pd (Indonesia)
9. Prof. Lorna D. Dino (Philippines)
10. Prof. Motlan, M.Sc. Ph.D (Indonesia)
11. Dr. Chong Kui Kian (Brunei Darussalam)
12. Prof. Dr. Asmin, M.Pd (Indonesia)
13. Dr. Pornpun Waitanyangkoon (Thailand)
14. Madam Irene Tan (Portugal)
15. Victor E. Ginting (USA)
16. Prof. Dr. Mukhtar, M.Pd (Indonesia)
17. Nui Orawan Sriboonruang (Thailand)
18. S. Wenuganen (USA)
19. Yaya Rukayadi (Malaysia)
20. Prof. Dr. Pargaulan Siagian (Indonesia)
21. Prof. Dr. Sahat Saragih (Indonesia)
22. Prof. Dr. Edi Syahputra, M.Pd (Indonesia)
23. Prof. Dr. Hastratuddin, M.Pd (Indonesia)
24. Prof. Dr. Albinus Silalahi, M.S (Indonesia)
25. Prof. Dr. Ramlan Silaban, M.Si (Indonesia)
26. Prof. Dr. Retno Dwi Suyanti, M.Si (Indonesia)
27. Prof. Dr. Mara Bangun Harahap, M.S (Indonesia)
28. Prof. Dr. Nurdin Bukit, M.Si (Indonesia)
29. Prof. Dr. Sahyar, M.S (Indonesia)
30. Prof. Dr. rer. nat. Binary Manurung, M.Si (Indonesia)
31. Prof. Dr. Wesly Hutabarat, M.Sc (Indonesia)
KEYNOTE SPEAKERS

1. **Prof. Dr. Syawal Gultom, M.Pd**  
   Universitas Negeri Medan, Indonesia

2. **Prof. Mauro Mocerino**  
   Curtin University of Technology, Perth, Australia

5. **Prof. Dr. G. Sudarsanam**  
   Sri Venkateswara University, India

6. **Assoc. Prof. Dr. Tossawat Seetawan**  
   Sakon Nakhon Rajabhat University – Thailand
# Rundown

**The 6th Annual International Seminar on Trends in Science and Science Education 2019**

*Le Polonia Hotel, October 17th, 2019*

| Time       | Activities                                                                 | PIC/Moderator                  |
|------------|----------------------------------------------------------------------------|--------------------------------|
| 08.30 - 09.00 | **Opening Ceremony**  
1. MC Speech  
2. Indonesian National Anthem  
3. Traditional Welcome Dance  
4. Pray  
5. Chairperson Report  
6. Welcoming speech of Dean of Mathematics and Natural Science Faculty Unimed  
7. Welcoming speech and official opening of Rector of Universitas Negeri Medan | Aswin Rangkuti/Rini Selly  
Ahmad Shafwan Pulungan |
| 09.00 – 09.40 | **Plenary Lecture 1:**  
Prof. Dr. Syawal Gultom, M.Pd  
(Universitas Negeri Medan – Indonesia) | Mangaratua Simanjorang, Ph.D |
| 09.40 – 10.20 | **Plenary Lecture 2**  
Prof. Dr. Tossawat Seetawan  
(Sakon Nakon Rajabhat University, Thailand) | Dr. Juniastel Rajagukguk |
| 10.20 – 11.00 | **Plenary Lecture 3**  
Prof. Dr. G. Sudarsaman  
(Sri Venkateswara University, India) | Nora Susanti, Apt, M.Sc |
| 11.00 – 11.40 | **Plenary Lecture 4**  
Prof. Mauro Mocerino  
(Curtin University of Technology, Perth, Australia) | Moondra Zubir, Ph.D |
| 11.40 – 12.15 | **Poster Session**  
Ahmad Saifwan Pulungan, M.Si  
Didi Febrian, M.Sc |                                |
| **12.15 – 13.00** | **Lunch Break** |                                |
| 13.00 – 16.30 | **Parallel Session**  
**Room 1** (Physics & Physics Education) | Aswin Rangkuti, M.Pd |
|              | **Room 2** (Mathematics & Mathematics education) | M. Badzlan Darari, M.Pd |
|              | **Room 3** (Chemistry & Chemistry Education) | Rini Selly, M.Sc |
| Room                      | Name                          |
|---------------------------|-------------------------------|
| Room 4 (Biology & Biology Education) | Elfrida Ginting, Ph.D |
| Room 5 (Computer Science and Education) | Said Iskandar, M.Pd |
| Room 6 (General Education)    | Wasis Wuyung Wisnu Brata, M.Pd |

16.30 – 17.00

**Closing Ceremony**

1. Oral Presentation Awards
2. Poster Presentation Awards
3. Closing Speech of Chairperson

Aswin Rangkuti/Rini Selly
## SCHEDULE OF PARALLEL SESSION FOR
## ORAL PRESENTATION

### Ballroom 1 (2nd floor)
**Mathematics Science and Mathematics Education**

**Moderator:** Mangaratua Simanjorang, Ph.D.  (+62 822-7429-7968)

| Time       | ID     | Speakers                                      |
|------------|--------|-----------------------------------------------|
| 13.00-13.10| A00048 | YM Rangkuti, A Huda                           |
| 13.10-13.20| A00053 | Elfitra, TM Siregar                           |
| 13.20-13.30| A00063 | Z Indra, Chairunisah, NR Refisis              |
| 13.30-13.40| A00067 | MS Sinaga, O Purba, H Nasution                |
| 13.40-13.50| A00069 | S Manullang, HDM Hutabarat, M Panjaitan      |
| 13.50-14.00| A00072 | F Marpaung, Arnita                           |
| 14.00-14.10| A00074 | Arnita, N Afrisah, F Marpaung                 |
| 14.10-14.20| A00081 | D Febrian, SIA Idrus, DAJ Nainggolan          |
| 14.20-14.30| A00093 | H Nasution, Marlina S                        |
| 14.30-14.40| A0101  | SIA Idrus, D Febrian, A Dipixian              |
| 14.40-14.50| A0104  | P Sitompul                                   |
| 14.50-15.00| A0105  | H Syahputra, Sutrisno, S Gultom              |
| 15.00-15.10| A0107  | H Syahputra, LK Basyar, AAS Tamba             |
| 15.10-15.20| A0009  | A Lubis                                      |
| 15.20-15.30| A0010  | M Firdaus, Mukhtar                           |

### Ballroom 2 (2nd floor)
**Mathematics Education**

**Moderator:** M. Badzlan Darari, M.Pd.  (+62 813-7030-2147)

| Time       | ID     | Speakers                                      |
|------------|--------|-----------------------------------------------|
| 13.00-13.10| A00025 | AA Nasution, A Mansyur, D Haris, FR Suwanto   |
| 13.10-13.20| A00038 | Mardiyah, R Johar, Mailizar                   |
| 13.20-13.30| A00041 | GID Purba                                    |
| 13.30-13.40| A00042 | N Siregar, SL Manurung                        |
| 13.40-13.50| A00044 | MB Darari, M Firdaus                         |
| 13.50-14.00| A00047 | Usman, RM Bambang, SM Hasbi, MZ Mardhiah      |
| 14.00-14.10| A00050 | A Andriani, PN Sagala                        |
| 14.10-14.20| A00054 | BH Siregar, Kairuddin                        |
| 14.20-14.30| A00057 | S Frisnoiry, MB Darari                       |
| 14.30-14.40| A00058 | TM Siregar, S Frisnoiry                      |
| 14.40-14.50| A00061 | A Munandar, Usman, Saminan                   |
| 14.50-15.00| A00062 | D Haris, Chairunisah                         |
| 15.00-15.10| A00064 | Susiana                                      |
| 15.10-15.20| A00068 | E Simanjuntak, Y Hia, N Manurung              |
| 15.20-15.30| A00071 | SL Manurung, Elfitra, M Simorangkir          |
| 16.00-16.10| A00120 | H Hakim, E Rahmadhani and S Wahyuni          |
| Room: Ngurah Rai (2nd floor) | Biology Education and Mathematics Education |
|-----------------------------|---------------------------------------------|
| Moderator:                 | Said Iskandar, M.Pd (+62 812-6099-9710)     |
| Time | ID | Speakers |
| 13.00-13.10 | A00012 | Mukhtar, Mulyono, KR Daulay, E Siregar |
| 13.10-13.20 | A00084 | Kms, MA Fauzi, Z Indra |
| 13.20-13.30 | A00092 | Syafari |
| 13.30-13.40 | A00102 | MM Simanjorang, A Mansyur, S Gultom |
| 13.40-13.50 | A00108 | MM Simanjorang |
| 13.50-14.00 | A00109 | Kairuddin |
| 14.00-14.10 | A00003 | BN Silitonga |
| 14.10-14.20 | A00023 | R Mukra, M Silitonga, M Restuati |
| 14.20-14.30 | A00034 | Z Simatupang, M C Manik |
| 14.30-14.40 | A00035 | I Sitanggang |
| 14.40-14.50 | A00056 | W Arwita, Hasruddin, Aryeni |
| 14.50-15.00 | A00065 | AYD Lbn Gaol |
| 15.00-15.10 | A00073 | HD Nasution, H Sipahutar, T Gultom |
| 15.10-15.20 | A00076 | WWW Brata, C Suriani, Siswanto |
| 15.20-15.30 | A00079 | W Rajagukguk, E Simanjuntak |
| 15.30-16.00 | Parallel Session Breaks |
| 16.00-16.10 | A00121 | Lazuardi, P Prastowo, E Prasetya, H Prakasa |
| 16.10-16.20 | A00123 | H Syahputra, Sutrisno, S Gultom |
| 16.20-16.30 | A00125 | H Sipahutar, Mukhtar, M Y Nasution, A Y D L Gaol |

| Room: Djamin Ginting 1 (2nd floor) | Biology Science |
|----------------------------------|-----------------|
| Moderator:                      | Moondra Zubir, Ph.D (+62 852-6273-6484) |
| Time | ID | Speakers |
| 13.00-13.10 | A00004 | M Silitonga, ES Gultom, M Nugrahalia |
| 13.10-13.20 | A00013 | FA Sinaga, R Hasibuan, M Risfandi, RN Sinaga |
| 13.20-13.30 | A00014 | F Harahap, E Djulia, D Purnama, Nusyirwan, V Altio, S Rahayu, Rosmayati, R Poerwanto, RFM Hasibuan |
| 13.30-13.40 | A00015 | ASS Pulungan, MY Nasution, SD Pohan, E Rahayu |
| 13.40-13.50 | A00016 | MY Nasution, M Restuati, ASS Pulungan, FM Siregar |
| 13.50-14.00 | A00018 | RN Sinaga, Zulaini, Jumadin IP |
| 14.00-14.10 | A00051 | Delvian |
| 14.10-14.20 | A00052 | D Elfiati, A Susilowati, C Modes |
| 14.20-14.30 | A00055 | NS Harahap |
| 14.30-14.40 | A00059 | AH Iswanto, N Septian, B Wirjosentono, A Darwin |
| 14.40-14.50 | A00060 | M Restuati, ASS Pulungan, MY Nasution, N Pratiwi |
| 14.50-15.00 | A00122 | WWW Brata, C Suriani, H Simatupang, S Siswanto, FTM Panggabean |
## Room: Djamin Ginting 2 (2nd floor)
### Biology Science

| Time       | ID     | Speakers                                      |
|------------|--------|-----------------------------------------------|
| 13.00-13.10| A00086 | DAS Siahaan, K Berliani, A Hartanto, HMM Tanjung, Nurbayti |
| 13.10-13.20| A00087 | MK Huda, N Pasaribu, Syamsuardi, ES Siregar     |
| 13.20-13.30| A00089 | E Munir, LDS Hastuti, WE Tarigan, A Hartanto  |
| 13.30-13.40| A00096 | ES Siregar, N Pasaribu                        |
| 13.40-13.50| A00098 | I Jamilah, D Suryanto, N Priyani, WN Khairiah, A Hartanto, F Akhmad |
| 13.50-14.00| A00100 | S Ilyas, S Hutahaean, Elimasni, H Francisca, WS Polem, O Mayani, L Nisfa |
| 14.00-14.10| A00110 | MNS Rangkuti, Idramsa, U Hasanah               |
| 14.10-14.20| A00111 | A Hasairin, T Harsono, A Nasution              |
| 14.20-14.30| A00113 | S Ilyas, S Hutahaean, I Nurwahyuni, WS Polem, O Mayani, L Nisfa, H Francisca |
| 14.30-14.40| A00114 | S Ilyas, S Hutahaean, I Nurwahyuni, H Francisca, WS Polem, O Mayani, L Nisfa |
| 14.40-14.50| A00115 | S Ilyas, S Hutahaean, I Nurwahyuni, L Nisfa, H Francisca, WS Polem, O Mayani |
| 14.50-15.00| A00116 | S Ilyas, S Hutahaean, Elimasni, O Mayani, WS Polem, L Nisfa, H Francisca |

## Room: Soetomo 1 (2nd floor)
### Physics Science and Physics Education

| Time       | ID     | Speakers                                      |
|------------|--------|-----------------------------------------------|
| 13.00-13.10| A00039 | NS Siregar, NS Harahap, RN Sinaga, A Affandi  |
| 13.10-13.20| A00095 | M Sirait, K Sinulingga, N Siregar, RSD Siregar |
| 13.20-13.30| A00099 | J Rajagukguk, C Sarumaha, R Situmorang, J Kaewkhao |
| 13.30-13.40| A00006 | YI Tanjung, AM Siregar, A Bakar               |
| 13.40-13.50| A00007 | Y Megalina, Sahyar, J Hutahaean               |
| 13.50-14.00| A00017 | W Bunawan, S Sahyar, MA Rangkuti, J Yanti    |
| 14.00-14.10| A00019 | Sabani, W Bunawan, YI Tanjung                |
| 14.10-14.20| A00022 | MB Harahap, SR Manurung                       |
| 14.20-14.30| A00028 | R Simbolon                                    |
| 14.30-14.40| A00066 | MA Rangkuti, W Ritonga, WWW Brata             |
| 14.40-14.50| A00117 | I Irwandi, IM Sari, R Oktavia, M Syukri       |
| 14.50-15.00| A00113 | N H S Simanullang, J Rajagukguk              |
| Time       | ID     | Speakers                                                                 |
|------------|--------|--------------------------------------------------------------------------|
| 13.00-13.10| A00045 | D Oktavianti, A Darmana, A Sudrajat                                      |
| 13.10-13.20| A00088 | A Sutiani, Zainuddin, A Darmana                                          |
| 13.20-13.30| A00090 | Z Muchtar, AVA Rosalia, S Silaban                                        |
| 13.30-13.40| A00094 | A Darmana, A Sutiani, Jasmidi                                            |
| 13.40-13.50| A00005 | PM Silitonga, M Silitonga, M Nugrahalia                                   |
| 13.50-14.00| A00008 | GI Dalimunthe, Muchlisyam, U Harahap, A Nasution                          |
| 14.00-14.10| A00020 | ID Riris, T Juwitaningsih, M Simorangkird, A Silalahi                    |
| 14.10-14.20| A00029 | JL Sihoembing, Herlinawati, AW Nugraha, AN Pulungan, T Nasution, AR Wibowo, S Gea |
| 14.20-14.30| A00040 | L Simatupang, M Situmorang, R Siburian, H Indriati, Nurfajrini, V Apriyani, TS Girsang |
| 14.30-14.40| A00046 | E Situmorang, N Susanti, W Fitri                                         |
| 14.40-14.50| A00049 | R Yuniarti, S Nadia, A Alamanda, M Zubir, RA Syahputra                   |
| 14.50-15.00| A00075 | AW Nugraha, IS Jahro, D Onggo, MA Martoprawiro                            |
| 15.00-15.10| A00078 | D Roza, YS Manalu, Eddiyanto, RE Dibyantini                              |
| 15.10-15.20| A00082 | Ridwanto, MS Lubis                                                        |
| 15.20-15.30| A00091 | M Yusuf, Nurwulandari, E Utama                                           |
| 15.30-16.00|         | Parallel Session Breaks                                                  |
| 16.00-16.10| A00124 | N Susanti, E Situmorang, W Fitri                                         |