E·A·S·E
East-Asian Association for Science Education

EASE2016TOKYO

2016 International Conference of East-Asian Association for Science Education

Innovations in Science Education Research & Practice: Strengthening International Collaboration

Conference Handbook
(Tentative Program)

Tokyo University of Science
Tokyo, Japan
August 26-28, 2016

東京理科大学
TOKYO UNIVERSITY OF SCIENCE

祝　東アジア科学教育学会東京国際会議 2016（EASE2016 Tokyo）開催

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「アクティブ・ラーニング」のための　国語/理科・生活/算数

表現力育成10のポイント（低学年編）

160分 DVD付き

著：白石範孝　佐々木昭弘　夏坂哲志

- 表現力育成のポイントを，教科の特性との関連で考えた，「アクティブ・ラーニング」推進のための待望のシリーズ第一弾。
- 表現活動は全ての教育活動でも行われ，全ての教科・領域で欠かせない指導である。何をどのように表現していくかという「方法」と「内容」についてのポイントを，板書例，ノート例，作品例などとともに掲載。
- 第三章ではDVDに収録された各教科の授業について解説も掲載。

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レベルアップ授業力

理数教育へのつながりを考える

幼児の体験活動に見る「科学の芽」

編著：森本　信也（横浜国立大学教授）
磯部　賴子（ベネッセ次世代育成研究所顧問）

- 幼児の体験活動に見られる「科学の芽」を，理科教育（森本）と幼児教育（磯部）のそれぞれの視点で分析。
- 幼稚園教育における様々な実践から科学的思考や知識の「芽生え」を見いだし，価値付け，わかりやすく解説。
- 幼稚園はもちろん，小学校理科，生活科における科学的思考や表現力を育む支援のあり方が見えてくる。

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レベルアップ授業力

言語力の育成を重視した

みんながわかる理科教育法

著：小田切 真（常葉大学教授）・寺本貴啓（園學院大學准教授）

- 小学校理科の新指導要領で重視されている内容について，教材研究の仕方や具体的な指導案を元に解説。
- 理科を久しぶりに担当する先生，苦手意識のある先生，これから教員を目指す学生にも，具体的な事例と語句解説でわかりやすく説明。
- 問題解決学習の解説から，「言語力を重視した理科授業」を意識した評価活動のありかたまで幅広く掲載。更に語句解説や特別支援の視点も交えたコラムなども多数掲載。

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理科指導ガイドブック

「授業力をみがく」シリーズ

本書は新任の先生はもちろん，自分の授業スタイルを振り返ってみたい先生方や
研修をご担当の先生にも参考にしていただける内容となっております。

小学校 理科

「授業力をみがく」

観察・実験ガイドブック

「観察・実験の進め方」「薬品や器具の安全な使い方」を取り上げ，具体的な事例について解説。また，付録 CD-ROMには，実際に作業している動画を収録。

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中学校 理科

「授業力をみがく」

指導ガイドブック

指導上の要点やスキルを実践的に取り上げ，中学校理科についての疑問や誤解を解消する内容を掲載。巻末「理科に関する教育用語」，付録「サイエンスカレンダー」

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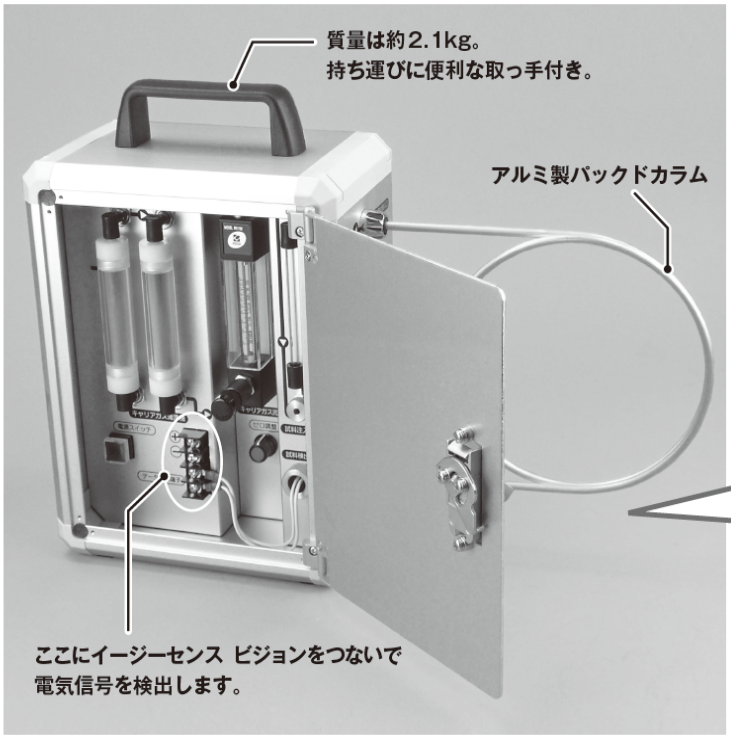

仕 様

- 注入口：セプタム（ガスタイトシリンジ使用）
- 検出器：半導体式センサ
- 出力：DC端子（出力範囲0～100mV）
- 分析カラム：アルミ製バックドカラム
- キャリアガス：空気清浄部を通した外気（清浄化装置付き、標準流量30mL／min）
- 電源：AC100V
- 大きさ・質量：200×125×250mm、約2.1kg
- 付属品：ACアダプタ、アルミ製バックドカラム1本、CP1（シリカゲル青）、CP2（活性炭）、ガスタイトシリンジ、イージーセンスビジョン、電圧センサC

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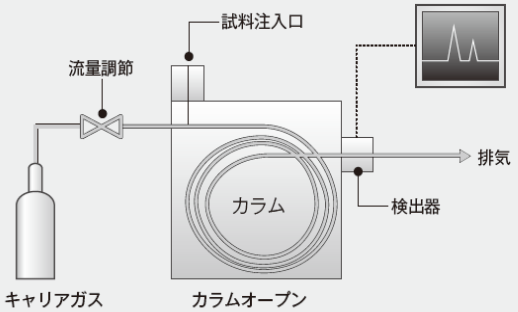
適当な充填物が均一に詰まった管内に、気体試料あるいは気化した液体をキャリアガスによって展開させ、化合物・混合物を分解しないように各成分に分離できる方法です。
分離した気体は、検出器で電気信号にして分析します。横軸に時間、縦軸に電気信号を記録することでクロマトグラフを得ることができます。また、電気信号が確認できるまでの時間から物質の同定ができ、ピークの高さや面積から定量を行うことができます。



▲一般的なガスクロマトグラフの構造

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OVERVIEW OF EASE2016TOKYO

Theme

Innovations in Science Education Research & Practice: Strengthening International Collaboration

Conference Dates

August 26 – 28, 2016

Venue

Tokyo University of Science (Kagurazaka Campus), Shinjuku, Tokyo, Japan

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Masakata Ogawa (Chair), Minoru Itoh, Tadashi Watanabe, Yasufumi Kawamura, Masayuki Inoue, Hisataka Ohta, Masaharu Takemura, & Hisashi Otsuji

WELCOME MESSAGE

Dear colleagues & EASE friends

It is our great pleasure to invite science educators and scientists, as well as EASE members to the EASE 2016 Tokyo Conference. The Conference, co-organized by the Tokyo University of Science, will be held at the Tokyo University of Science, Kagurazaka campus, on August 26 (Fri) to August 28 (Sun), 2016, with arrangement of registration, an ice breaking meeting, and an informal meeting of grad students and mentors on the 25 (Thu) afternoon.

This is the fifth EASE International Conference and the last one of the first round of the conferences for the decade. This means that we are going into the second round and the second decade. We need to make a difference, and we need something new. From this point of view, apart from our ordinary style and format of the EASE International Conferences, we do strongly encourage junior scholars (including graduate students) to commit the EASE. Especially, we expected the alumni group of the EASE summer or winter schools to take initiatives to do 'something new,' in order to strengthen their networking and collaboration for the future. Please encourage your students to come to the Conference, so that cross-regional exchange among the junior scholar group will be much visible.

We are very looking forward to seeing you all at TUS!!

Sincerely

Masakata Ogawa （小川正賢）
Chair of the Organizing Committee
Yoshisuke Kumano（熊野善介）
Vice-Chair of the Organizing Committee
Kazuo Kitahara（北原和夫）
Vice-Chair of the Organizing Committee

WELCOME MESSAGE

Dear colleagues and guests,

I am glad to see the successful launch of the fifth biennial EASE conference in Tokyo, Japan. With this conference, all five regions of EASE have now each hosted a conference. All of us at EASE share a common goal, that is to maintain and use it as a platform for science education researchers/teachers, on which we can share recent findings and solutions, and more importantly, to set out on a quest and exploration of science education. Through the various activities organized by EASE, we hope to encourage the cross-fertilisation of ideas, and facilitate research at the forefront of science education.

We may well be celebrating our 10th anniversary at EASE in 2017. Looking back, EASE has taken huge steps since its establishment under the leadership of the four presidents. We have published 34 editions of the EASE newsletter for which we have received contributions from colleagues, teachers, and students, and through which we have shared news and updates of research and activities. Both summer and winter schools for graduates have been organized to provide opportunities to learn from each other, reflect on individual progress, and generate friendships. We are happy to see the launch of the edited book led by Professor Lien Chi-jui, evidence of the collegiality and quality work at EASE. This publication marks our EASE colleagues' pursuit of excellence in the learning and teaching of science, our sincere quest for knowledge, and our contribution to the advancement of science education research. Last but not least, the biennial conferences are a highlight of the EASE achievements.

Here, I would like to thank the Chair of the Organising Committee of this conference, Professor Ogawa, and all the colleagues in Japan who have worked hard in the last year to prepare for this event. My thanks also go to the Executive Members of EASE who have worked with me and Dr Peter Wan at the Hong Kong Headquarters to steer the development of EASE during the past eight months.

I wish you all a very successful conference and a most memorable experience in Tokyo.

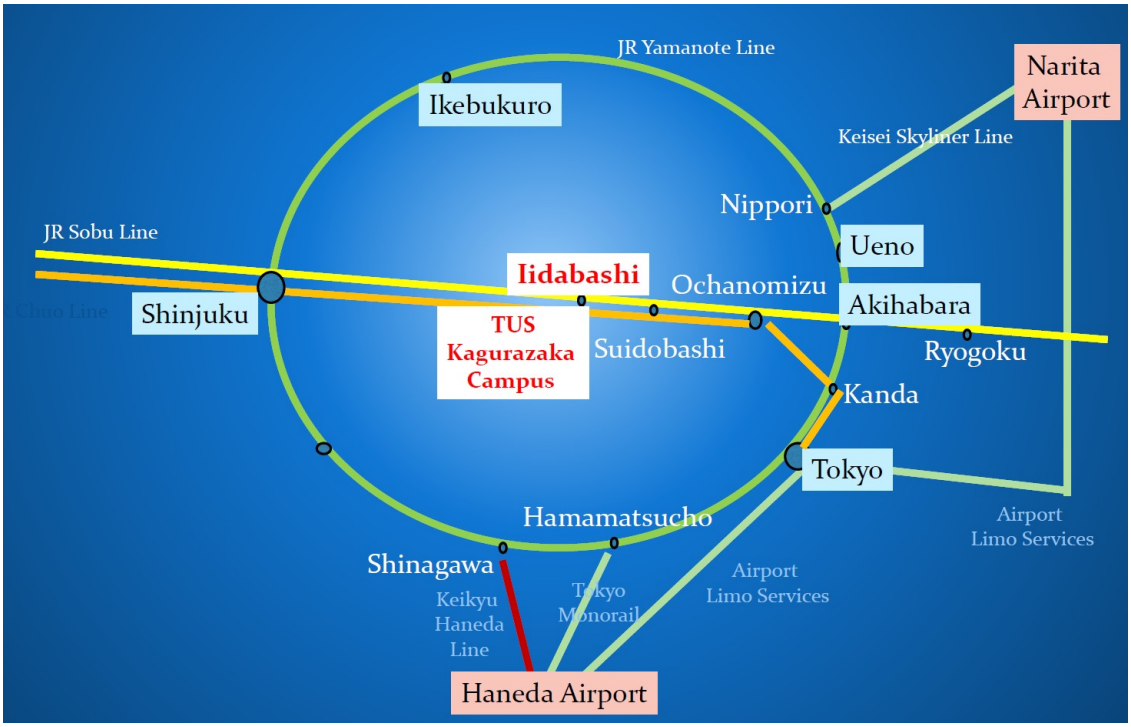
May Cheng

CHENG May Hung, May (鄭美紅), Ph.D.
President, East-Asian Science Education Association
Associate Vice-president cum Registrar,
Chair Professor of Teacher Education,
Department of Curriculum and Instruction
The Education University of Hong Kong

PROGRAM SUMMARY

	Time	Activities	Rooms
25th (Thu)	13:00-15:00	Preparations	All Rooms
	15:00-18:00	Registration	Room624
	15:00-18:00	Ice Breaking SIG Meetings EASE Grad Students' Meeting EASE Headquarter Meeting	Breakroom 1 Rooms A to L Room 845 Room 844
	18:00-20:00	EASE EMs Meeting	Room 844
26th (Fri)	08:30 -	Registration	Room 624
	09:00-09:40	Opening	Room A Live Remote (B, C, D, E & Breakroom 1)
	09:40-10:20	Plenary 1	
	10:20-11:00	Plenary 2	
	11:00-11:30	Refreshment	Breakrooms 1, 2, & Lobbies
	11:30-12:50	Oral 1 (4 papers/Room), Poster 1, Special Poster 1	Oral (Rooms A to L), Poster (Rooms X & Y)
	12:50-13:30	Lunch	All Rooms
	13:30-14:10	Keynotes 1 (Room A) & 2 (Room B)	Room A, Live Remote (C & Breakroom 1)
	14:10-14:50	Keynotes 3 (Room A) & 4 (Room B)	Room B, Live Remote (D & E)
	14:50-15:00	Break	
	15:00-16:00	Oral 2 (3 papers/Room)	Rooms A to L
	16:00-16:30	Refreshment	Breakrooms 1, 2, & Lobbies
	16:30-18:30	Symposia 1, Workshops 1, Demonstrations 1	Rooms A to L & X
	19:00-20:00	Asia Pacific Science Education' Reception	Room D
27th (Sat)	08:30 -	Registration	Room 624
	09:00-11:00	Oral 3 (6 papers / Room)	Rooms A to L
	11:00-11:30	Refreshment	Breakrooms 1, 2, & Lobbies
	11:30-12:50	Oral 4 (4 papers /Room), Poster 2, Special Poster 2	Oral (Rooms A to L), Poster (Rooms X & Y)
	12:50-13:30	Lunch	All Rooms
	13:30-14:10	Keynotes 5 (Room A) & 6 (Room B)	Room A, Live Remote (C & Breakroom 1)
	14:10-14:50	Keynotes 7 (Room A) & 8 (Room B)	Room B, Live Remote (D & E)
	14:50-15:00	Break	
	15:00-16:00	General Assembly	Room A, Live Remote (B, C, D, E, & Breakroom 1)
	16:00-16:30	Refreshment	Breakrooms 1, 2, & Lobbies
	16:30-18:30	Symposia 2, Workshops 2, Demonstrations 2	Rooms A to L and X
	19:00-21:00	Banquet (Pre-Registrants only)	Agnes Hotel & Apartments Tokyo
28th (Sun)	08:30 -	Registration	Room 624
	09:00-11:00	Oral 5 (6 papers / Room)	Rooms A to L
	11:00-11:30	Refreshment	Breakrooms 1, 2, & Lobbies
	11:30-12:50	Oral 6 (4 papers /Room), Poster 3, Special Poster 3	Oral (Rooms A to L), Poster (Rooms X & Y)
	12:50-13:30	Lunch	All Rooms
	13:30-14:50	Oral 7 (4 papers / Room)	Rooms A to L
	14:50-15:00	Break	
	15:00-16:00	Awards & Closing	Room A

TRANSPORTATION



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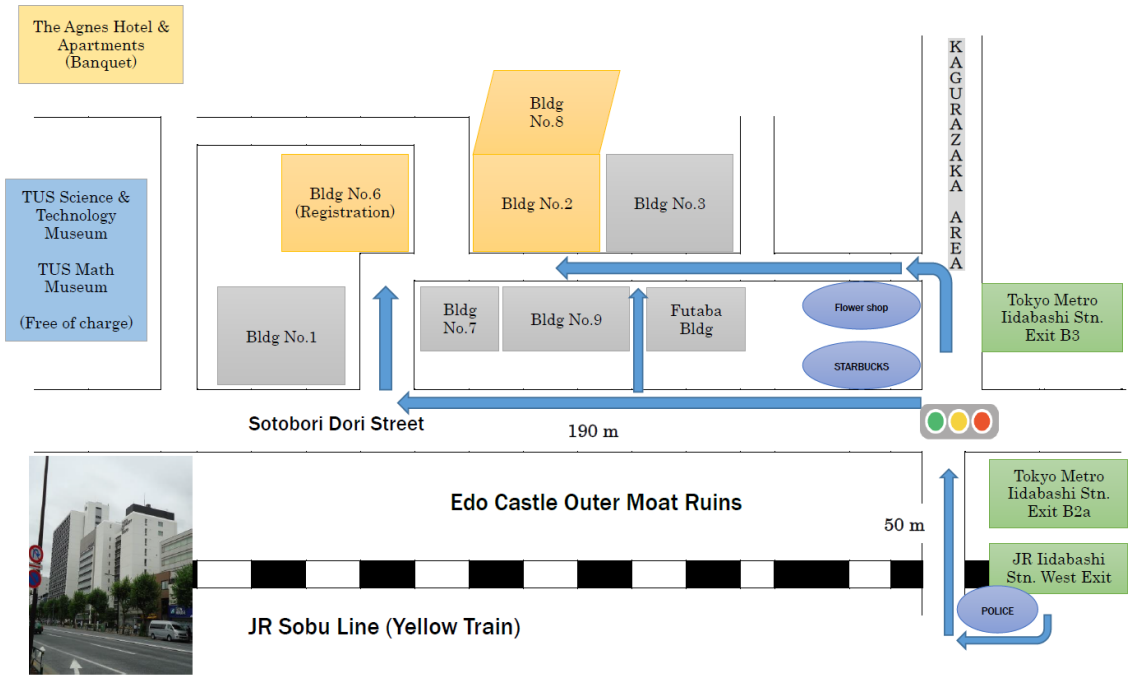
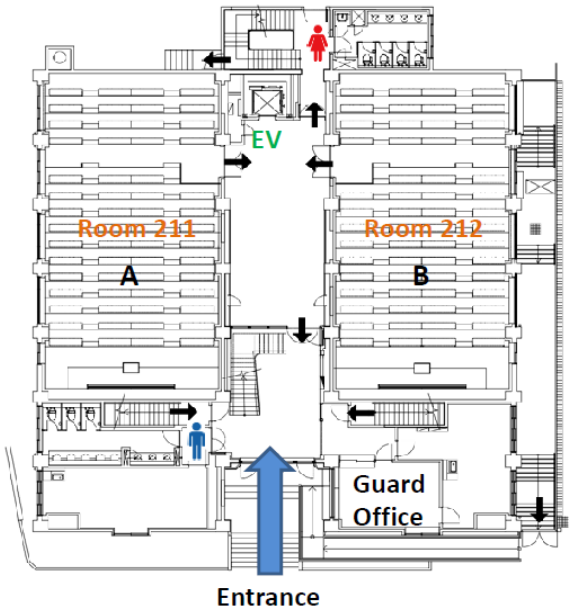
CAMPUS MAP



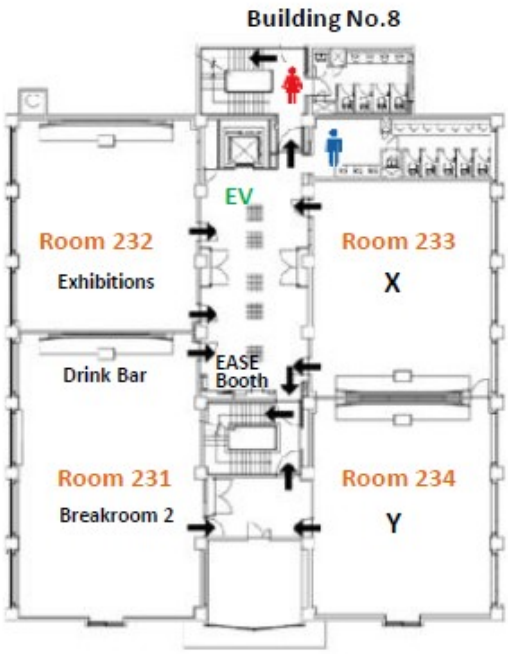
TUS Kagurazaka Campus Map (Venue: Bldgs. No.2, 6, & 8)

FLOOR PLANS

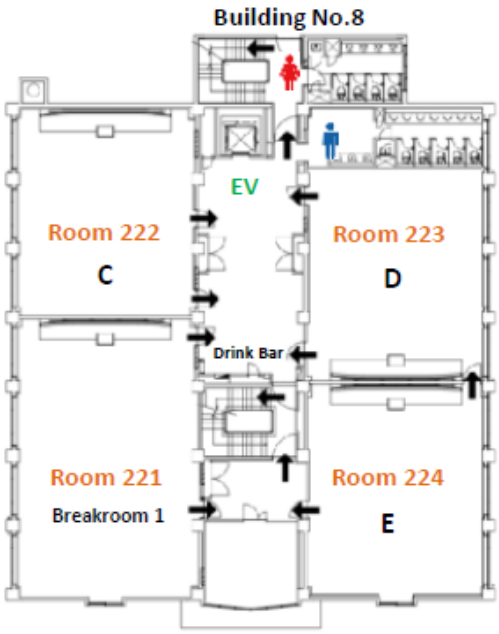
Building No.2 : 1st Floor



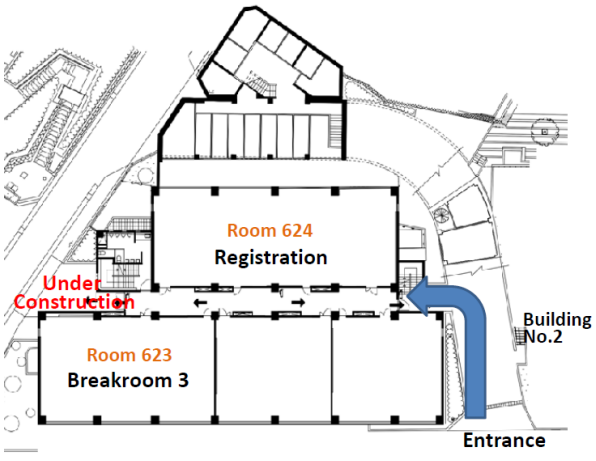
Building No.2 : 3rd Floor



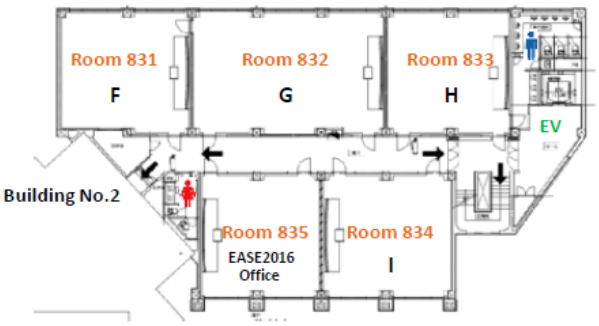
Building No.2 : 2nd Floor



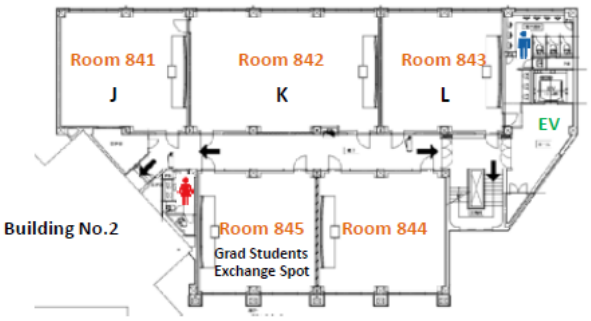
Building No.6 : 2nd Floor



Building No.8 : 3rd Floor



Building No. 8 : 4th Floor



GUIDELINES

Strands

1. Studies on Learners:
2. Studies on Teachers:
3. Studies on Interactions between Teaching and Learning:
4. Curriculum/Assessment/Policy:
5. Curriculum/Teaching Materials:
6. ICT in Science Education:
7. Integrated Sciences (SSI, EE, ESD):
8. Teacher Education:
9. STEM Education:
10. Historical, Philosophical, Sociological, Cultural and Gender Issues:
11. Science Education in Informal Settings:
12. Science Communication/Engagement:
13. Mathematics Education: and
14. Other Issues.

Oral Presentation

20 minutes, including 4-5 minutes for questions and discussion.
An LCD projector (connected with a VGA or Mini Display Port) is provided.
Neither computers nor tablets are available. Please bring your own machine with you.
Since no technical staff is available, please do it by yourself. You can check it in the afternoon of 25th.
It is recommended to prepare A4-sized handouts of the presentation.

(Session Chairpersons)

Since there are 12 concurrent sessions simultaneously running in each oral presentation slot, it is very difficult to invite chairpersons from other sessions. At the same time, there are three sessions simultaneously running with the poster session. Therefore, we decided to assign one (or two in the session consisting of more than 5 presentations) of the presenters (or authors) within each session to the session chairpersons. However, it sometimes happens that the presenter(s) cancel the presentation with unavoidable or unexpected reasons after the conference program had been announced. If such case happens, we appreciate someone else in the session to take on the chairperson's role. Our conference team had not enough manpower; however, our staff will serve as time keepers.

Poster & Special Poster Presentation

A0-sized (841mm (width) x 1189mm (height)) posters must be prepared.
Pins are prepared by the EASE2016. Tapes, and glue stick are prohibited.
In front of the panel, a table space (450mm (width) x 900mm (length)) is provided.
(For displaying handouts, models, photos, and computer demonstration to support the paper)
The place you can post your poster will be assigned on site.
The posters will be grouped by the strands.
The authors should post their posters 10 minutes before the session.
Posters will be presented during the designated poster session.
Presenters should stay during the assigned session to discuss their work with participants.
It is recommended to prepare A4-sized handouts of the presentation.

Symposium

Symposium should be limited to 2 hours, including presentations, discussion, and questions.
The session management is left to the organizer.
An LCD projector (connected with a VGA or Mini Display Port) is provided.
Neither computers nor tablets are available. Please bring your own machine with you.
A symposium should involve 2-3 experts or stakeholders to deepen the discussion.
It is recommended to prepare A4-sized handouts of the presentation.

Workshop

Each workshop should run from 60 - 120 minutes.
The presenter(s) must announce the total time of the workshop to the audience before starting.
An LCD projector (connected with a VGA or Mini Display Port) is provided.
Neither computers nor tablets are available. Please bring your own machine with you.
It is recommended to prepare a set of rich materials for the workshop audience.

Demonstration

The demonstration should be limited to 60 -120 minutes.
The demonstration should involve experiments/exhibitions relevant to science or science teaching.
A0-sized (841 mm (width) x 1189 mm (height)) illustrations are recommended.
The location of each demonstration will be assigned on site.

INFORMATION & REMINDERS

Registration Room, Help Desk, and Special Rooms

Room	Venue	Open Time & Explanation	
Registration Room	Room 624	25th, 15:00 – 18:00 26th, 08:30 – 16:00 27th, 08:30 – 16:00 28th, 08:30 – 12:00	Categories Pre-registrants [R0XXX] On-site Registrants (Cash) One Day Registrants (Cash)
Breakrooms	Rooms 221 & 231 with Drink Bars Room 623 without Drink Bar	26th – 27th, 08:30 – 18:00; 28th, 08:30 – 15:00 (Room 221 is unavailable during the live remote sessions (26th, 09:00 – 11:00, 13:30 – 14:50. 27th, 13;30 – 16:00).	
Help Desk (Non-Academic)	Lobby (1st Floor, Bldg. No.2)	26th – 28th, 09:00 – 16:00 (Chinese, Korean Students and High School Students' Volunteers)	
EASE2016 Office (Academic)	Room 835	Academic matters. Sorry, we cannot offer printing service available (handouts, etc.). Avail this service in convenience stores.	
EASE Headquarter Desk	Lobby (2nd Floor, Bldg. No.2)	EASE Membership	
Grad Students' Exchange Spot	Room 845	26th – 27th, 08:30 – 18:00; 28th, 08:30 – 15:00 (Managed by EASE Alumni & Mentors) "Melting" Spot of EASE Mentors & Grad Students (New Comers)	

Name Tag, Official Receipt, Conference Certificate etc.

All necessary materials (Name Tag, Official Receipt of Registration Fee (Banquet Fee), the Official Certificate of Participation, Lunch Coupons, Instruction Sheet, and Conference Bag Ticket) are printed on one sheet in the

series with perforations.

Registration Booth

Pre-registrants are identified only by the registration number ([R0XXX]). We cannot check your status with your name, region, affiliation, nor the abstract number ([A0XXX]). You can go directly to the appropriate booth led by your registration number. Pre-registrants with credit card problems need to go to the special booth, not to go to the pre-registrants' regular booth. On-site registrants (by cash only) should go to the on-site booth. No credit card is acceptable.

Apparatus for Presentations

Please make sure that you need to bring your own laptop or tablet (Caution: 100V, 50Hz, Type A plug) for the presentation. We are sorry that no computers are facilitated in our lecture rooms. An LCD projector (connected with a VGA or Mini Display Port) is provided in each room. But if your computer or tablet needs a different kind of connection with the projector, you need to bring it with you. In the afternoon of 25th, most of the session rooms are open for your pre-checking of the connection. Please feel free to check it in advance.

Lunch Box and Lunch Venues

Lunch box tables are open every day from 12:30 around the Breakrooms, 221 and 231. Lunch ticket on designated day is needed. Vegetarian and Halal lunches are for pre-registered participants (identified on the lunch ticket) only. You can enjoy lunch at any conference rooms including breakrooms, if the sessions are closed. [CAUTION] Conference participants are not allowed to go into the canteens (1st and 2nd Floors in Bldg. No.8).

Free Refreshment

Refreshment service is available at 11:00 and 16:00 at the drink bar areas, every day (except 16:00 on the last day).

Photos

Just as in our previous EASE conference, we will invite a photo team (TUS photo circle members) to take snapshots of 'what are going on' and the pictures will be uploaded to the Flickr site, which is shown in the instruction sheet, attached to the name tag, every day. You can enjoy the scenes you miss on the site, and even download them. (We believe that all of the participants accept to be photographed and uploaded on the Flickr site (which is not open to the public, but to the participants who know the particular Flickr site shown in the instruction sheet alone). However, if you find a picture you are not willing to show on the site, please send an email to ee2016tokyo.photo@gmail.com , identifying the photo number and asking the photo team to take down, so that they will delete them as soon as possible.

Conference Banquet Arrangement

Conference banquet is only for pre-registered participants. We are so sorry that no on-site requests are accepted. The banquet on 27th at the Agnes Hotel & Apartments Tokyo starts at 19:00, but the welcome drink service starts at 18:30. The hotel is 5 min walk from the conference venue (see the Campus Map of page 5).

TUS Science and Technology Museum & TUS Math Museum

During the conference, TUS' Museums are open (Free of charge).

Science and Technology Museum: Thursday, Friday, and Saturday (10:00 – 16:00)
Math Museum: Thursday, Friday (12:00 – 16:00), Saturday, and Sunday (10:00 – 16:00)

ACADEMIC PROGRAM

Invited Guests

PLENARY 1

Exploring K-12 Teachers' Conceptions and Implementation of Integrated STEM

Dr. Gillian H. ROEHRIG (USA)
Professor, STEM Education
Department of Curriculum and Instruction
Faculty of Education
University of Minnesota, Twin-

PLENARY 2

Enhancing "Scientific Literacy" through Chemistry Education in Europe: Wishes and Necessities, Challenges and Opportunities

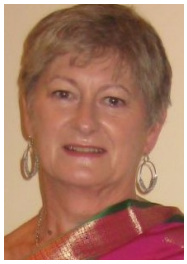
Dr. Claus BOLTE (Germany)
Professor of Chemistry Education
Department of Chemistry Education
Freie Universität Berlin

KEYNOTE 1

Lesson Study as One Art of Investigation for Practitioners and Researchers

Dr. Tetsuo ISOZAKI (Japan)
Professor of Science Education
Graduate School of Education
Hiroshima University

KEYNOTE 2



Talking and Doing Science in the Early Years - A New Rationale and Implementation in the 21st Century

Dr. Sue Dale TUNNICLIFFE (UK)
Reader in Science Education
Department of Curriculum, Pedagogy and Assessment
Institute of Education
The University College London

KEYNOTE 3

Integrating Education for Sustainable Development (ESD) into Science Education

Dr. Sun Kyung LEE (Korea)
Professor of Science Education
Department of Science Education
Cheongju National University of Education

KEYNOTE 4

International Perspectives on Science Museum for Science Learning: Cultural Assumptions as Barriers to Pedagogical Innovation

Dr. David ANDERSON (Canada)
Professor
Department of Curriculum & Pedagogy
Faculty of Education
University of British Columbia

KEYNOTE 5

e-Learning in Science Classroom: The Good, the Bad, the Ugly and the Future – A Personal Journey

Dr. Chun-Yen CHANG (Taiwan)
NTNU Chair Professor
Graduate Institute of Science Education & Department of Earth Sciences
Director of Science Education Center
National Taiwan Normal University

KEYNOTE 6

Learning Progressions in Science: Building Coherence across Standards, Curricula and Assessment

Dr. Ravit Golan DUNCAN (USA)
Associate Professor
Graduate School of Education
The Rutgers University

KEYNOTE 7

Striving to Make a Change in Science Classrooms: implications from Teacher Education

Dr. May May-Hung CHENG (Hong Kong)
Chair Professor
Department of Curriculum & Instruction
The Education University of Hong Kong

KEYNOTE 8

Science Education Research and the Learning Sciences

Dr. BaoHui ZHANG (China Mainland)
Qujiang Scholar Professor
School of Education
Shaanxi Normal University

Executive Summaries of Invited Speeches

Plenary 1

Exploring K-12 teachers' conceptions and implementation of integrated STEM

Gillian Roehrig
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http://www.cehd.umn.edu/ci/People/profiles/roehrig.html

August 26, 2016. Friday
09:40-10:20 Room A
(Live Remote: Room Breakroom 1, B, C, D & E)

Numerous national policy documents in the United States have called for improvements in K-12 STEM education. The premise of these reports is that continued progress and prosperity within the United States depends on the development of the future generation of STEM professionals. These calls for improvement of STEM education in the United States are driving changes in policy, particularly in academic standards. In addition, they recommend investment in quality STEM education programs that will increase the quality and knowledge of the teaching force in the STEM fields.

The problems that we face in our ever-changing, increasingly global society are multidisciplinary, and many require the integration of multiple science, technology, engineering, and mathematics (STEM) concepts to solve them. However, while policymakers and educators acknowledge the importance of STEM education, there is no common agreement on the nature of STEM education as an integrated or multidisciplinary endeavor. The Framework for K-12 Science Education (National Research Council [NRC], 2012) and the subsequent Next Generation Science Standards (NGSS; NGSS Lead States, 2013) are the most visible outcome of policy calls for improving K-12 STEM Education. Significant in these documents is the increased visibility of engineering by "raising engineering design to the same level as scientific inquiry in science classroom instruction at all levels, and by emphasizing the core ideas of engineering design and technology applications" (NGSS Lead States, 2013, p. 1).

These national guidelines have a strong influence on state standards within the United States; currently 17 states and the District of Columbia have adopted the NGSS and at least 36 states have some level of engineering integration in their science standards (Moore et al, 2015). Additionally, there are increasing international calls for integrated STEM education (Rennie, Venville, & Wallace, 2012; Organization for Economic Co-operation and Development, 2008). While these policy initiatives represents an important step in realizing improved K-12 STEM education, there exist few general guidelines or models for schools and teachers to follow regarding how to implement STEM integration approaches.

In our work, engineering is viewed as a catalyst for integrated STEM education, as "there is considerable potential value, related to student motivation and achievement, in increasing the presence of… engineering in STEM education in the United States in ways that address the current lack of integration in STEM teaching and learning" (NRC, 2009, p. 150). Rationales for the integration of engineering in K-12 classrooms include (Brophy et al., 2008; Hirsch, Carpinelli, Kimmel, Rockland, & Bloom, 2007; Koszalka, Wu, & Davidson, 2007):

1. Engineering provides a real-world context for learning mathematics and science;
2. Engineering design tasks provide a context for developing problem-solving skills; and
3. Engineering design tasks are complex, and as such, promote the development of communication skills and teamwork.

If these policy documents and the integration of engineering into science classrooms are to lead to improvements in K-12 STEM education, we need to explore new models of STEM teaching and learning, assessment, and professional development. Unfortunately, research on STEM integration in K-12 classrooms has not kept pace with the sweeping policy changes in STEM education. Thus, to promote the development of integrated models of STEM education, the National Science Foundation has begun to fund studies engaged in research on professional development, curriculum development and implementation of integrated STEM.

Minnesota represents a useful case for exploring the impact of policy decisions related to STEM integration. STEM education is valued in the state, the decision to integrate engineering into the state science standards was made in 2009 well in advance of the release of the NGSS. The placement of engineering in the science academic standards as opposed to separate engineering standards and clear statements within the standards frameworks is an unmistakable policy statement that STEM integration is the desired outcome. Critical to the success of STEM education in the state, is the support for professional development for K-12 teachers through regional Mathematics and Science Teacher Partnerships (MSTPs). Our research through the regional MSTPs and subsequent federally funded EngrTEAMS: Engineering to Transform the Education of Analysis, Measurement, and Science in a Team-Based Targeted Mathematics-Science Partnership has led to the development of strong models of professional development (Guzey, Roehrig, Tank, Moore, & Wang, 2014; Roehrig, Wang, Moore & Park, 2011). Our research reveals a continuum of conceptions of integrated STEM (Ring, Dare, Crotty, & Roehrig, 2016) which are related to different implementation approaches from lessons and units that attempt to integrate all of the STEM disciplines to engineering only lessons (Roehrig, Wang, Moore

& Park, 2011; Roehrig, Ellis, Dare, & Sheldon, 2016).

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Plenary 2

Enhancing "Scientific Literacy" through Chemistry Education in Europe: Wishes and Necessities, Challenges and Opportunities

Claus Bolte

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http://www.chemie.fu-berlin.de/cgi-bin/personen_en?Claus+Bolte

August 26, 2016. Friday
10:20-11:00 Room A
(Live Remote: Room Breakroom 1, B, C, D & E)

Enhancing Scientific Literacy is – in my opinion – the overarching aim of science education. But what do people consider relevant when they discuss the concept or the term "Scientific Literacy", the objectives of science education in general and those of chemistry education in particular? Which image emerges when representatives of different stakeholder groups (e.g. students, teachers, science educators or scientists...) express their understanding of current science and chemistry education practice?

By means of the International Curricular Delphi Study on Science Education I will portray the contours of Science Education practice in Europe, which indicate wishes and desires, necessities and challenges. They represent the variety of opportunities how to improve chemistry education, making science and especially chemistry more attractive and popular with the society in general and young adults in particular.

In my presentation, I will first draw attention to the diversity of aspects which represent the concepts and terms "Scientific Literacy" and "Chemistry Education". I will focus on aspects which are assessed as relevant and desirable in this field by a large sample of European stakeholders (N>2.700). Besides, I will discuss the issues realized to a higher or lower extent in science – especially in chemistry – education in the opinion of the European stakeholders involved in this study. Furthermore, the comparison of the importance and the practical realisation attributed to each aspect allows the identification of areas requiring further improvement and more efforts in order to enhance Scientific Literacy in Europe – and maybe also in Asian countries.

Especially the areas which are assessed as very important but improved satisfyingly in science education practice form the starting point for the development of innovative sequences of science lessons (termed as "modules"), which should support the enhancement of scientific literacy among our students. For the development of these modules, science teachers are of great importance. This is one reason why I will introduce a model for "teachers' continuous professional development (CPD)", which is based on a cooperation between science teachers and science educators. The CPD model, in which

teachers act as partners and in the role of "curriculum developers", has been successfully tried out in 21 different European countries within the framework of an international project funded by the European Commission named "PROFILES". Outcomes of this CPD programme are modules for more successful science teaching and learning as well as a higher level of teachers' professional attitudes, which partners of the PROFILES project term "teacher's ownership".

At the end of my presentation I will introduce one of these modules focussing on the topic "Bioenergy", which was developed in cooperation with science teachers in Berlin. The teachers have implemented the module in their classes and have evaluated it regarding the question how their students become more (intrinsically) motivated to learn science when they are taught based on modules like this. Some years ago we had the opportunity to apply a module like this in the frame of a German-Japanese-Cooperation we named the "German-Japanese Chemistry Class of Its Own". I will use this project as an example to illustrate how to enhance "Scientific Literacy" and demonstrate – on empirically based evidence – the role contemporary Chemistry Education could play in order to achieve this aim of general science education [in German termed "Naturwissenschaftliche Bildung"].

Keynote Speech 1

Lesson Study as one art of investigation for practitioners and researchers

Tetsuo Isozaki
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August 26, 2016. Friday
13:30-14:10 Room A (Live Remote: Breakroom 1 & C)

Science teachers continue their professional development in order to improve their teaching competencies and students' learning. There are several approaches to improving science teaching and learning. Science teachers' ordinary classroom and laboratory practice is the basis for systems to improve teaching and learning within a cultural context, e.g., reflective conversation with colleagues, observation visits and education conferences (OECD 2014), and Lesson Study (LS). Such practical methods are not based on theory but rather on traditional wisdom and expertise of practitioners. On the other hand, as improvement of teaching and learning might follow from research on teaching and learning processes, the integration of research perspectives into teachers' practice is necessary to unite practice and research. Understanding the aspects of knowledge that teachers interpret and transform for science lessons and the reasons for doing so will help bridge the gap between practice and research.

In Japan, LS is an important means for improving teaching and learning (Isozaki 2015). However, as LS has traditionally been embedded in teachers' culture in Japan since the late 19th century, there have been only a few attempts to theorize LS. For this purpose, the theories on teacher knowledge of Shulman (1987) and the didactic transposition theory of Chevallard (1989, 1999) might serve to bridge the gap between practice and research.
LS has three parts: preparation, the research lesson, and the reflective meeting/conference. According to a study of LS among lower secondary school science teachers (N=177) carried out in Hiroshima in 2016, 50.8 percent of the teachers responded that within the whole processes of LS, researching and developing teaching materials best facilitated their professional development. Researching and developing teaching materials, and also making and revising a lesson plan (main part of the LS preparation phase) require teachers to identify the lesson's implicit and explicit scientific and didactic values.

Shulman analyzed the concept of a "knowledge base" into seven types of knowledge, of which Pedagogical Content Knowledge (PCK) is associated with other six types of knowledge base such subject content knowledge, curriculum knowledge, general pedagogical knowledge. Compared to novice science teachers, experienced science teachers have structured, layered PCK, and can conceptualize pedagogical reasoning (e.g., Isozaki, et. al. 2007). PCK can play an important role in the LS preparation phase, especially in researching and developing teaching materials, and making lesson plans (Isozaki 2015), because teachers must transform their subject content knowledge in order for it to become teachable and learnable knowledge. According to Shulman's model of pedagogical reasoning and action (Shulman 1987: 16), this transformation would entail the following processes: (1) preparation, including critical interpretation, (2) representation of the ideas as analogies, metaphors, etc., (3) instructional selections of teaching methods and models, and (4) adaptation to the general characteristics of students, as well as (5) tailoring these adaptations to specific students. This transformation helps develop PCK, and is similar to the LS preparation phase.

Chevallard (1989, 1999) calls the process of adapting knowledge in order for it to become teachable and learnable knowledge, is called the didactic transposition of knowledge, and the meaning of knowledge depends on the institution or group; as Tiberghien and Sensevy (2015) pointed out, didactic transposition is a theoretical tool to analyze the curriculum and implement teaching practices. The didactic process includes three steps: (1) from scholarly knowledge to knowledge to be taught, (2) from knowledge to be taught to taught knowledge, and (3) from taught knowledge to learned, available knowledge (Bosch and Gascón 2006). As scholarly knowledge, generally called scientific knowledge in the research context, cannot be directly transferred into the minds of children, science educators have to transpose scholarly knowledge into teachable and learnable forms, called knowledge to be taught in the societal context (e.g., formal curriculum, textbooks) by different stakeholders (e.g.,

educators, curriculum developers, politicians and others), and then taught knowledge in the classroom, while keeping its power and functional character. The transposition from knowledge to be taught to taught knowledge can be observed at the LS preparation phase.

While LS is important for developing a teacher's professional knowledge, researchers can use theories on teacher knowledge and didactic transposition to analyze the transformation/transposition of professional knowledge of novice and experienced teachers in LS for the purpose of feedback to them respectively, e.g., what is transposed/transformed and why, and help teachers draw on their knowledge to decide what and how to teach.

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Key words: Lesson Study, Knowledge, Pedagogical Content Knowledge, Didactic Transposition Theory

Keynote Speech 2

Talking and Doing Science in the Early Years - A New Rationale and Implementation in the 21st Century"

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https://www.ioe.ac.uk/staff/CPAT/GEMS_23.html

August 26, 2016. Friday
13:30-14:10 Room B (Live Remote: Room D & E)

We are experiencing a paradigm shift in our understanding of science learning. Increasingly in the literature and at conferences educators are discussing early years science learning and its crucial role in the development of a person's science capital, (Archer r et al., 2015). Why? Pre school children are not 'tabula rasa' but competent scientists even before they can verbalise. But theirs is children's science. There is Children's science, School science and Scientist's science (Osborn, Bell and Gilbert, 1983). The foundations of Science understanding are laid in the earliest years of life. Children, before formal school (particularly 1 to 5 yrs.), are intuitive scientists and adults can be so important in this early critical stage of learning. Piekney et al (2013) have shown that preschool children already have a basic ability to evaluate evidence and a basic understanding of experimentation. Gopnik (2009) shows that young pre school children are intuitive scientists observing, asking questions, investigating, collecting data. Baruch and Specktor-Levey (2014) discus their work on using preschoolers verbal behaviour and responses an indicators of attitudes and scientific curiosity. Indeed Tunnicliffe and Uckert (2011) have suggested that there is a critical time for science learning in these early years as there is one it is thought to be for language acquisition (e.g. Johnson and Newport, 1991). Young children observe and investigate constantly if allowed to do so. Much of the play that they invent contains science experiences as well as everyday experiences which are science in action. Johnson (2005, p 33) claims that observation is the 'most important skill in science and the first we develop'. Indeed, Broadhead (2006) highlights the importance of understanding the tremendous importance of a young child's play in observation, interaction and reflections, vital components of science. Moyles (1989) discusses the importance of so called play in a child's learning. Careful participation of adults in the spontaneous observations and investigations of the very young can be a critical intervention in the positive development of a child's scientific literacy. Vygotsky (1962) stresses the importance of support of an adult in constructive leaning. Such is vital in these early years, not to instruct but to support. This involvement means talking to them, listening to their ideas, cuing them to think further. It does not mean explaining the theory in old-fashioned formal teacher mode! Learning science and associated subjects such as language, numeracy and social skills of cooperation, communicating are key competences in the learning journey of a child through all aspects of learning but of immense importance in their science repertoire. An issue is that preschool educators' attitudes to science can 'shape children's engagement in science and their curiosity' or not. Spektor –Levy,Baruch, and Mevarech (2013) investigated this. Finding that people involved in early years considered science activities in this early age were important but they

themselves felt inadequate. However, research into how children learn is becoming more frequent, such as the work of McGuigan and Rusell (2015) looking at the learning process and effective in a particular biological domain.

Thus, science learning does not start at secondary school, nor does it begin in the primary school, nor even in preschool, it begins from birth. Each successive stage builds on these foundations. It is a partnership between all participants. The most important people in the development of a child's science store are their adults and older children with whom they into contact. Nor must we underestimate the role of all media in this and the conflict between reality and fantasy they perpetuate School teachers, especially science educators in senior school, do not enjoy hearing this and usually do not agree. This talk will illustrate the importance of the earliest science encounters of a child's life in the everyday world, which they inhabit. Their observations and exploitations can be helped or hindered by their adults. Such 'first teachers' do not tell them the science information but encourage the learner to observe, question, seek patterns and ask, " Why?" " I wonder what happens if… I…". Alas, this natural gift often is extinguished once they start school with the rigid curriculum and tests. We are science education researchers, it is our role to help and find out the optimal means of developing this potential. In both learners and their adults.

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Keynote Speech 3

Integrating Education for Sustainable Development (ESD) into Science Education

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August 26, 2016. Friday
14:10-14:50 Room A (Live Remote: Breakroom 1 & C)

Sustainable Development Goals (SDGs) and Education for Sustainable Development (ESD) are two of the most important discourses at present. The United Nations Sustainable Development Summit in September 2015 adopted the 2030 Agenda for Sustainable Development, with 17 SDGs including quality education, to end poverty and transform the world. Muscat Agreement by the Global Education for All Meeting in 2014 and Incheon Declaration of the World Education Forum in 2015 emphasized ESD and global citizenship education (GCE) in post 2015 global education goals and targets. UNESCO, as a leading agency of the UN Decade of ESD (2005-2014), continues to implement Global Action Programme for ESD. In this sustainable development era, it would be a significant task to explore what science can contribute for sustainability and how ESD can be integrated into science education and school practices.

Conventionally, it has been argued that the practice of science is in value-neutral approach and science, technology and society are present independently. Value orientation of science, however, became important in the present, as the boundaries of science and technology are vague and ambiguous, and science and society are closely linked to affect each other. Similarly, the perspectives of scientific literacy have been expanded, which often expresses what should constitute the science education of all students. According to Roberts (2007) differentiating Vision I and Vision II after extensive literature review of scientific literacy, Vision I 'gives meaning to scientific literacy within science by looking at the products and processes of science itself.' Vision II of scientific literacy is interested in literacy about 'science-related situation,' which 'derives its meaning from the character of

situation with a scientific components and situations, which students are likely to encounter as citizens.' If science educators orient Vision II of scientific literacy in their practices of science education, there might be plenty of ways to integrate ESD into science education towards sustainability.

How to integrate ESD into science education can be explored in various levels and with diverse elements. First, ESD can be implemented in science education practices through the introduction of contents related to sustainable development and its principles and provisions (Burmeister & Eilks, 2012; Jestard & Sinnes, 2013; Fujii & Ogawa, 2015). Second, competence-based approach towards ESD can be used, which includes critical thinking, system thinking based on understanding the complexity of wicked issues in the real world (OECD, 2003; Adomßent & Hoffmann, 2013; Sleurs, 2008; Tschapka, 2014). Third, interdisciplinary and transdisciplinary approach may be added using STEAM (science, technology, engineering, art and mathematics) approach or other types of convergence education. Lastly, whole-school approach might be used to mainstream ESD in school practices through whole-school inquiry themes or other overarching doorway themes investigated in the sustainable schools initiatives in the U.K. (Breiting et al., 2005, Hendrson & Tilbury, 2004; DCSF, 2007; Hunt & King, 2015).

This presentation will explore various efforts and cases in integrating ESD into science education and school practices in Korea, Japan, and the U.K. to provide implications for innovative science education practices and research.

Keynote Speech 4

International Perspectives on Science Museums for Science Learning: Cultural Assumptions as Barriers to Pedagogical Innovation

David Anderson
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August 26, 2016. Friday
14:10-14:50 Room B (Live Remote: Room D & E)

There has been a tremendous growth in the number of Science Museums and Science Centers that have opened across the world in the past few decades – particularly in Asia. Broadly speaking, their missions are one of service to society in order to enhance scientific understandings, literacy and interest among a board diversity of citizens, including children, teenagers, families, K-12 students, and seniors. However, there continues to remain gaps between how museums can effectively realize their mission which in part are limited by implicit assumptions in the foundations of their origins and educational philosophies. Based on empirical research studies conducted in various Asian and Western countries, I argue that there are a number of barriers and inhibitors, as well as mismatches in museum pedagogy, which limit the effectiveness of science museums as cultural resources for science learning. This presentation will argue that identifying and realizing such barriers and mismatches holds the promise for reforms that may lead to more educationally effective use of science museums for science education and help improved scientific literacy for the broader society. Four key themes to be discussed include:

1) Recognizing cultural distinctiveness of audiences across national boundaries – Nations have cultural, social and political distinctiveness which influence their values about education and how their citizens engage in educational enterprises. Accordingly, there is a need to appreciate national cultural distinctions in how people engage in free-choice learning, and how museums think about the mediation of experiences for science education.
2) Cultural assumption implicit in the knowledge base – Much of the world-wide published research in learning in informal setting is culturally-homogeneous – dominantly (and historically) conducted in Western cultural contexts and with Western audiences. Yet, much of the understandings about science museum practices and pedagogy, and how visitors learn, are extrapolated and applied across contexts without much questioning of the cultural origins of the findings. As such, philosophical and pedagogical assumption implicate in research finding ought to be scrutinized thoughtfully, to the localized context, before application.
3) Cultural appreciation of audiences across the lifespan – Human beings learn in distinctly different ways as a function of life stage, as the needs and interests of each stage vary. Yet, the pedagogy of the museum in how audiences engage are in many instances homogenous and non-responsive to these variances. Accordingly, revising the pedagogy of the museum to meet audience learning needs and in keeping with their socio-cultural identities require careful thought.
4) Assumed cultural roles and responsibilities of stakeholders in informal education – Within the enterprise of informal education there exist multiple stakeholders (e.g., parents, teachers, museum staff). Mismatches in expectation of roles among stakeholders lead to tensions and ineffective or stifled educational practice and outcomes. Questioning and clarifying roles holds the potential to improve synergy within stakeholder partnering for more effective educational outcomes, and realization of intended educational missions.

This presentation, through the act of questioning cultural assumptions, will shed hope for fostering richer, more meaningful, utilization of science museums to the broader benefit of more scientifically literate societies.

Keynote Speech 5

e-Learning in Science Classroom: The Good, the Bad, the Ugly and the Future – A Personal Journey

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August 27, 2016. Saturday
13:30-14:10 Room A (Live Remote: Breakroom 1 & C)

In this talk, I would like to share with you, my personal journey in e-Learning research, practice and experiences, including:

1) The GOOD: new technologies bring science educators new hope, which usually promises to better student learning through innovations, such as clickers, and CAL (computer assisted learning), and more recently, ITS (intelligent tutoring system), MOOCs (Massive Open Online Courses), learning analytics, digital game-based learning, to name just a few;
2) The BAD: e-Learning tools, including hardware and software, advance so fast that it is generally hard to keep up with them, therefore, leading to a sad situation in terms of high costs and low amounts of preparation by both the instructors and students;
3) The UGLY: there is nothing new under sun, especially when it comes to new technologies employed in school in terms of concepts/ideas in improving student learning. Addictions and our focus on new technologies make people miss the real opportunities to guide students to learn better; and finally,
4) The FUTURE: some possible suggestions and studies/practices will be provided in light of this personal journey, with the hope of getting e-Learning back to the basics, which can be traced back to David Ausubel's view of learning: determining what students already know first, and teaching them accordingly.

Based on my reflection on e-Learning research, practice and experiences, a next-generation clicker system - CloudClassRoom (CCR) has been developed. Clickers are signal transmitters, similar in size to television remotes, used to collect students' responses to teachers' questions in the classroom. In CCR, the teacher poses a question, generally a multiple-choice type inquiry; students can then click the buttons on their remote-like devices to specify answers to questions. Students' answers are then transmitted to a monitoring system typically through infrared or radio frequency signals. By this means, every student in the classroom can express his/her thoughts instantly without being scrutinized by peers. The monitoring system then automatically aggregates the answers from the entire class with a histogram; the system then offers the teacher a choice about whether or not the overall distribution of students' answers should be publicly shown.

Clickers have been widely advocated as a useful tool to reform classroom learning because: 1) it can nurture a sense of classroom participation and thus makes students feel accountable to the academic task exercised in the cla27SS2) the real-time data collected by clickers can assist teachers in tailoring feedback to address students' difficulties just in time. However, to deploy clickers into every classroom, schools have to invest a lot of money for buying or renting hardware. Furthermore, the distribution and safekeeping of clickers in the classroom are not easy for teachers. To overcome these barriers, I have thus developed CCR with my students. CCR is developed using HTML 5.0, PHP, and MySQL. Such a technical design makes CCR work on every Internet-capable device without further software or plug-in installation. It also allows CCR to operate across-platforms, regardless of system being iOS, Android, or even Windows; and, it is compatible with a range of devices, such as smart phones, tablet computers, personal computers, and laptops. Thus, teachers and students are able to transform their own devices into clickers once they connect their devices with CCR on the Internet. Adopting web-based clickers is a more economical solution for schools, especially for those already equip with Internet access and Internet-capable devices. Such a solution will become more cost-effective as more and more schools start embracing the Bring-Your-Own-Device (BYOD) policy. Web-based clickers are well compatible with the digital devices that many students already own. In addition, web-based clickers are a far better research tool than traditional clickers in terms of obtaining learning analytics in a large-scale manner. With the CCR, a school is able to use one central monitoring system to access all students' data, regardless of which classroom the data is collected from. This system design also facilitates national or even global level research on learning analytics obtained from a group of real classrooms.

The web-based infrastructure of CCR allows researchers to customize clicker functions, based on educational studies, to support better teaching and learning. The insights obtained from my research into classroom learning have been translated into CCR. Two groundbreaking functions will be demonstrated during my talk, including:

1) Real-time analysis on free-text responses: The question formats of traditional clickers are limited to true-false and multiple-choice questions because only numeric responses are accepted. However, such the design might be an obstacle for teachers to make students focus on reasons, rather than answers. The presentation of a true-false or multiple-choice question is basically asking students to vote for answers, not for how they arrive at their answers. Even if each answer option is attached with a prescribed explanation, it may not adequately represent various students' reasoning processes. CCR thus provides teachers with the open-ended question format. Through the use of PCs, laptops, smart phones, or tablets, students are enabled to use textual responses to submit their

explanations for clicker answers. Moreover, Natural Language Processing (NLP) techniques have been incorporated into CCR to automatically analyze students' free-text responses in real time based on the semantic similarity and then generate a diagnosis report. This function substantially helps teachers to understand students' thinking processes and diagnose students' learning difficulties more deeply and precisely.

2) Heterogeneous group formation: It is known that frequent exchanges in reasoning are an important character of productive discussion. Through iteratively attending to, and dissecting contradictory opinions, students are more likely to jump out of the box and then find the blind side of their own reasoning. However, in order to do so, students must have some food for thought; it would be difficult for a group to pull some new ideas out of thin air if each group member comes up with the same ideas. It is thus critical to orchestrate groups for students in which diverse ideas are represented. Arranging students who hold different clicker answers into a group should be an effective way to increase the diversity within groups. CCR is embedded with an automatic function to from small groups based on students' real-time responses. For instance, if the teacher poses a yes-no question and chose to form heterogeneous dyads, CCR will randomly assign students with conflicting answers (i.e., one of them responded: Yes, and the other responded: No) into dyads. Students then follow the instructions provided by CCR to find their group members and initiate peer discussions. Leveraging the aforementioned features of CCR, teachers certainly can save a lot of time collecting students' responses and arranging heterogeneous groups. The classroom activities aiming to enhance the quality of peer discussion may thus be implemented in a much smoother manner.

To date, approximately 2000 teachers have registered in CCR. More than 9000 classrooms have been established on CCR. Over 10000 classroom activities have been conducted by using CCR. Nine different language versions of CCR have been released, including Chinese, English, French, Japanese, Arabic, Turkish, Korean, Swedish, and Vietnamese. Several empirical studies have been preliminary done and demonstrated the usability of CCR. I am currently leading in-depth studies to examine the how students learn with CCR. In order to collect empirical data in a large-scale manner, CCR has been further integrated with the learning management system of my university. We are seeking more international research partners to co-develop and co-examine the educational benefits and challenges of using CCR. It can be expected that CCR will be fine-tuned to create differential advantages for various users all over the world in the near future.

Keynote Speech 6

Learning Progressions in Science: Building Coherence across Standards, Curricula and Assessment

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August 27, 2016. Saturday
13:30-14:10 Room B (Live Remote: Room D & E)

Learning progressions embody a developmental approach to learning by describing hypothetical paths that students might take as they develop progressively more sophisticated ways of reasoning about scientific concepts and practices in a domain over extended periods of time (Corcoran, Mosher & Rogat, 2009; Duncan & Hmelo-Silver, 2009; National Research Council, 2007; Smith, Wiser, Anderson & Krajcik, 2006). While the scholarship on learning progressions in science is still in its early stages, these progressions have captured the attention of funding agencies and policy makers in the United States. The Framework for K-12 Science Education (National Research Council, 2012) and the Next Generation Science Standards (NGSS Lead States, 2013) in the U.S. both emphasize the potential of learning progressions in providing greater coherence and better alignment of standards, curriculum, and assessment.

In many ways learning progressions are not a new idea and share similarities with other constructs that focus on the development and deepening of children's knowledge over time such as Bruner's (1960) spiral curriculum, Vygotsky's zone of proximal development (Vygotsky, 1978), and developmental corridors (Brown & Campione, 1994). However, the specific construct of learning progressions in science was first mentioned in the Systems for State Science Assessments report (National Research Council, 2006); thus learning progressions in science have strong roots in the world of assessment and measurement.

Science learning progressions also share some similarities with mathematics learning trajectories, which have a longer history (Carpenter & Lehrer, 1999; Clements & Sarama, 2009; Fennema, Carpenter, Frank, Levi, Jacobs & Empson, 1996). While somewhat similar, the mathematics learning trajectories differ from science progressions in two key ways. First, mathematics trajectories tend to be grounded in teaching experiments and were developed through close and iterative work in mathematics classrooms. Second, they include much more specification about the tasks that can be used to move students' thinking forward along the path; thus mathematics trajectories include pedagogical approaches and strategies as an integral part of the trajectory itself (Clements & Sarama, 2009; Daro, Mosher, & Corcoran, 2011).

There are four key features that characterize learning progressions in science (Corcoran et al., 2009). First, progressions are centered on a few foundational and generative disciplinary ideas and inquiry practices. Several researchers have argued that it is the combined focus on content and practice that is unique to the current definition of science progressions (Smith et al., 2006, Songer, Kelcey & Gotwals, 2009; Schwarz et al., 2009). Second, progressions are

bounded by a lower anchor describing assumptions about the prior knowledge and skills of learners as they enter the progression, and by an upper anchor describing the expected outcomes by the end of the progression. The upper anchor is predominantly determined by societal expectations and analyses of the domain. Third, learning progressions describe the development of students' understandings as intermediate stepping-stones or levels between the two anchors. These levels are derived from analyses of research on student learning in the domain. Progressions also include descriptions of expected learning performances at each level that can be used to track student progress. Fourth, learning progressions are mediated by targeted instruction and curriculum. That is, they describe learning as facilitated by carefully designed learning environments.

It is important to note that learning progressions by their very nature are hypothetical; they are conjectural models of learning over time that need to be empirically validated (Duncan & Gotwals, 2015). In developing a validity argument for a learning progression one is trying to determine if the nature and order of the proposed intermediate steps fit empirical data on student thinking from cross-sectional studies (Mohan, Chen & Anderson, 2009; Stevens, Delgado & Krajcik, 2010), and teaching experiments (Gunckel, Mohan, Covitt, & Anderson, 2012; Songer et al., 2009). Constructing a validity argument for a progression entails the development of assessment items for the different levels of the progressions. Thus assessment and measurement is an integral aspect of learning progressions scholarship (Briggs, 2012).

My own research in this area has focused on the development and refinement of a learning progression for genetics spanning late elementary to high school (11- 16 year olds) that was developed in collaboration with Aaron Rogat and Anat Yarden (Duncan, Rogat, & Yarden, 2009). The progression is grounded in a framework for genetics literacy proposed by Stewart, Cartier and Passmore (2005) which argues that genetics literacy entails understanding three interrelated conceptual models and the relationships between them: (a) the inheritance model, which explains the probabilistic patterns of correlation between genes and traits; (b) the meiotic model, which explains the cellular processes that allow for the transfer of genetic information from one generation to the next; and (c) the molecular model, which explains the cellular and molecular mechanisms by which genes bring about their physical effects within an individual. In developing the progression we therefore identified eight constructs that map onto these three conceptual models, interactions between them, as well as interactions with the environment (Duncan et al., 2009). Progress along the progression entails developing more sophisticated mechanistic explanations of genetic phenomena that draw on ideas embodied in the eight constructs.

Over the past decade my research team (Duncan, Castro-Faix, & Choi, 2014; Freidenreich, Duncan, & Shea, 2011; Shea & Duncan, 2012) and others (Todd & Kenyon, 2015) have engaged in the study and revision the progression (Shea & Duncan, 2012; Todd & Kenyon, 2015; Castro-Faix, Rothman, Seryapov, & Duncan, 2016). Towards this end we have developed numerous assessment items for the various constructs as well as instructional materials aimed at facilitating learning along the progression. This work has led to novel insights about genetics learning, the development of students' understandings, and refinement of several constructs of the progression. In my presentation I will provide an overview of learning progressions and discuss the research efforts around these progressions using examples from my own work on the genetics progression as well as the work of others in the field.

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Keynote Speech 7

Striving to make a change in science classrooms: Implications from teacher education

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August 27, 2016. Saturday
14:10-14:50 Room A (Live Remote: Breakroom 1 & C)

It is a concern among science educators that innovative pedagogical methods are not translated into classroom practice. To draw an analogy, science educators, curriculum developers and drivers for education reforms may not want to observe a cyclone or hurricane on the surface when life on the floor of the ocean has no turbulence at all. A number of ways to analyze the issue are to be suggested. A brief examination of the meaning and generation of the knowledge of teaching shows that teaching needs to be problematized, and with new designs, new knowledge can be generated. Consistent with the notion that theory is built with the support of concrete examples or experiences, researchers have advocated the creation of practitioner knowledge which is linked with practice and which addresses problems of practice. Teachers are involved in elaborating the problems, analyzing classroom practice, considering alternatives, and testing and recording new knowledge which is then to be shared. Conversely, if research is seen to be disrespectful of teachers' knowledge of teaching, it is unlikely that the innovations suggested by researchers will be adopted.

Research has shown that there are other reasons to explain the difficulty of transferring research-based knowledge into teaching, including the fact that teachers are not convinced of new teaching innovations, and the lack of good communication between researchers and teachers. Moreover, teacher beliefs serve as a filter for research-based knowledge. Teachers with beliefs that curricula or teaching can be changed and improved will be more ready to adapt to innovative practices. In order to be ready to adapt, teachers need to be interested in different perspectives and in pursuing

alternative possibilities.

The process of improving practice and generating new knowledge requires collaborations between researchers and teachers. Possible directions for making a change will be suggested including the introduction of practitioner research, developing better communication between researchers and teachers, as well as facilitating teacher agency and ownership. The relationship between practitioner and researcher knowledge can be built in a way that teachers use their knowledge to test and implement new ideas. With this implementation, new hypotheses can be built based on teachers' experience and observations. Researchers can then draw on classroom implementation experiences and generate new generalized knowledge. In a similar vein, teacher learning can be described as a process of construction and reconstruction of knowledge which involves individual and collaborative inquiry. Interactions between researchers and teachers are crucial to the success of implementing new practices in the classroom. Both parties can be engaged in reflective thinking, which is considered to be useful in enhancing teaching performance. The other key to success is to facilitate teacher ownership of or agency for the teaching innovations. Teachers with a strong sense of agency will be knowledgeable of themselves, possessing a drive and the skill to improve their teaching, and will also be responsive to students' needs. If teachers develop a connection between the innovation and their students' needs, and see how the innovation suits them personally, the personalization will make it their own and will increase individual investment in the innovation.

Keynote Speech 8

Science Education Research and the Learning Sciences

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August 27, 2016. Saturday
14:10-14:50 Room B (Live Remote: Room D & E)

The EASE (East-Asian Association for Science Education) 2016 conference theme is "Innovations in Science Education Research & Practice: Strengthening International Collaboration". To be aligned with the conference theme, there is a need to learn how research paradigm change, which can be part of any innovations in research, affects science education research and practices. A new research paradigm, the learning sciences, is explored in connection to innovations in science education research & practice in the context of globalization. The following research questions guided this study: 1) What can be innovations in science education research & practice？ 2) What are the relationships between science education and learning sciences research communities and research? and 3) How to advance science education and learning sciences research and practice through international collaboration?

Various types of search were conducted on general search engines and some English and Chinese literature databases. Information of the intersection of science education and the learning sciences was retrieved and selected. Content analysis was conducted in regard to the above questions on the following items: 1) Organizations (e.g. the International Society of the Learning Sciences and the National Association of Research on Science Teaching), 2) Journals (e.g. Journal of the Learning Sciences and Journal of Research on Science Education), 3) Representative books (e.g. the International Handbook of Science Education and the Cambridge Handbook of the Learning Sciences) , 4) Scholars, and 5) Representative projects (e.g. research topics, methods, results of research, the effectiveness and long-term impact of the projects).

Results revealed that the importance of science education has been recognized internationally including the learning sciences communities; science education had been a popular context of learning sciences research. On the other hand, learning sciences research produced knowledge and methods on how people learn different subjects including science; learning sciences has also provided principles about how to design and implement effective learning environments such as those for science education. There are scholars, journals, books, and organizations that are involved in scholarship in both science education and the learning sciences. For example, Professor Roy Pea and Allan Collins here are internationally well-known learning sciences scholars who have profound interests in science education. Pea and Collins (2008) describe four waves of science education reforms in the US. The first wave happened in the US from the 1950s to the 1960s; the reform was followed by similar reforms in other countries. The reform was characterized by the development of new science curricula that introduced scientific advances and emphasized scientific methods. The other three waves of science education reforms are cognitive science reform wave (1970s–1980s), the standards reform wave (1980s–1990s), and the systematic approach reform wave (2000s to date).

The dual domains of science education and the learning sciences have co-evolved and been mutually shaping. The presentation proposes more idea sharing and proposals for strategies to strengthen the collaboration among organizations and people who are in science education and the learning sciences across the world.

Key Words: Science Education Research, the Learning Sciences, International collaboration

Symposia, Workshops, & Demonstrations

Symposia 1 (26th, 16:30-18:30)

[26SS1A] *Museum Literacy cultivated through the communication with museum staffs and the public (A0229)*
Yoshikazu Ogawa (National Museum of Nature and Science), Reiji Takayasu (Chiba City Museum of Science), Kôzi Hayasi (Natural History Museum and Institute, Chiba), Tsutomu Owada (Obihiro Centennial City Museum), David Anderson (The University of British Columbia), Motoko Shonaka-Harada (National Museum of Nature and Science), Mika Matsuo (National Museum of Nature and Science): (Japan)

[26SS1B] ASTE Symposium *Science teacher preparation program (A0518)*
Young-shin Park (Chosun University), Xiao Huang (ZhiJiang Normal University), Wing MiuWinnie So (The Education University of Hong Kong), Yoshisuke Kumano (Shizuoka University), Tomoki Saito (Shizuoka University), Younkyeong Nam (Pusan National University), Sungho Kim (Incheon Buyeseo Elementary School), Phil Seok Oh (Gyeongin National University of Education), Corrienna Abdul Talib (Universiti Teknologi Malaysia), Muhammad Abd Hadi Bunyamin (University of Minnesota): (Korea)

[26SS1D] *Teaching Improvement to Promote Students' Disciplinary Competences in Chemistry (A0479)*
Lei Wang (Beijing Normal University), Yao Zhi (Teachers' training school of Beijing Haidian District), Yanning Huang (Capital Normal University), Fan Shi (Beijing Normal University), Dongdong Zhou (Beijing Normal University), Ying Chen (Teachers' Training School of Beijing Haidian District), Lan Wang (The Experimental High School Attached to Beijing Normal University), Xiaoli Guo (Teachers' training school of Beijing Haidian District): (China Mainland)

[26SS1E] EASE BOOK PROJECT Symposium *The 2016 EASE Book: Science education research and practice in East Asia: Trends and perspectives—Findings from the EASE Book Project (2013-2016) (A0344)*
Chi-Jui Lien (National Taipei University of Education), Huann-Shyang Lin (National Sun Yat-Sen University), Tetsuo Isozaki (Hiroshima University), Winnie Wing-Mui So (The Education University of Hong Kong), Lei Wang (Beijing Normal University), Chun-Yen Chang (National Taiwan Normal University), Myeong-Kyeong Shin (Gyeongin National University of Education), Jinwoong Song (Seoul National University), Hui-Ju Huang (California State University, Sacrament): (Taiwan)

[26SS1K] *Enhancement and Development of Science Education Utilizing Natural Science Museums and Zoo (A0160)*
Kiyoyuki Ohshika (Aichi University of Education), Heiwa Muko (Ehime University), Noriko Kawashima (Bunkyo City Bunrin Junior High School), Hiroyuki Furuichi (Inuyama City Jyoto Elementary School), Rie Akami (Japan Monkey Center), Hideto Okuyama (Asahikawa City Office): (Japan)

Symposia 2 (27th, 16:30-18:30)

[27SS2A] *The Development of Science Teachers' Training Programs Focused on ESD: Experiences in Asian Countries (A0615)*
Hiroki Fujii (Okayama University), Derek Cheung (The Chinese University of Hong Kong), AgusFany Chandra Wijaya (Indonesia University of Education), Shigeyoshi Watanabe (Kumamoto University), Sun-Kyung Lee (Cheongju National University of Education), Sompong Siboualipha (Bankeun Teacher Training College, Laos), Uuriintuya Dembereldori (Institute of Teachers' Professional Development, Mongolia), Dulguun Jargalsaikan (National University of Mongolia): (Japan)

[27SS2B] *Public engagement in science and technology in Society – structures and changes in the long run (A0278)*
Chun-Yen Tsai (National Science and Technology Museum), Paichi Pat Shein (National Science and Technology Museum), Jui-Chou Cheng (National Science and Technology Museum), Yuh-Yuh Li (National Science and Technology Museum), Ying-Yao Cheng (National Science and Technology Museum), Tai-Chu Huang (National Science and Technology Museum), Jia-Hao Young (National Science and Technology Museum), Yin-Tze Chen (National Science and Technology Museum): (Taiwan)

[27SS2E] *International Cooperation Projects on Science and Mathematics Education for Developing Country from Eastern Asia: Issue and Trend (A0446)*
Kinya Shimizu (Hiroshima University), Takuya Baba (Hiroshima University), Takashi Soma (Padeco, Co. Ltd.), Young-Min Kim (Pusan National University), Jinwoong Song (Seoul National University): (Japan)

[27SS2G] ASET Symposium *Studies for Facilitating Students' Learning of Science—Symposium of Association of Science Education in Taiwan (ASET) (A0345)*
Sheau-Wen Lin (National Pingtung University), Mei-Hsiu Chen (National Pingtung University), Jing-Ru Wang (National Pingtung University), Silvia Wen-Yu Lee (Graduate Institute of Science Education, National Changhua University of Education), Sung-Tao Lee (National Taichung University of Education), Meng-Tzu Cheng (National Changhua University of Education), Yu-Ling Lu (National Taipei University of Education), Chi-Jui Lien (National Taipei University of Education): (Taiwan)

[27SS2K] *Fostering the Scientific Mindset Fostering the Scientific Mindset (A0008)*
Kei Kano (Shiga University / Kyoto University), Shinichi Takeuchi (NHK Educational Corporation), Takayuki Shiose (Kyoto University), Eri Mizumachi (Kyoto University), Hiroaki Isobe (Kyoto University), Shotaro Naganuma (Kyoto University), Kensuke Shiga (DIRECTIONS, Inc.), Shingo Ohno (Freelance Art Director): (Japan)

Workshops 1 (26th, 16:30-18:30)

[26W1G] *Learning Scientific Practices through Video Games (A0492)*
Onur Imren (University of Limerick), Sibel Erduran (University of Limerick): (Ireland)

[26W1F] *Study of static electricity using Fly Stick (A0056)*
Noriyuki Nishiyama (Kazusa Hight School), Shuichi Yamashita (Chiba University): (Japan)

[26W1I] *Development of science teaching tools with oxygen sensor using an air battery (A0003)*
Norimichi Kawashima (International Pacific University), Yoshihiro Hada (International Pacific University), Mitsuo Takahashi (Tokyo National College of Technology): (Japan)

[26W1J] *Development of a Wildflower Identification site (A0165)*
Ken'ichi Saiki (Natural History Museum & Institute), Nobuya Hayashi (Ibaraki University), Fumi Nakanishi (Tokyo Gakugei University), Shuichi Yamashita (Chiba University): (Japan)

[26W1C] *Lesson Ideas on Integrating Student Learning and Thinking Experiences in School Science (A0378)*
Kok Siang Tan (National Institute of Education/ Nanyang Technological University): (Singapore)

[26W1H] *Promoting minds on experience when investigating yeast fermentation in high school biology laboratory (A0101)*

Kam Ho Chan (The University of Hong Kong): (Hong Kong)

[26W1L] *Hands-on Static Electricity and Dynamic Electricity Generation (A0626)*
Michal Marcik (NARIKA Corporation): (Japan)

Workshops 2 (27th, 16:30-18:30)

[27WS2J] *Developing an Improved Model of Moon Phases for Secondary-level Science (A0039)*
Shuichi Yamashita (Chiba University), Hideki Itou (Waseda Secondary School), Yoshiaki Shimono (Crafteriaux): (Japan)

[27WS2C] *Enjoyable science performance : "Daido-Kasetsu" (Natural Philosophy Demonstration) (A0504)*
Koji Tsukamoto (Chiba Institute of Science), Noritake Okazaki (Tamano Konan High School): (Japan)

[27WS2D] *New plan to teach a concept of the lift (A0531)*
Yoshinori Takeda (Okayama University of Science), Natsue Miyamoto (Okayama University of Science): (Japan)

[27WS2F] *What's in the Air? - By using a Colorimetric tube - (A0110)*
Masaaki Okuda (GASTEC Corporation): (Japan)

[27WS2L] *A study of training students' critical thinking ability in biology teaching in middle school (A0084)*
Meifang Li (Liaocheng University), Lusha Ji (Liaocheng University), Jiahui Hu (Liaocheng University): (China Mainland)

[27WS2H] *Simple and Beautiful Experiments X by LADY CATS and Science Teachers' Group (A0152)*
Kyoko Ishii (Tamagawa University), Masako Tanemura (Osaka Kyoiku University), Haruka Onishi (Higashiharima High School), Fumiko Okiharu (Niigata University), Asako Kariya (Hosei Daini Junior and Senior High School), Mari Satoh (MITA International School), Yuuri Kimura (Ohyu Gakuen Girls' Junior and Senior High School), Yumi Takano (Niigata University), Kasumi Endo (Niigata Meikun Senior High School), Hiroshi Kawakatsu (Meijo University): (Japan)

[27WS2I] *Hands-on activities of Materials Based Science Education (A0250)*
Masahiro Kamata (Tokyo Gakugei University), Masafumi Watanabe (Hokkaido University of Education), Ayaka Yanase (Tokyo Gakugei University), Keita Chiba (Tokyo Gakugei University), Koyo Oka (Tokyo Gakugei University), Shino Iwashita (Tokyo Gakugei University), Menggenquimuge (Tokyo Gakugei University): (Japan)

Demonstrations 1 (26th, 16:30-18:30)

[26D1X-1] *the Practice of Learning Plateform' Personalized Learning Resources Pushing System (A0293)*
li Zhe (Shaanxi Normal University), Guo Jian (Tokyo Institute of Technology): (China Mainland)

[26D1X-3] *Inertia Experiment Device & Huge Scaled Dynamics Carts (A0168)*
Yuhei Gomi (Tokyo University of Science), Shun Iimura (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26D1X-5] *Original Bicycle Dynamo (A0218)*
Shota Kitahara (Tokyo University of Science), Taiki Machinaga (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26D1X-7] *Newly Developed Physics Experiments for Secondary Students (A0280)*
Hiroki Ninomiya (Tokyo University of Science), Shion Mizutani (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26D1X-9] *Demonstration Machine of Global Warming (A0166)*
Yoshiyuki Oda (Tokyo University of Science), Hirohiko Sugimoto (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26D1X-11] *Simple Enzyme Kinetics Experiment using a Tablet Camera and Urine Test Strips (A0375)*
Sho Fukaya (Tokyo University of Science), Masaharu Takemura (Tokyo University of Science): (Japan)

Demonstrations 2 (27th, 16:30-18:30)

[27D2X-1] *New Experiments in Organic Chemistry for High School Chemistry Classes (A0202)*
Masayuki Inoue (Tokyo University of Science): (Japan)

[27D2X-3] *Dehydration of terpene alcohol with borate silica gel (A0236)*
Megumi Murata (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[27D2X-5] *Development of remote-controlled experiments for online scientific investigation: Arduino-based low-cost approach and implications for STEM education (A0595)*
Yau Yuen Yeung (The Education University of Hong Kong): (Hong Kong)

[27D2X-7] *using mobile science museum with VR to promote STEM in China (A0476)*
Xiaomei Yan (Beijing Normal University), Zhizhen Zhang (Beijing Normal University): (China Mainland)

[27D2X-9] *A STEM activity material using Hayabusa2 swing-by data (A0245)*
Susumu Yoshida (Wakayama Shin-ai High School), Yoshiko Sato (Wakayama Shin-ai High School), Tomomi Nakaguchi (Wakayama Shin-ai High School), Miyu Kitamura (Wakayama Shin-ai High School), Miyuki Nagashima (Wakayama Shin-ai High School): (Japan)

Oral Presentations

Oral 1 (26th, 11:30-12:50)

<1A> Learners (Teaching/Learning)
Chair: Sonya N Martin (Seoul National University)

[26O1A-1] *The Impact of Multiple Representations on Hearing Impaired Students Learning Human Circulatory System (A0023)*
Jia-Ying Lin (National Taiwan Normal University), Chun-Mei Hu (Academia Sinica), Mei-Hung Chiu (National Taiwan Normal University): (Taiwan)

[26O1A-2] *Pre-service Science Teachers' Changing Perceptions of Science for Students with Special Education Needs Based on Engagement in Practical Science Activities (A0062)*
Da Yeon Kang (Seoul National University), Sonya N Martin (Seoul National University): (Korea)

[26O1A-3] *An exploratory study on teachers and culturally and linguistically diverse students in the Korean science classroom: Implications for developing teacher education and professional development programs (A0498)*
Jennifer C Park (Seoul National University): (Korea)

[26O1A-4] *Action research as a professional development model for supporting teachers to improve science teaching and learning in diverse classrooms (A0507)*
Jennifer C Park (Seoul National University), Hee Kyung Park (Seoul National University), Yoon Su Cho (Siwha Middle School), Ju Yeon Lee (Siwha Middle School), Lina Lee (Siwha Middle School), Hee Soon Park (Siwha Middle School), Sonya N Martin (Seoul National University): (Korea)

<1B> Teachers
Chair: Miku Yoshida (University of Copenhagen)

[26O1B-1] *Exploring Physicists' and Chemists' Views of Scientific Models (A0138)*
Meng-Fei Cheng (National Changhua University of Education), Chia-Yuan Lu (National Changhua University of Education), I-wen Huang (National Changhua University of Education), Yu-Ju Hsu (National Changhua University of Education): (Taiwan)

[26O1B-2] *Science Teachers' Subject Specific Beliefs and their approaches towards Professional Development: curiosity and interest (A0542)*
Miku Yoshida (University of Copenhagen), Jan Sølberg (University of Copenhagen): (Denmark)

[26O1B-3] *Using a Comics-Based Instrument to Investigate Three High School Teachers' Mathematics Knowledge for Teaching: An Exploratory Study (A0435)*
Yung-Chi Lin (National Hsinchu University of Education), Hsiang-Yin Yu (National ChangHua University of Education): (Taiwan)

[26O1B-4] *German and Japanese student teachers' views of creativity (A0070)*
Luzie Semmler (Oldenburg University), Verena Pietzner (Oldenburg University), Shingo Uchinokura (Kagoshima University): (Germany)

<1C> Learners (Curriculum/Assessment/Policy)
Chair: Seungho Maeng (Seoul National University of Education)

[26O1C-1] *Validity Evidence for a Learning Progression of Scientific Explanation (A0009)*
Jian-Xin Yao (Beijing Normal University), Yu-Ying Guo (Beijing Normal University), Jie Yang (Beijing Normal University): (China Mainland)

[26O1C-2] *Science for Citizenship: Developing Butterfly Warriors (A0078)*
Junjun Chen (The Education University of Hong Kong): (Hong Kong)

[26O1C-3] *Examining students' concepts of spinning in space (A0599)*
Chi-ling Wu (Taipei University of Education), Chao-ti Hsiung (Taipei University of Education): (Taiwan)

[26O1C-4] *Development and Revision of Assessment items for a Learning Progression in Astronomy (A0373)*
Seungho Maeng (Seoul National University of Education), Kiyoung Lee (Kangwon National University), Young-Shin Park (Chosun University), Jeong-A Lee (Seoul National University), Hyunseok Oh (Seoul National University): (Korea)

<1D> Learners
Chair: Fang Huang (Huazhong University of Science and Technology)

[26O1D-1] *Characteristics of university students' explanations based on the science textbooks and their self-evaluation: A case study of thermal physics (A0396)*
Yong Wook Cheong (Seoul National University): (Korea)

[26O1D-2] *A Study on Views of Nature of Science of Undergraduate Students in Science Programs and Its Implications (A0403)*
Fang Huang (Huazhong University of Science and Technology): (China Mainland)

[26O1D-3] *Learning Scientific Practices through Video Games (A0329)*
Onur Imren (University of Limerick), Sibel Erduran (University of Limerick): (Ireland)

[26O1D-4] *Exploring the Structure of Attitudes towards Science: a Study of Hong Kong Secondary Students (A0033)*
Zhi Hong Wan (The Education University of Hong Kong): (China Mainland)

<1E> Integrated (SSI, EE, ESD)
Chair: Jessica Shuk Ching Leung (The University of Hong Kong)

[26O1E-1] *Children learn about environmental problems from a Japanese view of nature: An example from a nursery school with a distinctive natural environment (A0294)*
Mai Sakakura (Miyazaki International College), Koichi Kasahara (Tokyo Gakugei University): (Japan)

[26O1E-2] *Wonderful science education for spring in Korea - Integrated science education based on Disney movie 'Frozen' - (A0404)*
Sua Lee (Kyungpook National University): (Korea)

[26O1E-3] *Teaching Science Using Art Enhances Process Skills – Observe, Communicate, Compare, Measure, Organize (A0425)*
Lovelyn Cabansag Blanco (Harris Memorial College): (The Philippines)

[26O1E-4] *Informal Reasoning Regarding Socioscientific Issues among Science Majors and Non-science Majors: Using Obesity as a Context for Study (A0309)*
Jessica Shuk Ching Leung (The University of Hong Kong): (Hong Kong)

<1F> Teachers (Teacher Education)
Chair: Tetsuo Isozaki (Hiroshima University)

[26O1F-1] *The Predictive Effects of Teacher-Level Factors on TIMSS Grade 8 Students' Science Achievement: A Comparative Study between Malaysia and Singapore (A0001)*
Yoon Fah Lay (Universiti Malaysia Sabah), Khar Thoe Ng (SEAMEO RECSAM), Chwee Hoon Khoo (Teacher Education Institute Kent Campus): (Malaysia)

[26O1F-2] *Bird's eye view on science: Pre-service science teachers' representations of nature of science (A0015)*
Ebru Kaya (Bogazici University), Sibel Erduran (National Taiwan Normal University/University of Limerick): (Turkey)

[26O1F-3] *A qualitative study on effectiveness of educative mentoring during teaching practice in schools (A0073)*
Takuya Ochi (Hiroshima University), Tetsuo Isozaki (Hiroshima University): (Japan)

<1G> Teaching/Learning (Learners)
Chair: Mijung Kim (University of Alberta)

[26O1G-1] *A Study of Inquiry-Based Instruction Integrated with Information Literacy to Improve Students' Learning of the Concept of Mini Ecosystem (A0021)*
Jia-Hong Lin (National Sun Yat-sen University), Jia-Ying Lin (Taipei School For Hearing Impaired), Shu Ching Yang (National Sun Yat-sen University): (Taiwan)

[26O1G-2] *Children's reasoning as social action (A0024)*
Mijung Kim (University of Alberta): (Canada)

[26O1G-3] *Comparing Cognitive and Affective Effects between Drill & Practice and Role-playing Models in Playing Fire Games. (A0319)*

Jon-Chao Hong (National Taiwan Normal University), Ming-Chun Tsai (National Taiwan Normal University): (Taiwan)

<1H> ICT
Chair: Jiwon Lee (Korea National University of Education)

[26O1H-1] *Mobilised Learning – How Investigative Approach and Mobile Technologies Empowers the Learners for Deeper Learning – Two Case Studies: A class of 10 year-olds Primary Science students and a class of 13 year-olds Secondary Mathematics students from two diff (A0326)*
Nai Shun Nelson Chong (Ministry of Education): (Singapore)

[26O1H-2] *Collaborative Knowledge Construction using an Online Annotation System (A0466)*
Jiwon Lee (Korea National University of Education), Eric Mazur (Harvard University): (Korea)

[26O1H-3] *Study on roles of smart devices on model-based learning in elementary geo-science class (A0198)*
Eunjin Jang (Seoul National University), Chan-Jong Kim (Seoul National University), Seung-Urn Choe (Seoul National University): (Korea)

[26O1H-4] *Flipped classrooms: An instruction embedded with multiple mode representation in enhancing understanding of elimination reaction mechanism among Pre University students. (A0248)*
Sheila Shamuganathan (Penang Matriculation College), Mageswary Karpudewan (University Sains Malaysia), Sumathi Ganasen (Surya College): (Malaysia)

<1I> Curriculum/Assessment/Policy
Chair: Bing Wei (University of Macau)

[26O1I-1] *School Science Teaching and Learning in Macau: Problems and Challenges (A0118)*
Bing Wei (University of Macau): (Macau)

[26O1I-2] *A Study on the Conceptual Understanding of "Rainfall Phenomena and Related Conceptions" on Fourth-grade Students and their Teachers (A0162)*
Gaixiao Zhou (Beijing Normal University), Cheng Liu (Beijing Normal University), Enshan Liu (Beijing Normal University): (China Mainland)

[26O1I-3] *A Study on Method of Trend Researches using R (A0551)*
Seok-Hyun Ga (Seoul National University), Eunjin Jang (Seoul National University), Chan-Jong Kim (Seoul National University), Seung-Urn Choe (Seoul National University): (Korea)

[26O1I-4] *A comparative study of science teachers' beliefs on lessons between Japan and England (A0300)*
Susumu Nozoe (University of Miyazaki), Tetsuo Isozaki (Hiroshima University): (Japan)

<1J> Informal Settings
Chair: Nelson C. C Chen (National Kaohsiung Normal University)

[26O1J-1] *An Empirical Edutainment to Enhance the Motivation of Science Learning (A0606)*
Nelson C. C Chen (National Kaohsiung Normal University), Chia-Ju Liu (National Kaohsiung Normal University), Young Shin Park (Chosun university): (Taiwan)

[26O1J-2] *Role Playing of Science News Production: An Innovative Approach of Science Teaching to Develop Information Searching, Oral and Visual Presentation Skills in Taiwanese Junior High School Authors: (A0600)*
Hsiang-Hu Liu (National Taiwan Normal University), Yu-Feng Wu (National Taiwan Normal University), Chun-Yen Chang (National Taiwan Normal University), Yu-Hsuan Chien (National Taiwan Normal University): (Taiwan)

[26O1J-3] *Study on young children's scientific experiences in rural areas (A0205)*
Shinsho Tamayama (Ehime University), Manabu Sumida (Ehime University), Heiwa Muko (Ehime University): (Japan)

[26O1J-4] *Teaching Biology in the Context of Cultural Presentation: A Case Study (A0019)*
Fernan Peniero Tupas (Northern Iloilo Polytechnic State College): (USA)

<1K> Curriculum/Assessment/Policy
Chair: Chia-Yu Wang (National Chiao Tung University)

[26O1K-1] *Tracer Study of BSMT and BSMarE Graduates of the College of Maritime Education of the University of Perpetual Help System DALTA (A0067)*
Angelo Magdangal Acleta Maderal (University of Perpetual Help System DALTA): (The Philippines)

[26O1K-2] *Better way to elicit thinking process? Comparing concurrent and cued retrospective reporting techniques (A0136)*
Chia-Yu Wang (National Chiao Tung University), Ke-Wei Lee (National Chiao Tung University), Chih-Shen Hsu (National Chiao Tung University): (Taiwan)

[26O1K-3] *The study of contents and sequences in Taiwan science textbooks via Graphic Structure Analysis (GSA) - Using the concepts of microscopic particles and phase transitions as an example (A0079)*
Wen-Ling Wu (National Academy for Educational Research): (Taiwan)

[26O1K-4] *Biology investigations in senior secondary classes of Hong Kong (A0139)*
Lau Kwok-chi (The Chinese University of Hong Kong): (Hong Kong)

<1L> Curriculum/Teaching Materials
Chair: Shih-Hui Hsiao (National Taipei University of Education)

[26O1L-1] *Development of 3P(Play-Plan-Puzzle) teaching module to improve learning achievements and argumentation ability of medium-low achievement fifth graders studying in plant unit of nature study (A0120)*
Shih-Hui Hsiao (National Taipei University of Education), Hui-Lun Huang (National Taipei University of Education), Yu-Yen Chiang (National Taipei University of Education): (Taiwan)

[26O1L-2] *A Comparative Study of Matter in Chinese Physics Curriculum Standards and NGSS: Based on Learning Progression (A0260)*
Yi Yang (Beijing Normal University), Yu-ying Guo (Beijing Normal University): (China Mainland)

[26O1L-3] *The use of "Pokemon" to enhance learning of taxonomy in biology (A0419)*
Tao-Jen Yang (National Changhua University of Education/National Hemei Experimental School), Meichun Lydia Wen (National Changhua University of Education): (Taiwan)

[26O1L-4] *Developing, Implementing and Promoting Argumentation Training for High School Curriculum in Taiwan (A0585)*
Yi-Pei Tang (National Taiwan Normal University), Yi-Wen Hung (The Affiliated Senior High School of National Taiwan Normal University), Ying-Shao Hsu (National Taiwan Normal University): (Taiwan)

Oral 2 (26th, 15:00-16:00)

<2A> Learners (Teaching/Learning)
Chair: Yu-Ta Chien (National Taiwan Normal University)

[26O2A-1] *Development of an instrument to examine Engagement*

and Participation in Classroom – Science (EPIC-S) (A0441)
Wanjoo Ahn (Seoul National University), Hye-Eun Chu (Macquarie University), Sonya N Martin (Seoul National University), Yu-Ta Chien (National Taiwan Normal University), Chun-Hui Jen (National Taiwan Normal University), Chun-Yen Chang (National Taiwan Normal University): (Korea)

[26O2A-2] *Toward an understanding of students' verbal and non-verbal participatory practices in the science classroom (A0442)*
Yu-Ta Chien (National Taiwan Normal University), Chun-Hui Jen (National Taiwan Normal University), Sonya N Martin (Seoul National University), Hye-Eun Chu (Macquarie University), Wanjoo Ahn (Seoul National University), Chun-Yen Chang (National Taiwan Normal University): (Taiwan)

[26O2A-3] *Comparison of science classroom environment and culturally sensitive factors of science learning between Thailand and Korea (A0443)*
Jina Chang (Seong-il Elementary School), Chatree Faikhamta (Kasetsart University), Jiyeon Na (Chuncheon National University of Education), Jinwoong Song (Seoul National University): (Korea)

<2B> Teacher Education (Teaching/Learning)
Chair: Siriphan- Satthaphon (Kasetsart University)

[26O2B-1] *The promotion of preservice science teachers' PCK for teaching inquiry through video reflection. (A0159)*
Siriphan- Satthaphon (Kasetsart University), Pattamaporn- Pimthong (Kasetsart University), Teerasak- Verapaspong (Kasetsart University): (Thailand)

[26O2B-2] *Inquiry-based Teaching for Scaffolding Thai Students' Practice of PISA Scientific Competencies: Lesson Learned from Preservice Teachers' Action Research Projects (A0183)*
Jeerawan Ketsing (Kasetsart University), Chatree Faikhamta (Kasetsart University), Akarat Tanak (Kasetsart University): (Thailand)

[26O2B-3] *Analyzing the relationship between teacher's questions, time, and student responses (A0509)*
Sungho Kim (Bukyeseo elementary school): (Korea)

<2C> Integrated (SSI, EE, ESD)
Chair: Ah-Nam Lay (The National University of Malaysia)

[26O2C-1] *The Attempt of Identification Experience with Nature to Develop Attitudes of Loving Nature in Japanese High School Biology: Based on the Practice of Deep Ecology Work (A0297)*
Yoko Yamamoto (The University of Tsukuba): (Japan)

[26O2C-2] *Enhancing Korean Middle School Students' key Competencies through Collective (A0458)*
yunhee Choi (Soong moon Middle School), Hyunju Lee (Ewha Womans University), Yeonjoo Ko (Ewha Womans University): (Korea)

[26O2C-3] *The Effect of MyKimDG Module on Students' Achievement and Motivation in Chemistry (A0349)*
Ah-Nam Lay (The National University of Malaysia), Kamisah Osman (The National University of Malaysia): (Malaysia)

<2E>STEM
Chair: Kenichiro Mori (Hokkaido University of Education)

[26O2E-1] *The "technology" element in the primary science education in China and Suggestions of "Design and Technology" Courses in Primary Schools (A0156)*
Qi Kang (Beijing Institute of Education/ Capital Normal University), Bangping Ding (Capital Normal University): (China Mainland)

[26O2E-2] *STEM Habits of Mind; Its Meaning and Components (A0052)*
Anongnat- Karunram (Srinakharinwirot University), Pinit- Khumwong (Srinakharinwirot University), Teerawat- Prakobphon (King Mongkut's Institute of Technology Ladkrabang): (Thailand)

[26O2E-3] *Proposal of the Concept of implementing STEM Education in Japanese middle schools (A0368)*
Kenichiro Mori (Hokkaido University of Education), Akihide Kayano (Shimane University), Dan Takahashi (Nusamai Lower Secondary School), Satoshi Fujikawa (Hokkaido University of Education): (Japan)

<2F> Historical/Philosophical/Sociological/Cultural/Gender Issues
Chair: Sibel Erduran (National Taiwan Normal University/ University of Limerick)

[26O2F-1] *Infusing epistemic practices in chemistry curricula: A theoretical framework (A0014)*
Sibel Erduran (National Taiwan Normal University/ University of Limerick), Ebru Kaya (Bogazici University): (Ireland)

[26O2F-2] *A historical case study on educating 'a love of nature (shizen)' in Rika (School science) in lower grades in elementary schools in Japan: Focusing on the Elementary School Attached to Hiroshima Higher Normal School (A0083)*
Masako Yamada (Hiroshima University), Tetsuo Isozaki (Hiroshima University): (Japan)

[26O2F-3] *Explicit-reflective teaching Chinese Junior high school students conception of NOS (A0244)*
Xiao Huang (Zhejiang Normal University): (China Mainland)

<2G> Curriculum/Assessment/Policy (STEM)
Chair: Rei Kato (Tokyo University of Science)

[26O2G-1] *Study for the Basis of Designing Biology Education in Undergraduate Education from Students' Learning Experiences in Senior High Schools (A0076)*
Rei Kato (Tokyo University of Science), Kazuo Kitahara (Tokyo University of Science): (Japan)

[26O2G-2] *3D printed small animal's water server as experimental tools of atmospheric pressure (A0158)*
Katsunori Kanahara (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26O2G-3] *Simple analogical tool for teaching electrophoresis (A0374)*
Katsuki Izumi (Tokyo University of Science), Msaharu Takemura (Tokyo University of Science): (Japan)

<2H> Mathematics Education
Chair: Akio Matsuzaki (Saitama University)

[26O2H-1] *On the Mathematics of Hair Braiding (A0012)*
Dolly Rose Flores Temelo (West Visayas State University), Jolly Ann Blanco (West Visayas State University), Ana Mae Inocencio (West Visayas State University), Alfria Margarejo (West Visayas State University), Arje Jun Valzado (West Visayas State University), Mark Anthony Vargas (West Visayas State University): (The Philippines)

[26O2H-2] *Teaching Concepts and Use of High-Order Cognitive Strategies in Mathematics among Secondary School Teachers (A0108)*
Effandi Zakaria (Universiti Kebangsaan Malaysia), Norhidayah Addenan (Universiti Kebangsaan Malaysia), Siti Mistima Maat (Universiti Kebangsaan Malaysia), Norazah Mohd Nordin (Universiti Kebangsaan Malaysia): (Malaysia)

[26O2H-3] *A Consideration of Modelling Evaluation with Referring Functions of ICTs: Modelling Workshops Using Graphing Calculator with LEGO®MINDSTORM®EV3 (A0527)*
Akio Matsuzaki (Saitama University), Kosuke Tsukahara (Saitama

University): (Japan)

<2J> Informal Settings
Chair: Pin-Hsuan Wu (National Taiwan Normal University)

[26O2J-1] *Using Multiple Teaching Strategies to Improve In-service Teachers' Understanding of Buoyancy and Ship Stability. (A0132)*
Tso-Chung Sung (National Museum of Marine Science & Technology/National Taiwan Ocean University), Chia-Cheng Yeh (National Museum of Marine Science & Technology), Min-I Lin (National Museum of Marine Science & Technology), Wen-Jian Su (National Museum of Marine Science & Technology), Li-Shu Chen (National Museum of Marine Science & Technology): (Taiwan)

[26O2J-2] *Science Edu-communication: An exploration of the impact of science education initiated television news on learners' perceived Awareness, Enjoyment, Interest, Opinion Formation, and Understanding (AEIOU) (A0161)*
Pin-Hsuan Wu (National Taiwan Normal University), Leon Yu-Feng Wu (National Taiwan Normal University), Chun-Yen Chang (National Taiwan Normal University): (Taiwan)

[26O2J-3] *Cool Japan's science culture (A0401)*
Masataka Watanabe (University of Tsukuba), Tsuyoshi Hosoya (National Museum of Nature and Science): (Japan)

<2K>Curriculum/Teaching Materials
Chair: Alan Hase (Saitama Institute of Technology)

[26O2K-1] *Introduction of "Problem-solving Game Activities" into Science Education (A0045)*
Alan Hase (Saitama Institute of Technology): (Japan)

[26O2K-2] *Simplified electrophoresis apparatus developed for effective teaching practices in high school biology class (A0180)*
Masashi Kurabayashi (Numata Girls' H. S./Tokyo University of Science), Masaharu Takemura (Tokyo University of Science): (Japan)

[26O2K-3] *Activities and Research for Attracting Girls and School Teachers to Physics by LADY CATS and Science Teachers Groups (A0204)*
Haruka Onishi (Higashiharima High School), Masako Tanemura (Osaka Kyoiku University), Kyoko Ishii (Tamagawa University), Fumiko Okiharu (Niigata University), Hiroshi Kawakatsu (Meijo University): (Japan)

<2L> Learners (Teaching/Learning)
Chair: Chanat Intakanok (Chulalongkorn University)

[26O2L-1] *The Study of Game Competitive Anxiety, Gameplay Interest, Gameplay Self-Efficacy and Metacognition Related to the Performance of Covariation Reasoning (A0211)*
Jon-Chao Hong (National Taiwan Normal University), Chiung-Hua Chan (National Taiwan Normal University): (Taiwan)

[26O2L-2] *Enhancing Scientific Attitudes and Problem Solving in Middle School Students through Case-based Learning. (A0398)*
Chanat Intakanok (Chulalongkorn University): (Thailand)

[26O2L-3] *Poor verbal and visuospatial working memory of students induces modality specific errors in science learning (A0538)*
Yuki Harada (Hokkaido University/JSPS Research Fellow), Makoto Suzuki (Hokkaido University): (Japan)

Oral 3 (27th, 09:00-11:00)

<3A> Learners (Teaching/Learning)
Chairs: Hsiao-Ching She (National Chiao Tung University), Chang Fui Seng (Universiti Sains Malaysia)

[27O3A-1] *Designing a long-term weekend science camp for middle school students in rural area (A0044)*
Huei Chih Chang (National Taiwan Normal University), Wen Hua Chang (National Taiwan Normal University): (Taiwan)

[27O3A-2] *Use Eye Tracker to Explore Science and Non-Science major Students' Online Scientific Literacy Assessments (A0273)*
Ting-Ting Yang (National Chiao Tung University, ROC), Hsiao-Ching She (National Chiao Tung University), Pei-Yi Tsai (National Chiao Tung University): (Taiwan)

[27O3A-3] *Assessment in Chemistry and The Role of Higher Order Thinking Skills (A0310)*
Chang Fui Seng (Universiti Sains Malaysia), Mageswary Karpudewan (Universiti Sains Malaysia): (Malaysia)

[27O3A-4] *Exploring the characteristics of 5th & 6th-grade students' misconception about acids and bases (A0541)*
Yangsub Jung (Seoul National University of Education), Shinho Jang (Seoul National University of Education): (Korea)

[27O3A-5] *Investigating high school students' Chemistry Representation Competences (CRC) – Understanding properties and structures of covalent substances (A0497)*
Zhijun Xu (University of Hong Kong), Maurice M. W. Cheng (University of Hong Kong): (Hong Kong)

<3B> Teacher Education (Teachers)
Chairs: Ebru Kaya (Bogazici University), Wei Yan Ling (Beijing Normal University)

[27O3B-1] *Nature of science in pre-service teacher education: Learning to teach epistemic practices of chemistry (A0016)*
Ebru Kaya (Bogazici University), Sibel Erduran (National Taiwan Normal University/ University of Limerick): (Turkey)

[27O3B-2] *Analysis on Factors Affecting the Result of the Process Skills Test in Science of Science Teachers (A0559)*
Irene G Dela Cruz (Carmona Elementary School), Digna B Marquez (Milagrosa Elementary School): (The Philippines)

[27O3B-3] *What are the Differences between Japanese and German Forest Kindergarten Teachers' Qualification?: Comparison of their Institution Numbers and Learning Places and Contents (A0169)*
Mina Goto (University of Tsukuba): (Japan)

[27O3B-4] *In-Service Training of Science Teachers in the "Diagnosis-Design-Implementation-Evaluation" Model (A0237)*
Wei Yan Ling (Beijing Normal University), Wang Lei (Beijing Normal University): (China Mainland)

[27O3B-5] *Study on the Composition and Evaluation of Pre-serve Chemistry Teachers' Instructional Design Capability (A0483)*
Jiuhua Hu (Beijing Normal University), Xuan Wang (Beijing Normal University), Liqin Yuan (Beijing Normal University): (China Mainland)

<3C>Learners (Curriculum/Assessment/Policy
Chairs: Jiwon Lee (Korea National University of Education), Sang Sang Liew (University Sains Malaysia)

[27O3C-1] *Science for Citizenship Model (SCM): Assessing the effects of benefits, risks, and trust for predicting students' interest in science-related content (A0103)*
Brady Michael Jack (National Sun Yat-sen University), Ling Lee (National Sun Yat-sen University), Kuay-keng Yang (National Sun Yat-sen University), Huann-shyang Lin (National Sun Yat-sen University): (Taiwan)

[27O3C-2] *The Survey and Analysis of Grade Eight Students' Understanding about the Concept of Global Warming (A0172)*
Jing Lin (Beijing Normal University): (China Mainland)

[27O3C-3] *A Comparative Study on Scientific Integrity, Perception of Scientific Misconduct and Requests of the Research Ethics Education between Korean and Japanese Gifted Students (A0383)*
Jiwon Lee (Korea National University of Education), Jung Bog Kim (Korea National University of Education), Tetsuo Isozaki (Hiroshima University): (Korea)

[27O3C-4] *Identifying Junior High School Students' Misconceptions about Characteristics of States of Matter in Cambodia (A0413)*
Sreypouv Ouch (Hiroshima University): (Cambodia)

[27O3C-5] *Assessing Students' Physics Practical Skills Using Two Different Modes of Assessment (A0467)*
Sang Sang Liew (University Sains Malaysia), Hooi Lian Lim (University Sains Malaysia): (Malaysia)

[27O3C-6] *Thailand – Japan Comparative Survey on Motivational Factors for Studying Science by Lower-Secondary Students (A0572)*
Yasushi Ogura (Saitama University), Prachanant Benyapa (Chitralada School): (Japan)

<3D> Learners

Chairs: Jennifer Yeo (Nanyang Technological University), Wang Kuo Hua (National Changhua University of Education)

[27O3D-1] *Argumentation level in On-line Argumentation among Cram School Students (A0097)*
Ku Chien Fang (National Changhua University of Education), Yu Shu Mey (National Taichung University of Education), Wang Kuo Hua (National Changhua University of Education): (Taiwan)

[27O3D-2] *Mental Thinking Training for Attendees during Liquid Nitrogen Experiments Show (A0350)*
Tengfei Ye (Beihang University), Hua Tian (Beihang University,): (China Mainland)

[27O3D-3] *The Examination of Impact of Interest in Science of School Stage on Adults' Scientific Literacy - Focusing on Decision-Making and Relevant Components- (A0086)*
Shotaro Naganuma (Kyoto University): (Japan)

[27O3D-4] *Examining Students' Constructed Explanations in Thermal Physics (A0333)*
Jennifer Yeo (Nanyang Technological University), Xiu Wen Tay (Nanyang Technological University): (Singapore)

[27O3D-5] *Investigating science high school 1st year students' identity shift through R&E participation (A0503)*
Minjoo Lee (Seoul National University), Heui-baik Kim (Seoul National University): (Korea)

[27O3D-6] *The Comparison of Scientific Communication of Elementary Students in Mongolia and Korea (A0560)*
Seongsoo Jeon (Hoewon Elementary School), Kwang-Tek Oh (JangJae Elementary School), NamGwon Back (Cinju National University of Education), Jong-Ho Park (Chinju National University of Education): (Korea)

<3E> ASTE Session 1

Chairs: Winnie Wing Mui So (The Education University of Hong Kong), Todd M Milford (University of Victoria)

[27O3E-1] *Professional Development of the Public School Teachers in Japan the reflection (A0525)*
Tomoki Saito (Shizuoka University): (Japan)

[27O3E-2] *STEM Education in Bangladesh: Science Teachers Readiness to Make the Transformation (Bangladesh)(A0428)*
Kazi K Shahidullah (University of Nevada, Reno): (USA)

[27O3E-3] *Analysis of STEM activities in Hong Kong primary students' inquiry projects (A0104)*
Winnie Wing Mui So (The Education University of Hong Kong): (Hong Kong)

[27O3E-4] *The Prospect of Establishing the STEM Education Community in Malaysia: Recent Development in STEM and the Way Forward (A0192)*
Muhammad Abd Hadi Bin Bunyamin (University of Minnesota/ Universiti Teknologi Malaysia), Corrienna Binti Abdul Talib (Universiti Teknologi Malaysia), Johari Bin Surif (Universiti Teknologi Malaysia), Nor Hasniza Binti Ibrahim (Universiti Teknologi Malaysia), Nor Farahwahidah Bin Abdul Rahman (Universiti Teknologi Malaysia): (Malaysia)

[27O3E-5] *STEM in Early Childhood Education: Findings from a Canadian Case Study (A0330)*
Todd M Milford (University of Victoria), Christine D Tippett (University of Ottawa): (Canada)

[27O3E-6] *Needs for STEAM Education Models to Support Science Teachers (A0210)*
Hyunju Lee (Ewha Womans University): (Korea)

<3F> Curriculum/Teaching Materials

Chairs: Maurice M.W. Cheng (The University of Hong Kong), Jia-Ying Lin (National Taiwan Normal University)

[27O3F-1] *How students react to the analogies from textbooks (PEP) in China (A0304)*
Xin Yun Cheng (Sichuan Normal University), Wei Wang (Sichuan Normal University), Jing Yu Xiang (Xuan Han High School): (China Mainland)

[27O3F-2] *A Comparison of the Effectiveness of Animation and Augmented Reality in the Learning of the Concept of DNA (A0356)*
Jia-Ying Lin (National Taiwan Normal University), Chun-Mei Hu (Academia Sinica), Jia-Hong Lin (National Sun Yat-sen University), Mei-Hung Chiu (National Taiwan Normal University): (Taiwan)

[27O3F-3] *Developing understanding of image formation through the luminous ray model mediated by virtual simulation and physical experimentation (A0388)*
Hong-Syuan Wang (National Taiwan Normal University), Miao-Hsuan Yen (National Taiwan Normal University), Sufen Chen (National Taiwan University of Science and Technology): (Taiwan)

[27O3F-4] *The application of universal design for learning in elementary school science class. : Focused on the level control for visually-handicapped Elementary Students (A0489)*
Kwang-Tek Oh (Jangjae Elementary School), Seongsoo Jeon (Hoewon Elementary School), NamGwon Back (Chinju National University of Education), Jong-Ho Park (Chinju National University of Education): (Korea)

[27O3F-5] *Strategies for introducing the particle view of matters – cognitive conflicts, practical activities, multiple representations and assessment for learning (A0543)*
Maurice M.W. Cheng (The University of Hong Kong) : (Hong Kong)

[27O3F-6] *Enhancing students' learning achievement and argumentation ability by hand-on experiment integrated with argumentation procedure (A0058)*
Huei-Ying Ho (National Taipei University of Education), Yu-Ling Lu (National Taipei University of Education: (Taiwan)

<3G> Curriculum/Assessment/Policy

Chairs: Atsushi Yoshida (Nagoya Gakuin University), Yau Yuen Yeung (The Education University of Hong Kong)

[27O3G-1] *The analysis of the meaning of Science core Competency Education(SCE) in the Next Science Curriculum (A0339)*

Heein Chae (Gyeongin National University of Education), Sukgoo Noh (Gyeongin National University of Education): (Korea)

[27O3G-2] *What does "lesson study" carry for science education research? (A0119)*
Atsushi Yoshida (Nagoya Gakuin University), Shoju Tonishi (Aichi University of Education), Young Tae Kong (Chinju National University of Education), Mei-Yu Chang (National Hsinchu University of Education), Alice Siu Wong (The University of Hong Kong): (Japan)

[27O3G-3] *The Cultivation of Outstanding Chemistry Teachers: Teaching Strategy Design and The Characterization of Such Design (A0301)*
SU Lin (Shaanxi Normal University): (China Mainland)

[27O3G-4] *PISA science framework driven analysis of Chinese National Primary Science Curriculum (A0574)*
Yan Wang (University of Helsinki), Jari Lavonen (University of Helsinki), Kirsi Tirri (University of Helsinki): (Finland)

[27O3G-5] *Development of a new dual major science teacher education programme in Hong Kong: Approaches and implications for STEM education (A0604)*
Yau Yuen Yeung (The Education University of Hong Kong): (Hong Kong)

<3H> ICT
Chair: Chin-Cheng Chou (National Taipei University of Education),

[27O3H-1] *Explore the Effectiveness of Science Remedial Teaching for Fourth and Fifth Grade Students via Video and Plickers (A0605)*
Chin-Cheng Chou (National Taipei University of Education), Li-Chi Chiu (YungAn Elementary school): (Taiwan)

[27O3H-2] *Development of a self-made and self-measuring Arduino-based measuring device, date logger (A0175)*
Kazumitsu Sakurai (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science), Katsunori Kanahara (Tokyo University of Science): (Japan)

[27O3H-3] *Enhancing science learning with BYOD (Bring Your Own Device) in a primary school in Hong Kong (A0277)*
Yanjie Song (The Education University of Hong Kong), Daner Sun (The Education University of Hong Kong): (Hong Kong)

[27O3H-4] *The development process of the Liquid Shooter program with Bitbrick sensors (A0593)*
Yun Hee Choi (Soongmoon Middle school), Hong Nyung Kim (Soongmoon Middle school), Dong Ho Kim (Soongmoon Middle school), Jae Won Yoon (Soongmoon Middle school): (Korea)

<3I> Integrated (SSI, EE, ESD)
Chairs: Hye-Eun Chu (Macquarie University), Nina Christenson (Karlstad University)

[27O3I-1] *Using ePCK as a framework for examining elementary teachers' professionalization of teaching in a graduate level Interdisciplinary Environmental Education program (A0082)*
Young Joo Lee (Seoul National University), Hye-Eun Chu (Macquarie University), Sonya N Martin (Seoul National University): (Korea)

[27O3I-2] *Examining the effectiveness of using children's picture books in an English as Foreign Language (EFL) classroom to teach Education for Sustainable Development (ESD) concepts to elementary school students (A0440)*
Ga-Young Song (Seoul National University), Hye-Eun Chu (Macquarie University), Sonya N Martin (Seoul National University): (Korea)

[27O3I-3] *Exploring the influence of Korean and Australian students' science capital on conceptual understanding and modeling processes (A0439)*
Hyung Kyu Ku (Seoul National University), Hye-Eun Chu (Macquarie University), Seung-Urn Choe (Seoul National University), Sonya N Martin (Seoul National University): (Australia)

[27O3I-4] *Examining the impact of STEAM education on cross-cultural science learning with Australian and Korean elementary grade students (A0438)*
Hye-Eun Chu (Macquarie University), Kongju Mun (Ewha Women's University), Sonya N Martin (Seoul National University), Seung-Urn Choe (Seoul National University), Taesil Jeong (Seoul National University), Jinwoong Song (Seoul National University): (Australia)

[27O3I-5] *A framework for assessment of socio-scientific argumentation (A0054)*
Nina Christenson (Karlstad University): (Sweden)

[27O3I-6] *Exploring the Elements of Music in Creating Experiences of Scientific Concepts (A0407)*
Enrico Benjamin Natividad Reyes (Harris Memorial College): (The Philippines)

<3J> Informal Settings
Chairs: Yeh Jung-Hua (National Museum of Natural Science), Xerxes B Dulay (Harris Memorial College):

[27O3J-1] *The Role Identity of Science Museum's Curators should have: Much Educator than Scientist (A0372)*
Yeh Jung-Hua (National Museum of Natural Science): (Taiwan)

[27O3J-2] *How Can We Practice "Students' Science Practicing?" The Process of Students' Issue Identifying in Science Fair (A0135)*
Chang Hui Chuan (National Dong Hwa University), Lee Huei (National Dong Hwa University): (Taiwan)

[27O3J-3] *The effect of game-based learning on the marine environmental protection issue (A0312)*
Min-I Lin (National Museum of Marine Science & Technology), Keng-Hsuan Chang (National Museum of Marine Science & Technology), Chia-Cheng Yeh (National Museum of Marine Science & Technology): (Taiwan)

[27O3J-4] *The utility of the board game for structural concept of solar system and learning motivation : An astronomy board game for elementary school students (A0376)*
Ping-Han Cheng (National Taiwan Normal University), Ting-Kuang Yeh (National Taiwan Normal University), Chun-Yen Chang (National Taiwan Normal University): (Taiwan)

[27O3J-5] *Preliminary Exploration Of The Informal Science Learning Environment Questionnaire (A0397)*
Jen-Che Tsai (National Taiwan Normal University): (Taiwan)

[27O3J-6] *The Use of Alternative Materials for Hands On Approach in Science Education for Young Children (A0461)*
Xerxes B Dulay (Harris Memorial College): (The Philippines)

<3K> Teaching/Learning (Curriculum/Teaching Materials)
Chairs: Chuan Li (Beijing Normal University), Xiaomei Yan (University of Bristol)

[27O3K-1] *Explore one tertiary chemistry laboratory course from CHAT perspective (A0463)*
Xiaomei Yan (University of Bristol), Justin Dillon (University of Bristol): (UK)

[27O3K-2] *Teaching practice of "combustion" in Secondary School Chemistry class inspired by the scientific literacy insight of PISA (A0230)*
Chuan Li (Beijing Normal University), Kewen Liu (Beijing Normal University), Xiaoying Feng (Capital Normal University), Yan Zhu (Beijing Fangshan Teacher Training Schools), Lin Yan (The Fifth Middle School of Fangshan in Beijing): (China Mainland)

[27O3K-3] *Students' prior conceptions about knots (A0154)*
Wei-Min Sun (National Taiwan Normal University), Hak Ping Tam (National Taiwan Normal University): (Taiwan)

[27O3K-4] *A Comparative Analysis of Presentation of Equilibrium Concept in Chemistry Textbooks in the U.S. and China (A0430)*
Yuanyuan Fang (Beijing Normal University): (China Mainland)

[27O3K-5] *An Empirical Research on Implementation of Scientific Inquiry in Junior High School Science Teaching (A0247)*
Xiao Huang (Zhejiang Normal University), Wei Fang Bing (Zhejiang Normal University), Bao Cheng Cheng (Zhejiang Normal University): (China Mainland)

<3L> Learners (Teachers)
Chair: Chih-Hsiung Ku (National Dong Hua University)

[27O3L-1] *Science, language, and literacy: How to help students develop their reading understanding in the science classroom (A0315)*
Shih-Wen Chen (National Dong Hua University), CHIH-HSIUNG KU (National Dong Hua University), Wen-Jin Yang (National Taiwan Normal University): (Taiwan)

[27O3L-2] *Reflective thinking approach open Inquiry Learning Model and Experiment. (A0332)*
Chih Hsiung Ku (National Dong Hua University), Chou Yu Chin (National Dong Hua University), Laiu Pin Lan (National Dong Hua University): (Taiwan)

[27O3L-3] *Developing elementary students' inquiry skills in the situational interest-based inquiry lesson (A0129)*
Wen-Cheng Chen (Da Sing Primary School, Hualien), Chih-Hsiung Ku (National Dong Hua University): (Taiwan)

[27O3L-4] *Scaffolding the Concept of Density for Elementary School Students with Guided Inquiry Strategy. (A0131)*
Chih-hsiung Ku (National Dong Hwa University.), Chia-cheng Yeh (National Museum of Marine Science & Technology.), Tso-chung Sung (National Museum of Marine Science & Technology.), Li-shu Chen (National Museum of Marine Science & Technology.), Wen-Jian Su (National Museum of Marine Science & Technology.): (Taiwan)

[27O3L-5] *The Learner Autonomy of Remote Junior High School Students in Informal Science Program (A0227)*
Chia-cheng Shih (National Dong-Hwa University), Chih-Hsiung Ku (National Dong-Hwa University): (Taiwan)

Oral 4 (27th, 11:30-12:50)

<4A> Learners (Teaching/Learning)
Chair: Pattamaporn Pimthong (Kasetsart University)

[27O4A-1] *Longitudinal Impact of a Cooperative Inquiry-based Learning on Children's Images towards Scientists and Scientific Self-efficacy (A0077)*
Hsiang-Ting Chen (National Sun Yat-sen University), Hsin-Hui Wang (National Sun Yat-sen University), Zuway-R Hong (National Sun Yat-sen University): (Taiwan)

[27O4A-2] *A Study of Teaching for Conceptual Change in Primary Science (A0302)*
Pattamaporn Pimthong (Kasetsart University), Kritsada Sanguansin (Kasetsart University): (Thailand)

[27O4A-3] *The Analysis of Question Types between Multi-cultural Family Students and General Family Students in Elementary School Science Classes (A0510)*
HounTae Kang (Gyeongin National University of Education), SukGoo Noh (Gyeongin National University of Education): (Korea)

[27O4A-4] *Research about students' understanding of mole concept in high school students (A0474)*
Shunichiro Watanabe (Hiroshima University): (Japan)

<4B> Teachers
Chair: Hongming Ma (Federation University Australia)

[27O4B-1] *Exploring science teachers' use of narrative in teaching (A0010)*
Hongming Ma (Federation University Australia): (Australia)

[27O4B-2] *Differences in Pedagogical Content Knowledge between an Experienced teacher and a Beginning Teacher through Implementing Argumentation-based Inquiry (A0223)*
Chih-Yu Tsai (National Changhua University of Education), Ko-Hui Lu (National Changhua University of Education), Kuo-Hua Wang (National Changhua University of Education): (Taiwan)

[27O4B-3] *A transmission of science education (A0157)*
Kyouiti Sugiura (Hamana Junior High School), Shinya Ikeya (Hamana Junior High School), Takaya Tanaka (Hamamatsu Junior High School Attached to the Education Department of Shizuoka University), Yosuke Kominami (Shizuoka University), Keiichi Muraki (Hamamatsu Gakuin University 3-2-2 Nunohashi Naka-ku Hmamatusu 432-8012 Japan), Hitoshi Yamamoto (Shizuoka University): (Japan)

<4C> Learners (Teaching/Learning)
Chair: Takuya Matsuura (Hiroshima University)

[27O4C-1] *Integrating Musical Elements into Science Teaching to Explore Different Musical Intelligence and Naturalistic Intelligence Students' Science Learning Interest (A0573)*
Chi-Hang Chang (National Dong Hwa University), Jing-Wen Lin (National Dong Hwa University): (Taiwan)

[27O4C-2] *Students' Three Levels of Chemical Representation on Strong and Weak Acid-base Dissociation (A0598)*
Navara Seetee (Srinakharinwirot University), Chanyah Dahsah (Srinakharinwirot University), Richard K. Coll (The University of the South Pacific, Fiji), Manat Boonprakob (Srinakharinwirot University): (Thailand)

[27O4C-3] *Relationship between Scientific Reasoning and Critical Thinking by using Decision Tree model: the Theory of Buoyancy in Liquids (A0607)*
Takuya Matsuura (Hiroshima University): (Japan)

[27O4C-4] *The components and Characteristics Revealed at the Visualization Processes of Creative Science Problem-Solving (A0609)*
Jisoo Kim (Seoul National University of Education), Shinho Jang (Seoul National University of Education): (Korea)

<4D> Teacher Education
Chair: Ying Zhou (Beijing Institute of Education)

[27O4D-1] *The Training Models' Research of the Primary Science Teachers in Beijing Institute of Education (A0251)*
Qi Kang (Capital Normal University/Beijing Institute of Education), Jing Li (Beijing Institute of Education): (China Mainland)

[27O4D-2] *Learning-Program development for further understanding of radiation risk (A0265)*
Ayaka Maeda (Chiba University), Katsuo Sugita (Chiba University), Jun Nomura (Chiba University), Shoko Iida (Chiba University), Masaaki Iizuka (Chiba University), Kazuko Kita (Chiba University), Tetsuya Kato (Chiba University): (Japan)

[27O4D-3] *Analysis of the effects of university students who participated in science teacher internship abroad (A0311)*

Jun Nomura (Chiba University), Kyoko Yoshida (Adachi City Yanaka junior High school), Yoshiaki Yamano (Chiba University), Sapto Asharadianto (Chiba University), Ryugo Oshima (Chiba University), Satoko Baba (Chiba University), Beverley Home (Chiba University), Tomoyoshi Komiyama (Chiba University), Masaaki Iizuka (Chiba University), Yoshiya Itakura (Chiba University): (Japan)

[2704D-4] *The curriculum development of comprehensive practical courses in in-service teacher training based on STEM education (A0286)*
Ying Zhou (Beijing Institute of Education), Hua Feng (Beijing Institute of education), Liyan An (The Branch of Beijing No.13 Middle School), Guijun Ma (The High School Attached to Beijing Normal University), Mingxian Zhu (Beijing Zhou Koudian middle school), Lidong Wang (The Branch of Beijing No.5 Middle School), Leilei Shen (Beijing Institute of education), Jie Gao (The Branch of Beijing No.13 Middle School): (China Mainland)

<4E> ASTE Session 2
Chair: Yoshisuke Kumano (Shizuoka University)

[2704E-1] *Development of the theories to assess students' learning in a STEM Integrated Learning Environment (A0522)*
Tomoki Saito (Shizuoka University), Jin-Ichi Okumura (Shizuoka University), Shoko Sakata (Shizuoka University), Yoshisuke Kumano (Shizuoka University): (Japan)

[2704E-2] *Status Study on STEM Education Development and Results from Shizuoka STEM Education Trials 2014-2015 and Future Setting (A0520)*
Yoshisuke Kumano (Shizuoka University), Tomoki Saito (Shizuoka University), Jin-Ichi Okumura (Shizuoka University), Shoko Sakata (Shizuoka University), Naoko Kosaka (Shizuoka University), Lely Mutakinati (Shizuoka University): (Japan)

[2704E-3] *An Action-Research on the expansion of the biological knowledge and achievement of the scientific and engineering processes at the high school students in the learning of the avian embryonic experiment based on Bio-STEM perspective (A0353)*
Yoshisuke Kumano (Shizuoka University), Tomoki Saito (Shizuoka University): (Japan)

[2704E-4] *STEM Education for the Development of School Entrepreneurship: The Pilot Project in Thai Schools (A0346)*
Suparabhorn Subongkoj (The Institute for the Promotion of Teaching Science and Technology (IPST)): (Thailand)

<4F> Historical/Philosophical/Sociological/Cultural/Gender Issues
Chair: Eugene Kang (Pusan National University)

[2704F-1] *On the historical development and the pluralistic approach for the concept of electricity in secondary-school science (A0113)*
Eugene Kang (Pusan National University): (Korea)

[2704F-2] *Routes of secondary-school science textbooks from western countries to Korea via Japan and China in late 19th and early 20th centuries (A0114)*
Eugene Kang (Pusan National University): (Korea)

[2704F-3] *Physics education in Japan in the middle of Meiji Era effected by worldwide science educational innovation based on analysis of normal school students' notes (A0296)*
Fumiko Okiharu (Niigata University), Akizo Kobayashi (Niigata University), Keisuke Kamimura (Niigata University): (Japan)

[2704F-4] *The CHAT Analysis of Korean Science Teachers' Volunteer Service in Timor-Leste (A0217)*
Sungmin Im (Daegu University), JaeYoung Han (Chungbuk National University): (Korea)

<4H> Mathematics Education
Chair: Meichun Lydia Wen (National Changhua University of Education)

[2704H-1] *The Eye-Movement Behavior of Proof Validation in Abstract Algebra (A0225)*
Wei-Yang Chen (National Changhua University of Education), Meichun Lydia Wen (National Changhua University of Education): (Taiwan)

[2704H-2] *Flipped Teaching Approach in College Algebra: Cognitive and Noncognitive Gains (A0178)*
Maxima Joyosa Acelajado (De La Salle University-Manila): (The Philippines)

[2704H-3] *Proposal of learning support model using the reflection sheet in Secondary Mathematics Education -Attention to meta-learning skills- (A0298)*
Naoki Enomoto (Math Teacher (Junior High School) /Tokyo University of Science), Yuki Watanabe (Tokyo Institute of Technology), Minoru Itoh (Tokyo University of Science): (Japan)

[2704H-4] *Eye-movement analysis while solving Force Concept Inventory: a comparative study between Japan and Poland (A0243)*
Eizo Ohno (Hokkaido University), Rosiek Roman (Pedagogical University of Cracow), Miroslawa Sajka (Pedagogical University of Cracow, Poland), Michiru Iwata (Hokkaido University), Atsushi Shimojo (Hokkaido University): (Japan)

<4I> Curriculum/Assessment/Policy (Curriculum/Teaching Materials)
Chair: Manabu Sumida (Ehime University)

[2704I-1] *Evaluation of 'Science Project Research' as a Subject in Japan's Super Science High Schools (A0437)*
Yuki Ozawa (Ehime University), Manabu Sumida (Ehime University): (Japan)

[2704I-2] *Exploration on the Construction of Science Teaching Quality Monitoring System in Minority Areas of China (A0289)*
Boqin Liao (Southwestern University): (China Mainland)

[2704I-3] *The iHarris Academy Science-based Curriculum for Nurturing Gifted Potentials of Young Filipino Children (A0382)*
Greg Tabios Pawilen (Harris Memorial College): (The Philippines)

<4J> Communication/Engagement
Chair: Jianlan Wang (Texas Tech University)

[2704J-1] *Scrutinizing the Positions of Students and Teacher Engaged in Argumentation in a High School Physics Classroom (A0306)*
Jianlan Wang (Texas Tech University), Gayle A Buck (Indiana University): (USA)

[2704J-2] *Taiwan Students' Engagement in Science: Analysis of Data from PISA 2006 and 2015 Field Trial Test (A0212)*
Ya-Chun Chun (National Sun Yat-sen University), Huann-shyang Lin (National Sun Yat-sen University): (Taiwan)

[2704J-3] *Growing future citizens who survives scientific/technological society based on "Regulatory Science" (A0554)*
Midori Takahashi (Shizuoka Kita High School), Yuji Takagi (Shizuoka Kita High School), Kazunori Uchino (Shizuoka Kita High School): (Japan)

[2704J-4] *"Unless you can explain it to your grandmother": Voices from graduate students and their Professor regarding the course of science communication (A0226)*
Nadi Suprapto (National Dong Hwa University), Huei Hsuan Lin (National Dong Hwa University), Chih Hsiung Ku (National Dong Hwa

University), Te Sheng Chang (National Dong Hwa University): (Taiwan)

<4K> Teachers (Teacher Education)
Chair: Cedric Mpaso (Hiroshima University)

[27O4K-1] *A Conceptual Model for Understanding how PCK changes in Science Teachers (A0128)*
J Steve Oliver (The University of Georgia), Soonhye Park (North Carolina State University): (Georgia)

[27O4K-2] *Handling Experimental Data in Science Inquiry: Examining Teachers' "Thinking behind the Doing" (A0130)*
Muhammad Shahrin K S Moorthy (Academy of Singapore Teachers/ Ministry of Education): (Singapore)

[27O4K-3] *Perception of Science Teachers' on Student Centered Pedagogy Following Their Attendance to Continuous Professional Development (CPD) Trainings: A Case Study of Strengthening of Mathematics and Science in Secondary Education (SMASSE) INSET Malawi (A0393)*
Cedric Mpaso (Hiroshima University): (Japan)

<4L> Teaching/Learning (Teacher Education)
Chair: Yuxuan Xiang (Beijing Normal University)

[27O4L-1] *Connecting Biology to Real Life in a College Non-majors Course (A0194)*
Pradeep Maxwell Dass (Northern Arizona University): (USA)

[27O4L-2] *Learning-progression-based Teacher Professional Development: A Quasi-experiment Study in High School Physics (A0257)*
Yuxuan Xiang (Beijing Normal University), Yuying Guo (Beijing Normal University): (China Mainland)

[27O4L-3] *Investigate the influences of teachers' teaching beliefs in their instructional strategies (A0505)*
Ying Kuan (National Taiwan University of Science and Technology), Ya-Hui Hsieh (National Kaohsiung University of Applied Sciences), Jyh-Chong Liang (National Taiwan University of Science and Technology), Chin-Chung Tsai (National Taiwan University of Science and Technology): (Taiwan)

[27O4L-4] *A Study of Students' Views on Inquiry-Based Blended Learning Environmet for Computer Course (A0608)*
Yasemin Kahyaoğlu (Anadolu University), Ercan Akpınar (Dokuz Eylül University): (Turkey)

Oral 5 (28th, 09:00-11:00)

<5A> Learners (Teaching/Learning)
Chairs: Derek Cheung (The Chinese University of Hong Kong), Sungwon Kim (Ewha Womans University)

[28O5A-1] *The Effect of Messages Interference on Students' Creativity for Bags Design (A0089)*
Jian Hong Ye (National Taiwan Normal University), Jon Chao Hong (National Taiwan Normal University), Jing Yun Fan (Tainan University Technology), Hung Shun Huang (National Taiwan Normal University): (Taiwan)

[28O5A-2] *Analysis of elementary school students' understanding of light by conceptual metaphor theory (A0547)*
Jinkyu Jung (Pusan National University), Ji-Ae Lee (University of Ulsan), Youngmin Kim (Pusan National University): (Korea)

[28O5A-3] *The Development of Project based learning unit of solution process for grade 11 students (A0303)*
Patiwat Sritipsak (Kasetsart University), Pattamaporn Pimthong (Kasetsart University): (Thailand)

[28O5A-4] *How accurately can individual interest in science, situational interest, and science self-concept predict individual interest in school science for secondary school students? (A0167)*
Derek Cheung (The Chinese University of Hong Kong): (Hong Kong)

[28O5A-5] *The influence of affective Domain in the problem solving process in physics (A0523)*
Sungeun Lee (Ewha Womans University), Sungwon Kim (Ewha Womans University): (Korea)

<5B> Teacher Education (Teaching/Learning)
Chair: Hui-Ju Huang (California State University, Sacramento), Romklao Artdej (Khon Kaen University)

[28O5B-1] *Physics Teachers' Perceptions of Professional Development Program About Use of Animations and Simulations in Teaching (A0074)*
Mehmet Fatih Tasar (Gazi University), Duygu Yilmaz (Gazi University), Merve Lutfiye Senturk (Gazi University), Jale Ercan Dursun (Gazi University), Meltem Irmak (Gazi University): (Turkey)

[28O5B-2] *Envision science standards for STEM excellence (A0214)*
Hui-Ju Huang (California State University, Sacramento): (USA)

[28O5B-3] *Thai in-service teachers' competence in designing science learning activities to promote science process skills for primary school students (A0322)*
Chaninan Pruekpramool (Srinakharinwirot University): (Thailand)

[28O5B-4] *A Case Study of Improving Science Lesson Study Activity in a Pre-service Teacher Training Course (A0323)*
Tomokazu Yamamoto (Hyogo University of Teacher Education): (Japan)

[28O5B-5] *Case Studies on Pre-service Chemistry Teachers in Training Pedagogical Design of Model-based Instruction (A0347)*
Romklao Artdej (Khon Kaen University): (Thailand)

[28O5B-6] *Assessment analysis of mock science lessons of student teachers (A0452)*
Hironori Sasaki (Chugokugakuen University): (Japan)

<5C> Learners (Curriculum/Assessment/Policy)
Chairs: Jian Wang (Beijing Normal University), Sung-Youn Choi (Dongguk University)

[28O5C-1] *Exploring the Changes of Students' Cognitive Structure Based on HPS Teaching Strategy Measured through Word Association Tests (A0177)*
Qing Zhou (Shaanxi Normal University), Li Zhou (Shaanxi Normal University), Hui Gao (Shaanxi Normal University), Ya Fei Zhou (Shaanxi Normal University), Jun Chao Wei (Shaanxi Normal University): (China Mainland)

[28O5C-2] *Formative assessment in high school physics (A0126)*
Syoji Zeze (Yokote Seiryo Gakuin High School): (Japan)

[28O5C-3] *Exploration of Secondary School Students' Understanding about Crosscutting Concept (A0455)*
Yunhee Choi (Soongmoon Middle School), Sung-Youn Choi (Dongguk University): (Korea)

[28O5C-4] *Assessment of Grades 7-12 School Students' Scientific Reasoning Ability (A0558)*
Cong Wang (Beijing Normal University), Jian Wang (Beijing Normal University): (China Mainland)

[28O5C-5] *Seventh Grade Students' Mental Models of Blood Circulation Related to Exercise (A0602)*
Hui Tsung Cheng (National Dong Hwa University), Wen Jing Lin (National Dong Hwa University): (Taiwan)

<5D> Curriculum/Teaching Materials (Integrated (SSI, EE, ESD))

Chairs: Yanlan Wan (Shandong Normal University), Verena Pietzner (Oldenburg University)

[28O5D-1] *Chemistry of Fungi in Chemistry Classes of Lower and Upper Secondary Level (A0065)*
Verena Pietzner (Oldenburg University): (Germany)

[28O5D-2] *STSE education in three science textbooks of junior high school (A0603)*
Cheng Cheng Bao (Zhejiang Normal University), Bing lv (Zhejiang Normal University), Xiao Huang (Zhejiang Normal University): (China Mainland)

[28O5D-3] *What Major "Socio-Scientific Topics" Should Be Focused in Science Curriculum? A Delphi Study of the Expert Community in China (A0336)*
Yanlan Wan (Shandong Normal University), Hualin Bi (Shandong Normal University): (China Mainland)

[28O5D-4] *Comparison and Analysis of NOS in science textbooks of USA, Taiwan and mainland, China (A0596)*
Fang Bing Wei (Zhejiang Normal University), Qiao Lian Yi (Zhejiang Normal University), Xiao Huang (Zhejiang Normal University): (China Mainland)

[28O5D-5] *Analysis and suggestion: Scientific inquiry in three sets of textbooks (A0597)*
Zhi Feng Wu (Zhejiang Normal University), Xiao Huang (Zhejiang Normal University): (China Mainland)

<5E> STEM

Chairs: Harry Firman (Universitas Pendidikan Indonesia), Hyunju Lee (Ewha Womans university)

[28O5E-1] *Bringing Up STEM Education: Enrich Science Learning Source based on STEM Approach (A0534)*
Irma Rahma Suwarma (Universitas Pendidikan Indonesia), Harry Firman (Universitas Pendidikan Indonesia), Ari Widodo (Universitas Pendidikan Indonesia), Nuryani Rustaman (Universitas Pendidikan Indonesia), Ida Kaniawati (Universitas Pendidikan Indonesia): (Indonesia)

[28O5E-2] *Impact of non-formal integrated STEM education on students' interest towards STEM (A0482)*
Edy Hafizan Mohd Shahali (National University of Malaysia), Lilia Halim (National University of Malaysia), Mohamad Sattar Rasul (National University of Malaysia), Mohd Afendi Zulkifeli (National University of Malaysia): (Malaysia)

[28O5E-3] *The effect on group confidence and self-confidence on hands-on making technology contest (A0584)*
Jon-Chao Hong (National Taiwan Normal University), Chi-Ruei Tsai (National Taiwan Normal University), Kai-Wen Tai (National Taiwan Normal University): (Taiwan)

[28O5E-4] *Integrated STEM Through Project Oriented Problem Based Learning (PoPBL) in RBK-Energy Module: Level of Scientific Creativity Among Students in Grade 2 (A0589)*
Mohd Afendi Zulkifeli (National University of Malaysia), Lilia Halim (National University of Malaysia), Mohamad Sattar Rasul (National University of Malaysia), Edy Hafizan Mohd Shahali (National University of Malaysia): (Malaysia)

[28O5E-5] *STEM Education in Secondary Schools in Sri Lanka: Trends and Challenges (A0006)*
Aregamalage Sujeewa Vijayanthi Polgampala (Huazhong University of Science & Technology), Shen Hong (Huazhong University of Science & Technology), Fang Huang (Huazhong University of Science & Technology): (China Mainland)

[28O5E-6] *College Students' Conceptions of Nature of Technology (A0207)*
Hyunju Lee (Ewha Womans university): (Korea)

<5F> Historical/Philosophical/Sociological/Cultural/Gender Issues

Chairs: Shu-Fen Lin (National Changhua University of Education), Suhanna Binti Zainudin (Universiti Kebangsaan Malaysia)

[28O5F-1] *High Order Thinking Skills: Preparing a lesson plan with lesson study approach for Biology (A0371)*
Suhanna Binti Zainudin (Universiti Kebangsaan Malaysia), Zanaton Binti Iksan (Universiti Kebangsaan Malaysia): (Malaysia)

[28O5F-2] *Design a Teacher Facilitation Program to improve college teachers' professional development in science teaching (A0488)*
Cheng-Hong Yang (National Kaohsiung University of Applied Sciences), Ya-Hui Hsieh (National Kaohsiung University of Applied Sciences): (Taiwan)

[28O5F-3] *Elementary School Teachers Motivation and Difficulties Met in the Implementation of Lesson Study (A0576)*
Juan Gepullano (Department of Education), Jonny Bernas Pornel (University of the Philippines Visayas): (The Philippines)

[28O5F-4] *Validation of an Instrument and Exploring for Assessing Science Teachers' Views of Inquiry Teaching (A0185)*
Shu-Fen Lin (National Changhua University of Education): (Taiwan)

[28O5F-5] *The Research on Pre-service Chemistry Teachers' PCK Development by Case of Micro Teaching Curriculum (A0581)*
Wenhua Zhang (Central China Normal University), Dan Ji (Central China Normal University), Di Liu (Central China Normal University), Zuhao Wang (East China Normal University): (China Mainland)

<5G> Learners (Curriculum/Teaching Materials)

Chairs: Pei-Chi Chen (National Taiwan Normal University), Cindy Chyee Chen Wong (The National University of Malaysia)

[28O5G-1] *11th graders' problem-solving performances, self-efficiency and perceptions about physics problems with different representational formats (A0149)*
Hung Ching Sui (National Taiwan Normal University), Wu Hsin Kai (National Taiwan Normal University): (Taiwan)

[28O5G-2] *Exploring the misconceptions of students (A0305)*
Wei Wang (Sichuan Normal University), Xia Wu (Sichuan Normal University), Yu Jing Xiang (Xuanhan Middle School): (China Mainland)

[28O5G-3] *The Effects of Learning Outside the Classroom (LOC) Science Module on Academic Achievement and Intrinsic Motivation of Marginalized Learners in Malaysia (A0348)*
Cindy Chyee Chen Wong (The National University of Malaysia), Kamisah Osman (The National University of Malaysia): (Malaysia)

[28O5G-4] *Development of the Science Test to Measure Higher Order Thinking Skills to Indonesia Secondary School Students (A0384)*
Anjar Putro Utomo (Hiroshima University), Kinya Shimizu (Hiroshima University): (Japan)

[28O5G-5] *A novel teaching approach based on a DNA experiment lesson in high school biology laboratory class: Scientific inquiry by visualization of DNA sequence conservation and diversity and a developmental lesson to understand genetic diagnosis (A0415)*
Yoko Inoue (Kanagawa Prefectural Seisho High School/ Hyogo University of Teacher Education/Tokai University), Asako Otomo (Tokai University), Kazumi Takahashi (Tokai University), Hiromi Moriya (Tokai University), Yuko Ohnuki (Tokai University), Shunichiro Izumi (Tokai University), Hayato Miyachi (Tokai University), Shinji Hadano (Tokai

University): (Japan)

[2B05G-6] *Action Research on Game-based Learning of Chemistry in Senior High (A0470)*
Pei-Chi Chen (National Taiwan Normal University): (Taiwan)

<5H> Teaching/Learning
Chairs: Heui-Baik Kim (Seoul National University), Lay Hoon Seah (Nanyang Technological University/National Institute of Education)

[2B05H-1] *Features of Science Core Schools (SCSs) in Korea as Strategic Community of Practice (SCoP) (A0288)*
Jin Hee Kim (Seoul National University), Jinwoong Song (Seoul National University), Ji Yeon Na (Chuncheon National University of Education): (Korea)

[2B05H-2] *Probing Into Experiment Classes of High-School Level Organic Chemistry: Take Silver Mirror Reaction as An Example (A0578)*
Yuanyuan Fang (Beijing Normal University), Kewen Liu (Beijing Normal University): (China Mainland)

[2B05H-3] *The knowledge domains of students react to teacher's questioning through classroom discourse (A0313)*
Mei-Yu Chang (National Hsinchu University of Education), Fu-Yuan Chiu (National Hsinchu University of Education): (Taiwan)

[2B05H-4] *Responsive teaching activating students' epistemological resources in small group argumentation (A0200)*
Heesoo Ha (Seoul National University), Heui-Baik Kim (Seoul National University): (Korea)

[2B05H-5] *Examining the role of talk in addressing the language demands of science: Case studies of 3 secondary teachers (A0362)*
Lay Hoon Seah (Nanyang Technological University/National Institute of Education): (Singapore)

<5I> Curriculum/Assessment/Policy (Learners)
Chairs: Yew Jin Lee (Nanyang Technological University), Ying Luo (Beijing Normal University)

[2B05I-1] *Analyzing cognitive levels of learning objectives in elementary science curriculum in East-Asian countries (A0025)*
Yew Jin Lee (Nanyang Technological University), Mijung Kim (University of Alberta), Qingna Jin (University of Alberta), Hye-Gyoung Soon (Chuncheon National University of Education), Kenji Matsubara (National Institute for Educational Policy Research (NIER)): (Canada)

[2B05I-2] *Does peer assessment help students' understanding? (A0091)*
Florence Le Hebel (University of Lyon1, Laboratoire ICAR, CNRS, ENS Lyon, University of Lyon 2), Pascale MONTPIED (University of Lyon1, Laboratoire ICAR, CNRS, ENS Lyon, University of Lyon 2), Marianne Moulin (CNRS, Laboratoire ICAR, CNRS, ENS Lyon, University of Lyon 2): (France)

[2B05I-3] *Assessment on Senior Secondary School Students' Learning Progression of Galvanic Cell (A0116)*
Fan Shi (Beijing Normal University), Lei Wang (Beijing Normal University): (China Mainland)

[2B05I-5] *The Development of a Two-tier test for Grade 5 Students' Conceptual Understanding on Reproduction (A0221)*
Xinyan Liu (Beijing Normal University), Enshan Liu (Beijing Normal University), Cheng Liu (Beijing Normal Universtiy): (China Mainland)

[2B05I-6] *Performance assessment of Scientific Reasoning Competence in written tests of high school physics (A0565)*
Ying Luo (Beijing Normal University): (China Mainland)

<5J> Informal Settings
Chairs: Akihiko Tomita (Wakayama University), Eun Ji Park (Seoul National University)

[2B05J-1] *Observations of the Evening Sky: Learning Scientific Views and Skills in Daily Life (A0090)*
Akihiko Tomita (Wakayama University): (Japan)

[2B05J-2] *Communicating concepts of sustainable water consumption through an interdisciplinary science center exhibition (A0099)*
Sandra Sprenger (Universität Hamburg), Jens Christian Benninghaus (Universität Hamburg), Carola Kahlen (Mathematikum Science Center Gießen), Albrecht Beutelspacher (Mathematikum Science Center Gießen): (Germany)

[2B05J-3] *The Impact of a Short-Term Camp on Students' Awareness and Mental Models towards Marine Environment (A0060)*
Hsin-Hui Wang (National Sun Yat-sen University), Hsiang-Ting Chen (National Sun Yat-sen University), Kuay-Keng Yang (National Sun Yat-sen University), Yi-Ting Pan (National Sun Yat-sen University), Huann-shyang Lin (National Sun Yat-sen University), Zuway-R Hong. (National Sun Yat-sen University): (Taiwan)

[2B05J-4] *Effects of Science Drama Program on Creativity and Character Education for Science Gifted Students (A0448)*
Junghee Bae (Pusan National University), Jina Yoon (Pusan National University), Hae-Ae Seo (Pusan National University): (Korea)

[2B05J-5] *Becoming a scientifically literate person: three science hobbyists' stories (A0552)*
Eun Ji Park (Seoul National University), Chan-Jong Kim (Seoul National University), Seung-Urn Choe (Seoul National University): (Korea)

<5K> Integrated (SSI, EE, ESD)
Chairs: Hisashi Otsuji (Toyo University), Liu K. Ying (National Taiwan Normal University)

[2B05K-1] *Education for Disaster Risk Reduction in Japan: What should we teach about radiation? (A0550)*
Katsuhiko Yamaguchi (Fukushima University): (Japan)

[2B05K-2] *Education for Disaster Risk Reduction in Japan: When the Land is Covered by the Inconvenient (A0515)*
Hisashi Otsuji (Toyo University): (Japan)

[2B05K-3] *Education for Disaster Risk Reduction in Japan: Developing the In-service Teacher Training Program in Fukushima Pref. (A0359)*
Tatsuya Fujioka (Shiga University), Hiroki Abe (Tomioka Daiich junior High School), Hisashi Otsuji (Toyo University), Katsuhiko Yamaguchi (Fukushima University): (Japan)

[2B05K-4] *Chinese biology teachers' ethical reasoning patterns on the applications of assisted reproductive technologies (A0047)*
Chen Yu (The Education University of Hong Kong), So Wing Mui (The Education University of Hong Kong): (China Mainland)

[2B05K-5] *Examining civic ocean literacy in Taiwan (A0453)*
Liu K. Ying (National Taiwan Normal University): (Taiwan)

[2B05K-6] *Environment Related Features of the Curriculum of a Sustainable and Eco-Friendly School in Central Philippines (A0379)*
Joji Davila Linaugo (La Consolacion College Bacolod): (The Philippines)

<5L> Teaching/Learning (Learners)
Chairs: Jeonghee Nam (Pusan National University), Fenju Lin (National Changhua University of Education)

[2B05L-1] *Impact of Students' Assessment Activities on Reflective Thinking in High School Argument-Based Inquiry (A0215)*
Seonwoo Lee (Pusan National University), Jeonghee Nam (Pusan

National University): (Korea)

[28O5L-2] *Model-origin confusion as to waxing and waning of the moon. (A0224)*
Mitsuru Nakajo (Kochi University), Hiroaki Kusunose (Kochi University), Aya Kunisawa (Kochi University), Ken Kawasaki (Kochi University): (Japan)

[28O5L-3] *Network Technology Resources Blended into the Senior High School's Open-guided Inquiry Instruction: In the Case of "Green Energy" Chemistry Course (A0405)*
Fenju Lin (National Changhua University of Education), Erh-Tsung Chin (National Changhua University of Education): (Taiwan)

[28O5L-4] *The patterns of college students' dialogic argumentation in the context of SSIs based on individualism-collectivism constructs (A0495)*
Yeonjoo Ko (Ewha Womans University), Yunhee Choi (Soongmoon Middle School), Hyunju Lee (Ewha Womans University): (Korea)

[28O5L-5] *Analysis of High School Students' Interaction in Design-based Learning in Science Class (A0601)*
Jongman Park (Seoul National University of Education), Young Sook Shim (Seoul National University of Education), Shinho Jang (Seoul National University of Education): (Korea)

Oral 6 (28th, 11:30-12:50)

<6A> Learners (Teaching/Learning)
Chair: Kah Heng Chua (Universiti Sains Malaysia)

[28O6A-1] *Research on the Relationship Between the Quality of Oral Scientific Argumentation and the Characteristics of Identity Construction of Chinese Middle School Students (A0032)*
Yang Deng (Central China Normal University), Hou-Xiong Wang (Central China Normal University): (China Mainland)

[28O6A-2] *Nanoscience activities: A tool to improve the relevance of chemistry lessons to the upper secondary school students' everyday living (A0239)*
Kah Heng Chua (Universiti Sains Malaysia), Mageswary Karpudewan (Universiti Sains Malaysia): (Malaysia)

[28O6A-3] *Inquiry into Science Classes for Developing Scientific Literacy of Children -The Problem Investigation and Its Process in Nature Observation- (A0387)*
Shoko Sakata (Shizuoka University), Yoshisuke Kumano (Shizuoka University), Masakazu Goto (National Institute for Education Policy Reserch): (Japan)

[28O6A-4] *A study on the effect of practical work of science teaching and learning in Beijing's high schools (A0069)*
Xiao Zhang (Capital Normal University), Bangping Ding (Capital Normal University): (China Mainland)

<6B> Teachers (Teacher Education)
Chair: Yin Boyuan (Beijing Normal University)

[28O6B-1] *The view on the teaching evaluation of pre-service teachers (A0421)*
Hana Jung (Seoul National University of Education), Youngseok Jhun (Seoul National University of Education): (Korea)

[28O6B-2] *Comparison and Development of Science Teacher's Pedagogical Content Knowledge Assessment (A0456)*
Yin Boyuan (Beijing Normal University), Wang Lei (Beijing Normal University): (China Mainland)

[28O6B-3] *The Prevalence of Neuromyths among Teachers, Pre-service Teachers, Parents and Students in Taiwan (A0487)*
Ying-Chun Cho (National Taiwan Normal University), Ting-Kuang Yeh (National Taiwan Normal University), Chun-Yen Chang (National Taiwan Normal University): (Taiwan)

[28O6B-4] *Analyzing mentors' PCK and mentoring characteristics in mentoring conversations (A0555)*
Sunduk Lee (Pusan National University), Dongwon Lee (Kyungnam University), Jeonghee Nam (Pusan National University): (Korea)

<6C> Communication/Engagement
Chair: Kazuo Kitahara (Tokyo University of Science)

[28O6C-1] *International School Exchange Program Based on Year Cooperative Student Research (A0027)*
Man-Seog Chun (Korea Science Academy of KAIST), Allan Goh (National Junior College): (Korea)

[28O6C-2] *How do university students' critique farmers' arguments and peers' arguments about organic farming? (A0151)*
Jing-Yu Wu (National Taichung University of Education), Yao-Kuang Chang (National Taichung University of Education), Chien-Fang Ku (National Changhua University of Education): (Taiwan)

[28O6C-3] *Science Communication from Soccer Sport News (A0580)*
Xuan He (Guangzhou Sport University), Ying Xiao Chen (Guangzhou Sport University), Lian-Jun Zhou (Guangzhou Sport University), Hui Tsung Cheng (National Dong Hwa University), Ping Shen Chang (National Chiao Tung University): (China Mainland)

[28O6C-4] *Further Development of "Science Literacy for All Japanese" Project Including Risk Literacy (A0568)*
Motonori Hoshi (Tokyo Institute of Technology), Kazuo Kitahara (Tokyo University of Science), Enzo Nagasaki (National Institute of Education Research), Kazuyoshi Chiba (Ochanomizu Women's University), Rie Shahi (Air University), Rumiko Nara (Air University), Mitsuru Kudo (Kyoto University): (Japan)

<6D> Teacher Education (Curriculum/Teaching Materials)
Chair: Koichi Morimoto (Nara University of Education)

[28O6D-1] *The development of teaching materials for Infra-Red Thermography (A0055)*
Koichi Morimoto (Nara University of Education), Hikaru Kasuga (Tsuzakakita Primary School): (Japan)

[28O6D-2] *Assessment of the Capacity Building Program for Science Teachers: the K to 12 Perspectives (A0328)*
Ricky Magbanua Magno (West Visayas State University): (The Philippines)

[28O6D-3] *Perspectives of Filipino Teachers on Lesson Study: A Case Study in The Phiippines (A0486)*
Tetsuo Isozaki (Hiroshima University), Arlyne Marasigan (University of the Philippines), Sylvestre Amorsolo (PAREF Secondary School), Takuya Ochi (Hiroshima University), Virgilio Manzano (University of the Philippines, Diliman): (The Philippines)

[28O6D-4] *Assessing Effectiveness of a Nanotechnology General Course on Understandings of Nanotechnology Concepts of University Students with Science Majors (A0163)*
Pei-Yu Yao (National Changhua University of Education), Kun-Yi Shih (National Changhua University of Education), Kuo-Hua Wang (National Changhua University of Education): (Taiwan)

<6E> STEM
Chair: Hongshia Zhang (Nanjing University)

[28O6E-1] *Relationship between Zhongyong Literacy and Views on NOS of Chinese Primary Science Teachers—Based on a National Survey in China (A0041)*
Hongshia Zhang (Nanjing University), Mingfeng Qu (Nanjing University),

Qi Lu (Nanjing University), Linhai Lu (Nanjing University), Dongsheng Wan (Nanjing University), Bo Yu (Nanjing University): (China Mainland)

[28O6E-2] *A glimpse at GreenMech: use S-P chart to evaluate the students' performance on STEM learning outcome through hands-on technology contest (A0583)*
Jon-Chao Hong (National Taiwan Normal University), Kai-Wen Tai (National Taiwan Normal University), Chi-Ruei Tsai (National Taiwan Normal University): (Taiwan)

[28O6E-3] *High School Interdisciplinary STEM curriculum about Waste Management (A0549)*
Chanyah Dahsah (Srinakharinwirot University), Navara Seetee (Srinakharinwirot University), Kamonwan Kanyaprasith (Srinakharinwirot University): (Thailand)

<6F> Historical/Philosophical/Sociological/Cultural/Gender Issues

Chair: Jinwoong Song (Seoul National University)

[28O6F-1] *Goethe's Theory of Colours and Its Potential Meaning for Science Teaching (A0517)*
Wonyong Park (Seoul National University), Joonhyeong Park (Seoul National University), Jinwoong Song (Seoul National University): (Korea)

[28O6F-2] *Using political theory to frame argumentation for science education: The case of deliberative democracy (A0017)*
Sibel Erduran (National Taiwan Normal University/University of Limerick), Ebru Kaya (Bogazici University): (Ireland)

[28O6F-3] *Gender Issues in the 'making things' (mono zukuri) and the science. (A0501)*
Katsuhisa Kagami (Ochanomizu University), Akiko Sato (Ochanomizu University), Toshiko Amemiya (Ochanomizu University): (Japan)

[28O6F-4] *A Research to Develop Cultural Product Innovation-As An Example of Taiwan Cultural Lamp Design (A0429)*
Yi-Han Wang (National Taipei University Technology): (Taiwan)

<6G> Learners

Chair: Aris Cerbo Larroder (Philippine Science High School Western Visayas)

[28O6G-1] *Executive Function of the Brain and its Influences on Understanding of Physics Concept (A0143)*
Mohd Nor Syahrir Abdullah (Universiti Sains Malaysia), Mageswary Karpudewan (Universiti Sains Malaysia), Zalina Ismail (Universiti Sains Malaysia): (Malaysia)

[28O6G-2] *Prospective Science Teachers' Views about How Plants Gain Their Dry Mass and How The Mass Leaves Human Body During Weight Loss (A0235)*
Mehmet Fatih Taşar (Gazi Üniversitesi), Zeynep Merve Oskay (Gazi Üniversitesi): (Turkey)

[28O6G-3] *The Flipped Classroom Pedagogy in Chemistry education – Case Chemical Equilibrium Course (A0342)*
Ari Myllyviita (Viikki Teacher Training School of Helsinki University): (Finland)

[28O6G-4] *Noticed Gaps in the Teaching and Learning of Authentic Science Inquiry Inside the Classroom (A0508)*
Aris Cerbo Larroder (Philippine Science High School Western Visayas): (The Philippines)

<6H> Mathematics Education

Chair: Haw-Yaw Shy (National Changhua University of Education)

[28O6H-1] *Class Planning of the Jigsaw Method of Cooperative Learning in Mathematics Class (A0035)*
Tomohiko Shima (Kanagawa Gakuen Girls' Junior and Senior High School): (Japan)

[28O6H-2] *Enhancing Mathematics Skills through Science Activities (A0459)*
Franklin Rapsing Falculan (Harris Memorial College): (The Philippines)

[28O6H-3] *Student's Difficulties with Chemical Calculations (A0334)*
Lennart Kimpel (University of Duisburg-Essen), Elke Sumfleth (University of Duisburg-Essen): (Germany)

[28O6H-4] *Re-constructing Middle School Mathematics Teachers' Mathematics Concepts (A0081)*
Haw-Yaw Shy (National Changhua University of Education), Chung-Chiang Chou (National Changhua University of Education), Chen-Ju Pai (National Changhua University of Education), Mei-Hsien Chen (Ping Thung Liu-Chiu Junior High School): (Taiwan)

<6I> ICT

Chair: Jiyeon Na (Chuncheon National University of Education)

[28O6I-1] *Historical studies and Modern Reconstructions of Active-Learning Science Education Methods through the Analysis of Students' Notes since Meiji Era of Japan (A0127)*
Akizo Kobayashi (Faculty of Education, Niigata University), Fumiko Okiharu (Niigata University): (Japan)

[28O6I-2] *What kind of difficulties do pre-service elementary teachers encounter in the science class utilizing smart technologies? : Focused on the development of technology, pedagogy, and content knowledge (TPACK) (A0258)*
Jiyeon Na (Chuncheon National University of Education), Byung-Ghi Jang (Chuncheon National University of Education): (Korea)

[28O6I-3] *Bitbrick Water Purifier (A0502)*
Hyun-Su Park (Soongmoon Middle School), Young-Hun Jeoung (Soongmoon Middle School), Seung-Jun Lee (Soongmoon Middle School): (Korea)

<6J> Curriculum/Assessment/Policy (Curriculum/Teaching Materials)

Chair: Yu-Ling Lu (National Taipei University of Education)

[28O6J-1] *Using Three-Tier Diagnostic Test to Assess Conceptions of Ionisation Energy in Indonesia (A0153)*
Nadi Suprapto (National Dong Hwa University), Jing Wen Lin (National Dong Hwa University), Chih Hsiung Ku (National Dong Hwa University), Margaretha A Pasaribu (National Dong Hwa University), Kusumawati Dwiningsih (Universitas Negeri Surabaya): (Taiwan)

[28O6J-2] *Issues and Trends of Environmental Education at Primary Curriculum in Bangladesh (A0409)*
Mohammed Rashel Uddin (Hiroshima University), Shimizu Kinya (Hiroshima University): (Bangladesh)

[28O6J-3] *Using EEG to Explore Students' Attention and Relaxation Levels during Science Test (A0422)*
Chin-San Lin (National Taipei University of Education), Yu-Ling Lu (National Taipei University of Education), Chi-Jui Lien (National Taipei University of Education): (Taiwan)

<6K> Teaching/Learning

Chair: Yingye Ling (Beijing Normal University)

[28O6K-1] *Kids' programing class at a regional festival-event as a practical training field for the students in a high-school teacher course. (A0252)*
Shin Muroya (Matsumoto University): (Japan)

[28O6K-2] *Oriented to Hand making and Comprehensive Practice Courses design and practice research ——For the example of*

"Winemaking Experience Program" (A0610)
Ying Hou (Beijing Normal University), Ke Wen Liu (Beijing Normal University), Chuan Li (Beijing Normal University): (China Mainland)

[28O6K-3] *The Effect of Peer Critique on Concept Map Revising (A0464)*
Yingye Ling (Beijing Normal University), Cheng Liu (Beijing Normal University): (China Mainland)

<6L> Curriculum/Teaching Materials
Chair: Po-Hsi Chen (National Taiwan Normal University)

[28O6L-1] *Development of the Computerized Test for Assessing the Green Power Literacy (A0238)*
Po-Hsi Chen (National Taiwan Normal University), Kuo-Feng Chang (National Taiwan Normal University), Shao-Zu Su (National Taiwan Normal University), Jon-Chao Hong (National Taiwan Normal University), Hsien-Sheng Hsiao (National Taiwan Normal University), Yi-Hsuan (National Taiwan Normal University): (Taiwan)

[28O6L-2] *Effectiveness of Integrating Argumentation-based Instruction into the high School Earth Science Fieldwork on 10th Grade Students' Learning (A0594)*
Yi-Pei Tang (National Taiwan Normal University), Yi-Wen Hung (The Affiliated Senior High School of National Taiwan Normal University), Ying-Shao Hsu (National Taiwan Normal University), Horng-Sheng Mii (National Taiwan Normal University): (Taiwan)

[28O6L-3] *The Enlightenment of International Scientific Education Evaluation based on an International Comparative Study on the Difficulty of Science Textbooks for Junior High Schools (A0462)*
Hong Cui (Central China Normal University), Jiahua Zhu (Central China Normal University), Yuanhao Chen (Central China Normal University): (China Mainland)

Oral 7 (28th, 13:30-14:50)

<7B> Teaching/Leaning
Chair: Hiroki Fujii (Okayama University)

[28O7B-1] *Utilizing SCAMPER to Enrich Creativity in Green Energy Project Design (A0144)*
Jon-Chao Hong (National Taiwan Normal University), Hui-Ting Hsu (National Taiwan Normal University): (Taiwan)

[28O7B-2] *An Analysis of the Characteristics of a Whole-class and Small-groups in a Science Classroom: Focusing on the Perspective of Community of Practice (A0307)*
Joonhyeong Park (Seoul National University), Jiyeon Na (Chuncheon National University of Education), Yong Jae Joung (Gongju National University of Education), Jinwoong Song (Seoul National University): (Korea)

[28O7B-3] *A Perspective on Use of Folk Tales in Science Education: Exploring Rivers through Story and Science in Elementary School (A0411)*
Karen Onodera (Okayama University), Hiroki Fujii (Okayama University): (Japan)

[28O7B-4] *Experiencing Meaningful Learning through Portfolio Development in Ecology (A0112)*
Carmina Villariba Tolentino (Manuel S. Enverga University Foundation): (The Philippines)

<7C> Learners (Curriculum/Assessment/Policy)
Chair: Ronghui Zhang (Beijing Haidian Teachers Training College)

[28O7C-1] *A Study on Secondary School Students' Understanding of Energy in Chemical Reactions— Based on a learning progression (A0361)*
Weizhen Wang (Beijing Normal University), Lei Wang (Beijing Normal University): (China Mainland)

[28O7C-2] *The Effects of Hands-On Activities on Students' Basic Science Process Skills: A Case Study of a High School in Cambodia (A0385)*
Bora Sok (Hiroshima University): (Japan)

[28O7C-3] *Elementary students' perception toward scientific models (A0416)*
Show-Run Lee (National Taipei University of Education), Yu-Ling Lu (National Taipei University of Education): (Taiwan)

[28O7C-4] *Exploring Students' Performance on the Chemical Practice Investigating Chemical Reaction (A0457)*
Ronghui Zhang (Beijing Haidian Teachers Training College), Lei Wang (Beijing Normal University): (China Mainland)

<7D> Curriculum/Teaching Materials
Chair: King-Dow Su (De Lin Institute of Technology)

[28O7D-1] *Using Concept Maps and Animations to Support Students' Learning in Chemistry Equilibrium (A0399)*
King-Dow Su (De Lin Institute of Technology): (Taiwan)

[28O7D-2] *The Study on Functions and Values of Chemical Mini Kits and Teaching Approaches with the Support of the Kits (A0454)*
Bing Shi (Beijing Normal University), Yahui Suo (Beijing 214 Secondary School), Rui Wei (Beijing Normal University): (China Mainland)

[28O7D-3] *Vocabulary and Word Study to Increase Comprehension in Science Concepts for Primary Pupils (A0562)*
Lani M Garcia (Milagrosa Elementary School), Noel S. Ortega (Milagrosa Elementary School): (The Philippines)

<7E> STEM
Chair: Jon-Chao Hong (National Taiwan Normal University)

[28O7E-1] *An exploratory study on analyzing SCAMPER utilization in creative design workshop between junior high and elementary school students (A0587)*
Jon-Chao Hong (National Taiwan Normal University), Hsien-Sheng Hsiao (National Taiwan Normal University), Po-Hsi Chen (National Taiwan Normal University), Yi-Hsuan Hung (National Taiwan Normal University), Chi-Ruei Tsai (National Taiwan Normal University): (Taiwan)

[28O7E-2] *The Difference of the Students' Trait on Skill Learning by Animation Clips (A0588)*
Jon-Chao Hong (National Taiwan Normal University), Chun-Hsin Chang (National Taiwan Normal University): (Taiwan)

[28O7E-3] *Relationships among Influences, Academic Engagement, and Achievement of STEM Undergraduates – A Structural Equation Modeling Study (A0203)*
Yang Yang (University at Buffalo), Yujing Liu (Shandong University of Finance and Economics): (USA)

<7F> Historical/Philosophical/Sociological/Cultural/Gender Issues
Chair: Takahito Watanabe (Hokkaido University)

[28O7F-1] *The Study of Vocational College Students' Attitudes and Acceptability to Homosexuality (A0275)*
Yi Fang Lee (National Taiwan Normal University), Chia Cheng Yeh (National Taiwan Normal University), Hung Shun Huang (National Taiwan Normal University), Ya Yun Shih (National Taiwan Normal University): (Taiwan)

[28O7F-2] *Implementing history and philosophy of science on improving high school students' understanding of nature of science in*

chemistry teaching (A0170)
Zhou Qing (Shaan Xi Normal University), Lu Shi Huan (Shaan Xi Normal University), Yang Xiao Cong (Shaan Xi Normal University), Ma Jun Ping (Shaan Xi Normal University): (China Mainland)

[28O7F-3] *Short-term overseas studies on science for female students. (A0513)*
Akiko Sato (Ochanomizu University), Toshiko Amemiya (Ochanomizu University), Katsuhisa Kagami (Ochanomizu University), Noriko Watanabe (Ochanomizu University), Shota Matsuno (Ochanomizu University Senior High School), Haruko (Ochanomizu University): (Japan)

[28O7F-4] *Holding and Evaluation "Real Stargazing Party" at an Anime Festa in a Region (A0291)*
Takahito Watanabe (Hokkaido University): (Japan)

<7G> Learners (Curriculum/Teaching Materials)
Chair: Hsiang-Hu Liu (National Taiwan Normal University)

[28O7G-1] *Problem Solving as Strategy To Overcome Alternating Current Misconceptions of Indonesian Secondary School Students (A0402)*
Uswatun Hasanah (Hiroshima University), Kinya Shimizu (Hiroshima University), Takanori Tsutaoka (Hiroshima University): (Japan)

[28O7G-2] *Learning from News media: a new teaching method based on Science News production role playing to develop students oral report skills in Junior High School (A0469)*
Hsiang-Hu Liu (National Taiwan Normal University): (Taiwan)

[28O7G-3] *An Analysis of the Features of the 5-Year-Old Young Child's Exploration Extracted from their "Words" "Facial Expressions" and "Behavior" during the Air Activity (A0548)*
Yoshiko Nagase (Osaka Ohtani University), Akira Aratani (Osaka Ohtani University): (Japan)

[28O7G-4] *Beginning Science Concepts of Filipino Children (A0561)*
Thelma Rabago Mingoa (De La Salle University Manila): (The Philippines)

<7H> Mathematics Education
Chair: Tsu-Nan Lee (The University of Melbourne)

[28O7H-1] *The evidence of validity and reliability in developing an analytic scoring rubric of geometric argumentation at primary level (A0013)*
Tsu-Nan Lee (The University of Melbourne): (Australia)

[28O7H-2] *Curriculum for improving first graders' logical reasoning and problem solving: An example of bridge game (A0018)*
Yun-An Chen (National Sun Yi-Sen University), Chun-Yen Chen (The Affiliated Senior High School of National Kaohsiung Normal University), Kuo-Wen Chen (Guangrong Elementary School), Fu-Pei Hsieh (Kuanghua Elementary School): (Taiwan)

[28O7H-3] *The change of teacher's belief in mathematics teaching. And the effect on the learning attitude of her students. (A0381)*
Chi-Wei Kao (National Changhua University of Education), Haw-Yaw Shy (National Changhua University of Education), Chung-Chiang Chou (National Changhua University of Education), Hsin-Yi Lee (Keelung Municipal Ding Nei Junior High School): (Taiwan)

<7I> Integrated (SSI, EE, ESD)
Chair: Su Chi Fang (National Taiwan Normal University)

[28O7I-1] *Conceptualizing Socioscientific Decision-Making in Science Education: A Review of Research (A0106)*
Su Chi Fang (National Taiwan Normal University), Shu-Sheng Lin (National Chiayi University), Ying-Shao Hsu (National Taiwan Normal University): (Taiwan)

[28O7I-2] *The role of reading literature in promoting awareness and action with regard to ocean sustainability: Transportation experience (A0111)*
Chi-I Lin (National Sun Yat-sen University): (Taiwan)

[28O7I-3] *Getting students' voices heard in sexuality education: the case of implementing a radio drama in Hong Kong (A0206)*
Wilson Yiu Kay Chung (The University of Hong Kong), Valerie Wing Yan Yip (The University of Hong Kong): (Hong Kong)

[28O7I-4] *Development of gaming simulation in higher education for sustainable development: a design-based research (A0216)*
Siu-Kit Yeung (The Education University of Hong Kong), Wing-Mui Winnie So (The Education University of Hong Kong), Nga-Yee Irene Cheng (The Education University of Hong Kong), Cheuk-Fai Chow (The Education University of Hong Kong): (Hong Kong)

<7L> Teacher Education
Chair: Wing Yan Valerie Yip (The University of Hong Kong)

[28O7L-1] *A study of professional growth for elementary teachers' community of practice on nature of science. (A0064)*
Yu Hsueh Yun (National Changhua University of Education), Kao Huey Lien (National Pingtung University), Chin Erh Tsung (National Changhua University of Education), Su Ming Jou (Tajen University): (Taiwan)

[28O7L-2] *Enhancing teachers' understanding and perceived roles to teach nature of science (NOS) through the use of classroom videos (A0231)*
Wing Yan Valerie Yip (The University of Hong Kong): (Hong Kong)

[28O7L-3] *The Effect of SNS-based Program on Pre-service Science Teachers' Teaching Efficacy (A0530)*
Lei Gao (Ewha Womans University), Jungmin Yoo (Ewha Womans University), Soo-A Kim (Ewha Womans University), Sung-Won Kim (Ewha Womans University): (Korea)

[28O7L-4] *Technological Pedagogical Content Knowledge (TPACK) Instrument for Physics Pre-Service Teacher: Framework, Indicators, and Items Development (A0592)*
Arif Hidayat (Hiroshima University/ Indonesia University of Education), Kinya Shimizu (Hiroshima University): (Indonesia)

Poster & Special Poster Presentations

Poster 1X (26th, 11:30-12:50)

[26P1X-01] *Use of Facebook for College Engineering Courses In-Class Q&A Activities: Its Effects on Cognitive Development, Affective Involvement and Social Interaction (A0028)*
Yu-Hsin Liu (National Chi Nan University), Fu-Yun Yu (National Cheng Kung University): (Taiwan)

[26P1X-02] *CSimulator: Development of an Educational Support Tool for Chemical Experiments (A0431)*
Shin-ya Takane (Osaka Sangyo University): (Japan)

[26P1X-03] *Use the Bit brick and Scratch program to make music by using the concord of audience (A0524)*
Junchan Bum (Soong moon Middle School), Yu Ha Jun (Soong Moon Middle School), Jungyeon Jong (Soong Moon Middle School), Park Kyung Wook (Soong Moon Middle School): (Korea)

[26P1X-04] *Supporting primary school students' science learning*

through online student-constructed tests with citing (A0037)
Fu-Yun Yu (National Cheng Kung University), Ru-Ger Wei (National Cheng Kung University): (Taiwan)

[26P1X-05] *Virtual piano with Bit-Brick module (A0577)*
Choi Jeong Ho (Soong moon Middle School), Kim Min Seok (Soong Moon Middle School), Kimheon Yong (Soong Moon Middle School): (Korea)

[26P1X-06] *Development of a new student experiment in immunology based on ELISA (A0360)*
Shiori Terauchi (Tokyo University of Science), Rei Kato (Tokyo University of Science), Sho Fukaya (Tokyo University of Science), Masaharu Takemura (Tokyo University of Science): (Japan)

[26P1X-07] *Explore 6th to 8th grades students' critical thinking about environmental and nuclear energy issues by WISE (A0061)*
Yu-Chun Kuo (National Kaohsiung Normal University), Chin-Fei Huang (National Kaohsiung Normal Univeersity), Ying-Yao Cheng (National Sun Yat-Sen University), Chia-Ju Liu (National Kaohsiung Normal University): (Taiwan)

[26P1X-08] *Development and Evaluation of STEM Activities in Magnetic Force and Faraday's Law Topics (A0511)*
Pornrat Wattanakasiwich (Chiang Mai University), Yadanan Katekaew (Chiang Mai University): (Thailand)

[26P1X-09] *Development of higher performed dye sensitized solar cell model cars equipped with a pulley-rubber band system (A0123)*
Yuriko Ando (Tokyo University of Science), Yasuhumi Kawamura (Tokyo University of Science), Shion Mizutani (Tokyo University of Science): (Japan)

[26P1X-10] *Development of a low-cost experiment set enabling learners to experience the renewable wind energy and the hydrogen fuel cell (A0281)*
Seiya Iino (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science), Sota Okumura (Tokyo University of Science): (Japan)

[26P1X-11] *Newly Developed Experiments for Enegy and Environmental Education (A0088)*
Katsumi Itoh (Tokyo University of Science), Katsunori Kkanahara (Tokyo University of Science), Kazumitsu Sakurai (Tokyo University of Science), Saya Aihara (Tokyo University of Science), Shion Mizutani (Tokyo University of Science), Miyuki Muramatsu (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26P1X-12] *Kawamura's Top: A promising revision by utilizing parts printed by a 3D printer (A0208)*
Yasufumi Kawamura (Tokyo University of Science): (Japan)

[26P1X-13] *Conceptualization of a PCK Framework for Teaching Socioscientific Issues (A0209)*
Hyunju Lee (Ewha Womans University): (Korea)

[26P1X-14] *A Joint Research between Salesian Polytechnic Tokyo and Mongol KOSEN on Development of Hydroponic system using the M2M/IoT technology (A0391)*
Yuto Kamiwaki (Salesian Polytechnic Tokyo), Osamu Arihuku (Salesian Polytechnic Tokyo), Uranzev Tsogbadrakh (Mongol KOSEN), Namuunbaigali Barsbaatar (Mongol KOSEN), Mitsumasa Ito (Salesian Polytechnic Tokyo): (Japan)

[26P1X-15] *Our Community Park Improvement Project: A Case of Subjects Integration through PBL in Elementary Pre-service Education (A0566)*
Hyeoksoon Kwon (Cheongju National University of Education): (Korea)

[26P1X-16] *Exploring the sustainable ocean education program of a major marine NGO in Taiwan in light of social learning (A0308)*
Meng-Yuan Jen (Providence University), Shih-Jang Hsu (National Dong Hwa University): (Taiwan)

[26P1X-17] *A Worksheet that Leads to the Scientific Concept (A0085)*
Nobuyuki Kawai (Shioya Lower Secondary School): (Japan)

[26P1X-18] *An Academic Survey in Physics and Chemistry at Lower Secondary School for Gifted and Ethnic Students in Laos (A0038)*
Yukio Terashima (Naruto University of Education), Houmphanh Khanthavy (Research Institute for Educational Science, Lao PDR), Banchai Malavong (Research Institute for Educational Science, Lao PDR), Kaori Kitano (Naruto University of Education), Ayana Oki (Naruto University of Education), Takahiro Niinobe (Naruto University of Education), Jin Yamauchi (Naruto University of Education)

[26P1X-19] *Exploring Seventh Graders' Performance in Arguing-about-Science News Instruction (A0040)*
Pei-Ying Tsai (Taichung County Shun Tien Junior High School): (Taiwan)

[26P1X-20] *Designing a bridging science summer program for new junior high school students (A0042)*
Wan-Ron Kuo (Sanshia Junior High School), Chen-Chen Yeh (Sanshia Junior High School), Wen-Hua Chang (National Taiwan Normal University): (Taiwan)

[26P1X-21] *Image of Chemistry for New Students Probed by "Concept maps" (A0242)*
Hajime Tanaka (Shumei University), Tetsuya Suzuki (Tokyo Future University): (Japan)

[26P1X-22] *Investigating on pre-service science teachers' understanding and the degree of certainty of electromagnetism concepts (A0537)*
Jihyeon Jeong (Ewha Womans University), Sung-Won Kim (Ewha Womans University): (Korea)

[26P1X-23] *Research on development of a collaborative learning model using SNS (A0556)*
Heebok Lee (Kongju National University), Youngseon Seo (Seoul National University of Education): (Korea)

[26P1X-24] *Analysis of awareness of teachers for Core Competencies (A0068)*
Ji-hoon Ha (Kojan Elementary School), Youngjun Shin (Gyeongin National University of Education): (Korea)

[26P1X-25] *The Construction of a Teacher Training Programme Combining and Integrating Science and Technology (A0046)*
Hirotaka Doho (Kochi University): (Japan)

[26P1X-26] *Inquiry and investigation using plant materials in high school basic biology textbooks (A0417)*
Kana Kobayashi (Aichi University of Education), Kasumi Miyazaki (Aichi University of Education), Kiyoyuki Ohshika (Aichi University of Education), Juntaro Kato (Aichi University of Education): (Japan)

[26P1X-27] *Inquiry and investigation using plant materials in high school biological textbooks (A0418)*
Kasumi Miyazaki (Aichi University of Education), Kana Kobayashi (Aichi University of Education), Kiyoyuki Ohshika (Aichi University of Education), Juntaro Kato (Aichi University of Education): (Japan)

[26P1X-28] *Analysis on the Science-Related Activity Aims in the 'Guide for Educational Activities & Materials for Kindergarten' for Nuri Curriculum of Korea (A0532)*
Jihye Kim (Ewha Womans University), Sung-Won Kim (Ewha Womans University): (Korea)

[26P1X-29] *Application of Inquiry-based Science Assessment Questions on Earth Science content domain (A0142)*
Young Tae Kong (Chinju National University of Education): (Korea)

[26P1X-30] *Study of Using Computer Educational Games to Improve Students' Learning of Scientific Concept and Scientific Argumentation (A0406)*
Chen-Yu Chen (National Taipei University of Education), Yu-Ling Lu (Department of Science Education, National Taipei University of Education, Taiwan): (Taiwan)

Poster 1Y (26th, 11:30-12:50)

[26P1Y-01] *Edible science experiments for students —making a rainbow herbal tea without food additives— (A0343)*
Yoko Sato (Tokyo University of Science), Hisataka Ohta (Tokyo University of Science): (Japan)

[26P1Y-02] *Lessons of human evolution using a human skull replica produced with 3D printing technology. (A0320)*
Chieko Uchiyama (Tokyo Gakugei University/ Tokyo University of Science), Masaharu Takemura (Tokyo University of Science): (Japan)

[26P1Y-03] *A study for integrating PISA scientific literacy assessment into inquiry teaching to enhance science learning achievement of elementary school students. (A0290)*
Huey-Lien Kao (Tajen University), Hsin-Yu Huang (Fongshan Elementary School), Ming-Chou Su (Tajen University): (Taiwan)

[26P1Y-04] *The effects on students' learning motivation and reading literacy in connecting picture books with nature and science technology curriculum in elementary schools (A0253)*
Shu-Wen Liu (University of Taipei), Wei-Shan Lin (University of Taipei, Taipei), Ruei-Ping Chang (Texas A&M University): (Taiwan)

[26P1Y-05] *A Case Study of Custom-made Workshops for Informal Ocean Science Educators (A0026)*
Akiko Tsuzuki (Marine Learning Center), Noriko Imamiya (Marine Learning Center), Kazuya Hirai (Marine Learning Center), Yukiko Mori (Marine Learning Center): (Japan)

[26P1Y-06] *The analysis of science communication in dinosaur exhibit media (A0314)*
Yu Jiyeon (Chosun University), Park Gu-Reum (Chosun University), Park Young-Shin (Chosun University): (Korea)

[26P1Y-07] *Analysis Ability to Write Physics Laboratory Reports of Undergraduate Students (A0370)*
Yeo won Yoon (Kongju National University), Sang Tae Park (Kongju National University), Hyo Jun Seok (Kongju National University): (Korea)

[26P1Y-08] *Investigating Trends of Gifted Education in Domestic and Foreign Countries through Social Network Analysis from 2010 to 2016 (A0570)*
Jina Yoon (Pusan National University), Junghee Bae (Pusan National University), Hae-Ae Seo (Pusan National University): (Korea)

[26P1Y-09] *Cultivating Future Global Leaders for the Revitalization of Northern Japan (A0246)*
Eun Jin Bang (Iowa State University of Science and Technology), John William Brine (University of Aizu): (Japan)

[26P1Y-10] *An Approach to Developing Electronic Lab-book for Chemistry Experiment (A0516)*
Akira Ikuo (Tokyo Gakugei University), Yusuke Yoshinaga (Tokyo Gakugei University), Haruo Ogawa (Tokyo Gakugei University): (Japan)

[26P1Y-11] *A comparative study on biology textbooks for upper secondary schools between Japan and England: Focusing on the context of everyday life and society. (A0295)*
Takuma Edamura (Hiroshima University), Tetsuo Isozaki (Hiroshima University): (Japan)

[26P1Y-12] *Synthesis of triarylmethane dye molecules utilizing boric silica gel (A0147)*
Masatada Matsuoka (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[26P1Y-13] *Developing Physics Learning Material using Scientific Approach for New Indonesian Curriculum (A0335)*
Kaharuddin Arafah (Seoul National University), Jinwoong Song (Seoul National University): (Korea)

[26P1Y-14] *Analysis of experiences and views about scientific inquiry of the students who participated in the R&E Program (A0506)*
Songyi Heo (Ewha Womans University), Sung-won Kim (Ewha Womans University): (Korea)

[26P1Y-15] *The factor of science-phobia: test of a causal model of likability of science (A0220)*
Kana Suematsu (The University of Tokyo): (Japan)

[26P1Y-16] *Analyzing the behavioral differences between successful and unsuccessful learners in evaluating scientific explanations (A0261)*
Chih-Shen Hsu (National Chiao Tung University), Ke-Wei Lee (National Chiao Tung University), Chia-Yu Wang (National Chiao Tung University): (Taiwan)

[26P1Y-17] *Students' use of multimodal self-assessment on writing-to-learn science tasks (A0049)*
Hong-Ming Chen (Shi-Yuan Senior High School): (Taiwan)

[26P1Y-18] *Fifth Graders' Multimodal Representations of Birds in Expository Writing (A0066)*
Ya Hu Lin (Changhua County Chung Shan Elementary School): (Taiwan)

[26P1Y-19] *High school students' strategies to learning biology with relationships to epistemic views of biology and conceptions of learning biology: A Study of Structural Equation Modeling Analysis in Taiwan (A0071)*
Kuan-Ming Shen (National Sun Yat-sen University), Min-Hsien Lee (National Sun Yat-sen University), Chin-Chung Tsai (National Taiwan University of Science and Technology), Chung-Yuan Hsu (National PingTung University of Science and Tecnology): (Taiwan)

[26P1Y-21] *Analysis of attitude and knowledge state about physics by physics course selection (A0094)*
Kwangkyu Choi (Kongju National University): (Korea)

[26P1Y-22] *The Anthropologram of school subject pictured by teachers (A0292)*
Ryoei Yoshioka (National Institute for Educational Policy Research), Takeshi Fujita (Chiba University), Mitsuhiro Terada (Gifu Shoutoku University), Stefan Kaiser (Kokugakuin University), Gerhard Schaefer (Hamburg University), Michael Sinzinger (Goehte Gymnasium), SigridZörgiebel Schaefer: (Japan)

[26P1Y-23] *Analysis on the Teachers' Recognition of the Supporting System for Gifted Education in Korea (A0389)*
Joengim Woo (Wonmook High School), Kyunghee Hong (Seoul Metropolitan Office of Education): (Korea)

[26P1Y-24] *A comparative study on the history of science between Chinese and Japanese physics teachers. (A0259)*
Yunyi Zhang (Hiroshima University), Tetsuo ISOZAKI (Hiroshima University): (Japan)

[26P1Y-25] *Analysis of the Changes of the 'Making a Fossil Model' Activity Included in Elementary Science Textbooks by Korean National Science Curricula and Teachers' Perception on Fossil Model (A0395)*
Seung Min Sung (Gyeongin National University of Education), Gyuho Lee (Gyeongin National University of Education), Sang-Ihn Yeo (Gyeongin National University of Education): (Korea)

[26P1Y-26] *A Study of Teaching Reading in Science Classroom (A0029)*
Jing-Ru Wang (National Pingtung University): (Taiwan)

[26P1Y-27] *Development and Application of a Three-Tier Diagnostic Instrument to Assess Students' Understanding about Matter Science (A0363)*
King-Dow Su (De Lin Institute of Technology): (Taiwan)

[26P1Y-28] *Developing an instrument for assessing senior elementary students' understanding on microalgae biomass energy (A0366)*
Yu-Ling Lu (National Taipei University of Education), Chi-Jui Lien (National Taipei University of Education), Chien-Ju Li (National Taipei University of Education), Wen-Tsen Luo (National Taipei University of Education): (Taiwan)

[26P1Y-29] *Mediating factors of urban effect on science and mathematics achievement of Taiwaness grade eight students (A0392)*
Che-Di Lee (National Taiwan Normal University): (Taiwan)

Poster 2X (27th, 11:30-12:50)

[27P2X-04] *Systemic Approach for Improving Science Education in Local Area by Activating Core Science Teachers (A0590)*
Yasushi Ogura (Saitama University), Akira Nagasawa (Saitama University): (Japan)

[27P2X-05] *The study on change of pre-service teachers' perception about scientific inquiry through scientific practice and science teaching (A0267)*
Baek Jongho (Seoul National University): (Korea)

[27P2X-07] *Radiation Education Project in Teacher Education Universities (A0625)*
Kazuko Onishi (Tokyo Gakugei University), Akio Hirata (Tokyo Gakugei University), Masahiro Kamata (Tokyo Gakugei University): (Japan)

[27P2X-08] *Training Elementary Science In-service Teachers to Develop Insects' digital game aids by "Advanced Entomology" training curriculum (A0232)*
Chow Chin Lu (National Taipei University of Education): (Taiwan)

[27P2X-09] *Synthesis of fragrant esters and amides from Aspirin as an experiment for high school students (A0254)*
Hiroyuki Hujiwara (Tokyo University of Science), Syuta Mitsui (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[27P2X-10] *Development of a high school chemistry experiment: Cumene method using photo-radical initiator (A0249)*
Fumi Kumagai (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[27P2X-11] *Identifying various kinds of fibers: new experiments for high school chemistry (A0255)*
Syogo Yoshikawa (Tokyo University of Science), Akinori Hirose (Mitokeimei High School), Masayuki Inoue (Tokyo University of Science): (Japan)

[27P2X-12] *Aerobic oxidation of aromatic aldehydes utilizing a gold catalyst supported on chitin as the experiment for high school students (A0137)*
Wataru Shimamura (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[27P2X-13] *Developing a new material for energy education: A hydroelectric generation equipment consisting of a hub dynamo, blades (made of PET bottles) and a frame made by a 3D printer (A0087)*
Yasuhumi Kawamura (Tokyo University of Science), Katsunori Kanahara (Tokyo University of Science): (Japan)

[27P2X-14] *Development of Savonius-type Desktop Windmill Power Generator with Flywheel Produced by 3D Printer and Its Educational Effects (A0122)*
Shion Mizutani (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[27P2X-15] *Sugoroku is an effective simulation board game for advancing knowledge of diet management and enhancing welfare of animals kept in Japanese elementary schools (A0545)*
Mari Morimoto (Tokyo University of Agriculture), Shunya Horiguchi (Tokyo University of Agriculture): (Japan)

[27P2X-16] *Cultivating East-Asian 'Shared Leaders' through the Activities of Making a Water Heater by Plastic Bottles: A New Curriculum Materials for Environmental and Energy Education for High School Physics Classes (A0427)*
Miyuki Muramatsu (Tokyo University of Science), Yasufumi Kawamura (Tokyo University of Science): (Japan)

[27P2X-17] *A factors affecting students' learning activity after scientific experiments (A0233)*
Hiromi Yamagata (Nishinippon Institute of Technology): (Japan)

[27P2X-18] *Process of thinking and difference of rationality in the hypothesis formulation (A0287)*
Daiki Nakamura (Hiroshima University), Takuya Matsuura (Hiroshima University): (Japan)

[27P2X-21] *An Analysis of Science-Arts Integration Activities in Middle School Science Textbooks of Korea (A0540)*
Jungwoo Lee (Ewha Womans University), Sung-Won Kim (Ewha Womans University): (Korea)

[27P2X-22] *Research on Pre-serviced Chemistry Teachers' Instructional Design Abilities (A0125)*
Xiaohui Long (Central China Normal University), Wenhua Zhang (Central China Normal University): (China Mainland)

[27P2X-23] *Japanese lower secondary science teachers' convictions on scientific explanations of popular natural phenomena and their teaching (A0337)*
Satoshi Murakami (Tokyo University of Science), Yasuhumi Kawamura (Tokyo University of Science): (Japan)

[27P2X-24] *Identifying conceptions of teaching science (COTS) of pre-service elementary school teachers in Taiwan (A0098)*
Tzu-Chiang Lin (National Taiwan University of Science and Technology): (Taiwan)

[27P2X-26] *A Study on the Effect of Teaching Electric Voltage to Elementary School Students on Their Understanding of Electricity (A0134)*
Toshiyuki ISHII (Nara University of Education), Riku Yatomo (Nara University of Education), Koichi Morimoto (Nara University of Education), Akihiko Ito (Utsunomiya University): (Japan)

[27P2X-27] *Research on Specialized Courses Teaching of Science Majors in Colleges and Universities from the Perspective of Interdisciplinary Knowledge Communication (A0266)*

Linna Yao (Qujing Normal University): (China Mainland)

[27P2X-28] *Exploring how Place-based education practice can improve rural students' learning effects and perspectives concerning science learning (A0283)*
Chiung-Fen Yen (Providence University), HsuanFang Hung (Providence University): (Taiwan)

[27P2X-29] *The Teaching Strategy and Modeling Process for 'Scientific model co-construction' Using Smart Devices. (A0022)*
Hyunseok Oh (Seoul National University Middle School): (Korea)

[27P2X-30] *A Pilot Study on Developing and Validating a Fixation-Based Scaffolding Learning System (A0271)*
Chung-Yuan Hsu (National Taiwan University of Science and Technology), Guo-Li Chiou (National Taiwan University of Science and Technology), Meng-Jung Tsai (National Taiwan University of Science and Technology): (Taiwan)

Poster 2Y (27th, 11:30-12:50)

[27P2Y-01] *A case study of craftsmanship courses using a new distance education system for the overseas educational institutions of technical education (A0567)*
Mitsumasa Ito (Salesian Polytechnic Tokyo), Hiroshi Ichimura (Study Group on M2M): (Japan)

[27P2Y-02] *Research on development of a collaborative learning model using SNS (A0556)*
Heebok Lee (Kongju National University), Youngseon Seo (Seoul National University of Education): (Korea)

[27P2Y-03] *Avoid obstacles car and can control with VR (A0616)*
Cho Hyun Jea (Soong Moon Middle School), Huh Sung Woo (Soong Moon Middle School): (Korea)

[27P2Y-04] *Designing new media art (A0563)*
Seong-Won Ha (Soong Moon Middle School), Woo-Jae Lee (Soong Moon Middle School), Brian Min (Soong Moon Middle School): (Korea)

[27P2Y-05] *Sand mirror (A0613)*
Lee Hyoung Soe (Soong Moon Middle School), Lee Oh new (Soong Moon Middle School): (Korea)

[27P2Y-08] *A Teacher's Knowledges in Fraction Division Teaching: A Textbook-based Design (A0380)*
Shu-I Chang (National Taipei University of Education): (Taiwan)

[27P2Y-09] *Practice of Experiment-based Active Learning Aiming at Connection with Modern Mathematics in High School Mathematics (A0179)*
Mayu Ikeda (Tokyo University of Science), Junpei Gohara (Tokyo University of Science), Iwao Mizukai (Tokyo University of Science), Akifumi Sako (Tokyo University of Science): (Japan)

[27P2Y-10] *Development of Problems and Experimental Apparatus of Domestic Physics Competition for International Physics Olympiad and its Implication to Middle School Science Education (A0553)*
Yasuhiro Kondo (Tokyo University of Science), Kazuo Kitahara (Tokyo University of Science), Hire Totsuji (Okayama University), Masuaki Matsumoto (Gakugei University), Tadayoshi Tanaka (Kanazawa Institute of Technology), Hiroyuki Yoshida (SEG), Tsutomu Nakayashiki (Okayama Ichinomiya High School), Tsutomu Nakayashiki (Okayama Ichinomiya High School), Tsutomu Nakayashiki (Okayama Ichinomiya High School), Tsutomu Nakayashiki (Okayama Ichinomiya High School): (Japan)

[27P2Y-11] *A Review of Modeling Research in Science Education in Japan (A0174)*
Hiroshi Unzai (Hiroshima University), Takuya Matsuura (Hiroshima University): (Japan)

[27P2Y-12] *A Case Study from Free Semester in Middle School Applying STEAM Using High-Tech Display Products (A0004)*
Kyung Mee Lee (Korea Advanced Institute of Science and Technology), Kyu Seong Lim (Korea Advanced Institute of Science and Technology), Soo Yong Kim (Korea Advanced Institute of Science and Technology): (Korea)

[27P2Y-13] *Development of Project-Based Lesson Model in Junior High School Chemistry: Exploring Desirable Utilization of Plastics (A0611)*
Hiroshi Tanso (Okayama University), Norikazu Umehara (Togo Junior High School), Hiroki Fujii (Okayama University): (Japan)

[27P2Y-14] *Issues in Using Art Works as Teaching Materials (A0102)*
Hsin Ying Chiang (University of Taipei / Teacher of Taiping Elementary School): (Taiwan)

[27P2Y-16] *Talent Characteristics of Science and Non-Science High School Students in Japan (A0424)*
Sora Hashimoto (Matsuyama Higashi Senior High School), Manabu Sumida (Ehime University): (Japan)

[27P2Y-17] *Analysis on the inquiry activities in Physics Textbooks based on the 2009 science curriculum of Korea through the crosscutting concept 'patterns' of scientific practices (A0544)*
Bo Kyoung Kim (Ewha Womans University), Sung-Won Kim (Ewha Womans University): (Korea)

[27P2Y-19] *The Effect of Problem-Based Learning on Concept Change of Combustion (A0263)*
Kun-Yuan Yang (Chung Yuan Christian University), Miao-Li Changlai (China University of Technology), Wen-Feng Qiu (Chung Yuan Christian University): (Taiwan)

[27P2Y-23] *Thought of mathematical model in the application of "amount of substance" in the concept teaching of chemistry of senior high school (A0617)*
Wenhua Zhang (Central China Normal University): (China Mainland)

[27P2Y-24] *A Framework for automatic detection of attention in MOOC using eye tracking and facial expression (A0228)*
Yun Zhou (Shaanxi Normal University), Bei Dong (Shaanxi Normal University), Tao Xu (Northwestern Polytechnical University), Xiaojun Wu (Shaanxi Normal University): (China Mainland)

[27P2Y-25] *The learning outcomes exploration of English teaching with science picture books (A0426)*
Sing-Ruei Chen (National Taichung University of Education), Sung-Tao Lee (National Taichung University of Education): (Taiwan)

[27P2Y-26] *Exploring Topic-specific PCK Progression for Elementary Teachers Instruction of Astronomy: Focusing on the Topic of Planet Size and Distance in Solar System (A0145)*
Kiyoung Lee (Kangwon National University): (Korea)

[27P2Y-27] *The Effect of Authentic Learning in Elementary Science Classes: A Case Study in the Sixth-Grade Class of the Burning (A0105)*
Hiroshi Ogawa (Kyoto Notre Dame University), Toyosei Hirata (Bukkyo University), Shinji Matsumoto (Hyogo University of Teacher Education): (Japan)

[27P2Y-28] *Utilizing project-based instruction to promote students' information technology learning (A0433)*
Ching-San Lai (National Taipei University of Education): (Taiwan)

[27P2Y-29] *Teaching Mathematics to K-12 Students Using Artifacts from Museo De La Salle (A0269)*
Lea Diata Maderal (De La Salle University - Dasmarinas), Ma. Theresa

Christine Cuarteron Valdez (De La Salle University - Dasmarinas), EdwinS Bunag (De La Salle University - Dasmarinas): (The Philippines)

[27P2Y-30] *Exploring the change of understandings and practices of astronomical thinking through PCK: with the content of solar system and earth motion (A0514)*
Song JinYeo (Chonnam National University), Son JunHo (Moonsan Elementary School), Park Young Shin (Chosun University): (Korea)

Poster 3X (28th, 11:30-12:50)

[28P3X-01] *WeMAKE : Science & Technology Learning Platform (A0519)*
Jaekwon Kim (Munsu HighSchool): (Korea)

[28P3X-02] *The Studies of Developing STEM-teaching materials on Urban Heavy Rain in Taiwan Elementary Schools (A0480)*
Chien-Kuo Ku (University of Taipei), Heng-Chi Chou (Taipei City Kuangfu Elementary School): (Taiwan)

[28P3X-03] *Vargula hilgendorfii -as one of the wonderful bio-STEM materials (A0569)*
Naoko Kosaka (Shizuoka University), Yoshihiro Ohmiya (National Institute of Advanced Industrial Science and Technology), Yoshisuke Kumano (Shizuoka University): (Japan)

[28P3X-04] *International comparative study on exhibits related to astronomy: by focusing on characteristics and science curriculum reflected in exhibits (A0201)*
Soo-Kyung Kim (Seoul National University), Chan-Jong Kim (Seoul National University), Seung-Urn Choe (Seoul National University): (Korea)

[28P3X-05] *Evaluation of the "Let's Excavate Fossils" workshop conducted at elementary schools (A0107)*
Junji Amano (Gamagori Museum of Earth, Life and the Sea), Hajime Shimizu (Gamagori Museum of Earth, Life and the Sea), Masatoshi Kaida (Gamagori City Board of Education), Shogo Kawakami (Former Gamagori Museum of Earth, Life and the Sea): (Japan)

[28P3X-06] *Using Plastic Bottles as Reaction Vessels To Explore the Gas Chemistry of Old Submarine Technologies (A0115)*
Ryo Horikoshi (Osaka-Sangyo University): (Japan)

[28P3X-07] *Educational Effects of Science Camp on gifted students (A0582)*
Jiyoung Ryu (KAIST GIFTED), Ji Seon Kim (Korea Advanced Institute of Science and Technology), Bo Keun Kim (Korea Advanced Institute of Science and Technology), Mijin Kim (Korea Advanced Institute of Science and Technology): (Korea)

[28P3X-08] *Exploring science communication displayed by exhibit media and suggesting its development direction in science education: The case of nuclear radiation (A0268)*
Dahye Jeong (Chosun University), Min-Hwan Kim (Chosun University), Young-Shin Park (Chosun University): (Korea)

[28P3X-09] *A case study of teaching nature of science in elementary school: Student investigation about Japanese scientists. (A0324)*
Masakuni Shida (Hiroshima University Attached Elementary School), Susumu Nozoe (University of Miyazaki), Tetsuo Isozaki (Hiroshima University): (Japan)

[28P3X-10] *Development of a class for junior high school students to think about biodiversity conservation on the theme of introduced Genji firefly from other areas in Japan (A0164)*
Takahiro Yamanoi (Hakuoh University), Chiharu Sato (Hakuoh University), Yasunori Koya (Gifu University), Hajime Ohtsuki (Tohoku University): (Japan)

[28P3X-11] *Making Experimental Kit of Fuel Cell towards Teaching Material (A0539)*
Akira Ikuo (Tokyo Gakugei University), Yoshiya Hayashi (Tokyo Gakugei University), Wataru Osada (Tokyo Gakugei University), Haruo Ogawa (Tokyo Gakugei University): (Japan)

[28P3X-12] *Development of Science Teaching Materials in English and Teaching Practice at Overseas (A0484)*
Masako Tanemura (Osaka Kyoiu University), Tetsuya Iwamoto (Ibukino Elementary School), Mayumi Okuda (Osaka Kyoiku University), Takumi Katsuoka (Osaka Kyoiku University), Ryoji Kawaguchi (Osaka Kyoiku University), Shotaro Matsushita (Osaka Kyoiku University), Hidetsugu Tonomura (Osaka Kyoiku University), Hidetsugu Tonomura (Osaka Kyoiku University), Hidetsugu Tonomura (Osaka Kyoiku University), Hidetsugu Tonomura (Osaka Kyoiku University): (Japan)

[28P3X-14] *The Effect of Concept Change Texts with Concept Mapping on the Understanding of Photosynthesis (A0264)*
Miao-Li Changlai (China University of Technology, Taiwan), Kun-Yuan Yang (Chung Yuan Christian University), Xiu-Hua Liu (Chung Yuan Christian University): (Taiwan)

[28P3X-15] *College students' moral judgment about socio-scientific issues- An fMRI study (A0270)*
Wen Hua Chang (National Taiwan Normal University): (Taiwan)

[28P3X-16] *Research on the Constituent Elements and Development Level of Students' Ability of Scientific Experiment (A0351)*
Wei Lu (Shandong Provincial Institute of Education Sciences): (China Mainland)

[28P3X-17] *Fostering High School Students' Scientific Modeling through Model based Inquiry (A0423)*
Pannida Meela (Khon Kaen University), Romklao Artdej (Khon Kaen University): (Thailand)

[28P3X-18] *Collaborative innovation: a new mode and mechanism of in-service teacher education training in Beijing Institute of education (A0299)*
Ying Zhou (Beijing Institute of Education), Hua Feng (Beijing Institute of Education), Youfu Ding (Beijing Institute of Education), Weiyu Gong (Beijing Institute of Education), Zhanghua Sun (Beijing Institute of Education), Lingzhi Qiao (Beijing Institute of Education), Shuang Feng (Beijing Institute of Education), Shuang Feng (Beijing Institute of Education), Shuang Feng (Beijing Institute of Education), Shuang Feng (Beijing Institute of Education): (China Mainland)

[28P3X-19] *Enhance the ability of pre-service teachers' PCK through cooperative learning (A0618)*
Lei Jiang (Central China Normal University), Wenhua Zhang (Central China Normal University), Ling Ma (Central China Normal University), Zijie Wang (Central China Normal University), Xuan Wang (Central China Normal University), Xiaosu Lang (Central China Normal University): (China Mainland)

[28P3X-20] *The Investigation For Pre-service Teachers With The Ability Of Using The Microscopic Model In "Primary Battery" Concept Change Teaching (A0619)*
Zijie Wang (Central China Normal University), Wenhua Zhang (Central China Normal University), Xiaosu Lang (Central China Normal University), Ling Ma (Central China Normal University), Lei Jiang (Central China Normal University), Xuan Wang (Central China Normal University): (China Mainland)

[28P3X-21] *Research on the causes of the differences in the construction of the concept map of pre-service teachers (A0620)*
Ling Ma (Central China Normal University), Wenhua Zhang (Central China Normal University), Lei Jiang (Central China Normal University), Xiaosu Lang (Central China Normal University), Zijie Wang (Central China Normal University), Xuan Wang (Central China Normal University): (China Mainland)

[28P3X-22] *The discussion of the dilemmas for pre-service chemistry teachers in designing a chemistry exploratory teaching (A0621)*
Xiaosu Lang (Central China Normal University), Wenhua Zhang (Central China Normal University), Zijie Wang (Central China Normal University), Lei Jiang (Central China Normal University), Ling Ma (Central China Normal University), Xuan Wang (Central China Normal University): (China Mainland)

[28P3X-23] *Development of the Educational Program in Science based on Questioning Framework: Focusing on Interactive Activities in relation to Natural Phenomena for Inducing Cognitive Conflicts (A0057)*
Takekuni Yamaoka (Kitauwa Upper Secondary School), Hiroyuki Shirahama (Ehime University), Shinji Matsumoto (Hyogo University of Teacher Education): (Japan)

[28P3X-24] *Developing the Teaching Method for Nature of Science: Connecting Characteristics of Science and Decision Making (A0080)*
Kosaku Kawasaki (Okayama University), Yuki Yuge (Masuhigashi Elementary School): (Japan)

[28P3X-25] *A Study of Designing Learning Environment to Develop Student Competency and Teaching skills: Case of Japan (A0365)*
Masafumi Watanabe (Hokkaido University of Education, Sapporo Campus): (Japan)

[28P3X-26] *Effects of the Tutorials on students' understanding of Newton's laws: an investigation at a Japanese high school (A0124)*
Eiko Kaga (Hiroshima University), Shuji Munejiri (Hiroshima University), Masanori Inui (Hiroshima University): (Japan)

[28P3X-27] *The learning achievement of university students in web-based cooperative learning environment in ecology course (A0199)*
LiLing Chao (National Changhua University of Education), ChiaLing Wen (National Changhua University of Education), Wei Lung Wang (National Changhua University of Education): (Taiwan)

[28P3X-28] *Investigating the Factors that Influence Chemistry Teachers' Implementation of 'Scientific Inquiry' Activities (A0007)*
Bo Chen (Guangzhou University), Bing Wei (University of Macau), Kai Chen (Nanjing Xiaozhuang University): (China Mainland)

[28P3X-29] *A Case Study of a High School Biology Teacher to Promote Students' Conceptual Understanding through the Scientific Explanation (A0321)*
Jhuo-Syun Sie (National Changhua University of Education), Shu-Fen Lin (National Changhua University of Education): (Taiwan)

[28P3X-30] *Nature of Science for all Science Teachers (A0420)*
Shoju Tonishi (Aichi University of Education): (Japan)

Poster 3Y (28th, 11:30-12:50)

[28P3Y-01] *Developing students' scientific literacy using reading and writing activities (A0394)*
Yi-Fen Yeh (National Taiwan Normal University), Ying-Shao Hsu (National Taiwan Normal University): (Taiwan)

[28P3Y-02] *Development and Practice of "RIKADOKU" Program for Biological Education of the Early Year Children -Case Studies about "the Similarities and the Varieties of the Citrus Fruits" based on Japanese Culture- (A0352)*
Asami Ohnuki (Shirayuri University), Rumi Haraguchi (Tokyo Gakugei University), Yutaka Takigami (Kanto Gakuen University), Mikako Doi (NPO Galileo Science Workshop): (Japan)

[28P3Y-03] *Development of Training Design and Materials to Enhance Mathematics Teachers' Competencies (A0011)*
Dolly Rose Flores Temelo (West Visayas State University): (The Philippines)

[28P3Y-04] *The influence of parents on science course choice of female students (A0512)*
Toshiko Amemiya (Ochanomizu University), Katsuhisa Kagami (Ochanomizu University), Akiko Sato (Ochanomizu University): (Japan)

[28P3Y-05] *The preservice science teachers' learning of how to teach NOS (A0434)*
Sun Young Kim (Chosun University): (Korea)

[28P3Y-06] *Study on Anatomy Teaching of the Ordinary Elementary School Science Learning Book in the Early Showa Era (A0053)*
Tetsuya Suzuki (Tokyo Future University): (Japan)

[28P3Y-07] *Analysis and Reflection on Gender Culture in Illustrations of Physics Textbooks (A0219)*
Bing Yu (Northeast Normal University), Haibo Yu (Northeast Normal University), Rui Dai (Northeast Normal University): (China Mainland)

[28P3Y-08] *How Works the Super Science High School Using Japanese Traditional Mathematics: WASAN (A0043)*
Minoru Ito (Tokyo University of Science), Tetsuya Kobayashi (Ryugasaki Daiichi High School): (Japan)

[28P3Y-09] *Integrating reading into geometry teaching (A0377)*
Yi-Wen Su (University of Taipei): (Taiwan)

[28P3Y-10] *Empower elementary school students to learn algebra through remedial teaching materials and learning activities (A0063)*
Ru-Fen Yao (National Chia-Yi University): (Taiwan)

[28P3Y-11] *Promoting children's thinking skills through board games (A0526)*
Yu-Chi Chao (National Taipei University of Education): (Taiwan)

[28P3Y-12] *Opinions of Japanese University Students about Issues of Bioethics: Comparison between Male Students and Female Students (A0005)*
Junko Iwama (Toin University of Yokohama), Kunio Umeno (Former Nakamura Gakuen University), Shizuo Matsubara (Toin University of Yokohama): (Japan)

[28P3Y-13] *Exploring the Relationships between Taiwanese High School Students' Scientific Epistemic Views and Decision-making Style under the context of environmental education (A0133)*
Tung Lin Li (National Sun Yat-sen Universtiy), Min Hsien Lee (National Sun Yat-sen Universtiy): (Taiwan)

[28P3Y-14] *Effects of School-Community Joint Science Programs about the Abandoned pet issues (A0150)*
Jinhee Kim (Ewha Womans University), Suhi Kwon (Ewha Womans University), Hyunju Lee (Ewha Womans University): (Korea)

[28P3Y-15] *Exploring undergraduates' conceptions of environmental education in Taiwan: a phenomenographic analysis. (A0072)*
Yi-Lun Syu (National Sun Yat-sen University), Min-Hsien Lee (National Sun Yat-sen University): (Taiwan)

[28P3Y-16] *Consciousness on the relation between science and mathematics which focused on the "unit" (A0444)*
Takahito Yamada (Yokosuka City Takatori Junior High School), Mie Obara (Kanagawa Prefctual education Committee), Masato Kosaka (Japan International Cooperation Agency), Hidetoshi ANDOH (Hokkaido University of Education): (Japan)

[28P3Y-17] *Exploring the Influence of Prior Knowledge on Evaluating Scientific Explanation through Eye-Tracking. (A0262)*

Ke-Wei Lee (National Chiao Tung University), Chih-Shen Hsu (National Chiao Tung University), Yi-Zhen Lai (National Chiao Tung University), Chia-Yu Wang (National Chiao Tung University): (Taiwan)

[28P3Y-18] *The influences of junior high school students' environmental literacy on water pollution curriculums (A0050)*
Chin-Fei Huang (National Kaohsiung Normal University), Yin-Ru Lin (National Kaohsiung Normal University), Houn-Lin Chiu (National Kaohsiung Normal Univeersity), Ming-Chung Ho (National Kaohsiung Normal University), Chia-Ju Liu (National Kaohsiung Normal University): (Taiwan)

[28P3Y-19] *The Analysis of the Characteristics of Argumentation in the Scientific Inquiry Discussion Process of Elementary School Students (A0432)*
JIYE KIM (Seoul National University of Education): (Korea)

[28P3Y-20] *Development of Metacognition Questionnaire in Thai Contexts (A0533)*
Pornrat Wattanakasiwich (Chiang Mai University), Chantalak Tiyayon (Chiang Mai University), Duanghathai Katwibun (Chiang Mai University), Rungchat Chompuinwai (Chiang Mai University), Thanyaporn Siriwoharn (Chiang Mai University), Wichai Chattinnawat (Chiang Mai University): (Thailand)

[28P3Y-21] *Devising a national index for natural hazard awareness (A0390)*
David Anthony Cerulli (University of Tartu), Jack Holbrook (University of Tartu), Ulo Mander (University of Tartu): (Estonia)

[28P3Y-22] *The study of scientific thinking literacy departments: comparison of science education-related departments and non-science education-related departments (A0282)*
Shao-Zu Su (National Taiwan Normal University), Po-Hsi Chen (National Taiwan Normal University), Ya-Wen Chang (National Taiwan Normal University), Chia-Yi Lin (National Taiwan Normal University): (Taiwan)

[28P3Y-23] *Transition of astronomy curriculum in Japanese schools and spatial cognitive ability of elementary and junior high school students (A0284)*
Daiji Okada (Hiroshima Kokusai Gakuin University), Takuya Matsuura (Hiroshima University): (Japan)

[28P3Y-24] *The Evolution of the Curriculum in Chinese Preschool Science Education (A0414)*
Jiafa Jiang (Anhui Normal University), Han Zhang (Anhui Normal University): (China Mainland)

[28P3Y-25] *Study on Double-guard web-based interactive teaching method in introductory physics classes (A0623)*
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[28P3Y-26] *Students' performance in different format of evaluations: digital vs. paper-pencil tests (A0408)*
Yu-Ling Lu (National Taipei University of Education), Chi-Jui Lien (National Taipei University of Education), Wen-Tsen Luo (National Taipei University of Education), Chien-Ju Li (National Taipei University of Education): (Taiwan)

[28P3Y-27] *A learning system to enhance imagination and creativity learning for university engineering students (A0036)*
Hsien-Sheng Hsiao (National Taiwan Normal University), Jon-Chao Hong (National Taiwan Normal University), Po-Hsi Chen (National Taiwan Normal University), Yi-Hsuan Hung (National Taiwan Normal University), Jyun-Chen Chen (National Taiwan Normal University): (Taiwan)

[28P3Y-28] *Extracurricular Activities with Practical Experience Based on Expanding 'Seeing' (A0410)*
Satoko Uchida (University of Fukui), Kayoko Okakura (Kamishihi Junior High School), Masaru Kokaji (Shihi Elementary School): (Japan)

[28P3Y-29] *Developing students' scientific literacy in chemical equilibrium teaching (A0494)*
Ruizhe Shi (Beijing Fangshan Experimental High School), Kewen Liu (Beijing Normal University): (China Mainland)

[28P3Y-30] *Enhancing gifted students' scientific inquiry skills through the Enrichment Triad Model (A0445)*
Yu-Chi Chao (National Taipei University of Education): (Taiwan)

Special Poster 1X (26th, 11:30-12:50)

[26SP1X-01] *Expectation on the usage of ICT knowledge in Science Activity of Scientifically Gifted through Software Education (A0521)*
Miyoung KIM (Ewha Womans University), Sungwon Kim (Ewha Womans University): (Korea)

[26SP1X-03] *The Process of Developing Research Questions and Designing Research in High School Research Project Class (A0475)*
Jisun Lee (Ewha Womans University), Youn Jung Choi (Ewha Womans University), Sung-won Kim (Ewha Womans University): (Korea)

[26SP1X-04] *Analysis of effects on the competencies and understanding about SSI through Pre-service Teachers' Experiences of producing 'SSI video contents' (A0591)*
Songyi Heo (Ewha Womans university), Sung-won Kim (Ewha Womans university): (Korea)

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[26SP1Y-01] *A study of cooperative learning in Secondary Mathematics Education - focus on enhancing of communication skills - (A0436)*
Hiroshi Katayama (Tokyo University of Science), Minoru Itoh (Tokyo University of Science): (Japan)

[26SP1Y-02] *Analysis of Teaching Method in Mathematics Education for Academic Development – Focusing on Proficiency Level – (A0575)*
Yoshiki Habe (Tokyo University of Science): (Japan)

[26SP1Y-03] *The Development of Teaching Material about "Railroad" as Mathematics Activity (A0465)*
Tomoaki Harada (Tokyo University of Science), Minoru Itoh (Tokyo University of Science), Yuki Watanabe (Tokyo Institute of Technology): (Japan)

[26SP1Y-04] *Engineering Tournament (ET): Promoting 21st Century Skills in Primary Science (A0624)*
Xueqi Feng (The University of Hong Kong), Yundong Qi (Nanjing Langya Road Primary School), Yi Feng (Nanjing Langya Road Primary School), Chengming Zhu (Nanjing Langya Road Primary School), Xue Zhang (Nanjing Langya Road Primary School), Qimei Lin (Nanjing Langya Road Primary School, China), Yuan Xu (Nanjing Langya Road Primary School, China), Yuan Xu (Nanjing Langya Road Primary School, China), Yuan Xu (Nanjing Langya Road Primary School, China), Yuan Xu (Nanjing Langya Road Primary School, China): (Hong Kong)

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[27SP2X-01] *Why can 'amateur scientists' continue to devote themselves in their scientific practices?: Searching for effective scaffoldings to encourage students to continue their 'doing science' activities in their daily life settings after finishing school. (A0471)*
Yuuri Kimura (Tokyo University of Science): (Japan)

[27SP2X-02] *Synthesis of ethenzamide from methyl salicylate as*

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Ryo saito (Tokyo University of Science), Masayuki Inoue (Tokyo University of Science): (Japan)

[27SP2X-03] *How can we encourage students to be consistent in their explanations? : Using the particle model to explain phase change (A0369)*
Yukiko Hirano (Chiba University), Shuichi Yamashita (Chiba University): (Japan)

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[27SP2Y-01] *Direction of The Class Design of The Junior High School Mathematics, for The Purpose of The Motivation Improvement (A0364)*
Shohei Omori (Tokyo University of Science), Minoru Ito (Tokyo University of Science), Yuki Watanabe (Tokyo Institute of Technology): (Japan)

[27SP2Y-02] *Development of graph theory textbook for educators (A0140)*
Junpei Gohara (Tokyo University of Science), Mayu Ikeda (Tokyo University of Science), Iwao Mizukai (Tokyo University of Science), Akifumi Sako (Tokyo University of Science): (Japan)

[27SP2Y-03] *Development and practice of teaching materials of the cycloid for cooperation between subjects mathematics and physics (A0234)*
Daiki Inoue (Tokyo University of Science), Hiromichi Itou (Tokyo University of Science): (Japan)

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Wilco W.H. Chan (Hong Kong Polytechnic University), Norman Au (Hong Kong Polytechnic University), Cheris W.C. Chow (University of Macau), Baifeng Sun (Wenzhou Washi Primary School): (Hong Kong)

[28SP3X-02] *Examining the effects of displaying clicker voting results on high school students' conceptual learning outcomes: A comparative study between Taiwan and Japan (A0477)*
Yu-Ta Chien (National Taiwan Normal University), Eizo Ohno (Hokkaido University), Yu-Hsien Lee (National Taiwan Normal University), Kohsuke Nomura (Sapporo Kaisei Secondary School), Chun-Yen Chang (National Taiwan Normal University): (Taiwan)

[28SP3X-03] *An investigation on junior secondary school biology teachers' STEM perceptions and practices in China mainland (A0222)*
Xuan Huang (Beijing Normal University), Enshan Liu (Beijing Normal University): (China Mainland)

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[28SP3Y-01] *Study on the Guidance to Increase the Mathematical Expression Using "Tower of Hanoi" (A0316)*
Masato Ando (Tokyo University of Science): (Japan)

[28SP3Y-02] *Inquest of the Teaching Method in Educational Continuity from Primary through Early Secondary Levels (A0528)*
Satoshi Fujinawa (Tokyo University of Science): (Japan)

[28SP3Y-03] *Examination teaching materials for the ordinary differential equation to increase learning motivation. (A0241)*
Yuya Namatame (Tokyo University of Science), Hiromich Ito (Tokyo University of Science): (Japan)

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