8th ICASE World Conference on Science and Technology Education in conjunction with the Irish Science Teachers' Association 64th Annual Conference

Conference Handbook

School of Education, University College Cork (UCC), Ireland Monday 22nd June to Thursday 25th June 2026

A big Thank You to our sponsors

Department of Education and Youth
Teacher Professional Networks
ESERO Ireland
Research Ireland
Thermo Fisher Scientific
BASF
Royal Society of Chemistry (RSC)
University College Cork (UCC)
Fáilte Ireland /The National Tourism Development Authority

International Council of Associations for Science Education

In June 1972 a meeting of science teachers, sponsored by the United Nations Educational, Scientific and Cultural Organization (UNESCO), was held in Singapore. This meeting, hosted by the Science Teachers' Association of Singapore (STAS) and the Singapore National Academy of Science, aimed to establish an international organisation linking national science teacher associations. This international organisation would facilitate the exchange of information and promote research collaborations amongst scientists, teachers, and students. This innovative meeting led to the founding of the International Council of Associations for Science Education (ICASE).

The organisational constitution of ICASE was approved at the second ICASE meeting held at the University of Maryland, USA, on 15 April 1973. At this meeting a constitution and logo for ICASE were adopted and members agreed to contribute an annual subscription to support the work of ICASE. Organisations that are eligible to join ICASE as full members are mainly science teacher associations. Institutional membership is open to institutions such as schools and universities while corporate membership is open to companies involved in industry or education. Since its foundation, over 200 organisations have been members of ICASE.

As mentioned above, one of the main aims of ICASE is to provide an international communications network for member organisations to enable these organisations to collaborate in areas related to science education. Thus, ICASE is closely involved in connecting science education organisations around the world. It does this by organising events at local and international level and also by publishing the journal *Science Education International* as well as the *ICASE International Bulletin for Science Education*.

ICASE Management

ICASE is managed by an Executive Committee under the chairmanship of the ICASE President. Even a cursory glance at the list of ICASE Presidents, Table 1, shows the international nature of ICASE.

Period	President
1973 – 1975	Dr. J. David Lockard (University of Maryland, USA)
1975 – 1978	Mr. B. G. Pitre (All India Science Teachers' Association - AISTA)
1979 – 1981	Mr. Robert Silber (National Science Teachers' Association of the USA - NSTA)
1981 – 1985	Mr. Brian Atwood (Association of Science Education of the UK—ASE)
1985 – 1989	Dr. Winston King (St. Vincent Science Teacher Association, Barbados)
1989 – 1993	Mr. Bob Lepischak (Canada Association of Science Education (CASE)
1993 – 1997	Dr. Brenton Honeyman (Australian Science Teacher Association—ASTA)
1997 – 2001	Ms. Anna Garner (Iceland Science Teacher Association—ISTA)
2001 – 2004	Dr. Robin Groves (Australian Science Teacher Association—ASTA)
2004 – 2007	Dr. Janchai Yingprayoon (Sc. Soc. Thailand – Sc. Teacher Section.)
2008 – 2011	Dr. Jack Holbrook (Hong Kong Association for Science and Mathematics Education—HKASME/EACT)
2011 – 2014	Dr. Ben Akpan (Science Teacher Association of Nigeria—STAN)
2014 – 2017	Dr. Teresa Kennedy (The National Science Teaching Association – NSTA)
2017 – 2020	Dr. Bülent Çavaş (Dokuz Eylul University, Turkey – DEU)
2020 – 2023	Dr. BaoHui Zhang (National Association for Science Education, The Chinese Society of Education – CNASE)
2023 – 2026	Dr. Declan Kennedy (Irish Science Teachers' Association – ISTA)

Table 1. Summary of ICASE Presidents 1973 - 2026

The ICASE Executive meets three times a year. The day-to-day running of ICASE is carried out by a Management Committee consisting of the President, the Past President, the President elect, the Treasurer, the Secretary and the UNESCO representative.

ICASE World Conferences on Science Education

As part of its mission for fostering collaboration between science teacher organisations around the world, ICASE organises a World Conference on Science Education every three years in different locations around the world. Locations of these conferences to date are summarised in Table 2.

No.	Year	Location
1st	2003	Penang, Malaysia
2nd	2007	Perth, Australia
3rd	2010	Tartu, Estonia.
4th	2013	Kuching, Malaysia
5th	2016	Antalya, Turkey.
6th	2019	Pattaya, Thailand
7th	2023	Dubai, United Arab Emirates.
8th	2026	Cork, Ireland.

Table 2. Location of ICASE World Conferences to date.

International Council of Associations for Science Education

Welcome from ICASE

It is a great honour for the School of Education, University College Cork, to host the 8th ICASE World Conference on Science and Technology Education. I vividly remember the visit to UCC in 2011 by Professors Teresa Kennedy and Jack Holbrook, representing the ICASE Executive, to present the plaque recognising the Eureka Centre as an ICASE Science and Technology Education Centre. That plaque serves as a daily reminder of the strong and enduring links between UCC and ICASE, and it is especially fitting that we now welcome delegates from around the world to Cork for this conference.

It has been a privilege to serve as Chair of the Organising Committee of this conference. Over the past three years, I have witnessed at first hand the extraordinary commitment and dedication of committee members in preparing for this event. ICASE and the Irish Science Teachers' Association (ISTA) share many values, but one characteristic stands out above all others: all of the work undertaken by both organisations is carried out voluntarily in somebody's spare time. I extend my sincere thanks to every member of the Organising Committee for their hard work, enthusiasm and attention to detail in ensuring that this conference runs as smoothly and successfully as possible.

I wish to acknowledge the huge support received from University College Cork. My sincere thanks go to Professor John O'Halloran, President of UCC; Professor Stephen Graham, Head of the College of Arts, Celtic Studies and Social Sciences; Professor Nicola Ingram, Head of the School of Education, and Dr. Tara Singleon, Manager School of Education . I am deeply grateful to my colleagues in UCC who have contributed so generously to the organisation of the conference and for contributing to the conference programme itself.

I also wish to thank our sponsors, whose generosity has helped to keep registration costs to a minimum. Special thanks are due to the staff of UCC Room Bookings for their exceptional assistance throughout the planning process; to our exhibitors for their valued support; and to the General Services, Audio-Visual staff, catering staff and cleaning teams, as well as the many helpers whose contributions are essential to the smooth running of this conference.

Finally, I would like to thank you, our delegates, for joining us in Cork. Your participation, expertise and willingness to share ideas in discussions and in presenting papers are what make conferences such as this both stimulating and worthwhile. I hope that the coming days will provide opportunities for fruitful discussion, continuing professional development, new collaborations and lasting friendships as we explore together the challenges and opportunities facing Science and Technology education.

Céad míle fáilte go hÉirinn. (A hundred thousand welcomes to Ireland)

Warm wishes,

Declan Kennedy

ICASE President

Welcome from ISTA

I am delighted to extend a warm welcome to our colleagues from ICASE and ISTA who are attending this conference. This event is a tangible demonstration of the close and productive partnership that exists between ICASE and ISTA. As a member of the conference Organising Committee, I have witnessed at first hand the dedication, expertise and goodwill that both organisations have brought to the planning of this conference. The result is a truly collaborative international event that reflects our shared commitment to excellence in science and technology education.

The Irish Science Teachers' Association is one of the largest subject associations in Ireland. Founded in 1961, it has grown to a membership of more than 1,700 teachers representing all sectors of education. For over six decades, the Association has worked to support the professional development of science teachers and to promote the highest standards of science education throughout Ireland.

The ISTA operates on a voluntary basis and seeks to foster cooperation among science educators at all levels. Through conferences, workshops, publications and professional networks, the Association helps members remain informed about developments in science, curriculum, assessment and teaching methodologies. Above all, it seeks to support teachers in inspiring young people to develop a positive and informed attitude towards science and technology and their role in society.

The ISTA has been associated with ICASE since the organisation was established in 1972. We are proud that Dr. Oliver Ryan represented the ISTA at the historic meeting in Maryland, USA, in 1973 at which the ICASE Constitution was approved. This long-standing relationship reflects the international outlook of the Association and its commitment to supporting science education beyond Ireland's shores.

In recent years, the contribution of ISTA members to the work of ICASE has continued to grow. Mary Mullaghy serves as Honorary Treasurer of ICASE; Eoghan Long and Dr. Ryan Gallagher are members of the ICASE Website Committee; and Stephen Murphy is Editor of the International Bulletin for Science Education. A particularly significant milestone was reached at the 7th World Conference on Science and Technology Education in Dubai in 2023 when Dr. Declan Kennedy, ISTA Membership Secretary and National CPD Coordinator, was elected President of ICASE.

I am especially pleased that this World Conference is being hosted in Ireland and that we have the opportunity to welcome delegates from more than forty countries. I hope that your time in Cork will be professionally rewarding, intellectually stimulating and personally enjoyable. May this conference provide opportunities for learning, collaboration, friendship and the exchange of ideas that will continue long after the conference has concluded.

Sincere good wishes,

Humphrey Jones

Chairperson, Irish Science Teachers' Association

Conference Programme

Monday (See pages 8 to 13 for details)

9:00 Registration opens in the Boole basement (and is open all day)

10:05 – 10:45 Pre-Conference Workshops:
- UI World Erasmus+ . . . . . Boole 1
- acaSTEMy Project Erasmus+ . . . . . Boole 2
- Mathematics Seminar . . . . . Boole 5

10:45 – 11:15 Tea / coffee

11:15 – 11:55 Official Opening: Professor Stephen Graham. Welcome and Introductions . . . . . Boole 4

12:05 – 12:55 Dr. Matthew Thomas, and Dr. Teresa J. Kennedy
Keynote Opening: UNESCO and ICASE
Global Collaboration in Science Education . . . . . Boole 4

13:00 – 14:00 Lunch

14:00 – 14:55 **Keynote 1** Curriculum Development at International level.
Prof Áine Hyland (Ireland) Chair, Dr. Laura Daly (RSC);
Dr. Stuart Farmer (Scotland); Dr. Donna Governor NSTA (USA);
Dr. Manabu Sumida (Japan); Prof. BaoHui Zhang (China) . . . . . Boole 4

15:05 – 15:55 Concurrent Sessions **1** . . . . . Boole 1, 2, 3, 4, 5, 6

16:05 – 16:55 Concurrent Sessions **2** . . . . . Boole 1, 2, 3, 4, 5, 6

17:00 – 18:30 Welcome Reception in Eureka Centre. Launch of Ocean Decade book series and of UNESCO Ocean Decade Film Screening
Teresa Kennedy, Catherine McCann and Lucy Hunt . . . . . Eureka Centre

19:30 – 21:30 Buffet meal in Metropole Hotel and Welcome from the ISTA
Welcome from 'Robert Boyle', Lismore Castle, Co. Waterford
- Dr. Sheila Donegan and Dr. Eoin Gill, SETU, Waterford. . . . . Metropole Hotel

Tuesday (See pages 15 to 25 for details)

9:00 – 9:55 Welcome Address: President John O'Halloran UCC.
Keynote 2: The Assessment of Practical Work in Science Education,
Prof. Michael Reiss, Professor of Science Education, UCL . . . . . Boole 4

10:05 - 10:45
- Astronomy and the new LC Physics syllabus, Prof. Paul Callanan, UCC . . . . . Boole 1
- Pharmaceuticals in the new Leaving Certificate Chemistry syllabus, Dr. Stuart Collins, School of Chemistry, UCC . . . . . Boole 2
- Space as a tool for teaching STEM - projects for JC, TY, and LC. Áine Flood and Brendan Owens, ESERO Ireland/Research Ireland. . . . . Boole 3
- The Nature of Science and the Science of Nature, Dr. Fidelma Butler, UCC . . . . . Boole 4
- Concurrent Sessions **3** . . . . . Boole 5, 6

10:45 – 11:15 Tea/ Coffee Exhibitions

11:15 – 11:55
- The discovery of pulsars, Dame Jocelyn Bell Burnell, Oxford University . . . . . Boole 4
- Concurrent Sessions **4** . . . . . Boole 1, 2, 3, 5, 6

12:05 – 12:55
- Implications of the introduction of AAC Laboratory-Based Research Investigations in Ireland, Prof Mike Watts, Brunel University London . . . . . Boole 4
- Health and Safety aspects of AAC student laboratory investigations, Matt Endean, CLEAPSS, UK. . . . . Boole 4
- Concurrent Sessions **5** . . . . . Boole 1, 2, 3, 5, 6

13:00 – 14:00 Lunch and Exhibitions

14:00 – 14:55. **Keynote 3:** Artificial Intelligence and the Science Teacher, Prof Miles Berry, University of Roehampton . . . . . Boole 4

15:05 – 15:55 • Symposium Key Aspects of the Biology, Chemistry and Physics AAC projects . . Boole 4
• Concurrent Sessions **6** . . . . . Boole 1, 2, 3, 5, 6
16:05 – 17:00 ICASE Regional Meetings . . . . . Boole 1, 2, 3
ISTA Annual General Meeting . . . . . Boole 4
Concurrent Sessions **7** . . . . . Boole 5, 6
19:30 – 21:30 Buffet Meal . . . . . Metropole Hotel

Wednesday (See pages 27 to 30 for details)

9:00 – 9:55 **Keynote 4** - The PISA 2025 Science Assessment Framework: Implications for Science Education, Prof. Jonathan Osborne, Stanford University, USA. . . . . Boole 4
10:05 - 10:45 Concurrent Sessions **8** . . . . . Boole 1, 2, 3, 4, 5, 6
10:45 – 11:15 Tea / coffee and Poster Presentations
11:15 – 11:55 Concurrent Sessions **9** . . . . . Boole 1, 2, 3, 4, 5, 6
12:00 – 13:00 Lunch and Poster Presentations

13:00 **Excursions**

Buses depart to Cobh at 13.00
1. Spike Island – Heritage Island
2. Titanic Heritage Centre.
3. Cobh Heritage Centre.
4. Cobh Rebel walking tour.
5. Fota Wildlife Park Education Centre.
6. Tyndall National Institute in ICT at UCC

19:30 – 21:30 Conference Gala banquet and ICASE presentations / awards . . . . . Metropole Hotel

Thursday (See pages 31 to 32 for details)

9:00 – 9:55 **Keynote 5:** Industry-Education Links: Technology in Science Education and Sustainable Development. Chair: John McAuliffe (CEIA) and panel . . . . . Boole 4
10:05 - 10:45 Concurrent Sessions **10** . . . . . Boole 1, 2, 3, 4, 5, 6

10:45 – 11:15 Tea/ Coffee and Poster Presentations
11:15 – 11:55 Concurrent Sessions **11** . . . . . Boole 1, 2, 3, 4, 5, 6
12:05 – 12:55 Concurrent Sessions **12** . . . . . Boole 1, 2, 3, 4, 5, 6
13:00 – 14:00 Lunch and Poster Presentations

14:00 – 14:55. • Student projects SCIFEST and STRIPE Science Exhibition . . . . . Boole 3

• ICASE General Assembly Conference Declaration and Presentation of prizes . . . . . Boole 4
• Closing Ceremony . . . . . Boole 4

15:00 – 16:00 Farewell Reception . . . . . Boole 4

SciFest

20 Years of Equal Access, Endless Possibilities

Why Teachers Choose SciFest

- Free to Enter
- Open to All
- Supports the Curriculum
- Demonstrates Leadership in STEM Education
- Builds Professional Networks
- Recognises Achievement
- Teacher Support

At the Close of the Academic Year 2025/2026

- 165 SciFest STEM fairs will have taken place
- Almost 14,000 students will have presented over 5,000 projects at local SciFest@School fairs
- Over 2,500 students will have presented almost 1,400 projects at 15 regional SciFest@College fairs in third-level colleges

Conference Organising Committee

ICASE Management Committee

Dr. Declan Kennedy d.kennedy@ucc.ie

Dr. Bülent Çavaş bulent.cavas@deu.edu.tr

Dr. Teresa Kennedy tkennedy@uttyler.edu

Mary Mullaghy mmullaghy@gmail.com

Local Organising Committee

Rosemarie Ferriter ferriter.rosemarie@gmail.com

Sean Finn S.Finn@ucc.ie

Dr. Ryan Gallagher Ryan.Gallagher@ucc.ie

Rory Geoghegan RoryLGeoghegan@gmail.com

Sinead Hurley sinead.hurley@dcscork.ie

Jakub Janisweski j.janiszewski@northmonastery.ie

Humphrey Jones humphrey.jones@gmail.com

Ken Keohane ken.keohane@thermofisher.com

Eoghan Long EoghanJLong@gmail.com

Geraldine McCarthy germcc01@yahoo.com

Stephen Murphy StephenMurphy@ucc.ie

Robert Nolan r.robertcnolan@gmail.com

Paul Nugent paul.nugent@gmail.com

David O'Brien david.obrien@balcs.ie

John O'Donoghue john.odonoghue@tcd.ie

Siobhan Scott siobhanscottsweeney@gmail.com

Brian Smyth bds53@eircom.net

Monday 22 June : 10:05 – 10:45

9:00 – Registration, Boole basement

Note: Registration desk is open all day from 9:00 am in the basement of the Boole lecture theatre complex.

10:05 – 10:45 Boole 1

Pre-Conference Workshop Erasmus - Science Education Across Europe

This symposium examines the HUI-WORLD methodology as a framework for integrating Earth Science, digital pedagogy, inclusion, and active citizenship in secondary education. Drawing on questionnaire evidence and in-classroom teaching, it considers how inquiry-based and project-based approaches can enhance STEM engagement, environmental awareness, teachers' digital competence, and interdisciplinary practice across European secondary schools.

HUI World Erasmus +

Ryan Gallagher, Stephen Murphy (Ireland) and Serena di Grazia (Italy)



The HUI-WORLD methodology in secondary education refers to an Erasmus+ and global education framework designed to integrate digital literacy, environmental awareness, and cross-curricular teaching into the curriculum. It encourages educators to move beyond traditional instruction by fostering sustainable thinking, civic responsibility, and student-led collaborative learning.

Key Pillars of the HUI-WORLD Methodology

Cross-Curricular Approach: Breaks down traditional subject silos, allowing students to explore real-world challenges (such as the SDGs) across different academic disciplines.

Project-Based & Experiential Learning: Promotes "productive struggle" and active participation, requiring secondary students to construct knowledge through collaborative problem-solving.

Digital Integration: Utilizes digital platforms and educational technology to enhance remote or hybrid learning effectiveness.

Global Citizenship & Sustainability: Aligns classroom instruction with UNESCO's global education goals, empowering youth to become active contributors to society.

10:05 – 10:45 Boole 2

acaSTEMy: Strengthening Research-Based STEM Teacher Education in Europe

Miia Rannikmäe (University of Tartu, Estonia),
Bülent Çavaş (Dokuz Eylul University, Turkey),
Jack Holbrook (University of Tartu, Estonia),
Janari Teessar (University of Tartu, Estonia)
Online: Anssi Salonen (University Eastern Finland)



The EU-funded **acaSTEMy** project seeks to build a strong connection between research and STEM education by utilising research excellence to strengthen teaching strategies and support high-quality, research-based STEM teacher education.

The project, involving partners from 8 European countries, is grounded in the belief that teachers should be equipped not only with strong disciplinary and pedagogical knowledge, but also with the ability to justify and reflect on their educational choices in relation to quality, relevance, and societal needs. By linking educational research, teacher education, and policy development, the project contributes to a more sustainable and future-oriented STEM education ecosystem.

Within continuing professional development, acaSTEMy seeks to address gaps left by initial teacher education, strengthen teachers' digital and transversal competences, and widen pathways into the STEM teaching profession by enabling adults from other fields to transition into teaching.

The symposium will present and discuss the following key objectives of acaSTEMy:

1. **Building sustainable partnerships in STEM teacher education**
2. **Enhancing digital competences in STEM education**
3. **Developing and validating innovative modules and micro-credentials**
4. **Promoting international mobility and professional development**.

10:5 – 11:15 Tea / coffee

Monday 10:05 – 13:00

10:05 – 10:45 **Boole 5**

IMTA Mathematics Seminar

An examination of Imitative/Creative reasoning in post primary mathematical tasks

Dr. Brendan O'Sullivan

(Mathematics teacher, Davis College, Mallow; NQT Mentor, Teaching and Learning coach|; Past Chair of IMTA (Irish Mathematics Teachers' Association)

Understanding Gender Differences in Leaving Certificate Mathematics Performance

Eoghan O'Leary

(Maths Teacher, Kinsale Community School. IMTA National Council Member. Head of Maths at The Tuition Centre)

Jennifer Loftus

(Society of Actuaries in Ireland's Diversity, Equity, Accessibility and Inclusion Committee and chairs their Gender Pipeline Working Group. She is an Executive Director of Acorn Life and an Independent Non Executive Director of VHI. Jennifer holds an MSc in Data Analytics and an MSc in Sustainability Leadership.)

11:15 – 12:00 **Boole 4**

Official Opening

by Professor Stephen Graham

Professor Stephen Graham is Head of the College of Arts, Celtic Studies and Social Sciences.

Stephen was Executive Dean of the Faculty of Creative Arts and Media and Professor of Music at Goldsmiths, University of London from 2020 to 2025. He was Co-Head of Music at Goldsmiths from 2018-2020.

Stephen studied at UCD and King's College London, completing a PhD at Goldsmiths. After becoming Lecturer in Music in 2011, Stephen developed his PhD into a book; Sounds of the Underground was published by University of Michigan Press in May 2016.

Stephen's Becoming Noise Music was published by Bloomsbury in 2023. Stephen co-authored a multi-generic history of 20thC music for CUP (2022, with Tom Perchard, Holly Rogers and Tim Rutherford-Johnson). Stephen and Roddy Hawkins' The Work of New Music is under contract with CUP.

Stephen wrote chapters on popular modernism (Routledge, 2018), popular music biography and life writing (Oxford, forthcoming) and fringe music writing (Routledge, 2024). His article on late style and popular music appeared in the JRMA in 2021 and a piece on 1970s fringe music writing in 20th C. Music in 2019.

12:00 – 13:00 **Boole 4**

Keynote Opening UNESCO and ICASE: Global Collaboration in Science Education

Dr. Matthew Thomas,
UNESCO Lead on Teacher Education and Professional Development

Dr. Teresa Kennedy,
ICASE Representative to UNESCO

This plenary session examines the evolving global landscape of science and technology education through the interconnected perspectives of UNESCO, teacher education, international collaboration, and United Nations Decades. The first part of the session, "Science, Status, and Sustainable Strategies: UNESCO's Vision for Teachers and the Teaching Profession," delivered by Matthew Thomas, explores the current global status of teachers and the challenges facing the teaching profession, particularly in STEM education, including teacher shortages, artificial intelligence, conflicts, and changing educational demands, while highlighting UNESCO initiatives supporting teachers through advocacy, policy frameworks, professional development, and international partnerships.

The second part, "ICASE, UNESCO, and the UN Decades: Strengthening Global Collaboration Through Science and Technology Education," delivered by Teresa Kennedy, examines the role of the International Council of Associations for Science Education and NGOs in official partnership with UNESCO in advancing global collaboration through major United Nations initiatives. One featured example is the UN Decade of Ocean Science for Sustainable Development, including a short video address from **Vladimir Ryabinin** highlighting the role of Ocean Literacy, international cooperation, education, ethics, and collective action in advancing sustainable development. The session also highlights opportunities for engagement through additional United Nations initiatives, including the International Decade of Sciences for Sustainable Development (IDSSD).

13:00 – 14:00 **Lunch**

Panel Discussion: Curriculum Development at International level.

Professor Áine Hyland (Ireland), Chair,
Dr. Laura Daly (RSC),
Dr. Stuart Farmer (Scotland),
Dr. Donna Governor NSTA (USA),
Dr. Manabu Sumida (Japan),
Dr. BaoHui Zhang (China)

Professor Áine Hyland (Ireland), Chair

Curriculum Development at International level

Professor Áine Hyland, Emeritus Professor of Education, University College Cork. ahyland@ucc.ie

My contribution to this panel will consist of a summary of the approach taken to curriculum development and specifically the development of science curriculum in Ireland during the past 100 years.

Áine Hyland is Emeritus Professor of Education and former Vice-President of University College Cork, Ireland. She has been active in education circles in Ireland and internationally for over 50 years. She has been chairperson and member of various national education boards and committees and has published books and articles on the history of education, educational policy, and curriculum and assessment. She was elected a member of the Royal Irish Academy in 2019. In recognition of her contribution to Irish education, she has been awarded honorary doctorates by the National College of Ireland, the Royal College of Surgeons of Ireland, and University College Dublin.

Dr Laura Daly

Institution: Royal Society of Chemistry

Email address: dalyl@rsc.org

The national curriculum in England was last updated in 2015. Following a change in government, an expert led review of the curriculum for ages 5 to 18 was undertaken by Professor Becky Francis. Seeking to ensure the curriculum is fit for the future, imparting the knowledge and skills young people need and encouraging a love of learning, this review forms the basis of the work currently being done to reform the curriculum in England.

In this talk I will give an overview of the curriculum and assessment review, the recommendations it made for science education and how these recommendations are informing the creation of a new 11-16 chemistry curriculum intended to meet the needs of learners and teachers.

Curriculum Developments in Scotland.

Dr. Stuart Farmer., Institute of Physics Scotland and University of Stirling Centre for Research into Curriculum Making

Email address: stuart.farmer@iop.org

Curriculum for Excellence (CfE) was introduced in

Scotland between 2010 and 2015. It combined a Broad

General Education Phase for ages 3-15 which placed

emphasis on skills development with a Senior Phase for ages 15-18 where young people study for National Qualifications. Following two reviews by the OECD and several other consultations, Scotland has embarked on a Curriculum Improvement Cycle (CIC).

In this talk, I will give an overview of the key shortcomings identified in CfE and the focus of the CIC which seeks to clarify the role of knowledge in the curriculum and introduce a Know/Do/Understand model for the curriculum based on 'Big Ideas' and 'Concepts.

Dr. Donna Governor

Donna L. Governor, Ph.D., is president of the National Science Teaching Association (NSTA). She began serving her one-year term on June 1, 2026

She currently is a professor of science education in the Department of Middle Grades, Science and Secondary Education at the University of North Georgia where she has been since 2016.

Governor was a classroom teacher for more than 32 years. From 2002 to 2016, she taught science to middle level and high school students in the Forsyth County Schools District in Cumming, Georgia. During 1984 –2001, she taught elementary students and gifted middle school students in the Escambia County Schools District in Pensacola, Florida.

Her educational background includes earning a bachelor's degree in elementary education, a master's degree in early childhood education, and an education specialist degree in curriculum and instruction/instructional technology from the University of West Florida in Pensacola, Florida. In 2011, she earned a Ph.D. in science education from the University of Georgia in Athens, Georgia. She is certified in

AP Environmental Science and holds a Qualitative Studies Graduate Level Certification and Instructor Certification in Extended Reality (Edstutia) and Using XR technologies (including Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality).

Towards a Responsive Science Curriculum: Embracing the Socio-cultural Dynamics of the 21st Century

Professor Manabu Sumida, Faculty of Education, Ehime University.

Email: sumida.manabu.mm@ehime-u.ac.jp

The socio-cultural transformations of the 21st century - marked by globalisation, growing respect for diversity, and heightened awareness of sustainability - have intensified the need for a more responsive school curriculum. This keynote explores how science education in Japan is adapting to such changes, with a particular focus on the 2017 revision of the national curriculum, which emphasises both competency-based and inquiry-based learning. It further examines recent policy initiatives, including the promotion of STEAM education, the integration of local resources, and institutional efforts to improve gender equality. Consideration is also given to ongoing deliberations within the Central Council for Education, particularly those concerning curriculum flexibility: linguistic support for students whose first language is not Japanese; collaboration with external support centres for non-attending students; and personalised educational provision for the gifted and talented. The speech concludes by reflecting on the theoretical and practical conditions required for science education to offer meaningful learning experiences for all in an increasingly diverse society.

Biographical details

Manabu Sumida, PhD, is a Professor of Science Education in the Faculty of Education and the Director of the Centre for Gifted Education and Talent Development at Ehime University. He holds a PhD in Education from Hiroshima University. He was a visiting researcher at the University of Georgia, USA, in 1998 and a visiting scholar at the University of Cambridge, UK, in 2012–2013. His area of research interest is STEAM education for gifted learners. He is a founder of Kids Academy, a special STEAM programme for gifted young children. He was a committee member of the TIMSS 2003 and the OECD PISA 2006 and 2015. He received the International Contribution Award in 2016 and the Academic Award from the Japan Society for Science Education in 2018. Dr. Sumida also received the Ryoji Noyori (Nobel Laureate in Chemistry in 2001) Education Award in 2013. He serves as President of the Japan Society for Science Education and as the Asia Regional Representative of the International Council of Associations for Science Education.

Title needed

Professor ZHANG BaoHui
Former dean, School of Education, Shaanxi Normal University, 199 South Changan Road, Xian, China,710062
Immediate Past-President of ICASE (2023–2026)

(representing Prof. Weiping HU)

Email: icase2017bhzhang@163.com

This presentation will provide an overview of science education in China, from the primary years through to secondary schooling. The speaker will outline when students first encounter science in the curriculum, the age at which formal science studies begin in secondary education, and the national bodies responsible for curriculum development and reform. Attention will be given to the frequency with which the curriculum is reviewed and updated, as well as the balance between the separate disciplines of physics, chemistry, and biology. The presentation will also examine the level of curriculum guidance provided to teachers and its implications for classroom practice.

Biographical Note

Dr. BaoHui Zhang is Qujiang Scholar professor, former dean, and doctoral student supervisor at the School of Education (SOE), Shaanxi Normal University (SNNU), Xi'an, China. He received his Master degree in chemistry education from Beijing Normal University in 1994, master degree in 2002 and PhD degree in 2003 in Educational Technology from the University of Michigan, USA. He has 12 years' experience studying, living, and working out of China (6 years in the US and another 6 years in Singapore as a faculty member at the National Institute of Education, Nanyang Technological University). He served as professor and doctoral supervisor at the Institute of Education, Nanjing University (2011-2014) after returning to China. He joined SNNU in 2014 after its global dean search.

Monday 15:05 – 17:00

15:05 – 15:55 Concurrent Sessions 1

Boole 1 Concurrent Seminar 1	Boole 2 Concurrent Seminar 2	Boole 3 Concurrent Seminar 3	Boole 4 Concurrent Seminar 4	Boole 5 Concurrent Seminar 5	Boole 6 Concurrent Seminar 6
No: 147 Chem Ed D Otway, Ireland	No: 24 Curriculum Dev X Zhang, China	No: 74 Higher Ed N. Settari, Algeria	No: 91 Cognitive Pedagogy A. Black, Switzerland	No: 39 Electrochemistry John O'Donoghue, Ireland	No: 1 Marine Sc Ed T Kennedy, USA
					No: 2 Marine Sc Ed C McCann, Ireland
No: 120 Univ Ed S Brownell, USA	No: 40 Curriculum Dev R. Atomatofa, Nigeria	No: 92 Higher Ed J. Zhou, China	No: 43 Primary Science S.D. Tunnicliffe UK	No: 187 Sustainable Development Aileen Tennant, Ireland	No: 3 Marine Sc Ed P Cousteau, France
					No: 47 Marine Sc Ed E Glithero, Canada

Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

16:05 –16:55 Concurrent Sessions 2

Boole 1 Concurrent Seminar 7	Boole 2 Concurrent Seminar 8	Boole 3 Concurrent Seminar 9	Boole 4 Concurrent Seminar 10	Boole 5 Concurrent Seminar 11	Boole 6 Concurrent Seminar 12
No: 130 Lab Pr Work E Moore, Ireland	No: 66 Curriculum Dev S. Yamashita, Japan	No: 76 AI V. Radvila, Lithuania	No: 27 Communication S. Fankhauser USA	No: 8 Teacher Training S. Sexton, New Zealand	No: 69 Marine Sc Ed R Costa and C. Faria, Portugal
No: 115 Lab Pr Work P Ruyt, Chile	No: 117 Curriculum Dev S. Al-Timani and S. Forwai,, USA and UAE	No: 122 Higher Ed K Cooper, USA	No: 97 Communication D. Barker and S.A. Bain, UK	No: 123 Curriculum S Brownell, USA	No: 152 Marine Sc Ed R Stevens, South Africa
	No. 182 Curriculum Planning W Elsawah, UAE	No: 175 Higher Ed C. Mora, Mexico	No: 106 Communication D Worthington, USA		No: 134 Marine Sc Ed C Berger and C Isgrò, Italy

Monday 17:00 – 18:30 : Eureka Centre

Visit to Eureka Centre UCC and welcome reception.

UNESCO Ocean Decade (begins at 17:30)

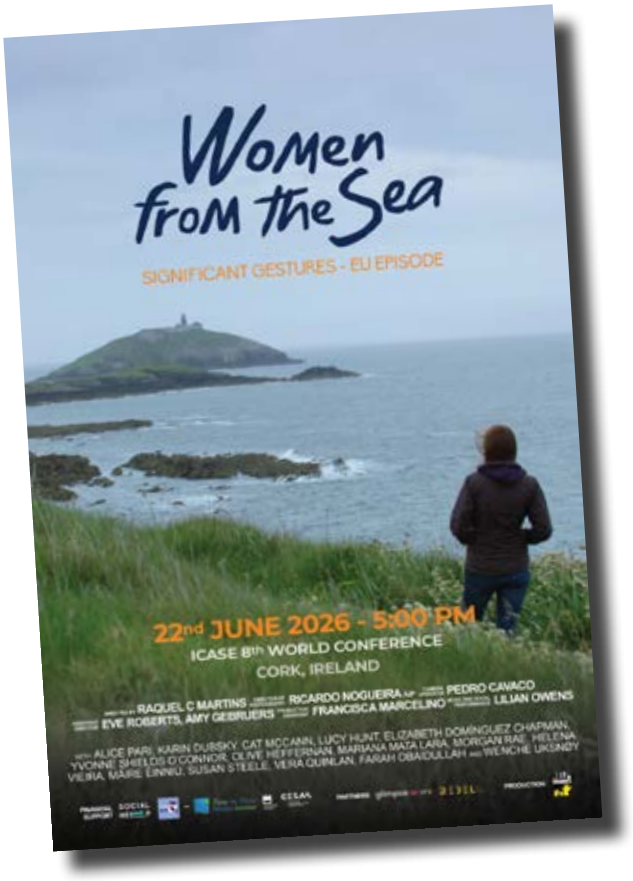
Launch of Ocean Decade three-volume book series Ocean Literacy – ***The Foundation for the Success of the Ocean Decade***

followed by

launch of UNESCO Ocean Decade Film Screening: ***Women from the Sea project*** (most of which was filmed in Cork, Ireland)

Moderators: Teresa Kennedy, Catherine McCann and Lucy Hunt.

Some light refreshments will be available.



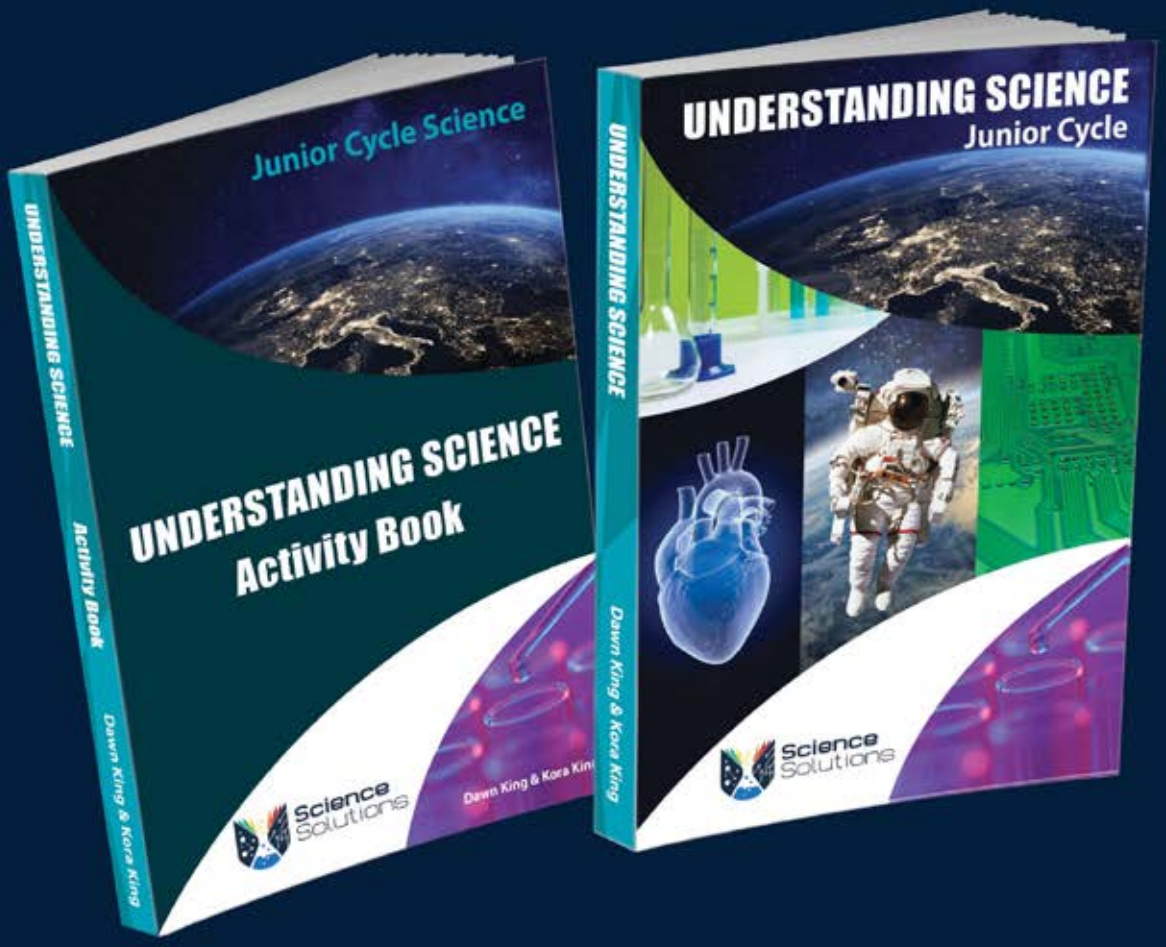
Monday 19:30 – 21:30

Buffet meal in Metropole Hotel

Welcome from Irish Science Teachers' Association (ISTA)

Ireland's most famous scientist - Welcome from 'Robert Boyle', Lismore Castle, Co. Waterford, presented by Dr. Sheila Donegan and Dr. Eoin Gill, South Eastern Technological University, Waterford, Ireland

New Junior Cycle Science Textbook and Activity Book



For Students & Teachers

- Student Book
- Interactive E-Book
- Interactive Quizzes

For The Teachers

- Chapter Assessments & Results Tracking
- Planning Documents
- Solutions to Homework & Assessments

Contact: 085 8677470 info@sciencesolutions.ie
www.sciencesolutions.ie

Science Solutions

Tuesday 9:05 – 9:55, Boole 4

President John O'Halloran UCC.

Professor John O'Halloran, MRIA, is the 16th President of University College Cork. He previously served as Deputy President and Registrar and Vice-President for Learning and Teaching. He holds the Chair in Zoology at UCC and previously held academic posts at Colby College in the USA and at the University of Wales. He was elected as a member of the RIA in 2024 and awarded an Honorary Doctorate from the University of Massachusetts Lowell in 2025.

John is Co-chair of the UN Sustainable Development Solutions Network Ireland, member of the Advance HE Board and Chair of the Advance HE Ireland Strategic Advisory Board. He is a member of the Board of the Ludgate Hub, Glucksman Gallery and the NUI Senate, and is Chair of the Biological and Ecological Sciences category of the Stripe Young Scientist and Technology Exhibition. He is Founding Co-chair of UCC's Green Campus Forum and Founding Director of UCC's Quercus Talented Students' Programme. He was Chair of the Board of Fota Wildlife Park from 2018 to 2023 (Board Member since 2013) and was a judge for the UNESCO-L'Oreal-Royal Society Women in Science Scholarship between 2011 and 2021.

During his academic career he has published over 250 papers, several book chapters and edited a number of books and research journals. He is a leading Irish ornithologist, recognised internationally for his leadership in ecological research and education. His research, shaped by societal needs, focuses on understanding the impacts of environmental change, land-use practices and climate change on biodiversity and ecosystems. He is dedicated to embedding sustainability at the core of UCC's mission and extending its influence to the wider community. Under his leadership, UCC became the first university in the world to be awarded a Green Flag in 2010 and is now ranked as one of the world's most sustainable universities.

The Assessment of Practical Work in Science Education

Professor Michael J. Reiss, Institute of Education, University College London; m.reiss@ucl.ac.uk

Practical work is a key component of science but how should it be assessed both formatively and summatively? I attempt to answer these questions for both laboratory work and fieldwork, looking at knowledge, skills and attitudes. While I am particularly interested in the practical work undertaken by 5-18 year-olds, I look at the increasing use of virtual assessment approaches in careers such as aviation and surgery and ask whether there are lessons that schools can learn, in a way that strengthens practical work, as traditionally understood, rather than replacing it with simulations (or worse). All this is taking place at a time when there are increasing financial and other demands on school science practical work, so any proposals need to be feasible as well as rigorous.

Michael J. Reiss is Professor of Science Education at University College London, a member of the Nuffield Council on Bioethics, and a Fellow of the Academy of Social Sciences. The former Director of Education at the Royal Society and the former President of the Association for Science Education and of the International Society for Science and Religion, his academic interests are in science education, bioethics, sex education, and science and religion. Recent books of his include: McCrory, A. and Reiss, M. J. (2023) The Place of Ethics in Science Education: Implications for Practice, Bloomsbury; Reiss, M. J. and Ruse, M. (2023) The New Biology: A Battle between Mechanism and Organicism, Harvard University Press; Briggs, A. and Reiss, M. J. (2021) Human Flourishing: Scientific Insight and Spiritual Wisdom in Uncertain Times, Oxford University Press; and Abrahams, I. and Reiss, M. J. (Eds) (2017) Enhancing Learning with Effective Practical Science 11-16, Bloomsbury.

10:05 –10:45
Concurrent Sessions 3

Boole 5 Concurrent Seminar 13	Boole 6 Concurrent Seminar 14
No: 94 International Collaboration R Harrison, UK	No: 95 Marine Sc Ed F Santoro, Italy
No: 174 Pre-instruction conceptions J R Gutierrez, Philippines	No: 70 Marine Sc Ed N Marcum-Dietrich, USA

Laboratory experiments for the classroom

AMGEN® Biotech Experience

Scientific Discovery for the Classroom

Ireland

The Amgen Biotech Experience (ABE) is an innovative science education programme that introduces secondary school students to the excitement of scientific discovery. Here in Ireland, we provide training in molecular biology experiments for secondary school teachers with subsequent access to professional-grade scientific equipment and curriculum-linked teaching materials to facilitate the teaching of laboratory practicals in the classroom, **completely free of charge.**

During the course, teachers will learn current molecular biology techniques, including
Lab 1: Micropipetting
Lab 2: DNA profiling
Lab 3: DNA restriction digest
Lab 4: DNA ligation
Lab 5: PCR, and
Lab 6: Bioinformatics.

Following the workshops, teachers can borrow the professional laboratory equipment for use in their own classrooms at no charge.

Our 2026-2027 workshops locations:

Labs 1-4

- UCD
- Drumcondra Education Centre
- Laois Education Centre
- Monaghan Education Centre
- O'Carolan College, Nobber

Scan me to register!

These workshops will take place in September 2026.

For more information, please visit our website or contact us at ABE-Ireland@ucd.ie

amgenbiotechexperience.net/ie/

www.ucd.ie

SYSTEMS BIOLOGY IRELAND
www.ucd.ie/sbi/

In partnership with

nibrt
www.nibrt.ie

Oide
www.oide.ie

ESCI
www.esci.ie

ista
www.ista.ie

Tuesday 10:05 –10:45

Boole 1

Astronomy and the new LC Physics syllabus

Prof. Paul Callanan, UCC

There is perhaps no better an example than Astronomy as a scientific discipline that can ignite the public imagination and promote the general appreciation of scientific discovery.

Similarly, the pedagogical and motivational experience of students taking Physics in secondary schools can also benefit significantly from the inclusion of many types of astronomical examples. Topics such as the expansion of the universe, discovering habitable planets around stars, the origin of the elements, the impact (sometimes, even literally!) of the extra-terrestrial environment on planet Earth - are all amenable to conceptual and quantitative understanding using relatively simple concepts from Physics.

This talk will outline how astronomy can be used as a powerful tool in the teaching of Physics in secondary schools, and will include some hands-on demonstrations.

Boole 3

Space as a tool for teaching STEM - projects for JC, TY, & LC.

Áine Flood & Brendan Owens, ESERO Ireland/Research Ireland

Discover how to use ESA space related projects to assist in your teaching and delivery of project work with curriculum links across STEM subjects, practical resources, and opportunities for your students. From physics to chemistry, biology to coding – there is something for every learner at all secondary levels!

At this session we will introduce the wide range of classroom resources available for educators and showcase the **ESA School Projects**. Providing unique ways to enhance your STEM teaching while helping students build a diverse range of skills and competences, these exciting interdisciplinary school-level projects include designing a space habitat and exploring material properties, building and programming a mini can-sized satellite, and improving your local environment, with versions suitable for all second level stages.

ESERO Ireland (European Space Education Resource Office) is a space and STEM education programme co-funded by Research Ireland and the European Space Agency, ESA.

Boole 2

Pharmaceuticals in the new Leaving Certificate Chemistry syllabus

Dr. Stuart Collins, School of Chemistry, UCC

Senior cycle chemistry covers a wide range of concepts, and students can sometimes find it challenging to recognise connections between topics. This talk uses pharmaceutical chemistry as a unifying context to integrate key organic concepts, including functional groups, reaction pathways and synthesis. Drawing on examples from natural products and contemporary pharmaceutical research, it shows how complex drug molecules are built from simple precursors. Practical approaches to developing inquiry-based learning and the Leaving Certificate research investigation are highlighted, supporting teachers in connecting classroom chemistry to real-world applications.

Boole 4

The Nature of Science and the Science of Nature

Dr. Fidelma Butler, UCC

The new Curriculum Specification for Leaving Certificate Biology outlines a wide array of topics from enzymes to evolution, biomolecules to biodiversity and cells to climate change, all detailed under the unifying strand of Nature of Science. The aim is to enable students to discover "how the natural world works". This talk will explore examples of encounters with nature and how such practical experiences can be used to inform elements of the new specification. Addressing biological questions using primary and secondary data develops an understanding of the nature of science and reveals the essence of the science of nature.

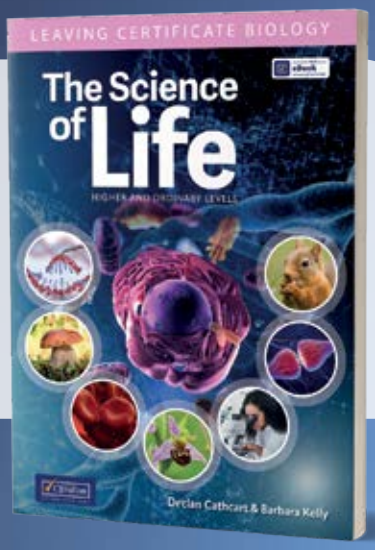
10.45 – 11:15 **Tea / coffee**

Science all wrapped up!

NOW AVAILABLE

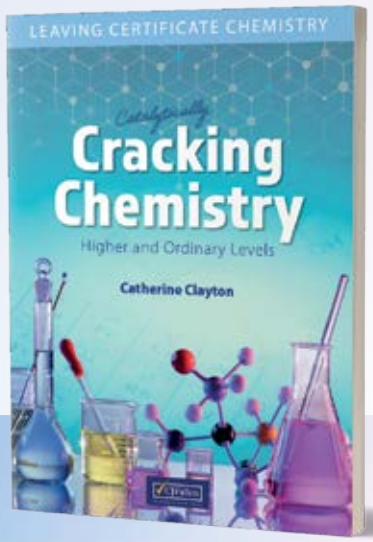
Biology

Inquiry-based in its approach, research and investigation are treated as key components of student learning.



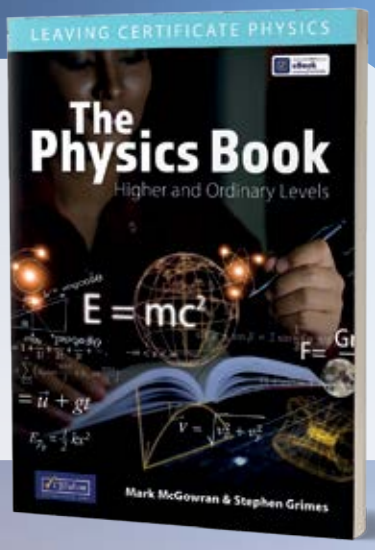
Chemistry

Empowering students to develop a scientific habit of mind while understanding core concepts and principles of chemistry.



Physics

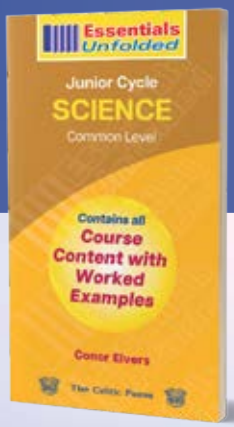
Helping students explore real-world applications of Physics, and understanding economic, ecological and ethical considerations.



Junior Cycle Science revision booklet

NEW

Essential Junior Cycle Science material in an accessible, student-friendly format.



If you would like more information, please contact your local sales representative, or contact us at sales@cjfallon.ie, or (01) 6166490.

Scan here to find your sales rep!

CJFallon
ESTABLISHED 1895

www.cjfallon.ie

Tuesday 11.15 – 11.55 in Boole 4

The discovery of pulsars

Dame Jocelyn Bell Burnell
Oxford University, UK.

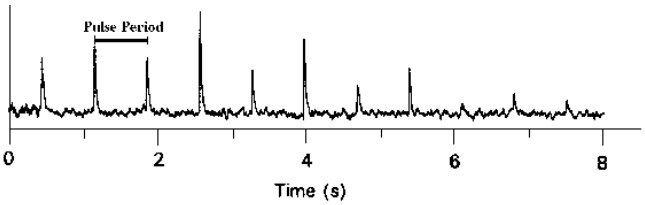
Jocelyn Bell Burnell was born in Lurgan Co Down. She inadvertently discovered pulsars as a graduate student in radio astronomy in Cambridge, opening up a new branch of astrophysics – work recognised by the award of a Nobel Prize to her supervisor.

She has subsequently worked in many roles in many branches of astronomy, working part-time while raising a family. She is now a Visiting Academic in Oxford, and the Chancellor of the University of Dundee, Scotland. She has been President of the UK's Royal Astronomical Society, in 2008 became the first female President of the Institute of Physics for the UK and Ireland, and in 2014 the first female President of the Royal Society of Edinburgh. She was one of the small group of women scientists that set up the Athena SWAN scheme.

She has received many honours, including a $3M Breakthrough Prize in 2018.

The public appreciation and understanding of science have always been important to her, and she is much in demand as a speaker and broadcaster. In her spare time, she gardens, listens to choral music and is active in the Quakers. She has co-edited an anthology of poetry with an astronomical theme – 'Dark Matter; Poems of Space'.

In this talk I will describe the accidental discovery of pulsars (pulsating radio stars), discuss some earlier incidents where they were 'nearly' discovered, and reflect on what this might mean for future, more automated, data analysis.



The plot (above) shows pulses from the pulsar PSR B0329+54.
Source: https://www.atnf.csiro.au/resources/education/pulsars/

Left: Optical telescope view of the Crab Nebula. The Crab pulsar is situated near the centre of this nebula.

Image Credit: ESO

Tuesday 11.15 – 11.55 Concurrent Sessions 4

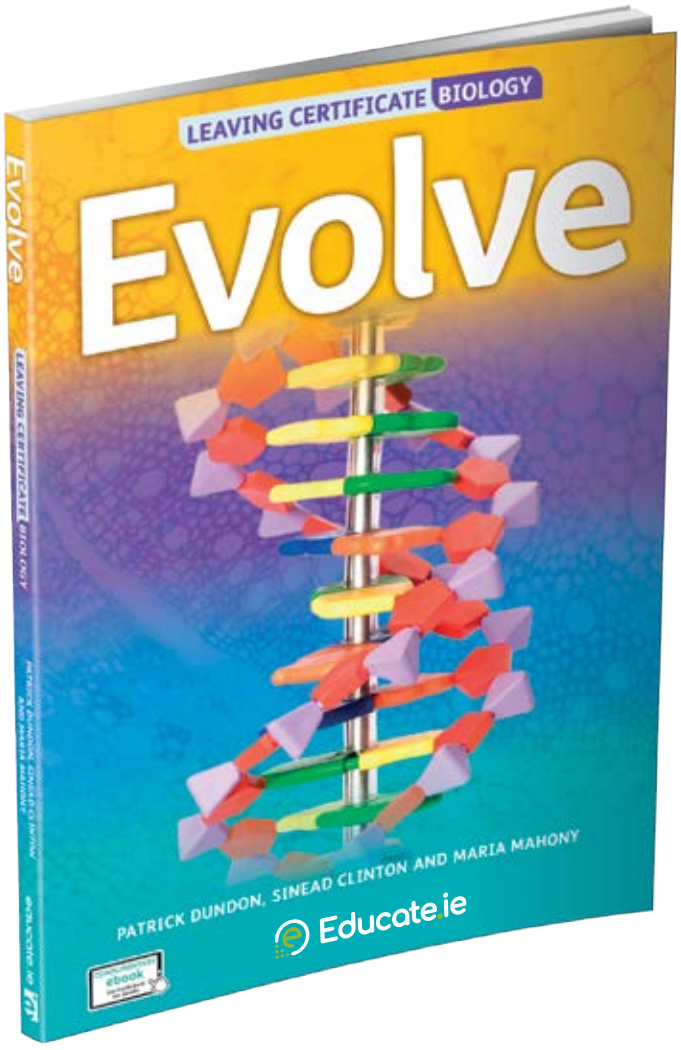
Boole 1	Boole 2	Boole 3	Boole 4	Boole 5	Boole 6
Concurrent Seminar 15	**Concurrent Seminar 16**	**Concurrent Seminar 17**	**See above**	**Concurrent Seminar 18**	**Concurrent Seminar 19**
No: 51 Biotechnology D. Cathcart, Ireland	**No: 54 Lab Pr Work P. O'Donnell, Ireland**	**No: 101 Communication E. Cubas-Rolim, Brazil**	***The discovery of pulsars*** **Dame Jocelyn Bell Burnell**	**No: 109 Sustainable Dev D. Mahon, UK**	**No: 150 Marine Sc. Ed. B Çavaş, S Acik, S Koc, M Kolac, Türkiye**
No: 64 Lab Refurbishment G. Hewston, Ireland	**No: 179 Lab Pr Work Michael Odell, USA**	**No: 165 Informal Ed C. Sumritdee, Thailand**		**No: 127 Sustainable Dev S. Gammel, Ireland**	**No: 186 Marine Sc. Ed. Shazia Waheed, Ireland**
					No: 188 Marine Sc. Ed. T. Kennedy, USA

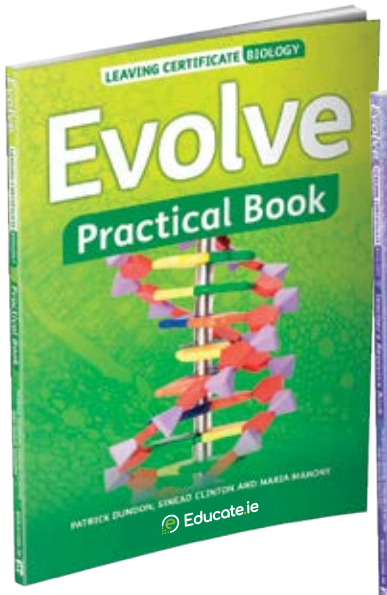
Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

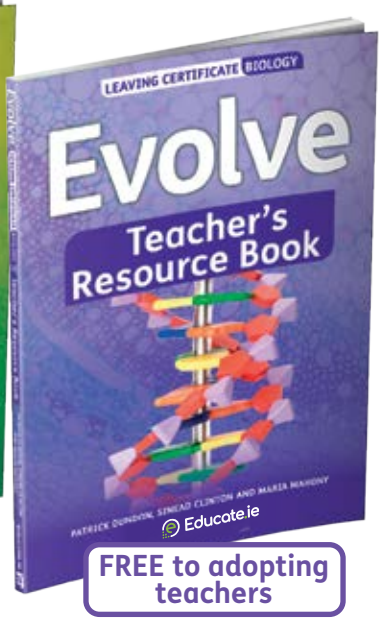
LEAVING CERTIFICATE BIOLOGY

Evolve

A NATURAL PROGRESSION TO THE LEAVING CERTIFICATE BIOLOGY SPECIFICATION 2025







FREE to adopting teachers

View the **flipbook**

COMPLIMENTARY **ebook**

- **Tailored to the new specification for Leaving Certificate Biology introduced in September 2025**
- **Emphasis on practical experience through investigation and engagement with contemporary issues in Biology** to develop students' personal interests and appreciation of how scientists work
- **Stand-alone Practical Book** where students can record and develop experimental and research inquiry skills, and apply Learning Outcomes to real-world applications of Biology in line with cross-cutting themes
- **Comprehensive support for the Biology in Practice Investigation component of assessment based on NCCA Guidelines**, including information and advice, descriptors of quality, an Investigative Log, and extensions for experimental and research investigations throughout

Educate.ie

Freephone: 1800 613 111
Email: sales@educate.ie
www.educate.ie

Contact your **Educate.ie Rep** for more information.

Tuesday 12:05 – 12:55 in Boole 4

Implications of the introduction of AAC Laboratory-Based Research Investigations in Ireland

Prof Mike Watts,
Brunel University London

This presentation examines the findings of a national study on the proposed Additional Assessment Component (AAC) laboratory-based research investigations in Leaving Certificate Biology, Chemistry and Physics in Ireland. The Health and Safety Working Group of the Irish Science Teachers' Association (ISTA) distributed a detailed questionnaire to post-primary schools throughout Ireland and the data gathered were subsequently analysed independently by Professor Mike Watts of Brunel University London. His report *A National Analysis of the Implications of the Proposed Introduction of AAC Laboratory-Based Research Investigations (worth 40%) in Leaving Certificate Biology, Chemistry and Physics in Ireland* was published in February 2026. The presentation will provide an overview of some of the key findings – especially those relating to laboratory facilities, equipment, staffing, Health and Safety, workload, technician support and the resources required for the successful implementation of AACs in Irish secondary schools.

Health and Safety aspects of AAC laboratory-based student investigations

Matt Endean,
Deputy Director at CLEAPSS, UK.

CLEAPSS is an internationally recognised organisation with expertise on Health and Safety and, since its foundation in 1965, CLEAPSS staff have developed a wealth of experience devising and evaluating laboratory practical activities for science teachers. CLEAPSS is a major provider of CPD courses for science teachers and organises over 200 one-day CPD courses each year for teachers.

In this presentation Mr Matt Endean, Deputy Director, CLEAPSS, will give an overview of key Health and Safety issues regarding the implementation of the AAC laboratory-based research investigations in Biology, Chemistry and Physics. In particular, he will focus on key aspects of Health and Safety associated with research investigations and, in addition to summarising the main principles of Health and Safety aspects he will also cover the area of carrying out risk assessments for AAC investigations.

Tuesday 12:05 – 12:55 Concurrent Sessions 5

Boole 1 Concurrent Seminar 20	Boole 2 Concurrent Seminar 21	Boole 3 Concurrent Seminar 22	Boole 4 See above	Boole 5 Concurrent Seminar 23	Boole 6 Concurrent Seminar 24
No: 62 **Comparative Studies** **K. Kobayashi, Japan**	**No: 42** **Teacher Training** **L.V.R. Franco, Brazil**	**No: 103** **Tech Sc Ed** **L.C.E.Campbell, UK**	*Implications of the introduction of AAC Laboratory-Based Research Investigations in Ireland* - Prof Mike Watts, Brunel University London	**No: 72** **Future Sc Ed** **C. Aldous, Australia**	**No: 157** **Marine Sc Ed** **R Griffin Ireland**
No: 96 **Comparative Studies** **D. Mahon, UK**	**No: 59** **Teacher Training** **S.L. Lee and B.C. Yap, Singapore**	**No: 132** **Tech Sc Ed** **C. Stari, Uruguay**	*Health and Safety aspects of AAC laboratory-based student investigations* Matt Endean, CLEAPSS, UK	**No. 119** **Game-based learning** **K. Offor and R. Saad, UK**	**No: 156** **Marine Sc Ed** **C Schio, Portugal** **No: 60** **Marine Sc Ed** **E. Koumpaki and X Symeonidou, Greece**

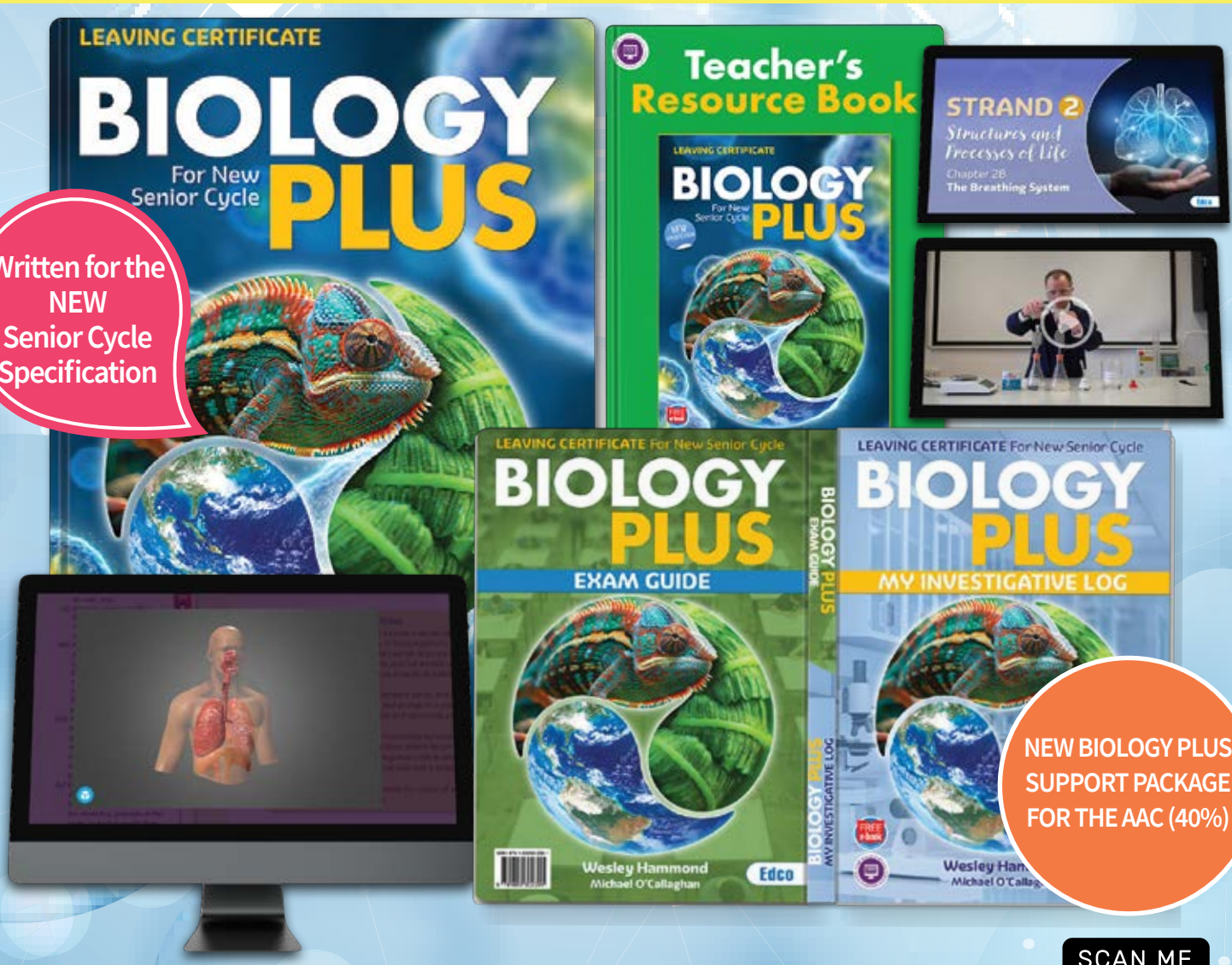
13:00 – 14:00 Lunch and Exhibitions

LEAVING CERTIFICATE

BIOLOGY PLUS

For New Senior Cycle

Ireland's No.1 Choice for Teaching New Senior Cycle Biology



Written for the NEW Senior Cycle Specification

NEW BIOLOGY PLUS SUPPORT PACKAGE FOR THE AAC (40%)

SCAN ME

Edco Learning
Interactive resources and e-book available on www.edcolearning.ie

FREE e-book With Digital Resources

Michael O'Callaghan
Wesley Hammond

The Educational Company of Ireland

Edco

Please contact your Local Edco Representative for further information and to request a sample copy
Ph: 01-254 6079, Email: info@edcolearning.ie, Website: www.edcopublications.ie

Tuesday 14:00 – 14:55

AI and science education: foundations, applications and implications

Prof Miles Berry
Froebel College
University of Roehampton
London
SW15 5PJ
m.berry@roehampton.ac.uk

Miles is Professor of Computing Education at the University of Roehampton, where he runs the secondary PGCE in computing course, teaches on the University's digital media and social science research methods degrees, and is a member of the University's AI development and innovation group. Prior to joining Roehampton, he spent 18 years in four schools, much of the time as an ICT coordinator and most recently as a head teacher.

Over the years he has contributed to a number of computing related projects including England's national curriculum computing programmes of study. He gave evidence to the House of Lords AI select committee, was an expert advisor to the US-based AI4K12 project, has supported Georgian universities in developing academic integrity policies. He chairs the BCS England computing curriculum committee, and until recently was chair of the National Centre for Computing Education's academic board.

Summary

This talk explores the educational implications of generative AI for science education in schools. It examines AI through three lenses: its foundations, its classroom applications, and its broader societal implications. Starting with how machine learning models work—particularly large language models—it explains their strengths, such as pattern recognition, and their limitations, including hallucination and bias. Practical classroom examples follow, including lesson planning, reducing workload, and supporting diverse learners with tools like NotebookLM and immersive readers. The talk also considers how pupils might use AI to study, revise, or even cheat, and it addresses the blurred lines between support and misconduct. Finally, it challenges educators to consider AI's environmental impact and its effect on scientific knowledge itself. While AI can enhance access and efficiency, the core message remains: true learning happens through effort and thought. AI should assist, not replace, the struggle that makes understanding meaningful.

Tuesday 15:05 – 15:55: Symposium, Boole 4

Key Aspects of the Biology, Chemistry and Physics AAC projects

In this symposium the convenors of the ISTA committees in

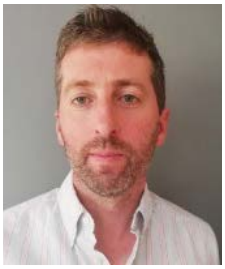
- Biology (David O'Brien),
- Chemistry (Mary Mullaghy),
- Physics (Sean Finn),
- Physical Science – formerly known as Physics and Chemistry combined (Patrick O'Donnell)

will lead a discussion on the key aspects of the Additional Assessment Component (AAC) laboratory-based research projects in these subjects.

The symposium will be chaired by

Humphrey Jones, ISTA chairperson.

Attendees will have the opportunity to contribute to the discussion.



miniOne® SYSTEMS

FEAR-FREE ELECTROPHORESIS

Make the most of your class period with student-friendly electrophoresis.

- Most labs complete in 45 minutes
- Affordable & intuitive
- No Weak Bands!

europe@theminione.com

eu.theminione.com

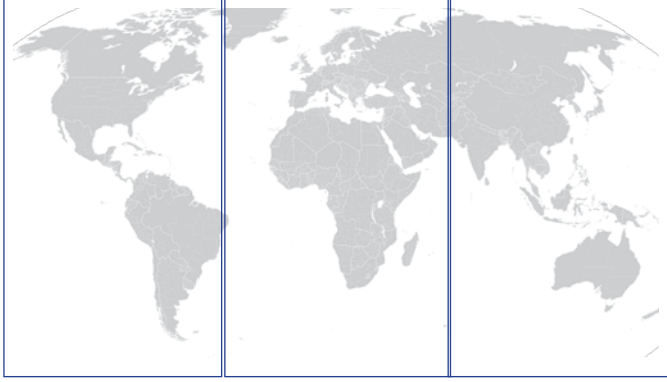
Tuesday 15:05 – 15:55 Concurrent Sessions 6

Boole 1	Boole 2	Boole 3	Boole 4	Boole 5	Boole 6
Concurrent Seminar 25	**Concurrent Seminar 26**	**Concurrent Seminar 27**	**See above**	**Concurrent Seminar 28**	**Concurrent Seminar 29**
No: 83 **Comparative Studies** **M. Kita, Japan** **No: 100** **Comparative Studies** **C.P. Silva, P. G. F. Santos, Brazil**	**No: 63** **Teacher Training** **J. Havia, Finland** **No: 79** **Teacher Training** **K. Conroy, F. Mensah, USA**	**No: 11** **Informal Ed** **S. Bas, USA** **No: 61** **Informal Ed** **S. Di Grazia, Italy**	*Symposium Key Aspects of the Biology, Chemistry and Physics AAC projects* *Mary Mullaghy, Sean Finn, David O'Brien, Patrick O'Donnell, Humphrey Jones*	**No: 162** **Outdoor Ed** **I. Rakhmawait, Austria** **No: 172** **Outdoor Ed** **E. Lettice, Ireland**	**No: 99** **Marine Sc Ed** **N. Burke, Ireland** **No: 31** **Marine Sc Ed** **G Avellis, Italy** **No: 154** **Marine Sc Ed** **T. Greene and B. Ching, USA**

Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

Tuesday 16:05 – 17:00 Concurrent Sessions 7

Boole 1	Boole 2	Boole 3	Boole 4	Boole 5	Boole 6
				Concurrent Seminar 29A	**Concurrent Seminar 30**
ICASE Regional Meeting Africa and Australia / Pacific **Benneth Uzoechi and Carol Aldous**	**ICASE Regional Meeting Latin America & North America** **Cesar Mora and John Munro**	**ICASE Regional Meeting Asia, Europe & Middle East** **BaoHui Zhang & Manabu Sumida**	**ISTA Annual General Meeting**	**No: 29** **Industry Ed Links** **W. AlAkaleek and S. Forawi, UAE** **No: 81** **Teacher Training** **M. Ali, Canada** **No: 133** **Comparative Studies** **S. Forawi, UAE**	**No: 139** **Marine Sc Ed** **R Melia, Ireland** **No: 78** **Marine Sc Ed** **J. Pivor, USA** **No: 155** **Marine Sc Ed** **T. Sasaki, Japan** **No: 141** **Marine Sc Ed.** **L . Hunt, Ireland** Featured videos: **No: 183: V. Ryabinin (Russia)** **No: 184: E. Kostianaia (Russia)** **No: 185: A. Magalhães (Portugal)**

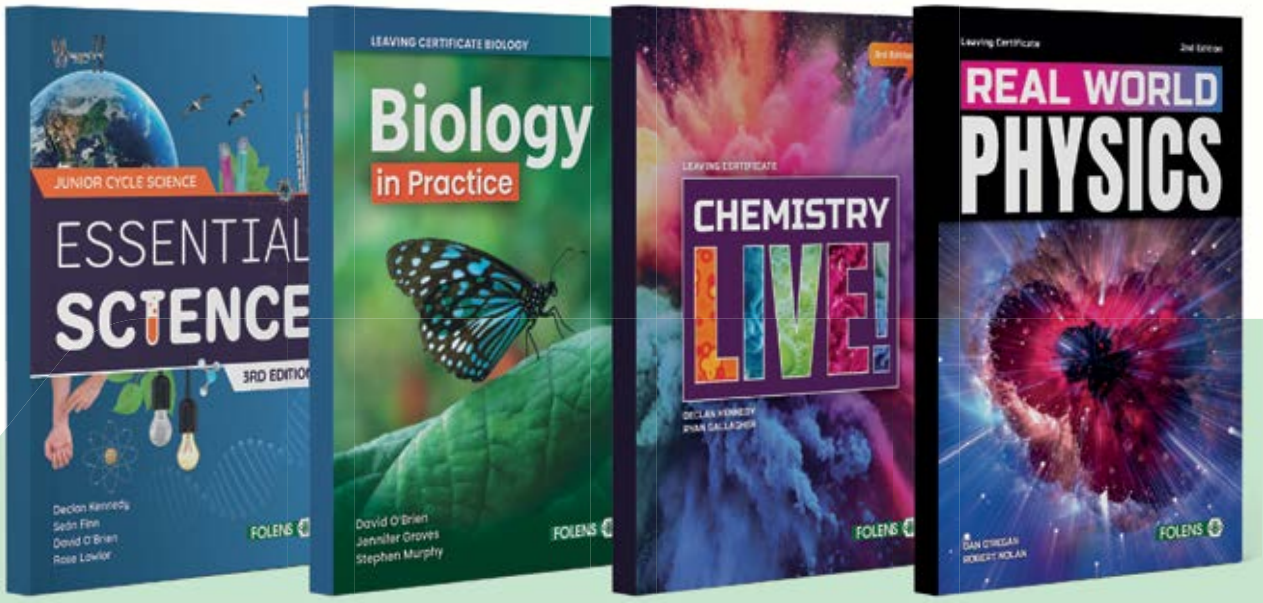


Tuesday 19:30 – 21:30 Buffet Meal

Buffet Meal in Metropole Hotel followed by social event - Irish traditional music and dance.

FOLENS

#1 Your 1 Choice for Science



Junior Cycle Science

Leaving Cert Biology

Leaving Cert Chemistry

Leaving Cert Physics

www.folens.com

Wednesday 9:05 – 9:55 in Boole 4

The PISA 2025 Science Assessment Framework: Implications for Science Education

(Denis Chisman Memorial Lecture)

Prof. Jonathan Osborne, Stanford University, USA.

The PISA 2025 Science Assessment Framework: Implications for Science Education.

The primary focus of the PISA Assessment in 2025 is on the outcomes of school science education for 15-year-olds. The 2025 Assessment framework, which was the basis of testing in over 90 countries in 2025, introduced three new elements.

First, two of the original competencies in the 2015 framework were merged. This change enabled the introduction of a new third competency that measured students' ability to "research, evaluate and use scientific information for decision making"

Second, because of the importance of educating students about the environment and climate change, a specific focus on environmental education was added. The framework for this was elaborated in the document Agency in the Anthropocene. This framework has three new competencies with a focus on education for sustainability and climate change. Finally, the concept of attitudes to science has been broadened to the notion of science identity which introduces the notion of capital.

This talk will explain these changes, their rationale and illustrate ways in which they were measured with sample items and discuss their implications for the teaching and learning of science.

Jonathan Osborne is the Kamalachari Professor of Science Education, Emeritus in the Graduate School of Education, Stanford University. He taught high school physics in Inner London for 9 years and then moved to teacher training and research at King's College in 1985. He completed his PhD in 1995.
He was President of the US National Association for Research in Science Teaching (2006-7) and a member of the US National Academies Panel that produced the *Framework for K-12 Science Education*. In 2018, he was awarded the National Association for Science Education award for Distinguished Contribution to Science Education.

Currently, he chairs the expert group that produces the framework for the science assessments conducted by the OECD Program for International Student Assessment (PISA) from 2012 to 2026. Most recently he led a series of virtual workshops that led to the production of the report *Science Education in an Age of Misinformation and an eponymous paper in Science* in 2022.

Wednesday 10:05 – 10:45 Concurrent Sessions 8

Boole 1 Concurrent Seminar 31	Boole 2 Concurrent Seminar 32	Boole 3 Concurrent Seminar33	Boole 4 Concurrent Seminar34	Boole 5 Concurrent Seminar35	Boole 6 Concurrent Seminar 36
No: 90 **Artificial Intelligence** **A. Aelita Bredelytė, Lithuania**	**No: 87** **Comparative Studies** **H. Tanaka, Japan**	**No: 85** **Teacher Training** **N. Holincheck, USA**	**No: 56** **International Studies** **A. Prieto, M. Pepe, T. Kennedy, M Odell,** **Argentina & USA**	**No: 93** **Constructivist Toolbox** **T. Laitinen, Finland**	**No: 164** **Marine Sc Ed** **T. Lunsford, USA**
No: 71 **Artifical Intelligence** **Marcum-Dietrich USA**	**No. 189** **Practical Science** **J. Yingprayoon, Thailand**	**No. 190** **Teacher Training** **R Gallagher, Ireland**	**No: 88** **Biology Pedagogy** **C. Zhang,** UK	**No: 121** **Curriculum Dev** **S. Brownell, USA**	**No: 28** **Marine Sc Ed** **G. Barord, USA**
No. 110 **Artifical Intelligence** **B Mercan, Türkiye**					

Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

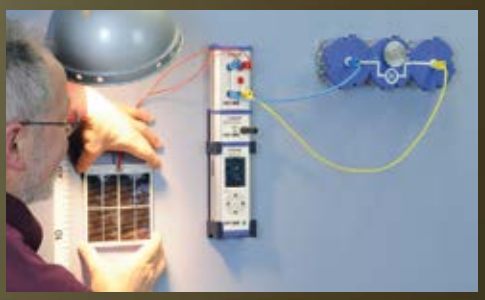
10.45 – 11:15 Tea / coffee and Poster Presentations

Teaching the Future of Energy.
From fundamentals to smart grids.

Lucas-Nülle and PHYWE as the LN Education Group provide hands-on solutions for teaching climate, energy and renewable technologies — from basic principles to advanced, interconnected energy systems.

Hydrogen. Renewables. Energy Storage. Smart Grid.

- Photovoltaics, wind turbines
- Solar thermal, heat pumps
- Fuel Cell and Hydrogen
- Conventional power plants
- Solar pumps and irrigation
- Microgrid, Smart Grid SCADA
- Complete power grid



PHYWE LN

LN EDUCATION GROUP

Ready for the future?

ln.eu/icase26

REAL
EXPERIENCE
LEARNING

Wednesday 11:15 – 11:55 Concurrent Sessions 9

Boole 1 Concurrent Seminar 37	Boole 2 Concurrent Seminar 38	Boole 3 Concurrent Seminar39	Boole 4 Concurrent Seminar40	Boole 5 Concurrent Seminar41	Boole 6 Concurrent Seminar 42
No: 80 Artificial Intelligence K. Lekutiene, Lithuania	No: 111 Teacher Training E. McLoughlin, Ireland	No: 189 Practical Science J. Yingprayoon, Thailand	No: 98 Sustainability L. Fitts, USA	No: 136 Scientific Writing M. Morgan, USA	No: 48 Marine Sc. Ed. R. Jackson, Ireland
No: 169 Artificial Intelligence B. Doyle Prestwich, Ireland	No: 112 Teacher Training K. Kozelková, Slovakia	No: 191 Practical Science R. Geoghegan, Ireland	No: 135 Sustainability S. Kilde-Westberg, Sweden	No: 137 Critical Thinking E. Moore, Ireland	No: 142 Marine Sc. Ed. L. Li, China
No: 140 Artifical Intelligence S. Digan, Australia					No: 151 Marine Sc Ed E. Copejans and D. Wojciezek, Belgium

Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

12:00 – 12:45 Lunch and Poster Presentations

Wednesday 13:00 – 18:00 Excursions

Excursions : Buses depart from UCC to Cobh at 13:00.

1. Spike Island – Heritage Island
2. Titanic Heritage Centre.
3. Cobh Heritage Centre.
4. Cobh Rebel walking tour.
5. Fota Wildlife Park and Education Centre.
6. Tyndall National Institute in ICT at UCC

Buses depart from Cobh at 17:15 to Cork city centre.

1. Spike Island – Heritage Island

Originally the site of a monastic settlement, the island is dominated by an 18th-century bastion fort now named Fort Mitchel.
The island was used to house convicts prior to penal transportation. Opened in **1847** to deal with growing number of convictions for theft during the **Great Famine**, the prison grew into what "for a few years in the mid-19th century was probably the biggest prison in the British Empire" It later gained a reputation as "Ireland's Alcatraz".(Wikipedia)

2. Titanic Heritage Centre: Titanic's last port of call.

Titanic Experience Cobh is a unique visitor experience located in the historic White Star Line Building – the very place from where Titanic's last passengers departed.
Take a guided tour and retrace the footsteps of our Queenstown passengers. Featuring real passenger stories and eyewitness accounts of the tragedy.
https://titanicexperiencecobh.ie/

3. Cobh Heritage Centre.

Discover the moving narrative of emigration and maritime history at the Cobh Heritage Centre in Cobh, County Cork. This captivating exhibition vividly portrays the roots, chronicles, and enduring impact of Cobh, while also recounting the tragic stories of the ill-fated Titanic and Lusitania.

From 1848 to 1950, over six million adults and children emigrated from Ireland – over 2.5 million of those departed from Cobh (formerly called Queenstown), making it the single most important port of emigration.
Learn about some of the emigrants who departed from Cobh, many in search of a new life in a land of opportunity, and many more who departed involuntarily as convicts to Australia or as forced labour to the colonies and the West Indies – known as the forgotten Irish.(https://cobhheritage.com/)

4. Cobh Rebel walking tour.

"Cobh Rebel Walking tours, involve an 80 minute leisurely walk, covering 16 War of Independence sites in Cobh. It tells the story of the Cobh Branch of the Irish volunteers, from their origins in 1913, through to their actions in the 1916 Rising, how they changed the name of their town from Queenstown to Cobh in 1920 and how they took the war to their British rulers, right up to the truce." (https://www.tripadvisor.ie/)

5. Fota Wildlife Park and Education Centre.

Fota Wildlife Park cares for several different animal species in danger of extinction. Through long-established Breeding programmes, which are run cooperatively with other institutions around the world, the Park is helping restore populations of some species while protecting the very survival of others.
Fota Wildlife Park is one of the most popular tourist attractions in Ireland and has been awarded 'Best Family Day Out' for both Munster and Cork on several occasions. It is also in the Top 25 Zoos/Animal Parks in Europe in the 2015 TripAdvisor Travellers Choice Awards.

6. Tyndall National Institute in ICT at UCC

Tyndall is a global leader in semiconductor innovation, driving breakthroughs in micro-nanoelectronics and integrated photonics. By bridging the gap between pioneering research and industrial application, we drive research excellence in emerging materials and devices, next-generation chip design, quantum hardware, and smart sensors. Our world-class facilities and expertise positions Ireland at the heart of the global semiconductor ecosystem.
https://www.tyndall.ie/about-us/

Buses depart from Cobh at 17:15 to Cork city centre.

19:30 – 21:30 Conference Gala banquet in Metropole Hotel and ICASE presentations / awards

Thursday 9:05 – 9:55 in Boole 4

Keynote 5
Industry-Education Links: Technology in Science Education and Sustainable Development

John Mc Auliffe (Chair)
Managing Director, Pilz Ireland Industrial Automation
Email address: j.mcauliffe@pilz.ie

John Mc Auliffe is an engineering graduate of University College with over 45 year's experience in high technology companies, in both the indigenous and multinational sectors. With a career spanning engineering, technology, product development, business development and managerial roles, he has worked in companies which developed strong links with the education ECO system in Ireland.

John is Vice Chairman of Cork's Technology Network – Cork;s Electronics Industry Association.

Panel of speakers
Valerie Cowman, CEIA
Ken Keohane ,ThermoFisher
Dr. Denis Beecher , BASF

10:05 –10:45 Concurrent Sessions 10

Boole 1 Concurrent Seminar 43	Boole 2 Concurrent Seminar 44	Boole 3 Concurrent Seminar45	Boole 4 Concurrent Seminar46	Boole 5 Concurrent Seminar47	Boole 6 Concurrent Seminar 48
No: 84 **Primary Science** **J. Simons, USA**	**No: 6** **Teacher Training** **C. Faria, Portugal**	**No: 57** **Industry Ed Links** **J. Hall-Dadson, Australia**	**No: 44** **ICASE Primary Science** **S.D. Tunnicliffe, UK**	**No: 166** **ICASE membership** **B. Zhang, China**	**No: 176** **Marine Sc Ed** **O. Doherty, UK**
No: 86 **STEM Assessment** **R. Edwards, New Zealand**	**No: 114** **Teacher Training** **E. McLoughlin, Ireland**	**No: 89** **Promoting Sc** **B. Çavaş, Türkiye**	**No: 180** **Early Childhood** **K. Demir and D. Peker, USA**	**No: 167** **Round Table** **B. Zhang, China**	**No: 159** **Marine Sc Ed** **D. Eparkhina, Belgium**
	No: 25 **Science on Stage** **S. Vasconcelos and I. Borges, Portugal**				**No: 178** **Marine Sc Ed** **L. Hunt, Ireland**

10.45 – 11:15 Tea / coffee and Poster Presentations

Thursday 11:15 – 11:55 Concurrent Sessions 11

Boole 1 Concurrent Seminar 49	Boole 2 Concurrent Seminar 50	Boole 3 Concurrent Seminar51	Boole 4 Concurrent Seminar52	Boole 5 Concurrent Seminar53	Boole 6 Concurrent Seminar 54
No: 50 Lab Pr Work L. Ngozi-Olehi, Nigeria No: 160 Lab Pr Work R. Sanchez, Mexico	No: 10 Artifical Intelligence S. Murphy, Ireland No: 17 Artifical Intelligence M. Odell and T. Kennedy, USA	No: 163 Early Childhood Science M. Sumida, Japan No: 128 Primary Science Y.O. Yilmaz, Türkiye No: 181 Early Childhood Science A. Carroll, UK	No: 102 Industry Ed Links E. Cubas-Rolim, Brazil No: 105 Industry Ed Links M. Ferzli, L. Paciulli, D. Thomas and P. Estes, USA No: 126 Industry Ed Links S. Kawagoe, Japan	No: 148 Chemistry Pedagogy D. Otway, Ireland No: 149 Chemistry Pedagogy B. P. Ndlovu, South Africa	No: 171 Marine Sc Ed A. Shepherd, USA No: 170 Marine Sc Ed M. Sullivan, Ireland No: 158 Marine Sc Ed Susan Rowe, USA

Abstracts of all these presentations are available, in numerical order, from page 34 onwards.

Thursday 12:05 – 13:00 Concurrent Sessions 12

Boole 1 Concurrent Seminar 55	Boole 2 Concurrent Seminar 56	Boole 3 Concurrent Seminar57	Boole 4 Concurrent Seminar58	Boole 5 Concurrent Seminar59	Boole 6 Concurrent Seminar 60
No: 20 Continuing Professional Development R. Hammack, USA No 65 Science on Stage G. Hewston, Ireland	No 45 Bioinformatics C. Mehaffy, USA No: 104 Artificial Intelligence E. Cubas-Roslim, Brazil	No: 14 Cognitive Pedagogy E. Long, Ireland No 38 Mathematics Pedagogy B. Nwoke, Nigeria	No: 129 Communication E. Cubas-Rolim, Brazil No: 107 Teacher Knowledge T. Ochi, Japan	No: 21 Assessment P. Dundon Ireland No: 168 Assessment E. Lettice, Ireland	No: 145 Marine Sc Ed S. Farady, USA No: 153 Marine Sc Ed S. Oguma, Japan No: 82 Marine Sc Ed X. Symeonidou and E. Copejans, Belgium and Greece No: 177 Marine Sc Ed J. Seys, Belgium

13:00 – 14:00 Lunch and Poster presentations

Thursday 14:00 – 15:00 in Boole 3

Student projects SCIFEST and STRIPE YSTE science fairs from students in local schools.

Some numbers from this year's SciFest

By the end of this academic year a total of 165 SciFest STEM fairs will have taken place. To date, almost **14,000** students have presented over 5,000 projects at local SciFest@School fairs, while over **2,500** students have presented almost 1,400 projects at the regional fairs in third-level colleges.

In November over 50 winning students from the previous academic year's regional fairs participated in the 2025 national final. Of these, three students brought their projects to compete in the Regeneron International Science and Engineering Fair (**ISEF**) in May 2026. Competing with over 1,700 students from all over the world the SciFest students won a total of 6 awards between them.

Stripe Young Scientist & Technology Exhibition

The Stripe Young Scientist & Technology Exhibition (YSTE) is Ireland's biggest celebration of scientific curiosity and innovation. What began in 1965 as a modest initiative to inspire secondary students has grown into one of the world's leading youth science fairs. Each January, 1,000+ students showcase 550 projects spanning quantum computing, AI, biotech, and climate solutions. Alumni have gone on to found companies, lead research institutions, and drive progress worldwide. Every year, the YSTE winner represents Ireland at the European Union Contest for Young Scientists (EUCYS), a stage where Ireland's students have claimed first place 17 times. Selected participants also compete at ISEF (the International Science and Engineering Fair) in the USA.

Thursday 14:00 – 15:00 in Boole 4

International Council of Associations for Science Education

ICASE General Assembly

Presentation of prizes for:the top three posters presented at the conference.

Closing ceremony.

15:00 – 16:00 Farewell

Farewell Reception - tea, coffee, pastries.

Tourism information stand for those staying on for vacation in Ireland.

Poster Presentations

Number	Title	Author, Country and Abstract Number		
1	A roadmap towards change: an approach of enhancing Ocean Literacy and Blue Education in the formal education system of Greece	Symeonidou Xeni	Greece	82
2	Application and Development of an Aquaponics STEAM Program to Enhance Ocean Literacy in Tsunami-Affected Areas	Tsuyoshi SASAKI	Japan	155
3	Practice Oriented Natural Sciences and Ballistics Teaching for Post Grad Professionals at Finnish National Defence University: The Principles	Totti Laitinen	Finland	93
5	Ocean Literacy /Ocean Voices and Connections in Early Childhood	Rita Melia	Ireland	139
6	Creative Currents: Art as a Tool for Ocean Literacy	Jeremy Pivor	USA	78
7	Visualisation, sonification and interaction in secondary school level evolutionary biology	Chenxi Zhang, James Lamb, Thomas R. Meagher, Daniel Barker	UK	88
8	Ocean Literacy in a Land Locked State	Gregory J. Barord, PhD	USA	28
9	Exploring the Representation of the Nature of Science Across Disciplines: A Content Analysis of Science Curriculum Standards in Biology, Chemistry, Geography and Physics	Xiaoshun Zhang	China	24
10	Preparing Science Teachers to Leverage Local Environmental Systems for Equitable and Sustainable Science Learning	Lacey Fitts	USA	98
11	Investigating Pre-service Teachers' Understanding of integrated STEM education	Marwa Ali	Canada	81
12	The Impact of Ocean Literacy Educational Materials on Perceptions of the Value of Eco-Friendly Farmed Fish	Tsuyoshi Sasaki, Sachiko Harada, Mihoko Wakamatsu, Rintaro Takayama, Taro Oishi	Japan	155
13	Science Education Fit for the Future: creating a research informed position statement to guide science education policy framings in Australia and New Zealand	Carol Aldous	Australia	71
14	Effect of Differentiated Instruction on Mathematics Achievement of Students with Learning Difficulties	Dr. Bright Ihechukwu Nwoke	Nigeria	38
15	ICORSA at ICASE2026 – Explore our EU funded Marine (PHAROS) and Maritime (MUSICA) projects	Giovanna Avellis and Rosarii Griffin	Italy and Ireland	31, 157
16	The Research PackTrack Program - A High Impact Program for Authentic Research Experiences	Patricia Estes co-authors: Miriam Ferzli, Lisa Paciulli and Dana Thomas	USA	105
17	Influence of Language of Instruction on Chemistry Achievement Among Secondary School Students in Owerri Municipal Council Area of Imo State	Ngozi-Olehi, L.C., Ehirim, A.I., Okore, G.J.	Nigeria	50
18	Storymaps as a tool for MSP education	Mairéad Sullivan	Ireland	170
19	The Ocean Race Learning - how an informal education platform can influence ocean literacy	Lucy Hunt, Rebecca White, Claire Tiley	Ireland	141
20	Sea Synergy: Connecting Community to the Ocean through Active Learning and Citizen Science	Lucy Hunt, Lucy Evans, Elis Martinelli	Ireland	178
21	The Role of Retrieval Practice in Secondary Science Education	Eoghan Long	Ireland	14

22	Ocean Decade Manual for NGOs	Teresa J. Kennedy	USA	1
23	One Ocean Many Voices	Teresa J. Kennedy	USA	1
24	International STEM Education Partnerships Through Citizen Science: The GLOBE Program as a Framework for Environmental Research and Collaborative Learning	Ana Prieto, Marianela Pepe, Teresa Kennedy, and Michael Odell	USA	56
25	Ocean Literacy Assessment in the Heraklion Bay area (Crete, Greece): Preliminary results from secondary school students	Eleni Koumpaki, Xeni Symeonidou, Anastasia Papakonstantinou, and Panayota Koulouri	Greece	60
26	Action-Oriented Watershed Education for Primary Learners	Nanette Marcum-Dietrich, Steve Kerlin, and Tamara Smith	USA	70
27	From Skills Labs to Skills WODs: A Move–Practice–Reflect–Repeat Framework for Midwifery Education	Maeve O'Connell, Maeve Brookfield School of Nursing and Midwifery, University College Cork	Ireland	N/A
28	Strengthening Science Communication in Course-Based Undergraduate Research Experience (CURE) Labs	Delaney Worthington	USA	106
29	The Role of Practitioner Inquiry in Physics Teacher Professional Learning	Eilish McLoughlin	Ireland	111
30	Non-formal education, when integrated with an international sporting event, provides a powerful platform for advancing Ocean Literacy and advocating for Ocean Rights	Lucy Hunt	Ireland	141
31	Sea Synergy: Connecting community to the Ocean through active learning and citizen science	Lucy Hunt	Ireland	178
32	Co-Designing Transdisciplinary Science for the Ocean We Want: Actions for Scientists to Enrich Ocean Literacy	Lei Li	China	142
33	Story Maps as a tool for Marine Spatial Planning education/engagement	Mairead Sullivan	Ireland	170
34	The Virtual Field	Angie Patterson, Chris Mead, Sara Kassis, and Itchung Cheung. Presented by: Teresa Kennedy	USA	192
35	To investigate the impact of Generative Artificial Intelligence technologies on the assessment of Leaving Certificate coursework.	Stephen Murphy	Ireland	10
36	"Students' Views of a Novel Pharmacy Simulation Program: A Mixed-Methods Survey Study".	Eoin Collins, Ruth McCarthy, Laura J Sahm; School of Pharmacy, UCC	Ireland	N/A
38	Establishing Professional Identity and Enhancing Employability through Experiential Research and industry Partnerships for Undergraduate Medical and Health Sciences Students	Louise M. Collins, Gerard W. O'Keeffe, Aideen M. Sullivan; Medicine / Anatomy and Neuroscience, UCC	Ireland	N/A
39	Exploring Implementation of a National Curriculum for Chronic Disease Prevention and Management in higher Education Institutes in Ireland	A. O'Leary (School of Nursing and Midwifery, UCC), E. Earley, H. Connolly, M. Bermingham, S. Flaherty, M. Flood, J. Green, D. Healy, P. McSharry, C. Murrin, M. O'Brien, D. Connolly	Ireland	N/A
40	The MicroMinute: Embracing Unfamiliar Pedagogy to Unlock Authentic Student Science Communication.	Niall O'Leary; Microbiology, UCC	Ireland	N/A

UCC: Shaping the next generation of STEM innovators

At **University College Cork** (UCC), our undergraduate STEM programmes prepare students to solve real-world challenges across science, engineering, food and environmental disciplines.

Through a combination of research-led teaching and hands-on learning, students develop the skills needed for careers in a wide range of sectors.

UCC offers:

- A broad range of programmes across science, engineering and food science
- Practical, hands-on learning in labs and real-world settings
- Strong industry links and work placement opportunities
- Pathways to global careers, research and further study

Brand new for 2026, UCC's BSc in Sustainability is an innovative interdisciplinary degree. Students will examine how science, society, business and ethics intersect in sustainability, gaining the skills to solve real-world challenges.

Explore our programmes: ucc.ie/en/sefs/undergraduate/ucc-stem-undergraduate-courses/ | Email: stem@ucc.ie

Poster Presentations

Number	Title	Author, Country and Abstract Number		
41	Planetary Health and the Sustainable Development Goals in Health Professions Education	Dr. Angela Flynn; Dr Margaret Murphy, and Anna O'Leary; School of Nursing and Midwifery, UCC	Ireland	N/A
42	Critical Decisions in Paediatric Emergency Medicine: Designing and Evaluating a Simulation-Based Course for Advanced Learners	Jessie Lynch, Michael Cronin, Rory O'Brien ; ASSERT Centre, UCC	Ireland	N/A
43	From Passive to Active Learning: Preclinical Medical Students' Perceptions of Simulation-Based Learning	Susan Lapthorne, Daragh Mathews, Michael Cronin, Leonie Heskin, Deirdre O'Brien, Maeve Doyle, Patrick J Stapleton ; Department of Pathology, UCC	Ireland	N/A
44	Does VTS participation impact VLA outcomes?	Curtin S, MacSweeney F and Harding M (Correspondence to Dr. Sharon Curtin; s.curtin@ucc.ie); Cork University Dental School and Hospital, UCC	Ireland	N/A
45	Evaluation of Core Competency Development in Pharmacology Practicals	Linda Katona and Roisin Kelly-Laubscher; Department of Pharmacology and Therapeutics, School of Medicine, UCC	Ireland	N/A
46	Equity and Inclusion in Teaching Histology to Undergraduate Medical Students: A Scaffolded Intervention Study	Mairaj Fatima, André Toulouse, Mutahira Lone; Department of Anatomy and Neuroscience, UCC	Ireland	N/A
47	Integrating 3D Visualisation and Digital Simulation to Enhance Engagement in Oral Surgery Education	Martha Woods; Cork University Dental School and Hospital, UCC	Ireland	N/A
48	Work Integrated Learning (WIL) @ UCC	WIL working group, inc. Clodagh Kerr, Stephanie Larkin, Luis Gomez De Membrillera; Career Services, UCC	Ireland	N/A
49	Designing an Engaging and Inclusive Learning Environment in Physiotherapy Education through a Digital Case-Based Platform	Yaokun Shan; Cork University Business School, UCC	Ireland	N/A
50	Student Perception of Virtual Laboratory Resources: A Survey of Undergraduates and Postgraduates at UCC	Christopher S. Burke, Edel Whelton, William Daly, Anna Maria Hogan, Janine Boertjes, Justina Ugwah, Niamh O'Mahoney, Aoife O'Sullivan, Ian O'Connor, Brian Murphy, Carmel Breslin, Frances Heaney, Denise Rooney, Ronan Bree, Bernard T. Drumm, Aoife Morrin and Eric Moore; School of Chemistry, UCC	Ireland	N/A
51	Video Images of Aseptic Techniques in Cell Culture	Edel Whelton; School of Chemistry, UCC	Ireland	N/A
52	A Regional Simulation-Based Training Programme for Intern Doctors in the HSE South West: Design, Delivery and Evaluation;	Jessie Lynch, Declan Herlihy, Daniel Schmidt, Michael Cronin; ASSERT Centre	Ireland	N/A
53	Visual Learning Impact: Curriculum Development for Training in Bioprocess Engineering	Martina Rehnert and Ralf Takors, University of Stuttgart	Germany	9

Abstracts of approved papers

1 Advancing Marine Science Education through Ocean Literacy

Teresa J. Kennedy, University of Texas at Tyler, United States

The United Nations Decade of Ocean Science for Sustainable Development (2021–2030) calls for strengthening society's relationship with the Ocean and advancing SDG 14 (Life Below Water). Despite its importance, SDG 14 remains among the least prioritized goals, highlighting a critical need for broader understanding and engagement. This presentation shares key findings of SDG implementation, outlines the Marine Science Education (MSE) Strand goals, and celebrates the three-volume series *Ocean Literacy: The Foundation for the Success of the Ocean Decade*, illustrating how Ocean Literacy connects science, education, and society to support informed action under Ocean Decade Challenge 10.

2 The Irish Ocean Literacy Network

Catherine McCann, Irish Ocean Literacy Network, Ireland

Since its establishment in 2016, the Irish Ocean Literacy Network (IOLN) has brought together individuals and organisations working towards achieving an Ocean Literate society across the Island of Ireland. Its voyage demonstrates how the Ocean can unite and motivate people around a common goal. This talk shares the story of the network and the importance of networking, collaboration, and peer-to-peer support in its development. Following challenges in 2021, the network turned a corner through member support, national partnerships, and Prep4Blue Horizon funding. Since becoming a company limited by guarantee in 2024, the IOLN has continued to grow and strengthen.

3 We are the Ocean

Pierre-Yves Cousteau, Marine conservationist and founder and CEO of Cousteau Divers, France

This featured video address opens the Marine Science Education Strand and reflects on humanity's relationship with the Ocean and the urgent need for reconnection. Drawing on his experiences in Ocean exploration, filmmaking, and citizen science, Cousteau emphasizes solidarity, intergenerational responsibility, and inclusive participation as foundations for a sustainable future. He highlights the Ocean Decade as an opportunity to unite science, emotion, technology, and empathy while encouraging audiences to transform awareness into meaningful action for the Ocean we all share together today.

6 Lesson Study and Inclusive Education: A Case Study with Pre-Service Science Teachers

Claudia Faria, Instituto de Educação da Universidade de Lisboa, Portugal

This study explores the potential of lesson study as a formative strategy to promote greater awareness of inclusive teaching practices among pre-service biology and geology teachers. Data was collected through written reflections made by the pre-service teachers and interviews with pre-service and collaborating teachers. Results indicate that lesson study promoted essential pedagogical competencies, such as the detailed lesson planning considering the diversity of students, the value of collaborative work, and deepened reflective practice. A key insight was the benefit of observing in-service teachers adapt instruction in real time, which helped pre-service teachers recognize and reflect about strategies for pedagogical differentiation.

8 Culturally Responsive and Sustaining Teaching Practice Through Primary Science in Aotearoa New Zealand

Steven S. Sexton, University of Otago, New Zealand

The need for better education through science is not a new idea in Aotearoa New Zealand. Through several curriculum changes, teachers have not been well supported by the Ministry of Education in implementing these changes. This presentation reports on how teachers can have more culturally responsive and sustaining teaching practice. It argues how mainstream curriculum and Mātauranga Māori (New Zealand's Indigenous traditional knowledge) can be woven together in meaningful classroom practice. It concludes by showing how both mainstream and Māori pedagogies can work together to support all students' learning and cultural competence.

9 Visual Learning Impact: Curriculum Development for Training in Bioprocess Engineering

Martina Rehnert, University of Stuttgart, Germany

The global growth of the biotechnology sector, including the bioreactor market, underscores the need for modernized education in bioprocess engineering. Over five years, 50 researchers of the program 'InterZell' collaboratively developed an innovative learning ecosystem featuring accessible, sustainable, and digital formats. These include visual tools, virtual laboratories, 3D environments, videos, and podcasts.

By combining scientific expertise with digital innovations, the program enables flexible learning and reduces reliance on resource-intensive experiments. The approach demonstrates the effectiveness of visual education methods and offers a scalable model for future curricula, supporting diverse learners and foster lifelong learning in biotechnology.

10 To investigate the impact of Generative Artificial Intelligence technologies on the assessment of Leaving Certificate coursework

Stephen Murphy, University College Cork, Ireland

This study investigates how Generative Artificial Intelligence (GenAI) affects the integrity of coursework assessment at Leaving Certificate level in Ireland. The research explores students' perceptions of academic integrity and examines issues of equity in access to GenAI technologies. Findings aim to inform future assessment policy and practice.

11 Bringing Everyone into Science: Museum Educators' Perspectives on Inclusive Science Education

Senem Bas, George Mason University, Virginia, United States

Museums play an important role in making science accessible to diverse communities, yet what inclusive science education looks like in practice remains unclear. This talk presents a qualitative study of educators at five U.S. museums, examining how they interpret and implement inclusion in their teaching and programming. Through interviews and analysis of institutional mission and DEAI statements, the study explores how educators connect institutional priorities with personal values and the realities of museum spaces. Centering educators' voices, this work offers practical insights for teachers, museum professionals, and policymakers working to make science more inclusive and meaningful for all.

14 The Role of Retrieval Practice in Secondary Science Education

Eoghan Long, University College Cork, Ireland

Retrieval practice offers secondary science teachers an evidence-based, actionable pedagogy for strengthening long-term retention and addressing curriculum pressures dominated by summative assessment. Grounded in cognitive science, it activates prior knowledge through deliberate recall, though its application must be sensitive to the complexities of real-world science learning. Despite robust evidence, uptake remains limited by teacher misconceptions, student anxiety, and superficial implementation. Embedding low-stakes quizzing, explicit self-testing instruction, and collaborative professional communities can support meaningful integration. Sustained researcher–practitioner–policymaker collaboration is essential to fostering a reflective, context-responsive, evidence-informed culture in secondary science education.

17 Artificial Intelligence, Practice-Based Teacher Preparation, and Improvement: Science Across a STEM University-Lab-School System

Michael Odell, University of Texas at Tyler / Texas STEM Coalition, United States

This paper presents an AI-supported model for STEM teacher preparation within a university-lab-school system integrating UTeach certification, clinical residencies, and Improvement Science. AI tools were embedded across three leverage points: lesson design aligned to standards, video-based coaching and reflection, and academic writing for practitioner research. Implemented through iterative PDSA cycles, the model strengthens connections between coursework and classroom practice. Early findings indicate improved preservice teacher confidence, more efficient feedback loops, and reduced workload for faculty and mentors. Ethical guidelines ensure responsible AI use while preserving relational coaching. The model offers a scalable framework for modernizing STEM teacher preparation globally.

20 Combining Indigenous Science Knowledge and Engineering Laboratory Experiences for Primary Science Teachers in the USA

Rebekah Hammack, Purdue University, Indiana, USA;
Paul Gannon, Nicholas Lux, Sweeney Windchief, Suzi Taylor, and Abigail Richards, Montana State University, Montana, USA

During this talk, I will provide an overview and findings from a six-week Research Experience for Teachers (RET) program in the USA that places primary school teachers into energy related engineering research labs at Montana State University for six weeks during the summer.

The RET teachers come from schools that enrol underserved rural and Indigenous children. The teachers receive targeted professional development on the tenets of Indigenous Science Knowledge (ISK) and the US Next Generation Science Standards (NGSS) and support while developing lesson plans that combine energy engineering concepts with ISK in a way that aligns with NGSS.

21 Exploring the affordances and constraints of 'Mock Exams' in a changing educational landscape – the case of Junior Cycle Science

Patrick Dundon, University of Limerick, Ireland

Mock exams remain central in Irish Junior Cycle Science despite major assessment reforms. This mixed-methods study examined their value and drawbacks across seven schools. Results from 531 students showed a strong correlation between mock and terminal exam scores ($r = 0.770$) but only a moderate correlation between CBA and terminal exam scores ($r = 0.564$). Teachers reported benefits such as focused feedback and exam-technique practice, alongside constraints including lost teaching time.

24 Exploring the Representation of the Nature of Science Across Disciplines: A Content Analysis of Science Curriculum Standards in Biology, Chemistry, Geography and Physics

Xiaoshun Zhang, High School Attached to Northeast Normal University, China

The significance of the Nature of Science (NOS) in cultivating scientific literacy is well - recognized in science education research. This investigation employed the Family Resemblance Approach (FRA) analytical framework to conduct a systematic content analysis of China's national curriculum standards for four STEM disciplines and revealed three primary findings: (1) The representation of NOS is heavily skewed towards the cognitive-epistemic system, while elements of the social-institutional system are critically underrepresented across all subjects ; (2) Distinct patterns of NOS emphasis exist between disciplines. (3) The compartmentalized, discipline-specific structure of the curriculum creates "epistemic silos".

25 Teach STEM with Science on Stage

Sandra Vasconcelos, AE Pedro Eanes Lobato, Portugal; and Isabel Borges, National Steering Committee Science on Stage Portugal Coordinator

This presentation introduces the Science on Stage European network and its potential to support teacher collaboration, the sharing of educational practices, and international visibility. It will present examples of interdisciplinary STEM/STEAM approaches, including inquiry- and project-based learning activities connected to sustainability and hands-on classroom practice. Participants will become familiar with pedagogical strategies, educational resources, and examples of experimental, activity-based instruction that may support the development of engaging learning experiences. The session also aims to highlight how interdisciplinary and real-world contexts can contribute to student motivation, scientific curiosity, and meaningful learning, while offering opportunities for professional exchange among teachers.

27 Publish and Persist: Engaging Students in Authentic Professional Scientific Communication

Sarah Fankhauser, Oxford College of Emory University, Georgia, United States

High school students rarely experience authentic scholarly communication, missing out on critical aspects of how science actually works. While students may conduct experiments, they often lack exposure to the reading, writing, peer review, and publication processes that scientists use to construct and disseminate knowledge.

For over a decade, the Journal of Emerging Investigators (JEI) has pioneered authentic science communication experiences for secondary students worldwide. In this talk, I will share student outcomes from their participation in JEI, and how we are adapting evolutions in science communication for secondary students.

28 Ocean Literacy in a Land-Locked State

Gregory Barord, Central Camus, United States

The Marine Biology Program at Central Campus Regional Academy in Des Moines, Iowa, United States provides high school students with connections to the marine ecosystem through aquarium husbandry, research projects, and conservation action, among others. Students within this program not only become local leaders but are taking on additional roles at state, national, and international levels. This talk highlights how the program fosters Ocean Literacy, illustrating the transformative impact of hands-on marine education and community engagement in preparing students to address global Ocean and climate challenges.

29 School-Industry Partnerships: Impact of Play-based STEAM Education Programs on Students' 21st Century Skills in Abu Dhabi Charter Schools

Wafa AlAkaleek and Professor Sufian Forawi, The British University in Dubai, United Arab Emirates

School-industry partnerships provide students with access to sustainable initiatives that connect students, parents, schools, and industry through cooperative, entrepreneurial, and world-class STEAM (Science, Technology, Engineering, Art, and Mathematics) play-based programs. They equip students with technical and soft skills that fulfil their passions and enhance future career paths. Yet evidence that provides a clear understanding of the development, implementation, accessibility, and feasibility of such partnerships remains scarce.

This study aims to investigate teacher perceptions and student understanding of the impact of a school-industry STEAM play-based program on students' 21st-century skills in Charter schools in Abu Dhabi.

31 Empowering Communities for Ocean Sustainability by Community Engagement and Stakeholder Involvement in Marine Initiatives

Giovanna Avellis (Italy), Gordon Dalton (Spain), Rosarii Griffin (Ireland), Erna Karalija (Bosnia and Herzegovina), Dannie O'Brien (Ireland), and Silvia Vilches (Alabama, United States)

This presentation highlights the role of community engagement and stakeholder collaboration in advancing sustainable Ocean initiatives, drawing on the work of the International Consortium of Researcher Staff Associations (ICORSA). Framed within the UN Sustainable Development Goals and the Ocean Decade, it demonstrates how participatory governance, education, and responsible

research practices strengthen the connection between local communities and marine sustainability efforts. Two EU-funded projects—MUSICA and PHAROS—are presented as case studies illustrating how community-driven approaches, nature-based solutions, citizen science, and co-designed governance models can enhance environmental resilience and social well-being. MUSICA focuses on integrated renewable energy systems for small island communities through a multi-use platform, while PHAROS addresses marine biodiversity restoration, pollution reduction, and pathways toward a sustainable blue economy. In MUSICA project we developed a Self-Assessment Tool for Responsible Research Innovation (RRI) and will illustrate its main features. Central to both initiatives are Living Labs and educational platforms that enable local actors to engage meaningfully throughout the project lifecycle, from planning to implementation and evaluation. The presentation emphasizes how education and Ocean Literacy support informed decision-making, shared responsibility, and long-term capacity building. Together, these examples demonstrate how inclusive, whole-of-society collaboration can generate scalable solutions to complex Ocean and climate challenges.

Keywords: Public Engagement, Living Lab (LL), Quadruple Helix (QH), Community Engagement, Stakeholders Engagement, UN Sustainable Development Goals (SDGs), Open Access, Gender Equality, Ethics/Research Integrity, Science Education, Responsible Research Innovation (RRI)

38 Effect of Differentiated Instruction on Mathematics Achievement of Students with Learning Difficulties

Bright Nwoke, Alvan Ikoku Federal University of Education, Nigeria

This study examined the effect of differentiated instruction on mathematics achievement among SS2 students with learning difficulties in Owerri Municipal, Imo State, Nigeria. Using a quasi-experimental design, 170 students were selected, including 109 with learning difficulties. Data were collected using a 40-item Mathematics Achievement Test (MAT) with a reliability coefficient of 0.87. The experimental group was taught using differentiated instruction, while the control group used traditional methods. ANCOVA analysis showed that differentiated instruction significantly improved students' achievement. Gender had no significant effect, and no interaction existed between method and gender. The study recommended adopting differentiated instruction in mathematics teaching.

39 From Optional to Core: Putting Electrochemistry into Context

John O'Donoghue, Trinity College Dublin and Royal Society of Chemistry, Ireland

Electrochemistry is an important part of our modern lives but is often associated with misconceptions which may have societal impact. In Ireland, it has recently moved from an optional section to become a core topic for the first time. Formative research began in 2019 with a survey and a focus group with science teachers. In 2021, funding from Research Ireland (SFI) kickstarted a national intervention programme in electrochemistry. This talk will focus on the CPD part of the programme which has been run as a partnership between the Royal Society of Chemistry (RSC) and the Irish Science Teachers Association (ISTA).

40 Perceived Difficulty of Physics Practical Topics and its Relationship with Students Achievement: Implications for Teaching, Learning, and Assessment

Rachel Atomatofa, Delta State College of Education, Mosogar, Nigeria

Physics practicals in Nigeria secondary schools are often perceived by students as difficult, particularly when they involve abstract reasoning, complex apparatus or multi-stage procedures, hindering learning and achievement.

In this talk, I will explore how students and teachers differ in their views of difficult physics practical topics and how these perceptions relate to student performance. I will highlight the role of cognitive load theory in explaining why certain practicals pose greater challenges and show how diagnostic assessment can reduce perceived difficulty. Finally, I will emphasize the importance of teacher-training and pedagogical alignment to improve engagement and achievement in Physics practicals.

42 Genetic Engineering and Ethics: A University Outreach Activity for Schoolteachers

Leticia Veloso R. Franco, Universidade de São Paulo, Brazil

This study aimed to foster reflection on the ethical aspects of science and to examine science teachers' familiarity with recent developments in biotechnology. Three real-world cases were discussed: (1) the controversial case of the Chinese twins whose genomes were edited to allegedly prevent HIV infection; (2) the "three-parent baby" case involving mitochondrial replacement therapy; and (3) the first personalized CRISPR-based therapy reported in 2025. Teachers then engaged in guided discussions addressing ethical issues related to gene therapies, the boundary between therapeutic and aesthetic applications, and challenges of implementation.

43 Practical science in Primary school: Hands-on- learning

Sue Dale Tunnicliffe, ICASE, CASTME, UCL IOE, United Kingdom

I will discuss how Primary science develops from Free choice play and everyday experiences. After learning to use equipment, using various resources and observing outcomes, children work in groups developing the logistics of practical work, team working using social skills, management of resources organising collecting equipment. Initially following instructions developing into designing their own solutions to challenges given in solving problems of everyday relevance, recording and communication what they did, their data obtained and what they have found out, hence using literacy and numeracy skills in a real context.

44 The Role of ICASE in Science Learning Developments in the Last Half Century

Sue Dale Tunnicliffe, ICASE, CASTME, UCL IOE, United Kingdom

ICASE, founded 1972, advised on secondary science. In 1988 ICASE recognised the emergence of primary science, (presecondary). Members developed hands-on science activities with low cost everyday materials which were disseminated through mailing a quarterly newsletter, "STEPPING INTO SCIENCE" by ASE. Source books were produced and an award scheme was introduced. Workshops at Science education conferences were initiated. In the 21st century the emergence of Early Years and community STEM has developed, and is now disseminated through the Journal. I will discuss this progress. Materials are available in the 'Publications sections' of the ICASE website.

45 Hybrid course-based undergraduate research experience (CURE) in microbiology and bioinformatics contributes to students' self-confidence in bioinformatic skills and increase their interest in bioinformatics

Caroline Mehaffy, Colorado State University, USA

Course based undergraduate research experiences (CUREs) provide opportunities to engage in authentic research projects and can contribute towards students' science identity, self-efficacy and increase students' confidence in laboratory skills related to their field.

In this talk, I will present a hybrid CURE consisting of microbiology and bioinformatic research where students assembled and analyzed bacterial genomes. I will provide ideas for implementation of this type of course and will present data related to students' gains in science identity, self-efficacy, and self-assessment of skills related to research and bioinformatics. I will also discuss students emotions related to their project as they complete this course.

47 47 Connecting People and Ocean: Mobilizing a Citizenry to Better Understand, Value, and Care for the Ocean

Elizabeth (Diz) Glithero, Centre for Ocean Literacy Collaboration (COLC), Nova Scotia, Canada; Lead Author, *Ocean Decade Vision 2030 White Papers—Challenge 10: Restoring Society's Relationship with the Ocean*

This Marine Science Education Strand keynote presentation explores how inclusive, community-driven efforts can strengthen Ocean Literacy by fostering stronger connections between people and the Ocean. Drawing on collaborative initiatives, impact measurement, and a 'living lab' approach in Canada, Diz will share key insights on strategies for designing high impact public Ocean engagement and empowering diverse communities. Emphasis is placed on emotional, cultural, and scientific connections that support informed decision-making, collective action, and sustained investment in Ocean Literacy.

48 Ocean Plastics Project

Rory Jackson, Oceans Plastic Project CLG, Gokane House, Tragumna, Skibbereen, Co. Cork P81TF44

The Ocean Plastics Project focuses on educating young people about plastics in our seas through Ocean Literacy, citizen science, and environmental action. Working in partnership with Educational Passages since 2017, more than 12 primary and secondary schools have participated in collecting data using mini boats and floaters, exploring tidal flows, investigating marine pollution and waste pathways, and connecting with young people internationally.

The project also emphasizes upcycling waste, helping students transform environmental challenges into positive community action. Engaging learners at all levels fosters a deeper understanding of Ocean waste while inspiring meaningful environmental stewardship and behavioral change.

The project has also been shared through public talks and outreach activities as part of Cork County Council's Make One Change campaign.

50 Influence of Language of Instruction on Chemistry Achievement among Secondary School Students in Owerri Municipal Council Area of Imo State

Lynda Chioma Ngozi-Olehi, Alvan Ikoku Federal University Of Education Owerri Imo State, Nigeria

This study examined the impact of language of instruction on the academic performance of senior secondary school chemistry students in Owerri Municipal, Imo State, Nigeria. Using a structured four-point Likert questionnaire, data were collected from 117 SS2 students selected from the study population and analyzed descriptively. Findings showed that language of instruction significantly influenced students' interest, classroom participation, and academic performance in chemistry. Translating scientific terms and explaining teaching aids in students' native languages improved comprehension and achievement. The study recommends strategic integration of mother tongue instruction in chemistry education.

51 Biotechnology 101: Bringing 21st Century Biology into Secondary School Laboratories

Declan Cathcart, Temple Carrig School & Amgen Biotech Experience & Science on Stage, Ireland

A practical biotechnology laboratory course was developed as an inquiry-based learning (IBL) module. Students learn actively through a structured problem-based learning (PBL) approach. Skills are learned as needed to move towards a solution, while fundamental biological concepts such as cell division, DNA replication, and gene expression are explored in the context of hands-on authentic investigations in real-world scenarios. Students carry out DNA profiling,

PCR and genetic engineering, developing practical skills and core knowledge in molecular biology.

The author will give an account of the evolution of these labs, supported by Amgen Biotech Experience and Science on Stage, through international collaboration.

54 To Critically Analyse the Introduction and Implementation of the Additional Assessment Component (AAC) for the New Chemistry Curriculum Specification

Patrick O Donnell, SPSL Rathmore, Ireland

Practical work is central to chemistry education, yet assessing it remains challenging. This paper reviews national and international approaches to practical assessment, focusing on Ireland's new Additional Assessment Component (AAC) for Leaving Certificate Chemistry. Drawing on policy, empirical research and comparative studies, it examines assessment purposes, models and tensions between validity, reliability and equity. International examples include school-based assessment, investigative coursework and external practical tests. The AAC, worth 40% of the final grade, combines school-based investigation with external marking. Its success will depend on teacher agency and the issues around this, such as teacher support, resources, moderation, equity and attention to health and safety in laboratories.

56 International STEM Education Partnerships Through Citizen Science: The GLOBE Program as a Framework for Environmental Research and Collaborative Learning

Ana Prieto, Marianela Pepe, Teresa Kennedy, and Michael Odell, National University of Comahue, Argentina, and the University of Texas at Tyler, United States

International STEM partnerships often struggle to sustain rigorous, locally relevant learning experiences across contexts. Initiatives from Northern Patagonia, Argentina, incorporated GLOBE Program activities and scientific protocols to support citizen science, environmental research, and collaborative STEM learning across educational levels through partnerships between the National University of Comahue (UNCo) and the University of Texas at Tyler. Drawing on 25 years of practice-based evidence, the work demonstrates how long-term participation in citizen science strengthens scientific autonomy, data literacy, curricular innovation, and international collaboration while supporting scientific achievement and community knowledge transfer.

57 Local Influences on Attitudes to STEM – Partnerships to Support STEM Workforce Participation

Jane Hall-Dadson, University of Tasmania, Australia

The knowledge, experiences, attitudes, and social connections of families help build their children's Science and STEM Capital. Place-based learning (PBL) draws on local environments and communities to increase relevance, support STEM identity, and create meaningful links between science, place, and everyday life.

In this talk I will describe how family influences in a small regional mining community in Australia have impacted students' relationships with STEM. I will also share examples of effective local partnerships and explain how PBL, in cooperation with local industries and organisations, has the potential to build STEM capital and increase STEM participation rates in the region.

59 A Professional Learning Approach to Developing Teachers' PCK in STEM Teaching and Learning

S.L. Lee and B.C. Yap
Singapore Teachers/Ministry of Education, Singapore

This paper presents a framework for STEM teacher professional development centred on transforming teachers' professional identities through Shulman's pedagogical content knowledge (PCK). The framework supports teachers in delivering interdisciplinary, real-world STEM learning that enhances students' 21st-century competencies and understanding of sustainability. Two pillars underpin the framework: the 5C Instructional Model (Curiosity, Comprehension, Convincing, Contextualisation, Consolidation) and cross-disciplinary Networked Learning Communities that foster collaboration and a shared STEM identity. Findings show the framework bridges theory and practice through authentic pedagogical experiences, collaborative implementation, and curated STEM resources that strengthen transformative STEM teaching practices.

60 Ocean Literacy Assessment in the Heraklion Bay area (Crete, Greece): Preliminary Results from Secondary School Students

Eleni Koumpaki, Xeni Symeonidou, Anastasia Papakonstantinou, Panayota Koulouri,

Institute of Marine Biology, Biotechnology and Aquaculture, Hellenic Centre for Marine Research, Greece

Ocean Literacy (OL) refers to understanding the mutual relationship between the Ocean and human life. Introduced in 2004, it highlights the need to integrate marine science into education. The MARBEFES project examines how changes in marine biodiversity affect ecosystem services, with Work Package 7 focusing on assessing students' Ocean literacy. Using a questionnaire developed along with the BlueLightS project, the study evaluates the dimensions of OL (knowledge, perceptions, behaviour, attitudes toward the ocean). Preliminary results from approximately 250 students (ages 12–16) in Heraklion, Crete reveal both strengths and gaps, supporting efforts to enhance marine education in Greek curricula.

61 FREELAND - Promoting STEAM through Participatory Urban Regeneration

Serena Di Grazia, MAIEUTIKE' APS, Italy

Freeland is an EU-funded educational project for secondary schools that engages teachers, students, and local communities in addressing urban environmental challenges through scientific inquiry, data analysis, and civic participation. Students investigate neglected urban spaces as outdoor laboratories, collaboratively redesign these areas through a digital platform, and implement cultural and artistic initiatives promoting sustainability and inclusion. By integrating science, technology, and art, the project fosters interdisciplinary learning, systems thinking, and environmental awareness. In this talk I present the teaching tools created by the project and the evaluation of their effectiveness after application in class..

62 A Comparative Study on the Environmental Consciousness and Behaviour of Japanese and German University Students: Aiming to Build Global Environmental Education

Naoto Nakamura, Okayama Shoka University; Kumi Kobayashi and Tetsuya Suzuki, Tokyo Future University, Japan

Purpose of the Study: This study aims to clarify the characteristics of environmental awareness and behaviour among university students in Germany, an environmentally advanced country, and Japan, known for its scientific and technological advancements.

Research Methodology: A web-based questionnaire survey will be conducted among university students from 2025 to 2026.

Results of the Survey: Both Japanese and German students demonstrated relatively high levels of environmental awareness. However, differences were observed in behaviour, with German students engaging in more environmental actions than their Japanese counterparts, although they were on par in some areas.

63 Preservice Primary School Teachers' Beliefs about Teacher's Low Subject Interest in Physics and Chemistry

Johanna Havia, University of Oulu, Finland

Primary school teachers teach a wide range of subjects; hence, it is natural that their subject interest in different school subjects varies. Typically, many primary school teachers find physics and chemistry challenging and might lack interest and confidence in teaching them.

In this talk I will share preservice primary school teachers' beliefs about teacher subject interest and their beliefs about how to cope, as teachers, with their possible low interest in physics and chemistry.

64 Optimising and Reviewing the Outcomes of Laboratory Refurbishment

Graham Hewston, ISTA member, Ireland

A laboratory refurbishment provides an opportunity to reimagine an environment which promotes the learning and teaching of science. Contemporary materials, modular serviced areas and storage solutions can aid towards meeting the complex demands of a school laboratory. An additional outcome of good design can also reduce extraneous learning load factors.

In this talk, I will present a journey of a school's process of planning, implementation and reflection on how the space has developed since the refurbishment.

65 Enhancing the effectiveness and overall audience experience in science on stage presentations

Graham Hewston, ISTA member, Ireland

Science on stage presentations offer a pathway to present to a variety of audiences scientific principles which are anchored in real-life contexts in an entertaining, engaging and memorable way.

In this talk I will share a personal origin story to acquire and use a set of transferable skills from an eclectic range of subject domains to meet the need of such presentations.

66 Development and Evaluation of Science Experiment Materials Using Scientific Tricks from the Anime 'Detective Conan'

Shuichi Yamashita, Japan

The anime "Detective Conan" is highly popular among students worldwide and incorporates scientific tricks relevant to elementary and junior high school science curricula. Episode 1163 features scientific tricks involving the pendulum (G5) and properties of metals (G7). The study aims to develop science experiment materials that explain this scientific trick in actual science lessons to enhance students' interest and understanding through enjoyable experiments.

Ninety-nine 7th grade students from four classes in a public school participated.

69 Implementing Ocean Literacy in Schools: Student Learning and Educational Change in the Blue School Programme

Raquel Costa and Cláudia Faria, Instituto de Educação da Universidade de Lisboa, Portugal


This study examines how participation in Portugal's Blue School Programme supports the development of Ocean Literacy. Data were collected from 3,191 students through questionnaires and focus groups. Results show high levels of awareness, attitudes, and pro-environmental behaviour, with significant relationships between cognitive, affective, and behavioural dimensions. Younger students reported stronger perceived impact, while older students demonstrated more critical and reflective engagement. Qualitative findings highlight the central role of experiential learning, emotional connection, and social interaction in transforming knowledge into action. The findings support the conceptualisation of OL as a situated form of scientific literacy, developed through participatory and affective experiences.

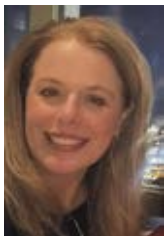
70 From Local Streams to Systems Thinking: Designing Action-Oriented Watershed Education for Primary Learners

Nanette Marcum-Dietrich, Millersville University of Pennsylvania, United States

This practice-oriented paper presents Shared Waters, a 10-lesson watershed curriculum for learners ages 8 to 12 grounded in environmental action. Students investigate how to positively impact their watershed through fieldwork, environmental data collection, runoff simulations, and evidence-based reasoning. Using a design-based research approach, we examine how these experiences support systems thinking. Students analyze water quality indicators, model land-use impacts, and design action projects. Findings suggest that integrating field science with digital tools strengthens students' ability to reason about human–natural systems, evaluate trade-offs, and construct evidence-based explanations. This work offers a transferable model for connecting local environmental learning with broader sustainability challenges.

71 AI Career Avatars in Primary Environmental Science: A Responsible Model for AI-Mediated Career Exploration and Scientific Reasoning

Nanette Marcum-Dietrich, Millersville University of Pennsylv, United States



This design and development paper presents a model for integrating conversational AI into primary environmental science that is developmentally appropriate and ethically grounded. AI Career Avatars, based on interviews with environmental professionals, are embedded within a 10 lesson watershed curriculum for learners ages 8 to 12. The avatars guide inquiry, model scientific reasoning, and connect learning to authentic STEM careers. Designed as reasoning partners, they support systems thinking during data analysis and environmental decision making. The model emphasizes responsible AI through curated data, moderated responses, and inclusive representation. This work offers a scalable framework for AI mediated science learning that strengthens STEM identity and broadens participation in sustainability related careers.

72 Science Education Fit for the Future: Creating a Research Informed Position Statement to Guide Science Education Policy Framings in Australia and New Zealand.

Carol Aldous, Flinders University, Australia

This paper presents a reflexive analysis of a three-year project led by the Australasian Science Education Research Association (ASERA) to develop a white paper on future-focused science education policy following the expiry of national STEM strategies in Australia and New Zealand. Reviews of science education policy and research identified three key themes: Curriculum and Pedagogy, Positioning the Sciences, and Communities of Practice.

These themes were refined through consultation across educational contexts. The resulting recommendations centred on five pillars of science education: community engagement, valued knowledge, future-focused thinking, respect for evidence, and the development of science identity and citizenship.

74 English-Medium Instruction and Curriculum Transformation in Algerian Higher STEM Education

Naziha Settari, Yahia Fares University of Medea, Algeria

As a response to broader efforts toward academic internationalization and mobility, recent reforms in Algerian higher education have opted for the implementation of English-Medium Instruction (EMI) in scientific and technological fields. While EMI has been broadly coined with language policy and global competitiveness, its implications for curriculum development and science teaching practices still remain underexplored. This theoretical paper analyzes EMI in Algerian higher STEM education as a strategic reconfiguration of the curriculum rather than a simple change in the language of instruction. It aims at addressing the existing gap in science and technology education research regarding how shifts in the language of instruction can ultimately affect disciplinary content, classroom interaction and assessment practices. Drawing on curriculum theory and research in science education on disciplinary knowledge and assessment practices, this paper develops a framework for understanding EMI as a curriculum reform that guides and reshapes how STEM knowledge is constructed, communicated and evaluated in multilingual university contexts. By conceptualizing EMI as a curriculum-level matter in Algerian higher education, this paper advances

debate in STEM internationalization and identifies directions for future research in science and technology education.

76 Shadow AI, Knowledge Validation and the Pisa 2029 Mail Framework

Vytis Radvila, Kristina Lekutiene, Aelita Bredelytė,
Klaipeda University, Lithuania

Generative AI is changing how students construct explanations and justify knowledge claims in science, yet informal use is still framed as misconduct rather than as a signal of deeper systemic tension. In this talk, I will reframe shadow AI as evidence of mismatch between governance, curriculum, and assessment, and show how authorship and epistemic agency shift when AI becomes a working partner in inquiry. I will connect these dynamics to the OECD PISA 2029 MAIL framework, drawing out implications for curriculum design, assessment task construction, and teacher education in hybrid human-AI knowledge work.

78 Creative Currents: Art as a Tool for Ocean Literacy

Jeremy Pivor,
Bow Seat: Creative Action for Conservation, Massachusetts, United States.

Ocean and climate science are often taught through facts and data alone, which can limit students' personal connection to environmental issues and opportunities for experiential learning. This practice-oriented study explores how Bow Seat's Ocean Awareness Contest—the world's largest environmental youth program dedicated to the creative arts—supports Ocean Literacy and climate science education among youth ages 11–18 worldwide.

Drawing on eight years of mixed-methods evaluation data, this presentation will highlight how creative expression can strengthen environmental knowledge, empathy, agency, and identity. Findings suggest that arts-integrated and interdisciplinary approaches can deepen engagement with complex environmental issues and support more meaningful science learning.

79 Acknowledging the Elephant in the Room: Using the Course Discussion Board for Race-conscious Conversations

Katherine A. Conroy and Felicia Moore Mensah
Teachers College, Columbia University, New York, United States

This ongoing study explores the importance of race-conscious science teacher preparation through an in-person course discussion board, encouraging identity work and critical reflection with science teachers. Grounded in frameworks such as critical race theory, critical whiteness studies, and the archaeology of self, this paper argues that building race-consciousness among in-service science teachers should be a central tenet of any quality science teacher education program.

Insights on the affordances of online course discussion boards, supporting the building of race-consciousness among science educators, are shared. Implications emphasize effective preparation for quality, race-conscious science teachers, hopefully, leading to better outcomes for science students.

80 From Tools to Socio-Technical Actors: Rethinking AI Curriculum in Science and Technology Education

Kristina Lekutiene, University of Ioannina, Greece; Klaipeda University, Lithuania;
Jenny Pange, University of Ioannina, Greece; Aelita Bredelyte, Klaipeda University, Lithuania

Artificial intelligence (AI) and social robotics are becoming embedded in science and technology education, functioning not only as tools but as interactive and socially responsive actors. However, curricula still frame AI mainly as a technical domain focused on coding and data literacy. This creates a gap between educational policy and learners' real experiences with AI as tutors, chatbots, and social robots. Drawing on AIED, HRI, psychology, ethics, and media studies, this study explores how human - AI relationships reshape education. The findings highlight the need for curriculum transformation integrating critical understanding of human - AI interaction as core learning outcomes.

81 Investigating Pre-service Teachers' Understanding of High-Quality STEM Integration

Marwa Ali, The University of Ottawa, Canada

Integrated STEM education has become increasingly important in contemporary education, particularly amid the rapid development of artificial intelligence and the growing need for problem-solving and critical-thinking skills. However, many pre-service elementary teachers still have varying understandings of what integrated STEM education means in practice.

In this presentation, I will discuss how pre-service elementary teachers conceptualize integrated STEM education and highlight key areas that were less emphasized, including authentic real-world problems, engineering design processes, and STEM career connections. I will also discuss the implications for teacher education programs in preparing future teachers to integrate STEM meaningfully.

82 A Roadmap Towards Change: An Approach of Enhancing Ocean Literacy and Blue Education in the Formal Education System of Greece

Xeni Symeonidou, Panayota Koulouri (Greece), Agueda Graz-Velazquez, Ivana Kovac Evita Tasiopoulou (Belgium), Manon Berge (France), and Evy Copejans (Belgium)

Greece is highly dependent on its marine environment for both recreational and economic activity. Although some studies have assessed students' Ocean Literacy (OL), no coordinated strategy exists to integrate OL and "blue" education into the national system. BlueLightS, a European-funded project, has provided the opportunity for Greece to self-evaluate, recognise obstacles and potential enablers to strengthen the Greek educational system and allow a more coordinated approach to blue education. This study will present Greece's progress towards a national strategy for blue education: what has been done and achieved so far, and what are the next steps.

83 Process Skills as a Lever for Systems Thinking: A Comparative Analysis of Science Curricula in Japan, the UK, France, and Selected African Countries

Masakazu Kita, Okayama University, Japan

This study analyzed science curricula from primary through upper secondary levels in Japan, the United Kingdom, France, Anglophone African countries (Ghana and Zambia), and Francophone African countries (Senegal and Madagascar), focusing on process skills and their relationship to the development of systems thinking as a capacity to address contemporary social issues. The findings indicate that the cultivation of systems thinking is strongly influenced by how clearly and concretely process skills are articulated within national curricula.

84 Quantum is Elementary: Quantum Conceptualizing and Sense-Making in Primary Grades

Jennifer Simons, George Mason University, Virginia, United States

Primary students are often seen as too young to engage with complex scientific concepts like those in quantum science. However, this study challenges that assumption, showing that with the right approach, even 5th-grade students can begin making sense of abstract ideas like superposition.

In this presentation, I will share how gamification and tangible analogies helped students develop meaningful understanding of quantum concepts and discuss implications for how we introduce cutting-edge, abstract science in primary classrooms.

85 Demystifying Quantum: Teacher Professional Learning and Resource Development in Primary and Secondary Science

Nancy Holincheck, George Mason University, Virginia, United States

As Quantum Information Science increasingly drives global technological innovation, preparing teachers to integrate these concepts in primary and secondary education is essential to modernizing science literacy and ensuring the long-term sustainability of the future STEM workforce.

In this talk, I will share my research team's work with primary and secondary teachers, including professional learning focused on quantum and pre-quantum science concepts, as well as the development of curricular resources for use in K-12 STEM classrooms. I will highlight our collaborative approach to teacher learning and explore the challenges faced in integrating innovative STEM content into K-12 classrooms.

86 What is Being Learnt in Primary STEM Education?

Richard Edwards, Te Rito Maioha, New Zealand

This project investigated what a group of New Zealand primary teachers think their students are learning in STEM education and how they know this. The qualitative study collected data using individual semi-structured interviews. Findings indicated that for these teachers assessment in STEM education focused more on inquiry skills and problem-solving than on specific knowledge and skills in science, technology, engineering, and mathematics. Teachers found it difficult to identify curriculum-specific learning. Their assessment approaches were diverse and mostly informal with 'in the moment' noticing particularly prominent. Implications are discussed with respect to teacher practice and the intent of STEM education.

87 Mapping Research Trends in Science Education: A Large-Scale N-gram Co-occurrence Analysis (2015–2024)

Hajime TANAKA, Shumei University, Japan

Tetsuya SUZUKI and Kumi KOBAYASHI, Tokyo Future University, Japan

Purpose of the Study: This study aims to map the structural evolution of research trends in science education by analysing keyword co-occurrences across major international journals from 2015 to 2024.

Research Methodology: N-gram extraction, co-occurrence intensity metrics, and Principal Component Analysis were applied to 639 full-text papers from eight leading science-education journals.

Results of the Analysis: Five categories were identified: STEM Core, Digital Technology, Environmental/Social Issues, Classical Practice, and Emerging Concepts. Three of these emerged as the field's main currents: STEM was the central hub (35 pairs); Digital Technology increased steadily throughout the COVID-19 period (+23%); and Environmental research peaked in 2021–22.

88 Visualisation, sonification and interaction in secondary school level evolutionary biology

Chenxi Zhang, The University of Edinburgh, United Kingdom

Phylogeny can be a challenging topic in secondary school biology. To support teaching and learning phylogeny, I have developed a workshop including videos, a website, a Minecraft world and music coding. I have piloted this in five schools. The pilot suggests its value in supporting students' understanding. Feedback was positive, with staff highlighting the importance of curriculum links. In the near future, I will explore the workshop's effectiveness on student motivation for learning phylogeny through a mixed-methods approach using questionnaires, interviews, and observations. This next phase will offer deeper insight into teaching abstract concepts in biology.

89 Science Education International (2020–2025): Trends and Patterns in Published Research

Bülent Çavaş, & Ayşe Ege AKAR,

Dokuz Eylul University, Türkiye

Science Education International (SEI), the journal of the International Council of Associations for Science Education (ICASE), aims to improve science education globally. This study presents a bibliometric analysis of the journal's publication trends between 2020 and 2025. A total of 258 articles across 6 volumes and 24 issues were examined. Contributions from 658 authors representing 48 countries were analyzed by geographic origin and research topics. Results highlight that published article are mainly focused on teacher education, learning, and learning contexts. These findings guide researchers in identifying future underrepresented fields.

90 Attitudes Toward AI Instruments in Education Across Educational Levels: Pilot Results Using an Adapted CAS Scale

Aelita Bredelyte, Klaipeda University, Lithuania; Kristina Lekutiene, University of Ioannina, Greece; Klaipeda University, Lithuania; Vytis Radvila, Klaipeda University, Lithuania

Artificial intelligence (AI) instruments are increasingly used in education, yet attitudes toward them differ across pupils, students, teachers, and the wider society. These differences can influence how AI is adopted and integrated into learning and teaching.

In this talk, I will present results from a study examining attitudes toward AI instruments using an adapted multidimensional scale. I will highlight key differences between groups, showing how students tend to view AI more positively, while teachers express greater concern. I will also discuss how these contrasting perceptions can inform more effective and responsible integration of AI in education.

91 A framework for scientific argumentation based on enhanced Cognitive Acceleration through Science Education

Alex Black, Lets Think Forum Council, Switzerland

This paper examines how the five pillars of Cognitive Acceleration through Science Education (CASE) : concrete preparation, cognitive conflict, social construction, metacognition, and bridging, are a powerful organizing structure for scientific argumentation. It explores how the necessary cognitive and social processes are supported. Particularly when paired with explicit prediction as a learning strategy. The paper explores how CASE offers a theoretically coherent and empirically plausible architecture for argument-based learning. It will also explore how successful implementation requires overcoming significant challenges through a rigorous professional development programme. Teacher expertise, cultural equity, and the challenges of generalised skills transfer will be discussed.

92 Factors Influencing Scientific Researchers' Participation in Science Education from the Perspective of Ecosystem Theory in China

Junru Si, Institutes of Science and Development, Chinese Academy of Sciences, China

Science education serves as a vital foundation and key support for the comprehensive implementation of China's integrated development strategy for education, science and technology, and talent. The participation of researchers from national research institutions in science education holds far-reaching strategic significance for enhancing the public's overall scientific literacy and cultivating top-tier innovative talent.

In this presentation I will focus on researchers from the Chinese Academy of Sciences (CAS), explore the current status and challenges of their involvement in science education, and investigate their underlying motivational mechanisms.

93 Constructivist Toolbox Building for Post Grad Professionals: A Practice Oriented Ballistics Course at Finnish National Defence University

Totti Laitinen, National Defence University, Finland

This study evaluates a constructivist, phenomenon-based teaching model for postgraduate technology procurement professionals. Designed to replace abstract theory with a practical "toolbox," the course uses collaborative, conversational learning focused on real-world phenomena. By avoiding complex math and utilizing authentic datasets, the curriculum fosters causal reasoning and independent critical thinking. Diagnostic assessments customize the content, while formative exercises and continuous feedback ensure relevance. Results show uniformly positive Student Evaluations of Teaching, confirming that this approach successfully equips professionals with transferable concepts and enhances their ability to solve workplace challenges independently.

94 Enhancing Science Education through International Collaboration: A Novel Approach to Developing Advanced Computing Skills in International Undergraduates

Richard Harrison, University of Surrey, United Kingdom

This novel research project creatively addresses an international skills gap in training undergraduates to use High Throughput Computing (HTC) clusters. We integrate international collaboration and sustainability-driven infrastructure development, contributing to an advancement of project-based computing education. Our model offers highly accessible, authentic learning experiences for students in diverse global contexts with minimal overheads for the partnering institutions. Evaluation of the impact on students' skills development and employability is being captured through questionnaires. Views of academic colleagues are being captured in a similar fashion. My conference presentation will include details of the project and preliminary results from the evaluation.

95 Advancing Ocean Stewardship through Ocean Literacy: Evidence from Global Programmes

Francesca Santoro, UNESCO, Italy

Ocean Literacy (OL) initiatives aim to enhance public understanding of the Ocean and promote sustainable stewardship through education, capacity building, and stakeholder engagement. This study analyzes the theoretical foundations of OL initiatives, identifying inter- and transdisciplinary approaches, and community-engaged learning as core elements. While OL potential to promote behavioral change and sustainable Ocean stewardship is widely recognized, significant challenges persist in quantifying its impact and establishing links between awareness and action. Based on evidence from global OL programmes, including Save the wave, the Blue School Global Network, and Ocean Literacy With All, this research examines key factors contributing to their effectiveness.

96 Participation, Responsibility and Capability in Transnational STEM Collaboration

Dominic Mahon, University of Surrey, UK;
Richard Harrison, University of Surrey, UK, Muhibuddin Fadhli, Universitas Negeri Malang, Indonesia; Rochmat Aldy Purnomo, Universitas Tidar, Indonesia; Dan Catlin, University of Surrey, UK

This paper examines how structured participation in transnational STEM projects shapes students' capability development. Drawing on the Enhancing Science Education through International Collaboration (ESEIC) project linking universities in the UK, Indonesia and Kazakhstan, it introduces the Participatory Capability Development (PCD) framework. Students worked in international teams addressing sustainability challenges, including repurposing electronic waste into computing infrastructure and designing civic communication tools. Using surveys, focus groups and collaborative artefact analysis, preliminary findings suggest that structured interdependence can shift participation from task division toward shared decision-making and collaborative responsibility. The paper considers implications for designing authentic, internationally collaborative STEM education.

97 University Interventions in School-Level Science Education: A Theoretical Reconsideration of Motivation, with Some Practical Consequences

Daniel Barker, University of Edinburgh, United Kingdom; Stevie A. Bain, School of Molecular Biosciences, University of Glasgow

Public engagement (PE) with science may involve university staff designing and delivering events targeted at schools. We note limitations to many motivations for such PE, particularly the frequently-stated aim to increase science capital. We propose an alternative motivation: academics' PE with schools should aim to leave young people better placed to ask questions about their world. PE can connect students directly with real-world issues, empowering them to ask questions and recognise how their voices can shape the decisions and changes that influence society. We discuss practical implications, remaining problems and future directions.

98 Preparing Science Teachers to Leverage Local Environmental Systems for Equitable and Sustainable Science Learning

Lacey Fitts, Mississippi State University, United States

Science teacher training often overlooks local environmental contexts that can connect science learning to students' lived experiences and foster a sense of place. I will present a professional development model implemented in rural Mississippi that leverages local ecological assets through soil, water, and air quality investigations as meaningful contexts for science teaching and teacher education. Findings indicate increased teacher knowledge, instructional confidence, and student engagement when place-based investigations are used as authentic scientific phenomena. This transferable approach offers practical tools and adaptable frameworks for science teacher preparation in rural communities.

99 Bringing the Blue Bioeconomy to Libraries in Ireland

Nóirín Burke, Galway Atlantaquaria / Explorers Education Programme, Ireland

In 2025, a national library campaign was organised by the Marine Institute, during Bioeconomy Ireland Week, a collaborative initiative led by Ireland's Department of Agriculture, Food and Marine, supported by the Department of Climate, Energy, and the Environment, state agencies and other national stakeholders. As part of this initiative the Marine Institute Explorers Education Programme carried out school workshops in libraries around Ireland. Entitled 'Food for Future' the theme of Integrated Multi Trophic Aquaculture (IMTA) was brought to 195 children and 14 teachers, through a range of hands-on interactive activities. Feedback was collected through surveys and work samples.

100 Environmental Education Public Policies and Social Justice in Science Education Research: A Scope Review

Carolina Pontes Silva, Universidade de Brasília (UnB)/ Secretaria de Estado de Educação do Distrito Federal (SEEDF), Brazil
Paulo Gabriel F. dos Santos, Universidade de Brasília (UnB)

Considering the worldwide socioenvironmental crises and the inequalities between nations and peoples, environmental education (EE) might be a promoter of different dimensions of justice. Understanding trends and gaps in science education (SE) research on this matter indicates if they are compatible to SE's goals as a social science.

In this talk, I will present the preliminary results of a scope review based on PRISMA-ScR protocol. The search strategy included terms such as "environmental education", "public policies", "social justice". The analysis focuses on the race-gender-class triad as a category related to social justice when studying EE and SE public policies.

101 Institutionalizing Receita Simples: Implementing a Plain-Language Prescription Tool in the Federal District Health Secretariat (Brazil)

Estevao Cubas-Rolim, University of Brasília– Faculty of Medicine, Brazil

Plain-language prescription tools are increasingly relevant in Primary Health Care, especially for patients with chronic conditions, low health literacy, and visual impairments. However, communication about medication use is often complex and difficult to understand, which may affect adherence and patient safety.

In this talk, I will present Receita Simples, a visual prescription tool developed in Brazil and officially adopted by the Federal District Health Secretariat (SES-DF). I will discuss how enlarged fonts, pictograms, and colour-coded schedules were used to improve therapeutic communication and accessibility. I will also highlight the institutional implementation process and the potential of low-cost communication technologies to support safer and more inclusive healthcare systems.

102 Scientific Production and Organization of Educational Products in Escola de Pacientes DF: An Integrated Teaching–Service–Community Experience in Primary Health Care

Estevao Cubas-Rolim, University of Brasília – Faculty of Medicine, Brazil

Scientific production in Primary Health Care often depends on fragmented initiatives and short-term activities, making it difficult to sustain educational innovation and long-term community engagement. Organizing academic outputs and educational products systematically may strengthen teaching–service–community integration and improve continuity in health education projects.

In this talk, I will present the experience of Escola de Pacientes DF in organizing scientific production and educational products through collaboration between a federal university and PHC services in Brazil. I will discuss how structured workflows, digital platforms, and student participation supported research development, scientific dissemination, and competency building. I will also highlight the role of community-centered educational innovation in strengthening academic training and knowledge management in public health settings.

103 The 4273pi Bioinformatics Education Programme: History, Content and Lessons Learned

Laura C. E. Campbell, School of Biological Sciences, University of Edinburgh, Scotland

For the last decade, we have brought bioinformatics workshops to schools across Scotland. We outline the aims, history and content of the project. Feedback suggests that pupils appreciate independence and interactivity, insights into university and careers and the opportunity to explore topics in more depth. Teachers appreciate curriculum links and that the workshops allow their pupils to interact with experts. Despite difficulties highlighted in the literature, we find that bioinformatics has advantages in terms of low cost, engagement, potential links to a range of curriculum topics, interdisciplinarity, and relevance to biology as practised in academia and industry.

104 SimulaPacientes in Gemini: A Digital Patient Library for AI-Based Health Sciences Simulation in Google

Estevao Cubas-Rolim, University of Brasília – Faculty of Medicine, Brazil

Artificial intelligence is increasingly being explored in health sciences education, but many simulation activities remain limited by cost, access restrictions, and difficulties in creating scalable clinical training experiences. Digital patient simulations may offer flexible opportunities to strengthen clinical reasoning and communication skills in undergraduate education.

In this talk, I will present SimulaPacientes, a library of AI-generated digital patients developed in Google Gemini to support simulation-based learning in health sciences. I will discuss how structured prompts based on clinical guidelines were used to create interactive patient cases and how the project evolved from traditional paper-based simulations to scalable AI-supported educational tools. I will also highlight challenges related to feedback standardization, assessment, and governance of AI-generated simulations.

105 The Research PackTrack Program - A High Impact Program for Authentic Research Experiences

M. Ferzli, L. Paciulli, D. Thomas and P. Estes; North Carolina State University, United States

To increase research opportunities for first-year and transfer students who have difficulty gaining access to research labs, we designed the Research PackTrack Program, a two-semester, course-based undergraduate research experience (CURE). Students progress from guided to independent research that contributes to faculty-led initiatives. Reflection, critical thinking, and real-world application are core components. At the end of each semester, students present their findings at a departmental symposium. We measured self-efficacy, belonging, preparedness, and basic research skills using a mixed-methods, quasi-experimental comparison-group approach. Findings suggest that students form impactful bonds with peers and mentors, facilitating their preparation for careers in research and science.

106 Strengthening Science Communication in Course-Based Undergraduate Research Experience (CURE) Labs

Delaney Worthington, Colorado State University, United States

Course-based Undergraduate Research Experiences (CUREs) enhance STEM persistence, self-efficacy, and science identity while emphasizing discovery, iteration, and collaboration. However, science communication (SciComm) expectations and behaviours within CUREs remain underexplored. Using evidence-based SciComm frameworks and the Theory of Planned Behaviour, we developed a CURE-specific SciComm training in a synchronous format and piloted it with students (n=38) in four classrooms. Pre- and post-surveys revealed significant improvements in SciComm self-efficacy and intentions. We are preparing an asynchronous version of the CURE SciComm training that will be ready for deployment by September 2026. This work will ultimately help address SciComm training needs in CUREs.

107 How do Japanese Science Teachers Draw on and Develop their Pedagogical Content Knowledge? Focusing on the Design of Practical Work

Takuya Ochi, Faculty of Science and Technology, Seikei University, Japan

In Japan, school textbooks are authorised, however, not a few Japanese science teachers adapt practical work from these textbooks in their own unique ways. Such adaptation is assumed to be an outcome of their PCK. Hence, we addressed the following research questions: 1) How do Japanese science teachers design practical work based on the textbooks to meet their students' needs? 2) What can be understood about these efforts from the perspective of PCK? We conclude that Japanese science teachers draw on and develop their PCK through perusing and comparing different publishers' textbooks and gathering information from multiple resources and communities.

109 Driving Transformation through International Hubs: Putting University Social Responsibility and the SDGs into Action

Dominic Mahon, University of Surrey, UK

This paper examines how international university partnerships can operationalise University Social Responsibility through student-led, locally grounded SDG projects. Drawing on the Enhancing Science Education through International Collaboration (ESEIC) network, it analyses initiatives involving universities in Indonesia, the UK and Kazakhstan, including interdisciplinary work on nutrition, well-being and mathematics attainment, and GIS-based volcanic hazard mapping. Using case analysis, stakeholder feedback and early indicators of student development, the paper explores how international partnerships move SDG engagement beyond institutional rhetoric. Findings suggest that distributed leadership, interdisciplinary teamwork and visible community-facing outputs are key mechanisms for embedding social responsibility into everyday academic practice.

110 Research on the Identifying the Artificial Intelligence Literacy Levels of Pre-service Science Teachers

Bülent Çavaş, Beyza Mercan, Dokuz Eylul University, Türkiye

This study examines the Artificial Intelligence (AI) literacy levels of pre-service science teachers and identifies requirements for enhancing these competencies within teacher education. Using a quantitative survey design, data were collected from 341 third- and fourth-year students across seven universities in Türkiye. Findings indicate that participants perceive AI as supportive for lesson planning, individualized instruction, and feedback, while also enhancing motivation and self-directed learning. However, ethical concerns, including dependency and misuse, remain prominent. Overall, results highlight strong pedagogical orientation alongside critical ethical awareness, emphasizing the need for structured and ethically grounded AI literacy integration.

111 The Role of Practitioner Inquiry in Physics Teacher Professional Learning

Eilish McLoughlin, Dublin City University, Ireland

Practitioner inquiry (PI) is defined as the systematic, intentional study by educators of their own professional practices and has been strongly promoted as an essential feature of all teacher preparation programmes. The teachers were facilitated to complete a PI as part of their participation in a national upskilling physics programme in Ireland, with 120 in-service teachers completing their PIs during 2021-2025. An overview of the PI approach adopted and how teachers were supported to complete their PI as part of a professional learning community will be presented. The study highlights the key learnings and insights reported by physics teachers conducting a PI and discusses implications for the use of PI in both pre-service and in-service teacher professional learning.

112 Examining Concurrent Models of Pre-Service Physics Teacher Preparation in Slovakia and Ireland

Katarína Kozelková, Institute of Physics, Faculty of Science, Pavol Jozef Šafárik University in Košice, Slovakia

This study reports on an examination of the preparation of physics teachers in Ireland and Slovakia. Two physics teacher preparation programmes which are delivered as concurrent university programmes of four-five-year duration are examined. Both programmes focus on development of teacher's knowledge of physics, knowledge of pedagogy, and knowledge of how to teach physics and focus of the development of teacher knowledge and understanding. The design and structure of these two programmes is examined using Etkina's (2010) framework for preparation of physics teachers pedagogical content knowledge (PCK). Programme content and outcomes are discussed under five aspects of PCK.

114 Influence of STEM Internships on Teacher Professional Learning

Eilish McLoughlin, Dublin City University, Ireland

This study examines the influence of the STEM Teacher Internship (STInt) Programme, which provides primary and secondary teachers (pre-service and early career) with the opportunity to complete a 12-week paid internship in a STEM role in Ireland. 371 STEM internships have been completed by 327 teachers across 70 host organisations in Ireland between 2016-2025. This study will discuss the influence of the programme on teacher's conceptualisation of integrated STEM education. Teachers recognised increased confidence in advising students on STEM roles and careers and increased awareness and use of inclusive practices that support diversity and inclusion in STEM education and careers.

115 From Instructor to Peers: Help-Seeking Network Dynamics and Self-Efficacy in Physics Laboratories

Pablo De Ruyt, Department of Educational Sciences, University of Bío Bío, Chile.

Undergraduate physics labs rely heavily on collaboration, yet we often overlook the instructor's critical role in these social networks. This oversight limits our understanding of how students actually seek help. In this talk, I will illustrate the "Network dynamics" nature of advice-seeking, showing how students balance stable relationships with their instructors against more exploratory interactions with other peers. Finally, I will highlight how self-efficacy operates as a cognitive filter, driving students to selectively target highly consulted peers and the instructor rather than simply exploring across different groups where symmetrical centrality fosters stable ties and asymmetrical relationships dissolve.

117 Investigating Educators' Perceptions of the Impact of STEM Project-Based Learning on 21st Century Skills

Prof. Sufian A. Forawi and Sanaa Al-Timani, United Arab Emirates

This study investigated educators' perspectives on the impact of implementing STEM project-based learning (PBL) in fostering 21st-century skills within private American schools in Ajman, UAE. A mixed-methods approach was adopted, involving 116 science, mathematics, and ICT teachers from elementary, middle, and high school levels. Quantitative data were gathered from a questionnaire consisting of 18 items across five key dimensions, while qualitative insights were obtained through interviews with four teachers. The findings indicated positive perceptions across all five dimensions regarding the effectiveness of STEM PBL in enhancing students' 21st-

century skills. However, teachers reported several challenges, e.g., in managing curriculum demands and dealing with limited resources.

119 Designing Game-Based Learning Environments to Support Collaborative Skills Development in STEM Education

Kennedy Offor and Rola Saad, University of Sheffield, United Kingdom


Teamwork is a core engineering competency, yet engineering education often reduces collaboration to task completion rather than professional judgement and shared responsibility. This paper presents a reflective case study of a gamified workshop intervention implemented within postgraduate engineering programmes at the University of Sheffield. Designed as an educative rather than motivational intervention, the workshop used structured constraints, differentiated roles, and interdependent tasks to support collaborative reasoning and accountability. Analysis of observations, debrief discussions, and student reflections suggests that the intervention enhanced negotiation, articulation of reasoning, and awareness of collective responsibility. The paper argues that gamification can function as a pedagogical scaffold for developing authentic collaborative capacity in engineering education.

120 Randomized Experimental Study Finds No Evidence of Student Bias Against Queer University Instructors

Sara E. Brownell, Arizona State University, United States

Stigma against lesbian, gay, bisexual, transgender, and queer (LGBTQ+) individuals in academic biology dissuades university instructors from revealing their identities to undergraduates. We conducted a national randomized experimental study of 2230 university biology students in the U.S. to assess the impact of brief instructor LGBTQ+ disclosure. Participants were randomly assigned to watch one of two teaching demonstration videos and evaluate an instructor actor. The videos were identical except, in one version, the instructor revealed an LGB identity. Across all of the participants, the reveal condition yielded no evidence of bias and moderately improved evaluations of the LGBTQ+ instructor.

121 Does Choice Matter? Student Rationales for Selecting Exam-Only Versus Participation-Based Grading

Sara E. Brownell, Arizona State University, United States

Abstract: On average, university students learn more in active learning science courses that require significant participation from students. In an upper-level university biology course in the U.S., some students were resistant to active learning approaches. A third of the way through the course, students were presented with two grading options: (A) exams plus participation points, or (B) exams only. A minority of students (n = 14 out of 336) selected the exam-only option, citing reasons such as long commute times and limited ability to attend class. Students selecting exams plus participation cited valuing active learning, accountability support, and strategic grade optimization.

122 Using Self-Determination Theory to Develop and Assess Fail-Safe Science, a Video Repository to Promote Wellbeing Among Science PhD Students

Katelyn Cooper, Arizona State University, United States

Fail-Safe Science is a free, publicly available online repository of 50 short videos where successful scientists share a challenge they encountered during graduate school, how they coped, and advice they have for PhD students. An interview study of 55 PhD students found that the resource helps engender hopefulness related to achieving academic goals. Allowing students to choose a video based on a challenge relevant to them was important in cultivating wellbeing.

123 Challenges to Evolution as a Core Concept in College Biology: Silence on Religion and Conflicting Goals for Acceptance

Sara E. Brownell, Arizona State University, United States

American national recommendations have proposed that evolution be taught as a core concept in biology, but do university biology instructors teach it as such? We surveyed 217 U.S. university instructors. Most recognized evolution as a core concept but reported teaching at least one biology course where they did not mention evolution, suggesting they are not following recommendations to integrate core concepts. Instructors were split on whether a goal of evolution instruction was for acceptance or solely for understanding. Half of instructors reported they did not think a student fully accepted evolution if they thought a higher power created evolution.

126 Development and Evaluation of an Industry–Academia Collaborative STEAM Inquiry Model Addressing Societal Challenges in Secondary Education

Shio Kawagoe, The University of Tokyo, Japan

This study developed and evaluated an industry–academia collaborative STEAM inquiry model for secondary education to address real societal challenges. A three-day design-thinking workshop engaged high school students in problem identification, solution development, and iterative testing with mentorship from industry professionals and graduate students. Pre–post analysis showed significant improvements in problem-solving, communication, and research competency, with a large effect in the latter. The findings

suggest that structured, socially grounded inquiry enhances higher-order skills and offers a transferable framework for STEAM education.

127 Design of a Programme to Engage Young People with the Climate Crisis and its Impact on Their Agency

Stephen Gammell, Dublin City University, Ireland

The world is in the midst of a climate crisis. As put by the IPCC in March 2023: "The choices and actions implemented in this decade will have impacts now and for thousands of years". In this presentation I will describe the design of a cross-curricular programme for TY students, called ClimateTalk which promotes engagement with climate action and the development of participants' science and media literacy. Preliminary findings on the impact of the programme on participants will be discussed.

128 AI-assisted Bibliographical Study for Scientific Inquiry in Early Childhood Studies Worldwide

Yasemin Özdem Yılmaz, Muğla Sıtkı Koçman Üniversitesi, Türkiye

This review explores early childhood science inquiry from 2020-2026 using AI to include studies in multiple languages, offering a comprehensive, culturally diverse overview. It highlights regional differences: North American and European studies focus on structured inquiry and STEM, while Latin American and Asian research emphasize emotional engagement and cultural identity linked to inquiry. These findings show that children's curiosity is universal, but the methods to nurture it vary globally. Understanding these differences can help educators broaden their perspectives and develop more inclusive curricula, fostering a global, holistic approach to early childhood education.

129 Mapping Public Policies for Health Education and NCDs: Refining a Trilingual Search Strategy and Building an Evidence Agenda for Science Education (ICASE) from Escola de Pacientes DF (Brazil)

Estêvão Cubas-Rolim, University of Brasília – Faculty of Medicine, Brazil

Public policies related to health education and noncommunicable diseases (NCDs) are often discussed separately, making it difficult to identify how governance, regulation, and educational strategies interact in practice. Building integrated evidence frameworks may help connect science education, public health, and policy implementation.

In this talk, I will present the development of a trilingual search strategy for a Scoping Review focused on health education, NCDs, and public policies. I will discuss how descriptors in Portuguese, English, and Spanish were organized to map evidence on governance, equity, implementation, and health literacy. I will also highlight how the experience of Escola de Pacientes DF supports educational innovation and science communication in Primary Health Care settings.

130 Development of Immersive Virtual Reality for Chemistry Education

Janine Boertjes[1], Christopher Burke1, Anna Hogan[1], Edel Whelton[1], William Daly[1], Niamh O'Mahony[2], Frances Heaney[3], Carmel Breslin[3], Bernard Drumm[4], Ronan Bree[4], Brian Murphy[5], Aoife Morrin[6], Denise Rooney[3], Elizabeth Gilchrist[1] and Eric Moore[1]

[1]University College Cork, [2]Munster Technological University, [3]Maynooth University, [4]Dundalk Institute of Technology, [5]Technological University of the Shannon, [6]Dublin City University, Ireland

As part of the Virtual Labs Initiative, a suite of highly immersive and interactive virtual reality applications has been developed to address key gaps in chemistry students hands-on experience with advanced analytical instrumentation, which are often expensive and have limited physical access. Among these applications is a VR experiment focused on Capillary Zone Electrophoresis, a technique with which few incoming postgraduate students have prior experience. Thus, they can benefit from the additional experience VR offers to prepare them for their degree examinations and industry challenges. Two cohorts of postgraduate students were involved in the development of the VR experiment, and their feedback was captured through surveys. The final cohort was split into a VR group and a control group, the latter watching a 2D video covering the same information as the VR experiment. Although the control group performed better in a theory quiz, students in the VR group found practical tasks easier. The students self-reported confidence increased by the same amount for both groups and both groups gave positive feedback on their respective pre-lab interventions.

132 Learning Kinematic Graphs through Embodied Interaction: Design and Preliminary Results

Cecilia Stari, Facultad de Ingeniería, Universidad de la República, Uruguay

Kinematics, essential in physics education, presents persistent difficulties: confusion among position, displacement, velocity, and acceleration; misinterpretation of graphs; and failing to see slope as a rate of change. We designed a physical–computational video-game environment to improve understanding of kinematic graphs through embodied interaction. Learners reproduce a position–time or velocity–time target graph by bodily motion; an ultrasonic sensor records position and displays a real-time graph alongside the target, offering visual feedback and a similarity-based score. Evaluated with MEEGA+, the game showed strong engagement, usability, and perceived learning impact. Implemented with first-year engineering students, preliminary pre–post results are presented.

133 STEM Education and Its Practice as Perceived by Teachers in the UAE

Sufian Forawi, British University in Dubai, United Arab Emirates

This study aimed to explore the implementation of STEM education as perceived by K–12 teachers in the United Arab Emirates (UAE). A quantitative research design was adopted, utilizing a researcher-developed questionnaire comprising 30 items based on a five-point Likert scale. The instrument was administered to a sample of 137 teachers representing diverse demographic backgrounds. The findings indicated that teachers generally held positive perceptions regarding the importance of STEM education, including its key dimensions such as knowledge, resources, planning, collaboration, and teacher roles. Statistically significant results were observed across the overall STEM construct as well as all subcategories, highlighting a strong endorsement of STEM integration in educational practices and policy development.

134 Storytelling, Digital Innovation, and Ocean Literacy: The MuMa Model for Marine Education

Carolyn Berger and Carmelo Isgrò, MuMa Museo del Mare di Milazzo ETS, Italy

How can narrative-based learning and digital tools enhance Ocean Literacy and students' understanding of human impacts on marine environments? In this talk, we will present the MuMa Milazzo Sea Museum, an Italian non-profit organization, established in 2019. Fundamental for the museum's transition was the "Let's Digitize MuMa" initiative. MuMa offers an example of how museum-based learning can contribute to science and marine education through storytelling and digital innovation, with implications for curriculum transformations in Ocean literacy.

135 Developing a Physics Laboratory Towards Sustainable Energy Use: A Design-Based Collaboration Between Researchers and Practitioners

Sebastian Kilde-Westberg and Maria Åström, University of Gothenburg, Sweden

In this talk, we will present results from a design-based study in Sweden where upper-secondary school teachers, together with researchers, designed lab activities relying on the thermoelectric effect to teach about sustainable energy use. We focus on discussing differences that occur as teachers tailor lab instructions to their specific student groups, and analyse the students workflow and learning trajectories during the lab.

136 Enhancing Scientific Writing Skills Through Interactive Video Workshops

Michelle Morgan, University of Pittsburgh, Pennsylvania, USA

Developing scientific writing skills in undergraduate general chemistry laboratories prepares students for writing formal laboratory reports in advanced chemistry courses and research groups. This talk will focus on a multi-year project in the Honors general chemistry program at the University of Pittsburgh where six laboratory writing workshops were created and implemented for specific scientific writing topics. The topics include abstract writing, hypothesis formulation, data presentation, argument construction, writing style, and report structure. Workshops used guided and collaborative learning through interactive videos, worksheets, rubrics, and writing assignments. Assessment through surveys and lab report scores showed substantial improvement across all topics.

137 Reinforcing Critical Thinking in Validation Science through Gamification of Industry Scenarios

Eric Moore, University College Cork, Ireland

The increasing complexity of regulated manufacturing environments has amplified the need for innovative approaches to training and competency development in validation science. This paper explores the use of gamified, narrative-driven industry scenarios developed through Twine, an open-source interactive storytelling platform, to enhance engagement, decision making skills, and practical understanding of validation concepts. These interactive experiences allow learners to experiment within a low risk virtual environment while reinforcing critical thinking aligned with Good Manufacturing Practices (GMP). This gamification approach to industry scenarios was developed for students upskilling in the field of validation science as part of their continuous professional development.

139 Raising Awareness of Ocean Literacy and Plastic Pollution in Early Childhood Education Through Science–Art Engagement

Rita Melia, Nóirín Burke, Jacquelyn Dale (JD) Whitman, Caroline Fahy, and Mary Skillington, Atlantic Technological University, Ireland

This science /art project aimed to ignite Atlantic Technologic University's BA Early Childhood Education and Care students' interest in Ocean Literacy and explore how that interest could be shared with young children in early years settings preschools and crèches. The project is a collaboration between ATU, Galway Atlantaquaria, Galway Childcare Committee and The Arts Council Artist in residence JD Whitman. The project culminated in a three-day public engagement and educational event "Ocean Voices" designed to communicate marine science, Ocean Literacy, and to promote interdisciplinary collaboration between higher education, early years education, community groups, and the public.

140 Human-AI Collaboration in Climate Change Education: Examining Data Practices and Reasoning in Initial Teacher Education

Sarah Digan, University of Wollongong, Australia

We report preliminary findings from a mixed-methods pilot study in which secondary science initial teacher education students collaborated with GenAI to analyse authentic spatial and temporal climate projections. Students constructed arguments about projected habitat shifts for a locally endangered species under 2050 climate scenarios in New South Wales, Australia, with a focus on how AI mediated their data practices and scientific reasoning. Findings from chatbot transcripts, screencasts, and student artefacts contribute to emerging understanding of how GenAI shapes student engagement with complex scientific data in climate change education.

141 Non-formal Education, When Integrated with an International Sporting Event, Provides a Powerful Platform for Advancing Ocean Literacy and Advocating for Ocean Rights.

Lucy Hunt (Ireland), Rebecca White (Spain), and Clare Tiley (United Kingdom)

Integrating non-formal education with a global sporting event like The Ocean Race acts as a powerful catalyst for advancing Ocean Literacy and advocating for Ocean Rights. Marine biologist and The Ocean Race Impact Director Lucy Hunt has championed this exact approach. Her work demonstrates how the excitement of international sport can scale marine conservation education to millions of people globally.

142 Transdisciplinary Science Actions for Ocean Literacy

Lei Li, Min Wei, Shuangfang Hu (China); Baki Billah (Bangladesh); Ziyi Lin, Jingxuan Li, Xiaoshu Zhou, Yan Huang (China)

Global Ocean challenges such as nano- and microplastic pollution require educational responses that connect scientific research with public engagement and transdisciplinary learning. This presentation, based on Chapter 21 of Volume I of *Ocean Literacy: The Foundation for the Success of the Ocean Decade*, introduces the EPICD framework for integrating scientists into formal and non-formal science education. EPICD emphasizes public engagement, educator partnerships, interdisciplinary collaboration, communication training, and digital resource sharing. Drawing on examples from China, including outreach initiatives coordinated through the Alliance of International Science Organizations (ANSO) linking research institutes with schools, the presentation explores how scientists can become co-designers of science education and strengthen Ocean Literacy through international collaboration and practice-based approaches.

145 Reinventing an Interdisciplinary Marine Affairs Curriculum for the 21st Century

Susan Farady, University of New England, Maine, United States

As coastal and marine issues become more complex, so do the needs of those engaged in them, whether it be as an educator, a manger, a conservationist or other stakeholder. Traditional marine science curriculum does not often connect application of scientific knowledge to problem-solving application. In my talk, I will describe the development of an interdisciplinary undergraduate marine affairs curriculum, and student success after graduation.

147 From Instructor to Cognitive Partner: 20 Years of PAL Evolution in Chemistry

David J Otway, William Daly, Ian O'Connor, David Jones; School of Chemistry, University College Cork, Ireland.

This paper will discuss our PAL (peer assisted learning) system in the School of Chemistry at UCC that supports the cohorts of students who enter 3rd level without Leaving Cert Chemistry and find the step up to UG 1st Year Chemistry a struggle (we also invite the whole class to be inclusive - a good few students who have done LC do attend). The PAL system works by using 2nd - 4th year UG students who are taking one of the chemistry degree courses as Peer Leaders (teachers) in small cohorts (3-4 students per PAL Leader with support from an Academic, some PG students and Technical Officer help. Over the past few years, we have been collecting data from students who were PAL leaders and from those who attended the sessions (via Final Year project students and targeted questionnaires around retention) and are presenting our findings. This initiative aligns with local and national priorities for improving the transition to higher education. It benefits both the 1st year students (gaining in confidence, building a sense of community, peer learning and a chance to chat with their peers in a small setting) and the PAL leaders (development of communication, teaching and leadership skills - graduate attributes).

148 Students as Pedagogical Partners Project (from the POV of a Large Cohort UG Chemistry Module)

David J Otway, Bonnie Mullinix, Anna Santucci, Sharon Ultsch, Khaled Alwisi, Abigail Foley, Panos Karousos; School of Chemistry, University College Cork & CIRTL University College Cork, Ireland

This talk will discuss our Students as Pedagogical Partners (SaPP) project. Important points to note were the active engagement that staff brought to those large room classes (ca. 310 students), the use of lectures not just for content but lifelong learning skills (TEA/always someone to talk to - etc.) and public service announcements (PSAs). A re-examination of the work and ideas in AY25-26

was undertaken in collaboration with a final year project student recently to see whether things have changed/improved/ or maybe the posts have moved completely now with genAI. This initiative moves beyond traditional student representation to achieve meaningful, collaborative engagement and a two-way dialogue between staff and students in teaching and learning. From a larger POV this work is grounded in the principles of global citizenship education, fostering a sense of community, respect for rights and responsibilities, and the capacity for students to help shape their world.

149 Pre-service Science Teachers' Adaptive Pedagogical Reasoning in AI-Supported Lesson Planning: A Case with Chemical Equilibrium

Bongani Prince Ndlovu, University of KwaZulu-Natal, South Africa

Pre-service science teachers' pedagogical reasoning remains underdeveloped in resource-constrained contexts, yet generative AI tools increasingly feature in teacher education. This study examined how adapting AI-generated lesson plans influenced adaptive pedagogical reasoning among pre-service science teachers planning to teach chemical equilibrium. Grounded in the Refined Consensus Model of PCK, the findings indicated that AI support enhanced reasoning about student thinking, instructional justification, and goal alignment. However, adaptivity in lesson design remained constrained. In this presentation, I will argue that generative AI, whilst beneficial, is limited in fostering the situated decision-making that characterises adaptive expert teaching, carrying implications for science teacher education.

150 Investigating Ocean Literacy Levels of Pre-Service Science and Social Studies Teachers in Türkiye: The Influence of Gender, Ocean Experience, and Environmental Activities

Bülent Çavaş, Şermin Açık, Simge Koç, and Mısra Kolaç
Dokuz Eylül University, Türkiye

Ocean Literacy is a key element of environmental education and refers to understanding how the Ocean shapes human life and how human actions affect the Ocean. This study investigates Ocean Literacy among 100 pre-service science and social studies teachers in İzmir, Türkiye, examining gender, prior Ocean-related experiences, and participation in environmental activities. Data were collected through a questionnaire administered to 3rd and 4th year pre-service teachers. Findings showed statistically meaningful differences in two survey items, with female participants demonstrating greater awareness and comprehension. Ocean experiences and participation in environmental activities were also associated with higher Ocean Literacy levels, highlighting the need for strengthened Ocean education in teacher preparation.

151 Advancing Seagrass Literacy across Europe

Dominika Wojcieszek and Evy Copejans (Belgium), Theodurus Democritos (Greece); European Marine Science Educators Association

Seagrass ecosystems are critical for coastal protection, biodiversity, and climate regulation, yet they remain largely absent from European primary education curricula. The Erasmus+ project SEAQUEST addresses this gap by developing a technology-enhanced educational approach to strengthen seagrass literacy in primary education.

This talk presents SEAQUEST's practice-oriented outcomes, grounded in a comparative analysis of curriculum frameworks, educational policies, and teaching practices across partner countries. Based on these findings, SEAQUEST developed a research-informed curriculum framework, a comprehensive teacher handbook, an educational digital game, and a Massive Open Online Course. These resources equip primary educators to integrate seagrass literacy into their classrooms.

152 Marine Sciences Curriculum: An Introduction in South African Mainstream Teaching Programme

Russell Stevens, Ocean Literacy, South Africa

Increased challenges for the state of Planet Ocean indicates a dire need for introducing Ocean awareness education into the formal school landscape.

This paper describes the process of implementing Marine Sciences as a formal subject in the South African Schooling system. The content topics within four strands are displayed and cognitive levels described.

153 Community-Based Continuity as a Driver of Ocean Education in Japan

Sachiko Oguma, Ocean Policy Research Institute, Sasakawa Peace Foundation, Japan

At the international level, the UN Ocean Decade (2021–2030) highlights Capacity Development (Challenge 9) and Ocean Literacy (Challenge 10) as priorities. For Japan, this urgency is reinforced by the absence of an institutional framework that defines Ocean education or Ocean Literacy education, leaving initiatives reliant on voluntary local efforts.

In this presentation, I will introduce initiatives of local governments which demonstrate conditions under which Ocean education can endure. In coastal areas, urgency linked to community sustainability embeds learning in social practice, demanding both national institutionalization and community-based mechanisms.

154 Promoting Ocean Literacy Through the ScienceOnShore (SOS) Program in Elementary Schools

Thomas Greene and Blanca Ching, Kingsborough Community College, New York, United States

Kingsborough Community College, located along the shore in Brooklyn, NY, opened its doors to the vast number of public elementary schools that lack a science laboratory. This educational initiative was inspired and motivated by the Ocean Literacy Movement which seeks to support the inclusion of an in-person, hands-on, inquiry - based marine science curriculum into educational institutional, both locally and globally.

This ScienceOnShore (SOS) program, which combines out - door real world exploration with in-door lab activities, will be shared with attendees at our Lightening Talk.

155 Application and Development of an Aquaponics STEAM Program to Enhance Ocean Literacy in Tsunami-Affected Areas

Tsuyoshi Sasaki, Tokyo University of Marine Science and Technology, Japan

An aquaponics STEAM program, which cultivates plants and fish within a sustainable circular model, aimed to enhance OL by fostering relational values and scientific inquiry skills.

This study demonstrated improved scientific inquiry skills and a clearer understanding of relational values. Aquaponics activities were found to be an effective educational program for developing abilities aligned not only with the OL framework but also with the educational goals of the school curriculum. As a future development, we are evaluating its effectiveness as a tool for regional revitalization through interdisciplinary collaboration in tsunami-affected areas experiencing significant population decline due to the Great East Japan Earthquake.

156 Cultivating Ocean Guardians: Evaluating a Novel Pedagogical Model for Enhanced Ocean Citizenship in Basic Education

Caroline Schio and Pedro Reis, Institute of Education, University of Lisbon, Portugal

This presentation introduces a pedagogical model developed within a PhD in Science Education to foster Ocean citizenship in basic education. The model integrates Ocean Literacy, systems thinking, and citizen science through hands-on, data-driven learning experiences. Implemented in schools, it engages students in environmental monitoring and real-world problem solving. Findings show increased student engagement, critical thinking, and environmental awareness. The study offers a practical framework to support the integration of Ocean Literacy into formal education and promote active, informed citizenship

157 Embedding Researchers in Marine Science Education: Ocean Literacy, Living Labs, and the Role of ICoRSA in the EU Funded PHAROS Project

Rosarii Griffin (Ireland), Giovanna Avellis (Italy), Gordon Dalton (Spain), Erna Karalija (Bosnia and Herzegovina), Dannie O'Brien (Ireland), and Silvia Vilches (Alabama, United States)

'PHAROS' is an European Horizon project supporting the EU Mission to 'restore Oceans and waters' by 2030. PHAROS promotes Ocean Literacy through ecosystem restoration, innovation, and stakeholder engagement. This paper examines ICORSA's role in embedding Researchers in Marine Science Education. Through 'Living Labs' in Gran Canaria (Spain), Ireland, and Iceland, researchers work with educators, Policymakers, and communities to co-create place-based learning. Acting as educators and communicators, PHAROS helps strengthen knowledge exchange and transdisciplinary collaboration by building Ocean Literacy and enhancing educational relevance, which help advance the goals of the Ocean Decade.

158 How Multimodality Opens Doors for Underserved Youth in STEM

Susan Rowe, Think WISE Studio, Oregon, United States

Drawing on the chapter *Multimodal Ocean Literacy for the Ocean Decade* in the three-volume series *Ocean Literacy: The Foundation for the Success of the Ocean Decade* and on my own trajectory as a scientist, educator, and administrator working to expand STEM access, I argue that visual, embodied, narrative, digital, and culturally-grounded multimodality transforms who can participate in marine science. Narrow norms in academic STEM shape identity, belonging, and pathways; multimodal approaches counter these constraints by validating diverse epistemologies and enabling cross disciplinary, community rooted engagement with Ocean systems. These approaches strengthen conceptual understanding, shift institutional practices toward more inclusive, equity centered models of STEM learning, and serve as a catalyst for systems level change in STEM education.

159 Shaping the Future of Science and Society through Ocean Literacy

Dina Eparkhina, EuroGOOS, Belgium

As environmental challenges intensify, Ocean Literacy is evolving from awareness-raising into a strategic bridge between science and society, centred on dialogue, co-creation, and engagement. This talk highlights European leadership through the EU4Ocean Coalition and the UN Ocean Decade project "Scientists for Ocean Literacy", demonstrating how inclusive participation, partnerships, and cross-sector collaboration strengthen Ocean knowledge, science-policy uptake, and societal stewardship, supporting the Ocean Decade vision of restoring society's relationship with the Ocean.

160 A teaching proposal using the flipped classroom approach and semiotic analysis to understand Boyle's Law

Rubén Sánchez Sánchez, Instituto Politécnico Nacional, Mexico

In education, students often encounter various challenges in their learning process. For example, when trying to learn the ideal gas law, students may be confused by the meaning of various technical terms such as pressure, volume, and temperature. To address this, they can be offered a hands-on experiment with a sample gas and a device that reproduces the physical phenomenon. However, schools often lack sufficient laboratory equipment for students to analyze the phenomenon in real time. Therefore, this pedagogical proposal uses a simulation, employing Francisco Esquembre's EasyJava educational software, which facilitates the graphical reproduction of the phenomenon; for example, Boyle's law can be simulated with this free software, and by employing the flipped classroom methodology, along with the use of semiotic records, a learning environment is fostered where the student can actively participate in their own learning process. While the flipped classroom can shift instruction outside the classroom (using videos and readings), it also allows for the use of in-person time to carry out practical activities. By planning activities that combine simulation with appropriate semiotic cues, and by explaining the learning activity to the student, we can create a more enjoyable and engaging experience for the student.

In this paper, we clearly describe how to synchronize these ideas to develop a sound teaching methodology for physics students, and in particular to address the topic of ideal gases.

162 Exploring Soil Animals Diversity through Microscope: Students' Interaction and Learning Experience

Ismi Rakhmawati, Universität Innsbruck, Austria

Soil animals play important roles in ecosystem functioning, but school science often overlooks this topic. In this study, students used microscopes to observe soil animals collected from a worm box and school garden. Students identified soil animals using a dichotomous key presented as a treasure map. The study aims to understand how do students interact with soil animals and how do they experience scientific observations of soil animals through microscopes during their practical work?

163 STEAM Learning for Well-Being in Young Children: A Case Study of Food Allergy Education

Manabu Sumida and Norika Shinozaki, Ehime University, Japan

The prevalence of food allergies in children has increased considerably in recent years, and managing these allergies has become a vital challenge for schools. However, educational opportunities that enable young children to understand food allergies, make informed judgements, and take appropriate action remain limited.

This study developed and piloted a one-hour online STEAM programme on food allergy education for six children from kindergarten to Grade 2. Activities included an allergy quiz, a home-based search for allergenic foods and ingredients, a video on allergic reactions, and a four-panel comic-strip task. The results suggest that young children can engage meaningfully with scientific content and everyday decision-making.

164 Ocean Literacy in the United States

Tami Lunsford, National Marine Educators Association (NMEA) and Newark Charter School, Delaware, United States

In a nation with a highly decentralized education system where standards vary widely across states, advancing Ocean Literacy in the United States requires coordination and creativity. As a professional network, the National Marine Educators Association (NMEA) and our partners have been at the forefront of this work. Participants will gain insight into how Ocean Literacy is implemented across diverse educational contexts including highly successful initiatives and UN Decade-endorsed projects such as "Ocean Literacy With USA Blue Schools" and "A US Ocean and Great Lakes Literacy Strategy", while also addressing persistent challenges and opportunities for innovation.

165 A Design Framework for Developing a Generative AI-Integrated Learning Environment for Older Adults in a Science Museum

Cheerawan Sumritdee, National Science Museum Thailand and Faculty of Education Khon Kaen University, Thailand

This study proposes a design framework for a generative AI-integrated learning environment in science museums to promote critical thinking for health literacy among older adults. Science museums have strong potential to support lifelong learning for aging populations; however, limited research has explored the integration of generative AI in museum-based learning for older adults. Using the Design and Development Research approach by Richey and Klein, the findings revealed a framework consisting of six key components supporting constructivist and AI-enhanced learning. The study contributes a conceptual foundation for inclusive informal learning environments and future science museum education for aging societies.

166 An Investigation of ICASE Member Service

Baohui Zhang and Xin Wang; Shaanxi Normal University, China

This presentation examines member engagement and service within the International Council of Associations for Science Education (ICASE). Drawing on document analysis, surveys, interviews, and comparisons with similar international organizations, the study explores how current, past, and potential members perceive ICASE and identifies opportunities to strengthen participation and communication.

Preliminary findings related to member needs, organizational visibility, and future directions for membership development will be discussed. The presentation also highlights how the results may contribute to future strategic planning and support the continued growth and international impact of ICASE.

167 ICASE Membership Committee Round-Table Session

Baohui Zhang, Shaanxi Normal University, China

This interactive round-table session provides an opportunity for conference participants, ICASE leadership, and representatives from member organizations to discuss the future of membership engagement within ICASE. Building on themes introduced in the related presentation, *An Investigation of ICASE Member Service*, the session encourages open dialogue about member experiences, expectations, communication, recruitment, and organizational growth. Participants will be invited to share perspectives and recommendations that may help strengthen collaboration, expand participation, and support the continued development and international influence of ICASE.

168 A SciArt Approach to Continuous Assessment in Plant Pathology

Eoin Lettice, University College Cork, Ireland; Julie Forrester and Emma Klemencic, Crawford Art Gallery, Cork, Ireland

The growing interaction between art and science (SciArt) can be useful for teaching, research and public engagement. It represents an opportunity for artists and scientists to collaborate but also encourages scientists to adopt artistic practices that can contribute to their work and vice versa. It is important that science students have an opportunity to integrate art into their study, research and assessment. Final-year students taking an undergraduate plant pathology course were each asked to create an artwork to address a topic of their choice from the course. The outcomes of student feedback were subject to thematic analysis and are presented along with examples of student artworks.

169 SmartRoots: A Co-Creation Approach to Sustainable Agri-Tech and AI Education

Dr. Barbara Doyle Prestwich, School of Biological Earth and Environmental Science, UCC, Ireland; Dr. Matteo Menolotto, Tyndall National Institute, Cork, Ireland

SmartRoots is a public engagement initiative funded by Research Ireland that explores how emerging agri-technologies, including artificial intelligence (AI), can support sustainability education. The study investigates how hands-on learning with vertical aeroponic urban farms, sensor technologies, and embedded AI can enhance engagement with science and technology among diverse learners. It also examines how co-creation with educators can inform inclusive STEM learning resources.

Using a mixed-methods, design-based research approach, the project engages students, teachers, and community members through workshops in schools, community centres, and public events. Data collection includes surveys, observations, focus groups, and educator feedback sessions, with qualitative and quantitative analyses used to assess learning outcomes and attitudes toward STEM and sustainability.

Preliminary findings suggest increased learner engagement, improved understanding of sustainability concepts, and strong interest in AI and sensor technologies in food systems, highlighting SmartRoots' potential to support inclusive, sustainability-focused STEM education.

170 Story Maps as a Tool for Marine Spatial Planning Education/Engagement

Mairéad Sullivan, Marine Institute, Ireland

Our seas are experiencing increasing pressure from human activities, which can impact marine ecosystems and the benefits they provide. Marine Spatial Planning (MSP) aims to balance the diverse and competing usages of the sea in order to plan for the future.

Communicating MSP decisions to public audiences and in particular to school children can be difficult. In this talk I will explain how we have been using Story Maps to translate complex datasets into accessible narratives, supporting understanding and engagement.

171 From Repository to Classroom: Transforming Multidisciplinary Ocean Data into Curriculum-Ready Resources with BCO-DMO

Adam Shepherd, Dana Gerlach, Danie Kinkade, Audrey Mickle, Sawyer Newman, Shannon Rauch, Karen Soenen, and Amber York

Biological and Chemical Oceanography Data Management Office, Woods Hole Oceanographic Institution, Massachusetts, United States

Access to real-world Ocean data can strengthen science education and data literacy, but such datasets are often complex and not readily usable in classrooms. Educators face challenges in finding, preparing, and integrating these resources. Data repositories like the Biological and Chemical Oceanography Data Management Office (BCO-DMO) help bridge this gap by providing curated, FAIR datasets. We present a framework that pairs these data with guided examples, preserving authenticity while reducing barriers, enabling educators to more easily incorporate real oceanographic data into teaching.

172 Learning in a living collection: the university arboretum as a pedagogical resource

Eoin Lettice and Barbara Doyle Prestwich, University College Cork, Ireland

Living collections, including arboreta (a collections of trees) provide valuable opportunities to engage students and the public in diverse ways. The UCC arboretum consists of over 2,500 trees and approximately 130 different tree species. It is accredited by ArbNet and remains the only Level II accredited arboretum in Ireland. It is co-located with the university where it serves as a teaching and learning resource for STEM and non-STEM students alike. This study presents the work of the UCC Arboretum Research Group as a case study for re-connecting an historic collection with the academic life of the institution through teaching, research and public engagement.

174 From Components to Systems: Pre-Instruction Conceptions of Material Science Tetrahedron

Jacqueline Rose M. Gutierrez, Benny Mart, R. Hiwatig, and Michael Siemens P. Uy; University of the Philippines National Institute for Science and Mathematics Education Development

Materials science is grounded in processing–structure–properties–performance (PSPP) relationships, yet students enter instruction with varying ways of organizing and interpreting these interconnected concepts. This session presents findings from a qualitative study examining how Grade 12 students conceptualize PSPP at both component and system levels prior to formal instruction. Drawing from students' definitions, diagrams, and written explanations, we highlight patterns in how learners represent relationships among PSPP components, including emerging connections and difficulties in expressing causal relationships.

175 Postgraduate Program Proposal on STEM Education for Teachers in Latin America

César Mora, Instituto Politécnico Nacional, Mexico

We present a proposal for an online postgraduate program in STEM Education, with the objective of training high-level specialists who, through educational research, will promote the application of the STEM model in Latin America. This project also includes designing and delivering STEM training courses for primary school teachers, developing community STEM laboratories in face-to-face, online, and remote formats, and promoting STEM Fairs to develop STEM skills in primary and secondary school students. We present our progress, the structure of the master's and doctoral programs, and the first experimental prototypes of remote STEM laboratories developed in Costa Rica.

176 Communicating the Ocean

Orla Doherty, BBC Studios Natural History Unit, United Kingdom

Orla Doherty, producer with the BBC Studios Natural History Unit and producer of ***The Deep and Our Blue Planet*** from ***Blue Planet II***, will connect from her current filming location to explore the role of storytelling in connecting marine science with global audiences. Drawing on her experience collaborating with scientists and Ocean explorers, Doherty reflects on the process of transforming complex scientific research into compelling narratives that inspire curiosity, understanding, and public engagement. Through immersive visual storytelling, her work demonstrates how media can bridge the gap between frontline marine research and society, helping audiences better understand the Ocean and humanity's relationship with it.

177 Future Directions for Ocean Literacy

Jan Seys, Flanders Marine Institute (VLIZ) and member of the UNESCO IOC Group of Experts on Ocean Literacy, Belgium

Some twenty-five years after the emergence of the Ocean Literacy concept and movement, it may be appropriate to take a cautious look at what has been achieved so far. I also want to use this closing keynote for the Marine Science Education Strand to fire a shot across the bow and suggest possible future directions for Ocean Literacy. Without a crystal ball, these are more like signposts. On the other hand, it is never too early—now that we are past the halfway point of the UN Ocean Decade—to look one step further to what lies ahead.

178 Sea Synergy: Connecting Community to the Ocean through Active Learning and Citizen Science

Lucy Hunt, Founder Sea Synergy Marine Awareness, Research & Activity Centre, Ireland

Sea Synergy specializes in translating marine science into engaging, multi-generational active learning environments.

The Explorers Education Programme: In partnership with the Marine Institute, the centre activates Ocean education in Kerrys's primary schools, introducing kids to Ireland marine life, bringing students to the seashore and bringing mini-aquariums directly into local Irish classrooms, tasking school children with caring for rock-pool animals like starfish and crabs.

Marine Creature Feature travelling exhibitions: The centre hosts interactive sea life displays, heritage presentations and workshops showcasing the immense biodiversity of Ireland's Atlantic waters

Seashore Safaris and Eco tours: Marine biologist Guided field modules lead children and adults onto rocky shorelines for hands-on species identification, beachcombing, and interactive games centered around marine litter awareness.

Citizen science: Through the Sea Synergy Oyster project local community learn marine species identification and biodiversity reporting skills, building pride of place and become local environmental stewards.

179 K–16 STEM Pipeline University STEM Lab Schools

Michael Odell, University of Texas at Tyler / Texas STEM Coalition, United States

This paper examines the University Academy model as a coherent K–16 STEM pipeline designed to address fragmentation in traditional education systems. As an open-enrolment public university lab school, the model aligns curriculum, instruction, and assessment with clear expectations for STEM readiness, including calculus preparation and dual credit attainment. Grounded in improvement science and continuous PDSA cycles, University Academies integrate project-based learning, high-fidelity STEM pathways, and partnerships with higher education. Evidence from implementation suggests strong academic outcomes and high rates of STEM major entry. The model offers a scalable approach for strengthening STEM pipelines and improving college and career readiness across diverse contexts.

180 From Design to Practice: Lessons from Implementing a Family Engagement Model in Early Childhood Science Education

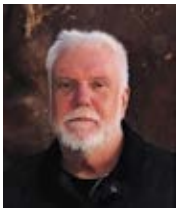
Kadir Demir, Georgia State University, Georgia, United States; Deniz Peker, Columbus State University, Georgia, United States

This study examined how a family engagement model extended inquiry-based science learning beyond early childhood classrooms. Using home-based science activities, family science packs, and collaborative events, the research explored how families supported children's curiosity and evidence-based reasoning. Findings showed increased student enthusiasm and stronger family involvement in science learning. However, challenges included declining participation, teacher workload, and logistical demands. The study highlights the importance of low-cost materials, clear caregiver roles, and alignment with classroom instruction to support sustainable and meaningful home–school science connections.

181 Crossing the ZPD in early years STEM education

Andrew Carroll, Brunel University London, UK

K–16 STEM Pipeline: University STEM Lab Schools



As a 'first' garrison school (nursery to Y4), serving the families of non- commissioned soldiers from the British Army, Alexander First School is a unique community.

Grounded in enactivism, academics alongside practitioners at the school followed enactive interactions of children across a number of classes.

Data comprises observations, video recordings, photographs and teacher interviews and the analysis is geared principally toward highlighting the children's meaning-making through their interactions and relationships within a particular environmental and material context, where this refers not just to the thoughts and actions of others but also to the physical – and imaginative – circumstances.

182 The Evolving Role of Gamification in Online Curriculum Planning

Wafaa Abdelrahim Metwally Ali Elsawah, The British University in Dubai, United Arab Emirates

This systematic review investigates the evolving role of gamification in online curriculum planning by analyzing 50 peer-reviewed studies published between 2019 and 2025. Drawing on theoretical frameworks including Gamification Theory (Deterding et al., 2011), Marsh's Curriculum Innovation Model (2009), and Grundy's Curriculum as Praxis (1987), the paper examines how digital platforms such as Kahoot, Mentimeter, and Quizizz influence curriculum design, delivery, and reflection. Thematic analysis reveals that gamification, when meaningfully embedded, functions as a strategic component in curriculum innovation, supporting adaptive learning pathways, real-time feedback loops, and learner agency.

183 The Ocean Decade and Ocean Literacy

Vladimir E. Ryabinin, Russia

In this featured video address, Dr. Vladimir E. Ryabinin, former Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, reflects on the role of Ocean Literacy in advancing the goals of the United Nations Decade of Ocean Science for Sustainable Development. Drawing on themes

from his foreword to Volume I of *Ocean Literacy: The Foundation for the Success of the Ocean Decade*, he emphasizes the urgent need to transform society's relationship with the Ocean through education, ethics, and intergenerational learning. Ryabinin highlights Ocean Literacy as a lifelong process that begins in early childhood and extends across all sectors of society and decision-making.

184 The UN Ocean Decade Programme for Early Career Ocean Professionals

Evgeniia Kostianaia, Russia

This featured video presentation highlights how the UN Ocean Decade Programme for Early Career Ocean Professionals (ECOP Programme) supports ECOPs through networking, training, professional development, funding opportunities, and international knowledge exchange. The presentation explores how the United Nations Decade of Ocean Science for Sustainable Development creates opportunities for young professionals to strengthen skills, contribute to Ocean science and Ocean Literacy, and engage in global collaboration. Emphasis is placed on capacity development, inclusive participation, and cooperation across sectors and regions, demonstrating how ECOPs contribute to innovation, communication, and long-term sustainability efforts throughout the Ocean Decade.

185 Blue Curriculum for Blue Skills

Ana Vitória Tereza de Magalhães, Portugal

This featured video presentation explores how Ocean Literacy is often isolated within education, making it difficult to connect marine ecosystems with economic systems and emerging career pathways. The presentation examines how this separation can limit the development of "Blue Skills" needed in a rapidly changing landscape shaped by climate change, technological innovation, and evolving workforce demands. Emphasis is placed on the importance of an integrated Blue Curriculum that aligns Ocean knowledge with innovation, sustainability, and industry perspectives. Through practical examples, the presentation illustrates how bringing the Ocean into the curriculum can help prepare an adaptable workforce ready to contribute to a resilient and sustainable blue future.

186 Delivery of the Marine Institute Explorers Education Programme in Cork through the Old Cork Waterworks

Shazia Waheed,
Lifetime Lab, Cork, Ireland

This year the Marine Institute's Explorers Education Programme celebrates two decades in action. What began as a 10-school pilot in Galway in 2006 has evolved into an exemplar in marine education, now reaching over 400 primary schools annually. In Cork, the outreach programme is delivered by Old Cork Waterworks, who have been part of the Explorers Outreach Team since 2011. Over the last 15 years the centre has engaged with thousands of primary school children, their teachers and schools, through a range of marine workshops and school projects. This presentation will showcase some of the incredible projects that have been carried out over that time and the feedback and learning we have received from teachers.

187 Living Laboratories: Zoos and Aquariums as Partners in Science Education

Aileen Tennant, Europe & Middle East Regional Representative, International Zoo Educators Association and Director of Fota Wildlife Park, Cork, Ireland

Beyond its work with endangered species, Fota Wildlife Park is a key player in conservation education. It is one of Ireland's largest outdoor education providers, welcoming over 18,000 students each year from primary, secondary, and higher education levels. The Park's Education Department has been consistently awarded the prestigious Sandford Award for Heritage Education, a distinction held by only three institutions in Ireland.

Nestled within the stunning surroundings of the 100-acre Park, the Education, Conservation, and Research Centre (ECRC) opened in 2024 as the base for the Education Department. Co-funded by the Office of Public Works, the ECRC is designed with sustainability at its core, featuring recycled materials, passive design, rainwater harvesting systems, and biodiversity enhancements. It also serves as a unique venue for conferences, meetings, and events—a space where corporate engagement meets conservation, education, and research. The ECRC continues to build Fota Wildlife Park's reputation as a leading venue connecting conservation science education with community engagement.

188 Bringing Coastal Ecosystems to an Inland Classroom: The Virtual Field in an Online Oceanography and Meteorology Course

Teresa J. Kennedy, University of Texas at Tyler, United States

This presentation describes the integration of The Virtual Field (TVF) into an online undergraduate Oceanography and Meteorology course at an inland university. Through Ecosystem Exploration activities, students investigated coastal habitats including estuaries, tidal marshes, rocky intertidal zones, and seagrass meadows while applying concepts from the Ecological Society of America's Four-Dimensional Ecology Education (4DEE) Framework. Student feedback indicated positive perceptions of the virtual field experience, highlighting its value for expanding access to authentic field-based learning, strengthening understanding of human–environment interactions, and connecting ecological concepts to real-world environmental challenges.

189 How to make Science lessons more meaningful, effective and interesting

Janchai Yingprayoon, Prince of Songkla University, Suratthani Campus, Suratthani, Thailand

Most students enjoy playing with toys, manipulative materials and magic. Appropriate recreational items can be found to stimulate intellectual curiosity, to develop problem solving and thinking skills, to promote discovery as well as to unleash creativity. The workshop will show how to make Science lessons more meaningful, effective and interesting, how to cultivate intrinsic motivation for learning science, and how to develop thinking abilities, problem- solving skills and creativity. This workshop is highly interactive with lots of toys and hands-on activities using locally produced low-cost high-tech materials.

190 The training of science teachers in University College Cork

Ryan Gallagher, School of Education, University College Cork.

The Bachelor of Science Education (BEdSc) programme at University College Cork is a four-year concurrent teacher education degree that integrates the study of science and education from the beginning of the programme. Unlike the consecutive model, in which students complete a science degree followed by a separate teaching qualification, students on the BEdSc develop expertise in two specialist science subjects while simultaneously studying science education. The programme includes extensive school placement experiences and professional preparation through the Eureka Centre. Since its establishment in 2000, the programme has made a significant contribution to the preparation of science teachers in Ireland.

191 Ten Practical Science Demonstrations

Rory Geoghegan, ISTA, Dublin

The practical demonstrations in this session all address fundamental concepts that are often misunderstood and indeed often incorrectly 'explained' in textbooks.

- Density of air and atmospheric pressure
- Modelling the height of the atmosphere
- Archimedes' Principle
- Centripetal force
- The scale of the Solar System
- Filters and subtractive colours
- Capillarity and surface ttension
- Real and virtual reflections
- Mirror images and 'true reflections'
- How to project a solar eclipse

192 The Virtual Field

Angie Patterson, Chris Mead, Sara Kassis, and Itchung Cheung

Field-based learning is critical for teaching scientific inquiry, yet financial, geographic, and logistical barriers often exclude diverse and marginalized student populations. *The Virtual Field* (thevirtualfield.org), a project of the Organization of Biological Field Stations supported by the National Science Foundation, offers an innovative solution to broaden access to these vital experiences. The platform connects classrooms to ecosystems worldwide by providing educators with free, peer-reviewed, inquiry-based educational tools. Through short ecosystem videos, 360-degree seasonal tours, and live interactions with global scientists, teachers can seamlessly integrate field research into their curricula, fostering eco-literacy and preparing a diverse generation for STEM careers.

Notes

Thanks to all our exhibitors and advertisers

- Educate.ie
- ESERO IRELAND
- Exam revision
- ExamCraft Group
- Gill Education
- Irish Ocean Literacy Network
- LeavinCertPlus
- Lennox Educational
- LN Education Group
- Sam Dennigan & Co
- Science on stage
- Spiring Enterprises Ltd.
- ABE
- CJ Fallon
- CLEAPPS
- Edco
- Folens
- IOP
- ISTA
- Mini One
- RSC
- Scifest
- SEFS UCC
- Stripe
- TUI

UCC Campus Map