National Centre for STEM Education

NEWSLETTER
Spring 2020

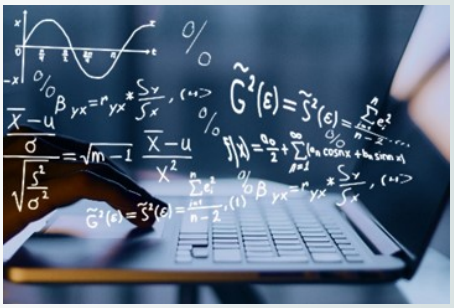
HEA fund research impact case study of the PDMT
Building Teacher Knowledge for quality mathematics education in Ireland

EPI• STEM has achieved national recognition for research impact arising from our delivery of the Professional Diploma in Mathematics for Teachers (PDMT). The Higher Education Authority has announced the award of €350,000 in performance funding to EPI•STEM, based on a review of Research Impact Assessment Case Studies submitted by all higher education institutions in Ireland. UL submitted two case studies, with 39 submitted nationally. Only 16 were recommended for performance funding from the HEA, including EPI•STEM's for the PDMT – the only UL case study to be funded. For more details see https://hea.ie/assets/uploads/2017/04/Performance-Funding-Allocations-2019.pdf

The funding will be used over the next two years to support the continuation of EPI•STEM, building on the Centre's wealth of expertise and experience in upskilling mathematics teachers via the PDMT. This knowledge will be applied in new ways to upskill teachers: (1) by adapting existing PDMT materials to produce a high quality online CPD programme focusing on mathematical knowledge for teaching; and (2) by developing a new programme aimed at Junior Cycle Science teachers with a focus on Physics. The project also contributes to creating a sustainable future for EPI•STEM, ensuring that the Centre is resourced to address current and emerging priorities
https://hea.ie/funding-governance-performance/managing-performance/institutional-stories-of-impact/university-of-limerick/

New UL Teacher Training Programme

Commencing in September 2020, UL will offer a new undergraduate programme for those wishing to become teachers of Mathematics and Computer Science. This programme would be suitable for any sixth year student interested in mathematics; modern technologies and computer systems who have a flair for working with people. It builds on other successful concurrent teacher education programmes offered by UL (e.g. Phyical Education and Mathematics) as well as the vast number of computing programmes offered in the university. This degree is designed to produce graduates with the mathematical knowledge and skills to satisfy the needs of the Irish second level school system in relation to teaching mathematics. Simultaneously graduates of the programme will have the knowledge and expertise required to teach the new Leaving Certificate Computer Science curriculum as well as short courses in coding on the Junior Certificate syllabus. Graduates of this programme will be eligible for appointment to all second-level schools. Furthermore, graduates of the programme, who will have a strong mathematics and computer science background will have wider opportunities available to them in the software industry. EPI•STEM's Dr Niamh O'Meara is the course director for this programme and for more information on this programme you can contact her at Niamh.omeara@ul.ie



John Coolahan Funding

In November 2019 the Teaching Council announced the recipients of funding under the John Coolahan Research Support Framework initiative. This Framework offers support to teachers and others conducting new research, or sharing, synthesising or applying existing research in their practice, either independently or in collaboration with others. The Framework forms a key part of the Council's Collaboration and Research for Ongoing Innovation [CROI] Research Series which places a strong emphasis on research activities which strengthen the links between research, policy and practice, and on collaboration among teachers, and between teachers and other stakeholders in education. Three members of staff in EPI• STEM were awarded funding under this scheme.

Prof Merrilyn Goos and Kathy O'Sullivan were awarded funding to support their Numeracy Across the Curriculum project, which is developing teachers' understanding of numeracy and providing guidance to teachers on how to recognise and embed numeracy opportunities within their subject area. The Teaching Council funding will enable us to hold a one-day conference at the end of this project to share its findings and launch a national network of teachers in order to influence numeracy practice and policy.

The Numeracy across the Curriculum summer school took place in Epistem in August. This was a three day summer school facilitated by Professor Merrilyn Goos and Kathy O' Sullivan. The teachers really enjoyed the different tasks assigned to them and looked forward to putting these activities into practice in their own schools for the upcoming academic year.

Dr Niamh O'Meara was also awarded funding under this call to conduct a study investigating the uptake of mathematics grinds among Irish second level students; the provision of mathematics grinds and the reasons behind the grinds. The research team consists of four researchers including Niamh, Dr Mark Prendergast (University College Cork), and two practising second level teachers (Ms Iseult O'Rourke & Ms Laura Lynne Duffy). The study will involve the dissemination of surveys to teachers across Ireland in February 2020 to ascertain their thoughts on the grinds culture currently in place in Ireland, particularly in the area of mathematics. If you would like to participate in this study and would be willing to complete a survey please contact Niamh.omeara@ul.ie for more information.

Jillian White, in conjunction with Eric O'Donnell and Thomond Community College, were awarded funding from the Teaching Council of Ireland under the John Coolahan Support Framework for their project Stance on STEM. The study is focused on measuring and monitoring the impact of in-school STEM initiatives on primary school students as they move from upper primary school into secondary school. This is a three year longitudinal study that is currently in its second year.

Irish Research Council's Government of Ireland Postgraduate Scholarship Programme

Jillian White (PhD student under the supervision of Dr Patrick Johnson and Prof Merrilyn Goos) was awarded funding from the Irish Research Council's Government of Ireland Postgraduate Scholarship Programme for her PhD project entitled "Reimagining Professional Development for Irish Mathematics Teachers". The research study aims to design a professional development programme for Irish secondary school mathematics teachers that can impact teacher pedagogies and student learning. The objectives are to examine the classroom realities of a group of teachers and analyse how they are currently teaching a topic (for the purpose of this study the topic will be mathematical problem solving), and thus design a longitudinal, evidence-based, support-centred CPD programme and monitor its impact on both participating teachers and their students. The CPD programme is currently underway with four participating teachers from the greater Limerick area.

Erasmus+ Trip to Austria

On September 19th and 20th 2019, Dr Niamh O'Meara and Ms Kathy O'Sullivan attended a partners meeting in Linz, Austria to further advance their work on an Erasmus+ funded project which is seeking to develop a Common European Numeracy Framework [CENF]. At this meeting partners from Holland, Austria, Spain and Ireland laid the foundations for the CENF and discussed ideas for the numeracy modules that will be developed to enhance the skills and knowledge of adult numeracy tutors. These modules will be based on an international survey that was disseminated to adult education organisations across Europe as well as the CENF. If you are interested in trialling some aspects of these modules with adult numeracy tutors, keep a close eye on the EPI• STEM website www.epistem.ie from April 2020.

Adult Numeracy: Guidelines for Good Practice

In recent months, EPI•STEM have been contracted by NALA to develop Guidelines for Good Practice for Adult Numeracy. The funding received will allow EPI•STEM to conduct a literature review investigating current practices in the teaching and learning of numeracy among adult learners as well as the issues faced by both teachers and learners. They will also analyse data collected by NALA from a range of different sources. These combined, will allow researchers in EPI•STEM to develop the Guidelines for Good Practice and it is anticipated that, once published, these will inform future developments in the teaching and learning of adult numeracy

STEMChAT

The implementation of the SFI funded project STEMChAT has continued at EPI•STEM over the past few months. Female undergraduate STEM Champions from the WISTEM2D programme, EPI•STEM staff and Johnson & Johnson industry mentors have facilitated informal workshops with post-primary school students both in schools and community locations around County Limerick. To date, over 400 students have participated in this innovative approach to addressing the under-representation of women in the STEM workforce in Ireland by engaging in small-group discussions about STEM stereotypes, courses and careers.

WiSTEM²D Awards Ceremony

The WiSTEM²D Programme launched on September 15th 2019 with a social media campaign and video promotion tool this year. The female student applicants from the University of Limerick were selected after a rigorous application and interview process. The awards ceremony for the successful students was held in Plassey House on November 7th where there was great celebrations for the girls' achievements. The 10 Individual Award Winners and 3 runners up were presented with their awards. The 'Women in Science Technology Engineering, Mathematics, Manufacturing and Design (WiSTEM2D) awards ceremony at the University of Limerick was a wonderful event celebrating the female students' achievements and prestigious awards. Following a rigorous selection process, ten students were presented with the awards, and 3 runners up, which supports undergraduate women in their pursuit of STEM2D careers with career mentors, site visits and a STEM2D network. In attendance were Johnson and Johnson mentors, the Johnson and Johnson Core Team, University of Limerick Academics, the University of Limerick Core Team, the winning students and their families.

The students attended Johnson and Johnson Vision Care and the EMEA Development Centre sites in Castletroy. The students thoroughly enjoyed their day from speaking to industry professionals to learning about how an industry plant works to a tour around the production lines, they learned so much from their day.

Back:Maeve Walsh - Castlebar Mayo, Nicole Berty - Clare, Niamh Finnegan - Roscommon, Emily Whelan - Kildare, Nicole Gorry - Westmeath, Christina Maletta -Limerick. Front: Nutsa Chichilidze - Limerick, Abbie Orchin Moloney - Longford, Aisling Smyth - Limerick, Aoife O'Doherty - Clare, Aoife Cotter - Limerick, Shauna Doellken - Cork and Emily McGurren - Limerick

PDMT Graduation

Congratulations to our 108 teachers from the Professional Diploma in Mathematics for Teaching who were conferred at the Autumn Conferring ceremony at the University of Limerick.

The PDMT, which is jointly accredited by the University of Limerick and NUI Galway, funded by the Department of Education and Skills and led by EPI•STEM, has now graduated over 1000 teachers since 2012. This is a fantastic achievement for everyone involved, and most of all for our graduates.

Gender Balance Project

EPISTEM has been contracted by the Department of Education & Skills to review Literature to Identify a Set of Effective Interventions for Addressing Gender Balance in STEM in Primary and Post Primary Education Settings. The Research Team led by Professor Merrilyn Goos includes Dr Veronica Ryan; Prof John O'Donoghue; Dr Ciara Lane; Dr Keelin Leahy; Dr Gráinne Walshe; Tracey O'Connell (Masters student) and Achmad Nizar (PhD candidate)

The aim of the Gender Balance project is to understand inequitable participation in post-primary STEM education in Ireland and to identify effective interventions for addressing critical barriers that girls experience in participating in STEM subject areas and careers. A systematic literature review will be employed to address three research questions:

1. What critical barriers do girls experience in participating in STEM education and careers?
2. Which of these barriers should be prioritised for further investigation in the Irish context?
3. What interventions have proven effective in addressing the prioritised barriers?

A central claim made by the substantial literature on gender differences in STEM participation and achievement, is that there are many factors that can explain girls' disadvantage in STEM. Moreover, these factors operate at multiple levels – individual, institutional, societal, and cultural – and they interact in complex ways. Understanding and addressing the barriers that hinder female participation and achievement thus requires "holistic and integrated responses" (UNESCO, 2017, p. 12) rather than singular "solutions". As a consequence, the literature review will give attention to the interplay between personal, social, and institutional influences on the development of gendered academic aspirations by young children, primary and post-primary students. The research team are employing a multilevel analytical framework based on Bronfenbrenner's (1989) Ecological Systems Theory to identify and organise known barriers and interventions to address the key aims of this project.

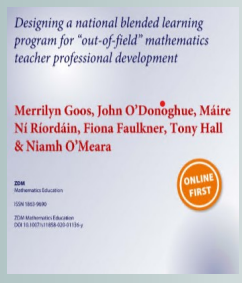
Career Mathways 2.0

In December 2019, Dr Niamh O'Meara, Dr Olivia Fitzmaurice and Dr Patrick Johnson were awarded further funding from Science Foundation Ireland [SFI] under their Discover Scheme to continue the work on the Career Mathways initiative. Career Mathways, is an exciting and novel initiative, which highlights the prevalence of mathematics and other STEM disciplines in a vast range of careers. In Phase 1 of the project, which was also funded by SFI and the Irish Independent, the research team collaborated with well-known, high-profile Irish personalities and professionals in order to make STEM, and mathematics in particular, more visible and fascinating to students. The team created and piloted a Transition Year (TY) teaching and learning package which comprised of videos and posters of our celebrities and professionals informing us how mathematics underpins and enhances their everyday lives and careers; stimulating and informative teaching and learning guides and innovative student booklets which provide opportunities to practice STEM-related, problem-based tasks and demonstrate that demonstrate the relevance and usefulness of mathematics. In Phase 2 of the project the research team will develop an online platform where all resources will be disseminated with participating teachers whilst a much stronger emphasis will be on teacher professional development so that teachers have ownership over the lessons and materials created. The team will continue to collaborate with well-known, high-profile Irish celebrities/professionals by inviting them to become STEM Ambassadors, to make mathematics more visible/fascinating to students. If your school would be interested in participating in this novel initiative please contact Dr Niamh O'Meara (Niamh.omeara@ul.ie) or keep an eye on the EPI•STEM website (www.epistem.ie) where we will be advertising for Expressions of Interest in the near future.

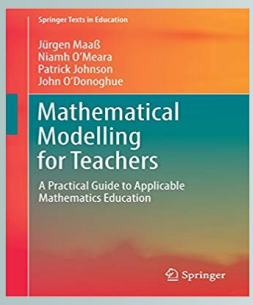
MEI

In the lead up to Maths Week 12th – 20th October 2019, the 7th Conference on Research in Mathematics Education in Ireland (MEI-7) took place on St Patrick's Campus, Dublin. The theme of the conference, Mathematical Literacy, throughout and beyond Education, was closely aligned with the work of EPI•STEM and both Kathy O'Sullivan and Niamh O'Meara presented their research at this event. At this conference Niamh presented on her study investigating teachers' perspectives of the bonus points initiative and this time focussed on whether teachers believed the bonus points initiative resulted in a notable improvement in students' mathematical capabilities and on the challenges now facing teachers as a result of the initiative. Kathy O' Sullivan presented a paper based on the "N" framework which is a framework designed to support teachers in embedding numeracy across the curriculum.

Latest Publications



Designing a national blended learning program for 'out-of-field' mathematics teacher professional development.
Merrilyn Goos, John O'Donoghue, Máire Ní Ríordáin, Fiona Faulkner, Tony Hall & Niamh O'Meara
ZDM
Mathematics Education



Mathematical Modelling for Teachers: A practical guide to applicable mathematics education
This book was co-authored by Prof Juergen Maasz, Dr Niamh O'Meara, Dr Patrick Johnson and Prof John O'Donoghue and is a practical textbook that can be used by both pre-service and in-service mathematics teachers. The book speaks directly to the reader and contains a variety of different ideas and tasks that will help to develop teachers' own modelling skills and offer them suggestions for incorporating mathematical modelling into their classroom. For more information, or to purchase a copy, please visit https://www.springer.com/gp/book/9783030004309.

Johnson, P., O'Meara, N. & Leavy A. (2020) Factors supporting and inhibiting teachers' use of manipulatives around the primary to post-primary education transition. *International Journal of Mathematical Education in Science and Technoloy.* DOI: 10.1080/0020739X.2020.1736348

Treacy, P., Prendergast, M. & O'Meara, N. (2019) A "new normal": Teachers' experiences of the day-to-day impact of incentivizing the student of advanced mathematics. *Research in Mathematics Education.* DOI: 10.1080/1479802.2019.1668832

Goos, M., Bennison, A., Quirke, S., O'Meara, N., Vale, C. (2020) Developing Professional Knowledge and Identities of Non-Specialist Teachers of Mathematics
DOI: 9789004418875

Visitors to EPI•STEM

Alessandra Cardinali is a second year PhD student at the University of Camerino (School of Advanced Studies), Italy, who was a Visiting Doctoral Fellow in EPI•STEM in 2020. Her PhD project is on the teaching of non-Euclidean geometry in upper secondary schools. The goal of her research is to find out whether non-Euclidean geometries can help students gain a better understanding of the axiomatic deductive approach and to give the students a new perspective on mathematics. As part of her PhD she has to spend a minimum of two months abroad, and she was successful in obtaining funding from ERASMUS+ for Traineeship to support her visit to EPI•STEM, where her PhD project was mentored by Professor Merrilyn Goos

Dr Odd Tore Kaufmann, a Visiting Fellow in EPI•STEM in 2020, holds a PhD in mathematics education from the University of Agder, Norway. His research interests include the professional preparation and development of mathematics teachers, the impact of digital technologies on mathematics learning and teaching, and student errors and misconceptions in mathematics. The aim of his visit was to broaden his academic horizons, develop new research collaborations, and improve his speaking and writing in academic English. His visit was funded by the University of Agder.

Oda Heidi Bolstad, a PhD student at the University of Agder, Norway, was a Visiting Doctoral Fellow in EPI•STEM in 2020. Her PhD research project focuses on teaching for mathematical literacy in lower secondary school. Shelook edat how school leaders and teachers understand the concept mathematical literacy, how students' mathematical literacy development is facilitated in mathematics teaching, and how students experience teaching for mathematical literacy. During her visit to EPI•STEM, she worked on her dissertation and participated in lectures and seminars on numeracy (mathematical literacy).

www.epistem.ie

Please see our website www.epistem.ie for all news items, resources and events

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