UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH

EPI·STEM
National Centre for STEM Education

Annual Report 2019—2020

EPI•STEM

National Centre for STEM Education

University of Limerick

Web Link: https://epistem.ie

EPI•STEM ANNUAL REPORT 2019/2020

1. History

The National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL) was established in September 2008 at the University of Limerick under the aegis of the Shannon Consortium, comprising UL, Mary Immaculate College, Limerick Institute of Technology and Tralee Institute of Technology. The Centre received €2 million in funding from the HEA's Strategic Innovation Fund Cycle 2[1] for an initial 3-year period from 2008-2011. During this time the Centre was situated within the UL Faculty of Science and Engineering.

By 2011 NCE-MSTL was a recognised brand and had established a range of partnerships with external stakeholders including enterprises in the Mallow region, Discover Science and Engineering, Engineers Ireland, MACSI, Texas Instruments, Careers Portal, ESB, Intel, PDST, Blackrock Observatory Cork, Pharmachemical Ireland, NCCA, and HEIs nationally and internationally. The Centre achieved the highest ranking for a project of its type in project rankings in the HEA/SIF Evaluation Report[2].

The HEA/SIF2 brief was to mainstream the Centre's operation into core HEI structures after an initial 3-year investment. Within UL, restructuring and negotiations between the Office of the VPA&R, Faculty of Science and Engineering and School of Education concerning the positioning of NCE-MSTL continued from 2011-2013. During this period, NCE-MSTL was successful in its bid for a nationally led programme to up-skill "out-of-field" teachers of mathematics: the Professional Diploma in Mathematics for Teaching (PDMT). NCE-MSTL also assumed responsibility for staffing, management and operation of UL's Mathematics and Science Learning Centres.

In 2014 a UL Foundation-sponsored Chair in STEM Education was established to replace retiring NCE-MSTL Director Prof John O'Donoghue. A high profile Director was essential for the future development of the Centre so as to raise its profile nationally and internationally. This position was filled in 2014 by Professor Sibel Erduran. During her tenure the centre was renamed EPI•STEM – the National Centre for STEM Education and relocated within the Faculty of Education and Health Sciences.

In October 2017 Professor Merrilyn Goos was appointed as Chair in STEM Education and Director of EPI•STEM. She is an internationally recognized mathematics educator and currently serves as Vice-President of the International Commission on Mathematical Instruction.

[1] http://edepositireland.ie/bitstream/handle/2262/85967/HEA%20strategic_innovation_fund_-_outputs_outcomes_report_2013_final.pdf?sequence=1&isAllowed=y

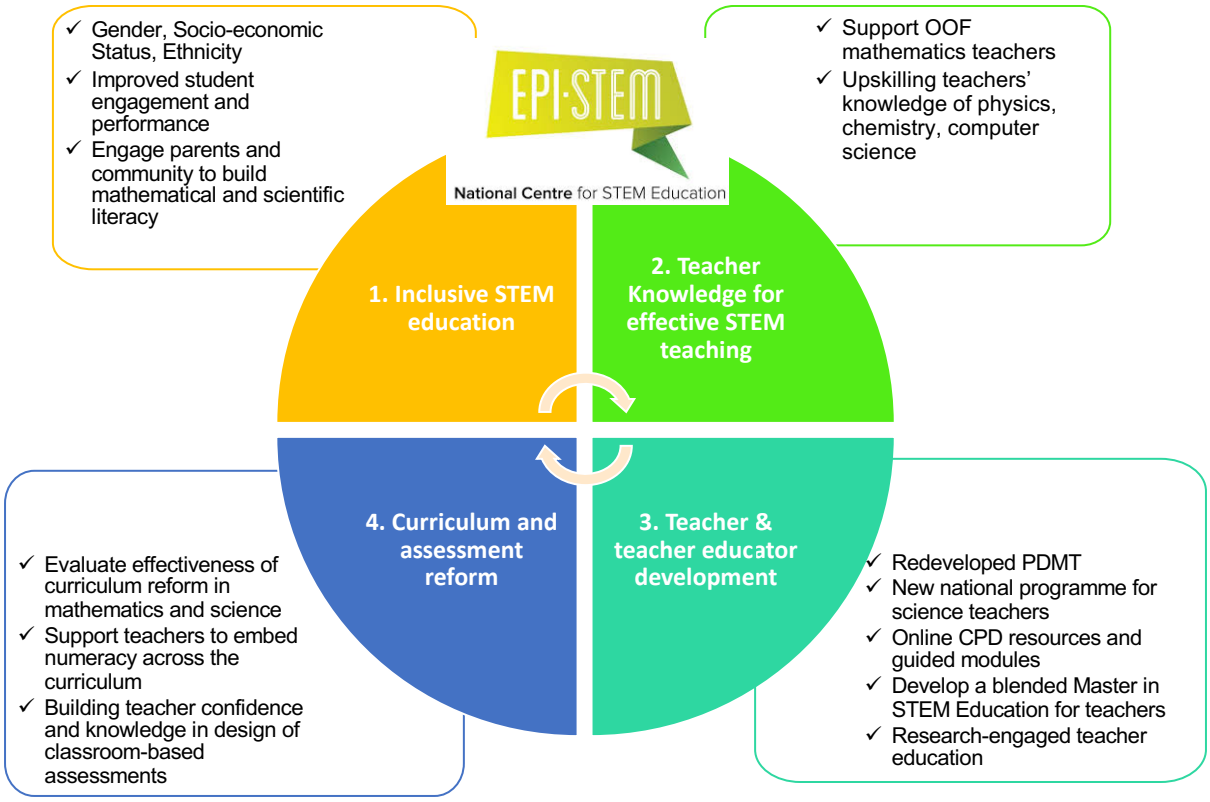
[2] Davies, G. K. (2010). Report of SIF Evaluation, Higher Education Authority.

2. Mission, Vision, and Pillars

The ***mission of EPI•STEM*** is to conduct an integrated program of research, teaching, and engagement that addresses national and international challenges in STEM education. We achieve this goal by leveraging our distinctive connections between STEM education academics and STEM discipline academics, and by forging connections with policy makers, practitioners, industries, and community groups that have a stake in STEM education.

The ***vision of EPI•STEM*** is to be recognised as the premier national centre for STEM education that positively influences STEM education policy and practice as well as public perceptions of STEM. EPI•STEM aspires to international recognition for high-quality, high-impact STEM education research that supports beneficial exchange of knowledge between researchers and the communities they serve and leads to enhanced teaching practices and improved educational outcomes for learners.

The four ***pillars of the EPI•STEM work programme*** are shown below and align with the Department of Education and Skills (2017) STEM Education Policy Statement[3].



[3] Department of Education and Skills (2107). *STEM education policy statement 2017-2026*. Dublin: Author. Available at https://www.education.ie/en/The-Education-System/STEM-Education-Policy/stem-education-policy-statement-2017-2026-.pdf

3. People

3.1 Current staff, arrivals, and departures

Staff	Position	Arrivals/Departures
Professor Merrilyn Goos	Director	
Ms Helen Fitzgerald	Senior Executive Administrator	
Emeritus Professor John O'Donoghue	Emeritus Professor	
Dr Niamh O'Meara	Lecturer in Mathematics Education	
Dr Ciara Lane	National Teaching Coordinator, PDMT	
Dr Peggy Lynch	Programme Coordinator, PDMT	Appointed Jan 2020 (0.6 FTE)
Ms Tracey O'Connell	WiSTEM^{2}D Programme Coordinator	
Ms Nichola Keegan	Administrator	Resigned to take up appointment to UL's Confirm Smart Manufacturing Centre
Dr Regina Kelly	Dean's Postdoctoral Fellow	Maternity leave followed by appointment to LBB in Science Education, UL School of Education
Dr Aoife Guerin	Postdoctoral Researcher	Resigned to take up multiannual post in Mathematics Learning Centre
Ms Kathy O'Sullivan	National Program Coordinator, PDMT	Resigned to take up 1-year contract as LBB in Mathematics Education NUIG
Dr Sila Kaya	Research Assistant	Resigned to take up postdoctoral post at DCU

3.2 Visiting Fellows

EPI•STEM's Visiting Fellow and Visiting Doctoral Fellow appointments are designed to enhance the STEM research community at UL by fostering collaborations with the Centre's academic staff.

Dr Odd Tore Kaufmann, a Visiting Fellow in EPI•STEM from January to March 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.

Alessandra Cardinali is a second year PhD student at the University of Camerino, Italy, who was a Visiting Doctoral Fellow in EPI•STEM from November 2019 to February 2020. Her PhD project is on the teaching of non-Euclidean geometry in upper secondary schools. 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 a Traineeship to support her visit to EPI•STEM, where her PhD project was mentored by Professor Merrilyn Goos.

Oda Heidi Bolstad, a PhD student at the University of Agder, Norway, was a Visiting Doctoral Fellow in EPI•STEM from September to December 2019. Her PhD research project focuses on teaching for mathematical literacy in lower secondary school. She looked at 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).

3.3 Academic Visitors

June-August 2019
Vasiliki Panagi is a first year Master's student at the University of Cyprus, Nicosia. She visited EPI•STEM under the Erasmus + Exchange programme. Whilst at EPI•STEM, Vasiliki was mentored by Dr Niamh O'Meara and continued to work on her research Master's as well as becoming involved in core EPI•STEM projects such as the Common European Numeracy Framework.

August 2019
Michael Jennings, Associate Lecturer in the School of Mathematics and Physics at The University of Queensland, visited EPI•STEM to meet with his PhD supervisor, Professor Merrilyn Goos, and to discuss research collaborations with staff. Michael is a Senior Fellow of the Higher Education Academy and in 2015 won an Australian Award for University Teaching.

September 2019
Professor Kathryn Holmes (pictured), Associate Professor Catherine Attard, Dr Nathan Berger, and Dr Erin Mackenzie from Western Sydney University, Australia, presented a symposium on their research into student attitudes and transitions in STEM education.
During their visit to EPI•STEM the WSU team explored future research collaborations and journal editing opportunities.

February 2020
EPI•STEM hosted an Erasmus+ Mobility Training visit from Dr Selcan Oztay, a science education lecturer from the Faculty of Education at Van Yuzuncu Yil University in Turkey. She is interested in pre and in-service science teacher education, STEM education and pedagogical content knowledge, particularly in chemistry education. The aims of her visit were to gain insight into teacher education at UL, foster international research cooperation and discuss future Erasmus+ activities such as faculty member exchanges

4. Research

4.1 Research Excellence

Research projects are aligned with one or more of EPI•STEM's work programme pillars:

1. Inclusive STEM education
2. Teacher knowledge for effective STEM teaching
3. Curriculum and assessment reform
4. Teacher and teacher educator development.

Grants and contracts (Continuing and *awarded 2019/20)

Pillar	Funding Body	Budget	Title	Project Leaders
1	Science Foundation Ireland	€35,880	STEMChAT – Women as catalysts for change in STEM education	M. Goos, R. Kelly
1	*Department of Education & Skills	€31,871	Review of literature to identify a set of effective interventions for addressing gender balance in STEM in primary and post-primary education settings.	M. Goos, J. O'Donoghue, C. Lane, K. Leahy, G. Walshe, T. O'Connell
1	International Science Council	€300,000 (€15,000 to UL)	A global approach to the gender gap in the mathematical, computer, and natural sciences: How to measure it? How to reduce it?	M. Goos, R. Kelly
1, 2	*Science Foundation Ireland	€34,181	Career Mathways: Phase 2	N. O'Meara, P. Johnson, O. Fitzmaurice
2	*Higher Education Authority	€350,000	Building teacher knowledge for quality STEM education	M. Goos (+ 2 postdoctoral researchers to be appointed)
2, 4	*Teaching Council	€5,000	NAC-Net: Establishing an Irish network to support teachers embedding numeracy across the curriculum	M. Goos, K. O'Sullivan (NUIG)

Grants and contracts (Continuing and *awarded 2019/20)

Pillar	Funding Body	Budget	Title	Project Leaders
2, 4	*Teaching Council & NISE	€7,500	Bridging the mathematical divide: Investigating the role of manipulatives in the transition from primary to post-primary education	N. O'Meara, A. Leavy (MIC) & P. Johnson
3	*National Adult Literacy Agency	€20,000	Good practice guidelines for adult numeracy	M. Goos, M. Prendergast (UCC), N. O'Meara, K. O'Sullivan (NUIG)
3	Erasmus+	€926,229 (€53,000 to UL)	Integrated approach to STEM teacher training	Linköping University, Sweden (Coordinator), Hacettepe University, Ankara, University of Limerick, Ireland (K. Leahy and M. Goos), Alpen-Adria-Universität Klagenfurt, Austria
3	*Teaching Council	€5,000	Delving into the shadows of the grinds culture in Ireland - A focus on mathematics	N. O'Meara, M. Prendergast (NUIG), I. O'Rourke & L. Duffy (Teachers)
3	ERASMUS+	€334,620 (€72,280 to UL)	Common European Numeracy Framework	K. Hoogland, N. O'Meara, J. Diez-Palomer & M. Stanic

Grants and contracts under review

Pillar	Funding Body	Budget	Title	Project Leaders
2, 3	EU Horizon 2020	First stage of 2-stage submission with final budget estimate €1.6 million (€200,000-€250,000 to UL)	Outdoor science education for a sustainable future	Geonardo Environmental Technologies and partners (M. Goos, R. Kelly)
3	Spencer Foundation	USD 500,000 (€67,000 to UL)	Developing research literacy in teacher education	M. Mills (UCL), M. Goos, N. Levinson, A. Phelan, M. Clarke, M. Mincu, M., N. Mockler, N., B. Taylor
3	ESRC/IRC	£10,000 to UCL + €11,480 to UL	Research in teacher education: Irish-UK network	M. Mills (UCL), M. Goos, A. Looney (DCU)
3	Australian Research Council	AUD397,306	Mathematics teacher educators' beliefs, practices, learning and identities.	M. Marshman, M. Goos, J. Anderson, A. Bennison, K. Beswick, L. Darragh
4	Spencer Foundation	€49,683	Irish teachers' journey into "unchartered territory": An investigation into a significant change in mathematics assessment culture in Ireland	N. O'Meara, M. Goos, M. Prendergast (UCC)
4	National Council for Curriculum and Assessment	€284,232	Evaluation of the impact and implementation of the Junior Cycle Framework.	M. Goos, O. McCormack, O. McGarr, J. O'Reilly

Internally funded or unfunded research

Pillar	Title	Project Leaders
2	Evaluation of the impact of the PDMT (1) Graduates' perceptions of the impact of the PDMT (survey study) (2) Case studies of the impact of the PDMT on teachers' classroom practice (observation and interview study) (3) Out-of-field mathematics teachers' action research	Multiple (see below) (1) M. Goos, M. Ní Ríordáin (UCC), J. O' Donoghue, N. O'Meara, F. Faulkner (TUD), C. Lane, K. O' Sullivan (NUIG), S. Quirke (2) M. Goos & A. Guerin (3) C. Lane, M. Ni Riordáin (UCC), PME students
2	Mathematics teachers' beliefs about mathematics and mathematics teaching and learning. This is an international study comparing the beliefs of teachers in Ireland and Australia.	C. Lane, M. Marshman (University of the Sunshine Coast, Australia)
3	Numeracy across the curriculum. This project aims to implement and evaluate a rich model of numeracy across the school curriculum in a small number of primary and post-primary schools in the Limerick region.	M. Goos, K. O'Sullivan (NUIG)
3	Students' reasons for studying higher level mathematics. This study seeks to unearth the main reasons behind students decision to study higher level mathematics in two different countries (Ireland & Australia) and compare the impact of the bonus point system in both regions.	N. O'Meara, M. Prendergast (UCC), P. Treacy (ECAE), M. Jennings (University of Queensland, Australia)
3	What's the point? In this study we investigate teachers' perspectives on the incentive of bonus points for studying higher level mathematics and will seek to offer guidance on the future direction of this initiative.	N. O'Meara, M. Prendergast (UCC), P. Treacy (ECAE)
4	Thomond Cluster Project. This project seeks to improve issues relating to the transition from primary to secondary STEM education by facilitating teacher and student workshops which bring together participants from both educational settings.	N. O'Meara & R. Kelly
4	Students' interest in mathematics – this study compares students' interest in mathematics under the previous post-primary mathematics curriculum and the new Project Maths curriculum to examine possible changes to student interest due to the different curricula experienced.	C. Lane
n/a	Evaluation of the EHS Dean's Succeed and Lead Postdoctoral Fellowship programme	M. Goos, C. Lane

Publications and Presentations

Books

Maasz J., **O'Meara, N**., Johnson, P., & **O'Donoghue, J**. (2019). *Mathematical modelling for teachers: A practical guide to applicable mathematics education.* Cham, Switzerland: Springer. https://www.springer.com/gp/book/9783030004309.

Book Chapters

Walshe, G., Johnston, J., & **Goos, M.** (in press). Promoting 21st century skills through STEM integration: A comparative analysis of national curricula. In L. Leite, E. Oldham, A. S. Afonso, F. Viseu, L. Dourado, & H Martinho (Eds.), *Science and mathematics education for 21st century citizens: Challenges and ways forward.* Hauppauge, NY: Nova Science Publishers.

Goos, M. (in press). Mathematics crossing borders: A comparative analysis of models for integrating mathematics with other disciplines in pre-service teacher education. In N. Radakovic & L. Jao (Eds.), *Borders in mathematics pre-service teacher education*. Cham: Springer.

Goos, M. (in press). Theoretical perspectives on learning and development as a mathematics teacher educator. In K. Beswick (Ed.), *International handbook of mathematics teacher education* (2nd ed.), Volume 4: The mathematics teacher educator as a developing professional. Rotterdam, The Netherlands: Sense Publishers.

Goos, M., Bennison, A., **Quirke, S., O'Meara, N.,** & Vale, C. (in press). Developing professional knowledge and identities of non-specialist teachers of mathematics. In D. Potari (Ed.), *International handbook of mathematics teacher education* (2nd ed.), Volume 1: Teacher knowledge, beliefs and identity in mathematics teaching and its development. Rotterdam, The Netherlands: Sense Publishers.

Erduran, S., Kaya, E., Cullinane, A., Imren, O., & **Kaya, S**. (in press). Designing practical learning resources and teacher education strategies on nature of science. In W. McComas (Ed.), *The nature of science in science education: Rationales and strategies* (2nd ed.). Dordrecht: Springer.

Makar, K., Dole, S., Visnovska, J., **Goos, M.**, Bennison, A., & Fry, K. (2020). Looking back and taking stock: Reflections on the MERGA research review 2012-2015. In J. Way, C. Attard, J. Anderson, J. Bobis, H. McMaster, & K. Cartwright (Eds.), *Research in mathematics education in Australasia 2016-2019* (pp. 7-26). Singapore: Springer Nature.

Kelly, R., & **Goos, M.** (2020). Some initiatives for reducing the gender gap in science: a database of good practices. In C. Guillopé & M.-F. Roy (Eds.), *A global approach to the gender gap in mathematical, computing, and natural sciences: How to measure it, how to reduce it?* (pp. 152-171). Berlin: International Science Council.

Goos, M. (2020). Crossing boundaries: Fostering collaboration between mathematics educators and mathematicians in initial teacher education programs. In D. Bailey, N. Borwein, R. Brent, R. Burachik, J. Osborn, B. Sims, & Q. J. Zhu (Eds.), *From analysis to visualization: A celebration of the life and legacy of Jonathan M. Borwein* (pp. 141-

148). Cham, Switzerland: Springer. DOI https://doi.org/10.1007/978-3-030-36568-4_9

Goos, M. (2019). Publishing for international impact in mathematics education research journals. In K. Leatham (Ed.), *Designing, conducting, and publishing quality research in mathematics education* (pp. 213-225). Cham: Springer.

Goos, M. (2019). Educational Studies in Mathematics: Shaping the field. In G. Kaiser & N. Presmeg (Eds.), *Compendium for early career researchers in mathematics education* (pp. 377-391). Cham, Switzerland: Springer.

Refereed Journal Articles

SJR	Details
Q3	Cantley, I, **O'Meara, N.,** Prendergast, M., Harbison, L. & O'Hara, C. (in press). Framework for analysing continuity in students' learning experiences during primary to secondary transition in mathematics. *Irish Educational Studies.*
Q1	**Kelly, R**., McGarr, O., Leahy, K., & **Goos, M**. (2020). An investigation of university students and professionals' professional STEM identity status. *Journal of Science Education and Technology*. DOI https://doi.org/10.1007/s10956-020-09834-8
Q1	Bennison, A., **Goos, M**., & Geiger, V. (2020). Utilising a research-informed instructional design approach to develop an online resource to support teacher professional learning on embedding numeracy across the curriculum. *ZDM Mathematics Education*. DOI 10.1007/s11858-020-01140-2
Q1	**Goos, M., O'Donoghue, J.,** Ní Ríordáin, M., Faulkner, F., Hall, T., & **O'Meara, N.** (2020). Designing a national blended learning program for "out-of-field" mathematics teacher professional development. *ZDM Mathematics Education*. DOI 10.1007/s11858-020-01136-y
Q1	**Goos, M.**, & **Kaya, S**. (2020). Understanding and promoting students' mathematical thinking: A review of research published in *ESM*. *Educational Studies in Mathematics*, *103*(1), 7-25.
Q1	**Lane, C**., & Ní Ríordáin, M. (2020). Out-of-field mathematics teachers' beliefs and practices: An examination of change and tensions using zone theory. *International Journal of Science and Mathematics Education*, *18*(2), 337-355.
Q2	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 Technology.* DOI:10.1080/0020739X.2020.1736348
Q1	Maass, K., Geiger, V., Romero Ariza, M., & **Goos, M**. (2019). The role of mathematics in interdisciplinary STEM education. *ZDM Mathematics Education*, *51*(6), 869-884.

Q1	**Goos, M.**, & Bennison, A. (2019). A zone theory approach to analyzing identity formation in mathematics education. *ZDM Mathematics Education*, *51*(3), 405-418.
Q1	**O'Meara, N.** & Prendergast, M. (2019). Teaching mathematics after hours. *Journal of Curriculum Studies*, *51*(4), 494-512.
Q1	Fitzmaurice, O., **O'Meara, N.,** Johnson, P. & Lacey, S. (2019). 'Crossing the equals sign': Insights into pre-service teachers' understanding of linear equations. *Asia-Pacific Journal of Teacher Education*, *47*(4), 361-382.
Q2	**O'Meara, N.,** Prendergast, M., Cantley, I., Harbison, L., & O'Hara, C. (2019). Teachers' self-perceptions of mathematical knowledge for teaching at the transition between primary and post-primary school. *International Journal of Mathematical Education in Science and Technology, 51*(4), 497-519.
Q2	**O'Meara, N.,** Johnson, P., & Leavy, A. (2019). A comparative study investigating the use of manipulatives at the transition from primary to post-primary education. *International Journal of Mathematical Education in Science and Technology.* DOI: 10.1080/0020739X.2019.1634842
Q3	**Lane, C., O'Meara, N.,** & Walsh, R. (2019). Pre-service mathematics teachers' use of the mathematics register. *Issues in Educational Research*, *29*(3), 790-806.
Q3	Prendergast, M., **O'Meara, N.,** O'Hara, C., Harbison, L. & Cantley, I. (2019) Bridging the primary to secondary school mathematics divide: Teachers' perspectives. *Issues in Educational Research*, *29*(1), 243-260.
Q3	**Goos, M**. (accepted 30 September 2019). The learning and development of mathematics teachers and mathematics teacher educators: From there to here to where? *For the Learning of Mathematics.*
Q3	Treacy, P., Prendergast, M. & **O'Meara, N.** (2019). A "new normal": Teachers' experiences of the day-to-day impact of incentivising the study of advanced mathematics. *Research in Mathematics Education*. DOI: 10.1080/14794802.2019.1668832.
Q3	**Lane, C**., **O'Meara, N**., & Walsh, R. (2019). Pre-service mathematics teachers' use of the mathematics register. *Issues in Educational Research*, *29*(3), 790-806.

Refereed Conference Papers

Marshman, M., & **Goos, M.** (2019). Making mathematics teachers: The beliefs about mathematics and mathematics teaching and learning held by mathematics teacher educators and pre-service teachers. In J. Pettigrew, L. Rylands, D. Shearman, & A. Yeung (Eds.), *Reflections of change* (Proceedings of the 12th Delta conference on the teaching and learning of undergraduate mathematics and statistics, pp. 61-70). Sydney: Western Sydney University and Delta. https://doi.org/10.26183/5d5f53ed9c926

Goos, M., & **O'Donoghue, J.** (2019). Designing effective professional learning programs for out-of-field mathematics teachers. In M. Graven, H. Venkat, A. Essien & P. Vale (Eds.), *Proceedings of the 43rd conference of the International Group for the*

Psychology of Mathematics Education (Vol. 2, pp. 288-295). Pretoria, South Africa: PME.

Goos, M. (2019). Making connections across disciplinary boundaries in pre-service mathematics teacher education. In J. Holm & S. Mathieu-Soucy (Eds.), *Proceedings of the 2018 annual meeting of the Canadian Mathematics Education Study Group* (pp. 9-20). CMESG/GCEDM. Retrieved 23 May 2019 from http://www.cmesg.org/wp-content/uploads/2019/05/CMESG-2018-1.pdf

Goos, M., Ní Ríordáin, M., **Lane, C.,** & Faulkner, F. (2019). Impact of a national professional development program on the beliefs and practices of out-of-field teachers of mathematics. In G. Hine, S. Blackley, & A. Cooke (Eds.), *Mathematics education research: Impacting practice* (Proceedings of the 42nd annual conference of the Mathematics Education Research Group of Australasia, pp. 316-323). Perth: MERGA.

O'Meara, N., Prendergast, M. & Treacy, P. (2019) What's the point: Evaluating the impact of the bonus points initiative for mathematics. In L. Harbison, & A. Twohill (Eds.), *Proceedings of the Seventh Conference on Research in Mathematics Education in Ireland (MEI7)*, pp. 219-226. Dublin, Ireland.

O'Sullivan, K., Goos, M., O'Meara, N. & Conway, P.F. (2019) The "N" framework: A potential solution to numeracy across the curriculum. In L. Harbison, & A. Twohill (Eds.) *Proceedings of the Seventh Conference on Research in Mathematics Education in Ireland (MEI7)*, pp. 235-242. Dublin, Ireland.

O'Meara, N., & Faulkner, F. (2019) Professional development for out-of-field post-primary teachers of mathematics: A pre and post analysis of the impact of mathematics specific pedagogical training. In A. Rogerson (Ed.), *Proceedings of the 15th International Mathematics Education for the Future Project Conference: Theory and Practice: An Interface or A Great Divide?* (pp.435 – 441). Maynooth, Ireland.

Hoogland, K. Auer, M., Palomer-Diez, J., **O'Meara, N.** & Van Groenestjin. (2019). Initiating a common numeracy framework. In U. T. Jankvist, M. van den Heuvel-Panhuizen, & M. Veldhuis (Eds), *Proceedings of the 11th Congress of the European Society for Research in Mathematics Education* (pp. 1349-1356). Utrecht, The Netherlands: Freudenthal Group & Freudenthal Institute, Utrecht University and ERME.

Lane, C., & Walshe, G. (2019). Student mathematical preparedness for learning science and engineering at university. In U. T. Jankvist, M. van den Heuvel-Panhuizen & M. Veldhuis (Eds.), *Proceedings of the 11th Congress of the European Society for Research in Mathematics Education* (pp. 4775–4782). Utrecht, The Netherlands: Freudenthal Group & Freudenthal Institute, Utrecht University and ERME.

Research Reports

O'Connell, T. (2020). An investigation of the impact of an industry-focused gender intervention on the self-perceptions and career aspirations of female undergraduate students in the STEM discipline. Available https://episteM.ie/resources/research-reports

Presentations

Goos, M. (2020). *How can research support professional learning about teaching in higher education?* Invited presentation at the Making connections: Research and professional development in higher education webinar, Letterkenny Institute of Technology, 28 May.

Goos, M. (2020). *Numeracy for adult learners: Developing conceptual understanding and procedural fluency in context*. Workshop presented at the annual conference of the National Adult Literacy Agency, Dublin, 5 March.

Goos, M. (2020). *ETB adult numeracy research: What we learned*. Invited presentation at the annual conference of the National Adult Literacy Agency, Dublin, 5 March.

Goos, M. (2019). *A comparative analysis of numeracy as a driver for curriculum reform in Australia and Ireland.* NISE seminar presented at UL and MIC, 2 December.

Goos, M. (2019). *Supporting gender diversity in STEM: What can schools and teachers do?* Presentation at the SOPHia (Science Outreach to Promote Physics to Female Students) Teacher Showcase, University of Limerick, 23 November.

Goos, M. (2019). *Fostering mathematical connections through mathematics teacher collaboration.* Invited plenary lecture delivered at the annual conference of the Portuguese Society for Mathematics Education Research, Alte, Portugal, 16-17 November.

Goos, M. (2019). *Task 3: Database of good practices*. Invited lecture presented at the Conference on Global Approaches to the Gender Gap in Mathematical, Computing and Natural Sciences: How to Measure it, How to Reduce it? Trieste, Italy, 4-8 November.

Goos, M. (2019). *A zone theory approach to examining identity formation in mathematics education.* Invited lecture presented at Agder University, Kristiansand, 22 October.

Goos, M. (2019). *Mathematic crossing borders: Integrating mathematics with other disciplines in teacher education*. Seminar presented to the Mathematics Education Research Group at Agder University, Kristiansand, Norway, 21 October.

Goos, M. (2019). *Numeracy beyond mathematics: What are the big messages?* Invited presentation at the Second National Literacy and Numeracy Forum, Dublin, 16 October.

Goos, M. (2019). *Issues in mathematics teacher professional development*. Invited presentation at the South Africa National Research Foundation Communities of Practice Mathematics and Science Workshop, Pretoria, 2-3 October.

Goos, M. (2019). *Models for professional teacher development, their evolution and possibilities for scaling up. Responses to South African Research Chairs Professor Jill Adler and Professor Cyril Julie.* Invited presentation at the South Africa National Research Foundation Communities of Practice Mathematics and Science Workshop, Pretoria, 2-3 October.

O'Connell, T., **Kelly, R., & Goos, M.** (2019). *An investigation of the Impact of an industry-focused gender intervention on the self-perceptions and career aspirations of female undergraduate students in the STEM disciplines*. Poster presentation at the 13th

conference of the European Science Education Research Association, Bologna, Italy, 26th-30th August.

Marshman, M., & **Goos, M.** (2019). *Mathematics teacher educator's beliefs about mathematics and its teaching and learning*. Paper presented at the 42nd annual conference of the Mathematics Education Research Group of Australasia, Perth, 30 June-4 July.

Jennings, M., **Goos, M**., & Adams, P. (2019). *Barely functional: Students' misconceptions of functions and related notation.* Round table presented at the 42nd annual conference of the Mathematics Education Research Group of Australasia, Perth, 30 June-4 July.

Brown, B., **Goos,** M., Jojo, Z., Lampen, E., McAuliffe, S., & Runesson Kempe, U. (2019). *Mathematical thinking* (Working Group 8). In M. Graven, H. Venkat, A. Essien & P. Vale (Eds.), Proceedings of the 43rd conference of the International Group for the Psychology of Mathematics Education (Vol. 1, pp. 169-170). Pretoria, South Africa: PME.

O'Meara, N., Prendergast, M., & Treacy, P. (2019). Increasing participation in advanced mathematics: Evaluating a possible approach. (Oral communication) In Graven M., Venkat H., Essien, A.A.& Vale, P. (Eds.) *Proceedings of the 43rd Annual Meeting of the International Group for the Psychology of Mathematics Education*, pp. 82-83. Pretoria, South Africa.

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Postgraduate research students (current enrolments)

Student	Degree	Supervisors	Thesis title
Kathy O'Sullivan	PhD	Merrilyn Goos, Niamh O'Meara, Paul Conway	*Numeracy teaching and learning at post-primary level in Ireland*
Stephen Quirke	PhD	Niamh O'Meara, Merrilyn Goos	*A performative lens on the mathematics teacher identities of out-of-field teaching mathematics teacher-learners*
Jillian White	PhD (IRC scholarship)	Paddy Johnson, Merrilyn Goos	*Reimagining professional development for Irish mathematics teachers*
Achmad Nizar	PhD (NISE scholarship)	Merrilyn Goos, Niamh O'Meara, Ciara Lane	*Mathematics teacher knowledge and beliefs among out-of-field and qualified mathematics teachers: A comparative study of post primary teachers in Ireland and Indonesia*
Joan Costello	PhD (SFI scholarship)	Merrilyn Goos, Sarah Hayes (SSPC)	*Science capital for youth engagement with STEM*
Carolann O'Neill	PhD	Merrilyn Goos, Marie Parker-Jenkins	*An ecological exploration of the use of ICT for learning in Irish primary education: Children's, teachers', and parents' perspectives*
Michael Lanigan	PhD	Merrilyn Goos, Niamh O'Meara, Ciara Lane	*An enquiry into the dynamics of collaborative mathematics learning as it pertains to the conjecturing atmosphere*
Maria Kyne	PhD	Merrilyn Goos, Marie Parker-Jenkins	*Engineering education quality assurance processes*
Onur Imren	PhD	Sibel Erduran and Liam Murray	*Using commercial video games for Learning scientific practices*
Tracey O'Connell	MRes (Stipend funded by J&J)	Regina Kelly, Merrilyn Goos	*An investigation of the impact of an industry-focused gender intervention on the self-perceptions and career aspirations of female undergraduate students in the STEM disciplines*
Una Fleming	MRes (SFI scholarship)	Oliver McGarr, Merrilyn Goos, Clare McInerny (LERO)	*Decoding the journey, evaluating Junior Cycle Coding in Action (JCCiA) initiative introduced to support the Junior Cycle short course in Coding*

Postgraduate research students (completions 2019/2020)

Sila Kaya	PhD	Orla McCormack, Naomi Birdthistle, Sibel Erduran	*Enhancing pre-service science teachers' understanding of how science works in society: The role of entrepreneurship and economics of science in nature of science*

Postdoctoral Researchers

Dr Aoife Guerin held a postdoctoral research post in EPI•STEM until November 2019. She designed a study that aimed to compare the experiences of three groups of mathematics teachers: (i) out-of-field mathematics teachers, (ii) in-field mathematics teachers who were out-of-field before completing the PDMT, and (iii) in-field mathematics teachers who were always in-field. The study used surveys, interviews, and lesson observations to investigate these teachers' beliefs, confidence, self-efficacy and classroom practice. Initial findings will be presented at the *Teaching Across Specialisations* symposium in Glasgow in September 2020.

Dr Yasemin Özdem Yilmaz, Assistant Professor in Mugla Sitki Kocman University Faculty of Education, was selected to participate in the EHS Faculty's 2019 MasterClass for Marie Curie Fellowship applicants. Yasemin's project was titled *Studying early primary students' reasoning in STEAM problem-solving through argumentation*, with mentors Professor Merrilyn Goos and Dr Aisling Leavy (MIC). Yasemin's project received a Seal of Excellence – a quality label awarded to project proposals submitted to Horizon 2020 that were judged to deserve funding but could not be funded due to budget limitations. Yasemin has been accepted into the EHS 2020 MasterClass and will resubmit her revised Marie Curie Fellowship application in the current round.

4.2 Research Impact

EPI•STEM achieved national recognition for research impact arising from our delivery of the Professional Diploma in Mathematics for Teachers (PDMT). The Higher Education Authority awarded €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.

The funding will be used over the next two years to appoint two postdoctoral researchers in mathematics education and science education, a research assistant and an administrator, thus supporting the continuation of EPI•STEM and 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.

See https://hea.ie/funding-governance-performance/managing-performance/institutional-stories-of-impact/university-of-limerick/

5. Teaching

5.1 Professional Diploma in Mathematics for Teaching

Current delivery of the PDMT

The Professional Diploma in Mathematics for Teaching (PDMT) is an interfaculty postgraduate professional development diploma that is jointly accredited by the University of Limerick and NUI Galway. This university accredited professional diploma is managed by EPI•STEM and delivered nationally in a blended learning format through online lectures (70%) and face-to-face tutorials/workshops (30%) in different institutions including the University of Limerick; the National University of Ireland, Galway; Dublin City University; Cork Institute of Technology; Letterkenny Institute of Technology and Waterford Institute of Technology.

The Department of Education and Skills pays the tuition fees of the participating teachers, who study part-time while still teaching full-time in schools. This funding arrangement has brought more than €7 million to the University of Limerick since 2012. The 6th and final cohort of teachers finished the programme culminating in the PDMT having graduated 1068 teachers who are now recognised as fully qualified teachers of mathematics..

Cohort	**Number of graduates**
1 (Graduated in January 2015)	288
2 (Graduated in January 2016)	240
3 (Graduated in January 2017)	179
4 (Graduated in January 2018)	119
5 (Graduated in January 2019)	134
6 (Graduated in January 2020)	108
Total number graduated by January 2020	**1,068**

The external examiner of the PDMT, Dr Elizabeth Oldham (TCD), provided the following report in September 2019:

> It has been a privilege to be associated as External Examiner with the work entailed in running the PDMT. The programme addressed a clearly identified problem: the presence of many out-of-field teachers who were teaching Mathematics in Irish second-level schools. This fact should be taken in conjunction with research that emphasises the importance of teachers helping students to *make connections* between concepts, and with findings that point to an over-emphasis on teaching procedural fluency at the expense of conceptual understanding in Irish mathematics classrooms. Hence, the need for significant professional development that addressed both mathematical understanding and pedagogies that enhance such understanding was manifest. The PDMT has provided such a programme. The complexity of devising and monitoring a curriculum that would be implemented nationwide was imaginatively addressed, using a blended approach; mathematical content was available online but learning was helped by tutorial support, while pedagogical modules were given in F2F mode. By the time that I was serving as External Examiner, the programme was reaching the end of its period of operation; the teaching materials and resources were established, and at that stage were not going to be changed. Much of the work, therefore, lay in the heavy administrative load and in the academic tasks of supporting and assessing the students. These have been punctiliously and well done. In line with this, from my

own perspective, I commend the degree of organisation and clarity in providing material for me to critique.
In terms of the achievement of learning outcomes for the students, I was shown a cross-section of the work that they presented. The best was outstanding, with students showing comfortable facility with the mathematics and appropriate imagination and creativity regarding pedagogy. The middle-range assignments were satisfactory. The distribution had a tail, encompassing some poorer performances, but this reflects the fact that the programme was suitably challenging (and perhaps that some of the students in the end could not give appropriate time to the Diploma work) rather than shortcomings in the design for teaching and learning. There may not yet be evidence of an improvement in teaching and learning within schools, but I would be very optimistic that course participants and their students have benefited greatly.
Altogether, the work done in devising and running the PDMT has been impressive. I hope that it will be possible for the team to build on the foundations, and to provide further CPD for mathematics teachers based on this model.

The DES contract concludes in August 2020. Currently 14 students are linking in and completing the PDMT course over 3 or more years dependent on their circumstances. Since enrolments closed with the final intake of teachers, more than 400 out-of-field mathematics teachers have registered their interest in enrolling in a future version of the PDMT course.

Future delivery of the PDMT

In December 2019 the Higher Education Authority called for proposals to deliver upskilling programmes for post-primary teachers in mathematics, physics, and Spanish. This represented an opportunity to seek a further 3 years of funding for the enhancement and continuation of the PDMT. EPI•STEM led a national consortium of 7 higher education institutions (NUI Galway, Dublin City University, Technological University Dublin, Cork Institute of Technology, Letterkenny Institute of Technology, Waterford Institute of Technology) in submitting a proposal for a mathematics upskilling programme. The UL-led proposal was selected as the preferred tenderer, and negotiations with the DES are under way regarding refinement of the programme and a feasible starting date.

5.2 Other Teaching

Course	Module	Staff member	Role
LM090	MB4001: Algebra & Discrete Mathematics 1	Niamh O'Meara	Lecturer, Tutor, Co-ordinator
LM090	MB4002: Algebra & Discrete Mathematics 2	Niamh O'Meara	Lecturer, Tutor, Co-ordinator
LM090	EM4006: Subject Pedagogy 2	Niamh O'Meara	Lecturer, Tutor, Co-ordinator
LM090/LM058/LM124	MB4017: Geometry	Niamh O'Meara	Lecturer, Tutor, Co-ordinator
International Foundation Programme	MA2001: Foundation Maths 1	Aoife Guerin	Lecturer, Tutor, Co-ordinator
International Foundation Programme	MA2002: Foundation Maths 2	Aoife Guerin	Lecturer, Tutor, Co-ordinator
LM116/LM118	MA4003: Engineering Maths 3	Aoife Guerin	Tutor
LM116/LM118	MA4004: Engineering Maths 4	Aoife Guerin	Tutor

9 PME theses supervised (Niamh O'Meara, Ciara Lane)
15 school placement students supervised (Niamh O'Meara, Ciara Lane)
1 PDMT action research project supervised (Ciara Lane)
1 MRes Independent Learning Module supervised (Ciara Lane)

6. Engagement

6.1 WiSTEM^{2}D Programme

In 2016, the University of Limerick and Johnson & Johnson formally launched the WiSTEM^{2}D programme with the aim of increasing representation of women in the fields of science, technology, engineering, mathematics, manufacturing and design. The project assists female undergraduate students to investigate issues that hinder their participation in STEM at undergraduate level and pursuing a career in STEM fields.

Johnson & Johnson provide annual funding to support WiSTEM^{2}D Individual Awards and Team Project Awards. Both award programmes provide opportunities for students to meet with female role models from industry, be mentored by Johnson and Johnson industry leaders, visit various J&J worksites and develop their peer networks.

The 2019/2020 WiSTEM^{2}D programme was launched on 15 September 2019 with a social media campaign and video promotion tool. 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 7 November, when the 10 Individual Award Winners and 3 runners up were presented with their awards.

The 20 Team Project students met with the 10 individual award winners and J&J mentors at their introductory workshop in mid-November 2019. The students completed projects on the following topics:

1. Identifying job titles and opportunities available to us as graduates
2. Influence of peers, teachers and families and Industry as women in STEM^{2}D
3. Transitioning into University as a woman in STEM^{2}D
4. The self-confidence formula changing the way for women.
5. How can STEM save the world

A report on research into the impact of the WiSTEM^{2}D Programme completed in May 2020 is available at the following link: https://epistem.ie/resources/research-reports

6.2 SFI Funded Outreach Programmes

Career Mathways: Phase 2

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.

STEMChAT

This project aimed to create new, engaging approaches to providing STEM career information for school students and parents. The project built on the WiSTEM^{2}D programme – a partnership between the University of Limerick and Johnson & Johnson – which connects female undergraduate STEM students to industry mentors, increasing their STEM networks and encouraging them to challenge gender stereotypes in STEM education and careers.

The project's objectives were:

- To encourage school students to consider a wide range of STEM career opportunities, develop positive perceptions of STEM careers and positive intentions to study STEM subjects in future.
- To develop and implement the concept of STEMChATs – small-group conversations between female STEM Champions and post-primary school students – as an alternative to career talks delivered by university lecturers or school-based career guidance counsellors.
- To recruit and train WiSTEM^{2}D programme participants as female STEM Champions who can facilitate STEMChATs.
- To design and deliver a suite of STEM career workshops for school students and parents, addressing gender stereotypes, unconscious gender bias, STEM courses, and STEM careers.
- To train female STEM Champions J&J industry mentors in STEM career workshop facilitation.
- To develop a resource package based on these workshops to be disseminated to participating schools and career guidance counsellors

There were 23 STEM Champions recruited from the 51 female undergraduate students who had participated, or were participating, in the WiSTEM^{2}D programme, and 5 J&J mentors. STEMChAT conversations were developed through discussions with the STEM Champions and EPI•STEM staff, creating a structure for the conduct of these conversations at schools. These were implemented in two rounds, in April-May and September-October-November 201, and reached an estimated 490 school students.

Our evaluation of the project discovered discipline-based and gender-based differences in student attitudes towards the constituent STEM disciplines. Mathematics and Science

elicited the strongest attitudinal responses (negative and positive, respectively), possibly because students have many years of experience in these subjects at school. Girls reported more positive attitudes towards science than boys, and this finding warrants further investigation so that lessons learned from this subject might be applied in the other STEM disciplines to achieve a better gender balance in attitudes and participation.

Young Modellers (YM) Initiative

This project involved EPI•STEM staff collaborating with the Mathematics Applications Consortium for Science and industry (MACSI) to design and deliver a 12-week mathematical modelling module for Transition Year students. The module challenges students and teachers to exploit problem solving-skills to solve real-world problems that appear in science, engineering, technology and industry using mathematical techniques.

Our evaluation of the project showed a small positive change in students' intention to study mathematics at college. Teachers noticed an increase in students' perseverance and taking their own initiative in engaging in solving problems. Teachers also reported some positive changes in their own thoughts, perceptions and attitudes towards mathematics and the teaching of mathematics since engaging with the Young Modellers programme.

6.3 *Irish Independent*

Sum It and Go Figure

Since 2012 EPI*STEM has been responsible for producing monthly mathematics education supplements for the *Irish Independent*. These are a 4-page curriculum-based teaching and study resource which aim to develop students' conceptual understanding of mathematics and problem-solving skills. Through the use of authentic, real-life examples these supplements help develop students' appreciation of the usefulness of mathematics whilst providing fun activities and games that help to motivate and engage students. These supplements are designed for use either in the classroom or as an independent learning tool. To date, EPI•STEM have produced 62 supplements (37 Sum-It aimed at Senior Cycle students, and 25 Go Figure, aimed at Junior Cycle students).

Science Scope

Science Scope is a monthly 4-page supplement published on Mondays by the Irish Independent in partnership with EPI•STEM and covers important curriculum topics across Biology, Chemistry and Physics, all whilst complying with both old and new Science specifications. This supplement has proven to be a valuable resource for both teachers and students in preparation for the Junior Certificate examinations as it can act as both a learning and study tool.

6.4 Other Outreach Activities

National Heritage Awards 2019 Award Winners

The Heritage Council National Heritage Awards shine a spotlight on Ireland's heritage heroes and showcase the most engaging and innovative National Heritage Week events. Olivia Fitzmaurice and Aoife Guerin created a maths trail for the Ennis Friary, Co. Clare, which was shortlisted for these awards. The tour for families explored Ennis Friary through the medium

of mathematics and comprised a trail to cater for children studying mathematics from fourth class to second year. It was developed to broaden the Friary's appeal beyond being a heritage site, and to explore the use of mathematics taught in school today, alongside learning about the life and times of the medieval kings, stonemasons and friars associated with the site.

Maths Week Ireland

Maths Week Ireland is an initiative, currently in its fourteenth year, which promotes awareness, appreciation and understanding of mathematics through a huge variety of events and activities. Each year EPI•STEM hosts an event on behalf of Maths Week Ireland and invites local secondary school students onto UL's campus to experience mathematics through fun and engaging activities.

NALA Tutor Training

The National Adult Literacy Agency hosts an annual workshop which provides professional development opportunities for adult education tutors. Staff from EPI•STEM have delivered a wide range of workshops and plenary talks at these workshops every year since 2012 focusing on the teaching and learning of numeracy.

6.5 Engagement within UL

President's Volunteer Award (Mathematics)

During 2019 – 2020 a member of staff from EPI•STEM in conjunction with the Faculty of Science and Engineering continued to coordinate the President's Volunteer Programme for mathematics where UL undergraduate students tutor secondary students from the Access Campus.

Tutor Training

In August 2019, a member of staff from EPI•STEM in conjunction with the Mathematics Learning Centre (MLC) delivered a mathematics tutor training course for 12 PhD students from the Department of Mathematics and Statistics who were teaching tutorials and/or teaching in the MLC**.**

6.6 Professional Contributions

Examination of Postgraduate Research Theses

Examiner	Details
Merrilyn Goos	Jill Lazarus, 2019, PhD, *Technology in mathematics classroom assessment: A collaborative inquiry*, University of Ottawa, Canada Nicole Maher, 2019, PhD, *Perspectives on pedagogical content knowledge in the senior secondary mathematics classroom*, University of Tasmania, Australia Svanhild Breive, 2019, PhD, *Processes of mathematical inquiry in kindergarten*, University of Agder, Norway

Aoife Guerin	Maria Ryan, 2019, PhD, *An investigation into the extent and derivation of mathematics anxiety among mature students in Ireland*, University of Limerick

External Examination of Taught Programmes

Examiner	Details
Merrilyn Goos	Dublin City University: Bachelor of Science with Education, 2019-2022

Editorships and Editorial Boards

Name	Details
Merrilyn Goos	Advisory Editor, *Educational Studies in Mathematics* (Scimago Q1) Editorial Board Member, *Mathematics Education Research Journal* (Scimago Q2) Editorial Board Member, *Journal of Mathematics Teacher Education* (Scimago Q2) Editorial Board Member, *International Journal of Mathematical Education in Science and Technology* (Scimago Q2) Editorial Board Member, *Teaching Mathematics and Its Applications* (Scimago Q3) Guest editor (with Katja Maass, Michiel Doorman, and Vince Geiger), *ZDM Mathematics Education* special issue on 21st century skills and STEM teaching and learning. Published as Volume 51(6) November 2019 (Scimago Q1)

Research Assessment and Advisory Boards

Name	Details
Merrilyn Goos	Member of the Advisory Board of the Education and Social Research Institute (ESRI) at Manchester Metropolitan University Member of the Australian Council for Educational Research Mathematics Anxiety and Engagement Strategy Advisory Board Member of the Standing Review Board under the Humanities and Social Sciences Panel of the Research Grants Council of Hong Kong Assessor of research grant and fellowship applications: Australian Research Council, National Research Foundation (South Africa), Israel Research Foundation, Royal Society of Canada

Professional Society Leadership

Name	Details
Merrilyn Goos	Vice-President, International Commission on Mathematical Instruction 2017-2020 and 2021-2024 Pre-Submission Coordinator, Annual Conference of the International Group for the Psychology of Mathematics Education. The Coordinator is appointed by the PME International Committee to organise support for novice or inexperienced researchers in preparing Research Reports and Oral Communications for the annual conference.

Conference Organisation

Name	Details
Niamh O'Meara	Member of the Organising Committee for the 15th International Conference of the Mathematics for the Future Project, 4-9 August 2019, Maynooth.