Abstracts for short talks for

Raising Awareness of Maths Anxiety in Ireland Workshop 12th June 2023

1. "Raising Awareness Around Dyscalculia and Maths Anxiety in higher education" Ruth Murphy, Deirdre Casey and Julie Crowley, Munster Technological University
2. "Implementing Mastery approaches to reduce maths anxiety using pedagogical action research with students in Initial teacher education" Geraldine Parks, St. Mary's University College Belfast, Abstract summaries
3. "Developing Mathematical resilience to improve Problem-solving Potential for Highly-able students" Aidan Fitzsimons, Aidan.fitzsimons4@mail.dcu.ie, Oatlands College
4. "Mathematics Anxiety and Adult Numeracy Education in Ireland," Mark Prendergast, Niamh O'Meara, Kathy O'Sullivan, and Fiona Faulkner, University College Cork, University of Limerick, University of Galway, Technical University Dublin
5. "Mathematics Anxiety in Undergraduate Business Studies Students," Orla McCullagh, orla.mccullagh@ul.ie, University of Limerick
6. "Barriers to a career choice in STEM: untangling math anxiety and math self-efficacy" Mariuche Gomides, mariuche.gomides@ucd.ie, University College Dublin, School of Psychology

Ruth Murphy, Deirdre Casey and Julie Crowley, Munster Technological University (Cork, Ireland), "Raising Awareness Around Dyscalculia and Maths Anxiety in higher education"

The Munster Technological University (MTU) "Raising Awareness Around Dyscalculia" (RAAD) project started in 2020. It is a collaboration between the Disability Support Service, the Academic Learning Centre, the Mathematics Department, and student partner. Its objectives were to raise awareness about dyscalculia in our university community, and to identify best practice approaches to support students with dyscalculia. This included developing teaching and studying guidelines to support both lecturing staff and students, following the principles of Universal Design for Learning. We will present our reflections on the learnings from the project as it has progressed to include maths anxiety. The project has sown a seed of interest in the topic of maths anxiety within the MTU Maths Learning Community, where an expert in Maths anxiety was invited to speak to MTU staff, leading to the inaugural meeting of the Irish branch of the Mathematics Resilience Network taking place in MTU. This demonstrates how this project has created an opportunity and a space for academic departments and support services to work closer together in supporting MTU students in the areas of Mathematics, Statistics, and general numeracy, and recognising the role of maths anxiety in maths learning.

Geraldine Parks, St. Mary's University College Belfast, Implementing Mastery approaches to reduce maths anxiety using pedagogical action research with students in Initial teacher education

As Maths anxiety (MA) is a nation-wide issue (Boaler 2013), finding ways to alleviate it and thus prevent teachers passing it to students is something which is significant. Recognising that anxiety in students can

influence achievement, this research considers whether similar feelings in future educators influence the nature and quality of teaching, raising the possibility that teachers who experience MA can affect students' thoughts and feelings. This project utilises pedagogical action research for the improvement of practice in education (Norton 2014). It explores the impact of Mastery teaching on the thoughts and feelings of student teachers as they complete a 10-week programme on the delivery of the Primary Maths curriculum. The EEF (2017) indicates the pedagogy had positive outcomes for children in England and therefore is something I explored in NI beginning with students in ITE with a view to extending it to schools in the future. Data analysis continues, however Initial findings suggest that Mastery teaching may alleviate maths anxiety and increase confidence in teaching Maths. If Mastery pedagogy goes some way to obtaining this goal and helps raise standards in schools, it may make a valuable contribution to our Education across the island of Ireland. In addition to discussing my project, I would like to widen this study in the future to see if similar results can be obtained in other colleges.

Aidan Fitzsimons, Aidan.fitzsimons4@mail.dcu.ie, Oatlands College, **Developing Mathematical resilience to improve Problem-solving Potential for Highly-able students**

Problem-solving Potential (PsP) is a triad construct of problem-solving skills, mathematical resilience and mindset. As part of a doctoral study, an intervention was developed to improve the PsP for highly-able Transition Year students. The intervention focused on mathematical problem-solving in a collaborative learning environment, with a facilitator to encourage traits of both mathematical resilience and a growth mindset. During the intervention, 98% of students were found to improve their PsP. In this talk, I will discuss the benefits of the development of mathematical resilience to this student cohort's PsP, and how the intervention was designed to promote traits of mathematical resilience. I will also discuss how mathematical anxiety may impact upon highly-able students' progress in the subject.

Mark Prendergast, Niamh O'Meara, Kathy O'Sullivan, and Fiona Faulkner, mark.prendergast@ucc.ie, University College Cork, University of Limerick, University of Galway, Technical University Dublin, **Mathematics Anxiety and Adult Numeracy Education in Ireland**

The affective domain and how emotions and learning are interlinked have long been recognised as an important aspect of education. This paper revisits data from a number of recent numeracy studies carried out in the further education and training sector in Ireland to investigate the causes and impact of mathematics anxiety amongst adult learners. Carpentieri et al. (2010) determine that adult numeracy learners have often had particularly poor school experiences of education, and in particular mathematics education. Such negative classroom experiences from the past are often the causes of mathematics anxiety for these learners (SOLAS, 2021). These findings are in line with those to emerge from this study which found that the most common barriers to accessing adult numeracy courses in Ireland arose from dispositional factors relating to fear, anxiety and lack of confidence with mathematics, largely due to negative experiences in formal schooling. Such negative experiences were strongly linked to a teaching style which excludes and reduces the time given to those students who were perceived to be less mathematically able. These findings align with research on the prevalence and consequences of mathematics anxiety amongst adults (Bibby, 2002; Carpentieri et al., 2010; Coben et

al., 2003) and provides evidence to inform the recruitment of adult learners and the preparation of adult numeracy tutors.

Orla McCullagh, orla.mccullagh@ul.ie, University of Limerick, Mathematics Anxiety in Undergraduate Business Studies Students

Performance in mathematics can be attributed to factors other than mathematical ability. A growing body of literature examines the significant impact of mathematics anxiety on mathematical performance and individuals' choices with respect to study and career pathways. However, much of the focus has been on Science, Technology, Engineering, and Mathematics (STEM) subjects, renowned for their high mathematical content. This study examines the prevalence, characteristics, and influence of mathematics anxiety in undergraduate business studies students. In all aspects of business, there is a strong impetus for the adoption of Artificial Intelligence (AI), data analytics, and machine learning prompting reform of business studies curricula. Hence, this is a critical juncture at which to examine mathematics anxiety within this cohort. We carried out a survey of undergraduate business studies students which integrated the Mathematics Anxiety Scale (MAS-UK) as a measure of participants' mathematics anxiety. We found gender to be an important factor influencing heightened levels of mathematical anxiety for females across all measured levels of mathematical ability. We further found an association between high levels of mathematics anxiety and business discipline pathway. This has important implications for business curricula reform and provides a foundation for the development of pedagogical interventions.

Mariuche Gomides, mariuche.gomides@ucd.ie, University College Dublin, School of Psychology, **Barriers to a career choice in STEM: untangling math anxiety and math self-efficacy**

Math anxiety might steer way students from pursuing careers in STEM. Previous research showed that highly math-anxious students are more likely to avoid math-related courses and activities. When investigating the association between math anxiety and career choice, very few studies have controlled for other possible confounding factors (e.g., math ability and math self-efficacy). The current study examined how math anxiety affected undergraduates' likelihood of pursuing a career in STEM, their attitudes towards mathematics, and their perceived mathematics abilities. Data from 180 Irish and English undergraduate students were analyzed. Math anxiety was not a significant predictor of undergraduates' likelihood of pursuing a career in STEM after accounting for the effects of math fluency, math self- efficacy, trait anxiety, and gender. However, further regression models indicated that math anxiety significantly predicted participants' attitudes towards mathematics and their perceived mathematics abilities. At odds with previous research, math-anxious individuals were not less likely to avoid a career in STEM. Interestingly, math self-efficacy, which was highly correlated with math anxiety, was a significant predictor of career choice. Nonetheless, math anxiety explained participants' attitudes towards math and their perceived math abilities. The present findings might suggest that math anxiety might play an indirect role in the association between beliefs and attitudes towards math and career choice.