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Mark Prendergast

Annette Forster

Niamh O'Meara

See next page for additional authors

Authors

Mark Prendergast, Annette Forster, Niamh O'Meara, Kathy O'Sullivan, and Fiona Faulkner

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Numeracy-Meets: an innovative professional development model for adult numeracy practitioners in Ireland

Mark Prendergast [a], Annette Forster[a], Niamh O'Meara [b], Kathy O'Sullivan[c] and Fiona Faulkner[d]

aSchool of Education, University College Cork, Cork, Ireland; bEPI*STEM, University of Limerick, Limerick, Ireland; cSchool of Education, University of Galway, Galway, Ireland; dSchool of Tourism and Hospitality Management Response, Technological University Dublin, Dublin, Ireland

ABSTRACT

Despite the clear and obvious need for adults to be proficient in numeracy, international studies suggest that many continue to struggle in this area. In Ireland, one of the main challenges continues to be the availability of effective adult numeracy education. This is a diverse sector, and little is known about the varied provision of adult numeracy courses and of those who teach on them. Recent research has highlighted an unmet demand for the professional development of adult numeracy practitioners with many looking for opportunities to network and further develop their practice. This study aimed to design, implement and evaluate a professional development model that supported adult numeracy practitioners in developing the necessary skills to support their students. After an initial needs analysis, a series of six 'Numeracy-Meets' were designed and implemented between February and May 2022. There was an average of twenty adult numeracy practitioners in attendance at each Numeracy-Meet. After all the Numeracy-Meets had taken place, five practitioners took part in individual semi-structured interviews to evaluate their experiences. This paper details the design, implementation and evaluation of these Numeracy-Meets and discusses whether they are a sustainable model of professional development for adult numeracy practitioners.

Introduction

The development of a numerate society is an international and national priority in education. The United Nations Sustainable Development Goals (SDGs), Target 4.6, calls on all world countries to ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy by 2030 (United Nations 2015). Research shows numeracy skills are critically important for the adult population to allow individuals to meaningfully engage in society; to earn a good wage; and to

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CONTACT Mark Prendergast ✉ mark.prendergast@ucc.ie 🏫 School of Education, University College Cork, Cork ,T12 R229, Ireland

protect their physical and mental wellbeing (Carpentieri, Litster, and Frumkin 2009; Parsons and Bynner 2005). On the other hand, low numeracy levels amongst adults can contribute to intergenerational cycles of inequality and disadvantage (Carpentieri, Cara, and Litster 2013). For example, research has shown that adults who struggle with numeracy are more likely than others to have lower incomes, have trouble finding employment, and suffer from poorer health (Carpentieri, Litster, and Frumkin 2009; Parsons and Bynner 2005).

However, despite such recognised importance, findings from the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), suggest that large numbers of adults, sometimes upwards of 30–60% in middle income countries and 10–40% in high-income countries, have low or very low numeracy skills (OECD 2019). The PIAAC numeracy proficiency scale is divided into six proficiency levels: Levels 1–5 and below Level 1. The overall PIAAC performance in numeracy showed that 7.5% of the adult population across 39 countries were at or below level 1 (the lowest levels) (OECD 2019). In essence, these adults are not capable of going beyond one-step processes in the area of numeracy nor are they capable of dealing with problem scenarios where the numeracy component is not wholly explicit.

With these issues in mind, it is important that there is increased attention on adult education, and particularly to the availability and quality of adult numeracy education. In Ireland, the Education and Training Boards (ETBs) are the national providers of post-compulsory Further Education and Training (FET), alongside a smaller range of adult and community education groups. The ETBs evolved from the Vocational Education Committees (VECs), restructured by the Irish state into sixteen regional ETBs in 2013 under the Education and Training Board Act (Grummell 2023). ETBs offer a range of accredited and unaccredited courses of learning, and they have responsibility for providing education and training, and youth work in Ireland. In terms of adult numeracy education, the provision across this sector remains diverse and little is known about the delivery of courses, those who attend them, and those who teach on them. For example, the National Adult Literacy Agency (NALA) estimates that there are currently over 40,000 adults attending literacy courses mainly provided by the ETB Adult Literacy Service in Ireland (NALA 2023). However, because adult numeracy is considered to be a component of adult literacy, there is no data collection to show how many adults' access or persist with numeracy-specific provision (Goos et al. 2023). In 2021, SOLAS (a State agency of the Department of Further and Higher Education, Research, Innovation and Science) commissioned a research study that sought to ' … capture and document standalone and integrated adult numeracy activity in the Education and Training Board (ETB) context, in order to develop good practice guidelines and inform future development of adult numeracy policy and practice' (SOLAS 2021, 6). It was envisaged that such an endeavour would provide a contemporary overview of numeracy provision in Ireland and inform a series of guidelines that would help shape the future of numeracy provision for adults. There were four main guidelines set out by SOLAS, the last of which focused on 'Supporting and developing adult numeracy tutors'. This guideline proposed that ETBs 'Plan for adult numeracy tutors' professional development' and 'Create networking opportunities for adult numeracy tutors' (SOLAS 2021, 11). With these recommendations in mind, this study sought to address the

following research question: How can the needs of adult numeracy practitioners in Ireland be addressed through the design, implementation and evaluation of a professional development model?

Overview of adult numeracy

The term numeracy was first used in the Crowther Report in 1959 and was initially defined as the mirror image of literacy but involving quantitative thinking (Geiger, Goos, and Forgasz 2015). Since then, its meaning has continued to evolve into a broader and more extensive concept (Hoogland and Díez-Palomar 2022). Modern-day scholarship views numeracy as a multi-dimensional concept involving the use of mathematical knowledge, tools, dispositions and critical thinking in a variety of real-life contexts (Geiger, Goos, and Forgasz 2015). In today's high-tech and scientific based society, numeracy is essential in helping people to participate as knowledgeable and insightful citizens. However, despite such importance, the domain seldom gets the recognition it deserves, and numeracy related skills and expertise that people use on a day-to-day basis can often go unnoticed (Diez-Palomar 2020; Keogh, Maguire, and O'Donoghue 2018). This is particularly the case in adult numeracy.

As outlined by Gal et al. (2020), 'Adult numeracy is a construct related to the ways people cope with the many mathematical, quantitative, and statistical demands of adult life' (378). It is very much an under-researched and under-theorised field (Coben et al. 2003; Safford-Ramus 2018). For example, in the U.S., Tout and Schmitt (2002) found that while there was a high level of research into secondary level mathematics education and general adult education, less than 1% of such research specifically addressed numeracy or mathematics within adult education. However, there has been increased attention around the globe in recent years. This is a consequence of the 'number drenched' society that has developed. Hoogland and Díez-Palomar (2022, 5) surmise that 'we are living in a numerate society, full of codes, data, uncertainty, and people do need to use numeracy skills to deal with all of that'.

From an Irish perspective there has been much research since the turn of the century into understanding adult numeracy. For example, the work of O'Donoghue (2002) and Maguire and O'Donoghue (2003) has been central to the evolving conception of numeracy, shifting from a narrow view founded on basic arithmetic to include more complex cognitive skills such as problem solving and communication. However, despite this backdrop, the performance of Irish adults in large scale assessment programmes remains a concern. When Ireland took part in the Programme for the International Assessment of Adult Competencies (PIAAC) in 2012, it revealed that over one-quarter (25.3%) of adults scored at or below Level 1 on the numeracy scale (OECD 2013). This score ranked Ireland 19th out of 24 participating countries and suggested that 754,000 Irish people struggle with everyday numeracy and may be unable to do a basic calculation such as subtraction (NALA 2017). This concerning issue has been reflected in a continued national policy focus over the past decade which has culminated in the publication of the first *Adult Literacy for Life (ALL) Strategy for Ireland* in 2021. This cross-Government strategy is underpinned by one simple vision: 'An Ireland where every adult has the necessary literacy, numeracy and digital literacy to fully engage in society and realise their potential' (Government of Ireland 2021, 33).

Adult numeracy provision in Ireland

Responsibility for the provision and accreditation of numeracy education to adult learners in Ireland lies with a number of State bodies. SOLAS, the State agency that manages FET programmes, along with the ETBs, fund all numeracy programmes within their provision (Goos et al. 2023). While the majority of adult learners receive tuition through the sixteen ETBs, a small number may also access numeracy education in other settings including community education, probation projects and disability services (NALA 2017). These are often voluntary, community-orientated settings which are generally outside the formal education sector and may offer some accredited or non-accredited adult numeracy provision. One such example is the Irish Men's Sheds Association. This is a community-based project, where men can come together to learn, share skills and make long-lasting friendships. While the learning activities in Men's Sheds are not typically linked to formal qualifications, Carragher and Golding (2015) found that a lot of incidental and informal learning results from the activities pursued. Members often work on projects in woodwork and crafts. While there may be numeracy skills involved, such tasks are often not conceptualised as numeracy learning.

This is a particular issue in Ireland as there is no agreed working definition of numeracy for use in adult education settings. A *Numeracy Definition Report* published by NALA (2022) recommends that SOLAS, in collaboration with the FET sector and others, should agree a working definition. The same report examined how the Common European Numeracy Framework (CENF) could be used or adapted to represent adult learners' understanding of numeracy in the Irish context. The CENF is a comprehensive numeracy framework developed to identify key factors in improving the quality of numerate behaviour of adult learners across Europe and to highlight numeracy as a multifaceted construct that goes far beyond basic mathematics (CENF 2022). The framework recognises numeracy as a multifaced concept and distinguishes between four main categories: context, content, higher-order skills and dispositions.

As well as there being no agreed working definition of numeracy for use in adult education in Ireland, there is also no national adult numeracy curriculum and no standardised course materials. NALA (2020) note how adult literacy and numeracy education in Ireland, is based on a 'student centred approach where the needs, concerns and experience of the students are the focus of learning, rather than an externally structured and enforced curriculum' (51). This is also the case for adult literacy education. The system is seen as facilitating and supporting a learner-centred ethos through responsive pedagogy and practices (Adult Literacy Organisation Association (ALOA) 2022). With specific reference to numeracy, each ETB decides on the type of numeracy programme they design and make available to the adult learners in their area and how these programmes are delivered. Standalone numeracy courses tend to focus on numeracy in everyday and practical contexts, such as numeracy for work, family and finance (Goos et al. 2023). Numeracy can also be offered as part of integrated, general learning certificate programmes in gardening, horticulture, internet skills and communications (NALA 2017). For example, a course on gardening can become 'a natural context for numeracy learning about measurement (length, perimeter, area, volume) and shapes (different-shaped garden beds)' (SOLAS 2021, 63). Responsibility for the accreditation of these

programmes, whether standalone or integrated, lies with Quality and Qualifications Ireland. For learners to gain certification for a course undertaken in an ETB or elsewhere, the programme(s) offered by the provider must be accredited by the QQI. Adult numeracy courses are accredited using the 10-level National Framework of Qualifications (QQI 2021) and tend to be offered at Levels 1–4, corresponding to knowledge and skills that are mainly concrete and applied in practical contexts (Goos et al. 2023).

The adult numeracy practitioner

The provision of adult numeracy education internationally is varied and complex, and courses often differ depending on who is teaching on them. Smith and Gillespie (2007) summarised the characteristics of adult education practitioners in the U.S. as working mostly part-time, few having formal qualifications in teaching adults, and they are not consistently provided with financial support to participate in in-service professional development. In the U.K., a review of the professional development and qualifications of adult educators revealed the inconsistent background of practitioners and the lack of systematic professional development opportunities (Morton, McGuire, and Baynham 2006). A similar scenario can be found in Ireland. A recent ALOA (2022) report noted that the current recruitment and progression conditions for adult educators do not encourage experienced practitioners to stay, nor do they encourage experienced people from other roles to bring their expertise to the adult education sector. As a consequence, there is a high turnover of staff and practitioner availability is often a challenge. Most practitioners are either volunteers or employed part-time. For instance, the SOLAS (2021) report found that only three ETBs had full-time staff members involved in adult numeracy. Furthermore, while professional development is offered, there is no formally accredited adult numeracy practitioner training and no requirement for practitioners to possess recognised teaching qualifications. Research carried out by NALA (2013) found that over 60% of adult numeracy practitioners reported that they did not have enough training in teaching numeracy to adults, and 15% reported that they had no training at all.

As outlined in the Introduction, the aim of this study was to advance Guideline 4 of the SOLAS (2021) report in 'supporting and developing adult numeracy tutors' in Ireland. For this study, the authors have used the word 'practitioner' to describe those who provide adult numeracy tuition in Ireland. As outlined previously, while there is considerable literature on mathematics teaching and learning in general, there is far less specifically relating to adult numeracy. Thus, there is very little evidence on how to effectively teach adult numeracy. Carpentieri, Litster, and Frumkin (2009) determined that in adult numeracy teaching, it is sometimes easier to quantify 'bad practice' than to define 'good practice'. NALA (2015) developed a framework for meeting the professional development needs of adult numeracy practitioners in Ireland. Their framework recognised that practitioners are also adult learners in the context of professional development, and it recommended that learning should be underpinned by a broad and dynamic view of numeracy. Given the learner centred ethos in adult education outlined in the previous section, adult numeracy practitioners in Ireland need to be reflexive in programme design and delivery and spend a lot of time in developing content specifically adapted to each learner's needs (ALOA 2022). The NALA framework also identified important qualities and knowledge that adult numeracy practitioners need to possess, including

excellent understanding of elementary mathematics; digital literacy skills; and a view of mathematics as part of everyday life. The SOLAS (2021) report recommended that ETBs should consider ways of supporting adult numeracy practitioners to develop these qualities, and of making such opportunities accessible to practitioners while avoiding costs in terms of time and financial commitment.

The study

This was a collaborative study bringing together academic expertise in the field of numeracy, teacher education and adult numeracy education. The researchers had worked together on previous adult numeracy projects and felt well placed in targeting Guideline 4 of the SOLAS (2021) report. The research team also sought the support of NALA. NALA is an independent charity committed to supporting people with literacy and numeracy difficulties in Ireland and ensuring they can fully participate in society and have access to learning opportunities that meet their needs. Since its establishment in 1980, NALA has developed and delivered professional development resources and opportunities for adult numeracy practitioners in Ireland. The researchers felt that the organisation's knowledge and networks in the area would be an invaluable addition to the project team.

Ethical approval for the study was granted in January 2022 by the Social Research Ethics Committee in University College Cork (Log 2021-226). The research was carried out in three main phases which took place over a five-month period between February and June 2022. Phase 1 was a needs analysis of a sample of adult numeracy practitioners in Ireland and the subsequent design of a professional development model. This model was implemented and evaluated in Phase 2 and Phase 3, respectively. The write up of this paper will be structured using each of these sequential Phases to guide the reader through the study.

Phase 1 – the design

Needs analysis

The first step in the design of the professional development model was a needs analysis of a sample of adult numeracy practitioners in Ireland. This was done through an online questionnaire using an instrument adapted from the Teaching and Learning International Survey (TALIS) Teacher Questionnaire Professional Development section (OECD 2018). There were three parts to the questionnaire, namely:

(1) Background information
(2) Attitude towards and perception of teaching
(3) Professional development needs.

The 16-item questionnaire was circulated via a Microsoft Forms link using non-probability sampling through NALA adult numeracy networks in February 2022. It was completed by 33 respondents. The quantitative data was recorded and transferred into an SPSS (version 25) file for statistical analysis. Given the relatively small sample size,

caution must be applied to the interpretation of findings from the statistical tests. The data from any open-ended questions were transcribed into a Microsoft Word for content analysis in relation to the professional development needs of adult numeracy practitioners. The findings show that the respondents ranged in age from 30 to 69 and the majority were female (79%). Berliner (2004) contended that teachers can be classified as 'novice' or 'expert' depending on experience. The time to develop expertise has been estimated at between 5 and 7 years (Berliner 2004). Taking 7 years as the time to develop expertise in teaching, 58% of practitioners in the current study would be classified as 'expert' and 42% would be classified as 'novice'. In terms of their 'Attitudes and Perceptions of Teaching', practitioners were generally confident in their abilities. For example, over 90% indicated that they could 'provide an alternative explanation' or 'vary instructional strategies' 'quite a bit' or 'a lot'. Respondents were least confident in their ability to support student learning through digital technology – 44% answered 'to some extent' to this question. In terms of professional development, 87% had engaged in online courses or seminars in the previous 12 months. However, they also identified specific areas in which they had a need for Continuous Professional Development (CPD). For example, 65% of practitioners indicated that they had a moderate to high level of need for CPD in pedagogical competencies in teaching numeracy. The TALIS questionnaire glossary refers to 'pedagogical competence' as 'knowing how to teach' and refers to competencies such as explaining, organising, etc. The needs analysis found that novice practitioners (92%) were more likely to require a moderate or high level of support in this area than expert teachers (41%). A Fisher's Exact test revealed that this difference was statistically significant ($p < .01$). Furthermore, 75% of practitioners revealed a moderate to high level of need for CPD in Information and Communication Technology (ICT) skills for teaching numeracy. A Fisher's Exact Test showed no significant difference in the need for support in this area between novice and expert teachers ($p = .408$). Respondents were also asked about barriers to participation in CPD. In all, 90% of practitioners 'agreed' or 'strongly agreed' that 'conflicts with work' affected their participation in CPD. 'Family responsibilities' were also cited as a barrier by 64% of practitioners. In an open-ended question on how the CPD needs of adult numeracy practitioners might be best supported, the main findings were centred on workshops, communities of practice, or collective forums where ideas could be shared. Participants also noted that shorter inputs which did not involve a long commitment would be most suitable.

Design of a professional development model

Taking the findings from the needs analysis into account, the research team decided to design a series of online Numeracy-Meets to best address practitioners needs. The term Numeracy-Meets was adapted from the Teach-Meet model of professional development which was developed in Scotland in 2006 and has been referred to as 'guerrilla CPD' (Bennett 2012). According to Blanchett (2014, 5), Teach-Meets 'provide a nice informal atmosphere to share ideas and good practice with a chance for everyone to have their say'. Many consider Teach-Meets to be based on the community of practice (CoP) model of CPD (Amond, Johnston, and Millwood 2018). The term communities of practice was first coined by Lave and Wenger (1991) in their book Situated Learning. This theory was further built on by Wenger (1998) in her book Communities of Practice: Learning,

Meaning, and Identity. Fundamentally, they are considered to be a type of informal learning community for both expert and novice practitioners in a social environment. As summed up by Wenger (2011, 1), CoPs are 'groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly'.

Li et al. (2009) note that CoPs are still an evolving concept and have been adopted in different contexts to facilitate knowledge exchange and learning between professionals. As such, there have been many arguments in the literature about what theoretically constitutes a community and whether a 'CoP' is truly a 'CoP' (Vrieling, Van den Beemt, and De Laat 2016). According to Wenger (1998), it is necessary to consider three defining characteristics in order for a CoP to emerge: a focus on a shared interest and domain; involvement in joint activities, discussions and sharing of information; and the development of a shared repertoire of resources. After considering each of these characteristics, the authors were satisfied that the Numeracy-Meets model would meet the criteria of a CoP. The shared focus would be adult numeracy; there would be discussions of practice and sharing of planning and instructional approaches; and there would be a shared repertoire of resources gathered after each Numeracy-Meet.

While the term Numeracy-Meets was initially adapted from the Teach-Meet model, there were also some fundamental design differences between the two. Amond, Johnston, and Millwood (2020) note that a Teach-Meet is 'an informal professional development event organised by teachers for teachers' (483). While informal in nature, the Numeracy-Meets were organised and facilitated by external providers rather than practitioners themselves. Furthermore, Teach-Meets generally involve a gathering of teachers from the same school or teachers from a cluster of nearby schools. However, given the dispersed nature of numeracy practitioners in Ireland, this would not be possible. The Numeracy-Meets needed to be a nationwide professional development strategy for remote practitioners to network and further develop their practice. According to Wenger, McDermott, and Snyder (2002), CoPs can exist both physically and virtually. Karam et al. (2018) noted that online CoPs afford promising alternatives for overcoming the absence of collocated peers and so it was decided that the Numeracy-Meets would take place virtually. There were also other benefits in deciding upon a virtual CoP. Unlike CoPs that meet face to face, the online nature ensures flexibility as well as anytime and anyplace participation (Karam et al. 2018). They can also give learners opportunities to revisit, extend and reflect on ideas and concepts at their own pace (Borba et al. 2016).

With all of this in mind, six online Numeracy-Meets were designed with the aim of providing practitioners with professional development in which learning could occur in an informal way, primarily through social interaction. This approach was particularly suited to this study's focus on numeracy given that 'like all human activity, numeracy is essentially social, and it is located in the interaction between people' (Barton and Hamilton 2012, 3).

Phase 2 – implementation

In terms of structure, the underlying theory of each Numeracy-Meet was an adaptation from Farley-Ripple and Buttram's (2014) work on developing learning communities in
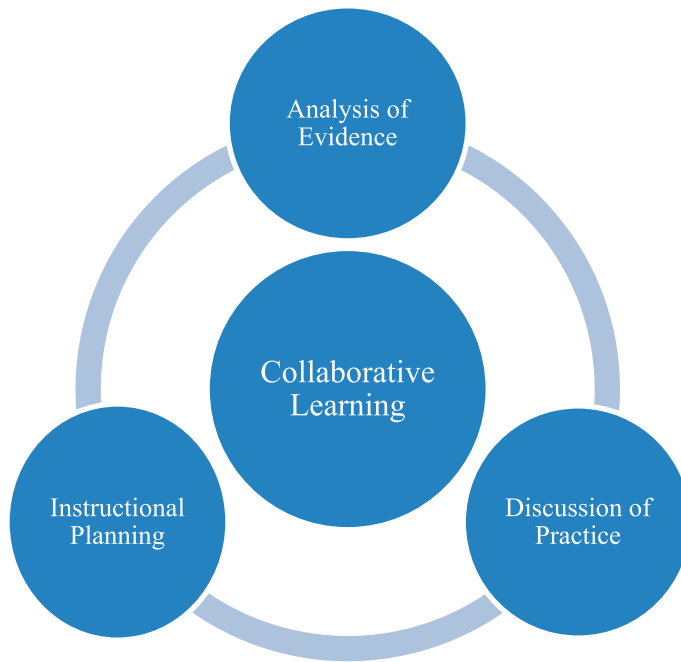
Figure 1. Underlying theory of each Numeracy-Meet.

the U.S. (see Figure 1). The central assumption of any community is that collaboration helps and that teaching and learning is more effective if practice and experiences are openly shared and discussed (Bolisani et al. 2020). Thus, there were three important components to the planned structure of each Numeracy-Meet. As evidenced from Figure 1, analysis of evidence, discussion about teaching practice, and instructional planning were at the heart of effective collaboration between the numeracy practitioners.

The common format of each Numeracy-Meet generally involved a twenty-minute input on a specified topic from an invited speaker followed by discussion and contributions from several attending practitioners (see Figure 2).
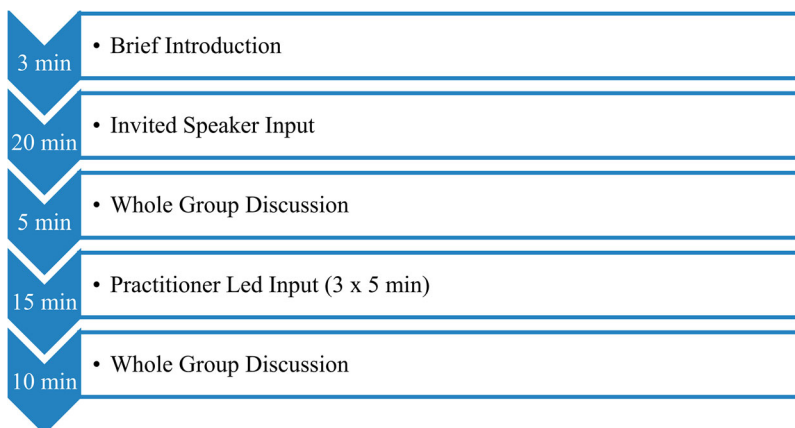

Figure 2. Common format of each Numeracy-Meet.

The content focus of the Numeracy-Meets centred on specific life domains (e.g. financial, health, digital, etc.) and related uses and practices of numeracy in the context of work, family and everyday life. This focus was adopted from the categories of the CENF and the specific content was planned and organised around the underlying theory and common format. For example, in terms of 'analysis of evidence', each Numeracy-Meet began with an input from an invited academic who shared evidence of previous research and theory in a specified domain (e.g. family numeracy) There was also practitioner-led input which focused primarily on discussing pedagogical strategies and sharing instructional planning for teaching numeracy in the specified domain. For instance, Figure 3 shows an example of a planned instructional activity that was discussed and shared in the context of family numeracy.

The resources from each of the Numeracy-Meets were shared with all participants and are available at https://epistem.ie/numeracy-meets/.

As evidenced in Figure 4, the implementation of the six Numeracy-Meets took place between 16 February 2022 and 11 May 2022. They were facilitated online using the Microsoft Teams platform and were scheduled on Wednesdays between 1pm and 2pm. Practitioners were asked to register their interest to attend the Numeracy-Meets via a Microsoft Forms link which was circulated through NALA's adult numeracy networks.

In total, 60 adult numeracy practitioners registered their interest. There was a wide range of diversity in the background of the practitioners who registered. For example, 14 of the 16 ETB's in Ireland were represented, along with adult numeracy practitioners from the Irish Prison Service, third level and other non-profit organisations. There was a range of 14–23 attendees across the six Meets and the median number of attendees who attended each Meet was 20. As evidenced from Table 1, the number of attendees was generally consistent over the course of the six Meets. The lowest attendance was for Numeracy-Meet 4 which focused on 'Numeracy for Health'. However, the drop in attendance for this Meet can be explained by a scheduling clash with another lunchtime professional development event for adult literacy practitioners.

Of the 60 adult numeracy practitioners who initially registered their interest, 40 attended at least one of the Numeracy-Meets. In line with the gender breakdown of
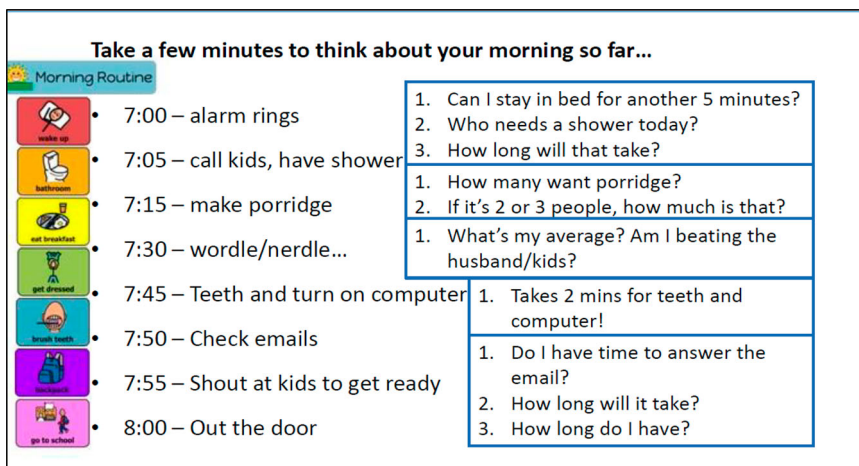

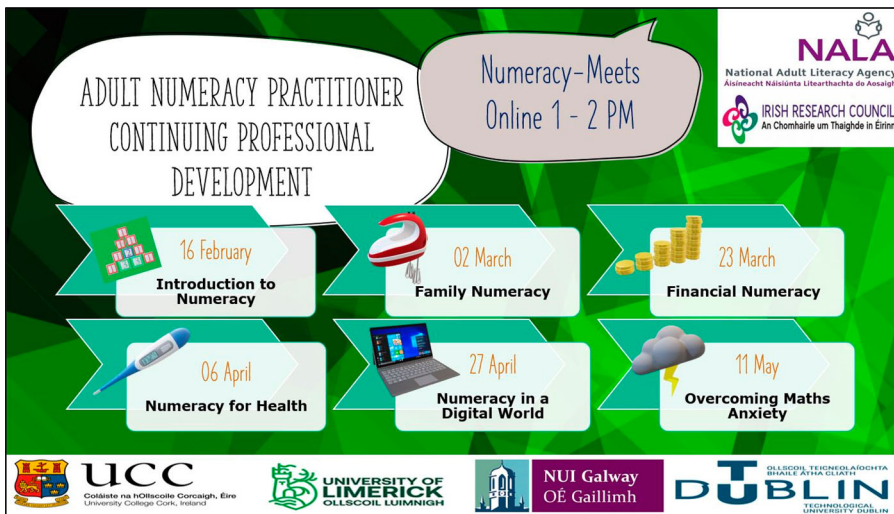**Figure 3.** Example of activity used in the 'Family' Numeracy-Meet.

Figure 4. Marketing poster with overview of the Numeracy-Meets.

Table 1. Overview of attendance at each of the Numeracy-Meets.

Date	Focus	Attendees
16/02/22	1. Introduction to Numeracy	23
02/03/22	2. Family Numeracy	21
23/03/22	3. Financial Numeracy	23
06/04/22	4. Numeracy for Health	14
27/04/22	5. Numeracy in a Digital World	19
11/05/22	6. Overcoming Maths Anxiety	18

the needs analysis in Phase 1, only 8 of the 40 attendees were male (5 of these 8 attended on only one occasion). There was a core group of 15 practitioners who attended at least four of the six Numeracy-Meets (Table 2). This core group included only 2 male practitioners.

Phase 3 – evaluation

The third and final phase concerns the evaluation of the Numeracy-Meets model. A central component of any intervention is its evaluation. There are four key parameters, outlined by Shapiro (1987) by which intervention research can be evaluated. These are

Table 2. Overview of repeat attendance at Numeracy-Meets.

	Number of Practitioners
Attended 6 out of 6	5
Attended 5 out of 6	4
Attended 4 out of 6	6
Attended 3 out of 6	7
Attended 2 out of 6	5
Attended 1 out of 6	13

not concerned with how the change is brought about but with establishing the boundaries of effectiveness or the relevance to practice (Prendergast and O'Donoghue 2014). The four parameters outlined by Shapiro (1987, 290) are treatment effectiveness, treatment integrity, social validity and treatment acceptability.

The data with which to evaluate the intervention was gathered using semi-structured interviews. After the six Numeracy-Meets had taken place, five participants were purposively selected from the core group of 15 practitioners who had attended at least four of the six Numeracy-Meets. These five participants were purposively selected to ensure that there was a proportional gender balance (one male and four female practitioners) and that there was representation from five different ETB's and adult education settings. Once selected, an email invitation was sent to take part in a one-to-one interview to evaluate their experience of the Numeracy-Meets. The email contained an information sheet explaining the key points and procedures of the study. It was made clear that their participation in the interview was completely voluntary and that they could refuse or withdraw without consequence. All five participants consented to take part and the interviews were conducted via Microsoft Teams in June 2022. The interviews were semi-structured, with nine questions divided around three main areas, namely:

(1) Overall perceptions of Numeracy-Meets as a professional development model (e.g. What did you most/least like about the Numeracy-Meets model?)
(2) Appraisal of the Numeracy-Meets in terms of addressing the CPD needs of adult numeracy practitioners (e.g. What CPD needs were the Numeracy-Meets most/least effective in addressing?)
(3) Future of Numeracy-Meets (e.g. How do you feel the Numeracy-Meets model could be sustained in the longer term?)

The data from each interview was transcribed into a Microsoft Word document and content analysis was performed by two of the authors. The application of content analysis ensured a systematic examination and interpretation of the qualitative data which informed our overall findings. The authors read and re-read the interview excerpts, and then coded the data which enabled the identification of initial themes. This process was then further shaped using the four evaluation parameters of Shapiro (1987) framework. Each of these parameters and relevant findings will now be discussed in further detail and accompanied with examples of quotes from the interviewees (pseudonyms used – Abbi, Brian, Chloe, Deirdre and Eimear).

Treatment effectiveness

The effectiveness of an intervention involves the evaluation of any change that occurred as a result of the intervention in relation to the amount of change, the immediacy of change, the strength of change that occurs, and generalisation (Shapiro 1987). Overall, the data from the interviews indicated that practitioners found the intervention *useful* and felt that the sessions *positively affected their practice*. Interviewees liked the *combination of theory and practice* and the *mutual sharing of practical ideas* which took place at the Numeracy-Meets.

> Deirdre: "I found it very good. It went through theory and then it related back to our every-day practices. It went back over past research that had been done and applied it and probably showed where it was going for the future."

Additionally, participants were interested in the different approaches used by practitioners, how practitioners approached different QQI levels, and the challenges that other practitioners face. They noted that the sessions provided 'a new angle' on numeracy and offered good practical examples that were instantly usable. For example, Eimear became more aware of numeracy in everyday life, allowing her to naturally incorporate numeracy in classes. Deirdre liked that the sessions provided ideas and content that was adaptable to different QQI levels.

Treatment integrity

Treatment integrity involves the 'extent to which a specified treatment is actually implemented in the manner prescribed' (Shapiro 1987, 292). This is of utmost importance to ensure that replicable results would be obtained if the intervention was to be repeated. As outlined previously, each of the six Numeracy-Meets followed the same underlying theory of action with a focus on three main components, namely, analysis of evidence, discussion about teaching practice, and instructional planning. Furthermore, each Numeracy-Meet also followed the same common format (as outlined in Figure 2) and was led by the same facilitator who mediated the online interaction between users. Interviewees commented on the importance of *the role played by the facilitator* and the relationship between practitioners and the research team. Brian explained that practitioners do not want to be told what to do and felt that 'the informal, light way' in which the Numeracy-Meets were conducted made practitioners feel comfortable. This point was also supported by Deirdre.

> Deirdre: "Very good facilitator who was encouraging and reassuring and eliminated our fears about expressing opinions and demonstrating ideas."

Social validity

Social validity is defined as 'the evaluation of the intervention' by the participants (Shapiro 1987, 293). Practitioners were asked about their overall perception of Numeracy-Meets as a professional development model, in terms of what they most and least liked. All participants contended that the Numeracy-Meets provided *relevant content, useful ideas for the classroom, and insightful information*. They enjoyed the participation of invited speakers from different areas and the adult education focus. Chloe noted that she would share the research findings discussed at Numeracy-Meets with coordinators at her education centre so that the research could inform decision making at the centre.

> Chloe: "The resources that were made available as well the presentations and the recordings I think they are a great tool for us maths tutors to have to try to influence strategy at centre level if we can."

Brian had already shared links to Numeracy-Meets videos and resources with colleagues who could not attend the online sessions and they had been well received.

Brian: "I was posting the stuff up, the links, because I was probably the only person who did it from my organization. I was putting them up locally for people here to see them."

On the other hand, participants suggested that *further practitioner participation* in Numeracy-Meets sessions would be desirable.

Abbi: "I would like to see even more tutors. I know every day we had tutors give a talk you know. I think I'd like to see that maybe, more of that … "

They contended that more opportunities for discussion would have been beneficial and would have provided participants with further chances to interact with each other and be honest about the challenges they face. Brian noted that a forum for participants to chat with each other and a forum for sharing resources would have been useful.

Brian: "Maybe a little bit more of a forum maybe for people to kind of get together you know maybe if we had something maybe where a little kind of chat group or something, do you know like a platform where we could maybe have popped up some resource. "Here this is where I got that idea from. Have you tried this? Oh yeah wow. Like I'll check that out.""

All interviewees agreed that Numeracy-Meets were a very good model of CPD and expressed a desire for them to continue in the future.

Abbi: "The only suggestion would be to continue having similar meetings as they were great support for those of us working in adult numeracy. It can sometimes feel that the issues we encountered are unique to our situation when in fact it's very similar in all adult education areas".

Intervention acceptability

This is closely related to social validity but is a measure of the degree to which participants receiving or giving the strategy like the intervention procedures. Based on the findings regarding the 'social validity' of the intervention, the 'likeability' rating of the intervention among the cohort was very high. There are a number of factors which may affect the acceptability of the intervention, namely format and duration. All interviewees liked the *flexibility* of the one-hour Numeracy-Meets sessions, which were conducted online via Microsoft Teams.

Chloe: "Online obviously has benefits in terms of it, it's more flexible you know, it it's easier to attend"

In comparison to one-day, face-to face CPD sessions, Numeracy-Meets were *short* and *continuous*, giving practitioners time to absorb what they heard.

Deirdre: "it was nice and condensed. I liked the topics. I liked the way it was run. You got a little bit of everything in a short period of time."

Abbi: "I think, it's better to meet more often than one blast [of CPD] in Dublin for a full day. it's continuous."

Abbi felt that online CPD was *easier than face-to-face sessions*, which are time-consuming and expensive due to travel and childcare costs. Deirdre concurred that face-to-face CPD is time-consuming and requires the practitioner to travel but noted that it does provide opportunities for practitioners to engage in informal chats to share ideas.

In terms of durations, as previously noted, the Numeracy-Meets were held at lunch time on Wednesdays once every 2–3 weeks between February and May 2022. Interviewees were *happy with the frequency.*

> Eimear: "I think the frequency was good … I think every week is probably too high a frequency, but I think if you spread it out much more it would lose the flow and the continuity"

Overall, participants liked the one-hour, lunchtime Numeracy-Meets slot.

> Deirdre: "The time was very good; it was just an hour you knew it was only an hour so that was good. You knew you were going to be gone within the 60 minutes"

However, the time was not suitable for everyone, particularly practitioners in the prison system, who had to leave the prison to access the internet in order to participate. Additionally, participants were sometimes late returning to class after the sessions and sometimes had to leave the sessions early. Brian felt that at times the sessions felt rushed and would have benefited from being longer.

> Brian: "I felt we were rushing at times … it was like trying to cram in so much. Maybe it could have been done maybe over more than one hour but I suppose that's all there was you know available."

Discussion and conclusion

Regardless of subject or level, teaching is a complex practice that needs to be learned and continually improved (Bayar 2014). The need to improve the teaching and learning of adult numeracy education has been well documented for many years. However, the systemic development of professional practice in this domain has been largely overlooked. This paper detailed the design, implementation and evaluation of a series of Numeracy-Meets for adult numeracy practitioners in Ireland. In addressing Guideline 4 of the SOLAS (2021) report, these Numeracy-Meets sought to support and develop adult numeracy practitioners in Ireland through a series of professional development and networking opportunities.

The evaluation of the model using the four key parameters outlined by Shapiro (1987) suggest that the Numeracy-Meets were an effective way for practitioners to network and share good practice and personal insights in teaching adult numeracy. In the design phase there was some concern regarding the viability of establishing a CoP in an online environment. However, given the dispersed nature of adult numeracy practitioners in Ireland, a virtual CoP was the most viable option. Engaging in this virtual learning community process with practitioners across Ireland would not have been possible without technology; however, it was not without issue. There were times when participants' Wi-Fi did not work or limited connectivity led to some practitioners dropping in and out of some Meets. However, as evidenced from the evaluation, the online approach, and short one hour input was generally popular since, in the main, it didn't conflict with family or work commitments and there was no financial cost involved. As one practitioner noted 'The online thing suits me because I would find it more difficult possibly to get away if I had to travel somewhere'. This was in keeping with the SOLAS (2021) report which recommended supporting adult numeracy practitioners while avoiding costs in terms of time and financial commitment. Nevertheless, while

practitioners may have avoided having to travel or pay fees and expenses at the Numeracy-Meets, participation was entirely voluntary and there was no recognition in terms or accreditation or workload.

In terms of practitioner development, participants recognised that they were all trying to address the same issues and could do this as a group despite being dispersed, both geographically and in a range of diverse settings. As noted by Dalby and Noyes (2022), such diversity amongst adult numeracy practitioners presents valuable opportunities for cross sector professional learning. However, as Johnson (2006) argues, virtual communities, because of limited face-to-face contact, require communication that is more explicit than usual face-to-face contact. This is where the role of the facilitator is so vital. However, this is a fine line. Authoritarianism from experts can actually hinder learning (Lave and Wenger 1991), while a complete lack of leadership can lead to chaos (Wenger, McDermott, and Snyder 2002). In this study, the lead author assumed the role of facilitating the Numeracy-Meets. The findings of Storck and Storck (2004) guided this role. They noted that facilitators should deal with relationship development, administration tasks and informational topics. The importance of relationship development was key throughout. In line with similar sharing of practice initiatives, the heart of the work is the importance of building relationships and creating a safe space to share (Civil 2022). This may take time to develop, and its absence is often an inhibiting factor to effective professional development. Wilson and Berne (1999) found that teachers are often so concerned with presenting themselves as 'good teachers' that this compromises their ability to share their problems. This was initially a problem as the research team found it difficult to recruit practitioners who were willing to present and share their practice at some of the earlier Numeracy-Meets. In retrospect, more time should have been allocated early in the series of Numeracy-Meets to allow practitioners to develop social connections, in order to enable them to feel more comfortable sharing and speaking and build a stronger sense of community. However, as the core group of practitioners who attended each Meet became more familiar with each other, so too did their willingness to share. This was evident in the evaluation as practitioners contended that more opportunities for discussion would have been beneficial. This is certainly something that the research team would like to foster going forward.

Another finding of note was practitioners' interest in the connection between research and practice and their satisfaction in seeing those connections being explicitly made. The 'analysis of evidence' was a central component to the underlying theory of each Numeracy-Meet. The evaluation highlighted how practitioners liked the integration of theory and practice that was shared by the invited speakers. These theories and new ideas led to debate and reflection amongst the practitioners. As outlined by McDermott (1999), even if a theory or new idea is not accepted by a CoP, the debate and reflection can cause deeper understanding and newly generated knowledge of traditionally accepted ideas.

Despite these many positives, the authors are also cognizant of the fact that there are some limitations with this study. A significant systematic limitation of the study is the lack of data on the number of adult numeracy practitioners in Ireland. As noted in the Introduction, the provision of adult numeracy education remains diverse, and little is known about the delivery of courses and those who teach on them. There is a high turnover of staff and most practitioners are either volunteers or employed part-time. This systematic limitation led to a methodological one as the sample size was

small. For example, there were only 33 responses to the needs analysis in Phase 1 and so a certain amount of caution must be applied to the interpretation of findings from the statistical tests. Furthermore, the five participants who took part in the evaluation were purposively selected from the core group who had attended at least four of the six Meets and thus there may be some potential bias in their responses. For example, in the interviews, some practitioners may have given feedback in line with what they thought the researchers wanted to hear. It may have also been useful to hear from some of the participants who had only attended one or two of the Numeracy-Meets and investigate why this was the case.

Notwithstanding these limitations, the research outlined in this study is timely and topical and provides useful insights into the professional development needs and wants of adult numeracy practitioners in Ireland. The authors believe that the Numeracy-Meets provided an effective, flexible and cost-effective model for supporting and developing adult numeracy practitioners in Ireland. The participants developed a sense of being part of a larger community with a common goal to improve adult numeracy provision. While there was only a core group of 15 practitioners who attended at least four of the six Numeracy-Meets, there was some evidence in the evaluation of the cascading effect of the CoP. The core group were passing on what they were engaging with and learning onto their fellow practitioners who were on the periphery of the CoP, attending occasionally, or who were not taking part.

However, the authors are also aware that there is still much work to be done in order for Numeracy-Meets to become a sustainable professional development model going forward. While there was huge enthusiasm amongst the core participants for the series to continue, the longer-term viability and wider scale needs to be considered and this is more difficult in adult education in Ireland given the diverse and dispersed nature of practitioners. Then again, perhaps it is these difficulties that make these professional development endeavours even more worthwhile. This is best summed up by one of the Numeracy-Meets participants:

> I think you can feel very isolated because we are a fairly small population within the overall tutor numbers, and it was a really good support network in many ways for me. They [Numeracy-Meets] really reduced my sense of isolation as a maths tutor, so for that alone I'm very grateful.

In terms of implications going forward, there is no doubt that more research is needed to create a solid foundation for practical interventions which support the development of adult numeracy practitioners in Ireland. In any case the professional development model on which this research is based offers a useful starting point for the establishment of a national adult numeracy learning community to support practitioners in sharing resources and local good practice. It also provides a basis for the design, implementation and evaluation of future research informed programmes to support the professionalisation of adult numeracy practitioners within the Irish context.

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Notes on contributors

Mark Prendergast is a Senior Lecturer of Mathematics Education in the School of Education at University College Cork.

Annette Forster worked as a Research Assistant on this study and has recently completely her PhD at Technological University Dublin.

Niamh O'Meara is the Deputy Director of EPI·STEM, the national centre for STEM Education, and a Lecturer of Mathematics Education in the University of Limerick.

Kathy O'Sullivan is a Lecturer of Mathematics Education in the School of Education at University of Galway.

Fiona Faulkner is a Lecturer of Mathematics at Technological University Dublin.

ORCID

Mark Prendergast http://orcid.org/0000-0002-1766-7421
Niamh O'Meara http://orcid.org/0000-0002-6959-2783

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