NALA Research

Numeracy Definition Report

A report on adult learner's understanding and conceptualisation of numeracy in Ireland

NALA
National Adult Literacy Agency
Áisíneacht Náisiúnta Litearthachta do Aosaigh

About this report

This research report describes adult learners' understanding and conceptualisation of numeracy. It was done to support the development of a working definition for numeracy in Ireland. This was a recommendation in SOLAS, the Further Education and Training Authority's report 'Good Practice in Integrated and Standalone Numeracy Provision at Levels 1-3'.

The views expressed in this report are not necessarily the views of NALA.

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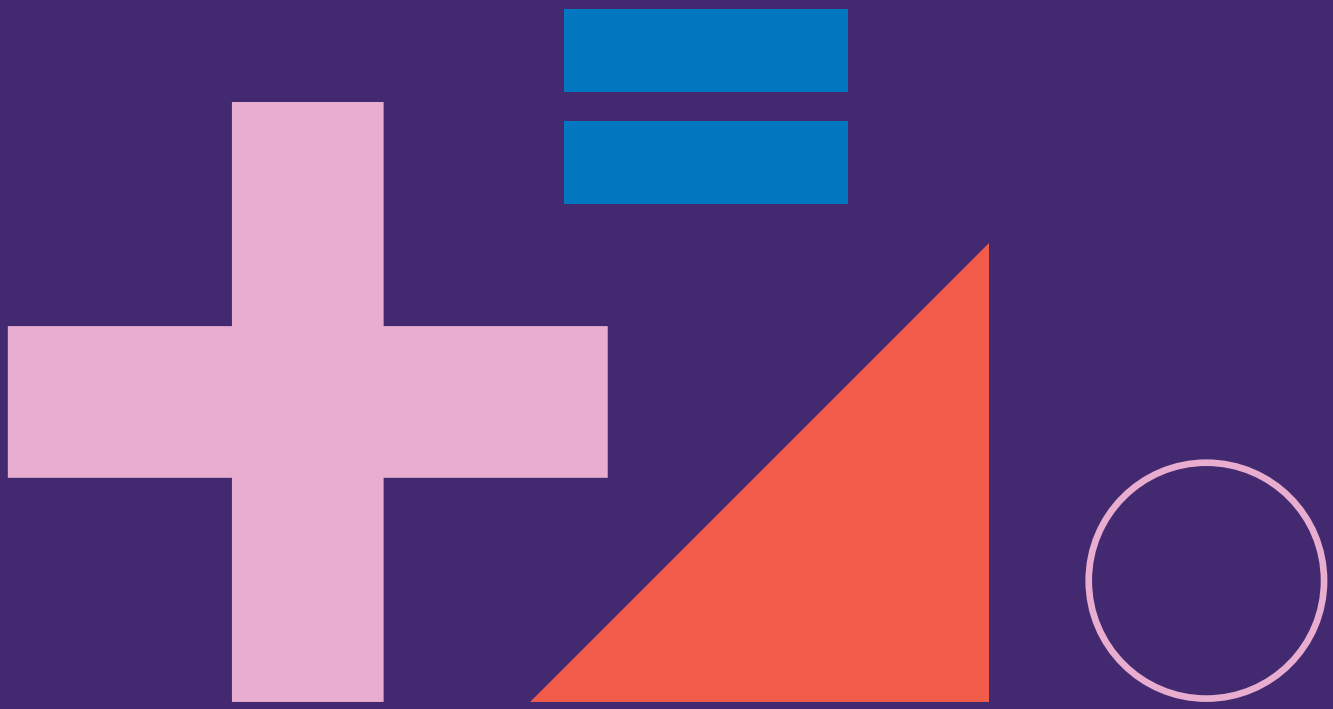

Numeracy Definition Report

A report on adult learner's understanding and conceptualisation of numeracy in Ireland

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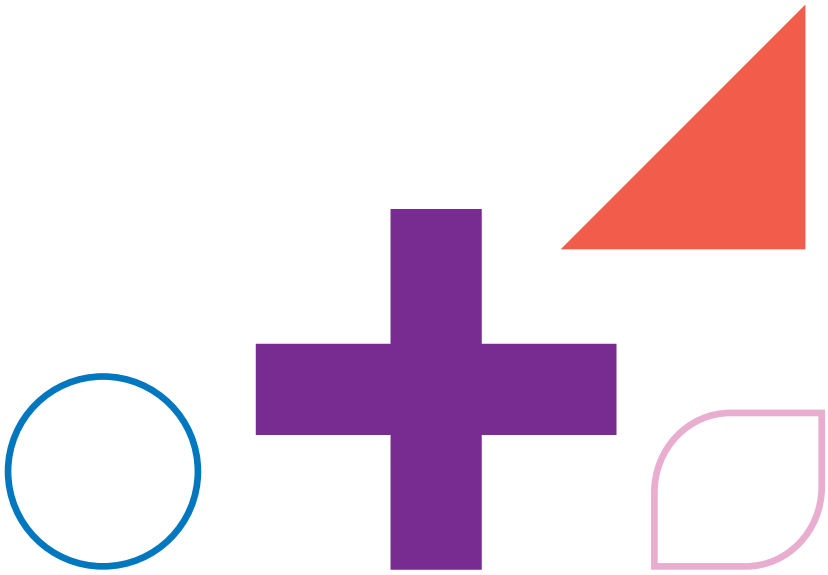


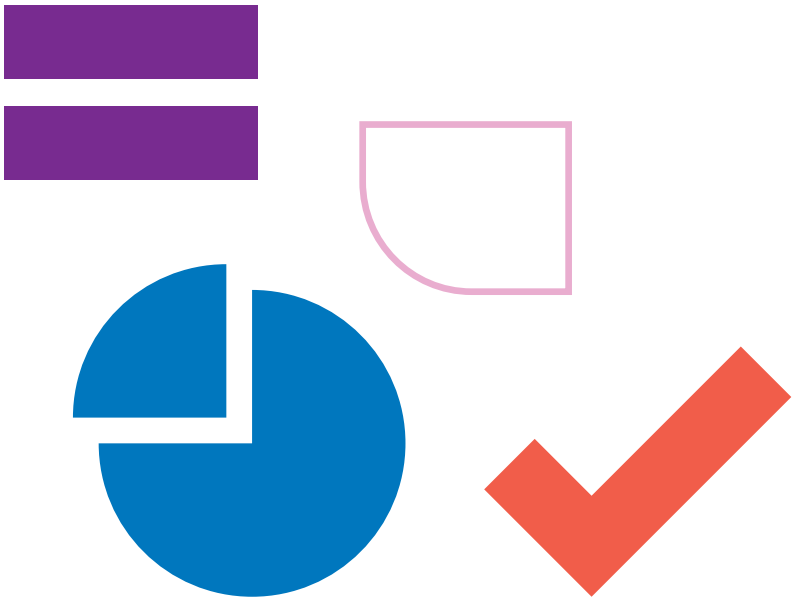
Executive summary

Background

In 2021, SOLAS – the Further Education and Training Agency – commissioned a research study to "…capture and document standalone and integrated adult numeracy activity in the Education and Training Board (ETB) context. This was in order to develop good practice guidelines and inform future development of adult numeracy policy and practice." (SOLAS, 2021: 6).

The research report provides a comprehensive and contemporary overview of the provision of standalone and integrated numeracy in Ireland. It also provides a list of guidelines to help shape the future of numeracy provision to adults in Ireland. The first of these guidelines suggested there was a pressing need to agree on a definition of numeracy that meets the needs of adult learners in Ireland in the 21st Century.

The report acknowledged that the concept of numeracy has evolved over time and it is critical that policy makers, adult educators, tutors and adult learners understand and agree a common meaning of this term. Based on this guideline, this research project sets out to discover adult learners' understanding of numeracy to support the development of a working definition for numeracy in Ireland.



Research design and methodology

This project sought to address two research questions. These were:

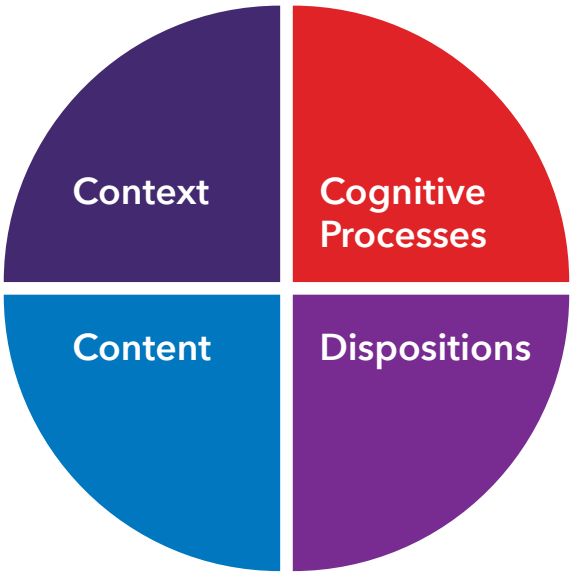
1. What is adult learners' understanding of numeracy?

2. How can the Common European Numeracy Framework (CENF) – see Figure 1 – be used or adapted to represent adult learners' understanding of numeracy?

Figure 1. The Common European Numeracy Framework (CENF)

Context
Everyday life
Work-related
Citizenship
Further learning
Finances
Health and care
Recreation

Knowledge and skills
Quantity and number
Dimensions and shape
Pattern, relationships and change
Data and chance
Using a calculator
Using spreadsheets
Using digital skills



Higher order skills
Managing situations
Analysing situations
Processing information
Reasoning
Mathematising
Problem solving
Critical thinking

Dispositions
Self-confidence
Affection
Beliefs
Collaborations
Flexibility
Math anxiety
Math difficulties

To address these research questions a qualitative approach was adopted. According to Clark and Jack (1998), qualitative research studies allow the researcher to value the insights and experiences of all research participants. Valuing the insights and perspectives of adult learners was critical for this study to arrive at a working definition of numeracy that aligned with the needs and expectations of adult learners as well as existing, contemporary conceptualisations of numeracy. For this reason, qualitative research methods were deemed most appropriate.

In total 11 semi-structured interviews were conducted alongside one semi-structured focus group. In total 17 adults were given the opportunity to share their insights with the research team with 11 (7 males and 4 females) of these engaging in a one-to-one interview and six males participating in a focus group. Participants in this study ranged in age from 22 – 72 years. Two participants were enrolled on an Access Mathematics programme while the remaining participants were drawn from the Men's Shed community in Ireland and NALA's distance learning programmes. The purpose of the interviews and focus group was to gain insights into adult learners' understanding of numeracy including what aspects they felt were important or not important to perform numeracy tasks effectively as well as their experiences of numeracy to date. The research instruments were informed by the Common European Numeracy Framework (CENF), a framework designed to capture the multidimensional nature of numeracy and to highlight how it is a multifaceted construct that goes far beyond basic mathematics. The interviews were transcribed and analysed using Braun and Clarke's (2006) six-step approach to qualitative thematic analysis.

Main findings

The main finding to emerge from this study was that adult learners in Ireland have a very narrow and limited understanding of numeracy. The study highlighted problems similar to those identified internationally in relation to difficulties distinguishing between numeracy and basic mathematics. Despite many participants in this study recounting scenarios where they engaged with challenging numeracy activities, the majority continued to equate numeracy with basic mathematical skills and were firmly of the belief that such activities did not require higher-order cognitive processes. In addition to this, the study revealed that adult learners in Ireland recognised that numeracy involved some of the different dimensions outlined in the CENF. In particular, they believed that numeracy required good number sense and was predominantly required in financial and day-to-day life context. However, other dimensions of the framework were completely overlooked by participants in the study, further contributing to the narrow view of numeracy they hold. For example, many did not consider numeracy being important in the workplace, for citizenship or for recreational purposes while, as mentioned previously, no participant associated numeracy with higher order thinking skills.

In addition to this, while dispositions, such as confidence and beliefs, is central to the CENF, many participants in this study only associated negative dispositions towards the concept, with many indicating that they were in fact suffering from mathematics anxiety. The authors concluded, based on the interviews, that this was a direct result of their school experience of mathematics, thus highlighting one of the key knock-on effects of the inability of participants to distinguish numeracy from mathematics.

Implications

The findings unearthed in this study have many implications for the future of the teaching and learning of numeracy to adults in Ireland. These can be summarised as follows:

1. SOLAS, in collaboration with the Further Education and Training (FET) sector and others, should agree a working definition of numeracy.

2. All involved in the education system in Ireland need to be aware that numeracy and mathematics are not the same.

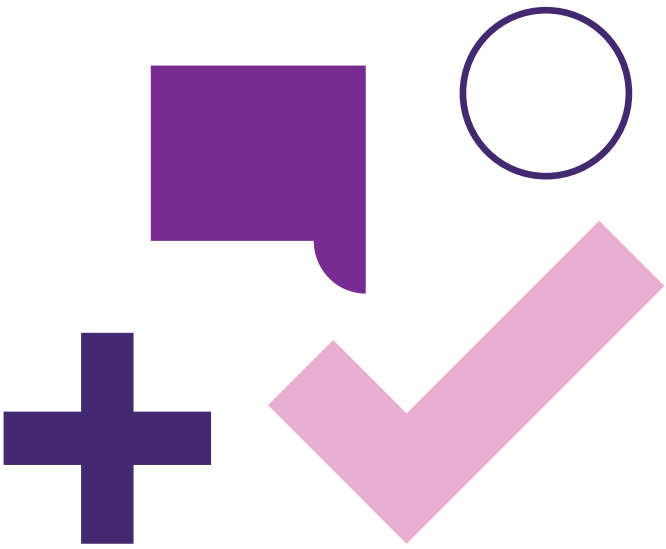
3. Every effort needs to be made to build effective adult numeracy teaching and learning practices in Ireland and to develop resources to help in this regard.

4. There needs to be a change in the narrative around numeracy in Ireland and it needs to be presented in a more positive light.

5. Further research is needed to determine if the education system, particularly at upper primary and lower post-primary is catering for the needs of students who struggle with basic mathematical concepts.

6. Adult numeracy providers need to recognise and respond to adults' previous experiences of learning mathematics at school, and in particular the gaps in their knowledge upon completing schooling.

Attention now needs to turn to how to transform these implications into actionable items to improve adult learners' experience, understanding and learning of numeracy.



Introduction

Numeracy is a concept rooted in everyday contexts that adults experience in their personal, professional and social lives. 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 physical and mental health (Carpentieri, Litster and Frumkin, 2010; Parsons and Bynner, 2005; Tout et al., 2017).

For these reasons, it is critical that every effort is made to remove or address any obstacles or challenges that prevent adults from developing the necessary numeracy skills and knowledge to engage in everyday life. One challenge identified in the literature in Ireland and internationally relates to a struggle among the adult population, to fully understand what is meant by the term adult numeracy (Kaye, 2018). One potential reason for this challenge is the multitude of words and phrases associated with this term.

A review of the literature in the area of numeracy indicates there exists many comparable terms for numeracy such as 'mathematical literacy' or 'quantitative literacy'. The terms used often depend on the country or jurisdiction, and these terms can be used interchangeably in some instances, without distinction. This can lead to a vague and confused understanding of the concept of numeracy.

Quantitative literacy is the term used for numeracy in the United States and is defined as the ability of a person to work effectively with quantitative data in all aspects of life. The Quantitative Literacy Design Team (2001), which developed this notion, acknowledged that quantitative literacy also included positive dispositions towards mathematics and an appreciation for the use of mathematics in society. They argued that numeracy plays a vital role in cultivating informed citizens and supporting democratic government. However, the Quantitative Literacy Design Team noted that although people believe quantitative literacy to be important, there is little agreement on one unified definition.

This leads to a second potential reason why the understanding of numeracy among adult learners has proven so difficult, that is the existence of multiple definitions for numeracy. Frejd and Geiger (2017) revealed that while numeracy is a word that is recognised internationally, there are many different interpretations and definitions of the term. As such, the term numeracy has a multitude of definitions with many definitions portraying a very narrow view of numeracy.

The initial concept of numeracy was first introduced in 1959 in the Crowther Report, whereby the word "numerate" was defined as "a word to mirror the image of literacy", while also including the skills necessary to think quantitatively. This initial definition is quite vague and led to many people seeing numeracy as a component or a subset of literacy.

Later in 1982, the Cockcroft report offered a broader definition when they ascertained the word "numerate" to have two attributes:

> "The first of these is an 'at-homeness' with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical mathematical demands of his everyday life."
>
> The second attribute is the ability to "have some appreciation and understanding of information which is presented in mathematical terms, for instance in graphs, charts or tables."
>
> (Cockcroft 1982: 11).

This definition, while broader, began to link numeracy to basic mathematical skills and such interpretations of numeracy have persisted in the intervening years. For example, when more recent policy documents discuss the term numeracy, there is a tendency to suggest that numeracy is the basic mathematical skill embedded in the description of literacy (SOLAS, 2014; Department of Education and Skills (DES), 2013; United Nations Educational Scientific and Cultural Organisation (UNESCO), 2006). In addition to this, Gal (2016) reports that numeracy is sometimes referred to as a skill that is learned primarily in school, while others believe numeracy is part of the mathematics curriculum. Madison and Steen (2008) discuss how the term numeracy came to refer only to simple arithmetic skills, normally attained in the early years of life.

The definitions presented so far all have subtle but important differences in meaning, highlighting the lack of consistency across the different understandings of numeracy. This, coupled with the simplistic view of numeracy that permeates the literature, means that it is difficult for policy makers, adult educators and the general adult public to fully appreciate the importance of numeracy. This therefore reiterates the need to fully understand what is required for the effective teaching and learning of numeracy.

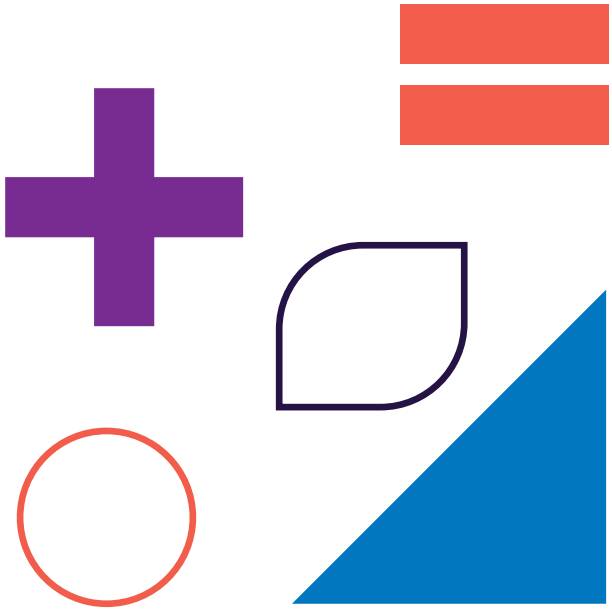
In response to this challenge, and others, SOLAS (2021) published a series of good practice guidelines to improve the provision of integrated and standalone numeracy. In this report, the first of these guidelines indicated that there was a need to "agree on a definition of numeracy that meets contemporary needs" (SOLAS, 2021: 59). This report acknowledges that there are different ideological perspectives on numeracy and the need for striking a balance between viewing numeracy as a social practice and a technical skill. This recommendation coupled with the fact that the new Adult Literacy for Life: 10-year Strategy (SOLAS, 2021) does not define numeracy led to this project being commissioned by the National Adult Literacy Agency [NALA].

This project sought to determine adult learners' understanding of numeracy so as to support the development of a working definition for numeracy in Ireland, that will serve adult numeracy learners and tutors. It will also underpin the provision of numeracy education to adult learners into the future. As such, the overall aim of this project was to conduct a scoping exercise in order to determine adult learners' understanding and conceptualisations of numeracy in Ireland. It sought to determine how their understandings of numeracy aligned with the Common European Numeracy Framework (CENF). 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 (www.cenf.eu).

The initial research questions that we sought to address as part of this study were as follows:

1. What are adult learners' understandings of numeracy?

2. How can the CENF be used or adapted to represent adult learners' understandings of numeracy?



2. Methodology

A qualitative study was conducted to address these research questions. According to Fossey et al. (2002: 723) qualitative research "…aims to give privilege to the perspectives of research participants and to illuminate the subjective meaning, actions and context of those being researched" and so it was deemed the most fitting research model for a study of this nature.

The overall aim was to conduct a scoping exercise to determine adult learners' understandings and conceptualisations of numeracy. A total of 11 interviews and one focus group with members of a men's shed[1] were conducted. There was a mix of male (n = 7) and female (n = 4) participants interviewed with a further 6 males involved in the focus group. The participants ranged in age from 22 years to 72 years of age and in this report each participant has been assigned a pseudonym for anonymity purposes. The interviews were centred around the CENF and probed students about their understanding of the different aspects of numeracy that were presented in this model. As such, questions in the interview schedule sought to determine what mathematical knowledge adult learners believed was important in order to be considered numerate; what emotions they associated with numerate behaviour; what contexts they believed numeracy to be important in and what cognitive processes were required to engage in numeracy tasks.

The majority of people interviewed reported that the highest level of mathematics they completed was Junior Cycle Ordinary level. All interviews and focus group were recorded and transcribed. The computer package NVivo was then used by the authors as they undertook thematic analysis of the data.

The work of Braun and Clarke (2006) provided a framework for this analysis which enabled the authors to derive an understanding of participants' understandings of numeracy. It was a flexible and recursive process, with repeated movement back and forth as initial codes were generated, and themes were reviewed. The coding process was thorough and comprehensive, and all themes were checked against each other and back to the original data set. While the initial analysis was completed by two of the authors, it was reviewed by the remaining research team members to ensure reliability. Overall, there were no major discrepancies with regard to the themes that emerged. Any disagreements in coding were discussed until all members of the research team fully agreed with each other. The findings of this analysis will now be presented.

1 A 'men's shed' is a community based project, where men can come together to learn, share skills and make long-lasting friendships together (see: **https://menssheds.ie for more information**)

3. Experience of mathematics in school

In this research study, which examined the experiences of 11 individual participants and one focus group, it was found that all participants, except one, regardless of age or level of schooling reached, reported having a negative experience of mathematics in school.

When school mathematics is referred to in this context, we are referring to participants' experiences across primary and secondary school taking into account that some participants were early school leavers and so had limited experience of mathematics at second level education. The one student highlighted as not reporting a negative experience, mentioned that they had a positive experience of primary school mathematics, however this became negative in secondary school:

> Suzy: "Em. Well, I, in primary school I loved maths. I found it like really interesting. I always was like really engaged in it. And then when went into secondary school, my teachers weren't as good, and I wasn't really getting to grips with it so then I kinda [kind of] started to dislike maths a lot more and stuff like that."

The reported negative experiences appear to be strongly linked with two different aspects of the mathematics classroom. The first being a teaching style which excludes and reduces the time given to those students who were perceived to be less mathematically able. Several participants gave examples of such teaching styles from their second level schooling experience:

> Jake: "I just noticed in high school most of the time in high school the teachers just focus on those that are already on like a higher level of understanding."
>
> Sam: "I was isolated from fourth year because I couldn't understand algebra and in fourth year in Day 1, we were told we were not allowed to ask any questions. And my punishment for asking questions was I was kind of banished to the other side of the room."
>
> Martin: "I couldn't keep up with the pace of higher level and then I was down in ordinary level…I just couldn't comprehend some of the formulas and stuff."

The second aspect of school life that led to students reporting negative experiences of mathematics related to corporal punishment which was described by several of the older participants when providing details related to their negative school experience of mathematics. Participants in several cases linked this form of punishment with a belief that they were "slow" learners:

> Davy: "The stick was kinda going that time. I got a few lashes of the stick when I was younger anyway. I know it was the 70s but still the stick was going. That's the way it was. You'd be more afraid of it. Probably I wasn't, probably I was a slow learner probably. They didn't care about that. Like if you didn't know it, they would move on with the other ones in the class."

The above quote also links with the first aspect of this theme in that it highlights the teaching style, which excludes and reduces the time given to those students who were perceived to be less capable in mathematics. While the corporal punishments of the past may no longer be an issue facing adult students in more recent times, there still seems to be an issue of denying those perceived to be less able the time needed to succeed.

It is clear from this aspect of the research that the damage of such negative school experiences for both the younger and older participants of this study has had lasting repercussions. Two major repercussions of such school experiences were unearthed in this study:

1. Lack of confidence when dealing with numeracy tasks, and

2. Inability to differentiate numeracy from mathematics.

Both of these outcomes are found to be problematic internationally also and will be examined further below.

3.1 The negative effect of the school experience on confidence

The negative school experiences reported by most participants in this research study have had an extremely lasting negative effect on their confidence. Much of what was discussed previously highlighted the focus within the mathematics classroom on getting things "correct" and doing this in an extremely prompt manner in order to be considered a 'good' or 'able' mathematics student. However, Jo Boaler, an esteemed mathematics education researcher, has found that:

> "It is not important to work quickly [in the mathematics classroom] and we know now that forcing kids to work quickly on mathematics is the best way to start mathematics anxiety..."[2]

This is definitely the case for many participants in this study. Experiencing mathematics in this way in school has led to many reporting low levels of confidence with numeracy and as a result avoiding numeracy in their adult life. In some cases this lack of confidence has led to adults avoiding social situations where they fear discussions around numeracy or problems that require numeracy might arise:

2 Leaflet with Advice for Parents, from Professor Jo Boaler (youcubed at Stanford University)

Liam: "Yeah, very nervous…yeah, no confidence and that, the fear of not knowing what to do."

Kate: "You'd always be worried when you are out that someone would want to ask you stuff, about you know, or if someone was talking in general about other things, the cost of living, not the em daily things like out doing shopping but other things about life and about politics with figures and that. You're kind of oh s*** I want to avoid that you know."

The effect of negative school experiences of mathematics on participants' confidence to engage in numeracy tasks in their everyday lives can also be linked to the extremely high value that the majority of them place on being numerate. There was unanimous agreement that improving your numeracy skills (regardless of your current level of numeracy) would lead to better life outcomes in general. Having unmet numeracy needs was deemed to have a negative effect on all aspects of life and it was likened to being unable to read or write:

Suzy: "It's like not being able to speak the language or read and write kind of. It's in every situation whether you realise it or not. So, I feel like if people didn't have numeracy skills, it would affect every aspect of their life. Em yeah. It's very important like."

This high value placed on being numerate which was evident in many cases could go some way to understanding why participants' confidence is so negatively affected if they believe they are not very numerate themselves. It could also contribute to our understanding of participants' inability to conceptualise numeracy and to identify their effective use of it in their daily lives. They may believe that if I am poor at mathematics at school then I am poor with numeracy and therefore the tasks that I engage in in my daily life must not involve numeracy skills. This idea is discussed in more detail when we consider participants' conceptualisation and understanding of numeracy next.

3.2 The negative effect of the school experience on the conceptualisation and understanding of numeracy

According to Barwell (2004: 20), "Numeracy somehow involves the use of numbers, calculation or diagrams in social practice, whilst mathematics involves some degree of abstraction or concern with structure." Despite this relatively clear difference between mathematics and numeracy, researchers have concluded that much work is needed in order to improve conceptualising the differences between numeracy and mathematics.

Goos et al. (2019) acknowledge that the difference between mathematics and numeracy can be difficult to capture in words, while Steen (2001) notes that a common belief in society is that numeracy and mathematics are the same subject, labelled differently. It was clear that this issue, which is one of concern internationally, was also something encountered by participants in this study and this may be a direct consequence of their experience of mathematics in school. Analysis of the data suggests that school experiences shaped participants' conceptualisations of numeracy in two distinct ways.

Firstly, as previously discussed, participants in this study reported very low levels of confidence and self-efficacy in relation to school mathematics. Many clearly believed that school mathematics was beyond them. Despite this, many participants also reported that they now feel confident when faced with different numeracy tasks in their adult life. As a result they held the belief that these numeracy tasks simply equated to basic mathematics as they thought, due to their school experience, that anything more advanced was beyond them. Participants in this study do not believe that the numeracy tasks they encounter regularly involve any higher order thinking skills but rather was limited to basic arithmetic operations and an understanding of numbers.

This was evident when participants were asked to describe their understanding of the term numeracy:

Jake: "It's numbers, basically all numbers."

Suzy: "…understanding maths and how it works. So, em, em, basic maths."

Sarah: "Just to be able just do the basic maths."

Tracey: "Yeah, I know [what numeracy is], it's figures."

Davy: "Numbers would be the first thing that would come into my head."

Notably, the terms mathematics and numbers feature in each of the responses outlined here indicating that many participants see numeracy being synonymous with these terms. When numeracy is thought to solely be about numbers it represents a very limited understanding of numeracy as "…numerate citizens also need to understand verbal arguments and visual representations of quantitative or spatial information such as graphs, diagrams and maps" (Goos et al., 2019: 15).

Furthermore, the failure to differentiate the term numeracy from mathematics is a concern. By equating numeracy with basic mathematics, key attributes of numeracy such as sense making, application and decision making are overlooked (O'Donoghue, 2002), and the multidimensional nature of numeracy is also lost when perceived in this way. In addition to this, if people such as those interviewed as part of this study, continue to view mathematics and numeracy as one and the same, then the negative experiences of mathematics from their time in formal education could colour their judgement regarding their ability to deal with tasks that require numeracy and also their understanding of the prevalence of numeracy in their day-to-day life. This was another issue unveiled in this study when adult learners' perceptions of numeracy in their life were investigated and it is this aspect of the research that will be discussed next.

4. Adults' perception of numeracy and the alignment with the Common European Numeracy Framework (CENF)

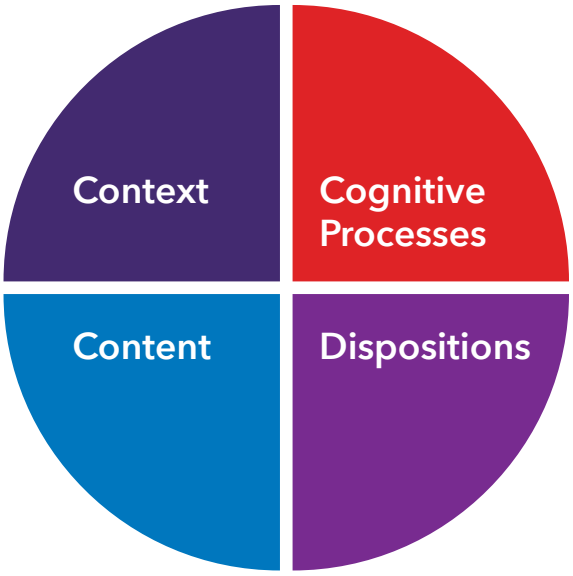
4.1 Overview of the CENF Framework

The Common European Numeracy Framework (CENF) was developed by a group of researchers based across four different European countries. The framework aims to capture the multidimensional nature of numeracy and to highlight how it is a multifaceted construct that goes far beyond basic mathematics. It outlines how there are four key constructs central to the concept of numeracy as shown in Figure 1.

Figure 1. The Common European Numeracy Framework (CENF)

Context
Everyday life
Work-related
Citizenship
Further learning
Finances
Health and care
Recreation

Knowledge and skills
Quantity and number
Dimensions and shape
Pattern, relationships and change
Data and chance
Using a calculator
Using spreadsheets
Using digital skills



Higher order skills
Managing situations
Analysing situations
Processing information
Reasoning
Mathematising
Problem solving
Critical thinking

Dispositions
Self-confidence
Affection
Beliefs
Collaborations
Flexibility
Math anxiety
Math difficulties

Firstly, the CENF framework highlights how numeracy is always embedded in a **context**, unlike mathematics which focuses on the abstract. The context will vary for different individuals and could include daily activities such as shopping or could involve the use of numeracy in the workplace. Likewise the context can be societal, for example, interpreting messages (in social media) or the context could relate to an individual's personal and social life.

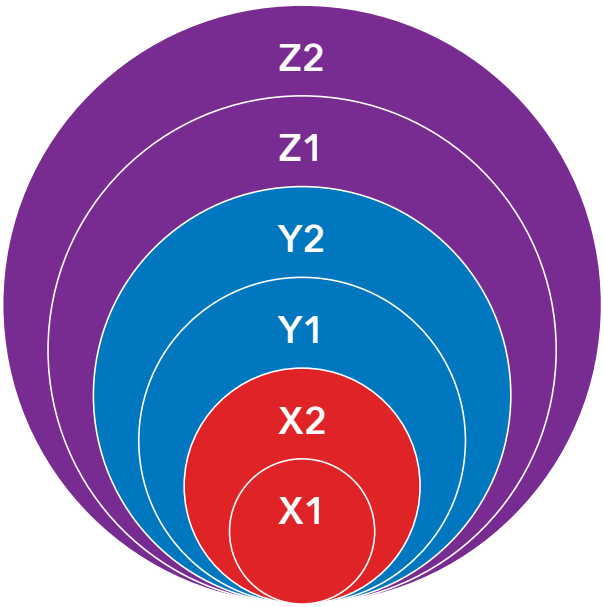
Secondly, the framework acknowledges that content **knowledge and skills** are critical in order to improve numerate behaviour. The first four sub-categories of this component of the framework (Quantity and number; Dimension and space; Pattern, relationships and change; Data and chance) feature in most frameworks regarding numeracy outside of the formal school system. However, the CENF also outlines how a knowledge and understanding of digital tools and applications is critical in order to have the knowledge necessary to be deemed numerate in our digitalised society.

Thirdly, the CENF recognises the importance of cognitive processes in improving one's numeracy skills. These processes, which are often referred to as **higher order skills**, matter to improve numerate behaviour. There is a strong alignment between the skills listed here and those coined 21st Century skills. The framework acknowledges that every individual, regardless of cognitive abilities and experiences uses higher order skills when making decisions, when reasoning and when processing information. Improving these skills alongside the content knowledge previously discussed in context all contribute to enhanced numerate behaviour among the adult population.

The fourth and final component of the CENF is **dispositions**. Dispositions refers to one's confidence and openness to using the appropriate knowledge and skills to engage with everyday numeracy tasks. According to Goos et al. (2019) in order to solve problems involving numeracy, a person must first want to do so and feel confident in their ability to do so. For many, using mathematics in real-life contexts can be challenging and as such one needs to have belief in their own ability and exercise flexible thinking. For adults the dispositions referred to here have been developed throughout their life, starting from childhood, through formal education and subsequently in the workplace and their day-to-day life. As such, some will display the previously mentioned positive dispositions towards numeracy through positive life experiences. However others, similar to those interviewed as part of this study, may have an aversion to mathematics which manifests itself in the form of mathematics anxiety or mathematics avoidance.

A second component of the CENF also seeks to highlight that adults can possess different levels of numeracy, as shown in Figure 2.

Figure 2. Levels of numeracy



Z Specialised societal and work situations

Y Societal and regular work situations / citizenship

X Daily life situations / needs

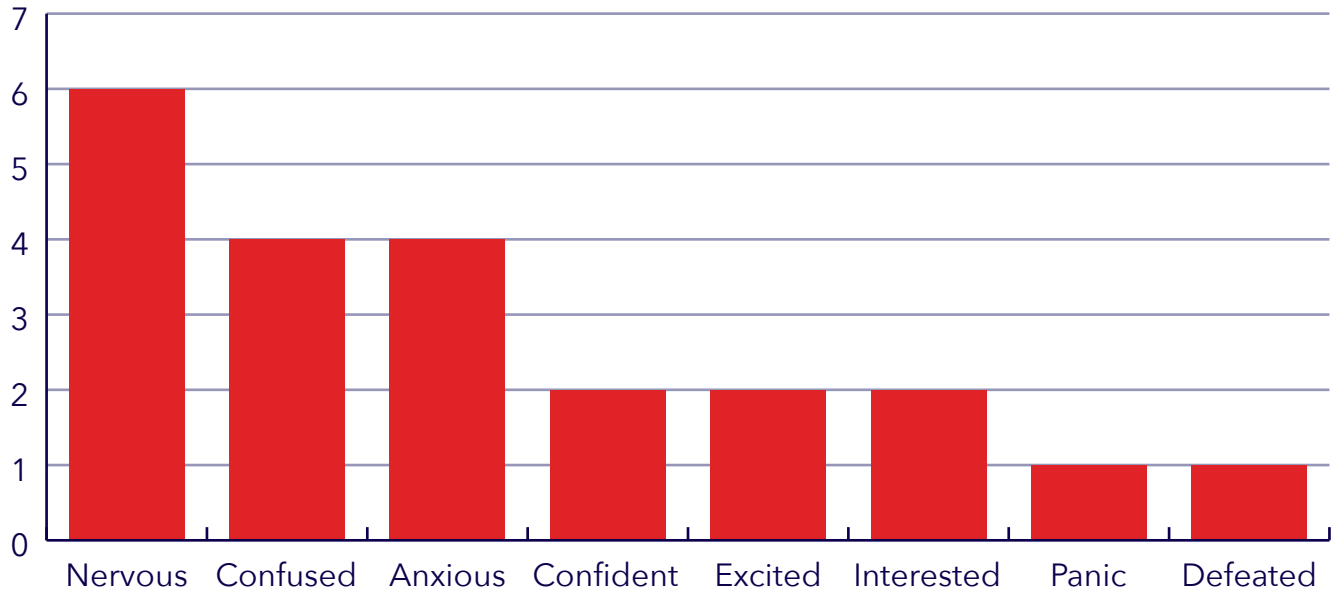
Figure 2 highlights how numerate behaviour can be considered at three different levels, each with two sublevels. At the lowest level, Level X, individuals can struggle with many aspects of the numeracy situations they encounter. According to Hoogland, Diez-Palomer and O'Meara (2020) adults at this level often experience mathematics anxiety and low self-esteem regarding their numerate capabilities. The second level, Level Y, is the level where the so-called 'average citizen' is situated. This is a person who is capable of dealing with regular numeracy activities in work and daily life and is relatively well-equipped to engage with media and political messages containing quantitative information. The third and highest level, Level Z, requires individuals to have an affinity with numbers, mathematics and science and who are competent in handling specialised mathematical tools in activities like modelling, designing, manufacturing, and problem solving.

One of the key aims of this study was to determine how adult learners' understanding of numeracy aligned with this European model of numeracy. As such, the authors will now consider the participants' perception of numeracy across each of the four components central to the CENF.

4.2 Adult learners' perceptions of the role of dispositions in numeracy

In order to gain an insight into participants' dispositions towards numeracy each interviewer first provided the participants with a list of sixteen emotions[3] and asked them to select all the emotions they experienced when thinking about or engaging with numeracy. As such, many participants offered multiple, different, often related, emotions with eight of the sixteen listed emotions cited during the interviews. The results are displayed in Figure 3.

Figure 3. Dispositions associated with numeracy



Two of the key dispositions outlined in the CENF are self-confidence and self-belief. Figure 3 indicates that these are not always emotions adult learners associate with numeracy. Instead nervousness, confusion, and anxiousness were the most commonly reported emotions. According to Ryan, Fitzmaurice and Johnson (2019) these emotions are symptomatic of mathematics anxiety and this can "…interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations" (Richardson and Suinn, 1972: 551). As such, these negative dispositions can inhibit one's ability to develop competency in numeracy and may lead to an avoidance of situations that require numeracy. This was evident in the responses of two participants in this study both who associated numeracy with feelings of confusion (Kate and Sarah), nervousness (Kate) and anxiousness (Sarah):

3 The emotions contained on the list were as follows: Confident, Nervous, Comfortable, Bored, Good, Confused, Fine, Panic, Excited, Anxious, Happy, Stupid , Love, Sick, Interested, Defeated

Kate: "You'd always be worried when you are out that someone would want to ask you stuff, about you know, or if someone was talking in general about other things, the cost of living, not the em daily things like out doing shopping but other things about life and about politics with figures and that. You're kind of oh s*** I want to avoid that you know."

Sarah: "When I left school, I left the maths at school…you know I never actually thought about it again, because you know if I needed to know something you know I'd get one of the brothers to measure it for me."

Two of the seventeen participants (between the individual interviews and the focus group) said that the three emotions they now associate with numeracy are confidence, interest and excitement. Interestingly, both of these participants, who are now enrolled on an Access programme in a higher education institution in Ireland, felt that these emotions are completely different to the emotions they would have associated with mathematics at school. As outlined earlier in this report, many participants felt that their experience of school mathematics had resulted in all confidence in relation to mathematics being lost. Their inability to then differentiate school mathematics from numeracy meant that they continued to lack confidence in their numerate competencies. However, these two participants, having experienced a different style of teaching and being exposed to mathematics as a useful and enjoyable subject have managed to overcome these negative emotions:

Martin: "It just makes more sense now. Maybe that's the way it's being taught in the Access programme…it's a lot easier to understand…so I'd say it's [mindset] changed 100% since school because I get enjoyment out of actually completing the maths…now I would apply, eh, confident, excited and interested."

This change in mindset reported by both Jake and Martin indicates that exposure to alternative teaching styles and approaches has resulted in a change in their dispositions towards numeracy and they now appear to display the confidence and self-belief that Goos et al. (2019) believe is critical to enable numerate behaviour.

Another important feature of the dispositions component of the framework is beliefs. A more positive picture emerged in this regard. In the main, participants in this study valued numeracy and appreciated the utility-value of numeracy. These sentiments were summarised in a response from Callum when asked if he feels there is a use for numeracy in his social life. He elaborated on how he might require numeracy skills in this aspect of his life and concluded with the following sentiment:

> Callum: "…it's [numeracy] almost nearly as essential to everyday as it is to speaking a language like you know. It's part of the language… Well, I can't see how a person would progress, even in their work or in their life like you know [without numeracy]."

Similar responses were received from other participants in the study suggesting that these adults do value numeracy and believe it is critical in order to be an engaged citizen in 21st Century Ireland. In addition to this, participants in this study also held strong beliefs in relation to the role numeracy can play in opening up opportunities for them. While many admitted not being confident in their own numeracy skills they do believe that their lives would improve immeasurably if they were afforded the opportunity to improve their numeracy knowledge and skills. This belief was evident when Davy was asked if his life would be better if he were to develop his own numeracy skills. He responded as follows:

> Davy: "Oh it would be a lot better. I'd have more confidence going for opportunities……because you could apply for a thing because there's lots of things I could have applied for down the years like I was mad about mechanics and things like that so I'd have loved that but I never had the courage to apply to go for a course on it or anything like."

Likewise Ollie feels improved numeracy skills would enable him to become an informed consumer.

> Ollie: "If someone comes up to me and says there's your bill I could have went hold on a minute, that's wrong. They didn't do that right. I can't do that at the moment. If someone comes up to me and says there's your bill. There's where I'm, I could be getting caught out. And I don't like being caught out."

Overall, while the CENF outlines many of the positive dispositions, which facilitate numerate behaviour, including confidence, self-belief and flexibility, this research study reveals that many adults are simply lacking in this regard. Despite participants' ability to identify numeracy tasks in their everyday life; to understand the value of numeracy; and to appreciate what can be achieved with enhanced numeracy skills, the majority of participants interviewed continue to see numeracy as a daunting concept that triggers negative emotions. This will in turn limit participants' ability to act as an informed citizen and will affect their willingness to engage and persist with challenges that emanate from working with problems requiring numeracy in the real world.

4.3 Adult learners' perceptions of the role of context in numeracy

During the interviews, participants were asked to detail incidences from their home, social and work life that would require them to use numeracy. The interviewers prompted the participants to consider where they might have come across numeracy in the following areas:

(a) everyday family life;
(b) work life;
(c) social and community life; and
(d) health and wellbeing.

Despite providing such prompts, the context that participants reported using numeracy in most frequently was the **financial context**. Of the 11 interviews and one focus group conducted as part of this study, examples from the financial context were provided in ten settings. Participants identified a multitude of different numeracy tasks in a financial context ranging from calculating a total shopping bill, to calculating the cost of household bills, to working out the correct change to give to a customer:

Sarah: "…handing back change to people making sure it's correct, I suppose you know calculating bills and you know stuff like that."

Men's Shed 1: "Even there now the other day I was thinking I was outside in Lidl and do you know the app said 33%, 33 and a half percent off…and the item was 3.99…so what would that be? What's coming off of it?"

Many of the examples provided may also be considered to be from an everyday life context, indicating that adult learners do recognise the need for numeracy skills on a regular basis. However, one area of concern identified by the authors in relation to this was that in five of the ten interviews / focus groups where numeracy was discussed in a financial context, the participants were unable to provide any other context in which numeracy was used. The concern here is that if the distinction between numeracy and financial literacy were to become blurred for these adult learners, then there is a risk that their understanding of numeracy will become even narrower, in that they solely associate numeracy tasks with tasks involving money, whereas in reality numeracy encapsulates much more than that.

This idea that numeracy features in contexts other than finance was evident in the remaining seven interviews / focus groups. For example, some participants discussed how numeracy plays an important role in their own health and wellbeing, which aligns with the health and care context outlined in the CENF. Many of the younger participants (22 – 40) in the study outlined how they would use numeracy regularly when working out and trying to maintain a certain weight:

> Martin: "My hobby is weightlifting and powerlifting, so I have to make my programme where I'm building up with percentages…I count my macros and what percent of carbs, protein and all that I've to take throughout the day."

> Jake: "Your weight I think is also part of numeracy…Like how much you weigh, how much you have to eat like your calories per day in order to lose a certain amount of weight or to maintain a certain amount of weight. When you go to the gym, like the distance, like maybe when you're on the treadmill."

In addition to the health and care context, many participants in this study, especially those with a trade background, were able to give meaningful examples of where they would use numeracy in the workplace:

Davy: "If you're doing a bit of roofing or plumbing or measuring pipes for plumbing. I know roofing has to do with a lot of measurements… plastering probably too, what measure for your mixture, you know 3 to 1 or 4 to 1, depends on what you are plastering."

Men's Shed 2: "I was up in a trade that used maths all the time. I was a floor layer. And the hardest part was when we went from feet and inches to metric."

Callum: "Now when as a farmer I go to a mart I see the weight of cattle. I understand the weight of cattle or try and understand the weight of cattle. We've gone in my time from ounces and hundred weights to kilogrammes you see."

These responses show that these participants clearly recognise the prevalence of numeracy in their work as plasterers, floor layers and farmers. However, this was not the case for all. Other participants in this study spoke about using mathematical concepts like percentages in their professional life but did not associate these tasks with numeracy:

Tracey: "I know that 20% off 100 is 80 and that brings it [cost price] down to 80 or 30% and I know those things. But that's all, that's not like anything to do with school. That's just going through the road of life."

In this instance, the participant believes that if the task at hand is not something that was learned in the mathematics classroom at school then it is not considered numeracy and so she is firmly of the belief that she does not encounter numeracy in the workplace. This is a common problem internationally as reported by Noss, Hoyles and Pozzi (2000) who found that for many, numeracy in the workplace is often invisible as they view it as being different to what they conceptualise numeracy to be – school mathematics.

Likewise, in Ireland, Keogh, Maguire and O'Donoghue (2018) found that many professionals considered the mathematical knowledge used in the work context to be simply "common sense" or "part of the job" despite many of these tasks being challenging endeavours which require a deep understanding of numeracy.

As demonstrated thus far, participants in this study described encountering numeracy in everyday contexts, financial contexts, health and care contexts and workplace contexts. No participant could provide meaningful examples of numeracy in a citizenship context, a further learning context, or a recreational context, again suggesting a limited understanding of numeracy among these adult learners. However, the examples that were provided across the previously mentioned contexts were often quite rich in nature and many of the tasks described would require these participants to use higher order thinking skills in many aspects of their lives, so bringing us to the third component of the CENF, cognitive processes.

4.4 Adult learners' perceptions of the role of cognitive processes in numeracy

As mentioned previously many of the tasks described by participants in this study would require the extensive use of cognitive processes. For example, the plasterer working out the correct ratio needed to make the plaster for a certain surface area would undoubtedly need to be able to analyse the situation at hand, process the information and problem solve. Another participant gave the following example of using numeracy in an everyday context, whilst baking:

> Sarah: "When you want to measure just say a thing of flour, you know you pop your, em, bowl on top of the weighing scales and then it has its own measurement so you have to minus the measurement of the empty bowl compared to when it's a full bowl."

This type of task would again involve analysing the situation, reasoning and critical thinking. Furthermore, during the course of the interview each participant was presented with the advertisement shown in Figure 4 and asked if they would be inclined to purchase one or two pizzas based on this offer.

Figure 4. Advertisement shared with participants during the interview

Across all interviews / focus groups only one participant was unable to determine if two pizzas for €7 was better value than one pizza for €3.50. All other participants recognised that "… you're not really getting a deal at all…it's set up to look good but it's not" (Kate). Arriving at this conclusion required participants to process the information available to them and engage in reasoning and critical thinking skills. Despite multiple examples being provided in the interviews that clearly show how these participants draw on higher order thinking skills when engaging with numeracy tasks, no participant associated numeracy with these type of cognitive processes.

As discussed previously, very few participants saw numeracy as more than basic mathematics. Despite providing very rich examples of challenging numeracy tasks that they encounter daily, no participant reported that numeracy required higher order thinking skills such as those outlined in the CENF. It is therefore clear to the authors that the participants do not fully appreciate the complexity of many of the tasks that they complete on a daily basis. While Keogh et al. (2018) ascertain that numeracy in the workplace is at times invisible to people, the higher order thinking skills that many of these numeracy tasks involve also seem to be completely overlooked. This could again stem from the lack of confidence displayed by the majority of participants in this study and in turn it could be a direct result of the beliefs they developed in school regarding their ability to complete "advanced mathematical tasks".

Regardless of the root cause of this issue it is really important that adult learners come to recognise that these higher order thinking skills, which Goos et al. (2019) coined as a critical orientation, are "crucial in a world where mathematical information is increasingly used by the media to persuade, manipulate and shape opinion about social or political issues locally, nationally and internationally" (Goos et al., 2019: 68). Not only that, but it is also necessary to highlight that they are already engaging with these cognitive processes on a regular basis to complete daily numeracy tasks that are much more challenging and advanced than these participants appear to believe.

4.5 Adult learners' perceptions of the role of content in numeracy

The final dimension of the CENF to be considered by the authors is the mathematical knowledge and skills which are required in order to be considered numerate. As discussed previously numbers and figures were seen to be synonymous with numeracy and so each participant recognised that numeracy required a good understanding of quantity and number. Across many of the interviews and the focus group, references were made to counting, calculating percentages, estimating time and calculating bills. All of these tasks would require a good understanding of the real number system. Furthermore in eight of the twelve interviews / focus group conducted, participants recognised that to be numerate required one to have a good understanding of dimension and shape. For example, Jake asserted that calculating the total volume of fluids drank requires numeracy while Suzy ascertained that numeracy was important if renovating and decorating:

Jake: "If I drink maybe four bottles of Heineken, that's going to be like I think 4 x 330ml, so how drunk will I be?"

Suzy: "Well measurements and stuff like that if you're decorating and reorganising and stuff like that."

Other examples provided related to calculating weights of farm animals and machinery, measuring lengths across different trades, working out the appropriate volume of air for a car tyre and converting between different units of measurement. As with numbers many examples from this strand of mathematics were provided but unfortunately, the same cannot be said for the remaining two strands: Pattern, relationships and change and data and chance. In two of the twelve interviews participants referred to numeracy requiring a good understanding of data:

> Callum: "Like the CSO, statistics, if I wanted to get something back and then I want to quote that. When I'd be involved, and I was involved in a farming organisation, and I'd be representing them at different interviews. And when I was asked for, you have to give specifics and specifics were numbers."

> Men's Shed 3: "I think the big one now is with Covid that all the information coming through all the news programmes, and they're all done in charts … And of course, stats can be manipulated to suit whatever information they want to put out there."

These excerpts show that these participants have a very good understanding of why one would need to have a good understanding of data and chance in order to be an engaged citizen in the 21st Century. However, it is worth noting that these responses came from two of the oldest participants in the sample and as such, the younger participants, despite growing up in "an increasingly complex and information drenched society" (SOLAS, 2021: 10), failed to see the need for a good understanding of data and probability to be considered numerate. No participant in the study referred to the need to have an understanding of pattern, relationships and change to be considered numerate. This is despite this dimension of mathematical knowledge being central to many mathematical formulae that adults would work with on a daily basis. For example, a good understanding of patterns and relationships would help an enthusiastic gym user to understand the method for calculating their target heart rate.

Similarly, it could be used by those interested in baking to convert from degrees Fahrenheit in a recipe to degrees Celsius for use with Irish cooking devices. These were areas that many of the adults surveyed expressed an interest in but yet did not recognise how patterns, relationships and change could play a role in these contexts.

The remaining three subcategories under the content knowledge and skills component of the CENF were included to reflect the prevalence of digital tools and applications in our digitalised society. Adult learners who participated in this study, in the main, appreciated the value of such tools and felt that they "certainly would be of great help" (Liam) when engaging in numeracy tasks. Only one participant, Ollie, could not identify any resources, physical or digital, that would assist with numeracy tasks despite this participant reporting using weighing scales and measuring tapes on a daily basis in his job.

> Ollie: "You weigh in on a weighbridge everyday and then you weigh out. That's all, that's not maths as such sure it's not. I'd be able to read all the weights whether in 10 tonne or 20 tonne."

This demonstrates that while this participant is working with measurements and tools, he does not consider this to be numeracy, or mathematics as he calls it, thus again suggesting a very limited, school-related understanding of the concept of numeracy.

For the other participants, the calculator was a resource that they instantly associated with being of use when working with numeracy tasks. For some, for example Kate and Davy, this was the only resource they felt that contributed to numerate behaviour while others believed that while the calculator had its benefits there was still some value to doing calculations mentally and only using the calculator as a last resort:

> Callum: "But I would think as well that you would fall back on the calculator and the beauty of the smartphone it has a calculator. So, tools are important, but the use of tools is almost a last resort in some ways."

This viewpoint, that resources such as the calculator should be used as a last resort, is another legacy of the school experience and the perception that numeracy is the equivalent of basic mathematics as this participant went on to state:

> Callum: "The basic maths, the basic maths would be em, and now I don't know about present, the scenario at our education level was that you were a dunce if you didn't come through with the three Rs[4] as they'd say without help."

4 The three R's are reading, writing and arithmetic.

However, others in the study were much more open to the use of physical and digital resources to enable them to solve different numeracy tasks that arose in their personal and professional lives. Many of those involved in trades cited the importance of measuring tapes and scales in order to perform their job efficiently and effectively while others reported that modern technologies and apps such as Google Maps, Revolut and Free Now assisted in their understanding of different tasks that required numeracy:

Men's Shed 4: "The most important one [tool to assist with numeracy knowledge] is your measuring tape."

Liam: "Yeah, I use, em, Free Now, that's for taxis. That's pretty good as well. That has a great map system on it as well."

Finally, it was interesting to note that the oldest participant in the study noted that while he appreciated the value of digital technologies, he believed this to be a "different kind of maths" (Men's Shed 3) and did not believe that a knowledge of these technologies and how they worked contributed to one's understanding of numeracy.

4.6 Adult learners' perceptions of the different levels of numerate behaviour

The second component of the CENF sought to highlight that adults can have different levels of numeracy, ranging from Level X where individuals struggled with numeracy tasks to Level Z where individuals used numeracy in specialised work settings. Most participants in this study viewed numeracy as basic mathematics that required very few higher order skills, suggesting many perceived themselves to be at Level X. However, the life stories they recounted over the course of the interviews / focus group would suggest that many were at a much higher level. Figure 4 shows the levels each participant was deemed to be at based on their life stories[5].

5 The Focus group data was omitted from this analysis as not everyone in the focus group had the opportunity to discuss their use of numeracy in their personal, social and professional lives.

Figure 4. Numeracy Levels of Participants Based on Life Stories Told

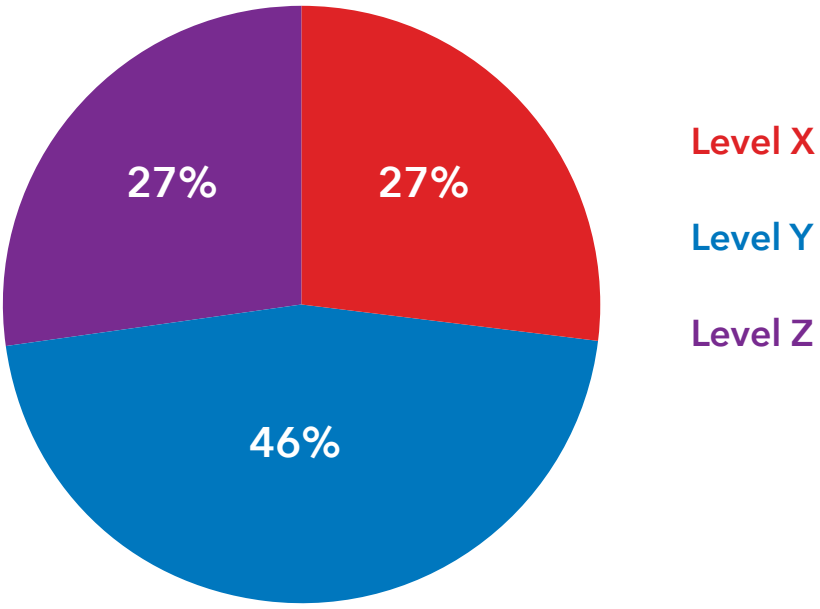


Figure 4 shows that only 3 of the 11 participants interviewed were considered to be at Level X, suggesting that these individuals may struggle with many aspects of the numeracy situations they encounter. However the majority (n = 8) demonstrated through storytelling that their numeracy capabilities exceeded this level. Many participants in this study lacked confidence in their numeracy skills and felt that challenging numeracy tasks were beyond them. However, the analysis revealed that when they recounted some of the tasks they did on a daily basis, it was clear that they were much more numerate than they gave themselves credit for. It was evident from listening to the stories of the participants that many, as Keogh, Maguire and O'Donoghue (2018) predicted, engaged with numeracy without recognising it as such.

One such example of this was in a story retold by Tracey. When asked to describe a scenario where she used numeracy she responded "No well I can't really think of anything off hand like". However, she then went on to outline how she had organised a charity event to raise money for a local member of the community. She discussed how she organised the event, was responsible for the ticket sales and in the end generated over €5,000 for the charitable cause. Such an undertaking would clearly involve the use of a multitude of the different components of the CENF (for example, financial context, citizenship context, using a calculator, quantity and number, mathematising and so on). Despite this, Tracey stated that she rarely used nor was confident in her numerate abilities.

The constant mismatch between adult learners' perceptions of the numeracy they engage in day-to-day and the actuality of their numeracy activities and abilities plays a significant role in the limited conceptualisation of numeracy evident in this research. The authors would argue from experience that such findings are likely to be reflective of much of the adult population in Ireland.

5. Summary of findings and implications

This research study sought to address two research questions. It first sought to **determine adult learners' understandings of numeracy**. The data revealed that participants in this study had quite a narrow and limited understanding of numeracy. They viewed numeracy as a subset of mathematics, a subject which they all had poor experiences of in school.

As a result of their school experiences, many participants in this study lacked confidence in their mathematical ability and numeracy competencies as they saw mathematics and numeracy to be the same. Many reported feeling anxious, nervous and confused when faced with numeracy tasks and felt that their own personal levels of numeracy limited the opportunities available to them.

The second research question focussed on **how the Common European Numeracy Framework (CENF) could be used or adapted to represent adult learners' understanding of numeracy**. The study indicated that adult learners recognise the need for numeracy in many of the contexts outlined in the CENF and appreciate that numeracy draws on mathematical content knowledge. For example, when prompted, participants in this study were able to provide examples of how they use numeracy in financial contexts, everyday contexts, work-related contexts, as well as in health and wellbeing contexts. They very much saw the need to have a good understanding of number systems in order to be considered numerate but other mathematical strands such as Patterns and relationships or Data and chance were not deemed as important, despite multiple applications in the previously mentioned contexts. Furthermore, they did not see the need for numeracy in citizenship or further education contexts. These perceptions reinforced the idea that participants in this study possessed a limited understanding of numeracy and its use and relevancy.

In addition to this, participants in this study were firmly of the view that competency in numeracy did not require a high level of cognitive processes. For example, they did not believe that numeracy tasks required them to critically analyse situations; to process information or to solve problems. This is despite these learners detailing instances and scenarios where they would have had to employ many of the higher-order skills referenced in the framework.

The transcripts indicated that this failure to recognise the cognitive processes required to complete numeracy tasks was due to the narrow understanding they had of numeracy, where they saw numeracy as no more than the capacity to work out simple calculations. A knock-on impact of this way of viewing numeracy meant that many participants did not feel that they could confidently call themselves numerate despite effectively engaging in numeracy tasks regularly.

This research showed that the CENF model is a good fit for understanding numeracy in the Irish context but work is now needed to:

(a) make policy makers, educators, adult tutors and learners aware of this framework;
(b) draw attention to the fact that numeracy is much more than basic mathematics; and
(c) broaden adults' understanding of numeracy.

We have identified the following five implications from these findings. Attention now needs to focus on how to transform these implications into actionable items to improve adult learners' experience, understanding and learning of numeracy.

Implication 1

SOLAS, in collaboration with the FET sector and others, should **agree a working definition of numeracy for use in adult education settings**. At present, the Adult Literacy for Life Strategy offers a definition for literacy but does not include the same for numeracy. As such, a refined and agreed definition for the sector, using the information in this report and the CENF would greatly assist adult education providers and support services produce teaching and learning aids that build on and support how adults use numeracy in different contexts.

Implication 2

All involved in the education system in Ireland need to be **aware that numeracy and mathematics are not the same**. Educators across the educational spectrum need to be able to distinguish between mathematics and numeracy. This distinction needs to be communicated clearly to learners at every stage of their educational journey. Teacher and tutor education and training and continuous professional development will be key to ensuring this becomes a reality but work also needs to be done to identify effective framework(s) to embed numeracy across the curriculum at primary and secondary level. Consideration is also needed to how such a framework can be adapted in community, further education and workplace settings. This will require collaboration and discussion between educational and other relevant stakeholders across the entire educational spectrum in Ireland including curriculum developers, policy makers, teacher educators, support services and adult education providers.

Implication 3

Every effort needs to be made to **build effective adult numeracy teaching and learning practices in Ireland**. First and foremost, work is needed to ensure that numeracy tutors have a deep understanding of what numeracy means. Continuous professional development for tutors around the CENF would help with this. In addition, teaching and learning resources aligned to this framework need to be developed, shared with and used by numeracy tutors and evaluated.

This study has shown that particular attention needs to be given to the **cognitive processes** that are critical for numerate behaviour. Adults need to be made aware that a variety of tasks they complete daily require an array of the cognitive processes listed in the CENF and not only basic mathematical knowledge and competencies. Lessons and / or resources designed to highlight this would therefore be very beneficial. This will help adult learners to view numeracy as a much more sophisticated concept that they can and do engage with regularly. This will only be possible if tutors are aware of the cognitive processes involved in an array of numeracy tasks. Therefore raising awareness of these cognitive skills and providing examples of the types of numeracy tasks that require such cognitive processes (such as through resources) will be important going forward. Only when tutors recognise the multi-faceted nature of numeracy will they be in a position to pass these messages onto adult learners.

In addition to providing professional development and resources relating to the CENF, the authors also believe that the teaching of adult numeracy will improve if tutors are given every opportunity to share best practice and network with their colleagues. The establishment of local communities of practice, similar to the Numeracy Meets initiative (Prendergast et al., 2022), should be explored.

Implication 4

There needs to be a change in the narrative around numeracy. Investigations need to be conducted to see how to promote the CENF as a way of developing adult learners' understanding of the broad and intricate nature of numeracy. The campaign, regardless of the format it takes, needs to highlight numeracy as a multi-faceted concept that involves both cognitive and affective dimensions. The CENF is a useful tool to demonstrate this. One possible strategy to help change the narrative around numeracy is to raise awareness of the CENF framework among adult educators and learners. Providing a promotional campaign is an opportunity to outline the different aspects that are central to the concept of numeracy and could help to highlight to adults the extent to which they are already using numeracy on a daily basis. The creation of teaching and learning aids that are modelled on the CENF should also be considered.

Implication 5

This study highlighted the lasting impact that participants' experience of school mathematics had on their willingness and confidence to engage with numeracy tasks. The authors firmly believe there is a need for **further research** to see if the education system, particularly at upper primary and lower post-primary, is catering for the needs of students who struggle with basic mathematical concepts. Research is needed to determine if current curriculum, teaching practices and parental supports are appropriate to meet the needs of this cohort of students.

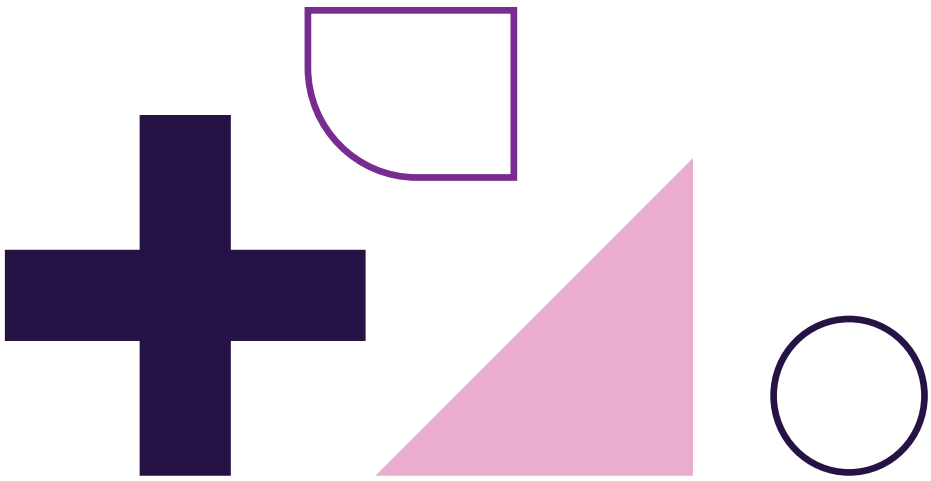
Implication 6

Finally, **adult numeracy providers need to recognise and respond to adults' previous experiences of learning mathematics at school**, and in particular the gaps in their knowledge upon their completion of schooling. This implication is in line with Guideline 2.2 in the SOLAS (2021) report. One possible strategy in this regard would be for adult numeracy providers to draw on the South African Mathematical Literacy course offered at school level (see Vithal & Volmink, 2005) in designing similar courses for adults in Ireland to address gaps in their numeracy knowledge.

6. Conclusion

In summary, this study has revealed numerous issues relating to adult learners' limited understanding of the concept of numeracy. While the CENF highlights the broad and intricate nature of this concept, adult learners' in this study did not believe that all of the different aspects outlined in the framework contributed to their own numerate behaviour.

However, the report has also identified some implications that the findings of this study will have and action now needs to be taken to address these. All stakeholders have a role to play in this. For example, policy makers need to agree a working definitions of numeracy. Support services and adult education providers need to widely publicise a broader definition of numeracy and produce teaching and learning aids that show how adults are using numeracy in different contexts. Employers need to highlight the wide variety of numeracy skills used in different jobs – not just arithmetic, while educators must build confidence and self-efficacy. Only when action happends on all fronts, will we witness changes in adult learners' understanding and appreciation of the broad and powerful nature of numeracy.



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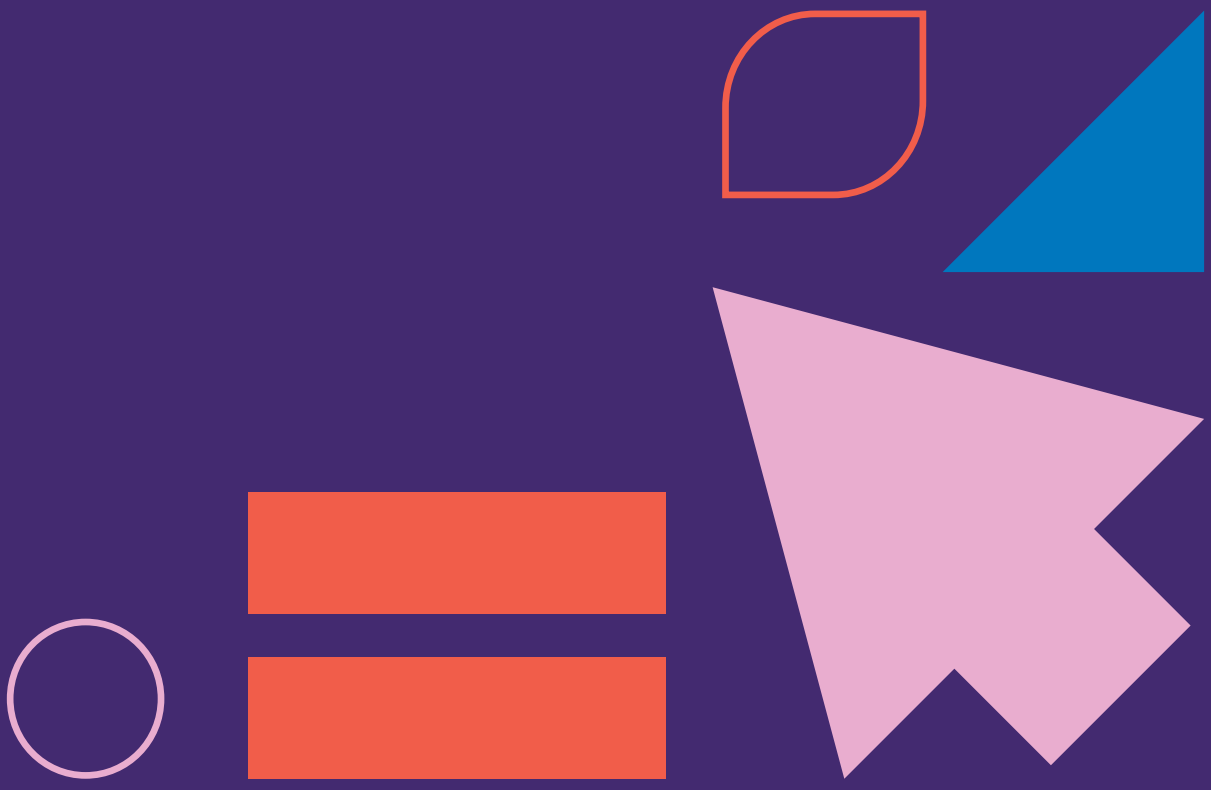

The National Adult Literacy Agency (NALA) is a charity and membership based organisation. We work to support adults with unmet literacy, numeracy and digital literacy needs to take part fully in society and to have access to learning opportunities that meet their needs. NALA does this by raising awareness of the importance of literacy, doing research and sharing good practice, providing online learning courses, providing a tutoring service and by lobbying for further investment to improve adult literacy, numeracy and digital literacy skills.

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