

Numeracy in Practice

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EXECUTIVE SUMMARY

The *Numeracy in Practice (NiP)* project aims to address the challenges facing adult numeracy education across Europe by developing educational materials and professional development resources tailored for adult learners. The project builds on the Common European Numeracy Framework (CENF), which emphasises numeracy as a multifaceted concept encompassing contexts, knowledge, higher-order skills, and dispositions. The NiP project aims to improve adult numeracy education by aligning teaching practices with learner needs and ensuring educators are well-equipped to support diverse adult learners across Europe.

In this report, the research team provides insights into data collected from adult learners and tutors in relation to numeracy provision to adult learners across 11 different European countries.

Methodology

A mixed-methods approach was adopted for this aspect of the NiP project, utilising an online survey for adult learners (n = 241) and semi-structured interviews with numeracy tutors (n = 32) across 11 European countries. The data was analysed using both quantitative statistical methods and qualitative thematic analysis.

Data Analysis and Key Findings

1. **Understanding of Numeracy:** Most learners associated numeracy with applying basic mathematics to everyday life. However, many equated numeracy directly with mathematics, reflecting a narrow conceptualisation.
2. **Attitudes toward Numeracy:** While many participants expressed positive feelings about numeracy, significant negative associations, such as anxiety and confusion, persisted, often linked to past negative experiences of mathematics in formal school settings.
3. **Effective Teaching Practices:** Both learners and tutors emphasised the importance of highlighting the utility-value of numeracy, using engaging teaching strategies, and fostering a supportive learning environment. Tutors highlighted challenges such as limited professional development opportunities, insufficient teaching resources, and time constraints all which impacted on their ability to teach numeracy to adults effectively.

Recommendations

Based on the findings to emerge from the data collection phase, the research team make the following recommendations which they believe will enhance the teaching and learning of numeracy for adult learners across Europe.

- Enhance professional development opportunities for tutors focusing on adult numeracy instruction.
- Develop culturally responsive and context-driven numeracy materials.
- Increase funding for adult education programs to ensure resource availability.
- Develop an awareness campaign to help highlight the fundamental differences between (school) mathematics and numeracy and the prevalence of numeracy in our daily lives.



1. INTRODUCTION

Numeracy is a term that can have a number of different meanings for different people (Goos et al., 2021). The concept of numeracy was first introduced in 1959 in the Crowther Report (Ministry of Education, 1959). In this report the word ‘numerate’ was defined as a word to mirror the term literacy and was seen to require the development of skills needed by individuals to think quantitatively. This definition was often criticised for lacking clarity and subsequently led many people to view numeracy as a component of literacy. However, it did provide a starting point for the evolution of the concept of numeracy. In 1982, the Cockcroft report offered a broader definition of the term ‘numerate’, deeming it 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’ and the second characteristic 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, p.11). This broader definition began to link numeracy to basic mathematical skills and such interpretations of numeracy have persisted in the intervening years. For example, 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. However, this view of numeracy as basic mathematics skills has, of late, been contested and criticised. For example, the assessment framework for the second cycle of PIAAC is very reluctant to define numeracy as basic mathematics skill (or a compendium of basic arithmetic skills). Instead, this report ascertains that numeracy is now seen as ‘a sophisticated capability requiring more than just arithmetic calculations and basic mathematics.’ (OECD, 2021, p.113).

Despite varying understandings of numeracy, no one can deny the importance of numeracy for active engagement in modern society. Managing finances, food shopping, cooking, taking medications, planning, traveling, reading the newspaper are just some examples of where numeracy skills are required by the general population. Furthermore, good numeracy skills empower people by giving them confidence in their everyday decisions; enhancing their job prospects and protecting their physical and mental health (O’Meara et al., 2024). However, many citizens lack essential numeracy skills needed to thrive in today’s technological and number-driven society. According to the OECD (2016), 22.7% of adults surveyed in PIAAC were performing at or below Level 1 of the proficiency scale in the area of numeracy. This means that these adults are not able to go engage in numeracy tasks that involve more than one-step processes, nor are they capable of dealing with problem scenarios where the numeracy component is not explicit. In some countries, such as Chile and Turkey, the proportion of adults in this category (61.9% and 51.2% respectively) is much higher. Such findings are of international concern as adults who fall into these categories will struggle to secure employment or actively engage in society in a meaningful way. This poses a threat to economic growth worldwide, especially with the increasing reliance on numerical data and predicted further technological developments.

In response to the lack of clarity around the concept of numeracy and the low levels of numeracy among European adults, a team of researchers across four different countries (Netherlands, Spain, Austria and Ireland) recognised the need to develop a framework that conceptualised numeracy for adult learners and highlighted the multifaceted nature of the concept. Thus, the *Common European Numeracy Framework* (CENF) was developed and was seen as a twin to the *Common European Framework of Reference of Languages*, which is used to compare



language proficiency. This framework outlines how there are four key constructs central to the concept of numeracy, namely contexts, knowledge and skills, higher order skills and dispositions. The framework also highlights how numerate behaviour can be considered at three different levels, each with two sublevels, thus allowing for numerate capabilities to be compared internationally. At the lowest level, Level X, individuals may struggle with many aspects of the basic numeracy situations they encounter. According to Hoogland et al. (2021), 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. A person who falls into this category 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.

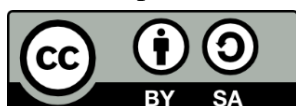
In addition to defining numeracy and identifying different levels of numeracy proficiency, the CENF was also designed to be used in conjunction with a set of professional development modules to facilitate improving the quality of numeracy teaching amongst educators of adult learners, in turn leading to improved adult numeracy levels. The project discussed in this report is a follow-up project to the CENF project and the two projects share many of the same aims. The *Numeracy in Practise* (NiP) project aims to develop the following resources all in the area of numeracy:

- Information and awareness packages;
- Teaching and learning material;
- Professional development materials;
- White papers on works in education.

These materials, when available, will contribute to the delivery of high-quality adult numeracy education across Europe, thereby contributing to policies which seek to improve adult numeracy levels across the continent.

The aforementioned materials will be grounded in both existing literature and current research. Prior to the development of the materials, the research team conducted a comprehensive review of existing literature. The literature review was designed to ascertain (a) how adult numeracy is defined; (b) challenges facing the teaching and learning of numeracy to adult learners; and (c) what constitutes effective numeracy practices. The key insights to emerge from this exercise was the lack of clarity around the definition of the term numeracy; the need for effective numeracy practices/experiences to be responsive to the needs of adult learners; the importance of highlighting the utility value of numeracy and ‘hidden numeracy’ to adult learners; and the urgent need for professional development and funding to be made available to improve the teaching and learning of numeracy to adults across Europe. These key insights from the literature review were then used to inform the development of the aforementioned materials for the NiP.

In addition to the literature review and the development of the suite of resources outlined above, the NiP project also sought to ascertain European tutors’ and learners’ understanding of the concept of numeracy; identify their perceptions on effective practices in the teaching and



learning of numeracy currently in existence internationally; and shed some light on the needs of adult learners in relation to numeracy education. Such insights would also serve to inform the resources developed as part of the study and provide a clearer picture of the state of play of numeracy education across Europe. In order to achieve these goals numeracy tutors ($n = 32$) across Europe were invited to participate in an online interview whilst adult learners ($n = 281$ [241 valid]) were invited to complete an online survey. In this report we will provide a comprehensive overview of the findings to emerge from this exercise.

2. METHODOLOGY

2.1 Research Instruments

A mixed methods approach was adopted for this study. As a result, both qualitative and quantitative data was gathered through the use of two research instruments. The first research instrument, an online adult learner survey, yielded a mix of qualitative and quantitative data. In total the survey contained four sections with the data collected primarily being categorical in nature. The four sections were:

- (a) *Background Information* section containing 1 multiple choice question and 2 open ended questions relating to participants' demographics.
- (b) *Understanding of Numeracy* section containing 3 open ended questions and 1 dichotomous question which sought to determine learners' understanding of numeracy and how it differs from mathematics.
- (c) *Attitude towards Numeracy* section containing 1 multiple choice question whereby participants were provided with a list of emotions and asked to identify those they associate with numeracy; 1 Likert scale question with 4 statements with which they outline their level of agreement (from strongly agree to strongly disagree), followed by 4 open ended questions where they explain why they provided the agreement rating for each.
- (d) *Numeracy Teaching and Learning* section containing 3 open ended questions where subjects were asked to describe a positive learning experience in the area of numeracy and outline how they would like to see numeracy taught to the adult population and 1 multiple choice question regarding what they perceive as an effective approach to numeracy education for adults.

The learner survey was designed on the Qualtrics platform and disseminated via a QR code to adult learners.

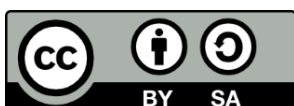
The second research instrument was a semi-structured interview conducted with adult education tutors. This research instrument yielded qualitative data. In total, four topics were addressed as part of this interview, namely:

- (a) Tutor background;
- (b) Approach to teaching numeracy to adult learners;
- (c) Resources for teaching adult numeracy;
- (d) Professional development.

Each interview was conducted online, recorded and then transcribed by the research team.

2.2 Sample

For this study convenience sampling was employed. While there are some obvious limitations associated with the use of this non-probability sampling method, it was deemed to be the best



fit for the purpose of this study. Each partner in the NiP team ($n = 11$) was asked to recruit 15 adult learners and three adult tutors in their own jurisdiction who would consent to take part in the study. This sampling strategy led to a sample size of 281 adult learners and 32 adult tutors. All 32 tutors participated in an interview which was later transcribed and analysed. When the 281 survey responses were reviewed it was noticed that some of these responses had to be removed from the final sample for a multitude of reasons. 3 responses were removed as the participant did not consent to participate in the survey; 9 responses were removed as the participant was under 18 years of age; 1 response was removed as the participant responded with the word “Test” to all questions; and 27 responses were removed as they provided no data apart from answering the initial questions. Once this data cleaning exercise was complete the sample size for the learner survey stood at 241. 40% of the sample identified as male, with 57% identifying as female and 3% preferring not to share information regarding their gender. Of the 241 respondents, 229 answered the question about their age. The age of respondents ranged from 18 to 83 with a median and interquartile range of 42 and 23 years, respectively.

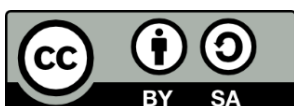
2.3 Data Analysis

Once all of the data had been collected the research team had to design a coding system so each respondent had their own unique identifier. Each code generated by the research team consisted of four characters, two letters followed by two numbers. The first letter was either L or T. This allows the reader to differentiate between the responses of adult learners (L) and those of tutors (T). The next letter is between selected from letters A to K and represent which of the eleven countries the participant comes from. We randomly assigned a letter to each country in order to protect the identity of each participant and the same letter for each country was used when assigning codes to learner and tutor. The last two digits are a number assigned to each participant. For the interviews, the numbers are 01 – 03 as there was a maximum of 3 tutors interviewed from any country. For the surveys, the numbers ranged from 01 to 36, as 36 was the maximum number of responses received from any one country. As an example, take the following two codes:

1. LB14
2. TK02

We can tell the first code was an adult learner responding to the survey since the letter L is at the start. This contrasts the second code, which we know was from a tutor who participated in an interview since the code starts with the letter T. Also, we can tell the two codes are from different countries (although we don't know which two) since the second characters in each code are different. Finally, the 14 in the first code tells us this was the 14th participant of the survey from country “B”, while the 02 in the second code tells us this was the 2nd interviewee from country “K”.

Once this coding exercise was complete the authors were in a position to begin analysing the data. For the quantitative data analysis, the researchers first cleaned the data for use in *R*. This involved making sure the responses to questions used universal terminology. For example, in one of the questions, the participants were asked to identify which (if any) of the words on a given list came to their minds when they heard the word “numeracy”. Due to the multilingual nature of the responses, efforts had to be made to ensure the same translation of each word into English was used. The authors elaborate more on this in the subsequent sections. Once the data



was cleaned, the data was imported into *R* and the *ggplot* package in *R* was used to generate descriptive statistics relevant to the adult learner participants' responses to the questions of the survey. For the qualitative data analysis, the researchers used thematic analysis to analyse the data. In particular, for the surveys, the six-step approach of inductive thematic analysis popularised by Braun and Clarke (2006) was employed by the researchers. The six steps central to this approach were:

1. Familiarise oneself with the data;
2. Generate initial codes;
3. Search for themes;
4. Review themes;
5. Define and name themes;
6. Produce a report,

The coding process was conducted in *NVivo*, with the researchers identifying major themes for each of the ten questions in the survey that yielded responses of a qualitative nature. The researchers met weekly to discuss their results and ensure that similar themes were being identified by both researchers.

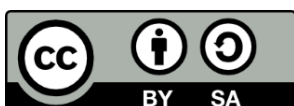
For the interviews, a hybrid inductive/deductive thematic analysis approach was used. This involved using the framework developed during the CENF project to identify the respondents' (i) concepts of numeracy (ii) their ideas of effective adult numeracy practises; (iii) the professional development experiences they have encountered; and (iv) the resources that they have utilised or are cognisant of for use with adult learners in a numeracy classroom. A less stringent inductive thematic analysis of the interview responses (compared to the analysis of the surveys) was also conducted in parallel to the deductive analysis to identify insights, which would have otherwise been missed through the narrow focus of the deductive analysis. On conclusion of the data analysis, the researchers compiled the following sections to provide an overview of key results, for dissemination to researchers in participating institutions and beyond.

4. SURVEY RESULTS

As previously discussed, the surveys were disseminated to adults in each of the 11 participating countries, with a specific focus on those who had taken an adult numeracy course at some point. The survey was developed in English and then translated for learners in the 11 countries, where necessary. The questions in the surveys were crafted to obtain relevant background information on the participants, their understanding and conceptualisation of numeracy, their attitude towards numeracy and what they believe constitutes effective adult numeracy practices. We provide the questions asked in the survey in Appendix A.

4.1 Background Information

The opening section of the survey collected demographical information about each of the adult learners. We have provided information regarding the gender and age breakdown when describing the sample above. In addition to this, adult learners were also asked to provide information on their prior experience of schooling; their engagement to date with adult numeracy courses and where they undertook such courses.



4.1.1 Prior experience with mathematics

Participants were asked to select all that apply from a list of options regarding their previous experience with mathematics in school and beyond. Their options included “primary school”, “lower secondary school”, “upper secondary school”, “vocational program”, “undergraduate degree”, “postgraduate degree” and “other”. If a participant chose “other”, they were asked to provide some additional information. 9 people did not choose any of the options and hence the sample for this question was $n = 232$. We note that the educational systems, particularly at pre-tertiary levels, are different in all participating countries and hence these terms may not translate exactly between participants, however a general idea of the participants’ experience with mathematics should be obtainable. We provide the results in Table 1.

Table 1. Prior experience of mathematics

Experienced mathematics in	Number (Percentage)
Primary school	174 (75%)
Lower secondary school	152 (66%)
Upper secondary school	129 (56%)
Vocational program	20 (9%)
Undergraduate degree	63 (27%)
Postgraduate degree	18 (8%)
Other	15 (6%)

Many respondents to this question only selected one option, despite the question specifying to select all that were applicable. In such instances, the option selected was considered the highest point to which the participants had studied mathematics.

4.1.2 Participants engagement with adult numeracy courses

In addition to gathering information about their experience of school mathematics the survey also sought to ascertain their experience of numeracy as an adult learner. The participants were asked whether they engaged with adult numeracy courses prior to taking the survey and in what kind of numeracy course they participated. Their options were:

- *Standalone numeracy courses* i.e. sole focus of the programme was on numeracy and/or mathematics;
- *Integrated numeracy courses* i.e. numeracy was incorporated into a programme with a different focus such as horticulture, cookery etc.;
- I have never engaged in a numeracy course as an adult learner.

The participants could choose as many options as applied to them. 13 people did not choose any of the options making the sample for this question $n = 228$, with some adults participating in more than one type of numeracy course during their time in adult education. The results of this question are provided in Table 2.

Table 2. Types of adult numeracy courses adults engage with

Type of participation	Number (Percentage)
Standalone adult numeracy course	73 (32%)
Integrated adult numeracy course	88 (39%)



Never engaged with adult numeracy course	81 (36%)
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Table 2 shows that over one-third of the sample had never engaged with numeracy courses. Of those who had participated, integrated numeracy courses were the most popular type of programme but there was very little difference across the two categories.

4.2 Understanding of Numeracy

4.2.1 What numeracy means to me

With the profile of adult learners who participated in this study firmly established the first goal of this study was to gain insights into adult learners understanding or interpretation of numeracy. In order to address this goal participants were asked to explain, in as much detail as possible, what the term “numeracy” meant to them. The responses were qualitative in nature and, as mentioned previously, the researchers analysed the data using inductive thematic analysis. The themes Table 3.

Table 3. Adult learners’ conceptualisations of numeracy

Theme: means...	Numeracy Number of countries	Example Quote
...applying mathematics to everyday life	10	LH07: Numeracy is the ability to understand and apply mathematical calculations to various situations in life. LB10: Numeracy refers to the ability to use, interpret and communicate mathematical information to solve real-world problems. LK08: Using mathematics in our lives, understanding and making sense of our environment through mathematics
...doing basic arithmetic/ working with numbers	9	LD07: Simple math knowledge LE25: The understanding of numbers and how they can be manipulated. LF03: The ability to do logical operations with numbers
...part of or the same as mathematics	7	LD08: The word arithmetic is a subset of the word mathematics LC09: I don't quite get it, for me it's maths LC13: For me, numeracy means learning mathematics

Participants in ten out of eleven countries reported feeling that numeracy involved applying mathematics to everyday problems. This suggests that the vast number of adult learners recognise that context is at the core of what numeracy means. The next major theme was doing basic calculations and arithmetic with participants in nine out of the eleven countries outlining that this is what numeracy means to them. Finally, the third theme was an expression that numeracy



was a part of mathematics or even identical to it. This view was shared by participants in seven out of the eleven countries. The latter two conceptualisations of numeracy indicate that while a large number of learners recognise the importance of context for numeracy many, across a range of different countries still do not associate higher order skills with the construct of numeracy and instead equate it to basic mathematical skills.

Finally, when considering participants responses to this question the research team noted the following response:

LJ03: It's name itself indicates it is about numbers.

From this response we can see that the term used to describe numeracy, in English and other languages, is influential. Here the respondent suggests that because of the similarities between the word number and the word numeracy he/she concludes that numeracy is just about numbers, despite research conducted as part of this study showing that numeracy encapsulates much more than this. As such, this indicates that one's interpretation of numeracy could be influenced by the word itself and its similarity to other words and researchers and policy makers ought to be aware of this when using different terms interchangeably to describe this idea.

4.2.2 Numeracy versus mathematics

As part of garnering insights into what participants understand numeracy to mean the authors thought it was pertinent to see if the participants recognised the difference between mathematics, particularly the mathematics that they learned at school, and numeracy. The participants were asked if they regarded ' numeracy and mathematics to be the same thing. The responses to this dichotomous questions are presented in Figure 1.

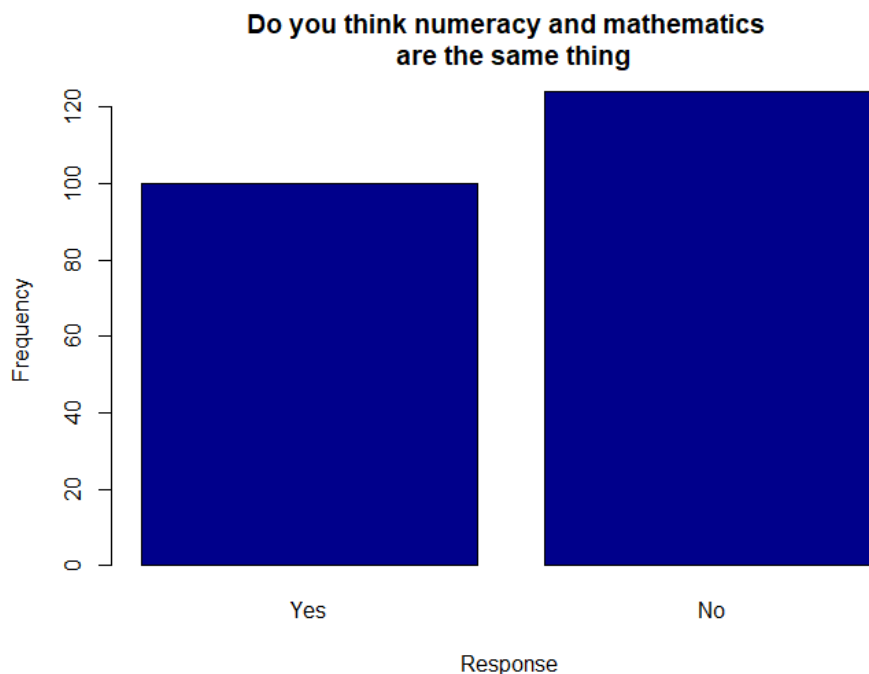


Figure 1. Are numeracy and mathematics the same?

In total, 17 people did not offer a response to this survey item meaning a sample size of $n = 224$. 45% ($n = 100$) of respondents were of the believe that there was no difference between



numeracy and the mathematics learned at school while the remaining 55% of the same ($n = 124$) thought that there was subtle differences between the two. The authors also wished to investigate if adult learners' perspectives on whether numeracy and mathematics were different constructs differed across countries. To do this, they considered the responses to the aforementioned dichotomous question from participants across each of the eleven countries. The results are presented in Figure 2.

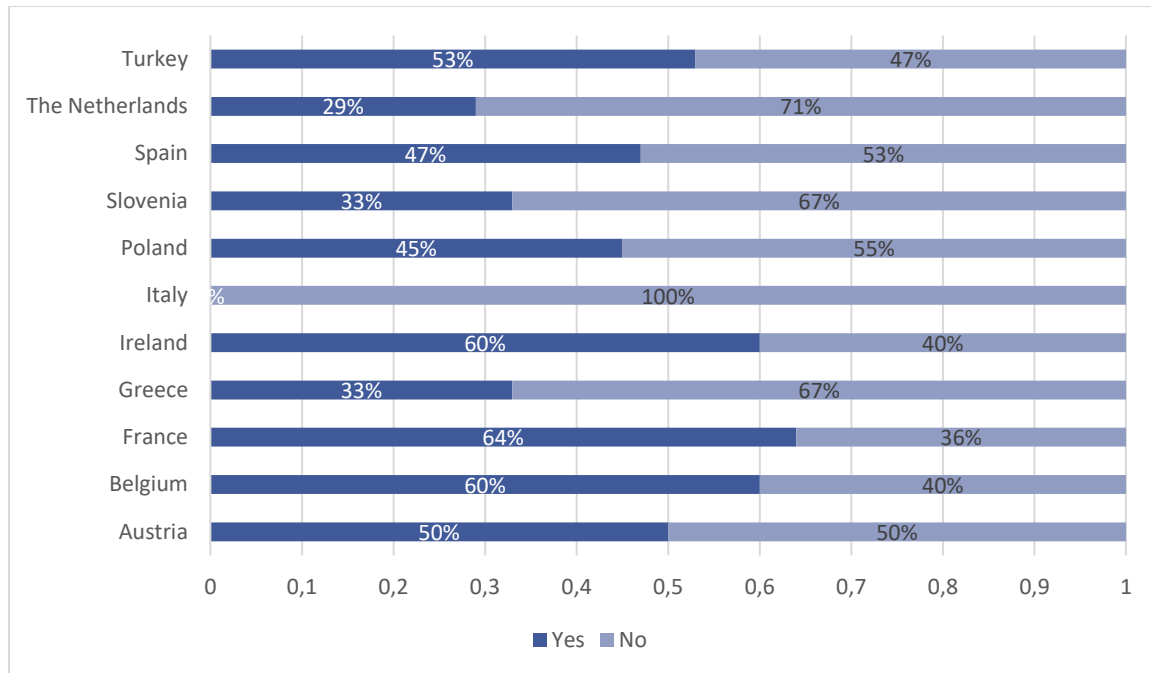


Figure 2. Are numeracy and mathematics the same: Cross-country comparison

Figure 2 shows that only in Italy did no adult learner report perceiving mathematics and numeracy as identical constructs. In every other country at least, some learners were unable to distinguish between the two. Notably, in five of the eleven countries (Austria, Belgium, France, Ireland, Turkey) where this study was conducted at least half the respondents were unable to see any differences between numeracy and mathematics.

To investigate this issue further, participants were then invited to elaborate on their response with two follow up questions. For those who believed mathematics and numeracy were the same they were asked to elaborate on why they believe this to be the case. On the other hand, those that reported viewing numeracy and mathematics as two different entities were asked to elaborate on what they considered to be the main differences between the two. The main themes that emerged from the responses of those who thought mathematics and numeracy were independent constructs are presented in Table 4.

Table 4. Perceived differences between mathematics and numeracy

Theme	Number of countries	Example Quote
Maths is broader/more complex than numeracy	11	LF02: Numeracy skills is based on mathematics, but not all mathematics is numeracy,



		mathematics is a broad subject that includes a lot of different fields LI10: Math is more complex, numeracy we use daily.
Mathematics is knowledge and numeracy is mathematics applied to real life	10	LH07: Mathematics is a field of knowledge, and numeracy is the ability to apply mathematics to everyday life situations
Don't Know/Unsure	7	LG24: No idea LE27: I don't really know

Table 4 demonstrates how some participants across all eleven countries believe that mathematics is broader or more complex than numeracy. This suggests that adult learners consider numeracy a subset of mathematics. The second theme shows how the adult learners surveyed consider mathematics to be a bank of knowledge and numeracy is using that knowledge to solve real world problems. This theme also corroborates with the findings that emerged when adult learners were asked to share insights into what numeracy means to them. Once again, we are seeing here that adult learners view numeracy as mathematics applied to solve real world problems. Furthermore, both these conceptualisations of numeracy are in line with modern thinking and help to underline the power of numeracy. This, therefore is an extremely positive finding. The third theme, don't know/unsure, is also interesting. This theme, which was reported by learners in a majority of countries, reports a general lack of knowledge or confidence in knowing the difference between numeracy and mathematics is, despite acknowledging that there is some difference. The participants seemed to be comfortable reporting what they considered numeracy to be but were far more uncertain when asked to report on the how mathematics and numeracy are differentiated.

Those adult learners who did not believe there to be a difference between mathematics and numeracy were asked to outline why they held this belief and the analysis of responses to this question indicated that the themes described in Table 5 were the most common.

Table 5. The overlap between mathematics and numeracy

Theme	Number of countries	Example Quote
Mathematics and Numeracy share the same core characteristics	9	LE02: They are all dealing with numbers LB07: It is about numbers. LD04: They include similar things and knowing math means knowing the other.
Don't know/Unsure	3	LC05: In truth, I don't know, I don't understand this word "numeracy" LD14: I'm having a hard time telling them apart.



Table 5 shows that the main reason people see mathematics and numeracy as the same is that they share many core characteristics. For example, the adult learners surveyed believe both involve primarily working with numbers and so can be considered one and the same. Such beliefs, the authors hypothesise, again stem from the narrow conceptualisation of numeracy held by adult learners in this study, as discussed previously. Of the countries that answered this question ($n = 10^1$), Austria was the only country, which did not report this theme. In fact, Austria only expressed the view of the second theme – don't know/unsure. The second theme to emerge from the data collected in response to why numeracy and mathematics are not considered to be different again indicates a lack of understanding around the concept of numeracy and highlights the knock-on effect that this can have. In this instance, because adult learners such as LC05 don't fully understand the concept of numeracy they do not believe it to be different to mathematics but cannot then articulate why this is the case.

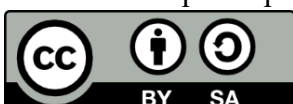
4.3 Attitudes towards numeracy

In addition to investigating how the adult learners in this study conceptualised numeracy the authors were also keen to determine the dispositions of these adult learners toward numeracy. In order to garner such insights the survey first contained a question whereby the respondents were asked to pick from a list of sixteen words/emotions, those that they associate with numeracy. Eight words reflected positive associations while the other eight reflected negative associations. The words presented to the respondents were:

- Confident
- Good
- Excited
- Love
- Nervous
- Confused
- Anxious
- Sick
- Comfortable
- Fine
- Happy
- Interested
- Bored
- Panic
- Stupid
- Defeated

A challenge in analysing the responses to this question arose when the surveys were translated, and different words, or different versions of the same word were used in translated versions of the survey. For example, “Stupid” translated as “dumb” in one set of surveys and “silly” in another set. Hence, the first step of the analysis for this question was to standardise the words.

¹ No participant from Italy reported that they felt mathematics and numeracy were the same and hence no participant of the Italian survey responded to this question.



A set list was chosen and any words that diverged from this were manually updated by the researchers in the master file so that every response only contained the standardised words listed above.

32 participants did not choose any of the words and therefore the sample for this question was $n = 209$. The participants were free to choose as many words as they liked and the results are given in Figure 3.

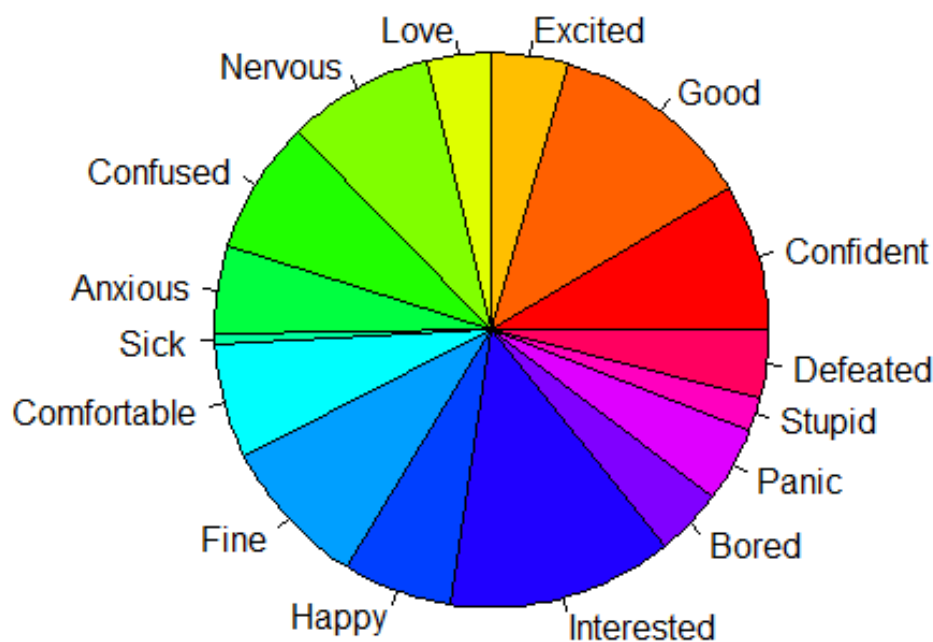
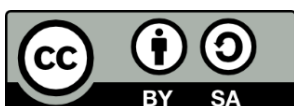


Figure 3. Words adult learners associate with the term numeracy

Figure 3 indicates that the adult learners surveyed as part of this study have a relatively positive disposition towards numeracy. The two words most commonly associated with the term numeracy are *interested* which was selected by 40% ($n = 84$) of respondents and *good* which was selected by 37% ($n = 77$) of respondents. On the other hand, only 2% of the sample ($n = 4$) associated the word *sick* with numeracy. This is a positive finding to emerge from this study, however it must also be noted that while people did perceive numeracy in a relatively positive way very few reported being excited (14%) by or loving numeracy (11%). Likewise, a significant proportion of the sample reported feelings of nervousness (26%), confusion (24%) and anxiousness (16%) when faced with numeracy tasks. This suggests that while learners involved in this study might not hate numeracy engaging with numeracy tasks can make them apprehensive and worried, feelings often associated with the idea of maths anxiety. Such feelings will limit these people's capacity to engage and interact with numeracy tasks in a meaningful and efficient manner.

In order to further explore adult learners' dispositions towards numeracy, a set of Likert Scale questions were included in the survey. Participants were asked to rate their level of agreement with four statements on a five point scale from *Strongly Agree* to *Strongly Disagree*. The four statements which were presented to adult learners were:



1. I have a positive attitude towards numeracy learning;
2. I have enjoyed studying numeracy as an adult;
3. Numeracy skills are extremely important;
4. Everyone can possess good numeracy skills.

When analysing the data collected from these questions there was again a slight translation issue. In order to analyse the data in *R*, the same standardised answers had to be used. For the researchers, this involved manually changing any translations that did not match the 5 standard responses. For example “I really agree” was changed to “I strongly agree”. This was minor however and did not cause as many problems as the previous questions, since the response from each participant was clear, removing any ambiguity. The four statements the participants were asked to rate their agreement on were

For the first statement, 34 participants did not give a response and hence $n = 207$. For the second and fourth statements, 33 participants did not give a response hence in these instances $n = 208$. For the third statement, 32 participants did not give a response hence $n = 209$. We provide the results to the four questions in Figure 4.

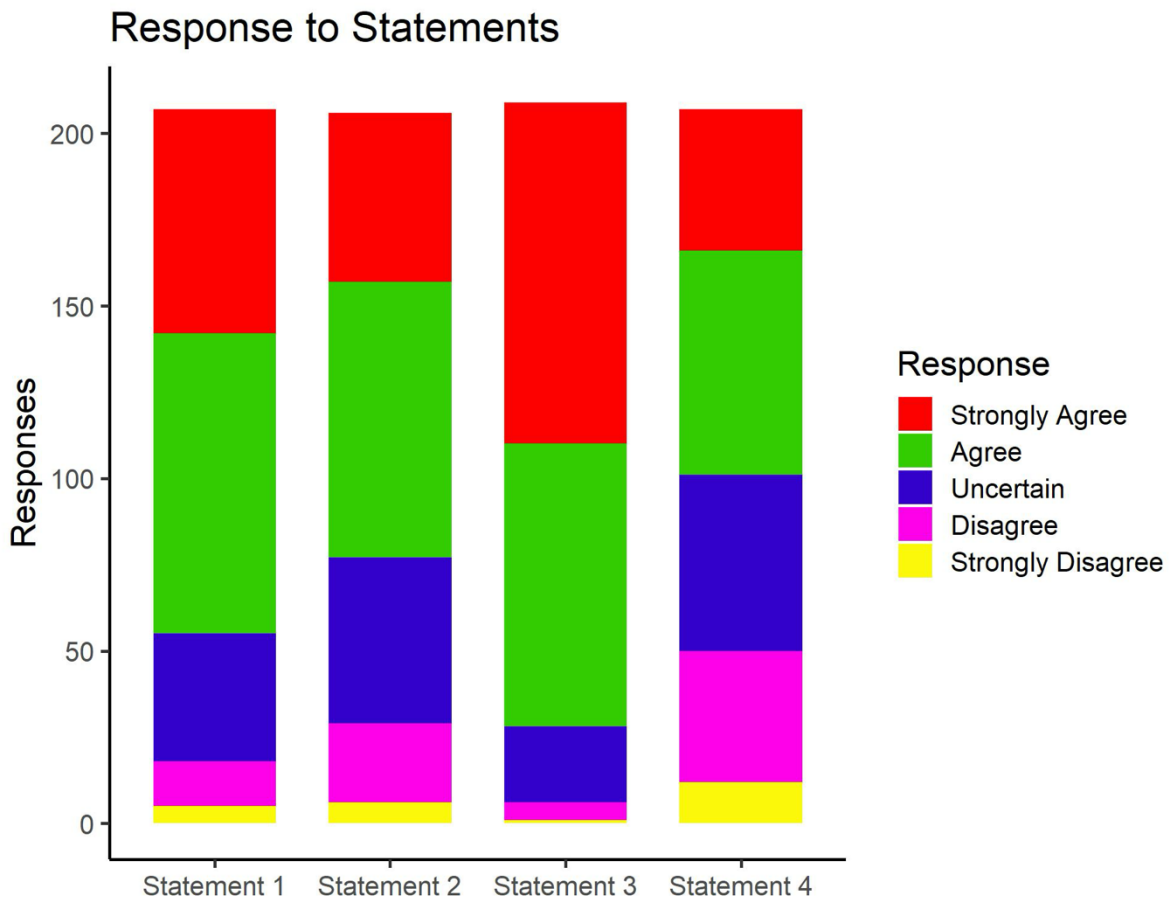


Figure 4. Adult learners' responses to statements around their disposition towards numeracy

In the main students appeared agreeable with each of the four statements presented to them. For example, over 50% of respondents either agreed or strongly agreed with each statement, with the largest proportion (86.6%) agreeing or strongly agreeing that *Numeracy skills are extremely important*. On the other hand however, close to one-quarter (24.1%) of respondents disagreed or strongly disagreed that *Everyone can possess good numeracy skills*. This is of concern as if numeracy is considered inaccessible to many then some adults will avoid the subject due to their belief that they will never be able to succeed., regardless of the effort they make.

In addition to asking adult learners to rank their level of agreement with these four statements they were also asked to explain the rankings they provided for each. We will now present these findings by first outlining the reasons offered by those who were agreeable with the statements before presenting the reasons offered by those who disagreed with the statements. As a result, there are two tables of responses per statement. We provide the themes in the responses to the first statement (I have a positive attitude toward numeracy) in Table 6 and Table 7.

Table 6. Reasons adult learners were agreeable with the statement *I have a positive attitude towards numeracy*

Theme	Number of countries	Example Quote
General interest/like of mathematics	10	LK07: I love math science and finding solutions LG02: I have an above-average interest in numeracy
Mathematics is very useful/important	9	LH09: Mathematics is necessary for life, so you need to know it. LI02: Because today using numbers is unavoidable.
Like/open to learning in general	3	LJ05: I like to live learning. LG18: Learning can always be fun

Table 7. Reasons adult learners were disagreeable with the statement *I have a positive attitude towards numeracy*

Theme	Number of countries	Example Quote
Previous negative experiences with mathematics	7	LA14: because I have negative experiences from school (bullying), strict teacher at school
Negative feelings towards mathematics in general	5	LI04: I was never good at numeracy. LF08: I never had a good relationship with subjects linked with mathematics, they give me anxiety



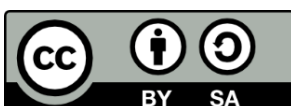
Given that Figure 4 indicates a generally positive attitude towards numeracy, it is not surprising that the majority of the responses to this question were positive in nature. The themes in Table 6 above indicate that the main factor affecting one’s attitude towards numeracy is a general interest or liking of mathematics. This is closely followed by the perceived utility value of mathematics in real life and its importance in day to day living. These two themes are expected as one who enjoys mathematics or who finds mathematics useful is certainly more likely to appreciate it and have a more positive attitude towards it. However, again the authors wish to point out how adult learners surveyed as part of this study tend to use the terms numeracy and mathematics interchangeably and here when explaining why they were positively disposed to the construct of numeracy they tended to make reference to mathematics only rather than numeracy. This may not be problematic in this instance but when we consider the reasons students gave to explain why they were not positively disposed to numeracy some issues begin to emerge. There were two main themes reported by participants who possessed a negative attitude towards numeracy. Both stem from negative views on mathematics in general and as such we see how failure to distinguish between mathematics and numeracy can negatively impact on their perceptions of numeracy. Adult learners involved in the study reported that previous negative experiences with school mathematics in particular, had a lasting impact and resulted in these adult learners feeling anxious and uncomfortable when engaging with numeracy. This is an important point as it shows that people’s attitudes towards numeracy is heavily impacted by their experience with mathematics at school, particularly when they cannot see the difference between mathematics and numeracy. Having a teacher scold you in school or struggling with a topic in mathematics class can result in a negative view of numeracy well into the future. Hence, remedying issues surrounding negative dispositions towards numeracy may need to commence earlier in one’s educational journey.

The themes for the responses to the second statement (I have enjoyed studying numeracy as an adult) are given in Table 8 and Table 9 below.

Table 8. Reasons adult learners were agreeable with the statement *I have enjoyed studying numeracy as an adult*

Theme	Number of countries	Example Quote
General interest/like of mathematics	10	LA10: Because I love maths LD06: Yes I liked it because it is in my interests
Being able to expand/revise knowledge skills related to mathematics	6	LC27: It's a great way to brush up on your maths LB15: I like numeracy because it develops problem-solving skills
Being able to use mathematics in real life	5	LK05: It makes me happy to master the mathematics that we use in every aspect of our lives.

Table 9. Reasons adult learners were disagreeable with the statement *I have enjoyed studying numeracy as an adult*



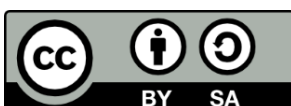
Theme	Number of countries	Example Quote
Negative impression/experiences of mathematics	11	LA14: because I have negative experiences from school (bullying). LI03: I don't link number learning with a positive feeling.
Didn't do adult numeracy course	9	LI11: There were not many numeracy courses available. LF01: I didn't have many opportunities to study numbers as an adult

The reasons given by participants in agreement with the statement are similar to those identified for the statement regarding positive attitudes towards numeracy. Most participants here point to a general interest/like in mathematics with only The Netherlands not reporting this theme. It is a little surprising that adult learners in just five countries (Ireland, Belgium, Spain, Italy and Austria) reported that they enjoyed studying adult numeracy as it was useful to their real life. This is something to consider as teaching adult numeracy should, according to tutors also, be focused around teaching skills that are applicable to real life, as will be discussed by tutors in Section 5.3. The primary reason provided by those in disagreement with the statement was again related to a negative impression of mathematics that stemmed from some prior experience. This is to be expected as a reason why somebody may not enjoy an adult numeracy course. Finally, one theme that is not displayed in the table above was predominantly reported by participants from Ireland and Belgium. These countries had participants who used the phrase “it depends” a lot more than any other country. Such responses generally fit into the themes in Table 8 or Table 9 above, however they were written together and this therefore serves as a reminder that for a lot of participants, the responses are not necessarily black and white and the intricate nature of their perspectives needs to be considered.

The third statement which adult learners were asked to rank their level of agreement with in this section of the survey was *Numeracy skills are extremely important*. The vast majority of respondents ($n = 181$) either agreed or strongly agreed with this statement and the main reasons given by these participants for such a ranking are outlined in Table 10.

Table 10. Reasons adult learners were disagreeable with the statement *Numeracy skills are extremely important*

Theme	Number of countries	Example Quote
Important for real life	11	LJ07: We live in a numerical world LG08: Yes you do need knowledge of numbers in daily life and to some extent in your work too
Knowing basic arithmetic is important	5	LE24: Even though we have calculators I think everyone should be able to do basic maths, just like everyone



		should have basic reading skills
Not important	4	LB08: No, good health is extremely important

The primary reason given by participants for agreeing that numeracy skills are important is because they recognise the prevalence of numeracy in our day to day lives. Participants across all eleven countries involved in this study reported that they could see instances where they would need numeracy skills in order to function from day to day. Such findings indicate that the participants are aware of how useful numeracy is and the multitude of different day-to-day tasks it can assist with. The second and third themes were less pronounced however it was interesting to see that despite all eleven countries reporting numeracy is important to real life, participants in four countries also reported that numeracy is not important. It is clear that some participants continue to be oblivious to the power and applicability of numeracy. Some other responses from participants which were not identified as themes as they only appeared in the responses from one or two countries were numeracy is important for (i) scientific advancement, (ii) numeracy is important for work/job opportunities, and. (iii) numeracy is important to improve people’s way of thinking. The latter point is interesting as the increase in the use of new technologies such as social media and AI means it is increasingly important that people have the skills to critically analyse information provided to them thus making numeracy even more important in our highly digitised world.

The fourth and final statement which adult learners were asked to rank their level of agreement with in this section of the survey was *Everyone can possess good numeracy skills*. The primary reasons behind participants decision to agree (Table 11) or disagree (Table 12) with this statement are provided below.

Table 11. Reasons adult learners were agreeable with the statement *Everyone can possess good numeracy skills*

Theme	Number of countries	Example Quote
Important to know at least the basics	8	LI08: I would not say everybody. People have different strong points. Everybody can probably learn the basics. LF02: I don't think that everyone can have good calculating skills, but everyone can have basic ones
If there’s a will, there’s a way	6	LC21: Yes, you just have to get involved. LG06: perseverance and repetition LH05: Ability and willingness are needed
Possible under the right conditions (such as a teacher)	6	LH01: Anyone can have high mathematical competence. It's just a matter of learning and a good, patient teacher. LE02: I think if a person is comfortable in where and how they are learning they will be able to learn anything

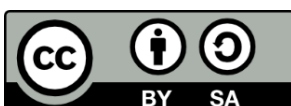


Table 12. Reasons adult learners were disagreeable with the statement *Everyone can possess good numeracy skills*

Theme	Number of countries	Example Quote
Everybody is different/has different strengths	7	LI02: All people are not the same and some people surely have trouble wit this...
Some people have difficulties	6	LG14: people with dyscalculia, for example, panic at numeracy assignments and will always have difficulty with numeracy

The most common reason given by those in agreement with this statement is that participants believe that people can at least grasp the basics, which includes arithmetic and basic mathematical operations. A large number of participants across 8 different countries believe that such knowledge and understanding is accessible by everyone. In addition to this, the second most popular reason provided for agreeing with this statement is that if people are determined enough they will learn the skills and knowledge necessary to be considered numerate and to engage with tasks that require some level of numerical ability. Finally, this study shows that adult learners believe people can develop numeracy knowledge and skills if the right conditions are met. Such conditions include having a good teacher and having access to resources and support. The primary reason offered by those who disagreed with this statement is that everyone is different and that some people are stronger in certain subjects compared to others. People who expressed such a view were of the opinion that numeracy was not everyone’s strength and rather they may excel in other areas. However, that is not to say that they cannot develop basic numeracy skills albeit they may not excel beyond the basics. In addition to this, a number of people who disagreed with the sentiment that everyone can possess good numeracy skills believe that environmental and learning difficulties make numeracy inaccessible to some. They believe that such factors, without the appropriate supports in place, can result in some learners being unable to overcome the difficulties they encounter when faced with numeracy tasks despite their best intentions. In summary, the reasons offered in both tables above are, in the main, speaking to the same point, that is, adult learners are of the believe that the majority of people can learn numeracy, at least to a basic degree, as long as they are supported and their difficulties are accommodated for. This offers all policy makers, educators and learners hope going forward.

4.4 Numeracy Teaching and Learning

The third aim of the survey was to identify participants’ perspectives on what they believed constituted effective numeracy practices for the adult population. In order to address this participants were first asked to describe a positive experience that they had while learning numeracy as an adult. 51 people did not answer this question meaning 140 responses were collected. The most common types of experiences described by participants are presented in Table 13.

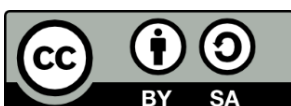


Table 13. Most common positive experiences when learning numeracy

Theme	Number of countries	Example Quote
Using mathematics in real life	10	LB10: I use numeracy while working in the garden to measure the number of plants
Overcoming a difficulty/improving knowledge of mathematics	7	LJ02: Now I really enjoy it when I get an equation right, and before I couldn't. Before, I was terrified just looking at problems, but now I can do the formulation.
Having a good teacher in school	5	LE13: From a young age I had an excellent teacher who was able to explain in various ways. I never got behind in my maths learning, so every lesson was useful. I was never told that maths is hard, so I never had reason to doubt I could do it or thought it would be boring.
Not having a good experience	5	LF08: I don't have any good memory to be honest.

The positive learning experiences reported by participants in all countries, with the exception of one, involved the use of mathematics in real life contexts. Many participants gave examples like that reported by LB10 of learning experiences where they were tasked with using numeracy skills in settings such as the garden or in the household. This reiterates why it is important to highlight the utility value of numeracy and to work through many real life examples and tasks that require one to employ numeracy skills and knowledge. The next type of positive learning experience reported by participants across seven countries was one in which they overcame a longstanding challenge/difficulty through improved numeracy knowledge and skills. This theme is in some ways related to the aforementioned experience as it is concerned with receiving some reward for putting in the work to develop numeracy skills. While the reward for many was being able to apply their skills to help them with everyday tasks for these people the reward constituted being able to develop new knowledge to solve problems that had previously appeared insurmountable. Being able to finally understand a difficult topic and apply it to solve a problem is something that would understandably bring a sense of achievement and hence positive emotions to someone. The third type of positive learning experience referred to the role of the teacher. Participants from five countries reported having a good teacher as a positive experience they have had with numeracy. This shows the importance of teachers both in mainstream education and adult education settings and the role they can play to influence adult learners attitudes towards numeracy. The fourth most popular response to this question was not positive in nature. Instead these participants reported was that they had never had a positive experience with numeracy. This is a little disheartening and it shows that while many people reported numerous positive experiences there was a proportion of the sample who never had any positive encounters with the topic of numeracy. This sentiment only further shows the need to improve



adult numeracy levels and that taking into account people’s previous experiences with adult numeracy is an important factor.

The next aspect of the survey which investigated teachers’ perspectives of effective numeracy asked the participants what kind of course they think is most effective for teaching numeracy to adults. The participants could choose one of three options:

- Standalone numeracy courses i.e. sole focus of the programme was on numeracy and/or mathematics;
- Integrated numeracy courses i.e. numeracy was incorporated into a programme with a different focus such as horticulture, cookery etc;
- Other (please describe)

45 people did not respond to this question leaving a sample size of 156. The results of this question are presented in Figure 5.

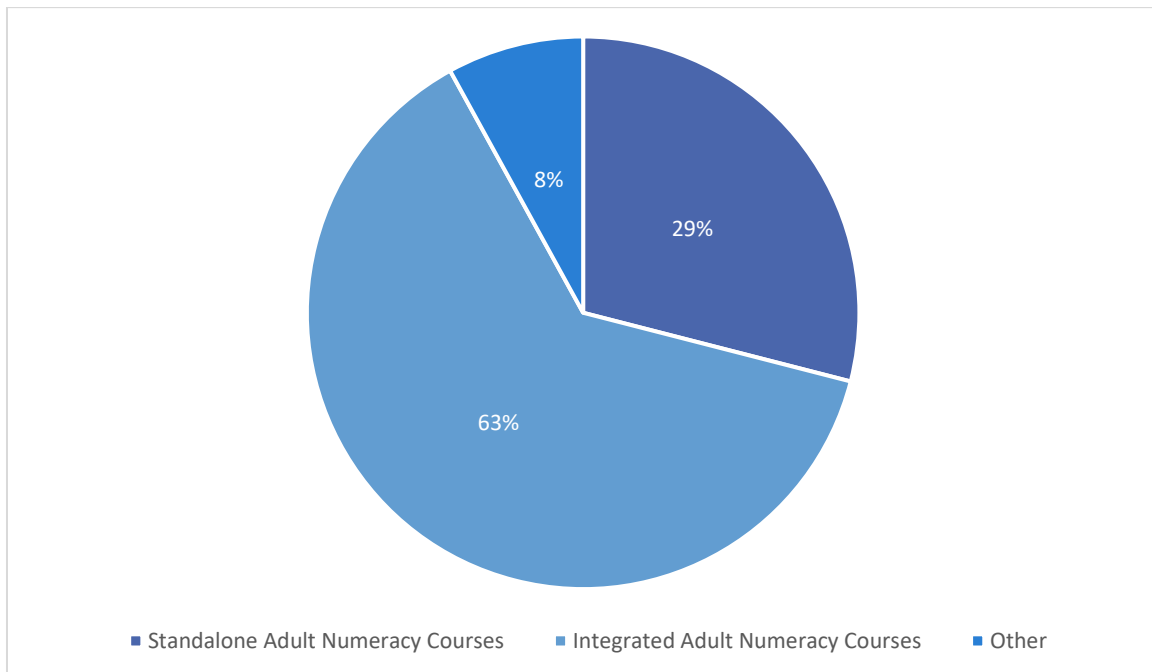


Figure 5. Preferred Type of Adult Numeracy Course

Figure 5 shows that adult learners prefer when numeracy is integrated into other courses, for example courses such as horticulture or cookery. This finding again highlights the value placed by adult learners on seeing and experiencing numeracy in context. This point was further reiterated in the next part of the survey when participants were asked to describe, in as much detail as possible, how they would like to see numeracy taught to adult learners. This provided the research team with further insights into what these adult learners perceive effective practices in this regard to be and the findings are presented in Table 14.

Table 14. Adult learners’ perspectives on the core features of effective numeracy practices



Theme	Number of countries	Example Quote
Put an emphasis on real life application with lots of examples	9	LF03: Mathematics has to be taught by contextualizing it in real life events using graphic-visual methods. LI10: Using real-life examples, shopping, getting a loan. LK01: By providing examples which can be used in real life
Cater to each student's individual need	8	LD14: Maybe some flexible schedules, maybe evenings to allow the adult to attend in the afternoon.
Have competent teachers with specific teaching strategies	8	LB05: With games and good atmosphere LE02: Easy to understand language, examples, time and no pressure and no exams

The findings to emerge from this question align with the findings and perspectives reported thus far in this report. They again highlight a positive correlation between positive experiences in mathematics and what adults identify as effective adult numeracy courses. All but two countries report that their vision of effective numeracy involves courses/modules that place a strong emphasis on the application of numeracy to real life scenarios. This includes courses with many application based examples to work through. The second theme identified was courses/modules that cater to each student's individual needs. This primarily means catering to the student's level of numeracy; that is, start at a low level and build up from there. Focusing on the basics and building knowledge slowly were also distinct, albeit less prevalent, themes. The final major theme was to have good teachers that are using effective teaching strategies. The respondents mentioned using a diverse set of teaching methods and promoting a positive disposition towards mathematics as good teaching strategies. Once again, the responses to this question highlight the important role that context and teachers have to play in ensuring effective numeracy experiences for all.

The final question put to participants in the survey asked them to consider how the teaching of numeracy to adult learners could be improved into the future. Unsurprisingly, as shown in Table 15, the most popular suggestions put forward by adult learners when addressing this question are identical to the themes to emerge when they were asked to describe their ideal numeracy learning experience. This suggests that while adult learners know what they want and need in terms of numeracy education many believe numeracy is still not being delivered in that way. The responses to the second question are given in Table 15.

Table 15. Adults learners' perspectives on key improvements needed for adult numeracy education



Theme	Number of countries	Example Quote
Showing how numeracy is applicable to real life	7	LA18: More real life examples and more detailed explanations
Cater to student's needs	7	LI12: By preparing a learning curriculum that allows everybody to take part in learning.
Have better teachers with good teaching strategies	6	LB04: Good teachers!

In conclusion, the findings from the learner survey shows alignment between what adult learners believe numeracy to mean, what they believe constitutes effective numeracy teaching and their attitudes towards numeracy. They, like many academics in the field, believe context lies at the heart of numeracy and wish to see this reflected in the teaching and learning of numeracy to adults.

5. INTERVIEW RESULTS

The survey data just presented provided us with an insightful overview of adult learners' conceptualisation of numeracy and what they consider effective numeracy teaching. However, we also sought to ascertain tutors perspectives in order to see how the two align and to get a comprehensive overview of how numeracy is being taught to adult learners internationally. As such, interviews were conducted with practicing numeracy teachers ($n = 32$) across all 11 participating countries. The 32 interviews had a gender breakdown of 41.7% male and 58.3% female. The educators had a wide range of experience, ranging from 1 to 40 years, with a mean of 11 years of experience teaching numeracy and a median of 8 years.

An inductive thematic analysis was used to analyse the interviews. Each interview was coded and analysed using *NVivo* and themes were identified after this process. Themes were initially compiled country by country and then common themes across countries were identified. The themes were broken down into 3 overarching categories which will be discussed across the following three sections:

- Section 5.1: Challenges to Teaching
- Section 5.2: Teaching Strategies
- Section 5.3: Why are the teaching strategies effective?

1. 5.1 Challenges to Teaching

This section looks at the main challenges to teaching identified by the educators throughout the interviews. There was a wide array of challenges identified, with several common similarities noted across different countries. The challenges are broken down into 4 sub-sections:



- Time as an issue
- Resources
- Professional development
- Students' past experiences

5.1.1 Time as an issue

The issue surrounding the lack of time was a running theme across many of the countries. 81.8% of the countries identified time as an issue in general. There were different manifestations of time that presented teachers with challenges when teaching numeracy to adult learners. The educators identified the lack of time specifically to create resources (45.5%), lack of time for class preparations (36.4%), lack of time to engage in professional development (27.3%), and the lack of actual class time (18.2%). Sample responses from each of these themes are presented in Table 16.

Table 16. Time as a challenge for the teaching and learning of numeracy

Theme	Number of countries	Example Quote
Lack of time to create resources	5	TA01: "You just really need the time, and you need a place to retreat and to be able to concentrate on it [preparing resources], you can't do it on the side, in my opinion" TB02: "More professional time for development of these specific materials." TE01: "If I had more time, I'd make more videos and find more resources. I think that we could, we could easily design resources to explain things better, especially around measurement."
Lack of time to prepare for teaching class	4	TA01: "a bit more preparation time [for class] would be good" TE01: "Time would be good, paid time because we only get paid for the hours we teach" TE02: "if I could spend less time making up resources and more times how thinking about how I'm going to deliver this class"
Lack of time to engage in CPD	3	TD01: "So, if I had the time and resources, I would probably be keen in doing a second master's degree in adult education and probably focus on numeracy" TD02: "It's basically time. I don't really have time to take those courses" TF03: "The reason I cannot engage in professional development is perhaps little time, the lack of time"
Lack of class time	2	TG01: "Yes, lack of class time is an important factor, and there simply isn't enough of it in vocational education"



		TG01: “In this method, you start with a question that everyone answers individually, then you discuss the answers with the group and come to a collective conclusion. I don’t do this now because of time constraints”
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It is clear from the interviews that educators have a lack of time to improve their teaching and to plan and deliver effective numeracy lessons. It was highlighted that teachers do not get paid to prepare for class, either creating resources or any other classroom preparation. As such, some tutors advocated for the idea of receiving “paid time” (TE02) and “more professional time” (TB02) for the preparation for class.

5.1.2 Resources

Resources were also identified as a challenge faced by adult educators across Europe. A lack of available and relevant resources was a challenge identified in 8 out of the 11 (72.7%) participating countries. The lack of classroom materials and lack of funds to purchase classroom resources was an issue identified in over half ($n = 6$) of the countries. Two key themes emerged when considering resources as an issue for the teaching and learning of numeracy to adult learners and these are presented in Table 17.

Table 17. Issues around the lack of teaching resources for adult learners

Theme	Number of countries	Example Quote
Lack of available and relevant resources	8	TE02: “one of the big things in [adult education] is that it doesn't give enough resources at all. You're going to a secondary school and you've all the textbooks there in front of you. All the works done for you. However, at [adult education] you have to make it yourself, and that means then there's lots of preparation” TE02: “The resources that are out there, the standard is quite bleak. It's terrible” TI01: “I could improve my teaching if special tailor-made teaching materials were available to me”
Lack of classroom materials and budget for those resources	6	TI01: “I would like to have access to various learning platforms that require paid subscription.” TG01: “Materials I'd like to use, like everything related to the metric system, are expensive. Things like weights and decimetres, so you can physically show them in class” TI01: “We do not have the finances and also technical resources like computers, tablets.”

It is evident from these findings that educators are lacking resources required to teach adult numeracy effectively. The issue of a lack of resources raised by tutors in this study could have many root causes. For example this issue could be attributed to a lack of time to create resources and/or the lack of ready-made freely available resources. In order to overcome this, some



participants suggested the idea of a collaborative space/platform for adult numeracy educators to share resources with each other. This would alleviate issues around the time available for all tutors to create resources and could also lend itself to a community of practice among numeracy tutors, something that has shown to work successfully in many jurisdictions (e.g. Ireland). Furthermore, many interviewees highlighted that adult education is under-funded in their country, thus leading to poor investment in classroom materials. As such, if government bodies were to make more funds available to adult numeracy education it is apparent that many of the issues proposed by tutors of adult learners could be addressed.

5.1.3 Professional Development

The lack of available and specific professional development in the area of adult numeracy was a third issue highlighted by the adult tutors in the interviews. This issue is one that was very apparent across 9 out of the 11 (81.8%) participating countries, as demonstrated by the following responses:

TB02: “Specific trainings for teacher who work in basic adult education are rare.”

TI01: “There is a lack of appropriate professional development courses.”

TI01: “I could also use some specialised training on the topic of vulnerable adults as students, their needs, characteristics”

TG01: “There are currently very few specific programs for numeracy teachers in adult education”

These responses clearly indicate that the educators are acutely aware of the lack of professional development available to them as numeracy tutors. This issue, coupled with the lack of time to engage with professional development, is one that is rather alarming. Tutors in this study have articulated that specific training in adult education is “rare “ (TB02) while others report on a lack of specialised training for teaching “vulnerable adults” (TI01) and their extra needs. This challenge is something that is completely out of the control of the educators and one that can only be fixed at a higher level.

5.1.4 Students’ past experiences

The adult tutors we interviewed expressed their concern for students who had negative experiences with mathematics in the past. 5 out of the 11 (45.5%) countries in this study identified the issue of students having negative experiences with mathematics in the past. The interviews also revealed that 3 out of the 11 (27.3%) countries have students that they believe to fear mathematics, a typical symptom of maths anxiety, as shown in Table 18.

Table 18. Issues with adult learners’ past experiences of mathematics

Theme	Number of countries	Example Quote
Students with negative	5	TA01: “Many participants have had bad experiences in the past [with numeracy]”



experience in the past with math		TB02: “Many adult learners may have negative or anxious feelings about numeracy” TF01: “adults often come with negative backgrounds in terms of calculation and mathematical elements.” TG03: “I think, especially with adults, when you start working on something like numeracy, which they’ve often struggled with in the past and may even have a kind of trauma around, their brain can block.”
Students fearing/being afraid of math	3	TA02: “Many of them [students] get scared when they hear math” TA01: “Mathematics often is frightening for learners” TI03: “Some students struggle with the fear of math that they often have.” TK01: “Because people find math abstract, intangible in the beginning. People fear math, and it is quite abstract.”

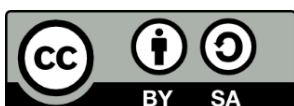
The past experiences of students in mathematics plays a big role in their reengagement with the subject in their adult life. These negative experiences in the past make students associate mathematics with negative feelings and due to their inability to distinguish mathematics from numeracy this has many repercussions in their later life. Due to this, tutors have the task of teaching students that display these negative feelings toward mathematics. These negative past experiences, according to the educators, cause students to suffer from a “brain block” (TG03) and disengagement with the subject.

2. 5.2 Teaching Strategies

One of the primary focuses of the interviews was to identify the teaching strategies most commonly used in adult numeracy education. The most popular teaching strategy identified by the educators was the importance of relating the content to the students’ everyday lives and interests., a theme also unearthed in analysis of the student survey. Adult tutors across all 11 countries highlighted this as a teaching strategy they use when teaching numeracy to adults. Another popular strategy deployed by educators is the use of visual aids and physical examples. This strategy was identified by tutors in 7 out of the 11 (63.6%) of the countries. Group work and discussions is another common teaching strategy used by educators, mentioned in 6 out of the 11 (54.5%) countries. Sample responses from each of these overarching themes are presented in Table 19 in order to provide the reader with a better insight into tutors’ perspectives on what works best in adult numeracy lessons.

Table 19. Effective teaching strategies for the adult numeracy classroom

Theme	Number of countries	Example Quote
Relating the content to students’	11	TB02: “One of the best ways to teach numeracy to adult learners is to connect it to their context and relevance. This means using examples, scenarios, and problems that



everyday lives and their interests		<p>relate to their personal, professional, or community situations.”</p> <p>TI03: “The importance of talking with the adult students about real-life topics like finances, shopping, percentages, units of measurements, parts of the whole etc. This I believe to be the best approach to teaching numeracy.”</p> <p>TI02: “The most effective teaching of numeracy is based on real-life situations where learners have to apply mathematical knowledge to everyday life situations, e.g. calculating discounts, shopping for home renovation materials, making judgements, calculating quantities in cooking recipes”</p>
The use of visual aids and physical examples	7	<p>TI01: “I also tried to show them practical application of math in daily life. For example, when we learned about the coordinate system, I used the map to show them that the map uses coordinates, and they understood it better as a result.”</p> <p>TK01: “I would use concrete materials. For example, if I want to teach number concept, even seeing ten, hundred and thousand blocks in front of them by concrete materials makes it easy for them to understand the concept.”</p>
The use of group work and discussions	6	<p>TA02: “Active participation and group work is extremely important so that the students can exchange ideas”</p> <p>TF03: “I’ve found that starting from practical situations and with group work leads to more effective results, and perhaps even more quickly, especially group work, which often allows communication between peers”</p> <p>TJ02: “it is in interactive groups, which is one of the most successful educational actions, but above all because, well, it is a way for them to help each other”</p>

Table 19 shows how tutors believe that the use of real-life examples is extremely important when teaching mathematics to adult learners. One educator spoke about the need to connect the content to the student’s “context” (TB02) and the need to use “examples, scenarios, and problems that relate to their personal, professional, or community situations.” (TB02). A common discussion during the interviews was the fact that adults differ from school going students in the fact that most of them are functioning and independent people in society, they pay bills, do shopping, and have to deal with numeracy to have gotten this far in life. The educators spoke about the importance of tapping into this knowledge the students have and using it to engage the adults in their classes. Group work and discussions are also a very popular strategy used by educators, one specific educator said “it is in interactive groups, which is one of the most successful educational actions, but above all because, well, it is a way for them to help each other” (TJ02).



3. 5.3 *Why are the teaching strategies effective?*

This section focuses on why specific teaching strategies are effective. Following on from Section B: Teaching Strategies, this section examines what makes the teaching strategies effective. The importance of students using the content in their everyday life is the standout reason for why the teaching strategies are effective, according to the educators. 8 out of the 11 (72.7%) counties saying that students using the content in their everyday life is why their teaching strategies are most effective. The educators explained that group work is very effective as it allows students to learn from someone, who isn't their teacher.

Theme	Number of countries	Example Quote
Students can use the content in their everyday lives	8	<p>TB02: “It [connecting the content to their real lives] will also make the learning more engaging and meaningful, as they can apply their numeracy skills to their own goals and interests.”</p> <p>TE03: “It kind of comes down to if it's effective, to be effective they need to be interested in it. It must relate to them in some way”</p> <p>TJ01: “This approach supports their progress and confidence during math lessons and gives them better understanding of practical application of math in everyday life.”</p> <p>TK01: “When people experience something in their own lives, it is kept in mind more easily. So, it becomes a more meaningful and permanent learning. Their daily lives make it easy for them to learn.”</p>
Students engage more with group-work and discussions	2	<p>TF03: “I've found that starting from practical situations and with group work leads to more effective results, and perhaps even more quickly, especially group work, which often allows communication between peers”</p> <p>TC02: “Because then it [group work] changes the relationship with teaching, it's not the teacher who gives them information but their peers”</p>

This section provided us with some interesting findings regarding the effectiveness of specific teaching strategies. It is clear the importance of students using the content in their everyday lives. The educators find this works best as they can use and practice the skills they learn in the classroom, outside of the classroom. This ensures that students are practising the skills they use in the classroom more often and to benefit their lives. One educator said “When people experience something in their own lives, it is kept in mind more easily. So, it becomes a more meaningful and permanent learning. Their daily lives make it easy for them to learn.” (TK01). The educators also spoke about the effectiveness of group work and discussions. Allowing the students to learn from someone new, a peer, and not their teacher. One educator said group work is so effective because “it [group work] changes the relationship with teaching, it's not the teacher who gives them information but their peers” (TC02).



CONCLUSION AND RECOMMENDATIONS

This report investigates adult learners' conceptualisation of numeracy and their disposition towards this important construct. Additionally, it provides insights into theirs and their tutors' perspectives on the effective teaching and learning of numeracy to adults. In this section, the authors will summarise the main findings and based on these findings will present a series of recommendations. If these recommendations are heeded by Government agencies, policy makers and adult numeracy providers we envisage a much improved numeracy offering for adults across the continent in years to come.

Firstly, this study highlights that adult learners recognise that context is at the heart of what numeracy means. Many of those surveyed outlined that while numeracy depended on mathematics it was different due to the importance of context in the area of numeracy. This aligns with the work of Hoogland et al. (2021) and Goos (2020) in that context was a core component in both the models proposed by these researchers. This is one of the most positive findings to emerge from this study as it suggests that adult learners are aware, at least to some degree, of the utility value of numeracy. However, when considering adults learners' conceptualisation of numeracy some areas for concern were also noted. Firstly, many of those surveyed did not associated numeracy with higher order skills. That is despite this being another core component of the aforementioned numeracy models. Furthermore, it is of concern that 45% of participants across 11 EU countries fail to see any difference between mathematics and numeracy, while in five countries involved in this study over 50% of respondents could not see the difference between the two. The ramifications of such strongly held beliefs are significant. A vast number of adult learners have been shown to have had negative experiences of mathematics at school (O'Meara et al., 2022). Failure, in later life, to differentiate between mathematics and numeracy therefore means that these adults associate the negative emotions and dispositions they have for mathematics with numeracy. This, as shown in this study, leads to feelings of anxiousness, nervousness and confusion among a significant proportion of learners when faced with numeracy in their adult life and all of these dispositions have been shown to contribute to the existence of mathematics anxiety among adult learners (Ryan et al., 2023). The tutors also referenced this point when they outlined one of the primary challenges they face is working with students who have a mental block towards numeracy due to past experiences of mathematics. They report how students often disengage with numeracy as a result of such experiences, and particularly when they cannot perceive any difference between mathematics and numeracy. Based on these findings the authors propose their first recommendation.

Recommendation 1: A publicity campaign needs to be designed and delivered that highlights the different dimensions of numeracy, including the importance of higher-order thinking skills for numeracy tasks. This campaign, which should involve targeted print materials, media advertisements and social media campaigns, also needs to reinforce the utility value of numeracy for society as a whole and point to the fundamental differences between mathematics and numeracy.

Secondly, adult learners and tutors appear to be in agreement in relation to what constitutes effective numeracy teaching and learning. In 10 of the 11 countries involved in this study adult



learners who were surveyed reported that their positive experiences of numeracy learning involved the application of numeracy knowledge and skills to real life settings. In addition to this, tutors across all 11 countries reported that from their experience the most positive learning environment for adult learners involves relating the content being taught to their everyday lives. As Westwood & Westwood (2008) pointed out numeracy skills are increasingly essential throughout life, from early childhood to adulthood and hence there are an abundance of contexts that adult tutors can draw on to ensure they teach numeracy in context. However, some tutors may need guidance in this regard and as such this study highlights how this guidance may not currently be readily available to all numeracy tutors. This study showed how tutors in 9 of the 11 participating countries felt that professional development opportunities were lacking and even in cases where professional development was available, they did not have the time to engage in such initiatives. This is in line with international findings (O'Meara et al., 2024; Goos et al., 2021; Mackay et al., 2006) and leads the authors to their second recommendation.

Recommendation 2: In order to keep abreast of developments in the field and to continue to highlight the modern power and utility value of mathematics to adult learners it is essential that professional development opportunities are made available to tutors of adult learners. These professional development opportunities should primarily focus on developing tutors' knowledge and understanding of core numeracy concepts, the rationale behind the procedures that they will teach as well as a range of applications and representations of these concepts. Furthermore, if and when such professional development opportunities are made available, tutors need to be afforded time to attend and any costs incurred while attending must be covered.

Finally, the lack of professional development was not the only challenge inhibiting the effective teaching and learning of numeracy in the eyes of tutors. The time available to plan and deliver lessons as well as the time available to create resources and the lack of a bank of readymade resources were all highlighted as challenges that tutors needed to overcome to be in a position to teach numeracy effectively. This has been a long standing issue for adult numeracy, as discussed by Gal (1993) but also when teaching numeracy across the curriculum (Koellner et al., 2009). Without the availability of such resources the task of developing effective learning experiences for numeracy, as described by Getenet (2024), becomes a challenging and at times impossible endeavour. Such findings bring us to our final recommendation.

Recommendation 3: It is recommended that a literature review and needs analysis first be conducted to determine the type of resources best suited to the needs of adult learners. Thereafter, funding needs to be made available to develop and design effective resources for use with adults in the numeracy classroom. A European platform needs to be created to allow for the sharing of resources and professional development be made available to tutors to help them develop the skills and knowledge necessary to design their own resources for the classroom.



APPENDIX A: SURVEY ITEMS

Numeracy in Practice: Learner Survey

Start of Block: Consent

Q20 Adult Learner Consent to Participate in NiP



Q21 Should you agree to participate in this study please read the statements below and if you agree to them, please proceed to complete the survey.

	Yes (1)	No (2)
I have read and understood the participant information sheet. (1)	<input type="radio"/>	<input type="radio"/>
I understand what the project is about, and what the results will be used for. (2)	<input type="radio"/>	<input type="radio"/>
I understand that what the researchers find out in this study may be shared with others but that my name will not be given to anyone in any written material developed. (3)	<input type="radio"/>	<input type="radio"/>
I am fully aware of what I will have to do, and of any risks and benefits of the study. (4)	<input type="radio"/>	<input type="radio"/>
I know that I am choosing to take part in the study and that I can stop taking part in the study at any stage without giving any reason to the researchers. (5)	<input type="radio"/>	<input type="radio"/>
I consent to take part in this study (6)	<input type="radio"/>	<input type="radio"/>

End of Block: Consent

Start of Block: Background Information



Q19 What is your gender?

- Male (1)
 - Female (2)
 - Non-binary / third gender (3)
 - Prefer not to say (4)
-

Q18 What age are you?

Q19 Please describe your prior experience with mathematics? Please select all that apply.

- I studied mathematics throughout primary school (1)
 - I studied mathematics at lower secondary school (2)
 - I studied mathematics at upper secondary school (3)
 - I studied mathematics as part of an undergraduate degree (4)
 - I studied mathematics as part of a vocational programme or trade qualification (5)
 - I studied mathematics in postgraduate studies (6)
 - Other (please describe) (7)
-



Q17 In what country are you enrolled as an adult learner?

Q10 As an adult learner, what type of numeracy courses have you engaged with? Please select all that apply.

Standalone numeracy courses i.e. sole focus of the programme was on numeracy and/or mathematics (1)

Integrated numeracy courses i.e. numeracy was incorporated into a programme with a different focus such as horticulture, cookery etc. (2)

I have never engaged in a numeracy course as an adult learner. (3)

End of Block: Background Information

Start of Block: Understanding of Numeracy

Q1 Explain, in as much detail as possible, what the word **numeracy** means to you. Note: Numeracy may also be referred to as quantitative literacy/mathematical literacy/arithmetic in your country.

Q28 Do you believe numeracy and mathematics are the same thing?

Yes (1)

No (2)



Display This Question:

If Do you believe numeracy and mathematics are the same thing? = No

Q29 What are the main differences between numeracy and mathematics?

Display This Question:

If Do you believe numeracy and mathematics are the same thing? = Yes

Q30 Why do you believe numeracy and mathematics to be the same?

End of Block: Understanding of Numeracy

Start of Block: Attitude towards Numeracy



Q22 From the list below, pick **all** the emotions that spring to mind when you think about numeracy?

- Confident (1)
- Nervous (2)
- Comfortable (3)
- Bored (4)
- Good (5)
- Confused (6)
- Fine (7)
- Panic (8)
- Excited (9)
- Anxious (10)
- Happy (11)
- Stupid (12)
- Love (13)
- Sick (14)
- Interested (15)
- Defeated (16)



Q23 Please rate your level of agreement with each of the following statements

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
Statement 1: I have a positive attitude towards numeracy learning. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statement 2: I have enjoyed studying numeracy as an adult. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statement 3: Numeracy skills are extremely important. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statement 4: Everyone can possess good numeracy skills (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q24 Briefly explain why you gave that agreement rating for **Statement 1**.



Q25 Briefly explain why you gave that agreement rating for **Statement 2**.

Q26 Briefly explain why you gave that agreement rating for **Statement 3**.

Q27 Briefly explain why you gave that agreement rating for **Statement 4**.

End of Block: Attitude towards Numeracy

Start of Block: Numeracy Teaching and Learning

Q31 Describe, in as much detail as possible, a positive experience that you had when learning numeracy. Describe the experience and why it was such a positive experience.

Q32 What do you think is the most effective approach for teaching numeracy to adults?

- Standalone numeracy courses i.e. sole focus of the programme was on numeracy and/or mathematics (1)
- Integrated numeracy courses i.e. numeracy was incorporated into a programme with a different focus such as horticulture, cookery etc. (2)
- Other (please describe) (3) _____



Q33 Describe, in as much detail as possible, how you would like to see numeracy taught to adult learners.

Q34 In your opinion, how could the teaching of numeracy to adult learners be improved?

End of Block: Numeracy Teaching and Learning



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