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ARTICLE

Exploring the Challenges for Adult Learners Seeking Professional Progression without a Level 2 Maths Qualification

Kevin Norley [1*] **, *M. Mahruf C. Shohel*** [2] **, *Wendy Sall*** [3]

[1] *Adult English and Maths Department, The Bedford College Group, Bedford MK42 9AH, UK*

[2] *Faculty of Business and Law, University of Roehampton, London SW15 5SL, UK*

[3] *School of Education, University of Nottingham, Nottingham, NG8 1BB, UK*

ABSTRACT

This study was conducted within the Adult English and Mathematics department of a further education (FE) college in England. Traditionally, the majority of adult learners enrolling on mathematics courses at the research site come from lower socio-economic backgrounds. In recent years, however, an emerging trend has been observed: increasing numbers of individuals in professional careers are seeking to undertake mathematics assessments in order to progress further in their chosen professional fields. Many professions now require not only higher-level qualifications, but also a recognised Level 2 mathematics qualification (equivalent to a pass at General Certificate of Secondary Education or GCSE). The research investigates how 15 professionals have managed to progress academically and professionally, often achieving higher-level qualifications, without having first secured a Level 2 qualification in mathematics. Drawing on a review of relevant literature and empirical data collected from research participants using questionnaires, the study explores the barriers these individuals faced in attaining mathematics qualifications during their schooling, as well as throughout their academic and professional journeys. Findings highlight inconsistencies regarding the level of mathematics required for entry to, or completion of, postgraduate degree programmes, including teacher training. The study recommends the adoption of a more robust and standardised approach to mathematics entry requirements for graduate and postgraduate programmes. Furthermore, it advocates for fostering a culture of high expectations in relation to mathematics skills, particularly for those

*CORRESPONDING AUTHOR:

Kevin Norley, Adult English and Maths Department, Bedford College Group, Bedford MK42 9AH, UK; Email: knorley@bedford.ac.uk

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pursuing professional careers. The article also discusses practical strategies for achieving this expectation, including ways to ensure that recommendations from Ofsted are effectively implemented by education leaders.

Keywords: Professional Occupations; Functional Skills Maths; Adult Learners; Maths Qualification; Numeracy Methods; Further Education; United Kingdom

1. Introduction

Research has consistently highlighted the scale of challenges in adult numeracy. Around half of the adult population in England is reported to have mathematics skills equivalent to those of an 11-year-old[1,2]. Despite this fact and research highlighting the negative impact of poor numeracy skills on individuals and their families, entire communities and society as a whole[3,4], there is quantitative evidence indicating that adult numeracy education is under-researched in the United Kingdom[5]. Moreover, the international context of the issue has been highlighted by studies that have shown that poor numeracy skills amongst adults are prevalent, and under-researched in many countries (including developed nations[6]. Previous studies have explored adult numeracy deficits, maths anxiety, and participation in adult mathematics education; however, little is known about adults who have successfully navigated higher education and professional careers without obtaining a recognised Level 2 mathematics qualification.

Adults who wish to improve their numeracy skills, often to gain a qualification for further study or employment, may pursue learning through further education (FE) colleges, adult and community learning providers, or work-based routes such as apprenticeships. This study is situated in the Adult English and Mathematics department of an FE college in England, where most learners enrol in Functional Skills or GCSE mathematics because they lack a Level 2 qualification. A Level 2 mathematics qualification is defined as a GCSE grade 4 or above (previously grade C), an O Level grade C or above, or Functional Skills Level 2. Some learners may have obtained such qualifications during schooling but are unable to provide certification. Motivations for returning to study vary and include gaining entry onto access or university courses, meeting apprenticeship or employment requirements, supporting children with homework, improving career prospects, and achieving personal goals. Fitzsimons[7] similarly identified becoming a role model for children and supporting them academically, preparing for further study or employment, and becoming a better-informed citizen as common motivations.

Learners seeking to enrol in mathematics at the case study institution complete a paper-based initial assessment designed by the department to determine their placement[8]. Based on performance and availability, learners are allocated to classes ranging from Entry 1/Entry 2 to Level 1/Level 2. Historically, adult learners in FE colleges have predominantly come from disadvantaged or lower socio-economic backgrounds, including those who are unemployed or employed in working-class occupations such as care or hospitality[9]. Many also experienced disrupted schooling, which adversely affected earlier attainment[10]. However, departmental observations reveal a notable minority of learners who are employed in well-paid middle-class professions, such as teaching and nursing, who already hold undergraduate and, in some cases, postgraduate qualifications. Consequently, the demographic profile of adult mathematics learners appears increasingly diverse, extending beyond traditionally disadvantaged groups.

Defining what constitutes a professional role is not always straightforward. According to the Equal Employment Opportunity Commission, professional jobs are typically those requiring a college degree[11]. Similarly, the Indeed Career Guide describes professional jobs as those that require specialised knowledge, advanced skills, and a certain level of formal learning[12]. The guide also recognises the subjectivity of such definitions, as the level of education and training required varies across professions. For this study, learners seeking professional progression are defined as those enrolled on programmes intended to lead to professional employment, who are simultaneously working towards a Level 2 mathematics qualification to progress academically or professionally.

An open-ended questionnaire was developed to explore participants' educational histories, professional trajectories, and perceptions of mathematics learning. The study also investigated barriers to attaining mathematics qualifications, as well as the strategies learners adopted to succeed academi-

cally and professionally in the absence of such qualifications. By drawing on existing research and reports on mathematics education, this article identifies challenges and offers recommendations for teaching methods and resources that can support learners in overcoming these barriers.

Within the context of a broad and under-researched area of study (adult numeracy education), this research focuses on a specific group of adults studying numeracy for professional progression to address two questions:

- What challenges do the adult learners face in their professional journey without a Level 2 maths qualification?
- What can be done to assist adult learner progression towards a Level 2 maths qualification?

2. Significance of the Research

The qualifications and skills required for professional careers have been widely recognised as critical to both individual progression and wider workforce development[13]. According to the Chartered Institute of Personnel and Development (CIPD), recruitment challenges are heavily concentrated in professional sectors, with 43% of employers citing a severe deficit in applicant skills[14]. This shortfall highlights the urgency of addressing adult numeracy, as national data consistently show that mathematical attainment remains low [1,2]. Earlier research[3,4] has also demonstrated the impact of poor numeracy on academic and employment opportunities, as well as on socio-economic participation and quality of life.

Numeracy, however, continues to be undervalued by the general public when compared with literacy. National Numeracy observed that millions of adults risk missing out on the personal, social, and economic benefits associated with improved mathematical skills because they underestimate their importance in everyday life[15]. While these concerns are well documented in relation to disadvantaged groups, little is currently known about how individuals in professional careers manage to progress academically and professionally without holding a recognised mathematics qualification. Jenkins et al.[16] also emphasise the lack of research into participation in adult numeracy learning.

This study is therefore significant in two key respects as it explores the ways in which professionals navigate academic and career pathways without a Level 2 mathematics qualification, and the barriers they encounter. Understanding this issue is crucial, since a deficit in numeracy skills can restrict access to professional training, limit career progression, or prevent individuals from entering their chosen profession altogether. The study also contributes to the debate on effective approaches to mathematics education as it draws attention to the relationship between teachers' subject knowledge, pedagogical approaches, and learners' attainment in mathematics. The study identifies gaps in current provision and points towards strategies that could better support both aspiring and established professionals in overcoming barriers to achievement in maths. Ofsted state that "Long term curriculum planning to develop pupils' ability to use the facts and methods they have been taught to solve familiar and unfamiliar problems is uncommon" and that "some pupils, particularly those who find learning mathematics more challenging and those taught by non-specialist teachers, are not effectively taught how to solve problems mathematically"[17]. They also emphasise the importance of teaching the facts and methods needed by learners to "form part of a strategy for solving a problem" and, in highlighting the inter-relationship between learning methods and knowledge acquisition, argue that "Calculation methods and presentation rules are procedural knowledge that need to be taught and rehearsed to automaticity"[1]. Ofsted further argue that in schools where curriculum planning around the teaching of mathematical facts and methods is weak, and where they tend "to take less account of what pupils have learned previously and what they will study later", pupils are often "taught a series of disconnected mathematical methods and 'tricks' that apply only in specific circumstances"[17]. The importance of teaching and learning suitable methods and maths knowledge, and allowing opportunities for practising methods in addition to the encouragement of clear workings, is outlined by Norley[18].

3. Methodology

3.1. Literature Review

A structured review of the literature was conducted to establish the context for the study and identify gaps in current knowledge. Academic journal articles, government reports, policy documents, and practitioner publications relating to adult numeracy, mathematics qualifications, employability, professional progression, and adult learning were reviewed.

Particular attention was awarded to research examining barriers to mathematics attainment among adults, the consequences of low numeracy skills for employment and social mobility, and the role of mathematics qualifications within professional education pathways. The review also explored evidence relating to mathematics pedagogy, teacher subject knowledge, and adult learners' experiences of returning to mathematics education. The literature informed both the design of the research instrument and the interpretation of findings.

3.2. Research Design

This study adopted a qualitative case study design. Case study research is particularly appropriate when investigating a contemporary phenomenon within its real-life context and when the boundaries between the phenomenon and context are not clearly evident. The study was situated within the Adult English and Mathematics department of a further education college in England and focused on a specific group of adult learners seeking professional progression while lacking a recognised Level 2 mathematics qualification.

According to Priya, "A case study is one of the most extensively used strategies of qualitative social research"[19]. A qualitative approach was selected for this study to facilitate exploration of participants' experiences, perceptions, and educational journeys, rather than measure predetermined variables. The case study design enabled an in-depth examination of how participants navigated academic and professional pathways despite not possessing a qualification that is increasingly required for progression in many occupations.

3.3. Research Tool

Data was collected through an open-ended questionnaire developed specifically for this study. The questionnaire was designed to gather information relating to participants' educational backgrounds, employment histories, current and future study aspirations, experiences of mathematics education, and perceptions of the role of mathematics qualifications in professional advancement.

The use of open-ended questions enabled participants to provide detailed reflective accounts while allowing data to be collected efficiently across a relatively large group of adult learners. The questionnaire also generated comparable responses across participants while providing opportunities for elaboration and personal reflection.

3.4. Research Participants

Purposive sampling was used to identify participants who met the study criteria. Participants were required to satisfy at least one of the following conditions: (a) currently employed in a professional role, (b) already in possession of an undergraduate or postgraduate qualification, or (c) enrolled on a programme leading to a professional career, such as teaching, nursing, or midwifery.

Fifteen adult learners enrolled on Functional Skills Mathematics courses participated in the study. Ten participants were recruited during the 2023–2024 academic year and a further five during the 2024–2025 academic year. Despite having achieved varying levels of academic and professional success, all participants lacked a recognised Level 2 mathematics qualification and were studying mathematics to support further education or career progression.

Efforts were made to include participants from diverse age, gender, and ethnic backgrounds in order to capture a range of experiences and perspectives.

Eligibility criteria required participants to either hold a professional job, have already obtained a first degree (with or without a master's degree), or be studying towards a degree leading to a professional career such as nursing, midwifery, or teaching. This information was derived from questionnaire responses and from students' Individual Learning Plans (ILPs). A shared characteristic across the group was that, despite previous academic and professional success, participants lacked a Level 2 mathematics qualification that they perceived as essential for future progression. Efforts were made to include a diverse sample in terms of age, gender, and ethnicity in order to minimise bias. Nevertheless, the cohort was largely composed of young professionals, reflecting the department's wider population of learners.

Jenkins et al.[16] note that older adults often display weaker numeracy skills but have historically benefitted from entering the workforce at a time when employment opportunities were less dependent on formal qualifications. In contrast, the current competitive labour market places greater emphasis on certified skills, and mathematics qualifications are becoming increasingly important. Fifteen learners participated in the study in total. Their demographic profiles,

drawn from the college's Prosol database, are summarised in **Table 1** below. Three of the original participants did not meet the criteria of an adult learner seeking professional progression and so were not included in the study.

Table 1. Breakdown of participants by age, gender and ethnicity.

Participant	Age Range	Gender (Female/Male)	Ethnic Group
1	30–39	F	White English
2	20–29	F	White English
3	50–59	M	White English
4	50–59	F	Black Caribbean British
5	40–49	F	White and Asian British
6	40–49	F	White English
7	20–29	F	Black African British
8	30–39	F	White English
9	40–49	M	White English
10	40–49	F	White English
11	20–29	F	Indian
12	30–39	F	Indian
13	30–39	F	White English
14	20–29	F	Black African British
15	70–79	M	White English

Although women often face barriers to re-entering education, such as balancing family responsibilities [7], they represented a clear majority in this study. This aligns with the broader gender imbalance observed in the department's Adult Mathematics (and English) courses.

3.5. Data Collection

Data was collected from three sources: departmental mathematics initial assessment records, Individual Learning Plans (ILPs), and participant questionnaires. The initial assessment and ILP data were used to verify participants' educational profiles and current learning goals. Questionnaire data provided detailed insights into participants' experiences, perceptions, and motivations.

Questionnaires were administered at two points in time. The first cohort of ten participants completed questionnaires in January 2024 following the examination period, while the second cohort of five participants completed questionnaires in October 2024 before departmental mock examinations. The timing of data collection was chosen to minimise disruption to learning activities while ensuring that participants had sufficient experience of studying mathematics as adults to reflect meaningfully on their journeys.

3.6. Data Analysis

A descriptive qualitative questionnaire was used to ask participants to reflect on their experiences and express their thoughts and perceptions. Responses to each question were explored in turn (see tables in the Results section below). Narrative data was then synthesised to inform recommendations and draw conclusions relevant to the research questions.

Data was analysed using thematic analysis [20] in order to identify and analyse themes within responses. Responses were first read repeatedly to achieve familiarity with the dataset. Initial codes were then generated to identify recurring patterns and significant statements relating to participants' education experiences, professional progression, perceptions of mathematics, and barriers to obtaining a Level 2 qualification.

Codes were subsequently grouped into broader categories and themes. Coding was inductive, i.e., the themes were developed from the data itself. The emerging themes were reviewed and refined through an iterative process to ensure that they accurately represented participants' accounts and addressed the research questions. Comparisons were made across participant responses to identify common experiences as well as notable differences. The final themes provided the basis for the presentation of findings and discussion.

3.7. Ethical Concerns

The study received institutional ethical approval before data collection and adhered to the ethical principles outlined in the British Educational Research Association (BERA) Ethical Guidelines for Educational Research [21].

Participation was entirely voluntary and informed consent was obtained from all participants prior to their involvement in the study.

Participants were informed of their right to withdraw at any stage without consequence. Confidentiality and anonymity were maintained throughout the research process[22], with all identifying information removed from the dataset and subsequent reporting of findings. Data was stored securely and accessed only by the research team.

As participants were enrolled in classes taught by the first author, particular attention was given to issues of power imbalance and social desirability bias. Participants were assured that their decision to participate or decline would have no impact on their studies and that questionnaire responses would remain anonymous throughout the research process.

4. Findings

In response to question 1 ('What maths qualification are you currently studying for?'), all participants wrote that they were studying for either Level 1 or 2 Functional Skills Maths, or a GCSE Foundation Maths qualification. For question 2 ('What is the main reason you need a Level 2 maths qualification?'), the responses are shown below in **Table 2**.

Table 2. Question 2 Responses.

No.	Responses
1.	To teach after finishing my qualification, my BA Honours in Applied Educational Studies
2.	To enrol on a university degree in quantity surveying and commercial management
3.	To progress in my teaching career
4.	To pursue a teaching qualification
5.	To get into my chosen university course (midwifery)
6.	So, I can do my nursing degree
7.	To have a maths qualification to help me find a job
8.	It was an entry requirement (onto a Cert Ed teaching programme) on the basis that I was studying towards a level 2 maths qualification
9.	I want to study for a degree and possibly go into teaching afterwards, so I need GCSE maths as I only got an E at school, but I already have English
10.	To get into uni for a teacher training (PGCE) course starting in Sept. 24
11.	To get into Adult Nursing
12.	Job progression
13.	To go on to study towards a PGCE
14.	Secure a higher-paying job
15.	Personal validation

Responses to questions 4 ('What other course(s) are you currently studying for?') and 5 ('Do you need a maths qualification to complete this course? If so, which qualification do you need?') are shown in **Table 3**.

Table 3. Questions 4 and 5 Responses.

No.	Responses
1.	'BA Honours in Applied Educational Studies' and 'Yes, level 2'
2.	'N/A' and 'N/A'
3.	'I am not currently engaged in any other study courses, but have regular CPD courses through various employers' and 'I require a maths qualification to teach English in a secondary school and increase my employability in the education sector'
4.	'Nil' and 'No'
5.	'Access to HE: Healthcare Professions' and 'Yes, functional skills level 2'
6.	'None' and 'N/A'
7.	'None' and 'N/A'
8.	'Cert Ed Level 5' and 'No'
9.	'None' and 'No'
10.	'Go on to do Design + Tech (PGCE/UOB) at UOB'
11.	'N/A' and 'Yes and I need functional skills maths Level 2'
12.	'N/A' and 'continuing professional development for work'
13.	'None currently. Hopefully the PGCE course commencing September 2025' and 'Yes, GCSE maths grade 4 or above/Functional Skills level 2—pass'
14.	'Nothing at the moment, but I am looking' and 'Yes, GCSE maths'
15.	'None' and 'N/A'

Responses to question 6 ('What is your current job?') and question 7 (What qualifications did you need to obtain this job?) are shown in **Table 4**.

Table 4. Question 6 and 7 Responses.

No.	Responses
1.	'Unqualified primary teacher' and 'Level 3 Supporting teaching and learning'
2.	'Commercial Assistant for a construction company, working within the Quantity Surveying department' and 'None—started at a trainee level'
3.	'Teaching Assistant/Tutor of English Language and Literature' and 'BA (Hons) English Language and Literature. PGCE (Post-graduate Certificate of Education)'
4.	'Cover Supervisor (Primary and Secondary)' 'ABA (Applied Behaviour Analyst) tutor' and 'Diploma in teaching (from Jamaica)'
5.	'Housewife' and 'Far too many to list!'
6.	'NHS—Assistant Practitioner (Nurse) Band 4' and 'NVQ Level 3 Health and Social Care'
7.	'N/A' and 'N/A'
8.	'Employment Co-ordinator/Employability Tutor for SEND' and 'Level 2 English, and QCF Level 2 Health and Social Care'
9.	'Store manager for Pets at Home'
10.	'Self-employed packaging designer/Artworker' and 'Degree level'
11.	'Workshop Coordinator' and 'Admin skills—Computer skills'
12.	'Teaching assistant' and 'level ⅔ in childcare and education; English level 2—fs; Maths with CPD'
13.	'Unqualified teacher (Hairdressing)' and 'Level 3 Hairdressing, CTLLS, TAQA (assessors qualification). Maths + English GCSE grade 4 or above (or equivalent) or willingness to work towards. Willingness to work towards QTS'
14.	'Fraud Investigator' and 'I don't plan to stay at the job as I want something in technology or IT'
15.	'None. Previously college (FE) lecturer (computing)' and 'Cert Ed (FE)'

Table 5 below shows participant responses to questions 8 ('What is your highest-level qualification, and in what subject area?') and 9 ('Did you need a maths qualification to achieve this qualification?').

Table 5. Question 8 and 9 Responses.

No.	Responses
1.	'Level 3 Supporting Teaching and Learning' and 'Yes'
2.	'BTEC Level 3, construction' and 'No, I didn't need a maths qualification'
3.	'BA (Hons) English Language and Literature. PGCE Post-16 Education (Further Education)' and 'To complete the PGCE and achieve QTS status I require level 2 in maths, the equivalent of a grade 4 in GCSE'
4.	'Master's in Education' and 'No'
5.	'BA (Hons) English Literature' and 'No'
6.	'BA (Hons) Fine Art' and 'No'
7.	'Master's in Finance' and 'No'
8.	'Level 3 Award in Education and Training' and 'No'
9.	'A level computing' and 'No'
10.	'Degree—Surface Pattern BA' and 'No'
11.	'BA Hons Criminal Justice & Criminology degree 2:2' and 'No'
12.	'BA (Hons) Child & Youth Studies 2:2' and 'No'
13.	'BA Hons degree in International Culinary Arts (1:1) (level 6)'
14.	'Bachelor of Art—Textiles, Fashion, Interiors' and 'Yes! But still managed to study!'
15.	'Associateship, Trinity College of Music (HNC equivalent) Cert Ed (FE)' and 'No'

The findings were grouped into the following themes, based on Braun and Clarke [20]:

Theme 1: Professional Progression Despite Absent Mathematics Credentials

Analysis revealed that participants were employed within a wide range of settings (education, construction, fraud investigation, nursing, human resources, and store management) that varied in qualification requirements. None of the participants had been required to obtain a maths qualification before employment; however, Participant 13 (an unqualified teacher in FE) stated that they needed to be willing to work towards a GCSE grade 4 (or equivalent).

In this theme, the research question (What challenges do the adult learners face in their professional journey without a Level 2 maths qualification?) is addressed through highlighting the lack of standardisation within the employment sector regarding the need to have a Level 2 maths qualification, and how that can impact upon career progression.

Theme 2: Inconsistent Mathematics Requirements across Educational and Professional Pathways

These findings demonstrated that participants were studying for a range of courses, including a BA (Hons) in Applied Educational Studies, a Certificate in Education, and an Access to HE: Healthcare Professions programme. While none of these courses required a maths qualification for entry, some required a Level 2 maths qualification to complete the course.

Responses to questions 8 and 9 revealed a range of high-level qualifications including master's level degrees in education and finance; bachelor's level degrees in English, fine art, criminal justice and criminology, international culinary arts, fashion, and child and youth studies; a Certificate of Education (Level 4); and Level 3 qualifications in construction, supporting teaching and learning, education and training, and computing. None required a maths qualification to get on to or complete their Bachelor's or Master's degree programme. Participant 7, for example, said that they had a Master's in Finance, but did not need a maths qualification to achieve it. However, in response to question 9 ('Did you need a maths qualification to achieve this qualification?'), participant 14 stated, 'Yes! But still managed to study!' This apparent contradiction could be due to a variety of reasons; for example, it could reflect an oversight or an administrative failure by the education provider, or an inaccurate recollection by the participant.

Participant responses showed that a Level 2 maths qualification had not been a requirement for them to obtain their current job or any of the qualifications gained, or to enrol in their current course. However, the responses showed that for those pursuing a career in teaching, they are at a stage in their career whereby a Level 2 maths qualification is required to gain access onto a PGCE course (post-graduate teaching qualification), to complete a BA (Hons) degree in Applied Educational Studies and thereby transition from unqualified to qualified primary school teacher status, or for a position as a secondary school teacher (already in possession of a teaching qualification). Findings also revealed that participants pursuing careers in nursing or quantity surveying were similarly required to obtain a Level 2 maths qualification to gain access to a degree programme. Other participants focused on acquiring employment or obtaining a higher-paid role than their existing one.

In this theme, the research question (What challenges do the adult learners face in their professional journey without a Level 2 maths qualification?) is addressed by highlighting that participants needed to obtain a Level 2 maths qualification in order to progress in their professional journey, for example in teaching and nursing.

Theme 3: Negative Schooling Experiences and Disengagement from Mathematics

Question 14 (How did you find maths at school? Do you have any memories (positive or negative)?), and question 15 ('Do you have any particular memories of doing maths homework?') were phrased in such a way as to elicit possible factors relating to their schooling or home environment that could have impacted upon their progress in maths. Direct questions regarding the amount of support received at home were avoided to minimise the risk of 'triggering' negative memories or leading to participants having to address personal issues, which the authors felt went beyond the scope of the study. Responses varied according to individual schooling, home and community environment. Findings offered some insight into why participants struggled with maths, with many respondents reflecting on negative school or personal experiences.

Responses to question 14 were widely negative and often referenced teacher/learner conflict or issues with teaching staff that impacted their engagement with learning. Participant 6, for example, commented "I found maths confusing and intimidating. [The school] had a disruptive class/learning environment", and Participant 8 recalled that "[The] teacher would make an example of me getting questions wrong and make fun of me". Participant 15 referred to "chaos in class" and "alienation from [the] teacher", and added that, "unfortunately the school I attended had staffing issues so when our maths teacher was taken ill during our first GCSE year (year 10) they were never replaced—only on occasion by supply staff—so not a lot of learning took place after age fourteen. The school went on to gain a poor/unsatisfactory/special measures Ofsted rating shortly after—too late for myself and peers, unfortunately." Other participants noted that they found maths "hard [and] struggled with concepts and skills" and that it was "difficult to retain knowledge" (Participant 1). Participant 3 commented that "after the fourth form (at age fourteen), I became disengaged with maths and study in general. I regret this". However, there was also positive

reflection. Participant 14, for example, commented that they "enjoyed maths, had a great teacher who tried", whilst Participant 5 noted that they "enjoyed maths until year 9 when I was put in top set and obtained a D grade … twice."

Fitzsimons[7] argued that "Discouragement may be the result of negative parental or community attitudes towards success in mathematics." Although the possibility of some of the participants suffering from maths anxiety was seen as a possible avenue of enquiry in the study, (particularly in the context of research[6] showing that many adults have a negative attitude towards numeracy and suffer from maths anxiety), Ofsted[1] argued that it is not the subject itself that is the cause of students' anxiety, but rather it is the "… failure to acquire knowledge that is at the root of the anxiety pathway."

In this theme, the research question (What can be done to assist their progression and alleviate their obstacles towards a Level 2 maths qualification?) is addressed through highlighting common experiences and issues that held learners back in obtaining a suitable maths qualification in schools, and offering (evidence-based) ideas as to how the teaching and learning of maths can be improved in schools and colleges.

Theme 4: Mathematics Qualifications as a Barrier to Career Advancement

Question 2 responses revealed that participants required a Level 2 maths qualification for a range of reasons, including to gain access to a degree programme, to pursue a teaching qualification or supplement this qualification to gain employment as a teacher, to pursue a career in adult nursing, or for personal validation (having already retired as an FE lecturer). Participant 3, for example, noted that they needed a level 2 maths qualification, 'to progress in my teaching career', whilst Participant 6 responded, 'So, I can do my nursing degree'.

In this theme, the research question (What can be done to assist their progression and alleviate their obstacles towards a Level 2 maths qualification?) is addressed through highlighting inconsistencies around the level of mathematics required for entry to, or completion of, postgraduate degree programmes, and recommending the adoption of a more robust and standardised approach to mathematics entry requirements for graduate and postgraduate programmes.

5. Discussion

The findings highlight and support Fitzsimons'[7] argument that negative experiences of mathematics during schooling continue to influence adults' engagement with numeracy learning decades later. The findings also highlight inconsistencies around the requirement for adults to have a Level 2 maths qualification in order to pursue a teaching career. PGCE requirements vary, as do those for Master's level degrees. Master's level courses for education or finance do not require Level 2 maths, yet those for nursing, midwifery, and quantity surveying do. These findings correlate with anecdotal evidence from previous learners (and shared with departmental maths teachers), suggesting that FE and HE institution departments within the UK set their own requirements for the level of maths needed to enrol on programmes of study. The lack of standardisation, resulting in variations in the level of maths needed to study different subjects at PGCE and Master's level, appears to mirror the variation in qualifications of those delivering the maths curriculum within FE colleges. Despite findings from Vorhaus et al.[23] which indicated that learner progress in numeracy is greater where teachers are qualified in maths to Level 3 or above, Dalby[24] found that as few as 30% of FE maths teachers have a GCSE in maths as their highest qualification. Other issues relating to qualifications and maths levels of those working within the education system have also been highlighted by The Nutbrown Review[25], which reported that nursery staff and child minders were able to work at pre-school groups without demonstrating basic numeracy or literacy skills. Furthermore, Ofsted[26] reported that weaknesses in teachers' understanding of maths and science have held back pupil progress in some schools. Ofsted[1,17] has recognised that "The value of teachers' subject knowledge", together with cultural factors, contributes towards the wide gap in maths achievement between disadvantaged and advantaged pupils in schools. Students usually receive a poorer mathematics education in schools which "do not take steps to develop the subject knowledge and subject specific pedagogical knowledge of less experienced and non-specialist teachers …". Drawing from findings from previous studies, Norley[18] argued that a GCSE in maths should be a prerequisite for any student or trainee teacher to begin a teacher training course, and that those preparing to teach maths should obtain

an A-level qualification in the subject.

In summary, the study extends previous research by demonstrating that even highly educated professionals remain constrained by credential requirements in mathematics. The main issues that appear to confront adult learners seeking professional progression, and which need to be addressed by learning providers, are a lack of focus on the importance of the need for a Level 2 maths qualification and the teaching and learning of maths facts and methods.

6. Limitations of the Study

This study was limited to a single department within one FE college, with a relatively small number of participants. Although purposeful selection of participants is of greater importance than sample size in studies of a qualitative nature [27], there is the potential for bias in the results. Such bias could be mitigated by a larger-scale study which, in addition to eliciting data from a wider range of adults, would facilitate exploration across different adult education providers.

It is also important to recognise that participant responses reflect their own knowledge and perceptions of the qualifications needed for their current job or chosen career. This may not reflect the reality of the qualifications they need or have already obtained. Consequently, some responses may be biased or distorted. While the research design addresses social desirability bias, volunteer willingness, and the researcher-participant relationship, some participants may still have altered their responses to appear more favourable.

7. Recommendations

In view of the findings from this study, it is recommended that a more robust and standardised approach to the level of maths required for entry onto graduate and postgraduate programmes be adopted. Additionally, any role that involves supporting children or adults in schools or colleges (teachers and teaching assistants, for example) could stipulate that prospective candidates must have obtained a Level 2 Functional Skills or GCSE qualification in maths prior to employment. This is relevant to enrolment on any education or teaching qualification from Level 2 to Master's level and would ensure that those involved in delivering and supporting maths education have secure knowledge of the content they are teaching. The study also recommends that a future larger-scale study be conducted in order to validate findings from this study and minimise the potential impact of any misleading or inconsistent data.

Ofsted [1] advocate the use of textbooks and resources that reflect the curriculum and contain facts and methods together with the opportunity to practise methods through relevant exercises, arguing that they "… are particularly important for low attainers" and are "… a vital part of the infrastructure for efficiently transmitting subject knowledge and subject-pedagogical knowledge to new generations of pupils and teachers". *My Functional Skills Maths: Revision and Exam Practice, Levels 1 and 2* [28,29] are textbooks designed for adult learners studying Functional Skills Maths. These texts reflect the Department of Education's subject content for Maths Functional Skills at Levels 1 and 2, emphasise the use of practical and efficient methods and maths facts alongside worked examples, and provide opportunities to practise using methods and recalling mathematical facts. As Fitzsimons [7] argued, however, "Knowledge of mathematics much broader than any one textbook is essential, and it is useful to have a wide repertoire of teaching strategies drawn from experience."

Norley [30] notes that subject knowledge is best transmitted through teacher-centred learning and that, in the context of learning mathematics, "… learners need a degree of instruction, combined with facilitated rigorous practice of methods, error correction, feedback and reinforcement". In addition, "autonomous learning should be encouraged only when, and if, a thorough grounding in … relevant methods is established". Ofsted [1] also recommend "systematic teacher-led approaches" on the basis that they "lead to better attainment". They also advise that:

> "... teachers need to be cautious when considering approaches that are heavily weighted towards encouraging informal and self-generated methods. These approaches may purport to develop pupils' understanding, but the evidence shows that when pupils use a variety of informal procedures, it can inhibit understanding later on."

When discussing that students need facts in order to engage with learning and that those facts are best learned through teacher-led instruction, Christodoulou [31] noted that direct instruction is a highly effective method of teaching

and that frequent practice is important in order to develop higher-order skills and the development of long-term memory. Following an examination of Ofsted reports, however, Christodoulou[31] and Peal[32] both concluded that Ofsted favoured child-centred teaching methods over tutor-led approaches. This is contrary to findings from comparative studies (such as Miao and Reynolds[33], Jerrom and Vignoles[34]) which highlight the role of teacher-led methods over student-centred learning in helping to explain why standards of numeracy in South East Asian countries are so much higher than they are in the UK.

Whilst there may have been a shift in focus from child-centred learning methods to teacher-led learning over recent years as indicated in Ofsted[1], participants in this study would have completed their schooling prior to this shift. Moreover, it takes time for such changes in focus to filter down to school leaders to inform policy and facilitate change in practice at the local level.

Employers' perspectives on the importance of maths skills in the workplace, discussed in the CIPD report[14], reveal concerns about the impact of poor maths skills on their business. Despite desiring that their employees have good maths skills, "Too few employers engage with the further education sector and their awareness of the Government's technical education reforms remains low". In order to accentuate the importance of maths skills in the workplace, and subsequently in post-16 education settings, an area for further debate could be whether employers recruiting for professional roles should adopt an assessment-based approach at the interview stage.

8. Conclusions

Through exploration of participant experiences and opinions, this study has drawn attention to the barriers that people in professional occupations face if they do not have a Level 2 maths qualification. Findings highlight an apparent lack of expectation across the education system, from schools through to teacher training, regarding the achievement of this qualification, together with a lack of consistency around what is required in terms of maths qualifications for a range of jobs and higher-level academic courses, including maths teacher and teaching assistant qualifications. When considered alongside previous research that highlights the low levels of numeracy skills in the UK, and reports highlighting the importance of maths skills for both individuals and their communities, these findings suggest that low standards of achievement in maths have become normalised within the education system.

Areas for future consideration include the standardisation of the level of maths required for individuals to enter onto higher-level courses or to be involved in teaching and learning at any age phase, and the rationale behind a teacher-centred, systematic approach to the teaching and learning of maths methods and facts, along with a culture of high expectations, particularly for those pursuing professional careers. The study concludes that societal perceptions need to change in relation to the importance and value of maths skills within education and the workplace. This can be supported through a greater emphasis on the standardisation of maths entry requirements for higher-level courses leading to professional careers, and through greater emphasis on the assessment of maths skills embedded into the workplace recruitment process. Implementation of these changes is likely to go some way to improving the standard of maths teaching and learning for all school and college learners, regardless of social class background or ability in other subject areas.

Author Contributions

Project planning, K.N. and M.M.C.S.; data collection, K.N.; writing—original draft, K.N., M.M.C.S. and W.S.; methodology, K.N., M.M.C.S. and W.S.; formal analysis, K.N., M.M.C.S. and W.S.; conceptualisation, K.N., M.M.C.S. and W.S.; review and editing, K.N., M.M.C.S. and W.S.; validation, K.N., M.M.C.S. and W.S. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee

of The Bedford College Group (approval number 2023/0017, 1st Dec, 2023).

Informed Consent Statement

Informed consent was obtained from all research participants.

Data Availability Statement

The data used in this study is available from the corresponding author upon reasonable request.

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Conflicts of Interest

The authors declare no conflict of interest.

AI Use Statement

The authors declare that no artificial intelligence (AI) tools were used in the preparation of this manuscript.

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