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Maximising the opportunities presented by digital technologies in numeracy teaching - DigiMaths Survey:

report on a survey of teachers in Europe relating to their use of digital technologies to teach mathematics/numeracy in a variety of settings

1. Introduction

The DigiMaths project's aims

The DigiMaths project aims to:

- identify the extent and quality of numeracy teaching using digital technologies in Europe
- identify the latest international research in this area
- identify effective practice in the use of digital technologies to teach numeracy
- produce guidance for teachers in all sectors containing its findings
- produce a teacher training course and teaching resources that can be used across Europe
- share its learning widely, partly by publishing the guidance, training and resources on a website and by hosting a multinational conference.

The purpose of this survey

In order to address the first of its aims, the Scottish team in the DigiMaths partnership, led by Learning Link Scotland, undertook a survey to understand more about numeracy/mathematics teaching using digital technologies that is taking place in Europe, and about numeracy/mathematics teachers' competences in using digital technologies to teach.

The survey was designed to produce data that, along with a literature review being separately produced, will directly inform the development of the guidance, the training course and the resources that support the training course.

2. Methodology and limitations

The survey was a desk-based piece of research. It involved all six countries involved in the DigiMaths project.

The survey consisted of 15 questions, seeking between them both quantitative and qualitative data. The survey questions are appended to this report.

The survey was designed in English and then translated into a number of languages, in order to maximise responses from teachers in all sectors:

- English – disseminated in Scotland, Northern Ireland, Ireland and Switzerland (to accommodate non-German speakers)
- German – disseminated in Switzerland, Germany and Austria
- Danish – disseminated in Denmark
- Finnish – disseminated in Finland
- Swedish – disseminated in Finland (to accommodate Finland-Swedish-speaking teachers)

The survey was sent out to network lists held by the partners in the week beginning 11th January 2016, for responses to be returned by 19th February 2016. There was a delay in sending out the Danish and Finnish/Swedish surveys due to problems with technology and language translation.

3. Findings

In the survey we asked 15 questions. Question 3 checked whether respondents were teaching numeracy/mathematics, and closed the survey if the answer was 'no'. Question 15 was a request for permission to contact respondents in the future. Answers to questions 1, 2, and 4 – 14 are presented in analysis tables below.

In each table we provide summarised data from each responding country, an analysis of this data, then set out emerging conclusions and recommendations we can draw following each question.

In sections 4 and 5 below, we draw overall conclusions and make recommendations for the guidance, teacher training session and teaching resources that will be produced as part of the DigiMaths project.

<table>
<tr><td colspan="6">Question 1. Number respondents who completed the survey [number of unfinished surveys]</td></tr>
<tr><td>Denmark</td><td>Finland</td><td>Ireland</td><td>Northern Ireland</td><td>Scotland</td><td>Switzerland</td></tr>
<tr><td>148 [73]</td><td>30 [3]</td><td>35 [20]</td><td>3 [2]</td><td>45 [2]</td><td>54 [31]</td></tr>
<tr><td colspan="6">Analysis
We had a total of 315 respondents, with 131 (42%) not completing the survey. When the survey was initially distributed, there seemed to be a technical problem with it, which might have impacted on the number of people who failed to complete it.</td></tr>
<tr><td colspan="6">Emerging Conclusions
Highest number of respondents came from Denmark, with the lowest coming from Northern Ireland. This could be due to the networks of people available to partners when distributing the survey. In addition, differences in the sectors that responded (schools/adult learning etc) might have skewed the numbers of responses.</td></tr>
<tr><td colspan="6">Emerging Recommendations
The survey reached a large number of people, and a lot of information was gained from carrying out the survey.</td></tr>
</table>

Question 2. What is your job?					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
Teachers (grade 10-12/upper secondary) (82) Teacher of Mathematics (grade 1 – 10) (34) Teacher trainers (13) Teachers vocational and similar (12) Student (1) Grade K (1)	Upper secondary level teachers (Vocational school) Upper secondary level teachers (A-levels) Lower secondary level teachers	Adult Numeracy Tutors (21 respondents) Secondary Level Teachers (7 respondents – 20%) Third Level Lecturers (4 respondents – 11%)	Maths teacher School teacher Curriculum Manager	Adult Literacies Tutor (9) Teacher of Mathematics (7) Lecturer (7)	1. Basic skills trainer (19, various fields) 2. Trainer in adult education (18) 3. Teacher (8)
Analysis: Across all countries, surveys were completed by school teachers and in Scotland, Ireland and Switzerland adult basic skills trainers/tutors were also represented.					
Emerging Conclusions: Practitioners from the following settings have an interest in maximising the use of digital technologies in the teaching and learning of mathematics: primary education, secondary education, vocational education, adult basic skills, further education, higher education, teacher trainers.					
Emerging Recommendations: Resources produced from this project should be cross sectoral and adaptable to a range of educational settings.					

Question 4. Why are your students learning numeracy?					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
To understand maths taught during their study (31) To understand and be able to use maths in everyday life/being a responsible part of society (17) To be able to solve and evaluate tasks and results (6)	It is part of the curriculum. For everyday life For further studies and working life.	1. Part of their QQI programme 2. Important life skill and for the workplace 3. Need it for further studies	Compulsory – whether part of compulsory schooling or part of post-16 framework To gain a qualification To gain lifeskills	To gain accreditation (14) To brush up numeracy skills for everyday life (11) To help their children (8) and to budget /manage money (8)	1. Because it is part of the curriculum (16, training to find a job, catch-up training, basic skills training) 2. So that they can handle everyday situations (13, please note that this answer is also due to the German term "everyday mathematics" for numeracy)
Analysis: All countries identified that a key factor in the motivation of students to learn numeracy skills was to deal with everyday situations in day to day life, including working and home life. Another common reason for working on numeracy skills was that it was part of a set curriculum. Gaining accreditation featured in the responses from Scotland and Northern Ireland. Needing numeracy skills for future studies was reported in the responses from Finland and Ireland.					
Emerging Conclusions: Everyday application of numeracy skills is a key factor.					
Emerging Recommendations: Training plans and resources developed through this project should reflect the importance of everyday meaningful application of numeracy skills in home and work life situations and model this approach.					

Question 5. Level of mathematics/numeracy taught					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
Upper secondary (grades 10-12) primary and lower secondary (grades 0-9/10) teacher training, vocational (grades 10 – 12)	primary and secondary levels of education	Adult and further education	KS3 (14yrs), KS4 (16yrs), KS5(18yrs) school Entry level 1 to level 2 post-16 FE or training	SCQF levels 2, 3, 4, 5, 6 Curriculum for Excellence levels 1 to Postgraduate level	A1 (18) A2 (18) B1 (13) B2 (6) C1-2 (2) N=26
Analysis According to the survey, the levels of mathematics/numeracy taught range from the very initial stages of numeracy extending to university level mathematics (for those in teacher training programmes).					
Emerging Conclusions Digital technologies can be used at all stages to further numeracy and mathematical understanding.					
Emerging Recommendations The extent to which digital technologies is already being used in different sectors and at different levels suggests a need for cross-sectoral professional learning opportunities, in order to share new ideas and resources which could be beneficial to professionals across the board.					

Question 6. Percentage of respondents with a teacher training qualification					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
90%	94%	66%	100% (mandatory)	60%	89%
Analysis For the most part, a high percentage of our respondents had a teaching qualification. Scotland's results showed only 60% of people having a teaching qualification, and Ireland's 66%, but this could be due to people in working in non-statutory roles, for example in the third sector, including those who teach numeracy in a voluntary capacity.					

Emerging Conclusions
It is likely there are practitioners working across the countries in a range of roles, including in those that are non-statutory – and these might be harder to reach through traditional channels (cascading training and guidance through local authorities, for example).

Emerging Recommendations
DigiMaths should attempt to reach people who don't necessarily have a formal teaching qualification, but who are still involved in developing numeracy skills. Use of networks should be maximised to reach as many practitioners as possible, and there should be opportunities for bringing together groups of workers in statutory and non-statutory roles. Continued support of qualified teachers is also important.

Question 7. Percentage of respondents with digital technologies training (both formal and informal)

Denmark	Finland	Ireland	Northern Ireland	Scotland	Switzerland
71%	77%	63%	75%	60%	64%

Analysis
The highest percentage of digital technologies training was 77% (Finland), whereas the least occurs in Scotland (60%). Although training is being given (or is being accessed) to a fairly high degree, there appears to be a need for more training. In Denmark, some respondents claimed to have been self-taught.

Emerging Conclusions
Lack of training (or lack of access to training) seems to be a problem in some partner countries, so access to basic training needs to be made available, and more extensive training needs to follow.

Emerging Recommendations
Organisations with responsibility for teacher training, and employers, could be informed of the significant gaps in numbers of teachers having received any training in the use of digital technologies. Resources such as video tutorials and 'how-to' documents could be produced to offer informal training in technology to those with difficulty of access. An online forum could also be beneficial, where tutor/teachers could ask advice from their peers.

Question 8. Digital technologies being used Never [N], Rarely [R], Sometimes [S], Often [O], and Almost Always [A]					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
N: smart watches R: smart phones S: digital cameras/ YouTube O: calculators (iPad, phones) A: generic prog.	Least: apps on smart watches, social media, and online/ distant technologies Most: generic computer programs, websites, and calculators on smart phones, tablets or computers.	N: smart watches R: smart phone apps S: YouTube O: calculators A: generic prog.	N: smart watches R: YouTube S: calculators O: websites A: n/a	N: smart watches R: learning prog. S: YouTube O: websites A: generic prog.	N: whiteboard R: social media S: calculators (iPad, phones) O: YouTube A: generic prog.
Analysis The most common answer for “almost always” was generic computer programmes. In most countries, smart watches are severely under used, but this could be due to their newness – or a lack of affordable availability. Other technologies which are not used often are social media and long distance learning. Surprisingly, whiteboards are not used greatly (considering that, for example, almost every school classroom in Scotland now has one).					
Emerging Conclusions It is important to note is that the bulk of responses for each type of technology fell in to the categories “never” and “rarely”. So, even though there are a number of “almost always” and “often” responses, the results would suggest that a large proportion of people do not use any type of technology very often. Perhaps an interesting question to have asked would be order the technologies in terms of how often they are used.					
Emerging Recommendations An output of the project could be raising the awareness of the little used technologies, and their opportunities. This could be achieved through case studies of interesting ways of using each technology, demonstrating the opportunities offered.					

Question 9. Most and least common reasons for using digital technologies in teaching mathematics/numeracy.
Denmark and Scotland numbered answers 1=most common, to 4=least common, whilst other partners grouped answers into "least" and "most".

Denmark	Finland	Ireland	Northern Ireland	Scotland	Switzerland
1) introduce or develop a new concept 2) enable difficult or time consuming concepts 3) enable study of real life situations 4) provoke exploration of mathematical ideas	Most: introduce or develop a new concept, enable real-life applications Least: provoke exploration of mathematics ideas	Most: introduce or develop a new concept Least: provoke exploration of mathematical ideas	Most: introduce or develop a new concept Least: difficult or time-consuming calculations	1) introduce or develop a new concept 2) enable difficult or time consuming calculations 3) enable real-life applications 4) provoke exploration of mathematical ideas	Most: enable study of real-life applications, introduce or develop a concept Least: provoke exploration of mathematical ideas, enable difficult or time-consuming calculations

Analysis
The most common reasons for using digital technologies in almost all of the partner countries were to introduce or develop a new concept, and to enable real life applications. Many surveys returned the least common reasons to be provoking exploration of mathematical ideas, along with enabling difficult or time-consuming calculations.

Emerging Conclusions
Although broadly used in teaching varying levels of numeracy, digital technologies does not seem to be exploited for a wide spectrum of uses.

Emerging Recommendations
DigiMaths should promote the use of digital technologies in all areas of learning, especially those for which its applications are overlooked. Resources and lesson ideas would be beneficial in promoting such areas. Many participants may not know the opportunities or applications of digital technologies in these areas. Support from the DigiMaths project could promote effective teaching using technology.

Question 10. Most and least common topics taught using digital technologies

Denmark and Scotland numbered answers 1=most common, to 7=least common, whilst other partners grouped answers into "least" and "most".

Denmark	Finland	Ireland	Northern Ireland	Scotland	Switzerland
1) data handling 2) percentages, decimals, fractions 3) money 4) probability 5) measurement 6) whole numbers 7) time	Most: percentage, decimals, fractions, data handling Least: whole numbers, time, measurement	Most: percentages, decimals, fractions, data handling Least: time, probability	All topics were said to be taught. Specifically, shape and space.	1) percentage, decimals, fractions 2) money, data handling 3) whole numbers 4) time 5) measurement 6) probability	Most: money, measurement, time Least: probability, data handling, percentages, decimals, fractions

Analysis

It is interesting to note that the Swiss respondents seem to teach least the topics which the others are favouring more (data handling, percentages, decimals, fractions). Time and measurement, however, are taught, which is at odds with the other results.

Emerging Conclusions

Information and skill sharing is key here. Cross-community sharing could mean that more topics are taught using digital technologies, and fewer are avoided.

Emerging Recommendations

Pooling information and resources from partner countries and allowing access to users would increase subject areas taught. Showing how different topics can be taught, along with resources for lessons and methods for testing could mean these topics are taught more often.

An output for the project could be a webpage on which various topic headings could be found. Under each heading, websites, apps, etc could be added (initially) by DigiMaths, and then by users. Users could also be encouraged to share interesting and effective ways they used digital technologies, as well as things they did not find helpful. This would encourage more use of digital technologies, and less frustration when pit-falls are made clear.

Question 11. Examples of ways in which participants believed they had used digital technologies effectively in their numeracy/mathematics teaching					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
'Co-work among students in Google sheets with collecting and processing data' 'Investigating graph shapes of 1., 2. and 3. Degree using GeoGebra' 'Finding actual current interest rates. There is an app which solves simple equations, we use this to check results. We often draw graphs in GeoGebra; it's easy to get a picture of the graph.'	Having a blog on mathematics for students with daily posts Showing mathematical online animations for geometrical constructions Interactive quizzes on lessons, e.g. Kahoot Designing an app with which the students can practise calculations at home	Gapminder website to explore statistics using real world data, Zooniverse sites for students to do real research, GeoGebra for explanation, and Excel with mail merge in word to individualize assignments. Playing TV countdown numbers game as use of all operations. Using a Fraction app to break the barriers to scary fractions and decimal equivalents. Opening a session up - using a video explaining topic. Using PowerPoint to present a shape or visually related topic. Use of IWB so learners can model	Websites and apps for transformations; probability simulators; real world maths; reducing the need for drawing; analysis.	PowerPoint presentation to demonstrate X & / by 10, 100 & 1000. It gives a good visual demonstration of the techniques. YouTube videos to show solids breaking down to their nets, using money sense websites to help pupils understand the purpose of financial know-how, using randomising programmes on Smartboard for probability. Investigating graph shapes (using Desmos website), projecting image of pupil's work onto the smartboard for class to critique, as scaffolding for learning to solve four	Learning maths online: http://www.lernareal.ch/ or http://www.neuronation.de/ ; Calculate with time using YouTube videos. How much time do I have to watch a video if I have a meeting in 5 minutes? Calculating salary and rent

		answers to the whole class. Interactive quizzes as whole class assessments such as zondle. Polling software, to gain feedback on lesson from learners. Revision materials provided on website. Use of video to introduce topics.		term linear equations (Wisweb applet), putting video on loop to teach loci and constructions using a ruler and compass'	
Analysis: Practitioners responded with a wide range of examples of how digital technologies had been used effectively in their practice (please see examples above)					
Emerging Conclusions: Data from this survey illustrates that there are individual practitioners using a variety of digital technologies effectively in their practice, however the limitations of the chosen research methodology mean that it is not possible to accurately gauge the extent of this practice in different sectors or countries.					
Emerging Recommendations: Case studies highlighting good practice in the use of digital technologies for teaching and learning numeracy would be useful to include as an output of this project. Further research in this area would be beneficial in a future project.					

Question 12. The opportunities participants felt that using digital technologies presented for them and their learners.					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
One of the main opportunities identified was the use of digital technologies to differentiate between the students – it is more flexible and gives a better understanding. The dynamic aspect is highly scattered, because it gives the opportunity for the students to work with different numbers in different tasks without the need to calculate or draw almost the same repeatedly. Difficult tasks can be solved by more students, and it is possible for the students to do problem-solving both analytic and visual. The inquiry way is	The main opportunities were to complete calculations faster with the help of digital technologies, to simulate, illustrate and use visuals to clarify mathematical problems, to enable the students to learn in different ways and to inspire students and make them more interested in exploring the mathematical ideas further.	The main opportunities for teachers and learners were that technology appeals to different learning styles. It is a very visual and interactive resource and can also be a source of fun and motivation for students. It saves time in teaching concepts such as graphing and allows for faster calculations. Finally it allows learners to learn at a pace relevant to their abilities and this can contribute to independent learning outside of the classroom.	More engagement - students enjoy the interactivity and can often work independently more effectively; good for visual explanations; Keeping track of their assessments.	One of the main opportunities identified was the use of digital technologies to reinforce learning, with multiple examples learners could practise with independently to test out their ideas and instant and non-judgmental confirmation of achievement. Respondents believed this to be useful for learner engagement, motivation and confidence. Other responses highlighted the opportunity provided by digital technologies to encourage learners to focus on ideas rather than details	Most of the trainers responded that using digital technologies allows independent learning at individual pace, time and place. Trainers thus appreciate the opportunity to differentiate the various levels within a class and to have a richer variety in didactic tools they use. Learners have the opportunity to check their calculation themselves and have a closure look at the working-out. For learners, using digital technologies is attractive and a lot of fun. They are motivated to use it. By using e.g. their cell phone they can make a connection to their everyday life.

easier. It is easy to cope with a big amount of data. Quizzes are popular and give the opportunity to give feedback instantly and personally.				and to stimulate dialogue. Other themes to emerge were the opportunities presented for differentiation in terms of ability, understanding and pace and options to monitor student progress.	
Analysis: Responses about the opportunities presented by making use of digital technologies highlighted the scope to allow visualisation of abstract concepts and simulation potential. Other positives identified included ease of differentiation in pace, understanding and ability; allowing learners to focus on ideas rather than details and its usefulness for independent learning and reinforcement of newly acquired skills. Practitioners recognised the benefits of a range of dynamic digital learning environments to stimulate learning, enhance learner enjoyment, motivation and confidence and potential as a tool to promote dialogue.					
Emerging Conclusions: There are many opportunities for the effective use of digital technologies in the learning and teaching of numeracy. Practitioners with the knowledge, skills, resources and confidence required to make best use of such technology, and their students, are able to benefit most.					
Emerging Recommendations: There is potential within this project to utilise the expertise of those practitioners who have used digital technologies extensively in their teaching practice to produce guides, resources and tutor /teacher training materials to help to bridge the gap between the most and least digitally agile.					

Question 13. The challenges participants had experienced when using digital technologies in their teaching					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
The most common challenges faced by respondents were technical issues, from problems with equipment (old computers, slow processing speed) to connectivity issues (no Internet connection, lack of Wifi access) and access restrictions. Anxiety and frustration for learners who lack confidence in using IT was a concern for a few respondents. Some of the respondents were mentioning the fact that the students sometimes were tempted to make non-mathematical stuff like Face-book and similar. Finally, resource implications were highlighted,	The main challenges were the lack of suitable teaching materials, the access to tablets or computers and functioning of the devices, applications and connections.	The main challenge mentioned in the responses referred to time. This was mentioned in a number of different ways. For example – the time needed to prepare, set up and find suitable materials and time constraints in the everyday class and overall to get the course finished. Access to technology was also a big challenge. This referred to lack of suitable equipment, software and limited Wi-Fi connectivity. The other main challenge mentioned was familiarity and confidence levels in using digital technologies especially amongst adult learners.	Hardware; having enough access to computers/laptops; problems with internet connectivity; prohibitive online filters – see reference to YouTube above; Finding apps for the iPad that are cheap and effective;	The most common challenges faced by respondents were technical issues, from problems with equipment (old computers, slow processing speed) to connectivity issues (no Internet connection, lack of Wifi access) and access restrictions. Anxiety and frustration for learners who lack confidence in using IT was a concern for some respondents. Similarly, several respondents admitted to being daunted by new technologies themselves. Finally, resource implications were highlighted, both the cost financially of buying equipment and	The surveyed trainers quote that the high costs, unreliability and availability of infrastructure and software and their unreliability are an obstacle to the use of digital technologies. Moreover, trainers need to do a constant investigation of good learning programs in order to stay up to date. Trainers also face the challenge to keep the learning of using digital technologies (e.g. using a mouse) in the background and focus on maths. What is more, learning programs are often inadequate for adult learners. Basic skills learners often lack basic ICT-

both the cost financially of buying equipment and programmes and the time implications of sourcing online digital resources and testing for suitability.				programmes and the time implications of sourcing online digital resources and testing for suitability.	competences and fear using digital technologies. The learning groups are also often quite heterogeneous as to their competence level.
Analysis: The key challenges faced by practitioners fell into three main categories: cost, access and confidence. The cost of using digital technologies, both in financial terms and in time, is perceived to be high. Access to equipment is a common issue, as well as limited Internet access. Lack of confidence, not only in learners but often in practitioners too, is a significant barrier.					
Emerging Conclusions: Some of the challenges faced by practitioners are out with the scope of this project to address in sufficient depth.					
Emerging Recommendations: It is recommended that this project addresses the issue of how time consuming it is for practitioners to decide whether digital technologies are appropriate and beneficial to their learning outcomes. Links to sources of funding might also be useful but not all issues raised in the survey are within the scope of this project to solve. A decision should be made by the project team about where the most value can be added to the field, in terms of building confidence amongst practitioners in using digital technologies. It is likely that those who have very low digital skills are unlikely to change their practice significantly after completing a short training course or session so it might be most useful to pitch tutor training sessions at those practitioners with reasonable digital skills who have not made the connections of how to make best use of digital technologies creatively in their teaching practice.					

Question 14. Reasons participants had not used digital technologies as much as they would have liked to.					
Denmark	**Finland**	**Ireland**	**Northern Ireland**	**Scotland**	**Switzerland**
By far the most common reason for not using digital technologies more was lack of access to equipment, software and /or Internet Access and in connection to this the use of digital technologies could steal too much time. This was closely followed by a lack of time to source resources. Lack of knowledge of the resources and applications available and feeling challenged by technological advancements also featured strongly in responses. One respondent writes that it took 2 years for him/her to feel confident with the technologies and to	The main reasons were the accessibility to digital devices for all students and teachers feeling somewhat ill equipped in using digital technologies in teaching mathematics	The main reasons for not using were very similar to the main challenges. Lack of time and access were the main reasons. There were concerns about students' computer literacy but also about the computer literacy of the tutors/teachers. Some tutors felt they were not adequately trained and up to date in the area.	Similar to ques 13 Hardware working Lack of time to find good resources.	By far the most common reason for not using digital technologies more was lack of access to equipment, software and /or Internet access. This was closely followed by a lack of time to source resources. Lack of knowledge of the resources and applications available and feeling challenged by technological advancements also featured strongly in responses. One respondent highlighted a lack of resources mapped to the Scottish Curriculum. Finally, one respondent suggested that some guided workshops would be useful	A main reason for not using digital technologies is that the infrastructure, such as laptops or computer rooms, is not sufficiently available. A second reason that was mentioned is that many learners have "insufficient" competences to really teach them numeracy using digital technologies. A few trainers state that they themselves lack ICT-skills so that they fear using digital technologies.

be able to help the students in short time. But the respondent threw herself into the work and then had to tell the students that she would provide an answer tomorrow.					
Analysis : the responses to this question very closely mirror those of question 13					
Emerging Conclusions: see question 13					
Emerging Recommendations: see question 13					

4. Conclusions

The following conclusions build on the 'emerging' conclusions identified in the analysis of the survey question responses. For each conclusion, we show the question(s) it corresponds to in a footnote.

Conclusion 1 – *valuing diversity*[1]

Teachers from a broad range of educational settings/sectors and levels (e.g. primary schools, universities, vocational institutions) have demonstrated interest in, experience of, and willingness to further develop their capabilities in teaching numeracy/mathematics using digital technologies. There may well be scope and value in bringing together teachers from diverse backgrounds in any activities that make use of the outputs of the DigiMaths project (i.e. the guidance for teachers, the teacher training session and the teaching resources), so that they can learn together and from one another.

Conclusion 2 – *digital technologies and 'everyday numeracy/maths'*[2]

There is a broad recognition from respondents that linking numeracy/maths to 'everyday' applications (e.g. banking) is key to learners' understanding, and ability to apply learning and transfer it between contexts. There should therefore be consideration given to ways in which numeracy/maths learning can be 'linked' effectively to the 'everyday' through the use of digital technologies.

Conclusion 3 – *the need for the project's outputs to be creative and flexible*[3]

Not all teachers (especially in Scotland and Ireland) have a teacher training qualification, so formal formats for the outputs are less likely to impact on these teachers' practice. There should be consideration given to producing outputs that can be used creatively and flexibly (including online).

Conclusion 4 – *lack of training in the use of digital technologies for teaching*[4]

There are significant proportions of respondents in each country who have had no training in the use of digital technologies in their teaching, with between 25% and 40% of respondents across the countries having had no formal, or informal, training.

Conclusion 5 – *the usage of particular digital technologies applications*[5]

There are significant recurrences of applications of digital technologies that are 'never' or 'rarely' used (e.g. smartwatches).

Conclusion 6 – *the range of uses of digital technologies to teach numeracy/maths*[6]

[1] drawn from answers to survey questions 1, 2 and 5 of the original survey
[2] drawn from answers to survey question 4
[3] drawn from answers to survey question 6
[4] drawn from answers to survey question 7
[5] drawn from answers to survey question 8
[6] drawn from answers to survey question 9

Although broadly used in teaching varying levels of numeracy, digital technologies do not seem to be exploited for a wide spectrum of uses, with most respondents saying that they use them to introduce or develop a new concept, and to enable real life applications.

Conclusion 7 – *the range of topics taught using digital technologies*[7]

Between them, respondents use digital technologies to teach a full range of topics. Across the partner countries there is likely to be rich experience of applications of digital technologies that can be shared.

Conclusion 8 – *benefits of using digital technologies in learning and teaching of numeracy/maths*[8]

Practitioners see clearly the benefits of using digital technologies for a range of applications in the learning and teaching of numeracy/maths.

Conclusion 9 – *challenges for respondents in using digital technologies in their teaching*[9]

Cost, lack of access and lack of confidence are the main barriers identified by respondents to using digital technologies.

5. Recommendations

Recommendation 1 – *'valuing diversity'*

The outputs from the DigiMaths project should be relevant for those teaching numeracy/maths in all settings and at all levels of education. We should encourage the bringing together of teachers from different backgrounds in any dissemination of the project's findings and outputs and training of teachers using its outputs.

Recommendation 2 – *digital technologies and 'everyday numeracy/maths'*

The outputs should include a focus on ways in which digital technologies can link learning 'in the classroom' to 'everyday' applications of numeracy/maths.

Recommendation 3 – *the need for the project's outputs to be creative and flexible*

The outputs should be designed and provided in creative and flexible ways so that those teachers with little or no teacher training can best be supported in their practice.

[7] drawn from answers to survey question 10
[8] drawn from answers to survey question 11
[9] drawn from answers to survey questions 13 and 14

Recommendation 4a – *lack of training in the use of digital technologies for teaching*

The dissemination of the DigiMaths project should include targeting teacher training organisations to ensure that they are promoting, and delivering, and encouraging the delivery of, training for teachers in the use of digital technologies.

Recommendation 4b - *lack of training in the use of digital technologies for teaching*

The outputs of this project should be freely available to all teachers and should address teachers who have little or no experience or skill in using digital technologies in their teaching.

Recommendation 5 - *the usage of particular digital technologies applications*

The project's outputs should showcase/exemplify those applications of digital technologies to the teaching of numeracy/maths that the survey found to be underused, in order to raise awareness of their potential.

Recommendation 6 – *the range of uses of digital technologies to teach numeracy/maths*

DigiMaths should promote the use of digital technologies in all areas (i.e. topics) of learning, especially those for which its applications are over-looked. Resources and lesson ideas would be beneficial in promoting such areas. Many participants may not know the opportunities or applications of digital technologies in these areas. Support from the DigiMaths project could promote effective teaching using technology.

Recommendation 7 – *effective ways of teaching topics using digital technologies*

DigiMaths should make available guidance on how digital technologies can be used to deliver a range of topics, drawing on the experiences of the respondents to this survey. In addition to drawing on examples of effective practice (see examples in answers to survey question 11) this might require going back to those respondents who gave permission to be contacted again, and procuring ideas for teaching methods, learning activities and teaching resources. These could be catalogued on the project's website.

Recommendation 8 - *benefits of using digital technologies in learning and teaching of numeracy/maths*

The DigiMaths project should use "soundbites" from the survey responses on the project's website and in dissemination materials to help demonstrate to other practitioners the benefits of using digital technologies in learning and teaching of numeracy/maths.

Recommendation 9 - *challenges for respondents in using digital technologies in their teaching*

The barriers that practitioners face in using digital technologies in their practice are complex and not easily fixed as part of this project, but the three key barriers of cost, access and confidence should be considered in the development and dissemination of the project's outputs.

Appendix

Survey questions (in English)

This project seeks to:

- identify the extent and quality of numeracy teaching using digital technologies in Europe
- identify the latest international research in this area
- identify effective practice in the use of digital technologies to teach numeracy
- produce **guidance** for teachers in all sectors containing its findings
- produce a **teacher training course** and **teaching resources** that can be used across Europe
- share our learning widely, partly by publishing the guidance, training and resources on a website and by hosting a multinational conference.

This survey will help us to **find out about numeracy teaching using digital technologies that is taking place in Europe.**

Please answer these questions as fully as you can. Please also share this survey among your colleagues and networks.

Many thanks for your help!

The DigiMaths Project Team

General information

1. What country do you teach in?

2. What is your job?

3. Do you teach numeracy/mathematics? [end survey if not]

4. Why are your students learning numeracy?

5. What level of numeracy do you teach to (if appropriate)? [open]

6. Do you have a teacher training qualification? [open]

Using digital technologies to teach numeracy/mathematics

7. What training (formal or informal) have you received in the use of digital technologies for teaching? [open]

8. For each of the following digital technologies please tell us which you have used [Never, Rarely, Sometimes, Often, Almost always]

    i. generic computer programmes (for example, Word)
    ii. learning programmes (for example GeoGebra, Number Shark)
    iii. calculators on phones, tablets or computers
    iv. websites
    v. apps on tablets
    vi. apps on smart phones
    vii. apps on smart watches

viii. digital cameras (including on phones)
ix. YouTube or similar
x. social media (like Facebook)
xi. interactive whiteboard
xii. online/distance technologies such as Skype
xiii. other [please describe]

9. When teaching mathematics, how often do you use technology for the following purposes? [Never, Rarely, Sometimes, Often, Almost always]

    i. To enable difficult or time-consuming calculations.
    ii. To introduce or develop a concept.
    iii. To enable study of real life applications.
    iv. To provoke exploration of mathematical ideas.
    v. Other reasons? Please specify.

.
i.
i.
i.
i.
i.
i.
i.

10. For which topics do you use digital technologies? [yes/no]

    i. whole numbers
    ii. percentages, decimals, fractions
    iii. time
    iv. money
    v. measurement
    vi. data handling
    vii. probability
    viii. other, please specify

11. Can you give examples of ways in which you believe you have used digital technologies **effectively** in your numeracy/mathematics teaching? [open]

12. If you have used digital technologies in your teaching, what have you found to be the **opportunities** for you and the learners? [open]

13. If you have used digital technologies in your teaching, what have you found to be the **challenges** for you and the learners? [open]

14. If you have not used digital technologies as much as you would like to, can you explain some of the reasons? [open]

Conclusion

15. Would you be happy to be contacted about your answers? If so, please give your name and a contact email address. [spaces for answers]