In this report we give an account of the project's activity, including information that demonstrates how the original aims of the project have been achieved and what the major benefits of the collaboration that the project established are. We also list and justify the minor digressions from the original plan and outline the activity that took place instead.

Our project, (CAPTeaM: Challenging Ableist Perspectives on the Teaching of Mathematics) aimed to establish a partnership between two research groups (UK: led by Elena Nardi, PI; Brazil: led by Lulu Healy, co-I) in order to combine Nardi's approaches to investigating and transforming mathematics teachers' pedagogical and epistemological beliefs and Healy's research with mathematics learners with research results:

Professor Elena Nardi, School of Education and Lifelong Learning, University of East Anglia, Norwich NR47TJ, UK. EMail: e.nardi@uea.ac.uk

Professor Lulu Healy, UNIVERSIDADE ANHANGUERA DE SÃO PAULO, Rua Maria Cândida, 1813, 4º andar – Vila Guilherme, São Paulo, CEP 02071-013, Brazil. EMail: lulu@pq.cnpq.br

Overall our cost estimates were accurate and the above costs (Travel, Subsistence, Consumables and Other) correspond well to the amounts listed in the application (£4600, £1420, £500, £3430 respectively). There is an underspend of £791.05 due to an unexpected availability of consumables in our institutions (and the institutions where teacher workshops and dissemination took place) and the slight change of conferencing plans (see: Research and Final Report Data).

**Grand Total:** 9158.95

### Personal Details

**Name:** Professor Elena Nardi

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### Research

**Research results:** In this report we give an account of the project's activity, including information that demonstrates how the original aims of the project have been achieved and what the major benefits of the collaboration that the project established are. We also list and justify the minor digressions from the original plan and outline the activity that took place instead.

Our project, (CAPTeaM: Challenging Ableist Perspectives on the Teaching of Mathematics) aimed to establish a partnership between two research groups (UK: led by Elena Nardi, PI; Brazil: led by Lulu Healy, co-I) in order to combine Nardi's approaches to investigating and transforming mathematics teachers' pedagogical and epistemological beliefs and Healy's research with mathematics learners with...
disabilities. In this one year project – of what we envisage as a longer-term partnership – we developed and trialled materials that encourage teachers to reflect upon the challenges of teaching mathematics to students labelled as disabled and who may have previously received their education in special schools or classes. We collected data from these trials in both countries and our analyses suggest ways in which research, teacher education and practice can support teachers in overcoming these challenges. We disseminated project materials and results in teacher workshops in both countries, and elsewhere, and we presented results in national and international conferences which were then published in conference proceedings. We are currently preparing articles for publication and are continuing with project dissemination and impact generation activities in more teacher workshops. We are also preparing the next application for a three-year BA IPM grant that will build on the remarkable momentum generated by this first year of CAPTeaM.

We note that in this report and throughout the project we endorse the following definition of ableism: “...a network of beliefs, processes and practices that produces a particular kind of self and body (the corporeal standard) that is projected as the perfect, species-typical and therefore essential and fully human. Disability then, is cast as a diminished state of being human.” (Campbell, 2001; p.44). With this in mind, CAPTeaM has aimed, not only to acknowledge, but also to work with practising and future teachers towards challenging the ableist assumptions that currently mediate our interpretations of mathematics learning and our practices as educators of mathematics.

The CAPTeaM research design enacts the reciprocity principle of the BA IPM Scheme and was carried out in five phases:

Phase 1: Preparatory work towards Brazil to UK visit
Phase 2: Brazil to UK visit; task design, pilot
Phase 3: Preparatory work towards UK to Brazil visit; data collection
Phase 4: UK to Brazil visit; data analysis planning
Phase 5: Data analysis and dissemination

Note: During Phase 5, an additional second visit of the co-I (from Brazil to UK) took place. See below our more elaborate account of each phase.

These five phases have involved the design of tasks aimed at providing opportunities for pre- and in-service teachers to reflect upon issues related to the inclusion of disabled mathematics learners in their classes. In Phases 1 and 2, two types of tasks (Type I and Type II) were designed and trialed. We outline the project activity during each one of Phases 1 to 5 in what follows.

During Phase 1 both teams: consolidated familiarity with each other’s prior work; finalised arrangements for the reciprocal visits; identified cohorts of participants; planned the visit to the UK of Healy & Fernandes; drafted Task designs to be finalised during Phase 2 and used towards data collection on both sites during Phase 3.

During Phase 2 four tasks (three of Type I and one of Type II) were designed and piloted with small groups of participants (pre- and in-service teachers) in Nardi’s (UEA) and Healy’s (UNIAN) institutions.

The first step in the design of the Type I tasks involved members from the Brazilian team in selecting episodes of mathematical interactions between students and teachers from the database of video evidence collected in the different studies of the research programme Towards an Inclusive Mathematics Education (www.matematicainclusiva.net.br) that Healy has been leading in Brazil for several years. The aim was to locate episodes representative of the
mathematical practices associated with particular forms of interacting with the world – practices of learners who see with their hands and ears, who speak with their hands, whose visual memory is more efficient than their verbal memory, etc. We opted for episodes involving the use of interesting and valid mathematical strategies, but in which the properties and relations were expressed in unconventional or surprising forms.

Using the task design approach devised and deployed by Nardi and her team, each episode was inserted as a video clip into a brief narrative about a fictional mathematics classroom. We then invited the participants to assume the role of the teacher of this class and evaluate the interactions of the disabled students that were presented in the video clips – first individually and in written responses to a set of questions and then in a group discussion (which we also video-recorded).

In the tasks of Type II, which aimed to provoke reflections about how access to mediational means differently shapes mathematical activity, participants worked in groups of three. Two members of the group were asked to solve a mathematical problem whilst, temporarily and artificially, deprived of one of their sensory or communication canals. The third member of the group filmed their interactions. A group discussion of their experiences followed.

We note that during Phase 2 there was a minor digression from the proposed plan: only one of the two Brazilian team members scheduled to participate in the UK visit (co-I Healy) did so physically. Team member Fernandes was unable to travel (due to an accident that resulted in lack of mobility for the duration of Phase 2) participated virtually in the Phase 2 project activities. Funds saved from this digression from the original plan were deployed for a second visit by the co-I during Phase 5.

The Phase 2 visit to the UK took place during the final weeks of the Autumn Semester so that Healy could contribute to the UEA’s Public Seminar programme, PGCE programme as well as discuss the project with students from UEA’s doctoral, MA and BA programmes as guest lecturer. The project’s ethical approval application was also completed during this phase. Application to UEA’s Research Ethics Committee mirrored those previously produced by Nardi and UK team member Biza who are currently involved in a project of analogous research design.

During Phase 3, data was collected in Brazil and the UK from a total of 81 pre- and in-service teachers (60 from Brazil and 21 from the UK) who completed the four tasks in a three hour session. Data consists of: written responses to the Tasks; audio / video recordings of small-group and plenary discussions of the responses. Data collection was carried out in February in the UK and in March in Brazil, at the start of the southern hemisphere’s new academic year. Data analysis was initiated right after and has been ongoing in Phases 4, 5 and beyond. It is being conducted on each site, first separately and then collectively in accordance with agreed procedures that merge the approaches used in previous studies by Nardi, Healy and their collaborators. As the data is in English and Portuguese, selected translation (of texts, nuances and contextual details) is necessary.

During Phase 4, Nardi & Biza visited UNIAN for the main purpose of analysing the collected data and preparing dissemination of findings. Mirroring Phase 2, reciprocal lectures and seminars were offered to the respective programmes at UNIAN as well as to associated research groups and post-graduate programmes elsewhere in Brazil (at UFRJ, the Federal University of Rio de Janeiro which also hosts a group of researchers, led by Dr Claudia Segada, with interest and expertise in research into teaching of mathematics to disabled learners).

During Phase 5, project activity focused on data analysis, generating outputs for
dissemination and further impact generation activity. These included workshops tocohorts of teachers on both sites and conference presentations (BSRLM in the UKin June and submission for presentation at VI SIPEM in Brazil in November). At allevents (seminars and teacher workshops) in both sites (UK, Brazil) evidence wascollected of the impact generated by teacher participation in these. Further,teacher reflections and propositions related to subsequent (beyond this first year)phases of the project were also collected and are currently informing the design ofa scaled-up version of CAPTeaM (BA IPM bid, in preparation for submission byFebruary 10th, 2016).

We note that during Phase 5 there was a second, slight digression from theproposed project activity: participation at PME39. This digression was due todistance/cost reasons (it was held in Hobart, Tasmania, access to which wasbeyond the financial means of this project) – as well as timing (it was held in July,at a time that we deemed too crucial for reaching out to key user communities,teachers, prior to the end of the school year in the northern hemisphere). We seeour extensive dissemination activity during and beyond the project dates ascompensating for this slight digression from the initial plan. We are also currentlycompleting a PME40 paper for submission. This is due on January 15th, 2016.

During Phases 4 and 5, thematic analysis of the collected data aimed tocharacterise participants’ perspectives about teaching mathematics to people withdifferent disabilities, and to explore if and how engaging with the task results inany resignification in relation to these perspectives. Analysis was carried out inaccordance with these five dimensions:

1. Value and Attuning: to what extent the respondent attunes to and values thedisabled learner’s contribution(s), and how, if at all, s/he attends to the learningneeds in question;
2. Classroom integration and Benefit: how the respondent manages the classroomafter the contribution has been made;
3. Experience and Confidence: how experienced and confident the respondentclaims to be in teaching students with the special needs presented in the Tasks;
4. Institutional Possibilities and Constraints: what institutional possibilities andconstraints the respondent identifies as crucial to the teaching of studentspresented in the Tasks;
5. Resignification: evidence of respondent’s reconsideration of their views andintended practices in the light of engaging with the Tasks.

Analyses of the data are ongoing and currently revolve around the following keyfindings (sampled here from the Type I Task data analysis).

Value and Attuning
In the first Type 1 task, participants were asked to evaluate the strategy of a blindstudent as he worked on identifying, describing and constructing a geometricalsolid. The second Type 1 task presented the solution of a deaf student to analgebraic activity and in the third Type I task involved a student with Downsyndrome working with number. Although there was some variation across tasksand across countries, when asked how they would react as teachers to thedisabled students’ approaches, we noted a considerable and explicit valuing of thestudents’ contribution, but a limited attuning of the classroom action to thiscontribution. We observed two tendencies that crossed the task and countrydivide. The first related to respondents’ attempts to switch attention away fromless conventional descriptions of mathematical objects and their properties towards familiar textbook definitions and descriptions highlighted in themathematics curriculum of the respective countries. This was the case even whenthe unconventional approaches had mathematical validity. The second tendencywas associated with a general devaluing of strategies which appeared to dependon the use of concrete materials. In some sense, it appears that, for many of the
participants, the use of physical tools is judged as a sign of fragile grasp of mathematical knowledge – a view that at times may obscure innovative and valid strategies that involve the use by disabled students of materials used as substitutes to tools of the body. This tendency poses touching (or seeing with one’s hands) as a lower level strategy than seeing (with one’s eyes) and, in a similar way, treats written means of recording events to aid with memory as more sophisticated (and perhaps more mathematical) than physical tools.

Classroom integration and Benefit
Perhaps because the videos focussed mainly on individual students, the issue of classroom management received limited attention. However there was some indication that the participants were concerned that the disabled student would require more attention than “the rest of the class”. Implicit in this perspective is a view of the disabled as other, as deviating from some kind of homogenous norm to which all the other students belong. Such a view is perhaps further fuelled by the fact that most educational structures (physical structures, such as buildings, as well as curricular structures such as textbooks and materials, policies and assessment methods) are founded on the notion of “the normal student”, creating barriers that limit the independency and autonomy of those who do not correspond to the norm.

Experience and confidence
On this item there is absolutely no ambiguity in our results. The overwhelming majority of participants cite a lack of experience and confidence in supporting disabled students in their mathematics classrooms. Exceptions included those who had disabled family members or belonged to social groups which had brought them into contact with one or more disabled individual(s). Even these participants though tended to state low levels of confidence about including disabled learners in their mathematics classrooms, without more specific guidance than that received in pre- or in-service training. We also note that as the participants’ engagement with the tasks progressed, their expression of strong concern about lack of preparation and support for teaching disabled students increased.

Institutional possibilities and constraints
Some of the UK participants made reference to within-school support systems from which they might seek assistance. These were mainly references to Special Needs Coordinators (SENCOs) and Learning Support Assistants (LSAs), although explicit and elaborate examples of assistance from such external authorities were extremely rare. While some of the UK participants may have overestimated expectations about what authoritative sources (such as prior research) have to offer about teaching mathematics to disabled students, in Brazil very few of the pre-service teachers seemed to be aware of the existence (or not) of any such support systems. In the group discussions a frequently raised issue was that of assessment for disabled learners – even though we note that this is an issue not explicitly addressed in the Tasks we developed during this project.

Resignification
We see the very positive results on this item as crucial. Our results suggest that as the tasks progressed the participants started to rethink some of their initial views about working with disabled students in their mathematics classroom. Some began to reflect on how they might need to rethink some of the strategies they use. From the first Type I task, for example, one described how his tendency to use visual approaches would need to be adapted to include blind learners, and others who liked to include a lot of group discussion, talked of how this might need to be accompanied by additional visual material in the case of deaf learners. Notably after engaging with the Type II Task, where the participants were invited to work on a mathematical problem while temporarily deprived of one sensory or communication canal (seeing, hearing, speaking), an openness to facing the challenge of teaching mathematics to disabled students seemed to be emerging.
Comments such as “after seeing the videos, I would like to have this experience” and “inclusion is difficult, but I don’t think it is impossible. I am ready to try” appear in the written protocols.

Overall CAPTeaM outputs include:

• Task designs used in the project. Apart from this research, these are also suitable for use in teacher education and professional development programmes (prior experience of Nardi, Biza and their colleagues includes extensive use in UK in-service training sessions as well as professional conferences for secondary mathematics teachers).
• Project website.
• Reciprocal lectures and seminars to the student cohorts on both UEA and UNIAN. See also the Dissemination / Networking section of this report for contributions to the programmes of other institutions (in the two countries and elsewhere). The opportunities for these emerged during the project.
• Workshops to secondary mathematics teachers to disseminate findings from the analysis of data from both sites and share the benefits from the bilateral implementation of the project. The initial project proposal was for one workshop in the UK and one in Brazil but we note that the actual number of workshop exceeds the two promised in the proposal due to remarkable levels of demand. These workshop are also ongoing and have exceeded the official end date of the project. ) See also the Dissemination / Networking section of this report.
• Presentation of results at the day conference of the British Society for Research into the Learning of Mathematics (UK, June 6th 2015; BSRLM).
• Presentation of results at the 6th International Seminar on Research in Mathematics Education (Brazil, October 2015; VI SIPEM).
• Preparations towards a joint application for subsequent phases of CAPTeaM: a 3-year BA IPM application is currently in preparation for submission by February 10th, 2016.
• Outputs in preparation include:
• Presentation of results at the 40th Annual Conference of the International Group for Psychology in Mathematics Education (PME340) in August 2016, including publication of the paper in its peer-reviewed proceedings. This is due for submission by January 15th, 2016.
• Two journal articles are currently in preparation, one is a leading journal in mathematics education (Educational Studies in Mathematics) and a leading educational research journal (British Educational Research Journal). As CAPTeaM concerns issues of inclusion that transcend the boundaries of mathematics education we are preparing articles that will reach both specialist (mathematics education) and general readerships.

The major benefits from CAPTeaM concern the mathematics teachers in both countries both those who participated in the data collection and those who participated in the project’s dissemination activities. Our research findings and participant testimonials elaborate these benefits. The partnership was also beneficial for the two research groups (and respective institutions) at UEA and UNIAN in very substantial ways. In the UK, CAPTeaM has added a valuable third strand (Inclusion) to Nardi & Biza’s Task project (see, Dissemination / Networking section of this report and the associated materials posted on the project website), with the other two being Mathematical Reasoning and Classroom Management. In Brazil, CAPTeaM has offered Healy and her team insights on professional development gleaned by the UK team members, contributing to the process of disseminating the multisensory approaches beyond the Brazilian classrooms in which they were originally employed. The Brazilian team – whose expertise in research and development work in teaching mathematics to disabled learners is very substantial – has gained from the opportunity to interact with teachers in a different international context and to explore how different institutional constraints and affordances shape teachers’ views about the teaching and learning of
According to the ableist world-view, to be able-bodied is the norm and disability is a disadvantage that must be overcome. Within education, ableism results in prejudice against disabled learners, and has a drastic effect on teaching. CAPTeaM (Challenging Ableist Perspectives on the Teaching of Mathematics) investigates how ableist perspectives impact upon the teaching of mathematics. In this one-year project we established a partnership which combines approaches to investigating and transforming teachers' beliefs with research into the mathematics learning of disabled students. We developed tasks trialled by 81 mathematics teachers in Brazil and the UK. Responses indicated that teachers valued the mathematical contributions of disabled students, but did not feel confident about including them in their classes and would welcome support to better attune their teaching strategies to the approaches favoured by disabled students, especially those that deviate from conventional approaches privileged in the curriculum materials of the two countries.

Suitably anonymised samples of the project materials mentioned above are available on the CAPTeaM website, https://www.uea.ac.uk/capteam/, which also contains brief videos that present nutshell descriptions of the project's activities in British Sign Language. This mirrors the respective parts of the Brazilian site, www.matematicainclusiva.net.br, which offers such descriptions in Portuguese Sign Language.

<table>
<thead>
<tr>
<th>Title of research project:</th>
<th>Challenging ableist perceptions of mathematical learning in Brazil and the UK</th>
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</table>

**Synopsis of research:**

Across the two teams – see full lists of membership at the project website – six doctoral students (2 in the UK and 4 in Brazil) have benefited directly from involvement in the project as Research Associates. Analogous claims apply to faculty contributing to the mathematics teacher education programmes on both sites.

Electronic products or by-products of research - deposited:

Electronic products or by-products of research - accepted:
Published


In preparation

Future plans:
Publications
We are currently working towards the completion of publications listed in the Publications section as “in preparation”.

Future collaboration (CAPTeaM+)
We are also currently working towards a grant application for subsequent phases of CAPTeaM (a 3-year BA IPM application, CAPTeaM+). This is due for submission by February 10th, 2016. Preparations towards this submission are as follows:
• December 15th 2015: PI and co-I discuss first draft with UEA’s Research Office in order to secure timely administrative and Head of School support for January 2016.
• January 21st 2016: draft to be discussed at the monthly meeting of UEA’s RME (Research in Mathematics Education) Group. Amendments to follow right after.
• January 27th: final draft to be submitted to UEA’s Research and Head of School Offices.
• February 10th, 2016: Submission complete, with Referee and Head of School statements following soon after.

The focus of CAPTeaM+ has emerged from: CAPTeaM data analyses and findings; and, perspectives put forward by CAPTeaM participants (in evaluation forms as well as in the Reflections sections of participants written response templates). In a nutshell CAPTeaM+ will focus on the theme of Attunement that emerged from our data analysis as key to teachers’ preparedness for inclusive mathematics teaching. To this aim we will work with pre-and in-service mathematics teachers (including those training in our respective institutions, experienced teachers from the field and disabled teachers of mathematics who have been instrumental in the success of CAPTeaM) towards: interventions in teacher education programmes in our institutions and elsewhere (through contacts established during CAPTeaM’s first year); and, towards three sets of annual events (one set per project year, each adapted for the two sites in the UK and in Brazil) in which disabled learners in mathematics will participate in inclusively designed mathematical activities that will capitalise on – and strengthen further - their appreciation for / confidence in their mathematical abilities. The events will be designed, prepared and delivered in collaboration with aforementioned teams of pre- and in-service teachers.

Dissemination/networking:
This is the list of CAPTeaM teacher workshops and dissemination events.

Notes:
• Materials for all events (handouts, Powerpoint slides, participant feedback and evaluation) are available upon request from the PI - and are also sampled in the Research Activities section of the website.
• At all events where public discussion of videos from the Matematica Inclusiva project was necessary, we deployed anonymised versions of the videos using “cartoonizing”. Software “Video Cartoonizer Desktop Software 1.5” was purchased to this aim.
• In the events listed below CAPTeaM was the main focus or substantially referenced by the presenting team members.

Within the project start and end dates


27 March 2015 Seminar entitled Mathematics and Mathematics Education: A story of paths just crossing or of meeting at a vanishing point? UNIAN - Universidade Anhanguera de São Paulo, Brazil. (30 participants).

8 April 2015 Seminar entitled The CAPTeaM project: Challenging ableist perspectives on the teaching of mathematics. UFRJ – Universidade Federal de Rio de Janeiro, Brazil. (40 participants).

26 March 2015 & 7 April 2015 Co-presented seminars, with Irene Biza, entitled Balancing classroom management with mathematical learning: Using practice-based task design in mathematics teacher education. UNIAN - Universidade Anhanguera de São Paulo (40 participants) and UFRJ – Universidade Federal de Rio de Janeiro (40 participants), Brazil.


23 June 2015 Teacher workshop. University of East Anglia. (30 participants / see Research section of this Final Report).


4–8 July 2015 Invited lectures and workshops (6h), jointly with Irene Biza. Joint Post-graduate Mathematics Education Summer School (National and Kapodistrian University of Athens and University of Cyprus), Anavysos, Greece. 4–8 July (40 participants).

7 August 2015 Healy, L. Alfabetização (Matemática) e Educação Inclusiva [(Mathematical) Literacy and Inclusive Education] Mesa Redonda [Research
Panel], III Encontro de Educação Matemática nos Anos Iniciais. Universidade Federal de São Carlos, SP. Research Panel during a Regional Event for inservice primary teachers from the state of São Paulo approximately 250 participants).


Beyond the project end date


15 October 2015 Healy, L. Ouvindo a Matemática com ferramentas digitais [Hearing Mathematics with digital tools]. Mesa Redonda [Research Panel] I Simpósio Nacional de Tecnologias Assistivas do Instituto Benjamin Constant. Rio de Janeiro, RJ. (Presentation at the Instituto Benjamin Constant, the national centre of reference for the Education of the Blind, the focus was not specifically on CAPTeaM, although the ideas behind Type II tasks were presented).

29 November 2015 Healy, L. Diferença não é deficiência [Difference not déficit] Palestra no Seminário PIBID (Pre-service teachers). Universidade Adventista de São Paulo. Capão Redonda, SP. (Lecture to 35 pre-service mathematics teachers)


4-9 January 2016 Invited lectures and workshops (8h), jointly with Irene Biza. Joint Post-graduate Mathematics Education Programme (University of Western Macedonia and Aristotle University of Thessaloniki), Greece. 4–9 January (40 participants expected). Funded by the Erasmus bi-lateral agreement between UEA and UoWM.
CAPTeaM has generated the academic impact described in the Research section of this Final Report. There we describe the benefits that are specific to the ongoing research programmes of the two research groups (at UEA and at UEA) that this partnership has been generating. Most pertinently CAPTeaM benefits are to the mathematics teachers in both countries both those who participated in the data collection and those who participated in the project’s dissemination activities. These include pre- and in-service mathematics teachers on both sites as well as elsewhere where CAPTeaM analyses and results are being disseminated (see Dissemination/Networking section).

Key networking during (and now after) the project include the contact we established also with disabled teachers of mathematics, particularly Mr Malcolm Sinclair (mathematics teacher of the deaf) with whom we also worked closely towards the filming of the British Sign Language videos of the website and whose network of disabled learners, and their carers and families, have provided support – and inspiration – for the emerging proposal for CAPTeaM+.

Indicatively we sample below from the Reflections page of the template that workshop participants have been filling in. We provide more extensive evidence of this in the Research Activity section of the project website.

One of the questions on the Reflections Page was “Have the activities in this workshop helped you reflect on your teaching practice? If so, in what ways?”.

Consistently responses have acknowledged the value of the workshop activities and have included comments such as the ones below:

“Yes. We rarely have enough time to consider pupils with these kind of issues. It is a worry that our attempts to ‘include’ pupils in mainstream education often excludes them from many things and does not provide an opportunity for them to progress academically at a rate that they are capable. I will go back to class and try to give the pupils more input into their learning to ask them what they need to access the curriculum.”

“They made me realise how difficult it is for disabled students to understand certain concepts. The different activities used in the session gave me a few ideas on what strategies I could use with my students and to better explain certain topics.”

“Yes, they have helped me realize how deaf and blind people learn Mathematics, which restrictions and difficulties they encounter. Based on this, I have benefitted on how to adjust my maths teaching in order to incorporate all these pupils in mathematics learning. The videos we watched, the practical activities we had in the class, the discussion that we had as well as the tool of MusiCALcAlorida have significantly made me reconsider and reflect on my teaching practice”.

“Importance of communication. Task 1 – vividly remembered how students rely heavily on meaning of eg. “X” and the importance of “Yes/No” affirmation. Geometry (eg. Pyramid) – 3D geometry without always working at Net 1. Acting swiftly to attune and value.”

“It helped me understand how students understand Mathematical ideas in a concrete way and how their understanding itself can influence and inspire the lesson. It made it even more obvious how pupils need to go from concrete, to pictorial, to abstract in order to master mathematical ideas and how the ones that did, demonstrated higher order thinking and “out of the box” explanations.”

“Language teaching for deaf students in Primary and High schools. Specific maths language using sign language can be difficult to demonstrate if students have limited understanding in language for example – sign for number and digit are same signs. Visual aspects for deaf students are important as mentioned in the
groups today."

“Always look for different ways to include young people with disabilities – be pro-active. Value their contribution – their insight based on their experience is different to yours – You could well gain from understanding their perspective (Andre – squares on top of each other to describe the pyramid)"

“Yes. It is very interesting to give information without speaking and writing. I should create a new way to communicate with my student.”

“Yes. Maintaining emphasis on an inclusive classroom – access/resources made available for learners to be taught together.”

“Yes, I’m now asking how can I use/develop teaching aids for the disabled students in my class. – Re-thinking my go to strategy for the more commonly encountered disabilities.”

“Yes these activities helped me know in depth about the students. It helped to support the mathematical learning of students who have disability in classrooms. It helped to see the issues of different situation from different point of view.”

“Yes definitely. I would like to teach in a visual way and this emphasised this and how dependant I am upon pupils that are able to see my teaching. How can I adapt this for VI pupils, or even just pupils who do not learn so well from visual methods! Can blind pupils have a visual learning preference? Or do they have to be auditory/kinaesthetic learners? They seem to need to have to have a good memory/concentration span.”

“Yes. The task with a mute teacher and blind learner was particularly interesting as it forced us to use different modes of communication than normal.”