

Evaluation Report

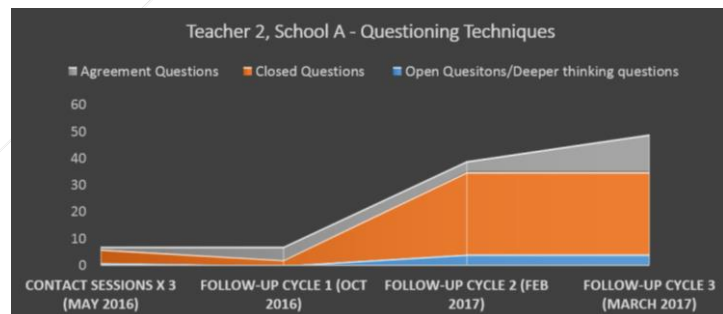
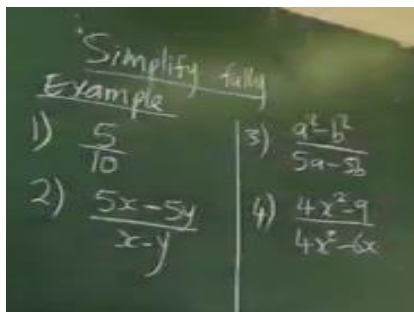


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Executive summary

The evaluation demonstrates that the pilot project was successful in advancing aspects of teaching pedagogy, concept development and providing mentoring support to most of the twelve teachers involved in the pilot project. However, the scope of project and the evaluation was restricted due to periods when a means of connection to the internet for participants was not available for administrative reasons. Some of the evaluation results have therefore been drawn from a more restricted pool than anticipated at the start of the project. The accompanying Monitoring and Rollout reports set out the wider circumstances of the project, describe the context to the evaluation, and include conclusions and recommendations.

The principle evaluation findings are as follows,

Contact sessions

- The contact sessions were successful in developing a strong relationship between the teachers and mentors and in introducing key pedagogical concepts to the teachers, however training was restricted for the reasons referred to above.

Follow-on sessions

- The project was successful in engaging all the selected teachers. Six teachers completed all three cycles and a further five were in the process of completing the cycles. Only one was unable to continue with the project for workload reasons and all teachers recorded and shared at least one reflection.
- The project relied on the elective participation of the selected teachers, and control over recordings and the sharing of videos was solely their own responsibility. In the light of this, teacher involvement in the project is a key outcome in addition to the teacher's ability to reflect on their practice, understand the pedagogical ideas and apply some of these to their classes.
- The most significant changes were evidenced in teachers' awareness of how students learn and developing a more learner-centred approach to their teaching.
- Amongst the Teach SA ambassadors, the amount of time that learners were engaged in active learning during the first twenty minutes of lessons increased over the course of the project.
- Feedback from ten of the teachers suggest that 80% felt that the project impacted on their teaching practice.

- Most of the participating teachers were able to use more and varied questioning techniques to engage learners throughout the lesson. However, the use of open-questioning in class was more sporadic across the teachers (in the evidence gathered).
- Two of the teachers were evidenced integrating differentiation into their classroom practice. Other teachers were beginning to develop strategies that suited the context of their classrooms.
- Lesson planning was seen to improve and a change of emphasis from curriculum delivery to planning for learner development was evidenced in five of the participating teachers.
- Improvements in learner behavior and participation was evidenced by most of the participating teachers - either in response to the presence of the cameras or the changes made to teaching practice (making classes more learner-focused).
- Improving the content knowledge of the teachers was not evidenced clearly through the evaluation however this was largely because the selected teachers content knowledge was felt to be sound. The IRIS Connect system however is capable of isolating issues in understanding and addressing these with advice and shared trusted mathematics web links where necessary.
- Increases in teacher confidence in implementing pedagogical approaches and networking were evidenced across the participating teachers
- The teachers who fully participated in the project, and sent the most reflections were the most positive about the effect that the mentoring had had on them
- The mentors and the teachers were able to address specific issues that pertained to their individual teaching style in addition to the key goals of the project (these included, classroom management, behaviour management, chalk board organisation, speed of delivery, explanations and sequencing of examples, and eye-contact and personal attention to the learners).
- The teachers' ability to self-reflect using the recordings was felt to be extremely valuable in allowing them to reflect and improve their own practice.

Networking and Mathematics-focused professional learning community

- The project has not developed a working mathematics learning community at this time. However, by the project end, the willingness to share and confidence to share had grown, with four of the teachers expressing intention to share within and outside of their schools.

- Over half of the teachers had shared their reflections ‘unofficially’ with other teachers in their schools, other schools or with their Head of department demonstrating a willingness to share.
- The Teach SA ambassadors felt that their group could benefit from networking together and one teacher had started sharing with some of this group.
- The heads of department varied in the amount of support they could give to the participating teachers across the six schools. Four HoDs were able to support the participating teachers by reflecting on practice together. Three of these suggested that the IRIS Connect system had helped them to monitor teacher performance (and could be used for evidence for the IQM)
- The degree of involvement by the district department was restricted by staff changes and workload issues, however there was very significant practical support and the team are following up the progress of the participating teachers and can see the potential in the equipment for training and monitoring purposes in particular.

Introduction

This report presents the findings of the evaluation of the United Kingdom-South Africa Mathematics teacher training pilot programme that utilised a video-based professional learning platform (IRIS Connect) to support the reintroduction of maths at Grade 10. The accompanying Monitoring and Rollout reports contain further information and findings concerning the practical and technical aspects of the pilot, together with recommendations.

Evidence presented in the field of teacher Continuing Professional Development (CPD) suggests that one-shot, top-down, approaches to CPD are, in many cases, ineffective (see Murphy 2000, Joyce & Showers 2002 and Cooper 2009). Research suggests that the most effective method of CPD need to be targeted (to current curricula needs), present the theory behind the practice to the teachers, allow for demonstration in real-life situations, give time for practice and feedback, as well as provide on-going opportunities for coaching and follow-up (Cooper, 2009). This project proposed to address some of these issues by introducing a video-mentoring system (IRIS Connect) into six schools located in township areas outside Johannesburg, South Africa. The use of video-mentoring in addressing some of these requirements has been examined by (amongst others) Kane et al (2005), Mitchel, Hobson and Sorenson (2007) and Bennet (2010). The use of video mentoring has shown to have four principle advantages: improve teacher ability to assess their own teaching practice; give teachers an insight into the learner perspective; provide a fairer and more reflective observation tool than classroom observations; and allow for a better distribution of time for training purposes (as observations could be undertaken at quiet times).

Video-mentoring has also been shown to present some weaknesses, in that it is not able to record close-group work across the whole class, the camera positions are 'controlled' by the teacher, and that technical issues may arise with sound or vision. Considering these issues, Kane et al (2005) suggest that video-mentoring should not replace in totum in-classroom observations. The three articles highlight the importance of anticipating any technological issues that may occur with the equipment (this covers technical issues as well as the personal training of those who will use it) as well as tackling any anxiety that teachers may have about filming themselves or 'publishing' this online. They also underline the importance of a school-wide approach to using video-footage that encompasses the staff at senior level. By encouraging school-wide support the usage and longevity of the approach is strengthened. Furthermore, Bennet suggests that the relationship between the mentor and mentee is key to success even with a video-mentoring approach, in short, the 'human element' is still crucial to the uptake and success of the training/mentoring given.

Considering this evidence, the pilot program sought to establish a teacher training method that utilized an innovative method of co-mentoring (blended coaching) between South African and UK Mathematics teachers. This used a combination of a week-long training session (in South Africa) followed by a minimum of three mentoring sessions via a video-based professional learning platform called IRIS Connect, as stipulated in the project requirements. The pilot worked with six schools located in the Ekurhuleni South District that were identified as experiencing significant challenges in maths performance and

participation rates¹. Twelve teachers in total took part in the pilot. These consisted of two teachers in each school, one of whom was a new Teach South Africa Ambassador² teaching mathematics and the other an experienced mathematics teacher. A further aim of the pilot project was to initiate a professional learning network of teachers who could share knowledge and practice via the IRIS Connect platform.

The project plan included:

- 1) **A Scoping visit** - to introduce the project and the IRIS Connect system to the senior management and staff of the six preselected schools. To collect baseline data.
- 2) **Online remote induction session** to familiarise the SA teachers with the IRIS Connect platform, build confidence in using the system and provide training on successful feedback methods in peer-to-peer mentoring.
- 3) **One-week contact session** at each of the six schools to train and build the confidence of the SA Teachers in using the IRIS Connect platform with one UK Mathematics teacher-trainer responsible for the mentoring of six teachers (across three schools). Aims included a more in-depth assessment and observation of the teachers in-class to tailor training, advice and training on pedagogic strategies to help develop engagement and concept development in class, and an opportunity to build rapport between the UK mentors and SA teachers.
- 4) **Three follow-up video mentoring sessions** using the IRIS Connect platform. The SA teachers' sent a minimum of 3 video reflections of their Mathematics year 10 teaching for comment by the UK teachers. Meta-reflection and sharing with other teachers (both within and outside of their schools was encouraged). This allowed for on-going coaching and follow-up (as suggested by Cooper 2009).

Project - Aims and Objectives

Following the baseline data (see front-end evaluation report - appendix A), the aims of the contact and follow-up sessions were finalized. These are presented below:

Objectives	Aim of contact and follow-up sessions
<i>Improve teacher content knowledge in mathematics (help address specific knowledge gaps)</i>	To improve at least one aspect of teacher knowledge during training (identified by trainer during contact session) To help create a Professional Learning Network (PLC) via the IRIS Connect system that allows teacher to share and assimilate knowledge
<i>Improve teacher awareness of how students learn mathematics</i>	To improve the ways that teachers use differentiation in large mixed ability classes To introduce new ideas for maths resources that can help engage pupils.

¹ The schools were selected by the DBE in South Africa in consultation with the Ekurhuleni South District leaders who had shown a positive attitude to new ideas and were keen to develop their teacher CPD.

² The Teach South Africa scheme is similar to the United Kingdom's Teach First graduate scheme whereby new graduates are fast-tracked into teaching jobs after a short training period (in the UK the training extends to six weeks, whereby in South Africa the training is two weeks). After which the graduates then have a guaranteed a job in a selected school.

	<p>To introduce ideas to engage pupils at the beginning of a class (so as to maximize learning time).</p> <p>To improve some of the ways that teachers manage mixed ability classes</p> <p>To allow teachers to self-reflect on their practice using IRIS Connect.</p>
<i>Improve teacher ability to assess students' understanding of Mathematics</i>	<p>To use IRIS Connect to enable teachers to access recorded footage of their teaching (that includes pupil's reactions) to improve their ability to assess learners understanding of mathematics.</p> <p>To introduce new questioning techniques that can be used in class to engage more learners (and allow teachers to assess understanding during lessons).</p> <p>To improve ways in which teachers monitor understanding among their learners</p>
<i>Develop a system of classroom observation and a culture of self-reflection</i>	<p>To train and induct all participating teachers (and 12 other teachers from the schools) onto the IRIS Connect system.</p>
<i>Establish a mathematics-focused Professional Learning Community (PLC)</i>	<p>To encourage and promote use of the system within their school and with the wider learning community for sharing practice, receiving and giving feedback..</p> <p>To establish sharing and/or co-mentoring between teachers - this may help to develop the sharing of mathematics subject knowledge (through a 'buddy system')</p>

Methodology & Method

The evaluation used a pragmatic methodology that encompassed a collaborative, outcome-based, mixed methods approach. This approach gathered data that was relevant to the impact of the project with a particular focus on the contact sessions and follow-up sessions. It was designed to maximise the capacity to understand both the impact of the project, and the project's affective outcomes (the thoughts and feelings of the participating teachers). Gaining an understanding from these two perspectives provides maximise scope for predicting the longer-term scalability of this pilot.

The evaluation utilised the following methods,

OUTCOME Evaluation method	Aims	Analysis
Pre-intervention baseline questionnaire (x2)	<p>To establish individual and collective needs as self-assessed by the participating teachers.</p> <p>To provide a baseline measure for the post intervention questionnaire</p>	Excel (by individual teacher, by school, by experience of teacher and collective results)
Training Diaries	<p>To create a written account of the training provided. This will allow for reflections of daily activity by both the SA teachers and the UK trainers. To record progress against the provisional key indicators, the individual areas of need</p>	Qualitative analysis: assessment of changes in behaviour, assimilation of ideas, issues that may have arisen, assess the development

	established by the trainer, and their use of the IRIS Connect platform for reflective practice and networking.	of networks between teachers (PLC).
Recorded Footage Contact week: Day 2 Day 4 or 5 Follow-up sessions: 3 submission (bi-weekly, pre-follow-up session)	To provide evidence of change from the beginning of the pilot on the provisional key indicators established by self-assessment at the baseline (i.e. using different methods for differentiation in class, applying different questioning techniques to expand pupils' explanation and understanding of maths, engaging teaching techniques and resources) or on specific needs of teachers as assessed by the UK trainers at the start of the contact sessions.	The analysis of the recordings will look for evidence of change, including in the three provisional key areas identified in the baseline - by observation, time-stamping and recording responses using the IRIS Connect evaluation tools.
Contact training Feedback form	To establish the strengths and weakness of the contact training sessions	Excel
Post-intervention questionnaire	To establish any changes in confidence from the teachers starting point to the end of the pilot.	Excel (comparison with pre-intervention results)
Output indicators	To record the number of recordings, reflections, shares (to whom and why) on IRIS Connect by the participating teachers (and potentially others))	A combination of IRIS Connect data, training diary information, follow-up phone calls (see below).

AFFECTIVE Evaluation method	Aims	Analysis
Affective evaluation: Follow-up Telephone semi-structured interview	To examine the teachers' attitudes, motivations, willingness to participate, valuing of what has been learnt and whether they have successfully assimilated any of the training into their teaching practice. Also, to explore any longer-term uses of the IRIS Connect system, and establishment of a PLC. To record number of reflections taken, shared and their outcomes	This will be analysed for key themes (attitudes, motivations, value, participation and incorporation). If possible, the telephone conversations will be recorded and transcribed and analysed for content as well as emerging themes.

Sample group

Twelve teachers, two from each of the six schools, in total were selected to participate in the pilot project. Six of the teachers were selected on the basis on being a newly qualified Teach South Africa graduates and six were more experienced mathematics teachers selected by the mathematics head of department in each school (identified using criteria developed by the project team - see appendix B). During the scoping visit teachers from, mathematics and, other departments expressed an interest in taking part in the project³. Three members of the district department were given log-in identifications. The purpose of this was that they could access the system and watch any shared reflections, post training videos and assume control over the mentoring once the pilot was concluded.

³ IRIS Connect offered these teachers a log-in identification so that they had the potential to use the system if the opportunity arose.

For the purposes of this report the teacher's names and their school names have been anonymized.

The following table presents the sample group that this report is drawn from,

Evaluation	Anticipated Sample	Received Sample
Pre-project baseline (X2)	12	12
Post-IRIS Connect training	24	21
Contact session training diary	12	12
Contact session post feedback	12	15
Recorded footage (contact session, plus 3 cycles)	48 (12 x complete cycles of four reflections)	39 (6 x complete cycles, 3 x two cycles, 3 x one cycle)
Post-Project evaluation form	12	10
Telephone interview	12	7
Head of Department Survey	6	4

Outputs

The outputs for the project were as follows,

OUTPUTS
24 teachers were provided with IRIS Connect accounts (double the original plan, due to demand from SA teachers)
21 teachers were trained on the IRIS Connect system
6 schools were provided with the IRIS Connect systems
12 teachers participated in the contact sessions
12 teachers recorded video of themselves teaching and accessed the platform
12 teachers participated in the follow up mentoring cycles*
6 teachers completed all three mentoring cycles*
3 teachers completed two mentoring cycles*
3 teachers were in their first mentoring cycles*

*The time available for the mentoring cycles online was restricted

The table below records the number of reflections sent per teacher,

School	Teacher	Number of Reflections taken in total ⁴	Number of Reflections (sent to evaluator)	Total comments by mentor	Cycles completed
School A	Teacher 1	10+	4	37	2
	Teacher 2	7-8	6	30	3
School B	Teacher 3	5-6	5	12	3
	Teacher 4	10+	10	39	3
School C	Teacher 5	7-8	6	40	3
	Teacher 6	1	0	0	0
School D	Teacher 7	4-5	2	23	2
	Teacher 8	10+	13	102	3
School E	Teacher 9	9-10	3	14	1
	Teacher 10	9-10	9	85	3
School F	Teacher 11	5-6	1	12	1
	Teacher 12	10+	3	34	2

Evaluation issues

Initially, a focus group had been planned to take place at the end of the project with the UK team and participating teachers to assess the strengths and weaknesses of the project through the teachers own voices and interactions. Due to a change to this original plan, the UK team could not return to South Africa at end of the project, so the planned formative assessment telephone interviews were moved to the end of the project to make it possible to gather more nuanced and detailed data from the teachers involved at that time. The evaluator was able to communicate with most of the teachers via a communications app commonly used in South Africa (WhatsApp). The monitoring report provides more details on the circumstances of the pilot and findings regarding practical implementation.

Several issues presented themselves with the submitted footage. A ‘best foot forward’ (Kane et al, 2005) approach was adopted for video submissions. The project team were conscious that the evaluation should not determine the outputs for the teachers and guide their submissions. Therefore, the amount of footage submitted to both the mentors and the evaluator was determined by the teachers themselves (which reflects the ethos of the IRIS Connect system and ensures security over data). This was also a strength for the teachers who, through the mentoring system, could select the footage that they felt was most relevant to developing their teaching practice. The footage sent varied from introduction lessons to revision sessions. All teachers were asked to send reflections that were not less than 20 minutes for review, however some of the teacher sent longer extracts and others shorter clips of their teaching (longer extracts were assessed for this evaluation at 20 minutes to be comparable). It is noted that the reflections sent offer a snap-shot of a small sample of individual teachers and care must be taken in making generalisations from these

⁴ The number of reflections taken was provided by each teacher at the end of the project (post-project survey)

results. An additional issue arose during the contact sessions, whereby the planned 'baseline' recordings of teachers, before any training, was not able to be undertaken however, the UK mentors were able to record their first impressions of the teaching in written form in the individual training diary for each participant.

Please note that the term 'trainer', 'trainer/mentor' and 'mentor' are used in this report interchangeably to refer to the two UK maths teaching specialists, part of the UK team, who provided both training and mentoring support to the participating teachers throughout the pilot.

Results

SECTION 1: Evaluation of the Contact-session training

The contact sessions were delivered across a three-week period with each UK trainer/mentor being allocated one school (with two teachers) per week. During each week teachers were: practically trained on the IRIS Connect system (using temporary sets that could not be left in schools); observed in the classroom to establish 'normal' practice; coached in developing new teaching pedagogy skills; helped to access resources and, where applicable, coached in developing specific mathematics skills. However, progress and time was severely limited due to administrative problems and school timetabling issues that restricted access to teachers as planned. The UK mentors worked closely with the participating teachers and the Mathematics heads of department (where timetabling allowed), so that they could embed the practice throughout the department. The UK trainers/mentors also conducted 'walk-through' observations in some of the schools to assess teaching practice school-wide. The key areas of training identified during the baseline evaluation were maintained, but additional training was tailored to suit individual teacher's needs (see case studies: section 3). A three-stage evaluation was undertaken for this stage of the project. These included, an evaluation form to assess the impact of the remote IRIS Connect training (delivered by the IRIS Connect team) and a post-contact session evaluation form for the South African teachers to assess the impact of the contact sessions and training at this stage. In addition, a qualitative training diary was kept by each trainer/mentor and teacher to record their progress in their own words.

IRIS Connect Induction

Induction to the Iris Connect system is designed to give an overview of the platform together with the principle uses of the system. It also presents some examples of practice by other teachers as a reflection training exercise. In addition, it provides a general outline of the technical interface using video conferencing and screen-share technology. The training of 21 South African teachers took place at the Ekurhuleni South District offices on the 3rd, 4th and 5th of May (with a repeat session on the 19th May). The training was administered remotely from the IRIS Connect head office in the UK. The Monitoring Report provides more details.

A feedback form, based on the IRIS Connect online feedback form, was devised to capture initial thoughts and reflections on the training. The form consisted of three scaled-questions, two closed questions and two open questions. The feedback sheet was administered by staff at the district office directly after the training session. Results were scanned and emailed to the UK evaluator for processing. (For full details of the evaluation see appendix C).

The IRIS Connect induction provided the South African teachers with an overview of the system, its functions and uses (81% rated the training 'good' or 'excellent'). By using a demonstration recording it showed the teachers the system in use as well as approaches for reflecting in a positive manner on footage. The training encouraged the teachers to start the

process of reflecting and commenting appropriately on practice. However, the respondents did not feel totally confident about their ability to be able to use IRIS Connect system because of technical limitations of time and absence of the IRIS Connect kit. Although the respondents could see the value in IRIS Connect as a reflective tool to enhance their own practice, they were less confident about their own motivation to network and share footage with other teachers at this stage.

As a result of this evaluation it was felt that some of the teachers would need additional support in using the technology during the contact sessions as well as supportive encouragement to share footage with other teachers from their own school and other schools.

The participating teachers' confidence in using the IRIS Connect system, uploading footage and reflecting on practice grew during the contact sessions (see below).

Contact sessions

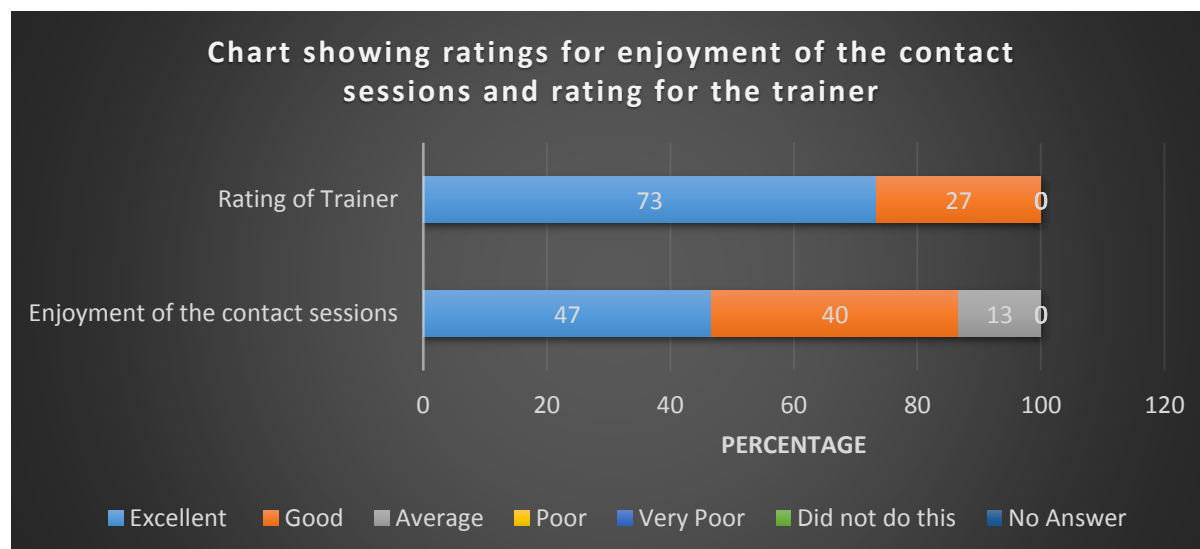
The following section gives the initial feedback of the South African teachers of the contact sessions that took place from 16th May-6th June 2016. The aim of the feedback form was to gather immediate feedback from the participating teachers and to collect initial thoughts on the delivery of the sessions, the usefulness of the IRIS Connect system and whether the contact sessions meet the key aims of developing maths pedagogy and knowledge based skills in mathematics.

Although the delivery of the planned programme was restricted, the South African teachers were positive about the contact sessions overall and could see the potential for the IRIS Connect system to develop their maths pedagogy, knowledge base and networking capabilities. The ability for the system to be used for teacher self-reflection and subsequent development was viewed as most useful by the majority of the South African teachers (at this stage of the project).

Fifteen teachers completed the feedback forms at the culmination of the contact sessions (this included, in some instances, the heads of department from each school). The forms were administered by the District Office, placed in a sealed envelope and returned with the UK teachers to the team evaluator. The form consisted of 16 Likert-scaled questions and three open-ended questions.

Results of post-contact session evaluation

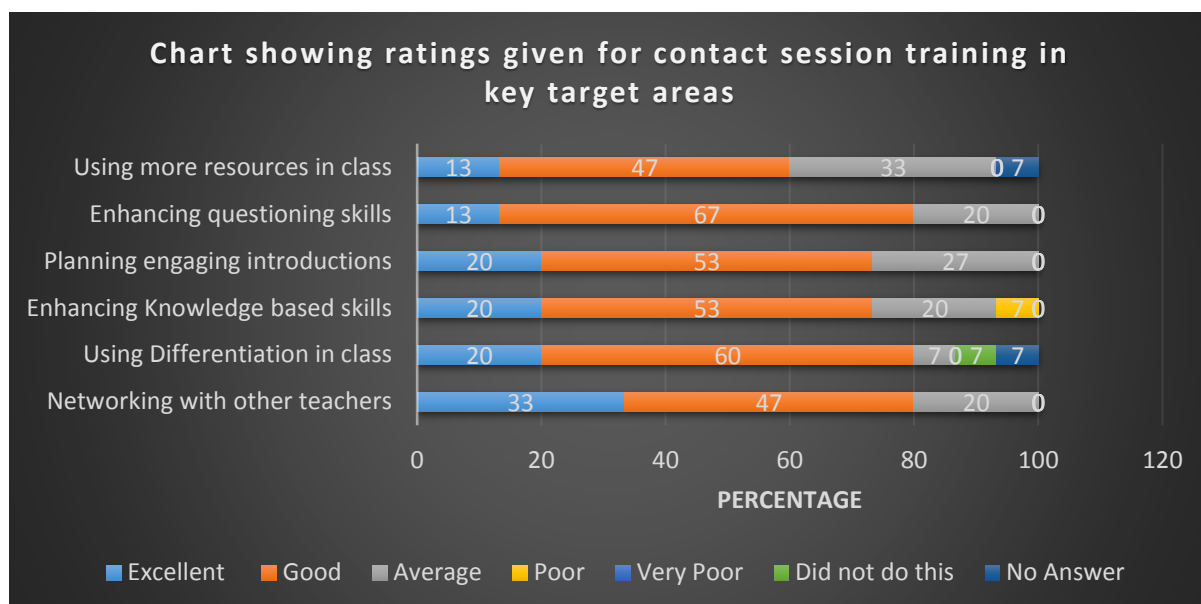
Enjoyment and trainer ratings



All of the teachers rated the trainers as either 'excellent' or 'good'. 87% of the teachers rated the enjoyment of the training session week as 'excellent' or 'good'. Two of the teachers rated their enjoyment as 'average'. This may have been connected to the administrative problems that resulted in reduced time spent on task for these teachers.

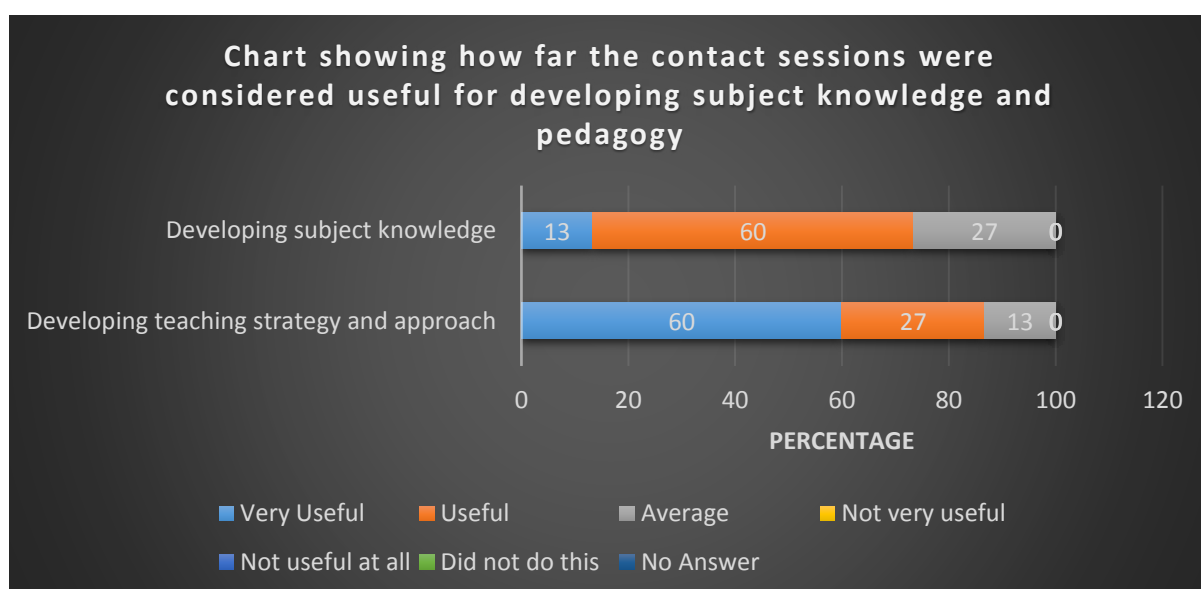
Rating of training in key areas

The planned training strategy covered several key areas including introducing more resources in class (that move away from the text book), enhancing the teachers questioning skills for assessment of learners' understanding of the mathematics concepts, engaging learners with active learning techniques (such as involving learners at the board) and differentiation in class (that allow for learners to pace their learning and teacher to assess learner levels) and enhancing knowledge based skills in mathematics.



The results show that the training in networking (using IRIS Connect) and training in differentiation were the most highly rated of the key areas covered during the contact sessions. The UK trainers/mentors were restricted in their delivery of the training due to administrative issues and the lack of basic resources within the school, such as photocopiers and means of showing pre-planned teaching and learning websites. The UK trainers/mentors were unable to identify clear gaps in teacher's individual mathematics knowledge during the short time of exposure and in general the twelve teachers' knowledge of mathematics (during observation) was felt to be sound. However, the trainers/mentors were able to establish that the style and mode of delivery across the twelve teachers did not allow for mathematics concept development and deeper understanding across the learners. Therefore, focus was placed on teaching pedagogy.

Ratings for Key Aims



The participating teachers felt that the contact sessions were more useful in developing teaching strategy and approach than they were developing subject knowledge (although 73% of teacher's felt that the training was very useful or useful in developing subject knowledge).

New Strategies or Ideas gained

Eight of the teachers said that they had gained 'a lot' of new ideas from the contact sessions and seven suggested that they had gained 'some' new ideas from the contact sessions. The teach SA ambassadors were most likely to state that they gained lots of new ideas whereas the heads of department and experienced teachers were most likely to comment that they gained some new ideas from the contact sessions.

The teachers were asked to list some of the most useful strategies gained. The diagram below illustrates the responses to this (only one of the teachers left this section blank),

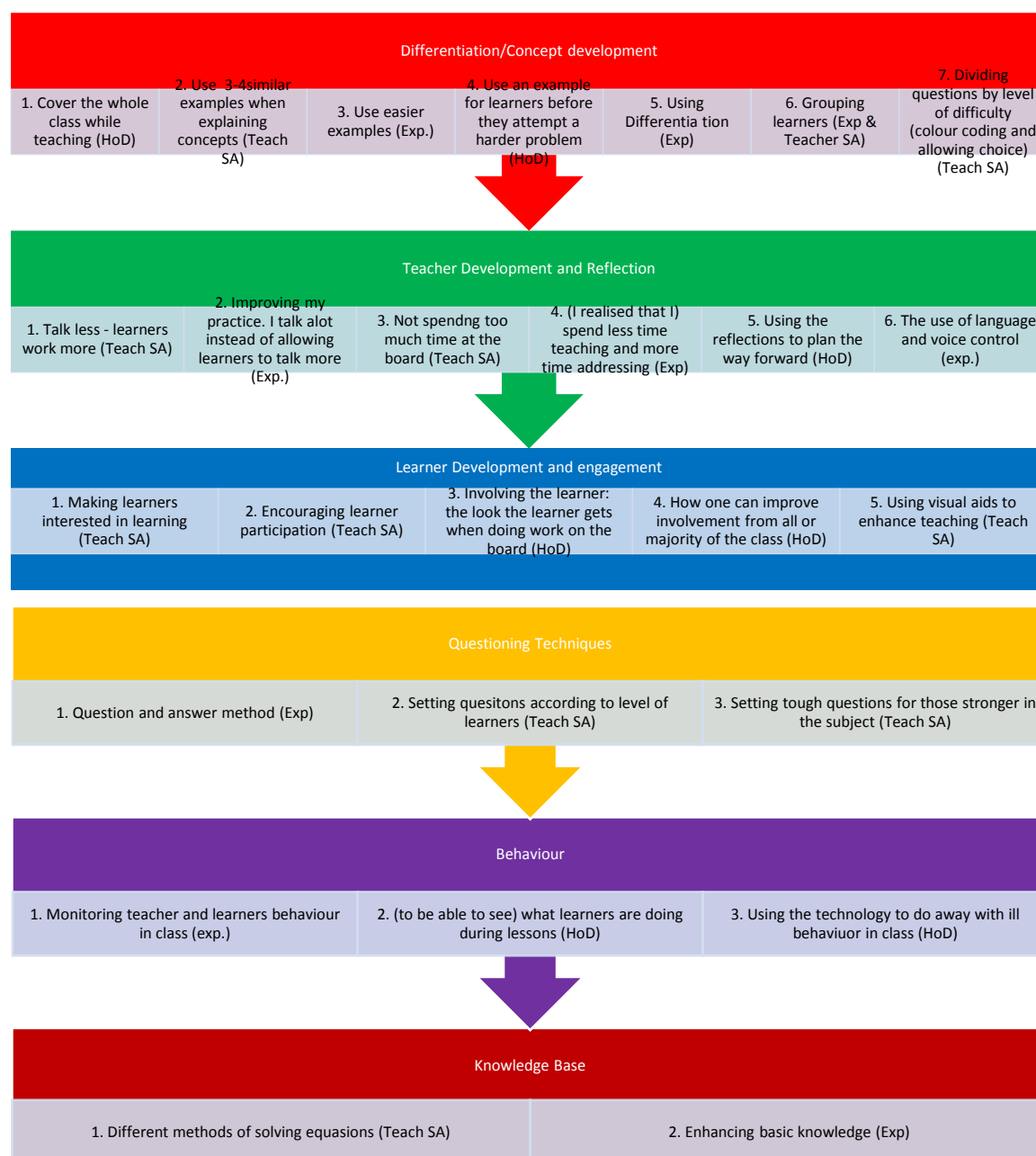
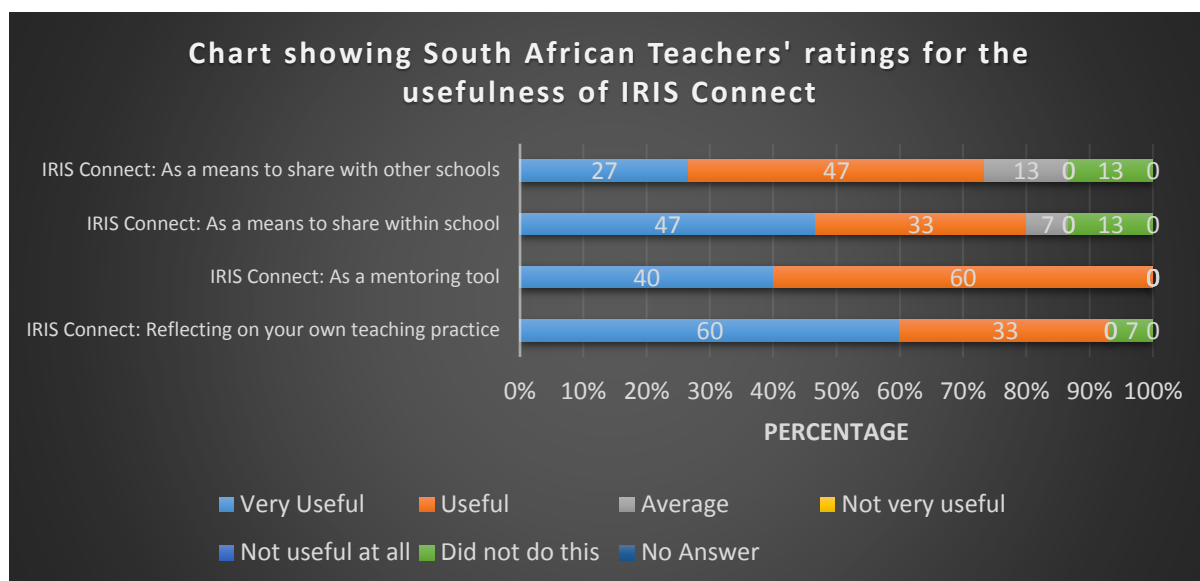


Figure 1: New strategies that were gained from contact session.

The above figure shows that the contact session was successful in allowing the teacher to begin to reflect on their own performance in the classroom and understand how changing the way that they might approach the classroom could impact on learner development and deepen understanding. The system's potential value extended beyond the intended mentoring and self-reflection tool.



At this stage in the project, the South African teachers rated the use of IRIS Connect as a reflective tool as its most useful aspect (93% rated this very useful or useful). 100% of the respondents felt that it was very useful or useful as a mentoring tool. Some of the teachers were less sure about its usefulness in sharing recorded sessions with their own school or others (note: the administrative issues faced during the contact sessions meant that teachers were unable to use the internet to access the IRIS Connect platform most of the time). Some of the teachers shared their reflections with teachers in their own schools. None of the teachers, at this time, shared their reflections with teachers from other schools, but two teachers shared with the district department).

Useful aspects of the contact session

The teachers were asked to list the most useful part of the contact week's training (only one teacher did not respond to this question).

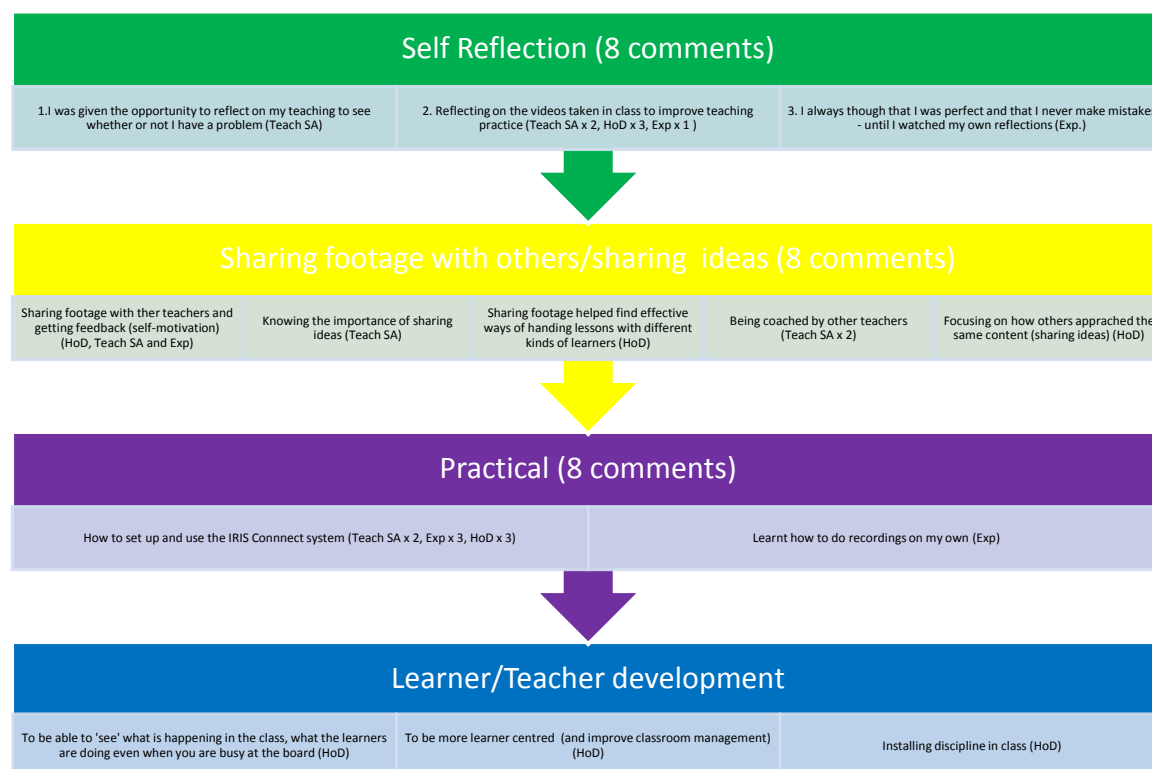


Figure 2: Teacher's impressions of the most useful part of the training

The majority of the respondents made comments that were connected to the IRIS Connect system. Comments referred to the set-up of the system along with the self-reflection and sharing capabilities that could aid their continuing professional development. This demonstrates that the teachers understood, and found useful, the two key aspects of self-reflection and sharing that the system offers.

When asked about the least useful part of the contact sessions only one teacher offered a comment that the contact week did not, 'teach him how to teach' (Teach SA). Two teachers made comments about the situation during the contact week. One commented that, 'the cameras were only for one class; it was not covering the whole school' and that, 'other educators didn't get a chance to learn the functionalities of the gadgets' (HoD) and the other commented that the timing of the contact sessions, pre-exams, meant that most of the lessons were revision sessions and not 'normal' classes.

Recommend to others

Fourteen of the teachers said that they would recommend this training to others (one teacher gave no answer). One teacher commented,

“Yes, I would, because from the training one gets to improve by being critiqued by other colleagues. Reflecting on one’s behavior in class is empowering”
(Teach SA)

Another experienced math’s teacher commented,

“Yes, because the trainer managed to give us an effective training on the benefits involved in this technology around this equipment. How to use the equipment and the networking”
(Exp. Teacher)

Another teacher commented,

“Our contact session was really good from the beginning until the end of training. Our facilitators were motivating/instructing us in a good way and fully open to us with all aspects. We received instruction to how we open the cameras and also their usage, recording, saving and sharing. Presently, we are fully covered about the equipment. We are learning some important information like discipline and active participation from our learners in class when using the cameras. Learners enjoy the way we instruct them to every activity in our classes and hence build self-confidence and discipline amongst themselves”
(Experienced Teacher)

Training Diaries

The twelve selected teachers and their mentors were asked to keep a daily reflective training diary to record their thoughts, suggestions and progress throughout each week’s contact session. These also acted as a record of other practical and administrative issues that arose throughout the contact sessions. All twelve teachers and their UK mentors maintained a daily diary these provided rich qualitative data that could not be captured by the post-contact session feedback evaluation (see above). The diaries have been used to form the case studies (see below section 3) and are discussed in the overall results of the project (below).

Conclusion to contact sessions

During the contact sessions, the UK trainers/mentors were able to establish strong relationships with each of the teachers and also train them in the setting up and using the IRIS Connect equipment as a self-reflection, mentoring and networking tool. All twelve teachers grew in confidence in using the system throughout the week.

Despite the administrative issues limiting access to the internet and equipment throughout the week the trainers/mentors were able to cover some of the key areas of focus for the project (differentiation, engaging learners, developing questioning techniques and

encourage concept development). Establishing gaps in knowledge in the teachers was harder to establish within the time-scale and exposure that each trainer had with the teachers. However, it was felt that the follow-up reflections may capture any major issues that arose with content knowledge. The mentors felt that the difficult circumstances of the contact sessions hampered the subsequent direction of some of the training and interfered with the flow of the project and the perceived level of ease for the teachers. Many of the teachers also felt frustrated by the administrative restrictions and particularly the limited ability to view and reflect on footage. However, in general the teachers were positive about the training offered and the potential of the system, feeling confident to continue using the equipment and to take forward some of the training in the follow-up sessions (see below).

SECTION 2: Evaluation of the Follow-up sessions - Mentoring

Introduction - follow-up sessions

The follow-up sessions provided opportunities for the twelve teachers to record partial or full grade 10 mathematics lessons, upload onto the IRIS Connect platform and send to their UK mentor for review and reflection. The system could also be used for self-reflection and comment. Additionally, the system allows the teachers to share reflections with each other for advice or share knowledge. The evaluation of this part of the project encompassed four areas:

- 1) Recorded footage: the teachers were asked to submit their reflections for independent assessment of the progress made with the key indicators.
- 2) Post-project evaluation form: the teachers were all sent an electronic survey to complete
- 3) Telephone Interviews: to assess the impact on the teachers from their own perspective⁵.
- 4) Feedback survey from the Heads of Department from each school

In addition, in-depth interviews with the two mentors (lasting one hour each), and telephone interviews with the District lead in Mathematics in South Africa were also conducted

Ten out of the twelve teachers completed the final evaluation stage the results are presented below (see page 10-11 for sample groups).

Results - follow-up sessions

The results are presented below against each of the objectives specified for the project (see page 8-9). They present results from the post-project questionnaire, telephone interviews and analysis of the recorded footage, as well as feedback from the heads of department survey and interviews with the District lead in Mathematics and the two mentors.

⁵ Due to high data costs, potential call charges and availability of teachers - only six teachers were contacted for feedback. The structured phone interviews lasted 20 minutes.

Objective One: Improve teacher content knowledge in mathematics (help address specific knowledge gaps).

The aim was to improve one aspect of teacher knowledge during the training/mentoring, this was to be identified during the contact sessions. The UK trainers/mentors were unable to identify specific knowledge gaps during the contact sessions (as discussed above), but were able to direct the teachers to online resources that might aid them in any area that they were weak. The UK trainers/mentors suggested that the classroom observations revealed that mathematics knowledge was often sound, but the ability of the teacher to move away from the textbook explanations and explain concepts in a new/different or sequential way was often lacking. The trainers/mentors felt that improving teaching pedagogy could have a greater impact on the learners than assessing and working on individual teacher's knowledge gaps, although these could be addressed, where needed, through the IRIS Connect system (mentor 1, telephone interview)⁶. The trainers/mentors did not observe any major issues with any of the selected teacher's mathematics knowledge.

The UK mentors were able to provide specific mathematics advice to four of the teachers where they felt that further explanations were needed, and provided web-links to subject specific websites via the IRIS Connect platform to four of the teachers. Teacher 2 commented about the website links,

"...it gives you alternatives that you could do, if you can't do it like this, perhaps there is another way that you could do it. If you are finding a problem dealing with functions for instance, here is a way that you could deal with functions easier, because we know that if you can't explain it any better it means that you don't understand it yourself, so, IRIS Connect gives you that platform to understand it yourself before you take it to class. For instance, I was (unclear) with the functions that I was given, so you say, "ok, it comes in the order that it was given - we go like that, we go like that, and I understand what I am going to deliver. So, it is very useful for other educators to say that if you have got old ways of using it, don't stay with conventional ways of doing it, there are other ways of doing it. And then if you try them, it should work for you..."

(Teacher 2, Telephone interview)

Teacher 5 also found the shared websites useful in helping her to understand how to introduce topics to her classes,

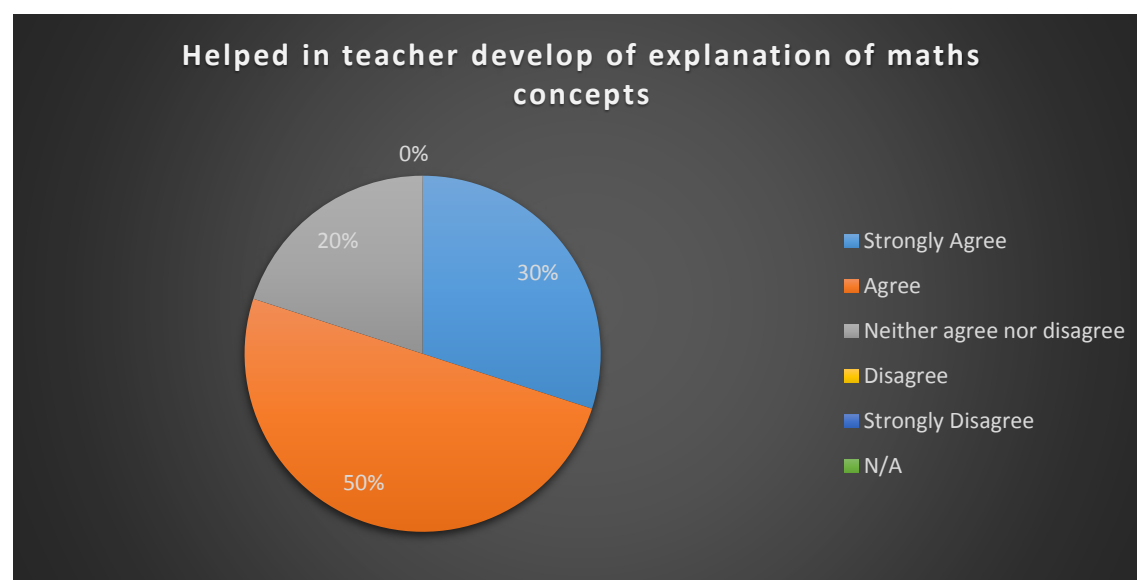
"They taught me a few introductions to topics. I found that they helped me a lot, watching how they do it and watching how they introduce different topics. That definitely did help".

(Teacher 5, Telephone interview)

⁶ It is noted that the IRIS Connect system was designed as a video-mentoring and self-reflection tool rather than a subject-specific training tool, however, the system allows for links to be embedded in comments that direct to more subject specific websites.

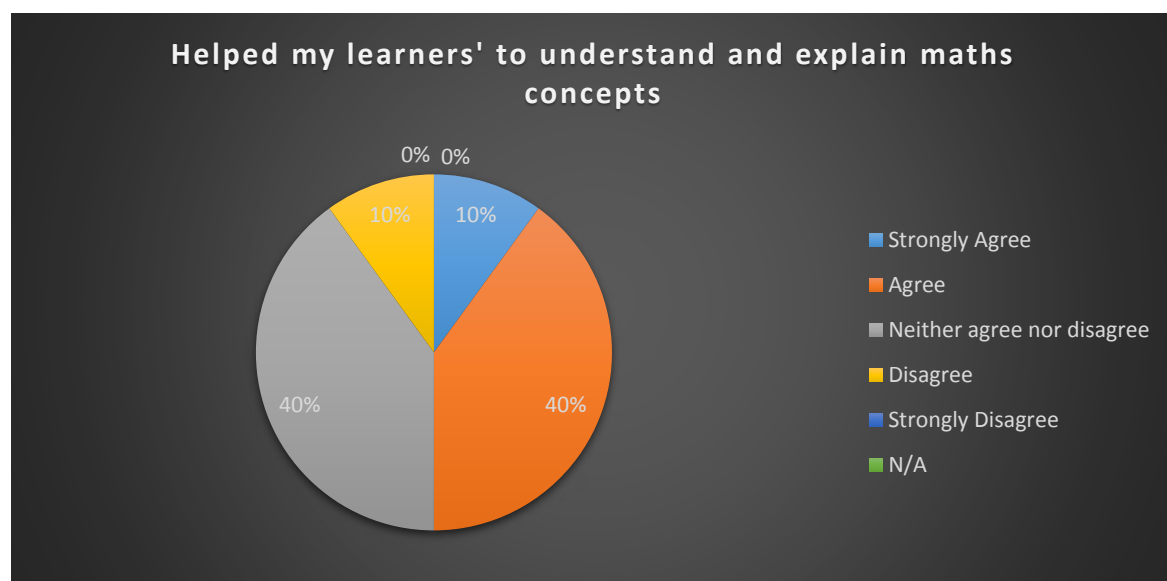
The Teach SA ambassadors had access to laptops and data (intermittently), that resulted in them being able to access shared websites and their reflections at home. The more experienced teachers involved in the project were not issued with this equipment and were largely unable access data, a laptop or a computer at home, and this restricted their use of both the IRIS Connect system and the shared websites (except during school hours and by arrangement with the ambassador. Mentor 1 restricted his sending of web-resources to some teachers avoid frustration developing (Mentor 1 interview). Mentor 1 felt that the written comments on the IRIS Connect system are not necessarily the best way to impart mathematics knowledge to a second party, although he was able to set out process and concept development of key concepts via the comments for some of the teachers, this would help them to sequence and level their explanations to the learners. The focus was placed on developing the teacher's mathematics concepts and how they impart knowledge to the learners (see below).

Maths concepts/explanations (teacher)



The majority of the teachers 'agreed' or 'strongly agreed' that the project had helped develop their explanation of math's concepts in class (80%). A breakdown of these results demonstrates no obvious pattern to these results. Two of the teachers who completed 3+ cycles and one who completed 2 cycles were most in agreement that the project helped them develop their explanation of maths concepts. The teachers who 'neither agreed nor disagreed' with this statement were drawn from both those that had completed 3+ cycles and those that had completed one cycle.

Maths Concepts (Learners)



The teachers were less confident that the project had aided their learners in understanding and explaining mathematics concepts (50% strongly agree/agree). There was no obvious pattern for the distribution of results. The teacher who disagreed with this statement had completed three cycles of training. The teachers who 'neither agreed nor disagreed' with this statement were drawn from both those that had completed 3+ cycles and those that had completed one cycle.

Some of the issues that were raised could account for the results. For one of the teachers, the amount of mentoring contact time that was presented was not sufficient, one commented that the project could benefit from more time from mentors to watch and comment on their submissions. For another, the data issues and restricted access resulted in unduly long breaks between the comments being given and the reading of the comments and action taken.

Analysis of the submitted footage shows evidence of more learner participation in class than evidenced during the contact sessions (assessed by the mentors during classroom observation). In some cases, learners were recorded giving long and detailed explanations at the board (Teacher 1, Teacher 3, Teacher 5, Teacher 10). These recordings show individual learner understanding and show the positive reactions given by the other learners (clapping, cheering and encouragement), which encourage further participation and demonstrate peer to peer support. Other teachers were evidenced bringing learners to the board to write down their answers, but not asking them to explain their understanding out loud to the class (Teacher 2, Teacher 4, Teacher 7, Teacher 8, Teacher 12). This indicates that further support may be needed to encourage teachers to develop learner participation further to incorporate explanation and concept development at the chalk board. This would also act as a diagnostic assessment tool for the teachers to assess individual and class progress.

In summary, the project team had to adapt this aim in response to additional pedagogical needs that were established during the scoping visit and the contact sessions. The selected teachers displayed sound knowledge of mathematics (as far as was evidenced during the contact time and submitted footage), therefore focus was directed towards the *way* that the teachers presented concepts to the class and in developing a more learner-centred approach. However, the mentors were able to present trusted web resources and links to the teachers where necessary, and these were used and ideas from these were integrated by some of the teachers (teacher 2, teacher 4 and teacher 5). Although the IRIS Connect tool is primarily a mentoring and self-reflection tool the project has shown, in a restricted way, the potential for it to be used in identifying gaps in knowledge and in forming structured approaches to tackle these (which may be through IRIS Connect or in combination with other external training if needed). The potential for the IRIS Connect in mentoring and sharing of knowledge to improve teaching pedagogy is much clearer, as mentor 1 comments,

“If they don’t have that opportunity to see other practice they
will become replicas of what they have experienced before - good,
bad or indifferent” (mentor 1 telephone interview)

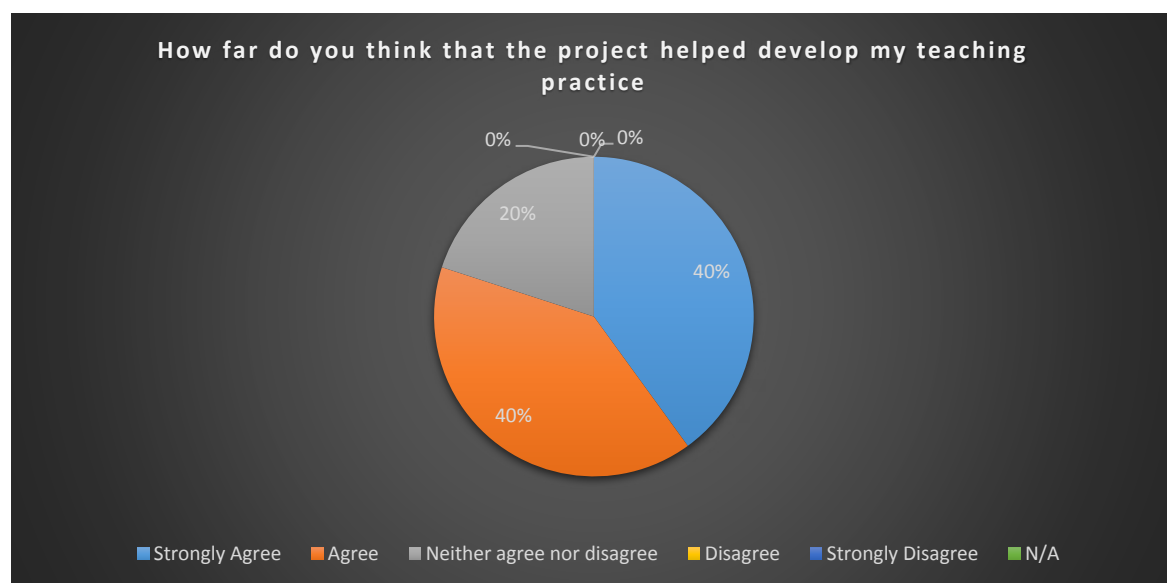
The following section explore this in further detail.

Objective Two: Improve teacher awareness of how learners learn mathematics

The aim was to introduce and/or improve the ways that teachers use differentiation in large mixed-ability classes. To introduce new ideas (in varying their teaching strategies), introduce new mathematics resources and active learning that can engage learners from the beginning of the class (learner-focused).

The project team also identified areas of lesson planning, classroom organization and learner behavior that were also approached (with the Teach SA teachers more so than the experienced teachers), these are discussed at the end of this section. Although the initial project was focused on grade 10 learners, not all the teachers selected for the pilot were teaching Grade 10 mathematics throughout (30% - due to unanticipated staff reshuffles). Nevertheless, the teaching strategies and mentoring given by the UK mentors was cross-applicable to all grades and therefore there was a continuation of support given to those teachers who were teaching other grades. 70% of the teachers that did teach grade 10 felt that they were able to incorporate some of the advice given into their grade ten lessons.

Teaching Practice

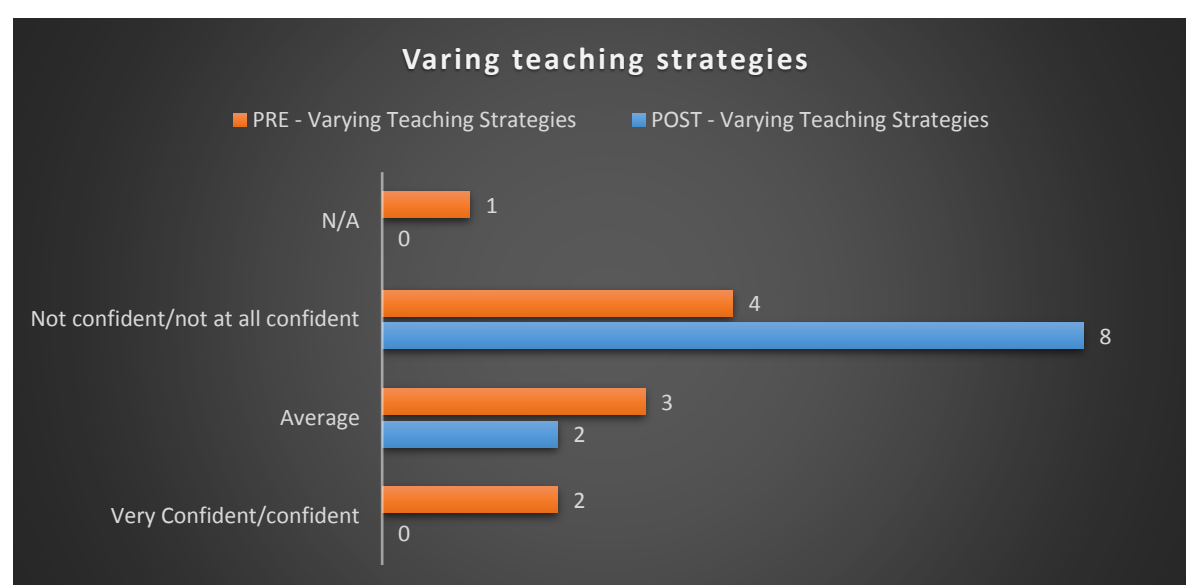


The majority of teachers involved in the project 'agreed' or 'strongly agreed' that the training had helped to develop their teaching practice (80%). There was evidence from the analysed submissions of changes in practice including: developing a more learner-centred approach; planning for differentiation and levelling in class; introducing lessons in a more learner-centred way; planning for activities to engage the learners; concept development; classroom management and behavior, and using questions to engage and assess the learners.

A breakdown of the data demonstrates that the teachers that participated more fully in the project were those that strongly agreed with this statement, however, those that 'neither

agreed or disagreed’ were also drawn from the pool that had completed 3 cycles. One of these teachers had limited access to data and a laptop and the other felt that her workload was too heavy to fully commit to the project. This emphasizes that cooperation and commitment was needed between mentor and teacher to fully embrace the journey and to develop and progress together, as well as the need to have internet access. Teacher 8 demonstrated a model approach to the project by sending reflections regularly and reading and adapting his practice according to his mentor’s advice and direction (see case study 1). Teachers 8 and 7 also continued their mentoring relationship via IRIS Connect despite their equipment being stolen (by borrowing the IRIS Connect kit from nearby school B).

Varying teaching strategy



The pre- and post-data demonstrates that by the end of the project twice as many teachers ‘agreed’ or ‘strongly agreed’ that they vary their teaching strategies than at the start. Five of the teachers stated at the end that they are, ‘very confident in varying their teaching strategies’. The mean change from pre- to post-project was an improvement from ‘average’ to ‘confident’. Two of the Teach SA teachers did not evidence a change from ‘average’ from their pre- and post- scores; these teachers had completed 2 and 3 recordings respectively. Teacher 5 felt that some of the suggestions made by her mentor had to be contextualized, she commented,

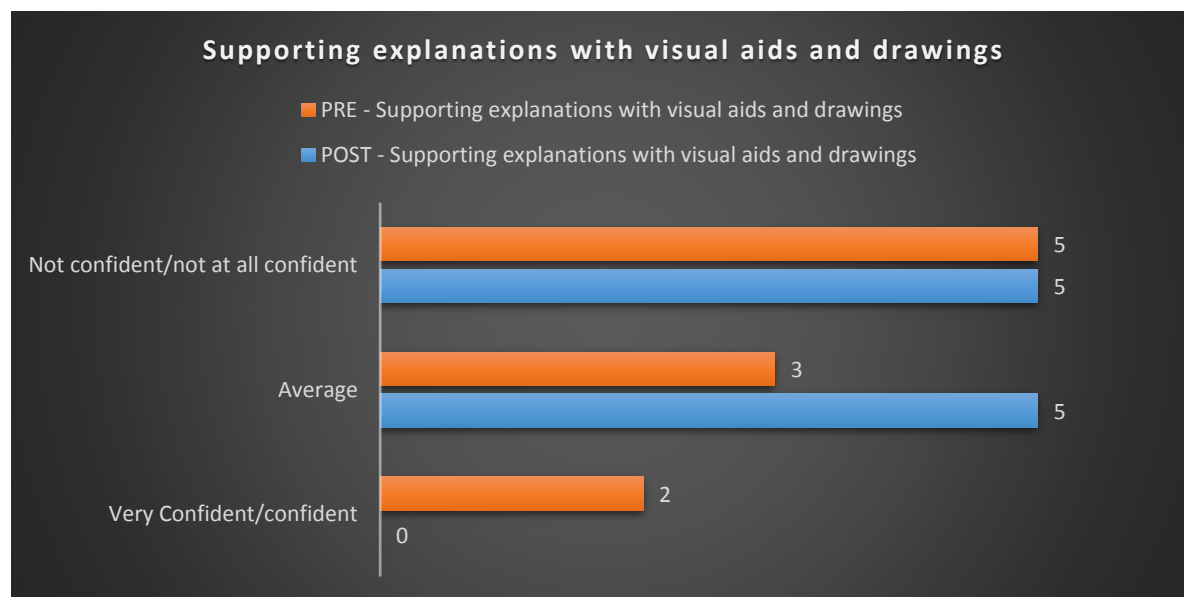
“The different teaching strategies suggested by my mentor had to be adjusted to my pupils’ lessons as there's different dynamics - such as understanding of previous grades work, or lack thereof, and time constraints” (Teacher 5, comment from post-project survey)

It is unclear whether the pre- and post-changes are due solely to the project and new teachers could learn new strategies from other sources or from colleagues. However, two of the teachers specified that the project had a direct impact on this and further comments

given by some of the teachers show that the project had some impact on their teaching strategies,

“I never thought I could admit to my own mistakes, hence watching myself has made me see my imperfections. I am now using more questions and require more learner participation. The mentor’s advice was very useful”
(Teacher 9, comment from post-project survey)

Visual aids and Drawings



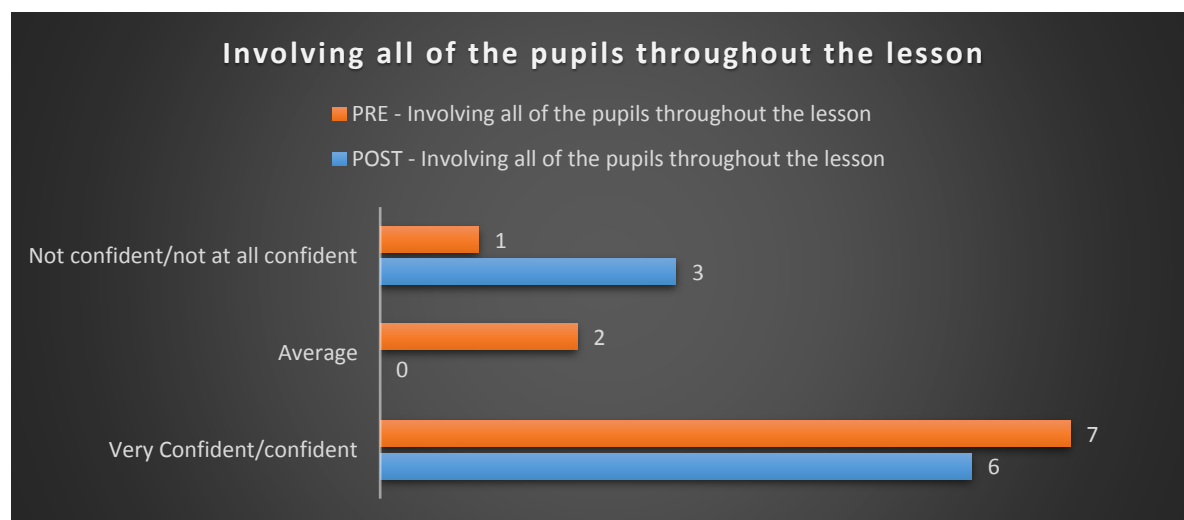
Classroom observation by the mentors during the contact sessions demonstrated a dominance of text-book driven, chalk-and-talk, teacher-led teaching. The scoping visit had identified scant use of whiteboards for presentation.

The pre- and post- data comparison shows little change in the teachers’ confidence to support explanations with visual aids and drawings. However, the mean difference from pre- to post-project increased from ‘average’ to ‘confident’.

The reasons for this remain similar to those identified during the start of the project (see monitoring report); a lack of resources and materials in the schools combined with lack of space and overcrowding in the classrooms. Although whiteboards are available in all schools (but not all classrooms), and use of these was evidenced in two submitted recordings (teacher 3 and teacher 5), teachers are limited to using them as ‘chalkboards’ due to lack of internet/data at the schools (to link them to the internet), and lack of training for some teachers.

The visual presentation of information on the chalk board was commented on by the UK mentors and suggestions for improvements made during some of the teacher’s submissions (teacher 8, teacher 2, teacher 4). Teacher 8 demonstrated considerable improvement in his chalk board presentation aided by uploaded training videos by his tutor (see case study 1).

Including learners throughout the lesson



The classroom observation undertaken by the mentors demonstrated that in many of the lessons the learners were passive in the class and that choral response to questions using a 'yes/no' response was the norm (mentor 1 and 2 telephone interviews and training diaries). The mentors wanted to encourage the teacher to use strategies that include more of the class in active learning (using questioning, engaging introductions, activities and involving learners in explanation at the chalk board). The pre- and post-data shows that the teachers were able to see a difference in the involvement of pupils throughout their lessons with the mean score changing from 'confident' to 'very confident'. The number of teachers who were now very confident about this rose from 0 to 6.

The data from the recorded footage (of those that submitted 3+ recordings) shows that all teachers were able to improve the involvement of learners over time, this was achieved by including learners up at the board, increasing questioning and involvement of learners throughout the lesson, incorporating activities at the beginning of lessons and/or giving the learners more time to work and supporting them as they did so. Teacher 8 comments,

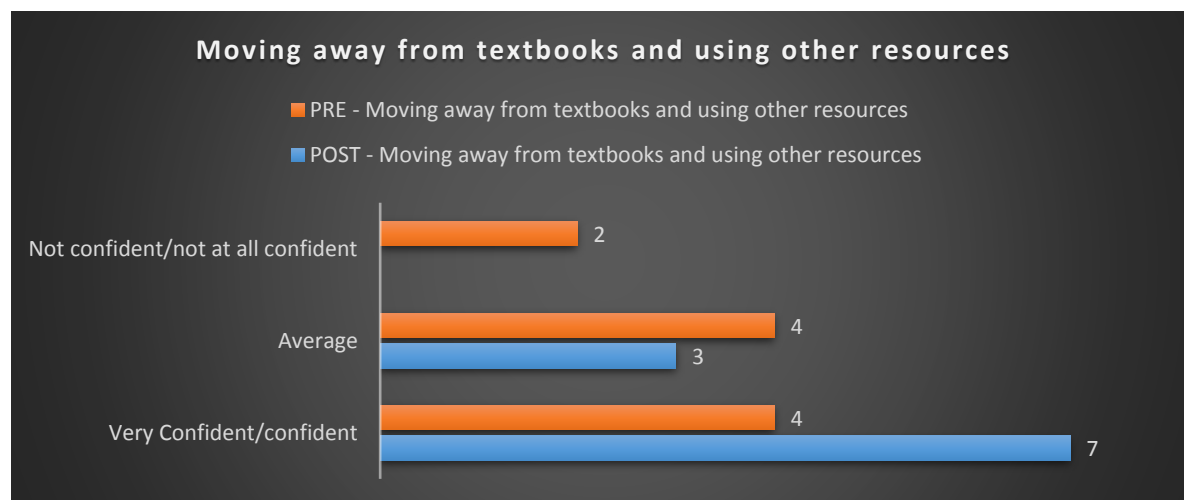
"I have always known and felt that learners needed to work more than listening, but I didn't know how I can implement that in my class, or if it can be possible given the amount of time given. But since Iris came in the picture, I got courage and advice which lead me to great lessons"

(Teacher 8, comment from post-project survey)

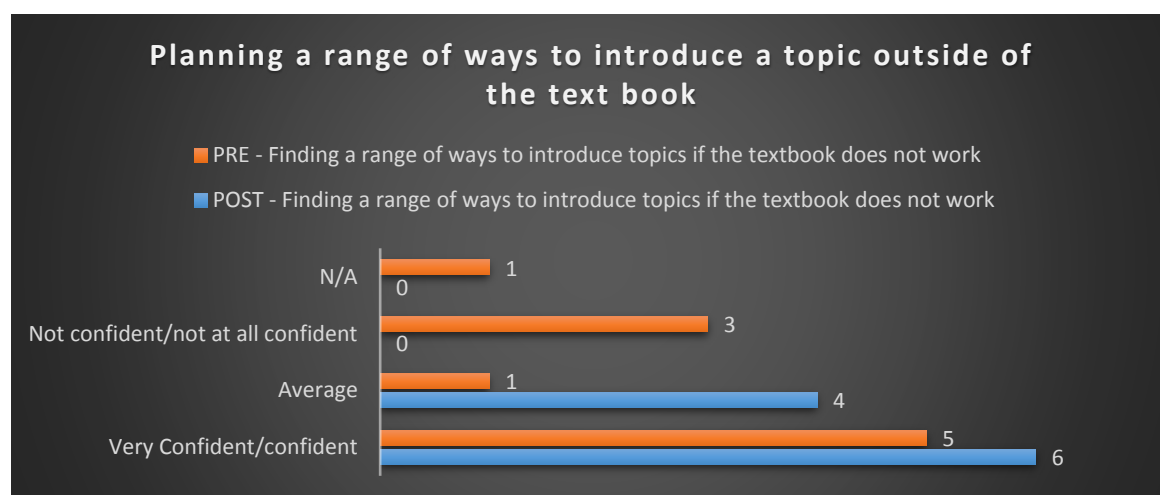
Using a range of resources

Addressing the lack of resources in the schools was beyond the scope of the project. Teaching resources were scarce in all six schools that were involved in the project, and this extended to basic resources such as paper, photocopying and in some schools, basic mathematics equipment (school B). Teacher 10 commented that when she started work, she was given a text book, and that was her only resource (Teacher 10 telephone interview).

The more experienced teachers involved in the project were more skillful in moving away from the textbook, however were sometimes limited in time to use these by the structured scheme of work. The mentors were keen to motivate the Teach SA Ambassadors to move away from textbook explanations.



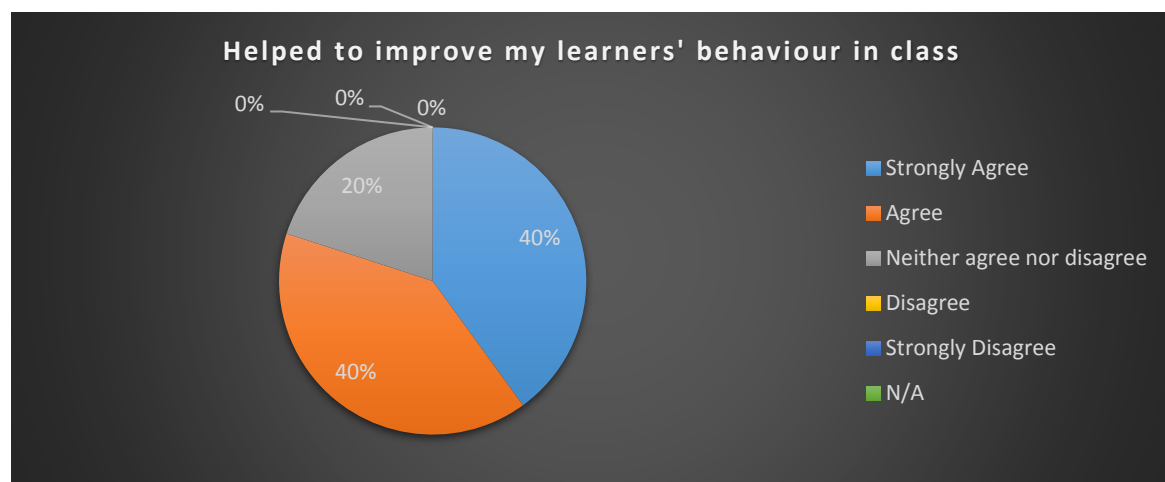
The pre- and post-comparison data demonstrates that the teachers felt that their confidence in moving away from the textbook and using other resources had grown. The mean went from 'average' (pre) to 'confident' (post) project. Two of the ambassadors felt that the online resources shared by her mentor had a large impact on moving away from textbook definitions and encouraged the use of other explanations found online (Teacher 2 and teacher 5 telephone interview).



The teachers also felt that their confidence had increased in planning a range of ways to introduce a topic outside of the textbook. The submitted footage is not clear in demonstrating this, however, some of the teach SA teachers are shown moving away from the textbook and drawing on pre-planned examples (teacher 8, teacher 5, teacher 2 and teacher 10).

Learner behavior

Learner behavior in class was identified as a major issue for many of the teachers. Although initially the teachers felt that the presence of the cameras in class could aid in controlling behavior in class, evidence from the UK and Europe shows that the impact of the cameras fades in time (IRIS Connect research). The mentors wanted to encourage teaching strategies with a learner-centred approach to engage more learners and in turn manage behavior in class.



The majority of the teachers 'agreed' or 'strongly agreed' that the project had helped improve their learners behaviour in class (80%). Some of the teachers felt that the presence of the IRIS Connect equipment itself had a positive effect on the learners, and this had not altered over the course of the project. Teacher 1 commented,

"In terms of interaction with my kids, I can say that it had a positive impact on how I approach the kids, because they are always respectful in class when they see that equipment - even when they are around you can't hear any noise - so you can go around the class and see what they are doing"

(Teacher 1, telephone interview)

Another teacher felt that the equipment promoted better participation rates in class,

"the IRIS Connect particularly the machine and the instrument that we are using ... they love it so much. If the cameras come out, and they go out on their break, they say, 'our class has got cameras!'. So, it is a good thing ... and participation ... I have seen a change in participation"

(Teacher 2, telephone interview)

For teacher 8, his relationship with the learners was developed with help and advice from his tutor, and this he saw as directly relating to better behaviour in class,

“he has helped me realise that maths is not all about writing and just looking over homework ... that they also have to enjoy. So, I can say that my mentor has helped me a lot (...). So, I feel that they are starting to like me now, and they are not doing that because of the camera they are doing it because they want to”.

(Teacher 8, telephone interview)

Teacher 11 (who is also a head of department), did not fully participate in sending reflections to the UK, did however make good use of the equipment for training and mentoring new teachers (and self-reflection), she commented,

“Yes, I’ve used mine - especially with our new teachers - who were struggling with discipline so basically I took my old recordings and used them. It showed how when you first get into a class you establish your rules for the first two or three weeks so that they get use to them, so it has been useful for that - when the new teachers come in - in terms of knowing how to discipline the learners”

(teacher 11, telephone interview)

The submitted footage that utilizes dual camera function gives opportunity to view the learners’ reactions. During self-reflection teacher 5 noticed two disengaged boys and commented to her mentor, ‘the two boys at the front look so uninterested how can I engage them?’ - the mentor was able to reassure her that tone and humour is accessible and that some boys are, or pretend to be, difficult to reach, but he also suggested looking at the structure of the lesson in terms of balancing teacher-talk and learner-work (taken from teacher 5’s submitted footage). Other examples, show the mentors being able to advise the teachers directly on how to deal with behavior in class, or supporting decisions that were made by the teacher. For example, on teacher 8’s early submissions his mentor commented,

“One of the best ways of keeping control of noisy classes is to keep them busy and we can do that in lots of ways: questions that are at their difficulty level asking them to explain/involving them personally. Seating arrangement (you decide where certain learners sit) and moving amongst them, challenging them individually (using their name if you know it) not letting the noise grow to begin with-if you don't want the noise, stop it straight away. It is also something that your learners will come to expect from you. Once they know you won't put up with it, they will do it less. It starts with the beginning of your lesson-things like insisting that they get their books out straight away-even before you start talking to them. Set the high expectations”

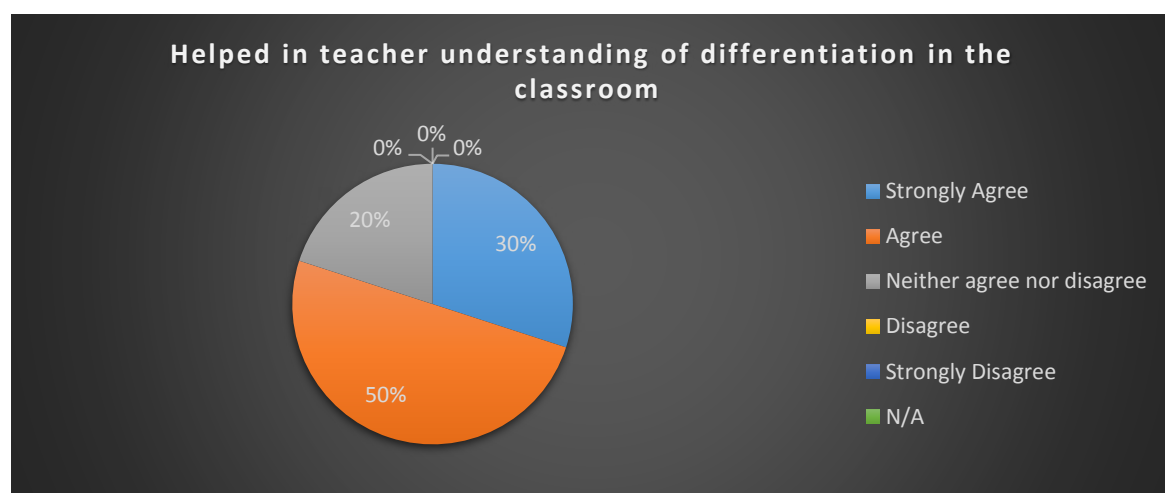
(Comment from mentor, submission cycle 1).

In summary, the project directly helped improve classroom behavior for eight out of the ten participating teachers. This was achieved both by the presence of

the camera (for some) and by the changing to a more learner-centred approach (for others).

Understanding of differentiation in the classroom

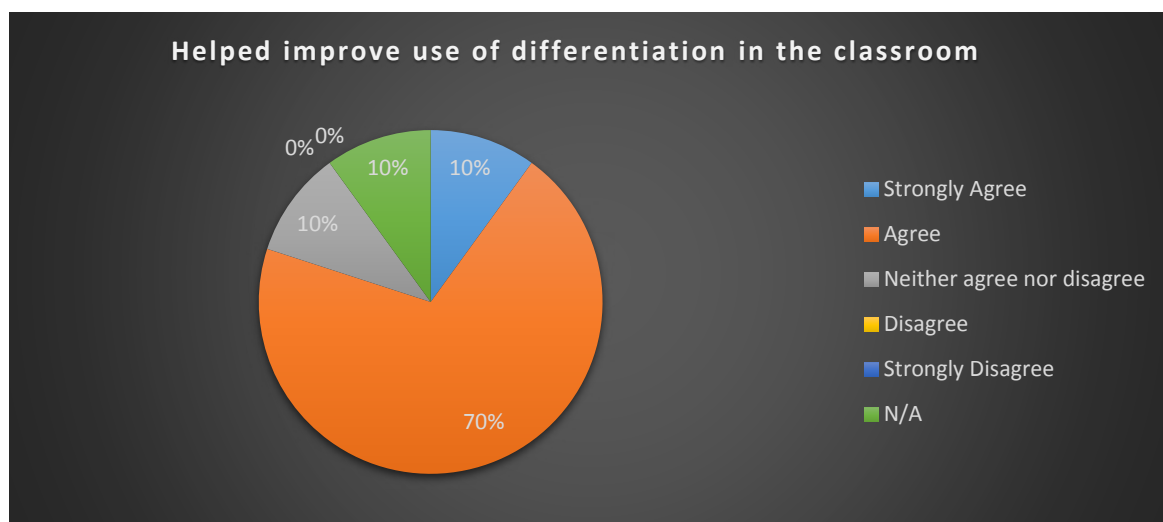
To support the teachers in techniques of differentiation that could be used in the large class-sizes trainers introduced them to differentiation by question. The traffic-light system⁷ was explained during the contact sessions as well as alternative methods by group and by task. A further training video was posted by mentor 1 during the follow-up stage.



The majority of the teachers 'agreed' or 'strongly agreed' that the project had helped develop their understanding of differentiation in the classroom (80%). A breakdown of these results demonstrates that the two teachers who 'neither agreed nor disagreed' with this statement came from the same school, indicating that further support or understanding about this schools issues with differentiation may be needed (neither teacher were available for telephone interview).

Use of Differentiation

⁷ The traffic light system uses levelled chalk-board/white board questioning to challenge, assess and manage the learners progress and lead to peer-to-peer learning/support. It presents three levels of question on a given topic (red - easy/learners need more support, amber - medium/learners need some help and support and green - hard/learners have a good understanding so need challenging further).



The majority of the teachers 'agreed' or 'strongly agreed' that the project had helped develop their use of differentiation in the classroom (80%). Again, the teachers who gave no answer or 'neither agree/disagree' were from school B, indicating that they had additional problems introducing differentiation in school.

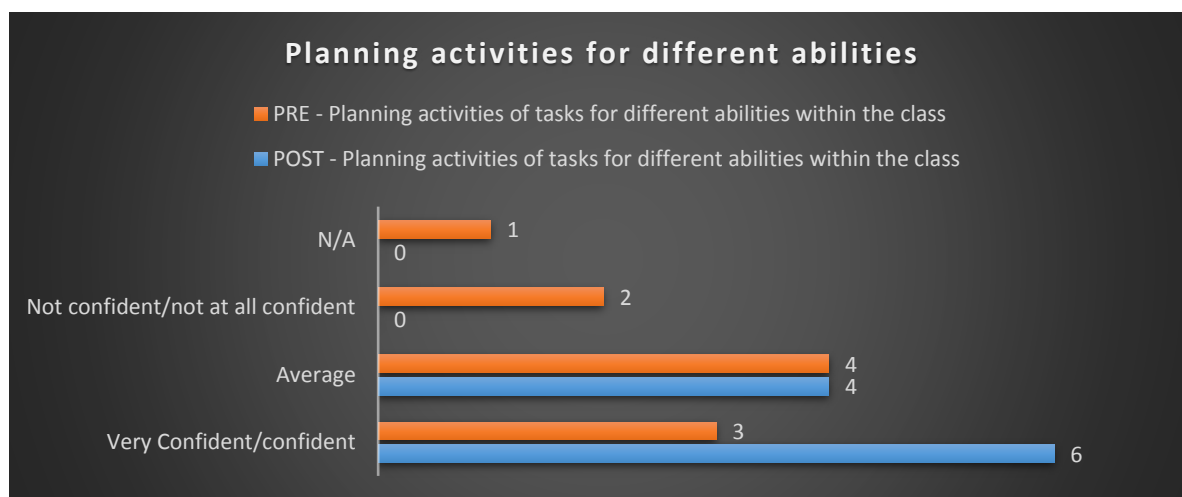
The reflections submitted by cycle 3 show two of the teachers using differentiation in the classroom, the telephone interviews gave further clarity on this. Teacher 2 and Teacher 8 (see case studies) both started to introduce differentiation by question into their lessons successfully. Teacher 11 commented that the training about differentiation in the classroom was helpful to her to remind her about the importance of differentiating learners, she feels that good practice often gets lost in the day-to-day context of a school. Teacher 11 felt that the mentoring on differentiation helped teacher 12, the Teach SA in her school, to plan for differentiation in the classroom (teacher 11 telephone interview).

However, differentiation was a struggle for some of the teachers and no evidence was recorded to suggest that it was taken up by some of the others (who didn't reach cycle 3). As teacher 5 comments about her intervention class (extra class for learners that are struggling),

"before I can use differentiation in the class, I need to find out the students who have knowledge backlog. So, before I even give them the simple questions, I need to give them last-years questions - they just don't have the basics that they were supposed to gain in the previous year. So, differentiation just becomes a little bit difficult here"

(Teacher 5, telephone interview)

Teacher 4 commented that the over-crowding in class and lack of movement hampered his progress in adapting differentiation methods.



Overall, there was an improvement in the confidence of the teachers in planning for different activities in class. Teacher 2 felt that her confidence had grown for her to try out new ideas for different activities for different abilities starting with differentiation by group and moving onto differentiation by question (teacher 2 telephone interview). Other teachers were evidenced using levelled questions that allowed different ability pupils to work at the same time (teacher 8, teacher 1, teacher 7).

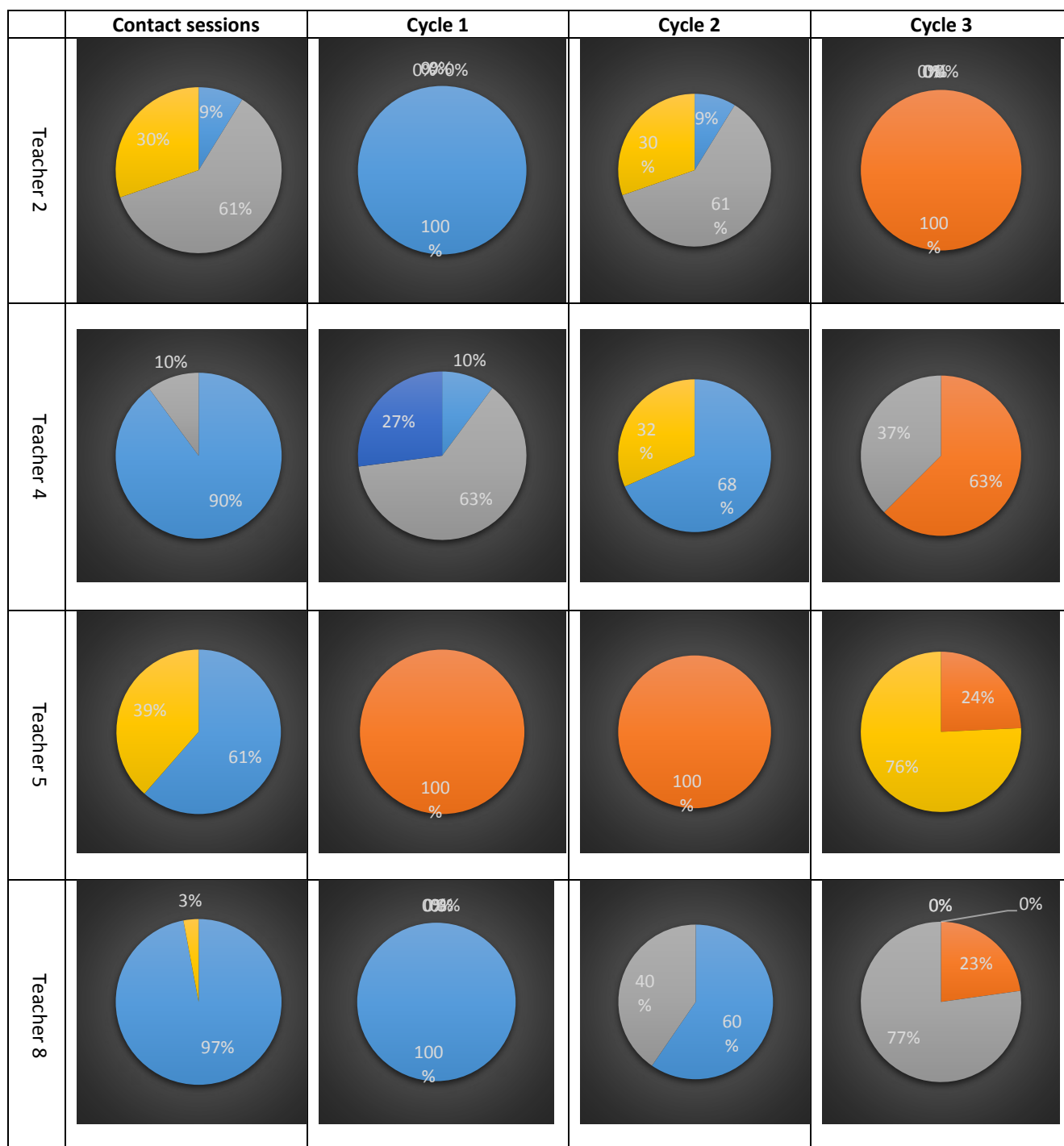
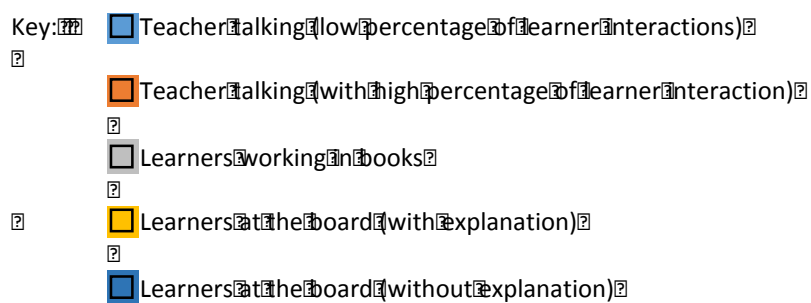
Active and Passive learning

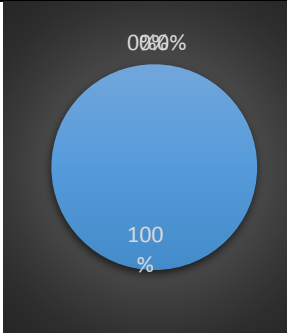
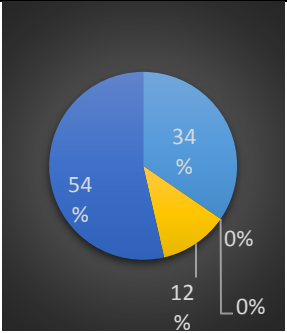
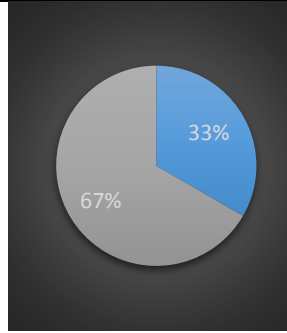
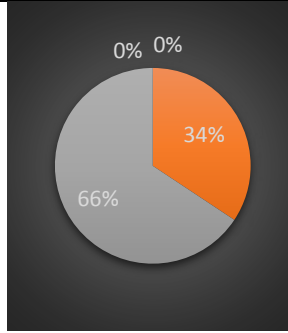
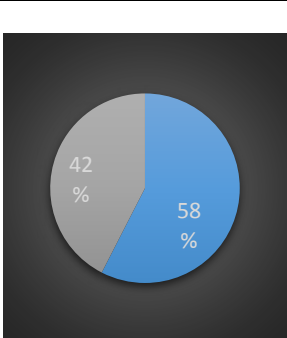
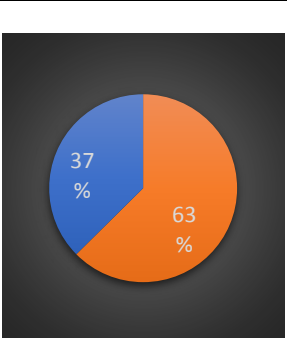
The classroom observation undertaken during the contact sessions revealed that for the majority of the lesson the learners were sitting down and listening to the teacher at the chalk-board. The mentors saw some variations between the twelve teachers, but passive learning was observed to be the norm in the observed classrooms. Although the teachers did interact with the learners, this was generally to answer 'agreement' questions (i.e. the answer is X, do you agree - yes/no), or 'value' questions (i.e. what is the sum of X and Y) - these questions were generally directed at the whole class, with no differentiation. The teachers were observed to talk for upwards of 20 minutes before giving the learners an activity to do.

The mentors wanted to guide the teachers towards a more learner-centred approach. This is where the learners become more active in the class, participate in explaining their understanding rather than just answering the question, and are given activities throughout the class (that develop their understanding).

Analysis of the Teach SA ambassadors submitted video footage shows the progression in the amount of active and passive learning in the first twenty minutes of the lessons. The charts below show the results of the Teach SA ambassadors only (the contact session recordings were taken mid-training),

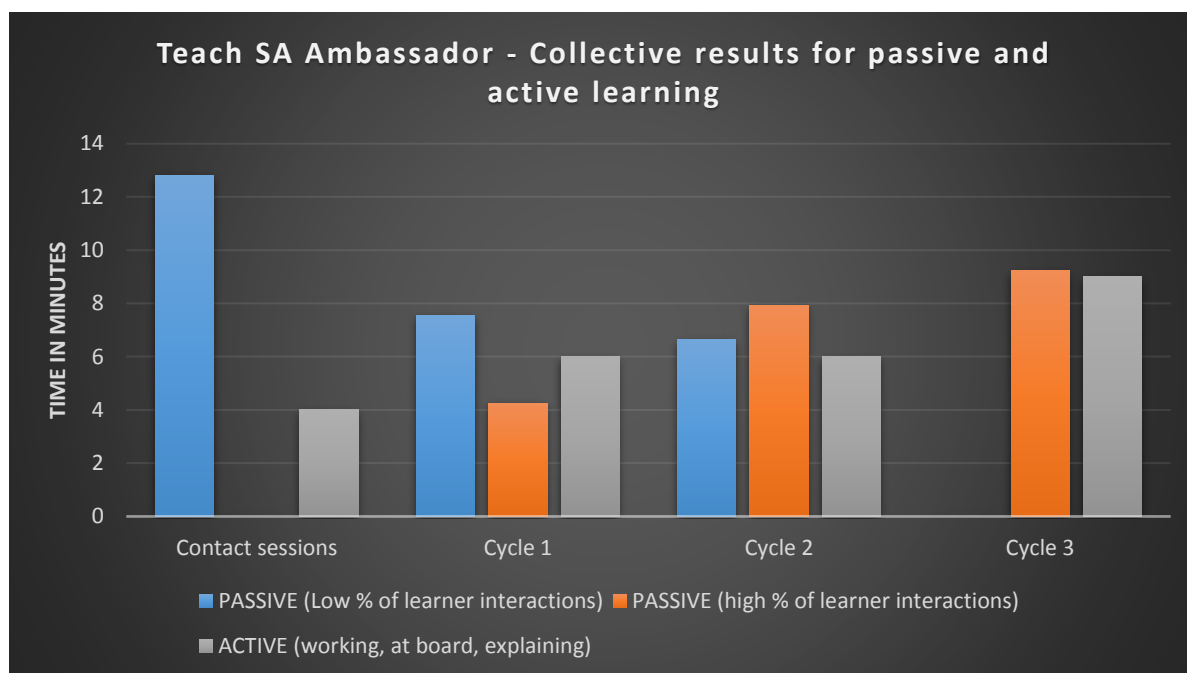
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Teacher 10				
Teacher 12			Did not complete all cycles	

The above charts plot the progress of the Teach SA ambassadors across the training cycles. The charts show a variation in presentation methods from a passive approach to integrating more active learning techniques. The although some of the teachers still talked for the twenty minutes, changes in the amount of questions directed at the learners (over 1 per minute), and the type of questions asked were evidenced (this has been classified as teacher talking with high percentage of learner interactions).

A collective analysis of the data observed from the submitted footage demonstrates that the Teach SA ambassadors were able to decrease the time spent on passive learning and increase the amount of active engagement within the first twenty minutes of the lesson. The chart below demonstrates this,



This analysis is not possible for the more experienced teachers because of the number of total submissions. However, in the submitted footage from teacher 1 and 3 there is evidence of a more active approach in the classroom over time (see case study 2 and 3).

In the short time-span of this project it is possible to evidence fluctuations in the style and delivery in eight of the participating teachers.

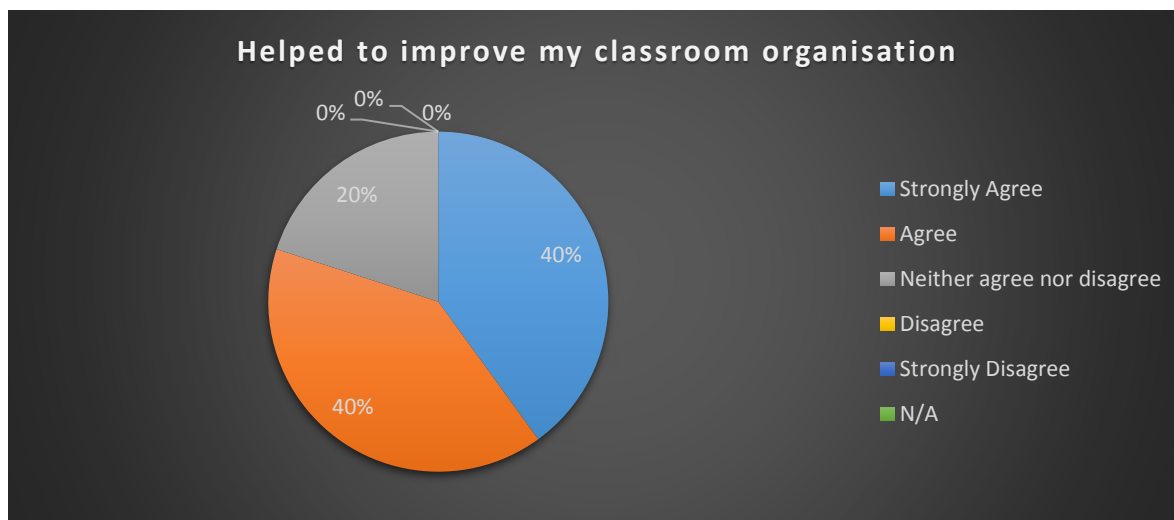
Lesson Planning

The teachers were also asked about their lesson planning. The post- evaluation demonstrates that some of the teachers were more confident in their ability to plan lessons, establish the aim of a lesson and plan the pitch of a lesson. The pre-project baseline evaluation demonstrated that few of the teachers mentioned the learners when asked about their lesson planning, most of the teachers referred to the curriculum and how they present this - i.e. 'question - answer - question' (teacher 3) and some of the teachers did not use lesson plans at all (see report appendix A).

The post-project evaluation demonstrates all the participating teachers now use lesson plans and that five of the teachers now mentioned planning for the learners; to both involve them throughout the lesson and levelling examples to suit different learners needs. Teacher 12 commented that the project helped in planning, "how to involve the learner in the lesson" and teacher 1 commented on his planning becoming more learner-centred (comment post-project survey). This shows a progression in the *way* the teachers plan lessons and a shift in *emphasis* towards the learners' development (rather than simply the curriculum). These changes show a significant shift in the way the teachers conceptualise lesson planning.

One teacher suggested that her fellow colleagues had helped her with her planning rather than the project directly (teacher 10).

Classroom Organisation



The majority of the teachers 'agreed' or 'strongly agreed' that the project had helped them improve their classroom organisation (80%). The submitted footage shows changes in the lay-out and set-up of individual classes and well as improvements in desk organization (books and pens out, bags off tables etc.). The lay out changes resulted in better classroom behavior (by not allowing learners to group towards the back of the class) and better access to the learners for the teachers (by creating pathways around the desks). Not all teachers were able to address some of the suggestions for classroom organisation, due to classroom sizes and overcrowding in the classrooms (desk-sharing). The case studies (section 3) include further evidence on how the mentors helped to improve classroom organisation for some of the teachers (specifically the Teach SA ambassadors).

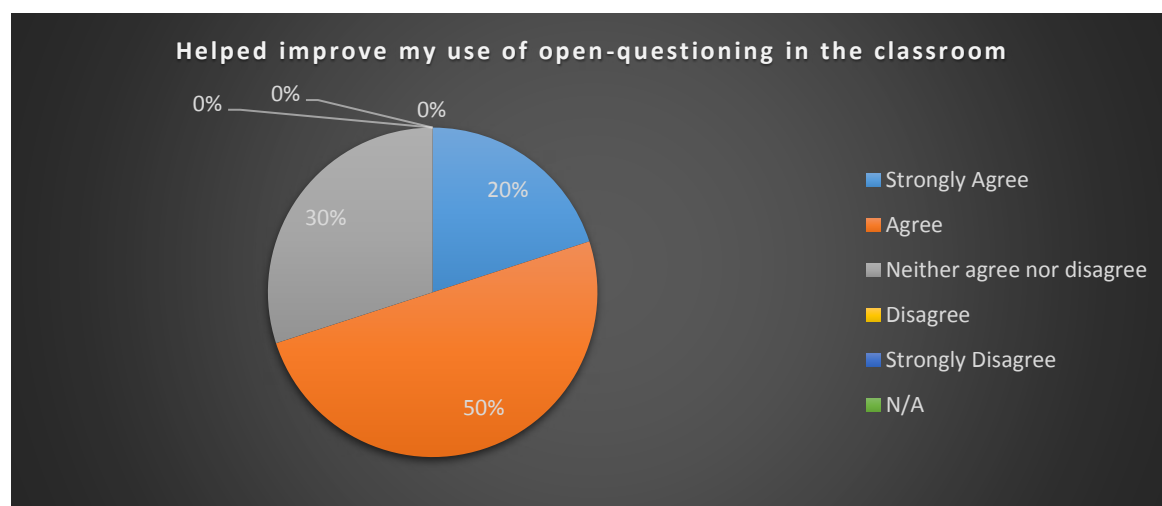
Objective Three: Improve teacher ability to assess learner's understanding of Mathematics

The aim was to introduce questioning techniques that can be used to engage more learners. These techniques also allow learners to explain their answers and develop a deeper understanding of mathematics. In addition, the way that teachers use questions in class can aid the teacher in assessing their learners understanding of key concepts (to establish starting points, further explanation, differentiation in class and peer to peer learning).

The classroom observation undertaken during the contact sessions demonstrated that the teachers relied heavily on 'agreement' questions (i.e. the answer is X, is it? - yes/no). This type of question did not engage the learners or challenge them in developing their understanding or explanation of mathematics and mathematics concepts. It was also observed, and confirmed by the district staff during the scoping visit, that many of the learners will answer these with a choral 'yes' or 'no', without deeper thinking skills being applied. The project team wanted to focus on developing the teachers understanding and use of open-questioning. Open questions challenge deeper thinking and explanation skills and transfer control of the explanation to the learner. In addition, the role of open and closed questioning in the classroom was discussed with the teachers during the contact sessions.

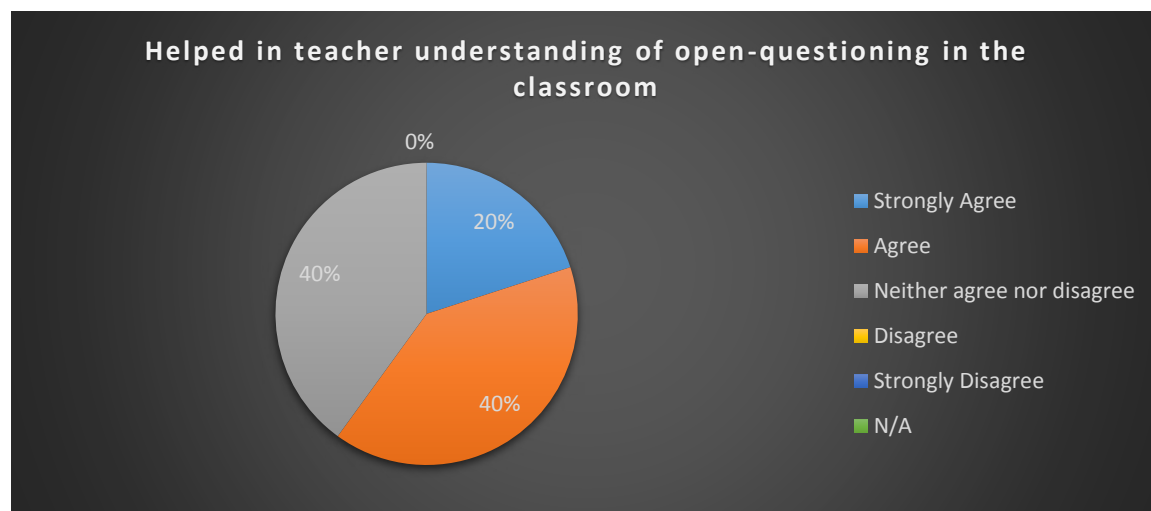
The participating teachers made some progress in integrating more questioning into their lessons, however, the introduction of open-questioning was intermittent between the participating teachers and understanding (of how to do this in a classroom context) was sporadic.

Use of open questioning

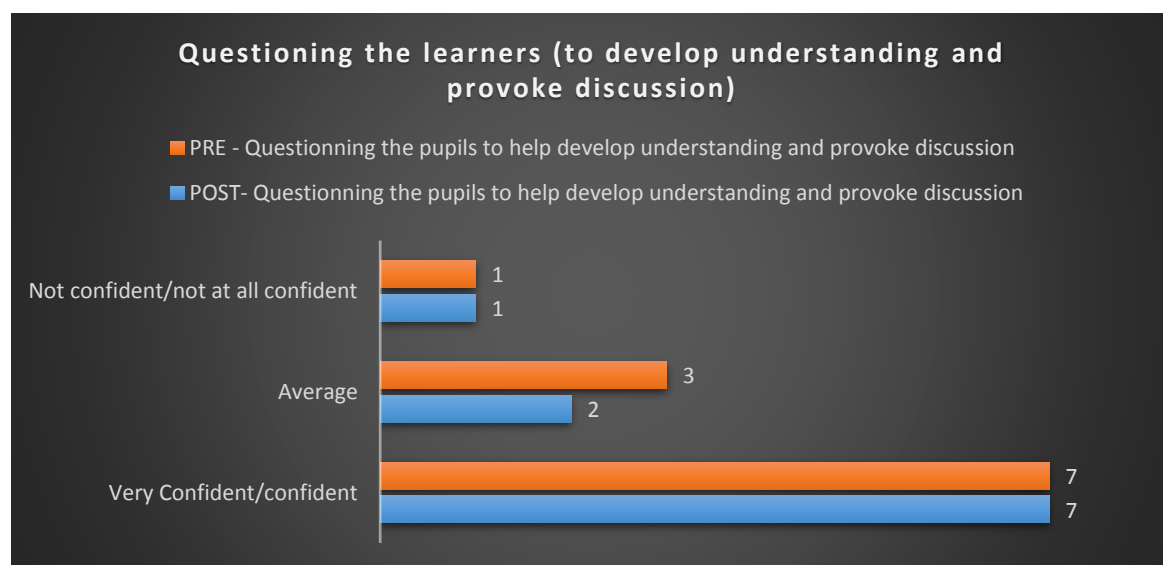


70% of the teachers agreed or strongly agreed that the project helped them to use open-questioning within their classes.

Understanding of open-questioning



The teachers were less sure that the project helped them to understand open-questioning in the classroom (60% agree or strongly agree). Some of the teachers may feel that they already knew these techniques and others may have struggled to integrate them into their maths classes (see discussion below).



The pre- and post- data shows that there was a small perceived change in perception in how the teachers use questioning in class. The 'very confident' rating went from 1 to 4 (modal change from 'confident' to 'very confident'). Three of the teachers felt that they already had a good grasp of open-questioning (note: it is unclear the extent of their understanding), and one who was unsure whether her knowledge of open-questioning had improved. Teacher 5 did not feel that the project particularly improved her use and understanding of open-questioning because she felt that embraced these techniques anyway, but it did help to reassure her that her approach was following good practice,

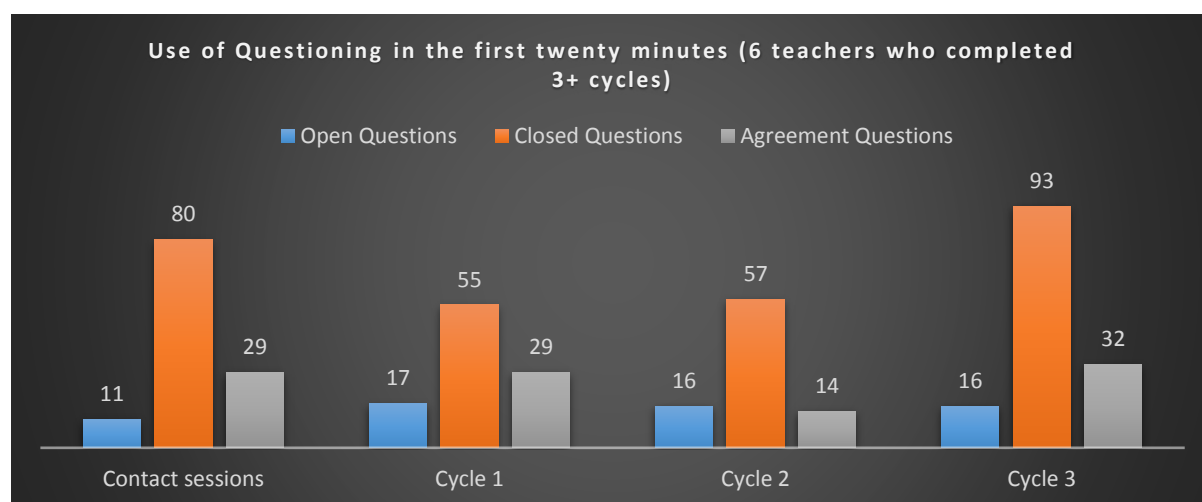
“when I came (into teaching), my focus was to get the learners to be more critical thinkers and not just *do*. I want them to think, ‘*why* are we using this formula’ more than, ‘we *just* use this formula’. So, I encourage them - and that is from day one. I am just that type of person who would rather let you get to the answer - think about the answer - you know - because we need thinkers in this country and we need thinkers in the world and we need people who are analytical (...) I think that is just me, but the project has just re-emphasized and reassured me that that is the way to go. Since I don’t have that teaching background, so it reassures me to think, ‘no, no, no, you are on the right track - this is supposed to be done, so continue with that’”.

(Teacher 5, telephone

interview)

For a new teacher with limited means of support and access to new teaching approaches this reassurance can be vital for the continuation of good practice (even if other teachers in the school are not embracing the same techniques).

Analysis was undertaken on the recorded submissions of the six teachers who completed 3+ cycles. The number of open, closed and agreement questions in the first twenty minutes of recording was counted and plotted. The results are not conclusive of major changes over time in the use of open questioning (since introduced during the contact sessions), however, there is evidence that closed questioning that involves the learners actively in class throughout the lesson increased over the cycles. See chart below for results,



Analysis of the recorded submissions also showed two of the experienced teachers encouraging learner-led explanation at the chalk-board using open-questioning to encourage them to not just write down their answer, but to describe to the class how and why they reached that answer (see case study 3). This was not a method used as fully with some of the Teach SA ambassadors, who were able to bring learners to the board but did not extend the learner experience by asking the learner to explain their answers to the class.

In summary, the project team were able to introduce teachers to open questioning techniques and extend their knowledge of them in most cases (see case studies), however, understanding of how to achieve this fully in class, was not evidenced across the board in the recorded submissions during the pilot and this is also echoed by the teachers' perceptions.

The teachers were able, in most cases, to make their classrooms more engaging and participatory for the learners by using more closed questions to engage the learners on a more regular basis (see also above data on passive and active learning page 38) and this demonstrates a significant change from the baseline observations.

The relatively short time-scale of the project, and the interruption of the flow might explain the fluctuations in results. Teacher 1 commented at the end of the project that he still, 'has a lot to learn', but will continue to integrate new ideas (teacher 1 telephone interview) and both teacher 8 and teacher 2 wished to continue the mentoring to continue to develop as teachers.

Mentor 1 commented on the changes that he has seen throughout the project,

"We've encouraged the teacher to free themselves up to monitor and patrol - they now actually do *engage* with the learners during the lesson, they actually see what is going on and they are intervening they are reshaping learning as the lessons proceed - rather than just delivering and hoping - there is more steering of the learning experience now from the teachers"

(Mentor 1 telephone interview)

Mentor 2 suggested that the workload can sometimes hamper the progress and creativity of the teachers to integrate new ideas, he suggests that a whole-school approach, driven by a staff-development programme in the schools, could provide a firmer base for changes in teacher practice in the future (supported by mentors/IRIS Connect).

In summary, the project has had some success in introducing the use of open-questions to the teachers, and there is evidence to suggest that the teachers have embraced a more learner-centred approach by passing control of the explanations to the learners in some cases (also resulting in increased attention being given by the other learners). However, some teachers were not evidenced extending and embedding the understanding of the learners by asking them to explain their answers to the class. What was evidenced was the increased use of closed-questions (integrated with open-questions) that helped to engage learners throughout the lesson.

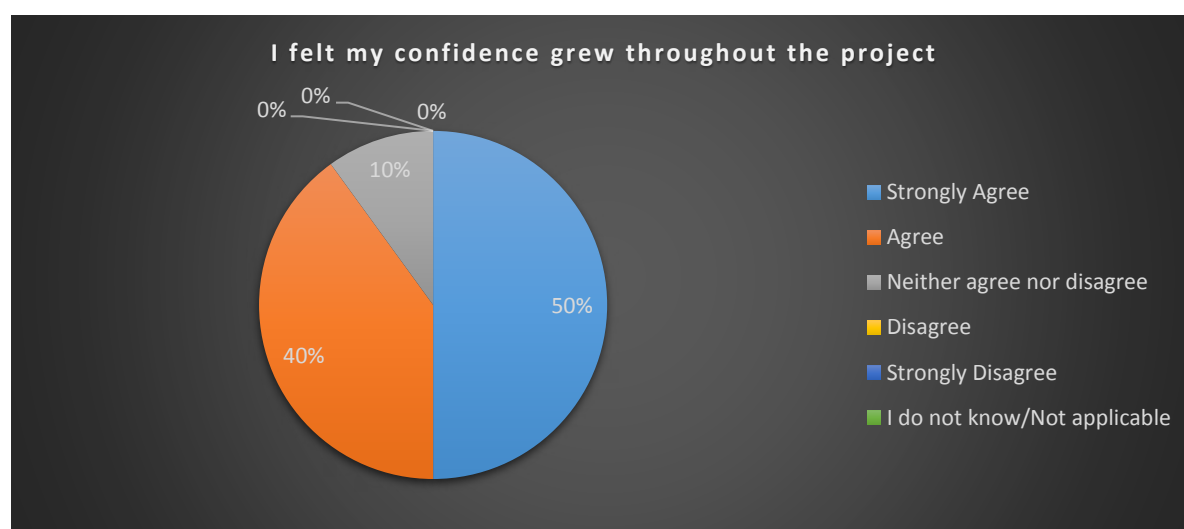
Objective Four: Develop a system of classroom observation and a culture of self-reflection

The aim was to integrate the IRIS Connect system into the classrooms of twelve teachers and provide opportunities and access to self-reflection, mentoring from a UK mentor and the option to share recorded footage (knowledge and practice) with other teachers (see objective 5 below). The IRIS Connect system allows the teachers to self-reflect on their own recordings without sharing with others, to share with a mentor for comments, and to share with others (individually or in groups) who have access to the system. In addition, reflections can be watched by third parties without sharing if accessed on the recording teachers log-in (with their permission).

All twelve teachers recorded at least one reflection that was sent to their mentor. For evaluation reasons the follow up cycles placed greater demands on teacher than would be normal with such a system, however six of the teachers completed all three cycles of the follow up stage (teachers 2, 3, 4, 5, 8 & 10), three completed two cycles (teachers 1, 7 & 9) and three completed one cycle (Teachers 6, 11 & 12). A substantial factor in these differences was due to administrative problems limiting internet access for each teacher, however interviews and feedback from the teachers also indicated that in some cases busy teaching schedules, lack of time, exam periods and other pressures also affected participation.

All the teachers felt that the advice given by their mentors was useful. Nearly all the teachers who participated felt that self-reflection was a useful and valuable part of the project and that they had been able to develop from this experience. All the participating teachers felt confident using the equipment and none of the teachers indicated any difficulties using it, although time spent setting-up equipment was on occasion an issue for some.

Confidence



90% of the teachers 'agreed' or 'strongly agreed' that their confidence had grown throughout the project. The support and relationships developed with the mentors was integral to this for some of the teachers. Teacher 8 commented that by the end of the project,

"I felt like he was *helping me* and not *teaching me* and that is what I liked, so... I think for me, that is what worked well"

(teacher 8 telephone interview)

In addition, teacher 5 felt that her mentor's comments gave her confidence in her own approach and to continue doing some of what she had started in her classes.

The recorded submissions show a considerable amount evidence of teacher confidence in class and command over their classes over-time, this is especially apparent with the Teach SA Ambassadors. The building of this confidence will not be solely down to the projects interventions, but, it is felt that the support and advice given had a direct impact on some of the teachers involved in the project. Ten of the teachers grew in confidence in filming themselves, self-reflection and sharing recordings. Teacher 10 commented,

"the first time I was nervous, because I was not even comfortable with the equipment, but it gets easier when you engage with it"

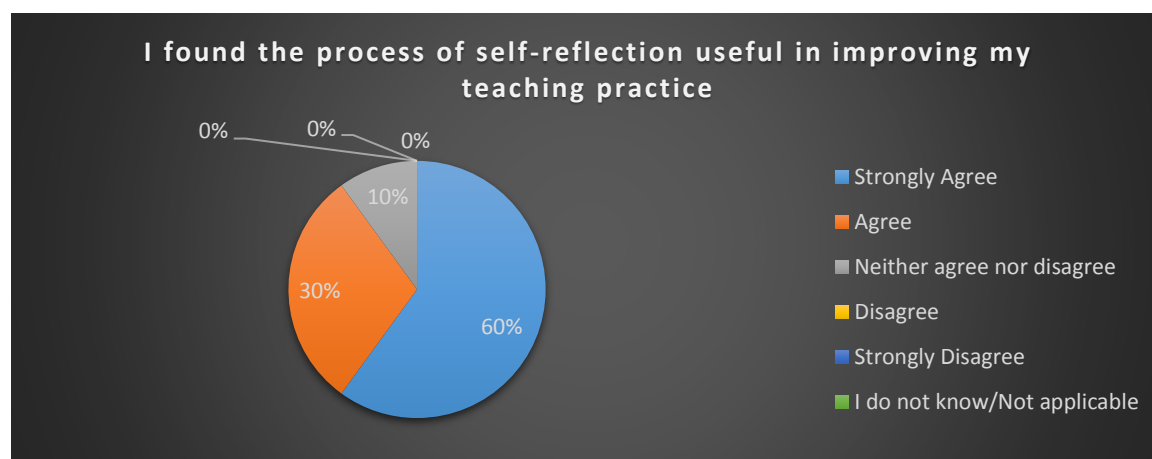
(teacher 10 telephone interview)

Additionally, teacher 8 commented,

When I saw myself the first time I was like "oh!" (*laughs*) "goodness me!", but after a while I got used to the camera. I got a lot of courage from my mentor because each video that I sent him, there was something that I did, that I didn't do the last time, so every time when I am teaching I'll send him and he'll say something that I didn't do and then he will get me to try"

(teacher 8 telephone interview)

Self-reflection



Nearly of the teachers found the process of self-reflection useful in improving their teaching practice. The IRIS Connect system was often used by the teachers as a self-reflection tool (as well as a mentoring tool). The ability to reflect on their own practice (and to view the learners at the same time as teaching) was beneficial to the teachers in allowing them to begin to isolate their own strengths and weaknesses. The teacher who selected 'neither agree or disagree' commented that at the beginning of the project she did use her recorded footage for self- reflection, but that as the project progressed she had greater work pressures and felt additional pressure to contribute to the project, with no time for her to spend reflecting on her practice (teacher 5 telephone interview). Teacher 11 found the process of self-reflection challenging, she commented,

"for me you are moving to another world where you have to look at yourself. When you reflect without looking at the videos - the videos tell you everything - they tell you the movement in class, what you are doing, your tone - you say, *"do I speak like that?"* So yes, it is scary"
(teacher 11 telephone interview)

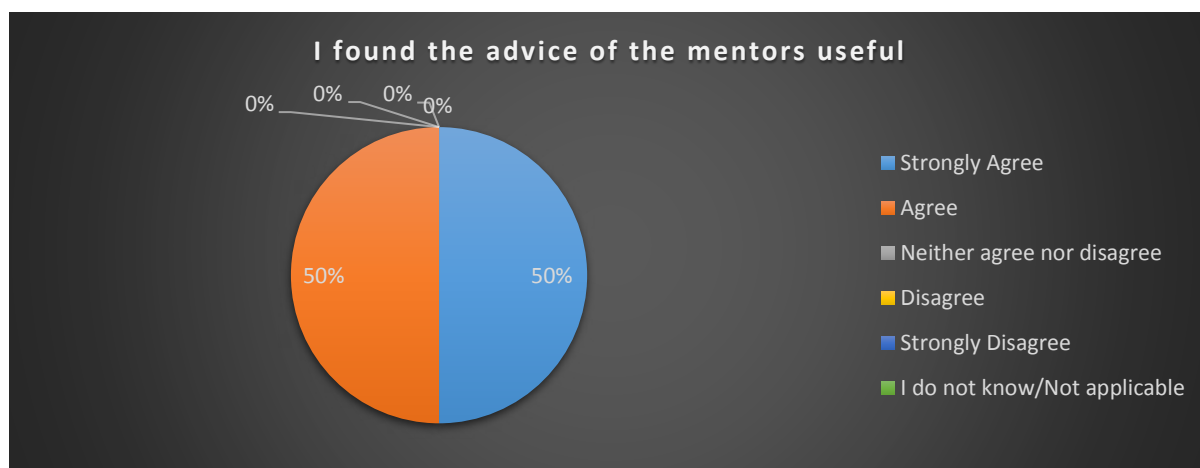
For other teachers, the self-reflection helped them in planning new strategies for their learners,

"that kind of self-reflection has helped me. Even before I could get a comment from my mentor that says that I should improve - I could see that. It's like, when I hear myself talking, I have to think, *'if I was in grade 8 would I understand what I am saying?'* And sometimes I was like, *"arghh no! I wouldn't"*, so then I went back to the drawing board". (teacher 2 telephone interview)

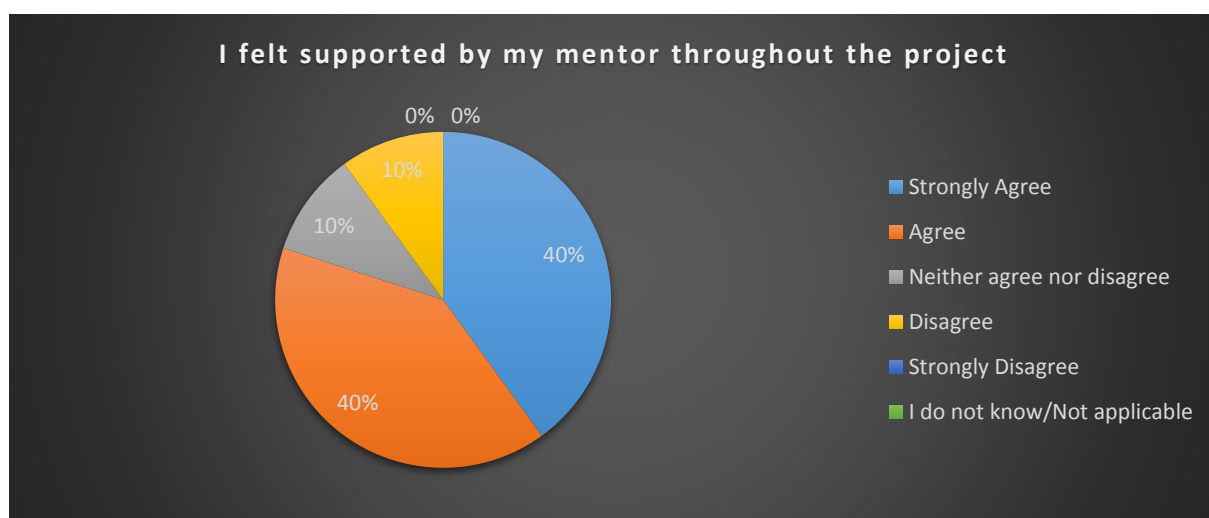
Teacher 9 had watched his reflections with his wife, who is also a teacher, and found this process very useful. He was able to discuss his challenges with her and plan solutions (teacher 9 post-project survey).

For teacher 8 the self-reflection was not as useful as the comments from the mentor which helped to guide him in better directions, "I think that videoing yourself and being able to look at yourself that helps, but it is the comments and everything that make a difference" (teacher 8 interview). This comment may be important for teachers who are looking for external guidance that can develop their teaching. Although self-reflection is a valuable tool and can promote change (as seen in teacher 2), there is a danger that some teachers would not be able to identify mistakes or develop practice without external guidance and/or exposure to new ideas.

The role of the mentor



100% of the teachers 'agreed' or 'strongly agreed' that the advice given by their mentor was useful to them. The mentors provided a vital guide for the teachers to support the training given through the contact sessions. In addition, to provide advice and guidance as well as give positive affirmation and encouragement to individual teachers.



The majority of the teachers felt supported by their mentor throughout the project, some of the teachers developed a strong bond with their mentors, and did not want the professional relationship to end (teacher 8 and teacher 2). One teacher did not feel as supported by their mentor. Further exploration found that this teacher was not able to access her reflections regularly or able to access the comments made by the mentor at all times due to data issues at her school and limited access to a computer (post-project survey). In addition, the mentor experienced technical issues with the sound on some of this teacher's submissions and was not able to comment fully on them. A temporary break in a mentor- teacher relationship can result in the loss of momentum and disengagement in some cases.

The opportunity that the IRIS Connect system gives the mentor to pause and reflect on teaching practice was highlighted by teacher 2,

“I think it is the best because it gives one more time. Because, if you are observing in my class you are looking at the mistakes that I am making right now and then you are there in the moment. You don’t go back and reflect on what I did. But, with the video system you can go back and you can check what I said and make notes...you are given a chance to go back *again* and check *again*”
(teacher 2, telephone interview)

Teacher 5 commented that the web links shared by her mentor were more useful to her than the comments, she put this down to the length of recordings that she sent that might not have been sufficient for the mentor to fully comment on her teaching (teacher 5 telephone interview).

The mentors tried to comment on as many submissions as they could, although the above mentioned technical issues prevented some comments and the large amount of submissions by some teachers meant that the mentors used a selection process to select relevant footage. Differences in style and technique were seen across the two mentors, mentor 1 provided more comments per teacher than mentor 2. Mentor 2 provided links to trusted web-sites when needed (whereas mentor 1 did not do this, but dealt with issues as they arose via the comments). Overall, the mentors were able to provide useful advice to develop teaching practice and establish relationships with 10⁸ of the participating teachers.

In summary, all of the teachers (who participated in the project) felt that the mentors’ comments were useful and nearly all felt supported by their mentor, however the prolonged interruptions due to administrative problems were seen as detrimental their relationships with the mentors. There was some difficulty understanding the length and type of submissions that the teachers should provide for the evaluation and some felt this could have helped them limit or target their submissions.

The project was able to implement a culture of classroom observation and self-reflection across 11 of the participating teachers (only one teachers was unable to participate after cycle 1). The results show that the teachers reacted to the flexibility of the IRIS Connect system that allowed them to self-reflect or share with others in order to develop. The role of the mentor was crucial to many of the teachers to guide and support them (especially the newly qualified Teach SA ambassadors).

⁸ This rose to 11 as Teacher 11 submitted footage at the end of the project that was commented on by her mentor - thus starting cycle 1.

Objective Five: To establish a mathematics-focused professional learning community

The aim as the project progressed was to encourage and promote the use of the IRIS Connect system within the teachers' schools and for teachers to share knowledge with the wider learning community. This also included involving the district department and mathematics heads of department in the learning community.

The reception of the concept of the project was extremely positive from both teachers, heads of department and the district department. However, despite considerable efforts from the project team there was a limited amount sharing of recordings between the teachers themselves, although several of the teachers 'unofficially' shared their recordings with other teachers via their own log-ins. The response from the teach SA ambassadors was more receptive to sharing between the ambassadors and teacher 8 shared some footage with some of the other ambassadors that he knew. By the end of the project, some of the teachers, particularly the Teach SA ambassadors were indicating that they were interested and felt ready to share some reflections. The table below shows the sharing, and intended sharing, between the teachers towards the end of the project,

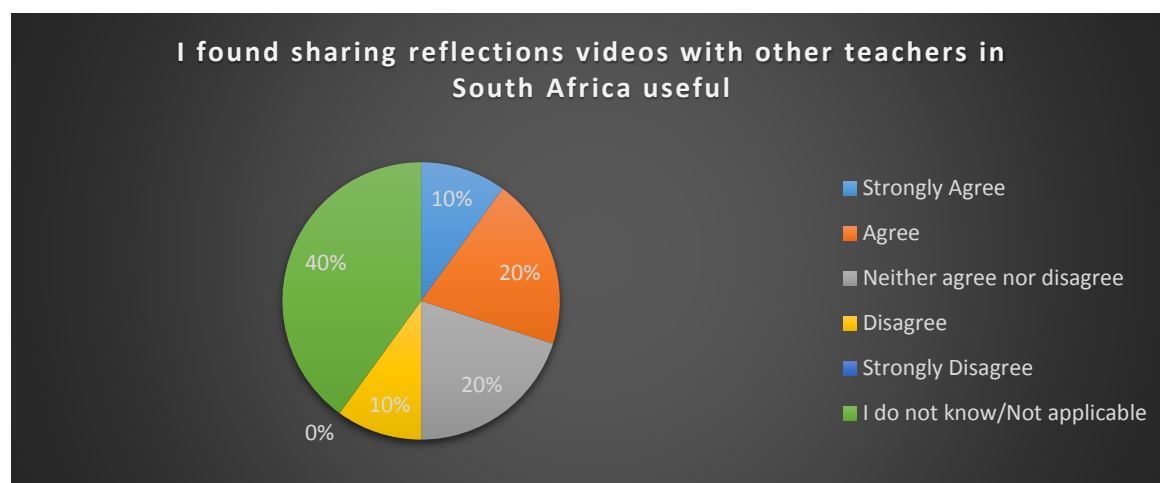
Teacher	Mentor	HoD	Other maths teachers in school	Other non-maths teachers in school	Teacher in another school	District	Others
1	Some shared				Intend to share		
2	All shared		Some shared			Some shared	
3	All shared	Some shared	Some shared	Some shared			
4	All shared	Intend to share					
5	All shared						Some shared
6	All shared						
7	All shared						
8	All shared			Intend to share	Some shared		
9	Some shared	Some shared	Some shared	Some shared		Some shared	
10	All shared		Some shared		Some shared		
11	Some shared	Some shared	Some shared	Some shared			Some shared
12	Some shared	Intend to share	Intend to share	Intend to share	Intend to share	Intend to share	Intend to share

The above table shows that although teachers were not always able to share reflections via the IRIS Connect sharing platform, 'unofficial' sharing was happening with over half of the teachers involved in the project. In addition, now that the system and teachers had gained

more confidence and fluency in using the system, four suggested that they intended to share some of their reflections.

The district department were involved in the project from the scoping visit onwards and were supportive of the aims of the project. However, due to work-load issues, staff changes and the lack of their own IRIS Connect equipment, the district were unable to record any training videos or offer additional support to the project at that time of running. Discussion with the district lead for maths post-project was promising, and she was confident that she could use the equipment successfully for teacher-training purposes and developing networks.

The heads of department varied in levels support in each school, some were able to view and comment verbally on teacher reflections - offering advice and support. In other cases the Head of Department was not able to view the reflections so played a more limited role.

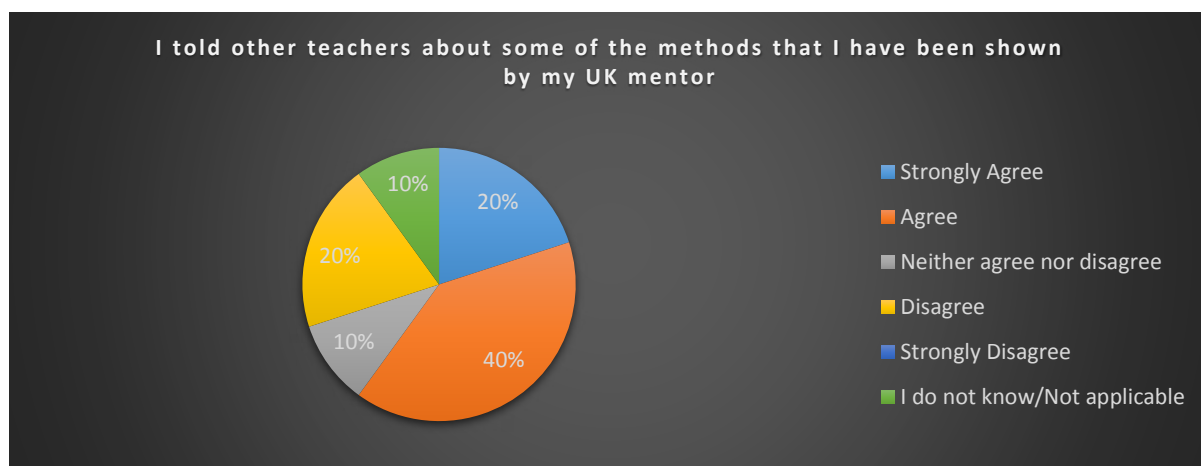


The above chart shows that some 30% of participating teachers shared ‘unofficially’ with other teachers, although they may not have ‘shared’ reflections with other teachers officially (via the IRIS Connect), Teacher 9 commented that he shared with his wife who is also a teachers and teacher 11 shared with new teachers in her school to demonstrate good practice in classroom management,

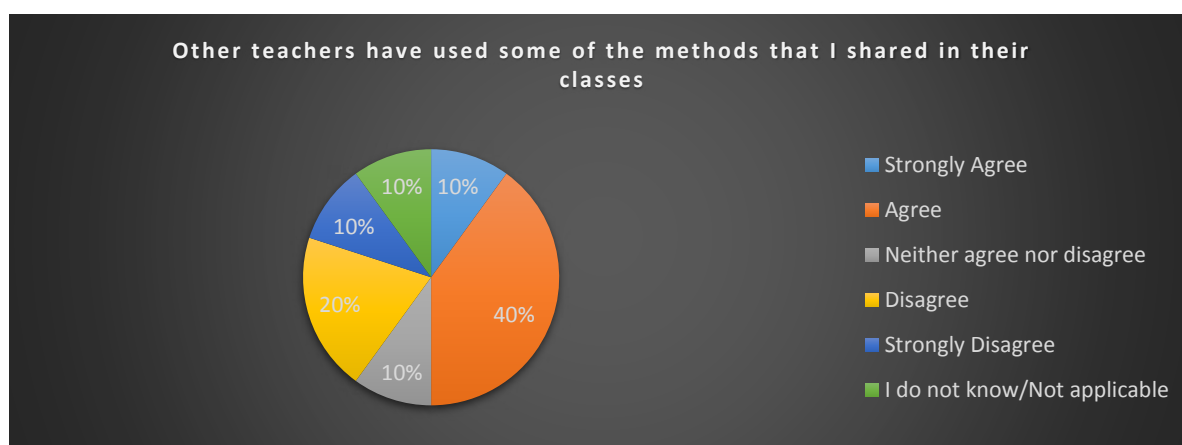
“I’ve used mine - especially with our new teachers, who were struggling with discipline. So, basically, I took the old ones I did and used them. It showed how when you first get into a class you establish your rules for the first two or three weeks so that they get use to them. (...) It was good for classroom management - in addition to that - it was good for the content - one of the videos was on the content. So, instead of me telling the teachers to come to my class, because we were teaching the same content, then the teacher could watch the video and take it from there”.

(teacher 11 telephone interview)

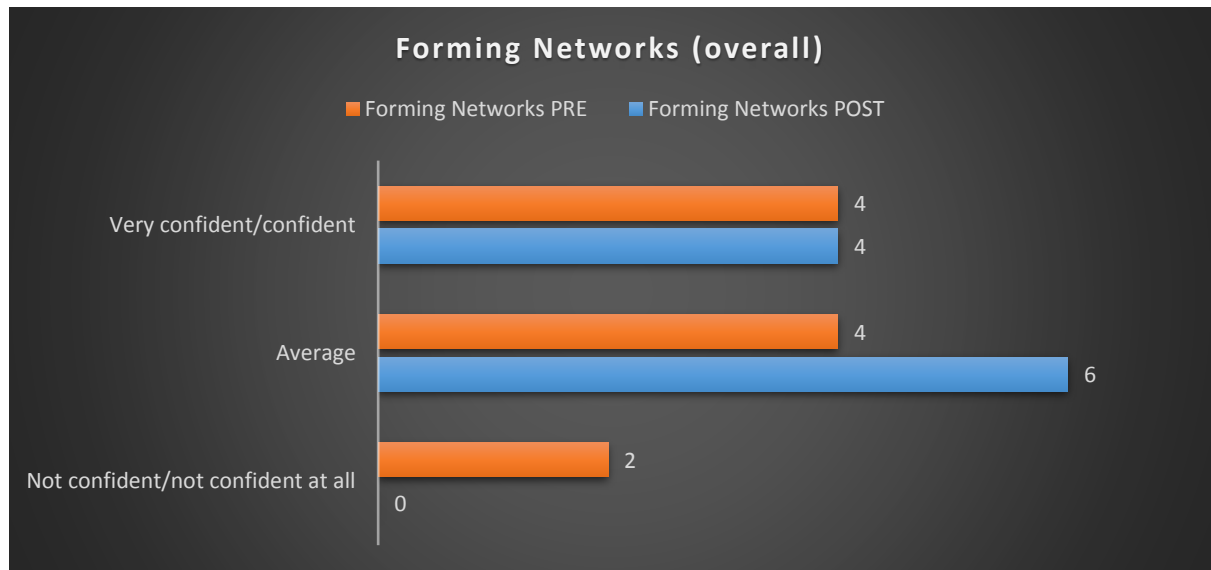
Following on from this comment, the chart below demonstrates how some of the knowledge gained through the project has been shared with other teachers,



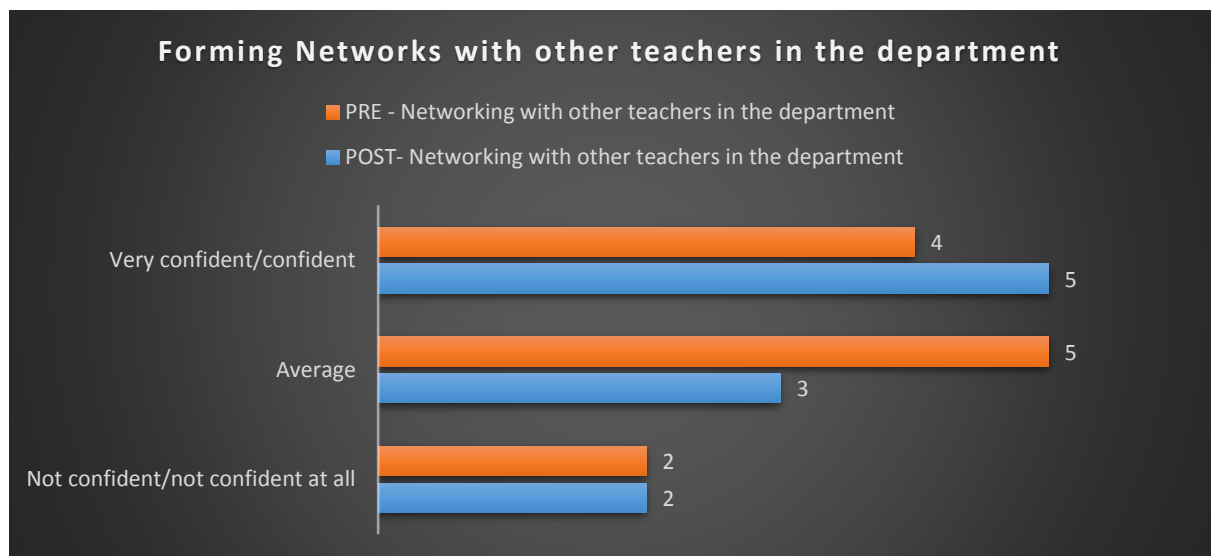
The results demonstrate that 60% of the teachers shared verbal information about teaching methods or strategies that they gathered through the project with other members of staff, thus extending the knowledge beyond the participants themselves. This establishes a dissemination route that spans beyond the confines of the participant teachers to share knowledge with other teacher in the school (i.e. it starts a ripple effect).

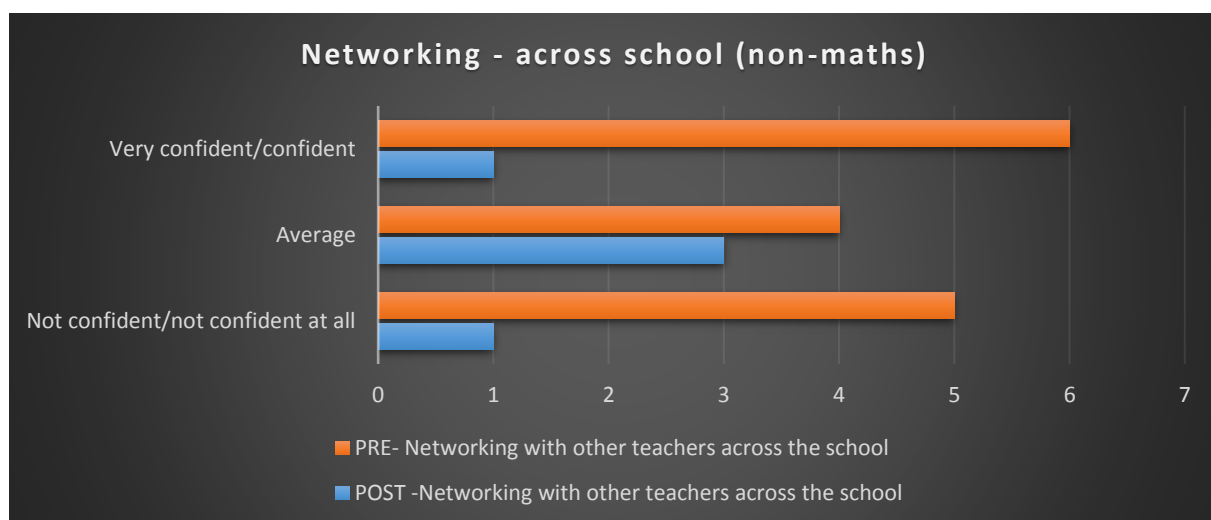


50% of the teachers felt that the teachers that they had shared knowledge and information with had used this in their classes, again showing the potential for dissemination of ideas across the school.

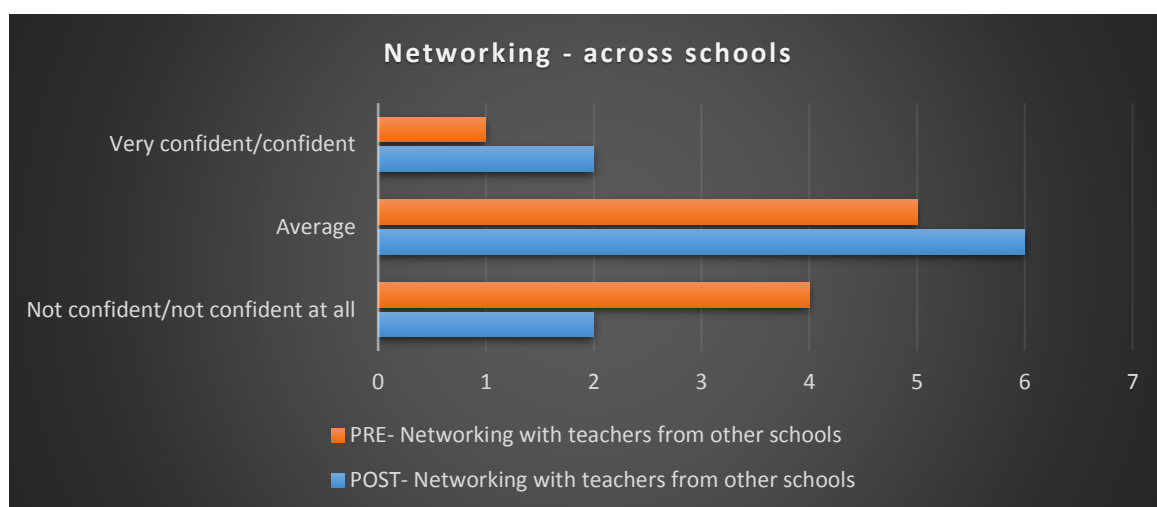


The above charts do not demonstrate any significant change in the teachers' perception of their overall networking skills over time. The mean from pre- to post- project remained the same, 'average'.





The teachers did however show more confidence in their networking skills, particularly in their networking across the school (across other departments), although it is unclear whether this was connected to the project, or teachers developing their own networks over the year. Modal rating changed from 4 (not confident) to 2 (confident)



There was a slight increase in the teachers' confidence in networking across schools and a growing appetite across some teachers, especially the Teach SA network, to start to share between themselves. Teacher 2 commented,

"I have thought about sharing my reflections with my other Teach South Africa Ambassadors (...) because we are all young and we are new educators. Just to share our reflections and say if we need to make changes here and here and there and there - from a new perspective. Not from a professional perspective but from a new and young educators perspective".

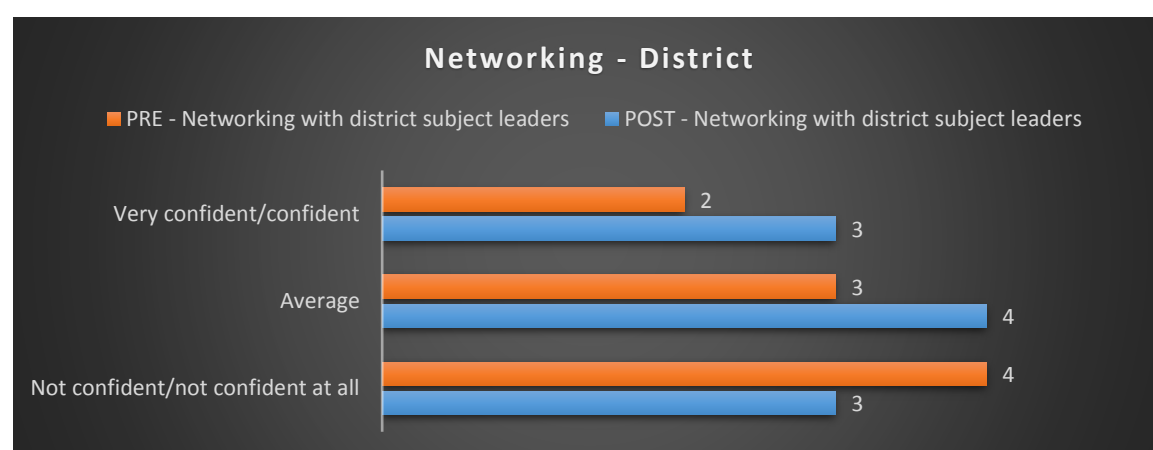
(teacher 2 telephone interview)

Teacher 8 also saw value in sharing with the other ambassadors and he perceived that this would be where the real value of the project would be, nonetheless he understood that some teachers may not feel comfortable sharing (teacher 8 telephone interview). Teacher 10 could see the value in sharing for both teaching and emotional support to help in the first year of teaching, however data issues in her school prevented sharing with other teachers outside of her school throughout most of the project. Teacher 5 had not shared any of her footage with other teachers, however she could see the potential of sharing footage with others to showcase new approaches to introducing topics (teacher 5 telephone interview)

Teacher 11 suggested that a process of stages would be needed to make her comfortable with sharing, she had shared with staff in the school and had just started sharing with her mentor toward the end of the project,

“to share it would have to be with your staff first - then if you feel okay, then share with the other friend and see, ‘oh this is how you do it’ - I think it is something that you go in and do it more often I think that you would be able to share as time goes on. It is like pictures on your phone - people now share it - when they first came out they didn’t”

The project team had designed a very similar process to that suggested by teacher 11 (where groups of teachers or individual teachers could be sent shared videos - see monitoring report). The administrative problems in providing teachers with a means of accessing the internet limited the flexibility teachers had to explore and practice with equipment and send regular reflections for comment which could have built-up confidence to share with other teachers (outside of the school). The district lead in maths for Ekurhuleni South suggested that confidentiality, rather than confidence might also be a barrier to sharing for some of the teachers - ensuring that there will be no negative ramifications for participating teachers in the longer-term was paramount (district lead telephone interview).



Again, the teachers felt slightly more confident in sharing with the district than previously. The district department were encouraging about the project and could see the potential in utilizing the equipment within the department for further CPD training.

There was potentially a key role to be played by the heads of department for each school. Four out of the six HoDs responded to an online survey, and the results show that only one out of the four used the equipment themselves (teacher 11), but three out of the four had viewed reflections. One HoD commented that the system was useful because, ‘the teachers and myself were able to go back and review lessons and also look at ways of improving teaching in our school’ (post-project HoD survey). This demonstrates that with HoD support the teachers can use the system to develop teaching strategies within departments. Another HoD suggested that the recordings would be useful for IQM (inclusion quality mark) and class visits. The HoDs that responded to the survey suggested some improvements for the project, one suggested that planning for the integration of the equipment into schools earlier in the year in coordination with the yearly planning would be beneficial to fully embed the practice into the school culture. In this way, structured development and recording times could be planned that could be set within the school’s busy timetable. Another suggested that reducing the participating teacher’s workload to give additional time to recording and reflecting would be beneficial. Two HoDs suggested that more access for other teachers would also be advantageous to share knowledge and practice (but one HoD warns that internet access would need to be available to fully utilize the potential of the equipment). All of the HoDs who responded to the survey ‘agreed’ that the project had improved the teachers’ delivery of maths, confidence in teaching maths, helped develop learner participation and supported teachers though making changes in their teaching practice. They were also confident that the project was able to help them in supporting their teachers by being reflective together.

In summary, the pilot project was not able to establish a robust professional learning community by the end of the project, however a sharing community between teachers within schools and between the Teach SA Ambassadors was beginning to emerge (with teacher 8 leading the first shares). Six teachers showed the ability and willingness to share with colleagues in a ‘unofficial’ way by using their own log-ins. Some of the teachers shared knowledge verbally with colleagues and this was taken-up by other educators showing the dissemination potential of this system. Coordinated encouragement from the district leads and heads of department throughout the project may have aided this process further. The IRIS Connect system is set-up so that the teacher has complete control over their recordings, therefore confidence building, trust and gradual encouragement is needed to motivate sharing. The administrative problems in providing internet access contributed to lack of shares. However, the evaluation showed an increase in teachers’ confidence in networking across schools and with the district, demonstrating a change in attitude towards sharing expertise and ideas amongst the participating teachers.

IRIS Connect platform

The teachers were overall very positive about the IRIS Connect equipment and platform. 100% of the teachers, post-project, said that both were easy to use. There were however administrative issues that limited the provision of internet access to the participating teachers (discussed in the monitoring report) needed to use the system. The teachers felt that the training they received during the contact sessions aided in their understanding and

confidence in using the system. The UK mentors and teacher 2 felt that the online technical support offered by IRIS Connect was extremely efficient in dealing with any issues with connectivity (during the contact sessions) on the platform (during follow-up).

The teachers all reported that the learners responded positively to the implementation of the equipment and in many cases the presence of the cameras acted as an incentive for the learners to engage in the class. Teacher 1 felt that the behavior of the learners was improved and that he had been able to use the equipment to help maintain discipline in class (teacher 1 telephone interview).

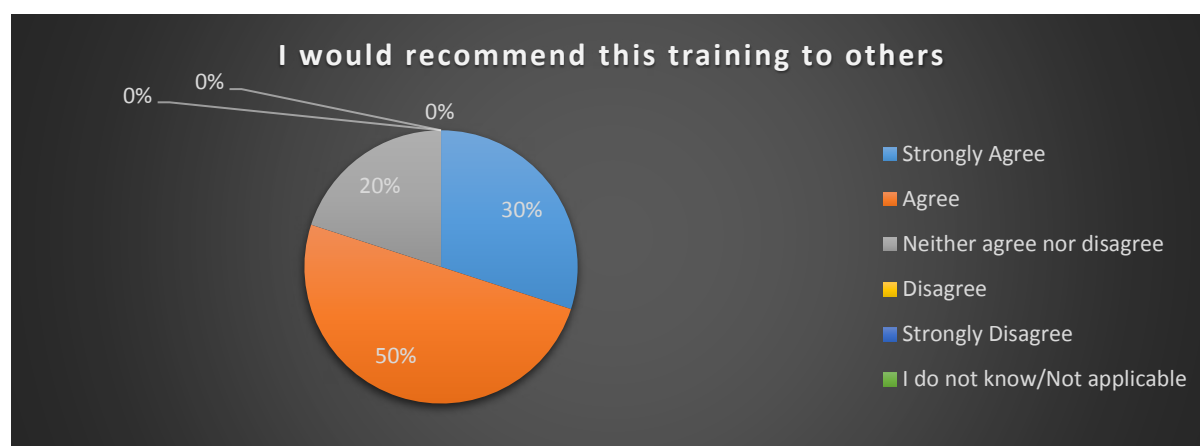
The Teach SA ambassadors showed the most confidence and uptake of the equipment, whereas the more experienced teachers could struggle at times, as Teacher 2 commented,

“Okay, let just say, when I was working with teacher 1 the downsides would be, teacher 1 would sometimes would turn off the *Bluetooth* and then there *would not be* sound and then it won’t share. So those are the tiny things that I would go away to him after he had recommended the lesson I would go to him and say, ‘was your Bluetooth on’, and he’d say ... “no” and then I would have to go back and turn the Bluetooth back on - so those are the downsides (laughs). So, for me, sometimes he would forget to plug in the audio jack and I would say, ‘did you plug in the audio-jack?’ and he’d say, ‘yah, I forgot!’ so then I have to constantly go to him and ask if literally if he has done the connections correctly because he’d forget step by step what you have to do “
(Teacher 2, Teach SA. Telephone Interview)

Teacher 8, teacher 3 and teacher 11 all commented that the equipment took time to set up and that classroom space was often an issue (in overcrowded classes). This, on occasion, cut into teaching time (teacher 3). Teacher 8 said that with continual use and careful planning, he was able to set up the equipment much faster (teacher 8 telephone interview).

In summation, the IRIS Connect system was found to be easy to use by most of the teachers. Some of the more experienced teachers, who lacked basic computer skills and experience using email, struggled more, but were still able to record, send and watch reflections. The system was seen to have great potential by the teachers, in particular for developing and sharing teaching strategies. The administrative problems that for long periods prevented the provision of equipment needed by the teachers to access the internet were felt to have affected the flow of the project and the motivation of teachers to engage, and when it was available on occasion teachers had to upload reflections from other locations (teachers 9, 10, 11, 12). Overall, the IRIS Connect equipment and platform were valued as a training, self-reflection and mentoring tool by the teachers and mentors alike.

[Recommend to others](#)



80% of the teachers 'agreed' or 'strongly agreed' that they would recommend this training to others. The two teachers who 'neither agreed nor disagreed' with this statement had different reasons for this. Teacher 3, felt that the set-up time for the equipment was too long and that it interfered with her teaching time. In addition, lack of internet access restricted her use of the equipment and she was unable to watch and read all of the comments (she has no access to computer or WIFI at home). Teacher 5 felt that the pressure of her first year in post combined with the expectations of the project led to her not being able to clearly see the value in the project for herself at that time. She also felt that although the shared web links her mentor shared were useful, the recordings that she sent to her mentor may not have been adequate for him comment on (teacher 5 telephone interview).

The teachers offered advice to improve the project, these have been coded and grouped into the following six categories,

Advice given by participating teachers	
Planning:	(a) within the yearly teaching timetable (b) to free-up teachers for reflection (c) to have equipment ready when needed (at school/in class).
Security:	Ensure the equipment is safely stored and carefully used
Attitude:	understand why you are doing it - to share practice and improve teaching (not to test teachers or prove that they are the best), keep a positive attitude and embrace the opportunity.
Internet/Connectivity:	(a) government drive to improve data access in schools (mornings only perhaps) (b) trust teacher to handle data bundles so that continuity can be achieved.
Time, frequency of use and participation:	(a) involve more teachers across the school (b) use equipment regularly to familiarize yourself, get use to set up and build confidence (c) more time given to test out the equipment before sharing (d) more time for the project to embed into the school culture.
Mentors:	Need to offer constant support and advice with no gaps (especially for new teachers)

It should be noted that the participating teachers were not aware of many of the reasons for the lack of equipment to access the internet or of how this affected other aspects of the project.

Summary of section two

The participating teachers overall suggested that the following areas had been developed through the training/mentoring project,

Key outcomes given by participating teachers and HoDs
Differentiation: planning and delivering for different abilities and levelling questions for all cognitive abilities
Understanding a learner-centred approach: developing strategies to include more learners in the learning process: questioning; participation; individual support and setting activities
Classroom management: layout of classrooms, behaviour management, movement around the classroom.
Lesson Planning: using different resources away from text book, planning for different learners and levels, timing of lessons and dividing lessons into segments
Adding to pedagogical content knowledge: questioning techniques, differentiation, active learning, drawing on real-life examples and using new resources
Formal & informal assessment: Could provide evidence of teaching practice methods for formal assessment (IQM - inclusion quality mark), provides a forum to view and discuss teaching practice, content development and classroom management within the department (HoD and teachers)
Training: Provided a forum to show new teachers teaching techniques
Self-confidence: reflecting on one's own practice, being able to address areas for improvement in a supportive environment, and seeing progress over time.

Key areas for improvement by teachers were as follows,

Key areas for improvement
Access to computers and the internet: This is essential, but access to computers and internet at home/school would increase the benefits.
Understanding context: strategies and resources suggested to suit the context/capabilities of the individual school/teachers as far as possible (taking into account class sizes and capacity and resources in the schools).

Key suggestions for integration by the teachers were as follows,

Key suggestions for integration
Time allowance: alleviate participating teachers to focus on reflecting and planning (preferably with HoD)
Planning: Plan ahead for maximum usage and uptake - integrate a training plan into the yearly school structure, time to practice and prepare teaching staff for their roles (HoD, new staff, experienced staff etc.)

The case studies provided in section three provide a detailed account of the project from the viewpoint of four of the participating teachers, two newly qualified Teach SA Ambassadors and two experienced teachers.

SECTION 3: Case Studies

The following section provides case studies for four of the participating teachers who participated in the pilot project. These illustrate the process and outcomes for each of the teachers throughout the project. The case studies have been composed using evidence gathered from the teacher-mentor training diaries, pre- and post-project survey data, video footage submitted to the evaluator and telephone interviews with the teachers (where possible). The case studies presented are for two Teach SA Ambassadors and two of the experienced teachers who completed the more than one follow up cycle (selected at random from the cohort).

Case Study 1 - Teacher 8, School D

Introduction

Teacher 8 graduated in Mathematics in 2015/16 and has entered teaching via the Teach South Africa route. He completed the two-week intensive course in teaching (Teach SA), before being appointed to his school as a mathematics teacher. As an inexperienced teacher, teacher 8 wanted support across the board including varying teaching strategies, lesson planning, networking and assessment (baseline assessments). His primary objective for the training was to develop strategies to engage and interest the learners in the subject matter (and improve classroom behaviour). The baseline assessments across the twelve teachers had identified three key areas of focus for the training: developing questioning techniques to assess understanding in learners (including developing more open-questioning); differentiation in the classroom (to produce levelled work for different abilities of learner within the classroom); and exploring methods to engage learners more actively in learning in the classroom to embed knowledge. In addition, in some cases, individual teachers were set additional targets (after classroom observation had taken place).

Contact sessions

During the contact sessions Teacher 8 worked with mentor 1. Mentor 1 and Teacher 8 kept a training diary that recorded their progress over the week. Through classroom observations Mentor 1 identified some other areas that Teacher 8 could work on. These were identified as: classroom layout; board discipline; sequence of question that support concept development; and providing a range of explanations and examples to embed knowledge. Teacher 8 had a number of strengths which included a passion and enthusiasm for teaching and the subject, good classroom presence, IT awareness and willingness to learn and develop networks with other teachers.

Teacher 8 was very proficient in understanding and working the IRIS Connect equipment and was confident in his use by the end of the training sessions. He commented,

“it is an easy process and it gives the feeling that someone (myself) is looking at me, and I will want to do good on the camera, because I wouldn’t want to disappoint myself when I watch it”

(Teacher 8, Day two, Training diary)

Teacher 8 felt that by recording and viewing his performance he would push himself to perform better as a teacher. He also commented that the presence of the camera in class may have a positive effect on the learners,

“using the camera to make them want to participate more since they will be in the video. Making learners feel more appreciated and respected might make them want to return the favour”

(Teacher 8, Day two, training diary)

Teacher 8 felt that there was potential in the IRIS Connect system, not just for his own professional development, but as an incentive for the learners to feel *valued* within class.

Reflecting on the footage, Teacher 8 was able to see the value in not just discussing his teaching method, but actually being able to show others and receive feedback (day three, training diary). He commented,

“It was so amazing to be able to look at myself teach. I could always judge myself accordingly to how I hear myself in my mind, but now I get a chance to actually look at myself as I explain about my teaching”

(Teacher 8, Day three, training diary)

By reviewing his performance in class (with the UK mentor), Teacher 8 was able to see the strengths of his approach, and identify areas for improvement in his teaching style and classroom management. The UK mentor and the SA Head of Department (non-maths) both highlighted the layout of the classroom as an area that could be improved upon. The baseline recording showed that the majority of the class had congregated at the rear of the classroom making it difficult for the teacher to circulate around the room and track engagement and behaviour of the learners (see figures below). Through the process of self-reflection and peer mentoring using IRIS Connect Teacher 8 also commented,

“I have learned that I need to give the learners more time to answer questions that I ask, and the camera needs to be a bit closer to the board so that I, and the people that I share with, can see if there are errors or things that need more clarity”

(Teacher 8, Day 2, training diary)

By day two, Teacher 8 was self-reflecting on his own teaching using the IRIS Connect system. A head of department within the school also offered support during the contact sessions and was able to comment on one of Teacher 8's reflections.

Progress - contact sessions to follow-up sessions.

Teacher 8 was keen to use the equipment and was able to record a total of 3 reflections (during the contact week), and a further 10 reflections subsequently (note: the issues with equipment and connectivity halted the project at times, therefore the total project time was

extended leading to resumed activity by some teachers - explained further in the monitoring report). Close review of these submissions was undertaken by the UK mentor (who was able to comment on five reflections with a total of 102 individual comments). Analysis of the outcomes and impacts looking specifically at the changes/developments in Teacher 8's teaching in terms of the key aims and indicators identified was undertaken by the UK evaluator. These will be discussed in the following sections.

One of the key areas that Teacher 8 wanted to develop was how to engage learners who are presenting as not interested or are disruptive within the classroom. Initially, Teacher 8 felt that, 'most of the learners are not interested in learning. They come to school because they have no choice' (Page 10, training diary). He felt that the presence of the camera would be an incentive for the learners to engage in lessons (see above). The UK mentor wanted to show Teacher 8 where he could try to engage the learners in the class with his delivery methods rather than rely on the camera (where novelty would eventually fade). The focus points of his training were:

- To use **questioning techniques** to be more inclusive by involving the learners in class discussion. Using open-questions to encourage learners to understand the principles of the lesson and develop deeper-thinking skills in the learners.
- To **involve learners** in explanations and discussions (in class and up at the chalk board)
- To Improve **chalk board discipline** for clarity and sequencing of ideas (also aiding in concept development and differentiation)
- To use **differentiation** in class to level learning for individual learners. To provide a **range of examples** to engage different types of learners/types of understanding.
- To give **Personal attention to learners**. To involve learners individually including addressing them individually by name, travelling around the classroom helping and enthusing the learners and encouraging them to lead the learning at the chalk board (also including: setting and marking homework).
- **Classroom organisation and discipline** (sanctions and rewards)

Teacher 8's progress in these focus points are discussed below.

Questioning Techniques and Explanations

Teacher 8 had felt reasonably confident that he used questions that enabled understanding and provoked discussion (detailed baseline), however, he had not heard of the term 'open questioning' (first baseline) which reflected his limited training in teaching pedagogy. Teacher 8's first reflection taken during the contact session and observations by the UK mentor showed that he used a range of questioning techniques, but that 'closed' and 'consensus agreement' (yes/no) type questions were the most common. The district leads had also identified this practice as a wider issue across many teachers in the area; they noted that the learners often said 'yes' even if they did not understand (scoping visit). Initially, Teacher 8 provided few attempts to extract further information from individual learners (who volunteered themselves to the chalkboard), with little attempt to establish understanding across the whole class. The mentor wanted to work on using questioning techniques so that the learners were challenged more to think about *why* and *how* they

reached the answers they did, rather than just stating the answers or using consensus agreement. It was also felt that the learners could get more actively involved in the learning process and not be passive observers of a lesson by explaining their answers on the chalk board.

Throughout the contact session Teacher 8 tried to integrate more open and challenging questions into his classes. The comment below reflects on his first impressions of watching himself and reviewing his practice (with the mentor),

“(I need to) use different methods to explain my lessons if the learners don’t get the kind of technique that I give them. Taking time and looking at learner’s opinions and asking them how they get the answer before I show them the correct one”

(Teacher 8, Training diary, Day three)

With encouragement and contact session training and comments from the mentor, Teacher 8 moved towards a more participatory style of teaching whereby the learners were encouraged to come up to the chalkboard to demonstrate their answers. The mentor commented on the baseline submission,

“Keep making the learners explain. It really helps them to understand. What is the answer? Can you explain why? Keep asking this”

(Comment from Mentor 17/05/16)

In his next submission, Teacher 8 shows that he has integrated some of these suggestions. He is shown to ask the class, “which one is negative” the class respond, “3” Teacher 8 then challenges the classes understanding and asks the class “why?” (Submission 1 cycle 1). This challenges the learners to think more about the method and also allows the teacher to do a quick assessment of the understanding of the class. His mentor responded,

“Brilliant! Which one is negative? Why? Great to ask them to explain”

(Comment from Mentor 26/07/16)

In addition to encouraging deeper understanding amongst the learners, allowing them to participate more in class and challenging them to engage also had an impact on their behaviour in class, it was noted that, “the class is much more settled when you ask them questions and include them in your explanations” (comment from mentor 26/07/16). In this submission, Teacher 8 does not ask any learners to the chalkboard, his mentor asks, “what do you think would happen if you asked a learner to come to the board to write? Do you think they would listen well and watch them?” (comment from mentor 26/07/16).

From Teacher 8’s next submission (financial maths - 25/10/16), he attempts to engage a learner in coming up to the chalkboard to solve a problem. However, she is reluctant to travel to the front of the class and solves the problem from her desk with Teacher 8 writing on the board (at 9 minutes 30 seconds on 25/10/16). The rest of the class do not respond actively in listening to this explanation. In the following submission of a grade 8 class (27/07/16), Teacher 8 has more success in getting a learner to the chalk board and engages

a learner within the first two minutes of class, this has a positive effect on the class, who are focused and listening to the learner at the board. However, Teacher 8 does not ask the learner to explain her workings or why she approached the question in the way she did. By seven minutes into this lesson, the class are animated and excited to be taking such an active role in the lesson. At 10 minutes 40 seconds one girl jumps up to try to solve the example. She hurriedly explains the answer to Teacher 8 and the class whoop with joy and applaud. By creating a positive atmosphere, the learners were seen to be more invested in the lesson (from camera two).

In Teacher 8's next two submissions he focuses more on teacher explanation (using mainly closed questions) followed by active classwork. In these submissions, no learners come up to the chalkboard, but all learners are engaged in classwork that Teacher 8 has pre-prepared on the chalkboard. A combination of short explanations (using closed questions) followed by trying out examples in their textbooks seems to work well to keep discipline and interest throughout the class. Using this method, Teacher 8 is able to move around the class helping learners individually, challenging individual learners and making quick assessments of their understanding and progress. Teacher 8 uses the cameras well here, travelling around the class with a camera to show the learners workings in their exercise books.

Although Teacher 8 makes some progress throughout the mentoring in assessing his learners' understanding through closed questions, he is beginning to use more open-questioning from time to time, however he makes good use of closed-questions to keep the class engaged and he reduces his use of 'agreement questions' throughout the submissions. He also makes progress in asking learners to the chalk board to show their answers, but he does not ask them to *explain* their workings to the class.

Classroom Layout

The baseline footage demonstrated that the physical layout of the classroom could be contributing to the lack of participation that Teacher 8 had noticed. Initially, the majority of the chairs and desks had been predominantly located at the rear of the classroom. This resulted in a large number of, mainly male learners, congregating at the back of the classroom. It also meant that Teacher 8 could not travel around the room with sufficiency, especially toward the back of the classroom (See figure X).



Figure 3: The baseline submission shows desks and learners grouped at the back of the class furthest away from the chalkboard (May 2016).

Advice from the mentor and head of department suggested that Teacher 8 take more control of the layout of the classroom (where possible - some classes can have upwards of 40+ learners in them).

Subsequent submissions showed a better organised class layout where Teacher 8 could easily patrol the room and help learners when needed,



Figure 4: Shows a more manageable and well distributed classroom layout (February 2017)

The mentor commented,

“the layout of your room is much better and you walked down the rows to challenge learners more than you did” (mentor comment 26/07/16)

Chalkboard discipline

Board discipline was highlighted as an area for improvement for Teacher 8 during the contact sessions with the UK mentor. The UK mentor used the reflections that Teacher 8

sent to highlight good practice in chalk board use and to show how its clarity and structure can help the learners to understand and follow the sequence of maths that has been displayed. He guided Teacher 8 to improve his board discipline, legibility and preparation. The figures below demonstrate this process,



Figure 5: Teacher 8's chalk board from the contact sessions (May 2016) was not sequential or clear for the learners to follow, the writing was small and Teacher 8 filled in small spaces on the board to write up examples. He did not pre-write examples on the board.



Figure 6: Teacher 8's chalkboard from mid-training (July 2016) showed improvements in the size of writing and beginning to sequence the board, however as the lesson progressed board discipline slipped..

The mentor commented,

"Are there other ways you can start the lesson to get the learners thinking and quiet straight away? Could you write the text book page instructions on the board already so that they know what to do immediately? Could you write a simple question on the board that they should start as soon as they sit down?"

"Your board work is clearer than it used to be. Well done. Is this your classroom? Can you wipe the board with a damp cloth one day to get rid of the chalk dust? It may help to make things even clearer"

(comment from mentor 27/07/16)

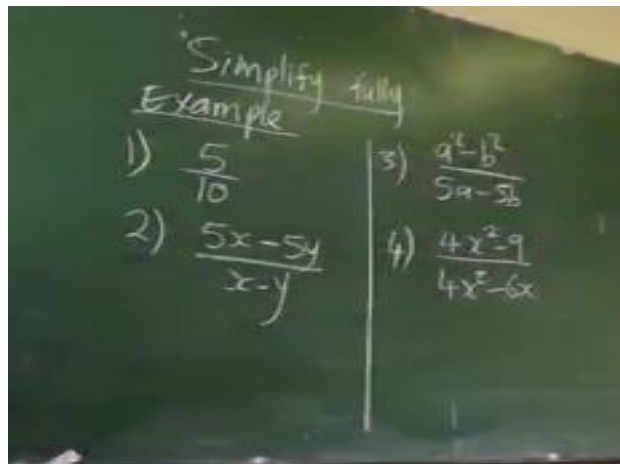


Figure 7: Following the mentor's advice Teacher 8's chalkboard has been cleaned and pre-prepared before the start of the class (differentiation also can be seen here) (09/02/17)

The mentor commented,

"Wow! The board looks very clear, the class looks very organised and the learners are very focused. Well done! Such a difference from the last video!... Your board is clean, your writing is big and clear and the questions increase in difficulty really well. (...) I think you could write the questions across the top of the board, spaced across the whole width of it and then do workings down from the questions. It makes it even clearer, keeps the work high up so that the learners at the back can see it without it being blocked by heads in front".

(comment from mentor (09/02/16))

Following the mentor's advice, the photo below demonstrates that Teacher 8 has prewritten the examples across the top of the board so that the learners can do their workings in a sequential manner from right to left across the board.

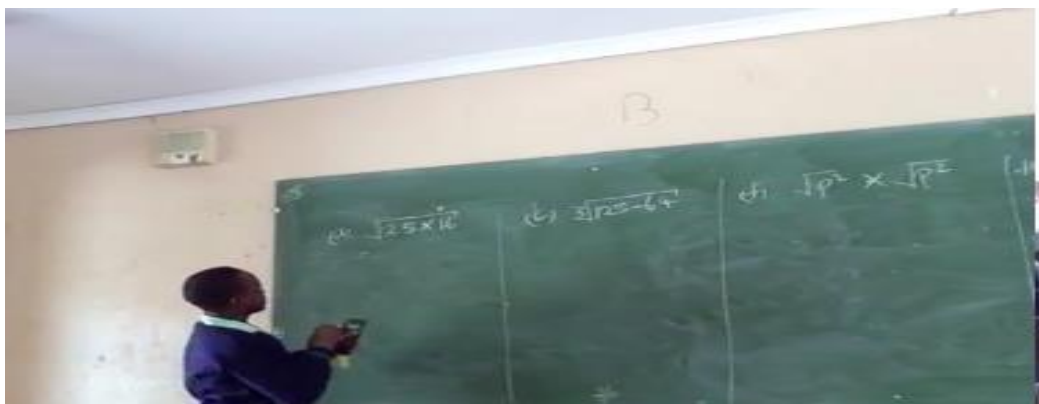


Figure 8: The examples have now been pre-written before class and set across the top of the board from left to right so that learners have space to present their workings clearly to the class.

From the observations of Teacher 8's video footage, the improvements in the chalkboard resulted in a clearer understanding of what the learners had to do, and added excitement and eagerness for the learners to become active in the lessons. Through his work on organization, Teacher 8 was also able to improve classroom behavior (see below) and bring a more positive attitude towards participation. Teacher 8 commented that at first the learners took a while to get used to the new layout, but once the class progressed the learners were enthused to take part and determined to get the answers right, "they all wanted to attack me with their determination to get it right" (Whats app communication between Teacher 8 and his mentor).

Differentiation

Differentiation was identified as an issue for all of the teachers. The large class sizes, lack of resources and policy of non-segregation in schools created a challenge for the UK mentors. Differentiation by question was discussed with Teacher 8 as a way that he could structure differentiation in class using the traffic light system. This was slowly introduced to Teacher 8 and was aided by a training video presented by and uploaded by his mentor (31/01/17). The mentor started by addressing Teacher 8's choice of examples. In the submission from the 26/07/16 the mentor comments on his movement from easy to hard questions without levelling or providing a logical progression/sequence,

"You move from question to question quite quickly and the questions are all different. Does every learner understand Q1 before you move to Q2? Could you find a question that is the same type as Q1 and when you finish your explanation and demonstration, you could then ask the learners to try a different, but very similar example? Some of the learners struggle to keep up and then they are the ones who switch off and become noisy. It is also really helpful to give the learners a chance to practice the skill you taught them before moving on to a new one"

(comment from mentor 26/07/16).

The next submission (12/08/16) shows that Teacher 8 has tried to integrate this into his practice, the mentor comments,

"What I like most in this lesson is the way that you talked a bit less and made the learners do more examples in the second half of the video. You also walked around the room, patrolling the learners and made sure you checked whether or not they understood. This was really good. They listened to you best when you made them do an example, they got stuck because they didn't understand, you spotted that when you walked around and then explained it to the whole class. They listened well because they had tried and failed. This meant that they really wanted to know how to do it so listened hard when you explained"

(Comment from mentor, 12/08/16)

A training film was uploaded by the mentor on the 31st January which explained and showed how to plan and set out differentiated questions on the chalkboard. Teacher 8's last two submissions (09/02/17 and 16/02/17) show him attempting to integrate this technique of differentiation by question into his classroom practice by preparing levelled questions that build up skill and knowledge in stages (see figures 7 and 8 above for a visual representation). Although, the submissions do not show him using the traffic light system in grouping his learners (note: this might be difficult to tell by watching the footage). Teacher 8 is attempting to both build-up the knowledge and difficulty in stages and allowing more advanced learners to attempt the more difficult questions if they are able. The learners respond well to the challenge and the footage shows that four/five volunteer to go up to the chalkboard to solve the sums straight away (a difference from Teacher 8's first submissions where he could not persuade the learners to the board).

Engaging learners and Personal attention for the learners

The contact sessions identified that lessons were predominantly passive experiences, where the learners were expected to listen to the teacher for upwards of 20-30 minutes with no activity. Teacher 8's first submissions demonstrated a similar pattern with the start to classes being dominated by teacher talk for on average 20 minutes (see submissions from May, July and August), this sometimes resulted in a lot of learner chatter and lack of focus (shown on camera 2). Following advice given by the mentor, the subsequent submissions showed a change in the structure of the class, whereby Teacher 8 gave shorter explanations and set the learners to work earlier on in the class, tackling issues if they arose. This was seen to have an impact on the focus and behaviour of the learners on the second camera.

Teacher 8 also progresses well in developing his personal attention to the learners and showed improvements in the time spent going around the class helping individual learners. Teacher 8 used this time to identify common mistakes that the learners were making and he was able to bring these to the chalkboard to explain to the rest of the class.

Teacher 8's response to the training/mentoring experience.

A telephone interview with Teacher 8 took place on the 10th March 2017. He gave very positive comments about his experience of the training/mentoring and how this has enabled him to try new ideas and develop as a teacher. For Teacher 8, it was the support and encouragement that the mentor provided that made the difference to the experience,

"Some of the things that he told me are the things that I have thought about, but it is just that I didn't know how to implement them. So, he gave me ideas on how I can make that happen because sometimes you can find yourself pushing the learners away and not drawing them in. So my mentor gave me a lot of tips on how to (do that) ... for my learners. The teaching concepts ... which is something that is what I needed.(...). I felt like he was **helping** me and **not teaching me** and that is what I liked, so... I think for me, that is what worked well"

(Teacher 8, telephone interview March 2017)

The relationship between the mentor and teachers had developed throughout the project, and was aided by the week's contact session. Teacher 8 felt that he would like the mentoring to continue past the life of the project and enquired how this might be done. He felt that although the self-reflection aspect of the system was valuable it was the mentor's comments that had the biggest influence on his teaching,

"I think that videoing yourself and being able to look at yourself that helps, but it is the comments and everything that make a difference. If you have someone to mentor or comment on you - it takes a lot of courage (from the teacher to record and share)"

(Teacher 8, telephone interview March 2017)

He also saw the potential in sharing with other teachers, especially those that are in the same position as himself (i.e. ambassadors)

"I think that it would have most impact when you share with others for example, with the ambassadors. There becomes a problem if you are not able to share, if someone does not feel comfortable sharing"

(Teacher 8, telephone interview March 2017)

Teacher 8 shared some of his reflections with three other ambassadors on the 11th March 2017.

For the longevity of the project and potential roll-out, Teacher 8 felt that they key to future success lay in the confidence of the teacher to record and share their teachings in a true sense (his words, *"be yourself"*).

"...it takes a lot of courage. When I saw myself the first time I was like "oh!" *laughs* "goodness me!", but after a while I got used to the camera and, yah. I got a lot of courage from Mentor 1 because each video that I sent him, there was something that I did, that I didn't do the last time, so every time when I am teaching I'll send him and he'll say something that I didn't do and then he will get me to try that and then I will realise how I can make it"

(Teacher 8, telephone interview March 2017)

In conclusion, Teacher 8 made significant progress in his classroom management, chalk board discipline and implementing active learning in his classes which in turn, lead to better relations with his learners and improved behavior. Teacher 8 developed a strong bond with his mentor and built up confidence over time to make changes in his teaching strategies and planning. Teacher 8 was keen to continue the mentoring past the life of the project as he can see the impact that

it has made to his confidence and teaching methods. Further development is still needed in other key areas identified by the project, such as open-questioning and drawing on a range of resources to explain and expand understanding.

Case Study 2 - Teacher 1, School A

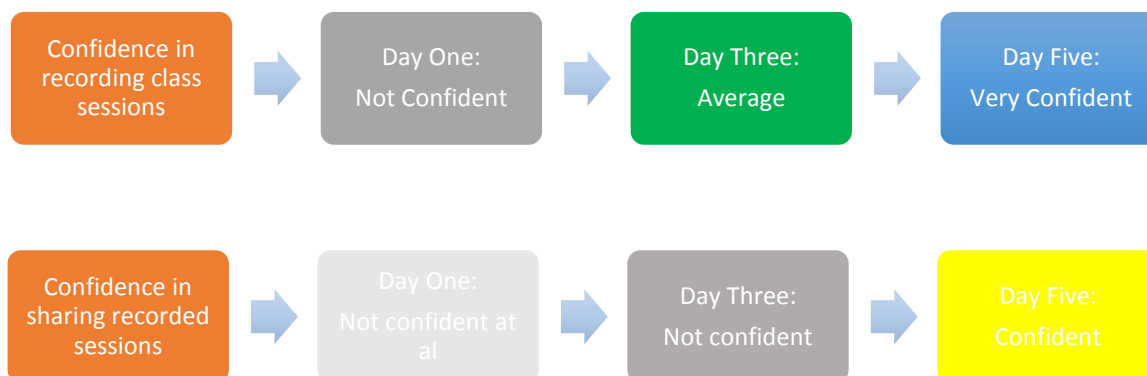
Introduction

Teacher 1 is an experienced mathematics teacher of sixteen years with a well-developed subject knowledge. Teacher 1 completed the detailed baseline questionnaire. This demonstrated that he has confidence in his networking and managing assessment, but did not feel as confident in moving away from the text-books and using other resources. He cites additional reasons that are preventing this are, lack of screens in classroom (whiteboard or computer), lack of chairs and furniture in class and over-crowding of classrooms. Teacher 1 was not confident or experienced in using technology/computers so was apprehensive about his ability to use the new IRIS Connect equipment. The baseline assessments across the twelve teachers had identified three key areas of focus for the training: developing questioning techniques to assess understanding in learners (including developing more open-questioning); differentiation in the classroom (to produce levelled work for different abilities of learner within the classroom); and exploring methods to engage learners more actively in learning in the classroom to embed knowledge. In addition, in some cases individual teachers were set additional targets (after classroom observation had taken place).

Contact sessions

During the contact sessions Teacher 1 worked with mentor 2. Classroom observations were undertaken during the contact session in May 2016. Mentor 2 observed that Teacher 1 had very good subject knowledge and a good command of the class. He had a willingness to take on new ideas and was keen to develop further networks to support teaching (training diary, page 1). However, his classes were very traditional with the teacher leading the lesson at the front of the class and little interaction from the learners. The mentor felt that the learners needed to be more involved in the class and be encouraged to explain their understanding of the mathematics to embed their knowledge. The mentor suggested introducing differentiation during class activities would benefit the learners. In addition, Teacher 1 was advised to develop a better rapport with the learners - using names and good eye-contact to engage individual learners. Teacher 1 and Mentor 2 kept a training diary throughout the weeks training to record progress.

Teacher 1 was able to record and share two sessions during the contact sessions. He was able to reflect on of these with the UK trainers. Teacher 1's confidence in using the IRIS Connect system grew throughout the week, and he was able to record and upload footage himself. Teacher 1 recorded his confidence in using the equipment over the course of the week,



It should be noted that Teacher 1 was not provided with equipment with which to access the internet during the project and could only do so by arranging to borrow equipment from others during school hours. This limited his ability to familiarize himself with the system or to access online support. Unfortunately, additional administrative problems during the contact sessions also limited the progress that could be made during the weeks training (see monitoring report). There were some audio problems and issues with the swivel function of the camera (recorded in the diaries). Teacher 1 captured a class and was keen to play it back to the learners, however due to incorrect set up of the cameras the audio was not working for this recording (day five, training diary). By day two Teacher 1's confidence in using the IRIS Connect system had grown, he commented,

"I am feeling totally confident when using the apparatus. I can operate them and only a little 'knowledge of practice' is required " (day two, training diary)

The initial fear of using the camera and recording himself soon dissipated as he got more use to the camera and felt invested in the project,

"when filming myself, initially I was so scared because it was the first time to use those apparatus, and as the time goes on, I started enjoying everything and hoping to have such technology inside my classrooms so that I can share my experience with other educators around the world" (day two, training diary)

Teacher 1 also felt that the learners responded positively to the camera, and that it had an impact on learner engagement and behaviour, he commented, 'learners were so happy and feeling comfortable as they use those apparatus' (day two, training diary). On day three the UK trainer feels that Teacher 1 can adequately set up and record sessions with the IRIS Connect system and, 'is realising the potential of developing his use to inform his teaching' (UK mentor, day three, training diary). However, on day four, there is still problems in Teacher 1 being able to review his footage (due to lack of time in the school day and heavy timetabling commitments and no availability of Wi-Fi at home). The shared footage showed that Teacher 1 was able to use the equipment, and demonstrated that he understood that the IRIS Connect necklace (with mic.) needed to be passed to the learners when they were at the board.

In reflecting on his recordings, Teacher 1 was able to acknowledge his lack of movement around the class (he was generally at the front of the class at the board). The reflections with his mentor showed Teacher 1 that moving around the class more will engage the learners and help to ensure higher engagement levels. Training was provided on differentiation techniques in class and questioning (see below).

Teacher 1 felt that the presence of the cameras in class was having a positive effect on the learner's behaviour and active attention during class (day one). This effect continued throughout the week, by day four Teacher 1 comments that the camera 'fosters strong discipline in the learners'. On day five, Teacher 1 felt that learner behaviour was beginning to change and that saved a lot of time and allowed focus and active participation on the topic (day five, training diary). The mentor was keen to show that by adapting his teaching methods to include more active learning and by implementing differentiation, this could also have similar effects on the learner's behaviour (as the novelty of the camera would eventually fade).

The topics discussed during the contact session training covered the following areas: overall classroom practice (including movement around class); group work; questioning techniques; differentiation of learner's activities; using resources to be more creative in the classroom (video starters, maths games and quizzes), and concept development (summary/planning).

During the contact sessions Teacher 1 shared footage with the UK trainer and evaluator.

Progress from contact session to follow-up sessions

Teacher 1 recorded a total of two reflections during the contact sessions and a further two reflections in February 2017 (completing two cycles). The delay in using the system appears to have been mainly due to not having ready access to equipment to get online. Close review of these submissions was undertaken by the UK mentor (who was able to comment on the four reflections with a total of 38 individual comments). Analysis of the outcomes and impacts looking specifically at the changes/developments in Teacher 1's teaching in terms of the key aims and indicators identified was undertaken by the UK evaluator. These will be discussed in the following sections.

Questioning Techniques and Explanations

The baseline data indicated that Teacher 1 was quite confident that he used questioning in class to help develop learners understanding and provoke discussion, however, in the classroom observations undertaken by mentor 2 it was clear that Teacher 1 used mainly closed questions and did not always encourage learner interactions in the classroom. The mentor suggested that Teacher 1 use more open questions and learner interaction/explanation at the board to enthuse and include learners in the learning process and show that they have greater knowledge and understanding of the math's topic.

Teacher 1 was keen to use these techniques and from his first submission (during the contact training), Teacher 1 is integrating the suggestions into his classroom practice. The extract below shows how Teacher 1 makes good use of questions that challenge the learners on their understanding of the terms and processes,

“Before I carry on I want to find out what the class understand by factorisation, do you know the meaning of the word or the definition of factorisations?” Teacher 1 asks the class to raise up their hand if they know. He repeats the question and allows time for the learners to respond. No one responds, so Teacher 1 picks a boy from the front. He tries an answer, Teacher 1 says, “not exactly” and asks for another volunteer. She responds (unclear on the mic, but she responds correctly), Teacher 1 responds by saying, ‘factorisation is the reverse process of finding the product’. He reinforces this by now writing it on the board. He checks their understanding further by asking, ‘**what** is the meaning of the word product?’” (extract from 27/05/16 reflection).

The second reflection shows Teacher 1 involving learners at the chalkboard and challenging the class to participate by asking the class if the learner has reached the correct answer, when they respond ‘no’, Teacher 1 challenges their understanding by asking ‘where has she gone wrong?’, the class then respond. The mentor acknowledges his progression in the comments. In his third and fourth submission, Teacher 1 shows how he is continuing to use a combination of closed, open and agreement questions to formatively assess understanding within the class and challenge learners on their understanding. However, the mentor’s comments challenges Teacher 1 to go further in allowing the learners to time to think and reflect on their understanding within class.

The table below provides an analysis of the amount of closed, open and agreement questions that teacher 1 made during the recorded submissions made to the evaluator,

Cycle	Number of closed questions	Number of open questions	Number of agreement questions
Contact session x 1	5	4	3
Contact session x 2	1	4	5
Cycle 1	13	7	3
Cycle 2	3	3	2

The above table shows the increased number of open questions used by teacher 1 over the course of the project (note: cycle 2 was mainly learners at the board with facilitation by the teacher, hence there is a fewer number of total questions, but longer time required to answer open-questions).

Teacher 1 made good progress in integrating more open and explanation questions into his class, and used questions to develop, explore and embed knowledge. He has also shown that he can manage learners at the chalkboard and encourage explanation and challenge from the class. With further mentoring this could be further developed to encourage Teacher 1 to find ways to engage the learners and allow them to discuss and reflect on their understanding of the maths concepts.

Differentiation

Differentiation was identified as a key area of focus for all of the teachers. The large class sizes, lack of resources and policy of non-segregation in schools created a challenge for the UK mentors. Differentiation by question was discussed with Teacher 1 as a way that he could structure differentiation in class using the traffic light system (explained above). This allows the teachers to identify the learners who may require additional support and challenges those that are at the higher level and can help structure peer-to-peer support.

Teacher 1 understood this method and could see how it could work in the classroom. He felt that it, 'helps us to group our kids according to their abilities; and hence fosters competitions and active participants' (day two, training diary). By day three the mentor notes that Teacher 1 is attempting to group his learners, but that the large class sizes and lack of space (and furniture) is challenging (UK mentor, day three, training diary). The mentor comments,

"Teacher 1 is taking on board the ideas of how to improve his teaching. He is keen to arrange his learners in groups and make differentiation of the activities and examples more widely available so that his learners feel more included and ultimately benefit"

(UK trainer Day three, training diary)

The follow-up submissions do not clearly evidence that Teacher 1 has successfully integrated differentiation in the classroom (note: this was the aim for cycle 3 - not reached by Teacher 1) however, in one of the submissions we see Teacher 1 has written a number of examples onto the chalkboard for the class to try,



Figure 9: Teacher prepared chalkboard with levelled examples for the learners

His mentor advises,

"the learners are all working through the same problems you could try arranging the learners into groups and give them different problems on the basis of Red, Amber &

Green groups”

(Comment from Mentor 2, 06/02/17)

Teacher 1 felt that he still had some progress to make in differentiating his learners, however he understood the concepts and ideas and had started to use these in some of his classes (teacher 1 telephone interview and post-project survey).

Engaging learners and Personal attention for the learners

The contact sessions identified that many of the lessons were predominantly passive experiences, where the learners were expected to listen to the teacher for upwards of 20-30 minutes with no activity or little activity (or activities happening much later in the class). The advice given by the mentor was aimed at encouraging more learner interactions and activity throughout the class to keep them engaged and to manage learner behaviour. Teacher 1 achieved a better balance of passive to active learning in his class by integrating more learners at the chalkboard, dividing the lesson up into sections of listening and then class work and keeping learners active in multiple questioning (using a range of closed and open questions). The table below presents the results of the analysis of active to passive learning from teacher 1’s submissions to the evaluator,

Contact session x 1	37%	63%
Contact session x 2	31%	69%
Cycle 1	74%	26%
Cycle 2	0%	100%

The later submissions show that Teacher 1 has made some inroads in using better eye-contact with the learners and shows good support of the learners at the chalk board (although single-camera recordings make this difficult to assess fully - see below ‘technical issues’)

Technical issues

Teacher 1 felt reasonably confident with the IRIS Connect equipment at the end of the contact sessions, however all his submissions are single-camera only and therefore show he had not understood how to correctly set up the cameras. Teacher 2, at the same school, mentioned that Teacher 1 often forgot how to set up the equipment properly, Bluetooth not switched on or no sound cable connected (Teacher 2 interview March 2017). She often had to offer support to Teacher 1 on setting up the equipment.

Teacher 1’s response to the training/mentoring experience

Teacher 1 had enjoyed the experience of being included in the pilot project, he felt that the overall experience had made him feel more self-confident about his role as a teacher. He also suggested that the mentoring had offered valuable support and advice to guide his teaching. He had noticed positive changes in learners’ behavior and participation rates even towards the end of the project. Teacher 1 made considerable progress in developing a more active and learner-centered classroom and using more open-questions to embed

knowledge. Progress needs to be focused on implementing a workable differentiation strategy in class.

Case Study 3 - Teacher 3, school B

Introduction

Teacher 3 is an experienced Mathematics teacher with 15 years of experience in teaching. She completed both baseline questionnaires. These highlighted her confidence in lesson planning, managing homework and managing assessment. They also called to attention her need to vary her teaching strategies especially when supporting explanations using visual aids and small group learning. Her typical modus operandi for classroom lessons was stated as, 'question, answer question' - this leaves little room for explanations and questioning pupils for their understanding. She also lacked confidence in networking across the wider school, with other schools and the district. Teacher 3's main aim for the training was to, 'better her teaching style to help increase her pass percentage'. The baseline assessments across the twelve teachers had identified three key areas of focus for the training: developing questioning techniques to assess understanding in learners (including developing more open-questioning); differentiation in the classroom (to produce levelled work for different abilities of learner within the classroom); and exploring methods to engage learners more actively in learning in the classroom to embed knowledge. In addition, in some cases individual teachers were set additional targets (after classroom observation had taken place).

Contact Sessions

During the contact sessions Teacher 3 worked with mentor 2. A training diary was kept all week to record progress and reflections on the training. Teacher 3 was observed to have good subject knowledge and was keen to use the system and learn about new teaching strategies. The classroom observations also identified the following areas that Teacher 3 could work: planning for concept development in class, seating plan and behaviour management, using differentiation (by task or group) and developing questioning techniques to establish understanding (introducing open-questioning rather than closed) to include learners more in the learning process.

During the contact sessions equipment needed to access the internet was not provided to participating teachers at school B, and this meant that although recordings were able to be taken, upload and reflection was not possible for the whole week. This was frustrating for the UK trainers and SA teachers alike. However, Teacher 3 was able to practice setting-up the equipment and recording her class. Mentor 2 was able to upload and reflect on one of Teacher 3's recordings by day four (using slow connection at his hotel), this was viewed by Teacher 3 on her phone (using her own data).

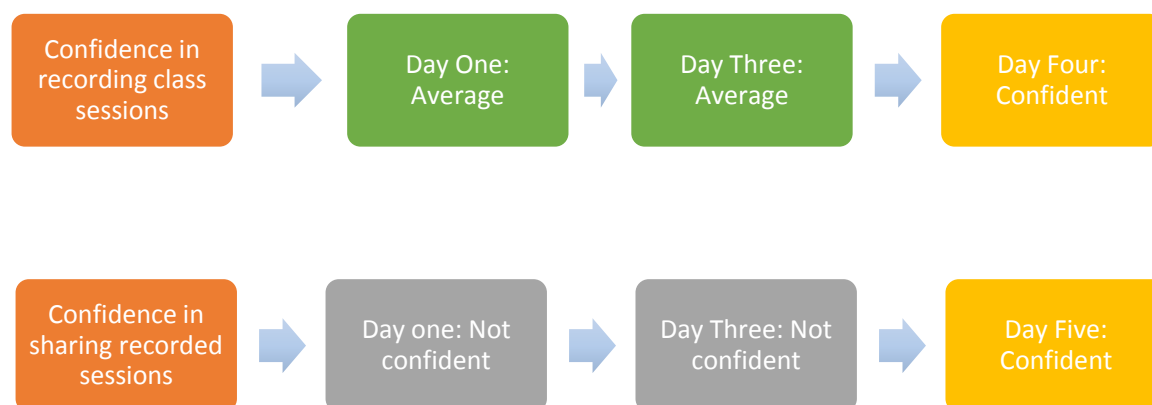
Teacher 3 was enthusiastic about trying the IRIS Connect system and was shown, on day one, how to use the system (using Mentor 2's computer). By day two, Teacher 3 tried to

operate the system, but needed additional support from Mentor 2 until she was fluent in switching the cameras on and off (training diary, day 2). Although she was able to set-up the equipment, Teacher 3 was limited in practicing and using the system due to the necessary equipment not being provided. On day four, Teacher 3 was able to pair the cameras herself and was able to view part of her recording on her mobile phone (using her own data). By day five, she felt more confident in her ability to use the equipment and also in sharing with others. She comments,

“I can set up the camera myself now. My videos might even help younger teachers to teach in their own classroom. My reflections will help me to reflect on my lessons - the good, and the bad, practice”

(Teacher 3, Day Five, Training Diary)

Teacher 3 recorded her confidence on using the system in the training diary,



The mentor was able to discuss using different teaching styles and learning styles in class, using more open rather than closed questions with learners and using paired or group work to alter the learning style and encourage peer to peer work and the use of resources to support work (away from the textbook definitions)

Progress - Contact sessions to follow-up sessions

The lack of equipment to access the internet hampered the progress of school B initially, and no reflections were uploaded from the contact sessions. Teacher 3 was eventually able to send a total of three reflections. Close review of these submissions was undertaken by the UK mentor 2 (who was able to comment on three reflections with a total of 11 individual comments). Analysis of the outcomes and impacts looking specifically at the changes/developments in Teacher 3's teaching in terms of the key aims and indicators identified was undertaken by the UK evaluator. These will be discussed in the following sections.

Questioning techniques and explanations

The contact session observations noted that Teacher 3's lessons were focused heavily on the text-book and up-coming exams and were fast paced. Although Teacher 3 used questioning with her learners, most of these were closed (Q&A style) questions that failed to capture the learners understanding or act as an assessment of understanding for the teacher. There was limited evidence of engagement with the learners (training diary, page 2). Mentor 2's training focused on questioning techniques - using open-questions to gauge understanding. These have a dual function of expanding the learners understanding of the concepts (and not just the answers) and are a method of engaging the learners to be part of the lesson. It was noted that Teacher 3's lessons were teacher-led rather than learner-led (Mentor 2, Day one, Training diary). On day three of the training diary Teacher 3 noted that one of her targets was to 'engage the learners, most of the work to be done by the learners and not by me' (Teacher 3, Day Three, Training dairy). Mentor 2 also discussed engaging ways to start lessons and using resources to engage the learners further and aid in explanations (this included a more robust use of the whiteboard as a resource as well as a writing board). Mentor 2 also suggested that using real-life explanations can help learners to understand and grasp concepts better (moving away from the pre-defined text-book explanations).

The evidence presented in her follow-up submissions shows a progression in Teacher 3's use and understanding of open questioning, and her continued use of learners explaining their understanding to the class.

In her first submission, she attempts to encourage a deeper understanding by challenging a learner at the board. Below is a summary extract from this reflection,

- 4:05 The teacher encourages a learner to come up to the board (they are a bit reluctant at first) but with positive encouragement from teacher she comes up. Learner is smiling and so are the class (class clearly want to hear her, and one girl 'shhh's' the class so that she can hear her friend)
- 4:26 The teacher asks the learner at the board to talk and explain to the class. Teacher asks, "you want the Pythagoras theorem here **how** do you get the Pythagoras Theorem here?" The pupil at the front attempts to answer - the class are focused, quiet and listening carefully. The teacher then takes over the explanation with more closed questions to the class.

Her next submission showed that she has continued this process of learner inclusion at the very start of the class.



Figure 10: A learner at the chalkboard explaining her workings

The following summary extract shows how she encourages the learner to explain her answer to the class,

- 0:10 The teacher has already prepared her board (on the right-hand side, with all the examples that they are going to do in the lesson).
- 0:25 A female learner volunteers to go to the board. The teacher says that after she has done it she has to **explain** to the class, "So that she can see whether they have understood what they are doing". While the learner is at the board, teacher is recruiting other learners to do the next 5 examples.
- 1:47 Learner has written up the example on the board, the teacher asks her to explain what she has done to the class. Learner explains clearly the processes that she went through to get the answers (using a clear voice to describe the process, an explanation of why she did this and the answer).
- 2:51 The teacher asks for the next volunteer and checks with the class who got number one right

This extract demonstrates that Teacher 3 has embedded the practice of learner participation and has started to plan for this in her lessons. The learners are also engaging in

this practice and Teacher 3 encourages a positive attitude towards this by allowing time at the board and she thanks all the volunteers when the lesson draws to a close.

The last submission that Teacher 3 sent demonstrates a revision lesson, she tries to engage the learners with some open and some closed questions and some involvement of learners at the board. The mentor comments that she has established a good rapport in the class and was able to assess learners understanding and progress before moving to the next explanation.

Differentiation

Differentiation was identified as an issue for all the teachers. The large class sizes, lack of resources and policy of non-segregation in schools created a challenge for the UK mentors. Differentiation by question was discussed with Teacher 3 using the traffic light system.

Mentor 2's observations during the contact sessions showed that Teacher 3 used limited differentiation during her classes. Her classes are large (45+ learners) and classrooms small, making differentiation more problematic. Mentor 2 discussed different methods of differentiation with Teacher 3 on day two of the training, he focused on the 'Red, Green, amber' method that allows differentiation by task/question. Although Teacher 3 had heard of differentiation her understanding of the various methods that could be applied was limited. Teacher 3 was concerned, initially, that differentiation in class meant that she might have to prepare 45 separate tasks for her learners. Once Mentor 2 explained some of the methods of differentiation Teacher 3 had concerns that the size of her class and the layout (due to overcrowding) was incompatible for grouping learners. They agreed that the 'red, amber, green' method might work best in her larger classes and that paired work could be attempted in some of her other classes. Teacher 3 tried out grouping her learners on day four. She commented,

"I tried moving desks and chairs for learners to do group work, but
I as a teacher could not get around due to lack of space. I will maybe
have to try them working in pairs" (Teacher 3, Day Four, Training Diary)

She also tried differentiation by task using the 'red, amber, green' method, Mentor 2 reported that she found this method difficult due to the large number of learners in her class and the limitations of time to cover the topics (the rigid structure of the curriculum also results in a lack of time to focus on weaker learners). There was little evidence of differentiation in the footage that Teacher 3 sent for evaluation.

Teacher 3 was not provided with equipment to access the internet for the project and had to try to make arrangements to borrow this from her Teach SA Ambassador colleague (when it was available) to participate. This created significant obstacles to her in gaining and retaining familiarity with the equipment and in uploading reflections, viewing her own reflections or reading comments from the mentor. Teacher 3 found it difficult to fully participate in the project as planned and this is reflected in teacher 3's feedback. However,

the shared reflections do show that teacher 3 was willing to embrace methods suggested by the mentor and showed considerable skill in enabling learners to have control of the explanation of the maths at the chalkboard (these reflections would be worthy of sharing with the less-experienced teachers). Teacher 3 was unavailable to receive a telephone call (due to high data costs and no school landline), however, her post-survey feedback indicated that she struggled in setting up the equipment which she felt interrupted valuable teaching time.

Case Study 4: Teacher 2, school A

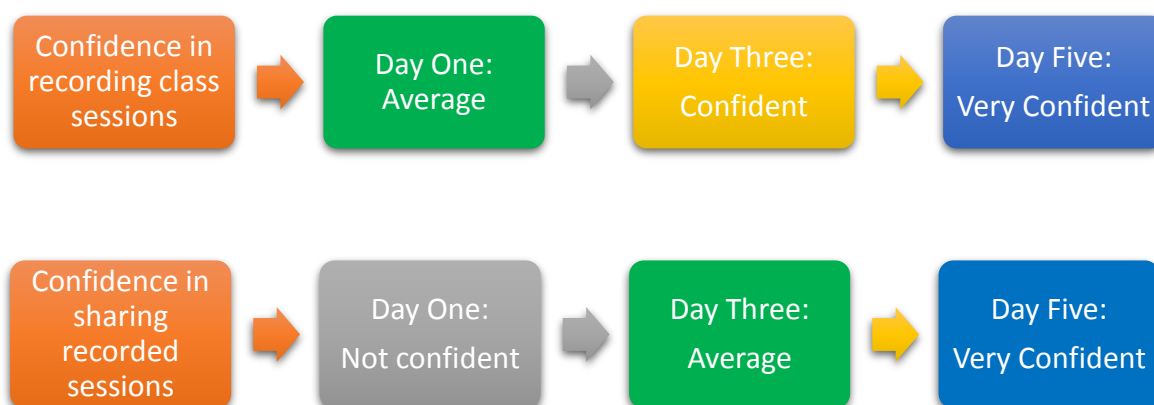
Introduction

Teacher 2 is a recent graduate in Geology with a good knowledge and theoretical understanding in Mathematics. She completed both baseline questionnaires, but was considerably less confident in her responses to the second baseline (perhaps due to the fact that she had now started classroom teaching and was able to better assess her strengths and weaknesses). She had completed a two-week intensive teacher training course with Teach South Africa. As she is new to teaching, she was not confident or aware of many of the areas covered in the baseline questionnaire, but she was keen to learn to improve her teaching skills. She specifically wanted to improve her classroom management, lesson planning and effective use of visual aids in the classroom. The baseline assessments across the twelve teachers had identified three key areas of focus for the training: developing questioning techniques to assess understanding in learners (including developing more open-questioning); differentiation in the classroom (to produce levelled work for different abilities of learner within the classroom); and exploring methods to engage learners more actively in learning in the classroom to embed knowledge. In addition, in some cases individual teachers were set additional targets (after classroom observation had taken place).

Contact sessions

During the contact sessions Teacher 2 worked with mentor 2. Mentor 2 and Teacher 2 kept a training diary to record training given and progress made throughout the week. Through classroom observations Mentor 2 identified some other areas that Teacher 2 could work on. These were identified as: lesson planning to use creative ways to engage the learners; planning resources to support activities; engaging learner in a positive manner (using names, praise, support); and varying teaching styles to suit different types of learners. Teacher 2 had a number of strengths including enthusiasm to learn, IT awareness and good subject knowledge.

Teacher 2 recorded, reflected on and shared a total of three recordings (all between 5-7 minutes long) with her mentor and the team evaluator during the contact sessions. Her confidence grew throughout the week, both in using the equipment and in recording and watching herself. The diagram below plots Teacher 2's confidence, as recorded in the training diary, in recording the sessions and sharing the recordings with others,



By day five, Teacher 2 was very confident in both aspects of the IRIS Connect system. Her mentor confirmed her competence in using the equipment by day three of the training commented, 'she can make recordings using the camera and she can use the pairing mode to record with two cameras. She knows how to upload and switch off the ipads before packing away the kit' (Training Diary)

On day one, teacher 2 noticed that the learners had responded positively to the class being recorded. She felt that the presence of the camera, 'ignited more classroom participation'. When she reflected on the session with her mentor she commented,

"reflecting on the footage was very informative because I got to discover that I need to have eye contact with the learners and to address them by names as learning (then) becomes on a personal level"

(Teacher 2, Day two, training diary)

By reviewing her performance in class, Teacher 2 was able to see her strengths and identify the areas for improvement. She also found that she was not asking the learners to support each other in their progression (peer to peer learning). She commented,

"I get (need) to engage with learners by looking at their work and identifying their problems and addressing them as a class. (I can help them) by involving other learners who understand the concept"

(Teacher 2, Day two, training diary)

The reflection and review process was hampered by the late arrival of laptops for the Teach SA graduates and late provision of equipment to access the internet. This meant that most of the teachers did not have access to the reflections at the relevant times, and occasionally feedback was given verbally from the classroom observations made by the UK mentors.

Progress - contact sessions to follow-up sessions.

Teacher 2 recorded a total of 3 submissions during the contact sessions and a further three submissions subsequently throughout the follow-up sessions, completing all three cycles.

Close review of these submissions was undertaken by the UK mentor (who was able to comment on five reflections with a total of 30 individual comments). Analysis of the outcomes and impacts looking specifically at the changes/developments in Teacher 2's teaching in terms of the key aims and indicators identified was undertaken by the UK evaluator. These will be discussed in the following sections.

Content knowledge and development

Although Teacher 2's maths skills were sound, the mentor established that teacher 2 needed help in developing the way that she explained and taught the maths concepts to the learners (Mentor 2, telephone interview). In a submission showing a functions lesson, the mentor was able to direct teacher 2 to a Eleri academy web resource that demonstrates how to develop your explanations of functions. Teacher 2 was able to integrate what she learnt through watching these resources into her lessons,

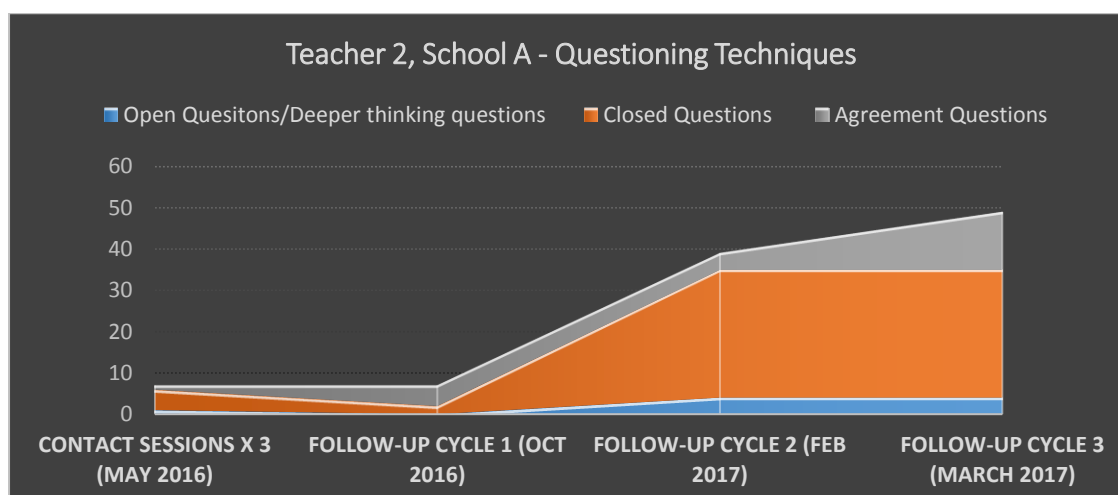
"IRIS Connect is actually a good thing because it gives you alternatives that you could do, if you can't do it like this, perhaps there is another way that you could do it. If you are finding a problem dealing with functions for instance, here is a way that you could deal with functions easier, because we know that if you can't explain it any better it means that you don't understand it yourself, so, IRIS Connect gives you that platform to understand it yourself before you take it to class. For instance, I was (unclear) with the functions that I was given, so you say, "ok, it comes in the order that it was given - we go like that, we go like that, and I understand what I am going to deliver. So it is very useful for other educators to say that if you have got old ways of using it, don't stay with conventional ways of doing it, there are other ways of doing it. And then if you try them, it should work for you..."

(teacher 2, telephone interview, March 2017)

The mentor continued to monitor teacher 2's content knowledge, but found that it was the way in which the explanations were presented to the learners that needed further development. Mentor 2 was keen to expand teacher 2's knowledge of the different ways that the maths concepts can be explained and directed her to different web resources which she was able to consult and integrate into lessons where appropriate. In the later submissions presented to the evaluator, Teacher 2 was evidenced to be moving away from the text book and retrieving examples she saved from the maths resources (saved onto her mobile device).

Questioning techniques and explanations

Teacher 2 was keen to try and develop her questioning techniques in class. The analysis and coding of the recorded footage that Teacher 2 sent shows a marked increase in closed questioning from the contact sessions and a smaller increase in the use of open-questions. The large number of questions asked during the twenty minute clips demonstrated a high percentage of learner interaction during class (see chart below).



The mentor was keen to develop Teacher 2's ability to direct open-questions to her learners and establish their understanding, he commented on cycle 2 (a financial maths lesson),

“before starting a new topic ask the learners questions
so that you have a better understanding of what they already know
and it's useful to provide examples of the sort of financial maths that
they will come across in their daily lives”

(Mentor comment, 06/02/17)

Teacher 2's use of open questioning did increase over the span of the project, the mentor was keen to develop this further by encouraging her to use more open questions that give control of the explanation to the learners (resulting in the teacher being able to establish deeper understanding in their learners). In the initial submitted footage there is evidence of Teacher 2 encouraging learners to the chalkboard, but not asking them to explain their answers to the class, which would have embedded their knowledge and enabled teacher 2 to assess their current understanding. In the next submission, teacher 2 has adjusted her practice and when a learner goes to the board she asks the learners to explain *why* she got the answer she did. However, this practice is not consistently evidenced in the subsequent submissions that she shared.

The mentor was also keen for teacher 2 to develop and use more questioning to establish understanding in the learners, building up understanding from the basics and progressing from there. In her third cycle submission, Teacher 2 is shown to encourage understanding from first principles with the learners at the beginning of the lesson. Below is an extract from her last submission,

“If $2X$ is equal to 8, what is the relationship between 2 and X ?”

She allows time for the learner to respond. Afterward she asks,

“so what must you do now? How do you find the value of X ”

(extract from Teacher 2 submission 7/3/17)

This demonstrates the teacher's ability to build-up learners' knowledge from simple examples and to develop learner's knowledge and understanding in stages. In addition, teacher 2 demonstrates her ability to explore learner understanding of the basic finance in her submission for cycle 2. From watching other reflections and from her own experience, teacher 2 realised that some of the class were not aware of how many Cents make up one Rand (or how many cents in 50 Cents), because the learners often use 'local terminology' to describe these denominations. This is something that teacher 2 commented about during the telephone interview,

"so, it seemed that I was educating to a higher level and their level of understanding is below (the learners), it means that I should go down and start at the beginning - so that kind of thing I have picked up from the reflections; my own reflections when I was watching (I found) that I needed to change basic knowledge and not to assume that they know these things"
(teacher 2 telephone interview)

Teacher 2 felt that the ongoing mentoring would help her to develop these skills further into her everyday practice (teacher 2 telephone interview).

Differentiation

Differentiation was identified as a key area for focus (especially for the least experienced teachers). The large class sizes (up to 50 pupils), and the policy of non-streaming in South African schools meant that this was a pressing issue, but not without challenges. The UK trainers focused on a tiered method of differentiation that focused on using a traffic light system of red, amber and green whereby the teacher can help to identify and support the weaker learners (red), whilst providing activities for the middle-ability learners (amber) and also challenging the stronger learners (green). Teacher 2 embraced these ideas during the contact sessions, and felt that she could integrate these ideas into her teaching practice (training diary, page 15). She understood that stronger learners could support weaker learners with peer to peer learning once learners are differentiated. Differentiation in practice is often difficult to detect on the recorded footage, but the footage sent in cycle 3 shows teacher 2 discussing differentiated groups with her class and explaining the work set. In the telephone interview Teacher 3 explains how she overcame difficulties in differentiating her learners,

"the focus point for cycle three was specifically how do you differentiate your learners. Do you differentiate by questions or by groups, but in our school we use a system that says your learners must sit alphabetically so it is difficult to use the format of 'groups' because you find that a not so performing learner would sit with a not so performing learner, so you cannot group them according to groups of performance because they arrange them alphabetically. So, now I use questions - I actually started to sort into groups between short-break and lunch, so once they have done eating and are back into class and form groups. I formed groups to say, as this is the only time I get for them to sit in whatever way that I want, and I give them different questions in their groups so that those people do that question and those

others do that questions. And then do it and they circulate the questions - so I think that has been very helpful the questioning of learners, how do they perform and how do you group them. Do you group them or do you give them different questions - so I was going to group them, but I saw it was impossible to group them because they are grouped alphabetically, so I did it though the questions”.

This process demonstrates teacher 2 working through ideas introduced by her mentor to see how they ‘fit’ within the South African classroom system. The training given during the contact sessions was continually supported with advice and reiteration from the mentor (alongside shared web footage demonstrating teaching practice). The mentor refreshes the idea of the traffic light system and refers teacher 2 to the online CPD resources that he had shared with her.

Personal Engagement

Classroom observation during the contact sessions demonstrated that Teacher 2 needed to work on her personal contact with the learners. This included eye-contact, using learner’s names and position in the class when teaching and supporting (training diary, page 3). The mentor was able to encourage teacher 2 to involve more of the learners at the chalkboard and establish a more supportive learning environment in class. The initial submissions made during the contact sessions showed teacher 2 frequently teaching from the back of the classroom, where she could not make eye-contact or control the behaviour of her learners. They also show teacher 2 using learners to point-out answers on the chalkboard. This footage was shared with the district lead who said, ‘the excitement of the learners when they are involved is great’. In subsequent submissions the rapport between learner and teacher is beginning to develop and teacher 2 uses positive language to encourage the learners, ‘once you have done that, just like that ... example one is done!’, she is also heard to use individual names of learners to engage them in the lesson and develop her eye-contact. In her cycle 2 submission her mentor comments,

“What a great start you have welcomed the learners and laid down the ground rules of expected behaviour in your classroom and you have organised your lesson format to have an introduction, Q&A session followed by activities to reinforce the learning together with a homework activity in support the class work” (mentor comment, 06/02/17)

And further,

“Your confidence in the classroom has really improved and you have a good rapport with your learners. They are all engaged in the activity and responding well to the Q&A session” (mentor comment, 06/02/17)

This indicates that as well as working on personal engagement teacher 2 has also worked on the planning and structure of her lessons with the help and encouragement of her mentor.

Teachers response

Teacher 2 feels that the project directly contributed to her changes in teaching practice and integration of ideas into lessons. She comments,

“I have developed more and even my mentor even saw that when he commented on one of my reflections recently, he sees an improvement. So, because I was an ambassador I was coming in fresh as a new educator so from the time that ... so, for me, watching the reflections on my own I could see that I could change...from just watching the reflections I could see that”
(teacher 2 telephone interview, March 2017)

furthermore, Teacher 2 demonstrates that she was open to advice and willing to learn and integrate advice into her teaching practice. She comments,

“basically, when I posted my reflections he would comment, so I would look to add to his comments, that’s what I looked for. So, when I put my reflections he would comment, and once he had commented it means that I have done what I wanted to do. I would go through my comments and look-up. ‘where is it I need to improve - and his compliments and his comments and all those things’.
(teacher 2 telephone interview, March 2017)

Teacher 2 also reflected on the difference between video mentoring and classroom observation. She felt that the video system allowed time to reflect and prepare reactions that were based on sound advice rather than gut-reaction or emotions (teacher 2 telephone interview, March 2017), she also suggested that this allowed for the build-up of a positive professional relationship between teacher and mentor.

The IRIS Connect equipment was felt, during the contact sessions, to have a positive impact on the learners’ behaviour and participation (training diary, page 8) and this impact had not diminished by the end of the project, teacher 2 comments,

“the IRIS Connect particularly - the machine and the instrument that we are using - they love it so much. If the cameras come out, and they go out on their break, and they say, ‘our class has got cameras!’. So it is a good thing ... and participation ... I have seen a change in participation. So the classes that I take, they tend to participate more because they want to be visible on the camera, they want to be the one answering and the one thing that I like is that they go back and they check on their books what they did yesterday, because they know that they are going to be asked and they know that they are going to appear on the camera, so they must

do all those things. So, it has impacted positively to say that. Um, the learners are now participating, they are not just passive to listen to me as a teacher or anything. They actually asking questions and they, actually, are responding so they are participating in a good manner”

(teacher 2 telephone interview, March 2017)

The changes in teacher 2’s delivery during lessons could also have impacted on these observed participation levels.

Teacher 2 made progress on planning and structure of her lessons, individual contact and personal attention to her learners, creating a more active and positive learning environment and using more questioning throughout her lessons to engage her learners. Focus was also given to explaining basic knowledge (starting from the learners point of view). She is also beginning to use differentiation by questions in her classes. Future focus should be on developing assessment to lead to peer-to-peer learning and using more open-questions in class to ensure that learners understand the concepts.

Conclusion

To conclude, the contact sessions and the follow-up sessions were severely restricted by the lack of provision of equipment to access the internet for long periods, and the experienced teachers needing to borrow equipment from a colleague at times when it was available. The evaluation of the follow-up part of the project relied on the elective participation of the selected teachers in a relatively demanding way at a very busy time for them, and control over recordings and the sharing of videos was solely their own responsibility. In the light of this, teacher involvement in the project is a key outcome in addition to the teacher's ability to reflect on their practice, understand the pedagogical ideas and apply some of these to their classes. The challenge for any mentoring project is ensuring the participation and equality of practice of both the mentor and mentee, so the long periods of inactivity during the gaps in provision of a means of access to the internet were challenging and resulted in frustration for the participating teachers. However, the project was successful in engaging all of the teachers with six teachers completing all three cycles of the training/mentoring and the other five were on their way to completing the cycles. Only one teacher disengaged with the project (due to a role-shift from maths to maths literacy and workload issues in her school).

The project succeeded in developing a system of classroom observation and a culture of self-reflection between the participating teachers (some of the teachers who did not share as many reflections were still able to self-reflect on their own practice over the course of the project or unofficially share with other teachers for guidance and support). The dual camera system allowed teachers to assess and address themselves as teachers and their learners, in some cases leading them to adapting practice accordingly without the support of the mentor. Objective one's focus shifted from improving teacher content knowledge to improving teachers concept development in mathematics as a result of classroom observation during the contact sessions, however, knowledge issues could be addressed through the system if required (although the participating teachers' mathematics knowledge was sound). The project was successful in addressing teacher awareness of how students learn and in strategies to introduce maths concepts to the learners (both through the contact sessions and with follow-on support via the mentoring). There was evidence of the use of differentiation in some of the classes, more proficient planning for learner engagement and development across some of the teachers and implementing strategies for a more learner-centred approach incorporating more active learning in class. There were also some improvements evidenced in how the teachers assess students understanding of mathematics, although this was not consistent amongst all the teachers. The more experienced teachers were more competent in encouraging learners to explain their understanding to the class than the Teach SA ambassadors, however the Teach SA ambassadors were able to increase the level of active learning in class and increase the number of directed-closed questioning that engaged the learners effectively within the first twenty minutes of the lesson. This, in turn, had a positive impact on learner engagement and behavior.

Additional individual training was also able to be delivered to the teachers which was outside of the original objectives of the project, but reflected the individual needs of the

participating teachers. There was evidence of improvement in classroom management, behaviour management, chalk board organisation, speed of delivery, explanations and sequencing of examples, and eye-contact and personal attention to the learners for individual teachers. These changes helped to increase the confidence and professional pride of some of the teachers.

A mathematics-focused professional learning community has not yet been established, however evidence gathered by IRIS Connect from similar projects in the UK and Europe suggest that teachers need a minimum of four-sharing experiences with a mentor/colleague before they feel proficient or confident to share with others. In this case, the green-shoots that are being seen with the unofficial sharing within schools and the first shares between the Teach SA ambassadors may indicate the beginnings of a sharing network. The district department are supportive of this.

The mentors themselves gained a lot from the experience and were able to establish strong professional relationships with many of the teachers. Mentor 1 sums up his feeling about the project,

“At the beginning, I was hugely excited by the potential and actually, despite the blips that we have had, most of which have been based on technology rather than anything else, I still think there is still huge potential. I think that we are finishing the project with real strength and momentum. Things seem to be going as well now as they have at any point in the project with those that we’ve been able to encourage to embrace the idea in South Africa” (mentor 1 telephone interview)