

A cascade model of professional development presents a particular risk that 'knowledge' promoted in a programme will be diluted or distorted as it passes from originators of the programme to local trainers and then to the target teachers (Soloman and Tresman 1999; Kennedy 2005). Careful monitoring of trainers' and teachers' knowledge as it is transferred through the system is therefore imperative. This paper focuses on the transfer of content knowledge through an in-service teacher professional development programme and offers an innovative methodology for investigating knowledge transfer, i.e. through insights gained during a mentoring process. The findings suggest that this methodology facilitated assessment of knowledge transfer because it involved the identification of knowledge in practice. The focus on knowledge in practice appeared to avoid a deficit model of trainers'/ teachers' knowledge and revealed that content knowledge was generally being successfully transferred throughout the system. A detailed analysis of different aspects of content knowledge transfer suggested various foci for additional training.

Key words: Knowledge transfer, cascade training, documentary analysis

Introduction: The professional development programme and the role of the mentoring programme

This paper discusses an in-service teacher education programme developed collaboratively by teacher educators from a UK university and colleagues from the Republic of Kazakhstan. The Kazakhstani partner in this enterprise was a recently established Autonomous Education Organisation entitled 'Centre of Excellence' (CoE) which was set up to provide professional development for in-service teachers. This organisation came under the umbrella of the Nazarbayev Intellectual Schools

(NIS). NIS was a Presidential initiative which established elite schools in all regions of the country in order to trial and develop new curricula and pedagogical approaches, the intention being that these should eventually be rolled out to mainstream schools. The CoE in-service teacher education programme discussed here aimed to reach teachers from all mainstream schools across the country.

The aim of the programme was to promote ‘new’ pedagogical approaches to Kazakhstani teachers that are necessary for educating ‘citizens of the 21st century’. This 21st century education was seen as involving the development of pupils as independent, self-motivated, engaged, confident, digitally competent, responsible and critically reflective learners. Success of the programme would ultimately be assessed by evaluating the development of pupils in relation to these aims. This paper focuses on an evaluation of the development of Kazakhstani trainers’ and teachers’ knowledge of the ‘new’ pedagogical approaches being promoted as revealed through the mentoring of Kazakhstani trainers when working with teachers.

The knowledge base of the programme was partially set by the Kazakhstani authorities who asked that the following topics be covered:

- New approaches to teaching and learning;
- Learning to think critically;
- Assessment of and for learning;
- The use of ICT and digital systems in support of learning;
- Teaching talented and gifted children;

- Responding to age-related differences in children in teaching and learning;
and
- The management and leadership of learning.

This knowledge base was interpreted through a socio-constructivist lens and the content drew on recent research, particularly that which was carried out at the UK university that was leading the training. For example, the ‘New approaches to teaching and learning’ was interpreted as ‘Dialogic teaching and learning’ and ‘Developing self-regulated learners’. ‘Teaching talented and gifted children’ was interpreted as ‘Inclusion of all students’ and ‘Learning without limits’. As well as drawing on their own experience and discussing these issues, trainers and teachers were given access to recent research in these areas through presentations and translated texts in handbooks and handouts.

The intended learning outcomes of the programme were that teachers:

- would have knowledge of the ‘new pedagogical approaches’ described above;
- be able to apply these in the context of their practice; and
- would have the skills to reflect critically on the impact of these approaches on teaching and learning.

The programme was designed at three levels. At the basic third level, teachers were expected to lead changes to learning within their own classrooms. At the intermediate second level, as well as leading change within their own classroom, it was intended that teachers would support more widespread change through coaching and mentoring colleagues within their school. At the advanced first level, the focus was on whole-

school leadership of learning and teachers were expected to lead change through school development planning supported by programmes of coaching and mentoring colleagues. At each level, the programme involved three phases which comprised of a face-to-face series of workshops with theoretical input (referred to as ‘Face-To-Face One’) followed by an extended practice based period (‘School-Based Period’) and culminating in a further face-to-face period of reflection (‘Face-To-Face Two’).

The learning outcomes of the programme were facilitated by the three part structure. During ‘Face-to-Face One’ trainers and teachers were introduced to the subject content. Training modelled the ‘new pedagogical approaches’ being explored. The programme consisted mainly of workshops sessions that facilitated group discussion and collaborative learning opportunities. Handbooks provided an outline knowledge base while other materials such as videos, presentations and web-links were available from a programme portal for each session. The adaptation and addition of resources was encouraged in order to meet local trainer and teacher needs. Teachers and trainers then applied these approaches in the school context during the ‘School-Based Period’. They were given specific guidance and tasks to complete. They collected data which was subsequently analysed and reflected upon during ‘Face-to-Face Two’. During this period teachers and trainers shared experiences and critically reflected upon them. They developed presentations and reports which were peer-reviewed in the ‘Face-to-Face Two’ period prior to formal assessment. Table 1 below indicates the length of each phase.

[Insert Table 1 here]

Teachers were able to access the training at any of the three levels depending on their experience and expertise; however, trainers were required to complete each level of training in turn (level 3, 2 and then 1) and were only able to train at levels for which they had been trained.

The programme began in January 2012 with courses being delivered in Kazakhstan for local trainers that were led by the developers of the programme and taught by experienced teacher educators from the UK university's Faculty of Education. These courses were condensed versions of those for teachers which were to be taught by the local trainers. The 'training of trainers' courses drew on resources developed for the training of teachers and modelled pedagogical approaches that the programme aimed to promote. There were three rounds of 'training the trainers' courses at all three levels and these were completed at the end of 2014. The trained local trainers then carried out training of teachers in all regions of the country. At the time of writing, the programme had reached over 39,000 teachers from all stages of compulsory education.

A cascade model of professional development was adopted for the programme in order to reach as many teachers as possible in the shortest timescale (Gilpin 1997). Hayes (2000) delineates the benefits of this model for bringing about large-scale change. He suggests that it is 'cost-effective, does not require long periods out of service, and uses existing teaching staff as co-trainers' (137). However, the problems associated with the cascade model have been well documented (Soloman and Tresman 1999; Kennedy 2005). For a detailed account of how the developers of the programme attempted to alleviate the problems associated with cascade training see

‘Centres of Excellence: Systemwide Transformation of Teaching Practice’ (Turner et al. 2014, 83-105). A principle concern was that of dilution of the messages of programmes as they are passed down the line. In response to this a programme was instigated in which the UK university involved in teaching the programme mentored local trainers during their ‘training of teachers’.

The primary focus of the mentoring programme was to further the development of local trainers; however, a secondary, and somewhat related aim, was to monitor and evaluate the quality of teacher training in relation to the aims of the programme. In the first year of this mentoring programme fourteen mentors worked with trainers in the central office of CoE and in eight regional branches. During one-week visits to each training centre, mentors gave confidential individual feedback to trainers and compiled an overall report about the training they observed in that centre. Mentors followed a common structure for these reports in which they commented on:

- The content of the training observed – *does it match that of the programme?*;
- The training approaches used – *are they consistent with those promoted in the ‘train the trainers’ courses?*;
- General strengths and areas for development of the trainers in relation to the five areas of the standards set for trainers;
- Any issues which appeared to contribute to, or which appeared to inhibit effective training – these may have been contextual or may have related to trainer preparedness; and
- Teacher learning – *how do the messages and ideas of the programme appear to be being received by the teachers?*

Mentors were also required to make recommendations for how training might be developed within the centre.

The mentor programme was highly evaluated by individual recipients of the mentoring and mentor reports were used by training centres to develop their programmes. In addition, the mentor reports provided a rich source of data for evaluating the impact of the national programme. An initial evaluation of programme ‘roll-out’ was made by analysing mentor reports completed in the first half of 2013. This covered mentoring visits involving six training centres and 26 trainers (Turner et al. 2014). This analysis was primarily based on Hayes’ (2000) five principles for the success of a cascade model of professional development:

1. The method of training must not be transmissive but experiential and reflective;
2. The training must be open to reinterpretation rather than expecting rigid adherence to prescribed ways of working;
3. Expertise should not be concentrated at the top but diffused through the system as widely as possible;
4. A cross-section of stakeholders must be involved in the preparation of training materials; and
5. Decentralisation of responsibilities within the cascade structure is desirable.

These principles resonated strongly with the aims and approaches of the programme and were therefore adopted as criteria for the evaluation. The first principle was consistent with the intended learning outcomes of knowledge, application and

reflection which were supported by the structure of the programme. During ‘Face-to-Face One’, trainers and teachers *experienced* teaching and learning which used the ‘new pedagogical approaches’, rather than learned about them through a transmissive approach. The modelling of practice facilitated the active application of programme content knowledge by teachers and trainers during the school-based period and beyond. The nature of the ‘Face-to-Face Two’ phase of the programme supported participants in reflecting on the application of knowledge in practice and helped develop skills in critical reflection. Although an outline knowledge base was provided through handbooks, key training resources were purposefully held electronically in order that they might be selected from, amended and added to in order to meet local need. This was consistent with the second principle. The third principle is central to all cascade programmes of training. In order to achieve the aim of the programme –*to promote ‘new’ pedagogical approaches to Kazakhstani teachers that are necessary for educating ‘citizens of the 21st century’* – ‘expertise’ clearly needed to reach teachers in classrooms and not just rest with the UK educators or local trainers in the country. Principles four and five were also consistent with the aims and approaches of the programme. It was recognised from the beginning that a successful programme could only be developed by working in a collaborative way. UK and Kazakhstani colleagues initially worked together to develop and instigate the programme with responsibility gradually being handed over to stakeholders.

The initial evaluation of mentor reports set out to investigate whether the intended aims and approaches of the programme, as reflected in Hayes’ (2000) five principle’s, were being realised in practice as the programme ‘rolled-out’ from UK educators to local trainers and on to teachers. The findings were generally positive, in so far as the

content and approaches of the ‘train the teachers’ courses closely reflected those of the ‘train the trainers’ courses and these closely aligned with Hayes’ (2000) five principles and associated criteria for successful cascade training (Turner et al. 2014). The principle that was found to be least well addressed was that ‘Expertise should not be concentrated at the top but diffused through the system as widely as possible’. Some aspects of programme knowledge did not appear to have been effectively ‘diffused’ to both trainers and teachers. It was therefore decided that a further analysis of data from mentor visits should focus on the transfer of these aspects of trainers’ and teachers’ knowledge. It is this analysis that informs the remainder of this paper.

Theoretical framework: Knowledge for training and teaching

The term *knowledge* is used throughout this paper as short-hand for ‘knowledge needed for training or teaching’ and incorporates a number of different forms suggested in the seminal work of Shulman (1986). Shulman suggested seven forms of knowledge necessary for teaching, and these provide the basis of a framework for considering trainers’ and teachers’ knowledge in relation to the programme aims:

- Knowledge of educational ends;
- Knowledge of learners;
- Curriculum knowledge;
- Knowledge of context;
- Subject matter knowledge;
- Pedagogical content knowledge; and
- (Generic) Pedagogical knowledge.

The programme was premised on the view that all of these forms of knowledge are important. However, the initial evaluation of programme ‘roll-out’ (Turner et al. 2014) suggested that although the first four forms of knowledge appeared to have been transferred successfully from UK educators to local trainers, transfer of the last three was less successful and that this was a problem.

Knowledge of educational ends is central to the aims of the programme since it is widely recognised that in order to bring about sustained changes in practice it is necessary to challenge beliefs (Pajares 1992; Soloman and Tresman 1999; Kennedy 2005). The enthusiasm with which trainers embraced the need for change in order to prepare pupils for the 21st century suggested a well-developed knowledge of ‘educational ends’. The 2013 analysis of data from the mentor visits suggested that the beliefs of the Kazakhstani trainers had undergone substantial change in relation to the underpinning ideas of the programme. A constructivist perspective underpinning a learner-centred approach is considered to be a feature of the highest achieving school systems of the world (Hattie 2014) and this was considered to be at the heart of the programme. The initial evaluation provided much evidence that trainers understood the need for *Knowledge of learners* and that such knowledge was well developed.

The initial evaluation suggested that knowledge for teaching was demonstrated well by trainers in relation to a further two of Shulman’s (1986) categories, these being *Curriculum knowledge* and *Knowledge of context*. Mentor reports strongly indicated that trainers were very knowledgeable about the curriculum of the programme and worked closely within it. However, consistent with Hayes’ (2000) second criteria for effective cascade training, it was clear that trainers did not ‘rigidly adhere to

prescribed ways of working’ and that training was ‘open to reinterpretation’. Trainers were very aware of the context for their training and made many appropriate additions and adaptations to materials, making them more relevant to the context of their teachers.

The UK university and CoE team in Kazakhstan were not complacent about the transfer of the four forms of knowledge briefly discussed above. However, the initial evaluation suggested that the focus for programme development should be on the transfer of *Subject matter knowledge*, *Pedagogical content knowledge* and (*Generic*) *Pedagogical knowledge*. The initial analysis of mentor reports suggested that some trainers and teachers may have had only an instrumental understanding of the pedagogical principles and practices promoted by the programme, i.e. they knew a set of procedures for performing practices but did not have a connected understanding of the underpinning principles. Trainers were seen explaining, using and modelling appropriate pedagogic strategies. However, deficiencies in some explanations given, and in the use of ‘how’ and ‘why’ questions, suggested their understanding was instrumental rather than relational (Skemp 1978).

Subject matter knowledge (SMK), *Pedagogical content knowledge* (PCK) and (*Generic*) *Pedagogical knowledge* (PK) may be distinguished from Shulman’s (1986) other four forms in that they are all related to the specific content of the programme. They are also interrelated and difficult to disentangle in practice. The subject matter of the programme consists of research-based pedagogical principles and practices; for example, what research tells us about the effectiveness of collaborative learning or about effective coaching and mentoring. The aim of the programme is to develop

pedagogy. Therefore, PCK makes up a substantial part of the content knowledge of the programme; for example, knowledge of strategies for promoting dialogic teaching or formative assessment. Although the programme does not focus on specific subject teaching, trainers were required to develop their PCK in relation to the most appropriate ways of cascading the content of the programme to teachers. The evaluation of knowledge transfer in relation to these three forms was not considered individually since they are so closely interwoven but rather as an integrated system of 'content knowledge'. The content knowledge of trainers and teachers, as revealed through observations of specific instances of training, was interpreted as being a combination of all three forms.

Hegarty (2000) argues that ways of categorising teachers' knowledge, such as that of Shulman (1986), do not explain how teachers' knowledge affects classroom behaviour, and so do not help in understanding effective teaching. He argued that the effects of all the different areas of teachers' knowledge can only be understood within the contexts of dynamic teaching situations and can only be identified in practice. Similarly, Mason and Spence (1999) argued that knowing is not a property of a person, but of a person in a situation (141). They drew on the seminal work of Ryle (1949) in which he distinguished between *knowing-that* (factual knowledge), *knowing-how* (knowledge of how to perform acts) and *knowing-why* (having stories to account for actions). Mason and Spence (1999) suggested that these three ways of knowing may all be considered as *knowing-about*, but that knowing about a subject does not guarantee being able to apply this knowledge in practice. They proposed *knowing-to* as a fourth way of knowing and suggested this can only be identified through observation of practice. Previous evaluations of the CoE programme, along

with anecdotal evidence, suggested that the ‘content knowledge’ of trainers might be more propositional than active, i.e. they knew the theory but did not understand the underlying principles and could not therefore adapt this to different contexts and apply it effectively.

The conceptual framework which underpinned the analysis of mentor reports was informed by the categorisation of forms of knowledge (Shulman 1986) and by the distinction between *knowing-about* and *knowing-to* (Mason and Spence 1999). Shulman’s categorisation of knowledge for teaching supported the identification of aspects of knowledge on which to focus when evaluating the ‘roll-out’ of the programme. Three integrated forms of ‘content knowledge’ were identified as being the focus of this analysis. Mason and Spence’s (1999) distinction between ways of knowing, i.e. *knowledge-about* (propositional knowledge) and *knowledge-to* (active knowledge) suggested two ways in which ‘content knowledge’ might be demonstrated. This distinction, along with the focus on content knowledge of both trainers and teachers, suggested a four-category model of ‘types of knowledge’ that might be commented on by mentors, i.e. *trainer propositional*, *teacher propositional*, *trainer active* and *teacher active*.

Earlier analysis of the mentor reports, as well as anecdotal evidence, suggested that some aspects of the knowledge base of the programme were not being transferred from trainers to teachers as well as might be hoped. We therefore wanted to look in more detail at the knowledge teachers and trainers were applying. This led to the research question ‘*What types of knowledge are demonstrated by trainers and*

teachers during the training of teachers in the CoE Professional Development Programme?’

The research design aimed to answer this question. The documentary analysis methodology used previously (Turner et al. 2014) was further developed in order to identify different aspects and types of knowledge demonstrated.

Methodology

The methodology for this study involved documentary analysis of reports written by UK educators while mentoring local trainers engaged in the training of teachers. These reports were very detailed, covering a wide range of training and thus provided a rich data source. Nineteen different, highly experienced, trained mentors contributed to the reports, bringing expert perspectives about the knowledge that was demonstrated by trainers and teachers. These reports were therefore deemed as a reliable source of evidence to answer the research question.

These reports followed a common structure and, once complete, were analysed; however, the sections of the reports most pertinent to evaluating the depth of trainers’ and teachers’ knowledge were ‘General strengths and areas for development of the trainers in relation to the five areas of the standards for trainers’ and ‘Teacher learning – *how do the messages and ideas of the programme appear to be being received by the teachers?’*. The first of these required mentors to comment on *trainers’ knowledge* for planning, teaching, assessing and evaluating; the second required them to comment on participant *teachers’ knowledge* of the programme ideas.

All 16 mentor reports completed in 2013 were scrutinised for evidence that trainers and teachers demonstrated or did not demonstrate ‘content knowledge’ of the programme. The mentor reports related to nine training centres and 77 trainers, covering training at all three levels of the programme with a predominance of training seen being at level one. Seven periods of ‘Face-to-Face One’ training and 16 periods of ‘Face-to-Face Two’ training informed the reports. Analysis of the reports took into account both the level and the phase of training being reported on.

Theoretical coding (Yin 2003) rather than emergent coding (Glaser and Strauss 1967) was used in the analysis of the mentor reports. This was purposeful as it allowed us to explore the research question from the perspective of our theoretical framework. Codes derived from the theoretical framework of knowledge for training and teaching (as previously discussed) and from the different aspects of content knowledge that made up the programme were developed into a framework for the analysis of mentor reports. The framework differentiated between trainers’ and teachers’ knowledge and between propositional and applied knowledge. This was reflected in the first part, or the pre-fix of the code which indicated whether knowledge was demonstrated by a trainer or by teachers and whether this was propositional or active knowledge. Active knowledge demonstrated by teachers was subdivided into that which was demonstrated in training situations, perhaps through peer-teaching, and that which was demonstrated through teaching in school as shown in presentations. These ‘pre-fixes’ are shown in Table 2 below.

[Insert Table 2 here]

The analytical framework also differentiated between different aspects of content knowledge as suggested by mentor comments. The remainder of the codes indicated specific aspects of content knowledge derived from three sources:

- The specific strands of the programme that formed the basis of all three levels of the programme and which were identified by the Kazakhstani Ministry of Education (specific);
- Knowledge relating to ‘teacher-leadership skills’ that were integral to the programme and progress through the levels (leadership); and
- Knowledge of key ideas which transcended the specific strands (general).

Some codes identified from these sources were rarely, if ever, attributed to comments in the mentor reports and so were eliminated from the final analysis. The aspects of content knowledge that were attributed in the analysis, their codes and their source are shown in Table 3 below.

[Insert Table 3 here]

Coding involved combining the pre-fixes with the codes for different aspects of ‘programme knowledge’ e.g. P1 AfL would indicate trainer propositional knowledge about assessment for learning (AfL). Each of the 16 reports was coded using this scheme. Two researchers (the first and second authors of this paper) independently coded the reports in order to establish inter-rater reliability. Hard copies of the reports were used and each researcher read and re-read the reports, identifying any comments that related to trainers’ or teachers’ knowledge of the programme. The length of these

comments varied from short phrases to a number of sentences. Comments were highlighted using different colours for trainers and teachers and the combined codes were written in the margin next to the highlighted text. Where there were discrepancies in coding the principal researcher revisited the text and made a final judgement. Only those codes that were agreed following the revisiting were used in the final analysis.

The incidence of comments referring to each of the aspects of knowledge in each report was recorded in charts indicating the pages of the report where comments could be found. Where more than one comment on a page related to the same area of knowledge, the page number was repeated. Where the comment was seen as suggesting a deficit in knowledge, ‘(-)’ was inserted next to the page number. Individual charts were made for each of the five ‘types of knowledge’, i.e. trainer propositional and active knowledge, and teacher propositional and active knowledge as demonstrated in the training setting or in school. This facilitated comparisons between the number and nature of comments referring to content knowledge that were made in reference to trainers and to teachers. It also enabled comparisons to be made between the relative frequency of comments that referred to propositional knowledge and applied knowledge. In the case of teachers, further comparisons were facilitated between the number of comments that related to knowledge demonstrated through training interactions and those related to knowledge demonstrated in their own classrooms. The principal researcher scrutinised each chart to identify the number of times different aspects of knowledge had been referred to and whether these were positive or negative comments. This enabled an analysis of the relative levels of trainers’ and teachers’ knowledge about different aspects of the programme.

Recording incidents of codes using page numbers facilitated the speedy retrieval of qualitative data for the illustration of quantitative findings.

Findings

Demonstration of different aspects of programme content knowledge

Table Four below shows the number of comments identified in mentor reports in relation to the different aspects of trainers' and teachers' knowledge. These are differentiated by the number of comments suggesting knowledge and the number suggesting deficiencies in knowledge.

[Insert Table 4 here]

Frequency of mentor comments by areas of knowledge

A total of 274 comments in the 16 mentor reports were considered to refer to trainers' or teachers' content knowledge as defined above. In addition to comments about specific aspects of knowledge, a number of comments were identified that referred to trainers' or teachers' knowledge of the programme in general. Comments of this type were relatively frequent. However, the most frequent comments by far in mentor reports related to *assessment for learning* (AfL). There were nearly twice as many comments relating to AfL than for any other aspect of knowledge including 'general' knowledge. The remaining specific aspects of knowledge fell into three frequency bands. The first of these bands received between 28 and 34 comments and included *research-based learning*, *critical thinking* and *reflection*. The next band received between 15 and 19 comments and included *collaborative learning*, *dialogic teaching* and *personalised learning*. The remaining aspects of knowledge received only a few

comments (between seven and nine), and these included *ICT, independent learning, coaching and mentoring* and *inclusion*.

Proportion of comments about trainers' and teachers' knowledge

The majority of comments made by mentors related to knowledge of trainers (n189) rather than to the knowledge of teachers (n89). There were more comments about the knowledge of trainers than that of teachers for all but three aspects of knowledge. For three of the most frequently commented on aspects of knowledge – *AfL, critical thinking* and *reflection* – mentor comments related to trainers around three times more often than to teachers. Collaborative learning came just below the band of the most frequently commented on aspects of knowledge, receiving nearly twice as many comments relating to the knowledge of trainers than that of teachers. Exceptionally, among the frequently commented on aspects of knowledge, many more comments were made about the general programme knowledge of teachers than of trainers (21:13) and slightly more comments were made about teachers' knowledge of research-based learning than of trainers (18:16). For most of the less frequently commented on aspects of knowledge, a high proportion of comments related to trainers rather than to teachers. The exception was *coaching and mentoring* where 7 comments related to teachers and only one to trainers.

Proportions of positive to negative comments

The total number of mentor comments suggested that trainers' and teachers' 'content knowledge' by far outweighed those that suggested deficiencies in knowledge and there were more comments suggesting knowledge than deficiencies in knowledge for all individual aspects. There were between two and three times as many positive than

negative comments for the most frequently commented on aspects of knowledge. As the frequency declined, the proportion of positive to negative comments increased. Where there were very few comments about an aspect of knowledge they were all positive. Knowledge of collaborative learning had a particularly high proportion of positive to negative comments (18:1).

Proportion of positive to negative comments about trainers and teachers

The overall ratio of positive to negative comments was very similar for trainers (15:4) and teachers (14:4). There were more positive than negative comments for both trainers and teachers in relation to all aspects of programme knowledge. However, the proportions of positive to negative comments varied between trainers and teachers in relation to some aspects of knowledge. In relation to general programme knowledge, trainers received 13 positive and no negative comments whereas teachers received the same number of positive but also eight negative comments. The proportion of positive to negative comments relating to AfL was 9:3 for trainers but only 4:3 for teachers. In comparison, teachers did relatively better than trainers in comments relating to *research-based learning* where the proportion of positive to negative comments was 5:3 for trainers and 7:2 for teachers.

Propositional and Active knowledge

Table Five below shows the number of comments relating to trainers and teachers broken down by propositional and active knowledge.

[Insert Table 5 here]

Table Six below gives examples of comments that were coded as indicating propositional and active knowledge of trainers and teachers. Examples are given of comments suggesting knowledge and also deficiencies in knowledge.

[Insert Table 6 here]

Overall, more than twice as many mentor comments referred to active than to propositional knowledge (157:62). However, when trainers' and teachers' knowledge were viewed separately an important difference was apparent. The active knowledge of trainers was commented on far more frequently than their propositional knowledge (147:42). However, there were fewer comments relating to the active knowledge of teachers than to their propositional knowledge (39:50). It was also apparent that the proportion of positive to negative comments for both trainers and teachers was higher in relation to active knowledge than in relation to propositional knowledge as indicated in Table Seven below.

[Insert Table 7 here]

Discussion

The focus of this paper – on how effectively ‘content knowledge’ was being ‘diffused through the system’ (Hayes 2000) – was prompted by previous findings that suggested that this might be problematic. ‘Content knowledge’ was conceptualised as an interrelated system of *subject matter knowledge*, *pedagogical knowledge* and *pedagogical content knowledge* (Shulman 1986). The analysis of mentor reports found a predominance of positive comments about trainer and teacher ‘content

knowledge’, suggesting that the cascade model of professional development was generally successful in the transfer of these three interrelated forms of knowledge from UK educators to local trainers and then on to teachers. The proportion of positive to negative comments was slightly higher for trainers than for teachers; this is consistent with an expectation that trainers would be more knowledgeable than the teachers they were training, but might also suggest a ‘dilution’ in the success of knowledge transfer as it ‘rolls-out’ to teachers. Most of the mentors had been instigators of the programme, serving as trainers of trainers. This might be expected to lead to a positive bias in the reports as they clearly wanted the programme to be a success. However, this concern may be countered by the expertise that mentors brought from knowing the programme and which enabled them to make more informed judgements. There is certainly plenty of evidence in the reports that mentors were not afraid to ask critical questions.

The distribution of comments between different aspects of content knowledge provided more detailed evidence of how well knowledge was being transferred. A lack of positive comments about a specific aspect of knowledge may be explained by it simply not having been addressed at the time of mentoring. However, where there were a relatively large number of comments, it was useful to look at the proportion of positive to negative comments. There were more positive than negative comments relating to all individual aspects of content knowledge and this was the case for both trainers and teachers. AfL was by far the most commented on aspect of content knowledge. The ratio of positive to negative comments was 3:1 for trainers but only 4:3 for teachers. The role of AfL in improving educational outcomes is well documented (Black and Wiliam 1998) and it appears more may need to be done to

ensure this aspect of content knowledge reaches all teachers successfully. Trainers did not always demonstrate good knowledge of critical thinking (the ratio of positive to negative comments was 3:2) and this may need to be a focus of further trainer training. There were a number of comments suggesting deficiencies in content knowledge of both trainers and teachers in relation to the aspects of 'research-based learning' and 'reflection'. These aspects of content knowledge are considered to be key to the sustainability of professional development and therefore deserve attention despite the prevalence of positive comments relating to them.

This programme involved the translation of knowledge from one international context to another. Although the findings of this analysis suggest that the transfer of content knowledge through the cascade training programme was generally successful, there were difficulties in the transfer of some aspects of knowledge. This is unsurprising from a perspective that sees knowledge as being *situated* (Mason and Spence, 1999; Hegarty, 2000). The knowledge demonstrated by trainers and teachers was likely to be affected by the *situations* they were in. Such situations not only involved external factors of the training context but also internal factors such as beliefs about teaching and learning developed through experience in the Kazakhstani context.

Numerous researchers, including Mason and Spence (1999) and Hegarty (2000), suggest that knowledge resides in, and is best identified in practice. Mentor reports were based on observations of practice and their analysis facilitated an evaluation of content knowledge 'residing in practice'. It was perhaps not surprising, therefore, that many more comments in mentor reports referred to active rather than to propositional knowledge. It was the modelling and provision of activities that more often revealed

trainers' knowledge rather than the 'regurgitation' of knowledge that they had learned from the 'train the trainers' courses. For example, trainers showed their knowledge of personalisation and inclusion through the way in which they worked with their teachers rather than through their explicit teaching of these ideas. As the recipients of training, teachers had fewer opportunities to demonstrate active knowledge than their trainers and more comments referred to teachers' propositional than their active knowledge. However, there were a number of mentor comments suggesting that teachers were actively demonstrating content knowledge through peer-teaching and also through their own teaching as revealed in video presentations of classroom practice.

Comments about the knowledge of both trainers and teachers were more than twice as likely to be positive when they related to active rather than propositional knowledge. This is consistent with the work of Hodgen (2003) who found that experienced practitioners demonstrated more sophisticated knowledge of mathematics in the context of their practice than they were able to do in an interview. Some methods for determining knowledge for teaching have been criticised for focussing on deficits. Hodgen's work suggests that focusing on active rather than propositional knowledge is likely to enable researchers to gain a more positive view. This study suggests that the method of identifying teachers' and trainers' knowledge through the analysis of mentor reports avoids 'falling into a trap' of focusing on deficits and is able to reveal the presence as well as the absence of knowledge.

Conclusion

Cascade models of training have been criticised as being prone to ‘dilution’ (Soloman and Tresman 1999; Kennedy 2005). Within this in-service teacher development programme, the mentoring of local trainers by those who trained them was employed to counter such dilution. The primary aim of the mentoring programme was to support continued professional development of local trainers and help them to deliver the training effectively. During the mentoring visit, mentors observed and held confidential professional conversations with individual trainers. Feedback suggested that Kazakhstani trainers understood the nature of the mentoring relationship and valued the process. Recommendations given to trainers were seen to have been responded to both by the individuals concerned and also sometimes by their colleagues. At an individual trainer level, the mentoring programme would seem to have supported the cascade model of training. Mentors also drew on all their observations to make general recommendations to the Directors of the CoE branches. There is anecdotal evidence from repeat mentoring that these recommendations were acted on and supported the development of training in the Centres.

A ‘side-effect’ of the mentoring programme was the opportunity afforded to monitor the ‘roll out’ of the cascade training. The report format asked mentors to comment on the content of training, training approaches and teacher learning. Mentors made general judgements about training they saw in relation to five areas of trainer practice; *Values, Planning, Teaching, Assessing and Evaluating*. Reports also included judgements about those features which appeared to contribute to, or which were obstacles to, the success of the programme. All this information provided a rich source of data to inform an analysis of how effectively the programme was being rolled out.

In the context of international development work, this paper offers a unique exploration of how different types of knowledge are demonstrated by teachers and trainers in a cascade programme of professional development. It also offers particular insights into the specific context of a large-scale programme in Kazakhstan which may serve as model for reader reference and adaptation. A key contribution of this paper to those involved in in-service teacher professional development programmes is to offer an example of how the analysis of mentor reports or other documented observations of training may provide useful information for programme development. This analysis focused on the transfer of ‘content knowledge’ and was able to pinpoint specific aspects of knowledge that needed further attention within the programme. However, other aspects, such as the use of active learning or the effective use of formative assessment, might be foci for evaluation of cascade training through the analysis of such reports. Mentoring can certainly support the ‘roll-out’ of cascade training; it may also provide rich evidence of the success (or otherwise) of a programme. A direct implication of this research is that there are some specific aspects of knowledge that might be focused on to strengthen the quality of learning in the programme. Three workshops which have been informed by findings from this research have already been implemented to address the identified needs. A wider implication for international professional development programmes is that the transfer of knowledge might best be evaluated through the observation of knowledge in action (*knowledge-to*). This would involve the recording of classroom observations in some format. In this research, mentor reports were found to be a useful form of recording for this purpose.

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