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ICT TEACHER TRAINING MULTILEVEL EVALUATION

ICT teacher training: Evidence for multi-level evaluation from a national initiative

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Abstract

This paper is one of a pair that re-examines the evidence from a national initiative to train all teachers in England to bring them up to the level of newly qualified teachers, who are required to know when to use and when not to use ICT in their professional practice. Reanalysis of data gathered for the 2004 evaluation uncovers the complexity of such professional development. The effectiveness of contrasting approaches to ICT-related teacher training was analyzed using the national survey of 496 trainees and experts' reports on 11 of the 47 training providers. Guskey's (2002) multi-level evaluation of professional development was shown to be robust for ICT teacher training, including a significant correlation between the views of experts and those of teachers. The presence of the middle level of "organizational support and change" emerged as a particularly discriminating factor, indicating that higher quality teacher training supports change in the classroom and in the school. Therefore we recommend that all five of Guskey's levels be consistently adopted for the evaluation of ICT teacher training and that research should also adopt a multilevel model. A second paper delves deeper to describe and contrast the highest and lowest rated approaches to ICT teacher training.

Keywords

Teacher training; IT-use; Distance learning; Continuing Professional Development; Computer-assisted learning; Organisational change.

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Introduction
Information and communication technologies (ICT) continue to permeate society accompanied by calls for equity, including UNESCO's mandate resulting from the World Summit on the Information Society. There are calls for ICT teacher training on a massive scale (IFIP Stellenbosch Declaration, 2005; Hinostroza, 2008, in press). Research has also established that effective technology-related professional development is an important pillar for successful integration and sustainability of ICT in education (Culp, Honey, & Mandinach, 2003). But what is effective ICT teacher training and how can it be evaluated and scaled up globally? One extreme argues for a machine-centred computer-based training and the other argues for a people-centred approach that scales up expertise within the school and region. This paper is the first of a pair that provides evidence from a national initiative to support the more people-centred approach, which recognizes that ICT teacher training impacts multiple ecologies including the classroom, school, and region.

An important framework to evaluate teacher professional development in general was provided by Guskey (2002) in his award winning paper in *Educational Leadership*. Guskey laid out five critical levels for the evaluation of professional development in general: (1) participants' reactions, (2) participants' learning, (3) organizational support and change, (4) participants' use of new knowledge and skills and (5) students' learning outcomes. Guskey cautioned that "With each succeeding level, the process of gathering evaluation information gets a bit more complex. And because each level builds on those that come before, success at one level is usually necessary for success at higher levels." (Guskey, 2002:46) Detailed case studies of teachers innovating with ICT over the period of a year provide evidence to support Guskey's levels, for example, studies by Zhao, Pugh, Sheldon, and Byers (2002) illustrate the importance of school support in addition to ICT teacher training.

However studies that compare the effectiveness of different approaches to ICT teacher training are rare, because ICT-related teacher training normally varies with each context. A national initiative in England that stimulated a range of approaches to ICT teacher training within a common evaluation framework provided an opportunity to study different approaches of ICT teacher training with the same population of teachers. The British government had been funding computers for schools since the 1980s, but as Opie and Katsu noted in 2000, the use to which ICT could be put across the curriculum was limited. This provided the impetus for the national ICT teacher training in 1999-2003 known as 'New Opportunities Funding' or NOF, after its source of charitable funding. NOF training stimulated development of consortia of alternative training providers that were subject to accreditation by the TTA (Teacher Training Agency, currently the Training Development Agency). Some providers also aimed to export their services abroad following deployment in Britain. The ambitious NOF ICT teacher training initiative became controversial when it received critical reviews in the press, which resulted in several rounds of evaluation leading to improvements in the teacher training.

Condie & Munroe's (2007) landscape review of the impact of ICT in schools provides the following widely held view of the NOF ICT teacher training initiative:

> These programmes were resourced through New Opportunities Funding (NOF) and often involved attendance at a series of staff development sessions which focused primarily on developing technical competence and understanding rather than on pedagogical principles. Beastall (2006) describes the NOF programmes as 'largely unsuccessful' and evidence from other studies supports this (Conlon, 2004; McCarney, 2004: Condie et al., 2005; Stark et al., 2002; Ofsted, 2004c). (p 19)

However, as noted by Preston (2004: 7), the TTA's original request for proposals called for consortia of training providers "to design a programme which focused on the pedagogy of using

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ICT in the classroom, rather than on basic skills training. The intention was that where basic ICT skills were required, then the training would be given within a pedagogical context or the schools would arrange separate training prior to starting the NOF programme." Further study of the variety of approaches to ICT teacher training is warranted, particularly now that the NOF ICT teacher training controversy has subsided because the data gathered on this initiative (Preston, 2004) could inform the understanding of ICT professional development and identify the characteristics of effective ICT teacher training. This first paper of a pair provides evidence to support multilevel evaluation, while a second paper delves deeper to inform design of ICT-related teacher training and theoretical understanding of the process (Davis, Preston & Sahin, submitted).

The data sources
The TTA was responsible for quality assurance of the national ICT teacher training in England from 1999 to 2003. It undertook this by two methods: (1) quality assurance evaluation by ICT teacher training experts and (2) surveys of a nationally representative sample of trainees. One nationally representative survey of teachers and the ICT experts' reports on eleven approaches to teacher training are the source of evidence for this study. This paper briefly describes the data collected through the survey of teachers and analyzes it to examine the applicability of Guskey's (2002) five-level model of professional development evaluation, followed by a complementary analysis of the experts' reports.

The survey of a nationally representative sample of 1,000 teachers in England was undertaken at the end of 2002, while some NOF-funded teacher training was still underway. The large majority of these teachers had finished their training because this was at the end of the national initiative. This final survey along with other evidence was used by the MirandaNet Fellowship to provide a national report on the initiative (see Preston, 2004). The consortium that undertook this evaluation was led by MirandaNet and included researchers from the Institute of Education, University of London, and that university's procedures were followed for ethical approval. The reanalysis also fell within the procedures of the same Institute. TTA office staff had introduced the original two-page survey questionnaire to widen its sample base. It sent the survey by postal mail and it was returned in the same way, or by fax. The cover letter noted that the data would be utilized both for quality assurance and for research by MirandaNet. No reminders or inducements were used, beyond the incentive to stimulate improvement of ICT teacher training through feedback to providers based on this information. The MirandaNet research team coded the data and the final section of comments was entered into a separate file grouped by approach to the training. These MirandaNet files were analyzed further by the authors for this study.

Teachers' evaluation of their ICT training: descriptive results
At the end of 2002, MirandaNet had gathered a total of 638 surveys for the national evaluation of ICT teacher training, covering 40 of the 47 ICT teacher training providers that had participated in the national initiative (Preston, 2004). The evidence discussed in this paper draws upon this opportunity sample covering 13 different approaches from 11 providers of ICT teacher training in England for which quality assurance reports and at least 15 survey responses were accessible. The use of a sample of the national data has helped the authors maintain anonymity of the providers, which is important for ethical reasons. A total of 496 surveys were used in this analysis, slightly over half of which were from secondary teachers and the remainder were from primary teachers (Table 1). Responses from librarians and those who taught both primary and secondary students were excluded due to the small number of such respondents. As can be seen in Table 2, the number of surveys ranged from 15 to 141 for one training approach. Although 15 is a small sub-sample it does come from a nationally representative sample of teachers in a survey with 63.8% return rate.

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[Insert Table 1 about here]

[Insert Table 2 about here]

Teachers were asked several questions about the modes of training that they had experienced, and multiple answers were encouraged. As shown in Table 3, about two thirds reported that they had been involved with face-to-face training, while only one third reported web-based training. Around a quarter had experienced some type of mentoring. Only 3% of the teachers reported no access to the Internet, over three quarters had access at school, and approximately half also had access at home. However it should be noted that access at school may have required the teacher to negotiate and make time for such access. At the start of NOF training in 1999, the U.K. National Grid For Learning promised rapid increased in connectivity and there were rapid increases for some educators and a few schools. However, when compared to broadband connectivity in 2007, the access to the Internet remained 'narrowband' or worse for most teachers during the NOF training. Condie & Munroe (2007: 20) note this remained a continuing issue in the U.K. and access is much more challenging in most of the world.

[Insert Table 3 about here]

A brief overview of the descriptive results from this sample is now provided to inform later discussion and we take this opportunity to reorder survey questions according to Guskey's (2002) five levels of professional development evaluation. In this context, it should be noted that the fifth level of pupils' learning was not covered and that access to the Internet at school as an indication of organizational support (level 3) is tenuous. Table 4 provides an overview of teachers' answers to the nine questions that assessed the impact of the training, showing a range of views with a bias towards the positive. The related Guskey level of evaluation of professional development is also identified for each question.

[Insert Table 4 about here]

Analysis of Guskey's levels
Factor analysis and reliability tests were performed on answers to the nine questions in Table 4, using them as variables regarding ICT teacher training. In this analysis, the correlation matrix and the component matrix showed positive, high correlation among the nine variables. The KMO statistic and Bartlett's test results ($p < .001$) showed that the nine variables fit together well. The value of Cronbach's standardized item alpha was .93 (Table 5). This result verified that a summated rating scale could be formed meaningfully from the variables, and this new variable was labelled "training evaluation." There was a significant difference between responses of primary and secondary teachers to the training factor ($p < .05$) (Table 6). Primary teachers were more positive about the training than secondary teachers.

[Insert Table 5 about here]

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[Insert Table 6 about here]

ICT teacher training evaluation: do Guskey's levels fit?
The focus of this paper is on improvement of ICT teacher training, including its evaluation. We were interested to see if Guskey's (2002) model could be confirmed for ICT teacher training. As introduced earlier, Guskey laid out five critical levels for the evaluation of teachers' professional development that build on one another and also predicted the hierarchical nature of these levels. The survey questions that related to Guskey's levels were recoded in the following way to reflect four of the five levels:

- Level 1: Participants' reactions to the training (items 3, 4, 5 and 7 were averaged)
- Level 2: Participants' learning, matched to identified training needs (items 6 and 8 were averaged)
- Level 3: Access to a computer and the internet at school was interpreted an indication of organizational support (item 14: Yes or No)
- Level 4: Participants' use of new knowledge and skills in relation to application of ICT teaching and to identify further training needs (items 1 and 2 were averaged)

The recoded levels were then formed into the following statistical model to test the hierarchical nature of four of Guskey's levels:

- Levels 1, 2 and 3 predict level 4.
- Levels 1 and 2 predict level 3
- Level 1 predicts level 2

Linear regression analysis was employed to determine the ability of the previous level(s) of Guskey's model to predict its higher levels. The results are laid out in Figures 1, 2, and 3. As shown in Figure 1, the results of the linear regression analysis showed that the first three levels made a significant contribution in explaining variance in the fourth level ($R^2 = .67$, $p < .001$). The other two predictions were also significant ($p < .001$) and the first two levels explained 6% of variation in level 3 (see Figure 2), and level 1 explained 47% of variation in level 2. Therefore the teachers' answers about their ICT training confirm the application of Guskey's (2002) multi-level evaluation of ICT professional development.

[Insert Figure 1 about here]

[Insert Figure 2 about here]

[Insert Figure 3 about here]

Experts' evaluation of the ICT teacher training
The length of quality assurance evaluation reports provided by seven different ICT experts for the TTA varied from 5 to 20 pages, containing both methodology and judgments on the quality of the ICT teacher training provision in four areas: (1) outcomes of training, (2) quality of provision, (3)

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quality of the learning experience and (4) quality of the management of the ICT teacher training. Reports often highlighted key issues and areas for development.

The objective of the second stage of our analysis was to provide an expert judgment and description of characteristics for each of Guskey's (2002) five levels from the reports. There were reports available from 11 of the 47 training providers (23.4%) with 15 or more teacher surveys and these were coded for Guskey's five levels plus the expert's overall view of the quality of the training approach. The first two authors, both experts in ICT teacher training, coded the reports separately. In general this qualitative analysis followed Stake (1995) and took place in two stages. In the first stage, both experts highlighted and coded phrases and larger sections that appeared to provide evidence for each of Guskey's five levels and the experts' overall opinion on the quality of the model of ICT teacher training. A large number of characteristics emerged and the researchers examined these to select discriminating factors for each level as follows:

- Level 1 (Participants' Reactions): Tutoring was chosen because it varied much more than resource-based learning. This was because a very large volume of materials had been developed and shared nationally.
- Level 2 (Participants' Learning): Needs assessment was always present, because it was required of all providers by the TTA. Therefore, use made of the needs assessment to inform further training was chosen.
- Level 3 (Organization Support & Change): The presence and quality of the negotiation with school leaders and/or support of schools to provide a suitable climate for ICT teacher training and innovation.
- Level 4 (Participants' Use of New Knowledge and Skills): Description of teacher use of ICT.
- Level 5 (Student Learning Outcomes): Student learning was rarely explicit, so examples of teacher use of ICT in the classroom that implied student use also, were included as evidence of student use. As expected, there was no evidence of the impact on student learning.

All the reports were then coded a second time using these discriminating factors and each approach was evaluated on a scale of 0 to 5 (see Key with Table 7). Two of the providers were judged to have different training approaches for primary and secondary teachers. In these cases, judgments for primary and secondary training were treated separately and both were retained when there were 15 or more surveys, thereby increasing the approaches of training provision from 11 to 13. Table 7 provides a summary of the analysis of the experts' reports on each of the thirteen approaches to ICT teacher training, which are coded from A, the most effective, to M, the least effective.

[Insert Table 7 about here]

There were a wide range of judgments, and that was expected given the original evaluation (Preston, 2004). Three approaches (A, B and C) were rated at the highest value (5) for all Guskey levels and in the overall judgement of the experts. Three training approaches (K, L and M) were rated at 1 or below for all five Guskey levels and the least effective training approach received a -1 because one report noted that the training had disrupted the curriculum and therefore could have negatively impacted student learning temporarily. Although the higher levels appear to be more discerning, as might be expected in a hierarchical model, the third level (Organization Support &

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Change) is particularly interesting because it is missing or ineffective from the start in the five lowest rated approaches (I-M) and has the highest score for all five of the most effective ones (A-E).

Correlation of teachers' and ICT experts' evaluations
The two sources of data provide an opportunity for validation (see Table 8). A strong significant correlation was found for levels 1, 2, and 4. As noted earlier, the measure for level 3 was weak. In conclusion, the significant correlations between teachers' evaluation and that of ICT experts reporting on the same provision confirm that Guskey's evaluation model does apply to ICT-related teacher training. This correlation also helped to address one of the weaknesses in the data collection. Between one and three of the seven experts reported on each of the 13 approaches re-analyzed. Had a different expert reviewed a particular training approach, then it is possible that there would be some difference in view. However, given the agreement between ICT experts and teachers, it is unlikely that the evaluation of any one approach by a different expert would have changed the perceived effectiveness reported in Table 7. A further analysis to contrast the approach perceived as most effective with the approach perceived as least effective clarifies this and the ecological characteristics that promoted or retarded ICT adoption (Davis et al, submitted).

[Insert Table 8 about here]

Conclusions and further research
This paper comes at a time when there is increasing demand for ICT teacher training in many countries (IFIP Stellenbosch Declaration, 2005; Hinostroza, 2008, in press) and the climate for ICT teacher training is changing in the U.K. (Preston and Cuthell, 2007; Hayden & Barton, 2007). This analysis of a national initiative with diverse approaches to ICT-related teacher training had three main purposes: to inform the evaluation of ICT-related teacher training, to inform the design of ICT-related teacher training, and to improve theoretical understanding of the processes of professional development.

This paper has provided evidence that Guskey's (2002) multi-level evaluation of professional development does indeed apply to ICT-related teacher training. Therefore we recommend that all five of Guskey's levels be consistently adopted for the evaluation of ICT teacher training and that research should also adopt a multilevel approach. The presence of 'organizational support and change' served as a particularly discriminating factor that indicated high quality training. This also informs the design of ICT-related teacher training suggesting that organizational change should be supported to complement ICT training for teachers.

As noted in a recent review by Condie and Munrow (2007), there have been significant changes in the nature of staff development for U.K. teachers in recent years. New initiatives have taken more ecological approach that promoted organizational support and leadership development alongside ICT teacher training. For example, the Masterclass initiative (Granville et al., 2005 in Condie & Munroe, 2007) provided staff development to three key groups: (1) school/classroom-based staff, including ICT coordinators, school librarians, and those with a staff development remit; (2) centrally-based staff, including local authority staff and external quality assurance staff; and (3) senior management in schools, including head teachers and deputy head teachers. Unfortunately the same has not occurred in the U.S., where the "No Child Left Behind" law appears to have led to ICT professional development to merge with whole school planning. This could have been beneficial but the requirement for evaluation of impact through randomized trials

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appears to have reduced or eliminated the opportunity the development of leadership of ICT in education and multi-level evaluation.

It appears that teachers change their practice with ICT more easily when ICT teacher training is accompanied by organizational support and change. This is also promoted by those who take an ecological perspective (Davis, 2008, in press; Zhao and Frank, 2003). Condie and Munroe (2007), recommend further exploration of the factors and note that:

> ... most progress has been observed where leaders demonstrated commitment and supported staff in achieving the strategic aims of the school. This involves both understanding of the potential of the technologies available and of how they can become integrated into the day-to-day life of the school. (p 20)

Further exploration was undertaken and is reported in our second paper that describes and contrasts the two extreme approaches to ICT teacher training in this NOF data with a further detailed analysis of the most highly rated approach and the lowest rated approach. We also linked the findings with ecological theory, which explains the need for both individual and organizational change (Davis, Preston & Sahin, submitted).

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Figures

Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.82	0.67	0.67	0.59

ANOVA[a]

Model[b]		Sum of squares	df	Mean square	F	Sig.
1	Regression	350.18	3	116.73	333.91	0.00
	Residual	171.99	492	0.35		
	Total	522.18	495			

[a] Predictors: (Constant), level3, level2, level1; [b] Dependent variable: level4

Figure 1: Prediction of Guskey's levels 1, 2 and 3 on Guskey's level 4

Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.24	0.06	0.06	0.37

ANOVA[a]

Model[b]		Sum of squares	df	Mean square	F	Sig.
1	Regression	4.19	2	2.09	15.42	0.00
	Residual	66.90	493	0.14		
	Total	71.09	495			

[a] Predictors: (Constant), level2, level1; [b] Dependent variable: level3

Figure 2: Prediction of Guskey' levels 1 and 2 on Guskey's level 3

Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.69	0.48	0.47	0.67

ANOVA[a]

Model[b]		Sum of squares	df	Mean square	F	Sig.
1	Regression	202.91	1	202.91	446.63	0.00
	Residual	224.43	494	0.45		
	Total	427.33	495			

[a] Predictor: (Constant), level1; [b] Dependent variable: level2

Figure 3: Prediction of level 2 by Guskey's level 1

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Tables

Table 1: Number of teachers surveyed by phase (n=496)

Phase	Sample analyzed here: Number (%) of teacher surveys	National sample: Number (%) of teacher surveys
Primary	230 (46.4%)	324 (49.5%)
Secondary	266 (53.6%)	330 (50.5%)
Total	496 (100%)	654 (100%)

Table 2: Number (and %) of teachers returning surveys for each of the 11 training approachs with 15 or more surveys in the sample, plus the number (and %) of comments on those surveys

Training approach code	Training for primary, secondary, or both	Number (%) of surveys	Number (%) of comments on each approach
A	Primary & secondary	15 (3.0%)	5 (2.9%)
B	Primary	19 (3.8%)	14 (8.0%)
C	Primary & secondary	15 (3.0%)	4 (2.3%)
D	Primary	33 (6.7%)	30 (17.1%)
E	Secondary	61 (12.3%)	14 (8.0%)
F & G	Primary & secondary	60 (12.1%)	22 (12.6%)
H & I	Primary & secondary	141 (28.4%)	14 (8.0%)
J	Primary & secondary	82 (16.5%)	5 (2.9%)
K	Primary & secondary	31 (6.3%)	26 (14.9%)
L	Primary & secondary	24 (4.8%)	29 (16.6%)
M	Primary & secondary	15 (3.0%)	12 (6.9%)
	Total sample	496 (100%)	175 (100%)

Table 3: Total number of survey responses to questions on training mode and access to the Internet (n=496)

Mode of training included ...	No	Yes
Face to Face training	172 (34.7%)	324 (65.3%)
Web based training	383 (77.2%)	113 (22.8%)
Mentoring	397 (80.0%)	99 (20.0%)
Teachers' access to the Internet?	*No*	*Yes*
Access to Internet at home	235 (47.4%)	261 (52.6%)
Access to Internet at school	86 (17.3%)	410 (82.7%)
No access to Internet	481 (97.0%)	15 (3.0%)

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Table 4: Teachers' responses to training evaluation questions (n=496)

Guskey critical level	*Brief description*	*Survey question with its number on the survey*	*Mean Value*
-	Training approach's efficiency	9. The administration of my training & communication with the training provider has been effective	3.23
G1	Participants' reactions	3. The approach of training is one which matches my preferred style of learning	3.16
G1	"	4. The training materials are well matched to my needs & relevant to the subject or phase in which I teach	3.09
G1	"	5. The trainers/mentors are well informed about the subject/phase in which I teach & are able to offer sound advice & guidelines	3.60
G1	"	7. I have received support from the training provider throughout my training	3.29
G2	Participants' learning	6. The training has taken account of what I already know & is matched to my identified needs	3.10
G2	"	8. I am aware of the progress I have made & any further training that I may require	3.63
G3	Organizational support and change	Internet access at school	82.66% (yes)
G4	Participant' use of new knowledge and skills	1. The training helps me to understand when & how I should employ ICT to teach my subject.	3.41
G4	"	2. The training has enabled me to apply ICT in my teaching & to be more critical of when ICT is an appropriate teaching resource	3.31
G5	Students' learning outcomes	Not questioned	-

Note: All questions used a five point Likert scale from strongly disagree to strongly agree, except for G3 "Internet at school?" that only permitted an answer of Yes or No.

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Table 5: Results of a factor analysis and reliability test on teachers' answers to 9 of the survey questions (shown in Table 5; n=496)

Items	*Factor loadings*	*Cronbach's standardized item alpha*	*KMO and Bartlett's test*
1. The training helps me to understand when & how I should employ ICT to teach my subject.	.85		
2. The training has enabled me to apply ICT in my teaching & to be more critical of when ICT is an appropriate teaching resource	.89		
3. The approach of training is one which matches my preferred style of learning	.80		
4. The training materials are well matched to my needs & relevant to the subject or phase in which I teach	.82		
5. The trainers/mentors are well informed about the subject/phase in which I teach & are able to offer sound advice & guidelines	.75	.93	.93
6. The training has taken account of what I already know & is matched to my identified needs	.81		
7. I have received support from the training provider throughout my training	.82		
8. I am aware of the progress I have made & any further training that I may require	.67		
9. The administration of my training & communication with the training provider has been effective	.86		

[a] Extraction method: Principal component analysis; [b] One component extracted.

Table 6: Responses of primary and secondary teachers to the training factor emerged from the nine survey questions

Group statistics

Phase		*N*	*Mean*	*Std. deviation*	*Std. error mean*
Factor for 9 questions	Primary	230	0.11	0.95	0.06
	Secondary	266	-0.10	1.03	0.06

Independent samples test

Factor for 9 questions	*Levene's test*		*t-test for equality of means*				
	F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean diff.*	*Std. err. diff.*
Equal variances assumed	2.86	0.09	2.26	494	0.02	0.20	0.09
Equal variances not assumed			2.27	492.18	0.02	0.20	0.09

ICT TEACHER TRAINING MULTILEVEL EVALUATION

Table 7. Analysis of reports on each training approach according to Guskey's five levels, plus the experts' overall view of each approach, in alphabetical order from most to least effective (left to right)

Training approach	A	B	C	D	E	F	G	H	I	J	K	L	M
Phase *	P&S	P	P&S **	P	S	S	P	P	P	S	S	P&S	P&S
No of reports analyzed	2	1	2	2	2	2	1	4	2	4	3	3	5
Experts' overall opinion	5	5	5	4	4	4	5	4	2	2	1	1	1
Guskey 1	5	5	5	5	3	4	4	2	4	2	1	1	1
Guskey 2	5	5	5	4	4	4	4	2	5	2	1	1	1
Guskey 3	5	5	5	5	5	4	4	4	0	0	1	0	0
Guskey 4	5	5	5	5	4	4	4	4	3	2	1	1	1
Guskey 5	5	5	5	3	3	3	3	4	3	1	1	1	-1

* Phase: P: Primary; S: Secondary; P&S Primary and Secondary; ** Specialist

Key to judgments used by the researchers in analyzing the quality assurance reports of each approach to ICT teacher training

Value		Description
0	Missing data	Not part of the approach OR never mentioned
-1	Negative	The training temporarily impacted the pupils negatively
1	Strongly disagree	Ineffective from start
2	Disagree	Poor, or introduced after the start with no or mixed opinion
3	Neither agree/disagree	Present, but no opinion OR mixed opinion
4	Agree	OK, or promising by end
5	Agree strongly	Very effective from start, or very effective at end, or both

Table 8: Correlations between teachers' and ICT experts' evaluations across Guskey's five levels using data from teachers' survey data (see Table 4) and ICT experts' reports (see Table 7).

Levels from ICT experts' report(s) on the training provider	Levels from survey data			
	Level 1	Level 2	Level 3	Level 4
Level 1	0.29**			
Level 2		0.18**		
Level 3			0.03	
Level 4				0.23**

** Correlation is significant at the 0.01 level.