Intel® Teach to the Future
Year Two Evaluation
South Africa

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Report prepared by Neil Butcher and Associates
for
SchoolNet South Africa and Intel® Teach to the Future, South Africa

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EXECUTIVE SUMMARY

This report presents the findings from the year-two evaluation of the Intel® Teach to the Future programme in South Africa.

The following questions guide the overall South African Intel® Teach to the Future evaluation:

1. How is the Intel® Teach to the Future programme implemented in a range of South African schooling contexts?
2. What are the experiences (positive and negative) of participants (project management, senior facilitators, facilitators, educators and learners) in the programme?
3. What opportunities and pitfalls can be identified in the implementation of the Intel® Teach to the Future programme?
4. Is there evidence of the use and integration of technology at the classroom level after taking part in the Intel® Teach to the Future training?
5. Is there evidence that ICT supports changes in pedagogical practice?

During year one, questions one to three were the focus, but not including the learner level. For year two, the focus shifted to questions four and five. Questions one to three continued to be explored, now including the learner perspective. With a focus on questions four and five, the evaluation research has moved to integrate an initial assessment of impact into the formative study.

A mixed-methodology has been used, and research methods included two surveys, a post training survey and an impact survey, as well as a case study in one school.

The report presents detailed qualitative and quantitative data. During the 2004 period more facilitators were trained than in the 2003 period, but fewer educators were trained. By the end of 2004 a total of 754 schools had been accepted into the programme, 623 facilitators and 718 educators had completed training, and an additional 1802 educators are currently in training.

The post-training (n=405) results show an overwhelmingly positive response to the Intel® Teach to the Future training, with 85% of respondents reporting that the training would definitely help them to integrate technology into learners' activities, and 91% stating that they would definitely recommend the training to a friend of colleague. In the post-training survey teachers are asked to rate themselves before and after training in terms of how well prepared they felt to implement different aspects of the training. A marked before and after difference was found for all competencies and these differences were all found to be statistically significant (Wilcoxon Signed Ranks Test).

An impact survey (n=231) was administered during the month of October 2004. This survey provides rich data with respect to implementation of the programme and also ICT access at the school level. Of those who completed the survey, 48.5% reported that they implemented a new technology-integrated lesson more than once per month since completing training. However, 28.8% reported that they had never implemented such a lesson. To better understand possible reasons for not implementing, additional analyses were done on this 28.8% of the sample. The most common reason given for not implementing training was that the 'necessary computers were not available' (75%). Of those who did implement, very positive responses were reported both from the educator and learner perspective. Some

implementation challenges included availability of computers, time constraints, learners' low level of computer skills and difficulties in scheduling sufficient time to complete the lesson.

In the discussion, the two focus questions of the year-two evaluation are addressed. With respect to evidence of use and integration of technology at the classroom level it was concluded that there is evidence of use and to some extent integration, but that the nature and quality thereof is variable. The final research question was whether there was evidence that ICT supports changes in pedagogical. The report concludes that ICT does support changes in pedagogical practices, however, it is not the technology per se, but ICT as a teaching tool, when training is provided to show how this tool can be used to support changes in pedagogical practice.

INTRODUCTION

This report is the second evaluation report prepared for the Intel® Teach to the Future programme in South Africa. Intel® Teach to the Future in South Africa is implemented by SchoolNet South Africa (SNA). Neil Butcher and Associates (NBA) was contracted in 2003 to evaluate the programme. Working closely with SNA and the Intel® Regional Educational Manager, the evaluation team seeks to provide data that can be incorporated into programme implementation, thus leading to improvements in delivery.

The year-one evaluation included documentation of the Intel® Teach to the Future programme in South Africa, analysis of post training evaluation forms completed during the facilitator training, and eight case studies. These case studies allowed for a detailed exploration of some of the different contexts in which the programme is being implemented in South Africa. Research methods used included semi-structured interviews, focus groups, a survey of the school's facilities, lesson observations, and Intel® Teach to the Future training observations. For year one, the evaluation was formative, seeking to document lessons that would support programme improvements. We did not include a focus on impact, as it was too early in the implementation of the project to begin assessing impact. In the year-two evaluation, reported on here, impact of the Intel® Teach to the Future programme at the school, educator, and learner levels was assessed.

This report begins by presenting the research design and methodology used for the year-two evaluation. This is followed by an overview of the study results, and finally the discussion and conclusion. Ground that was covered in the year one report, such as the South African schooling context, has not been presented again in this report. The reader is referred to the year one report for additional background information on implementing Intel® Teach to the Future in South Africa. For ease of reference, the executive summary of the year one report is included as Appendix One.

RESEARCH DESIGN AND METHODOLOGY

The evaluation research being conducted draws on both qualitative and quantitative methodologies. As such, a mixed-method approach is used. This is deemed important to understand nuances of project implementation and as a means of triangulating data gathered.

RESEARCH QUESTIONS

The following questions guide the overall South African Intel® Teach to the Future evaluation:

1. How is the Intel® Teach to the Future programme implemented in a range of South African schooling contexts?
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During year one, questions one to three were the focus, but not including the learner level. For year two, the focus shifted to questions four and five. Questions one to three continued to be explored, now including the learner perspective. With a focus on questions four and five, the evaluation research has moved to integrate an initial assessment of impact into the formative study.

RESEARCH METHODS

As noted above, a mixed-method approach has been used in this study.[1] Following the requirements of all country implementers of Intel® Teach to the Future to administer the standard 'post training' and 'impact surveys', these surveys were adapted to suit the South African education context and further questions were added. Both surveys are largely quantitative and formed the basis of the quantitative data collected.

Both surveys were primarily administered online, but with hard copies posted where requested. Post-training questionnaires should ideally be completed on the last day of every training session. However, we have found that this is not always done as teachers are eager to conclude the programme and do not always see the value of completing such surveys, particularly when they are rushing to complete their portfolios. As such, reminder e-mails were sent to all facilitators during the last two weeks of each quarter in an attempt to improve response rates. Post-training data have been reported quarterly throughout 2004. The cumulative 2004 data set has been used as the basis of the analysis presented here.

The impact survey was administered during October 2004. The plan was to gather data largely using an online form. An initial e-mail was sent to all qualifying facilitators, i.e. those who had completed their training at least six months prior to data collection. In this initial e-mail, facilitators were asked to provide a list of the educators they had trained and to indicate whether they and the educators at their school could complete the survey online. Response to this e-mail was poor, so each facilitator who did not respond was telephoned. Several facilitators requested hard copies of the survey for their schools. The required number of hard copies were posted to schools, together with a self-addressed and stamped envelop for return of surveys. To further encourage response, prizes were awarded to the first three schools to complete and submit all questionnaires, and ten lucky draw prizes were also awarded. Lucky draw prize winners were drawn from the full set of teachers who completed surveys.

In addition to gathering post-training and impact data, the evaluation also included one case study. The full case study report is included as Appendix Two. The school selected for the case study was one of the eight case study schools from the year one research and was chosen as a school that represents a 'typical' South African township school. The school was visited for two days in August and October, 2004. During school visits, interviews were conducted with the school principal, facilitators, and educators who had completed training. In addition, the researcher observed technology-integrated lessons of teachers who had been trained. Following lesson observations, informal class discussions were held with learners, and during the second visit learners completed a short self-complete questionnaire. Photographic data was also collected, and the researcher made use of an Intel® Digital Movie Creator to film parts of lessons.

[1] Copies of research instruments used are available on request; please email merridywilson@icon.co.za to request copies.

RESULTS

In this section we present the evaluation results for the post-training survey, impact survey, and case study. Each is dealt with in turn. Discussion in the following section brings together this range of results to draw conclusions and identify lessons.

At the time of writing this report,[2] 754 schools had been accepted into the Intel® Teach to the Future programme and 52 had been rejected. The most common reason for rejection is related to the computer infrastructure available at the school. In addition, 102 schools were pending, i.e. had completed the online registration form and were waiting for acceptance into the programme. A total of 623 facilitators had been successfully trained and 166 potential facilitators had applied to take part in training. Further, 718 educators had successfully completed their training (note, this number is dependent on the facilitator completing the database, hence the actual number of educators trained is likely to be larger than this) and 1,802 were currently taking part in training. Altogether, 169 educators were reported to have dropped out.

When educators drop out of the training the database automatically sends them an e-mail asking a couple of questions about why the person decided to discontinue the training. Of those who have dropped out and completed the withdrawal questions, the most common reason was insufficient time (85%). When asked if they would register at a later date for the course, 93% responded yes and 7% no. The short set of questions includes a space for comments. Two examples related to insufficient time were,

> It was merely the pressures of work, sadly so, that caused me to withdraw. Wonderful course and programme from which many can learn. I use what I learnt, be sure of that! Thank you for your interest and for taking the time to ask my opinion.

> Doing something just for the sake of it (i.e. making a learners presentation or pamphlet) at the end of a year when I am so busy with setting timetables and finalising reports made this quite difficult to get motivated to do it. I believe in everything Intel is about but the timing was very bad for me. I had to prioritize as I only have 24 hours in a day!

The table below compares 2003 and 2004 training statistics.

Table One: Training Statistics

TRAINING STATISTICS	2002-2003*	2002-2004**	DIFFERENCE 2004***
Number of schools accepted	374	754	380
Number of schools rejected	36	52	16
Number of facilitators trained	250	623	373
Number of potential facilitators registered to take part in training	237	166	N/A
Number of educators trained	426	718	292
Number of educators in training	1102	1802	N/A
Number of educators who have dropped out	84	169	85

[2] As per Intel® Teach to the Future South Africa database, available at: http://teach.schoolnet.org.za, 13/12/04. it should be noted that participants in the Northern Cape are not able to access the online database, thus the numbers presented here do not include a small section of participants.

** As of 29/01/04 – reflecting training that took place up until end of 2003.*
*** As of 13/12/04 – reflecting training that took place up until end of 2004.*
**** As of 13/12/04, reflecting training conducted in 2004 only.*

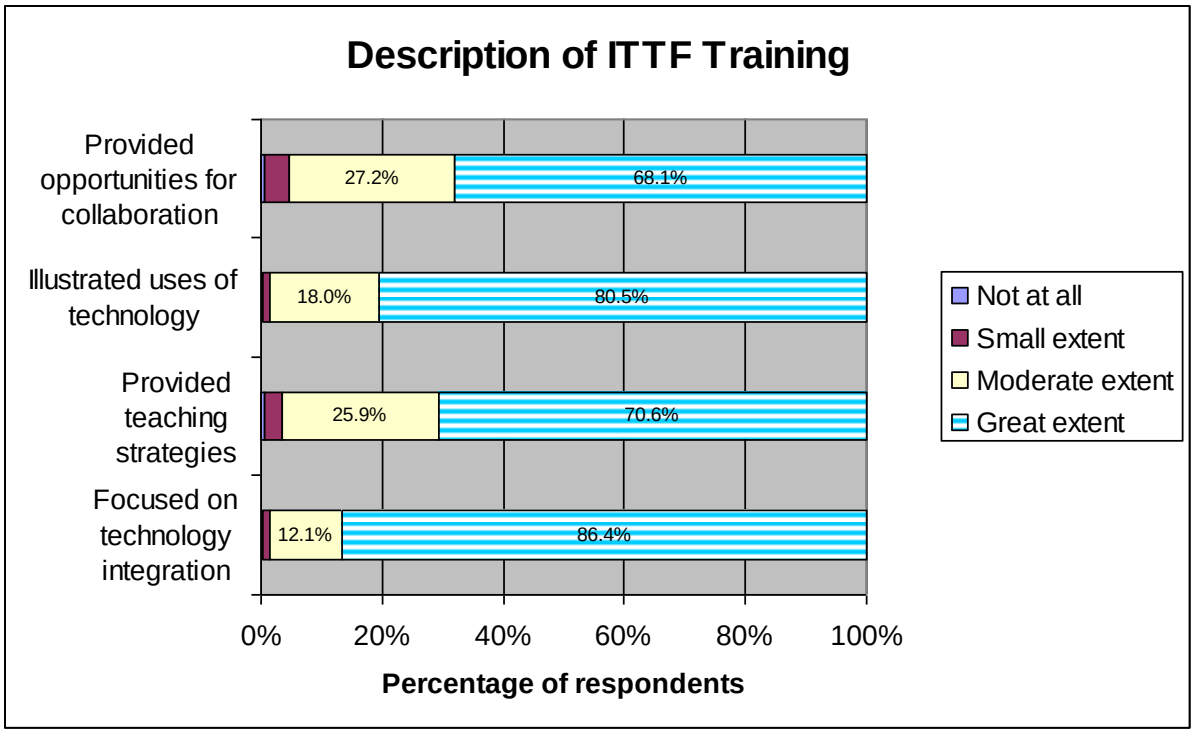
Thus, more facilitators were trained in 2004 than 2003, but fewer educators were trained. Since facilitator data is managed by the project manager and the senior trainers following the one-week facilitator training sessions, we can assume that this data is largely accurate. However, registering of educators who take part in the training becomes the responsibility of the facilitator once back at school. We have found lower than ideal use of the database once facilitators return to school. There are many reasons for this, one of the most common being costs of Internet access to enter data into the online database. Some facilitators have also indicated that they find the database complex to navigate and hence do not add all the data that they should. Nonetheless, statistics available via this project management tool are the best that we have available and hence are reported here. With respect to number of schools accepted, there is very little change, but the number of schools that have been rejected has decreased substantially in 2004. The number of educators who have dropped out has also remained constant from 2003 to 2004.

POST TRAINING DATA

A total of 405 respondents completed the post training survey during 2004, mostly online (only eight hard-copy responses were submitted). Based on the 2004 statistics presented above, 665 facilitators and educators completed training. This gives a post-training response rate of 61%. It should be noted that, because of the likelihood that not all educators who have been trained are reflected in the database, the response rate is likely to be somewhat lower than 61%. This limitation notwithstanding, this is an excellent response rate for an online survey.

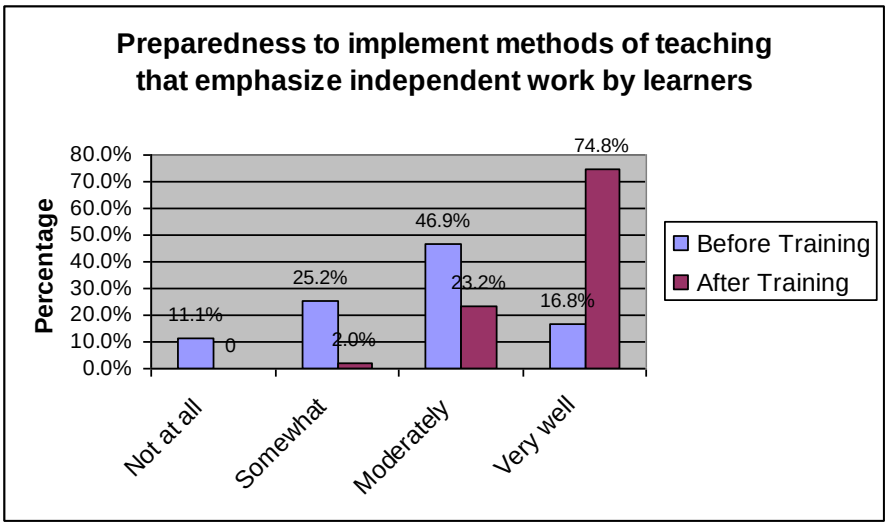
Of this sample, 70.1% had completed facilitator training and 29.9% had completed educator training. The number of responses decreased each quarter. In Q1, 164 (40.5%) participants completed the survey, in Q2, 121 (29.9%), in Q3, 83 (20.5%), and in Q4 only 37 (9.1%). One of the reasons for the lower numbers in Q4 is that the last round of facilitator training took place in early September and was included in the Q3 numbers. The next facilitators' training will take place in January 2005 just before schools open, rather than in December 2004. It is hoped that this will help to maintain the momentum of the new facilitators, and that they will be more likely to start training in their schools having just completed their own course.

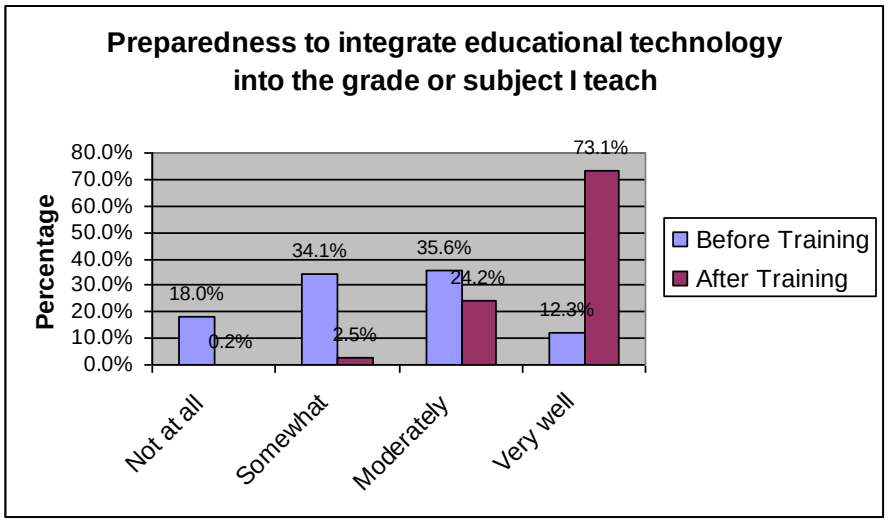
The post-training results for 2004 were overwhelmingly positive, with 85% of respondents noting that the training they had just completed would definitely help them to integrate technology into learners' activities. Further, 91% claimed that they would definitely recommend the training to a friend or colleague. Positive ratings were provided on questions about the training and the training curriculum, as shown in the graph below.

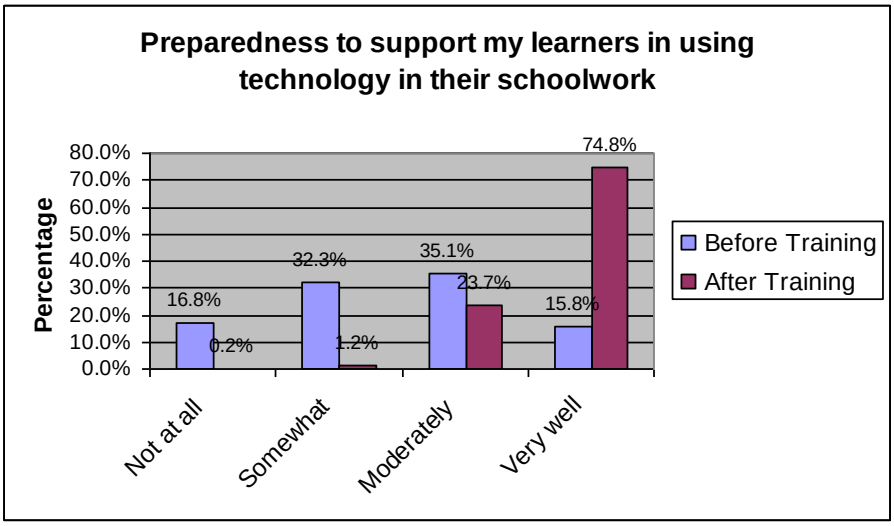


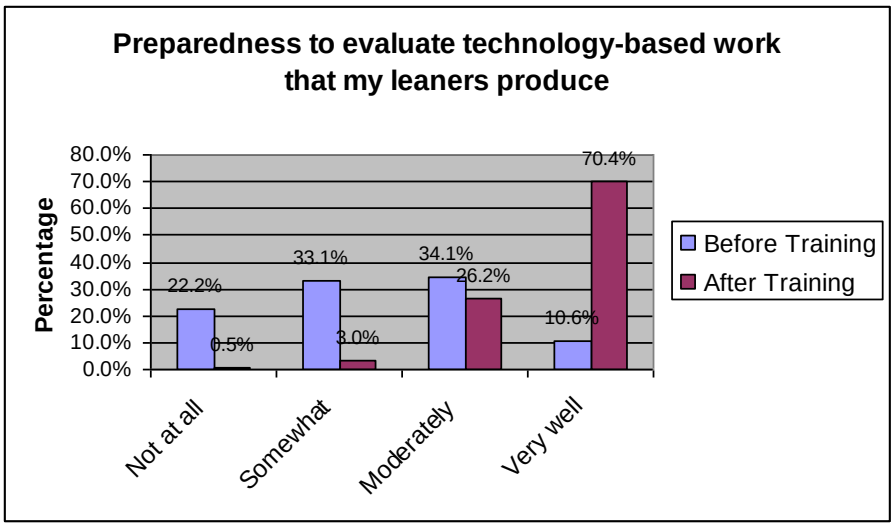
Note: Data values are not shown for 'not at all' and 'small extent' since percentage is so small and numbers did not fit on graph

Teachers were asked to rate themselves on how well prepared they felt to implement different aspects of the Intel® Teach to the Future curriculum. For each new competency, 'before' and 'after' ratings were given. Responses to each competency are presented in the graphs below.









These graphs show clear differences in 'before' and 'after' responses, with responses generally being much more positive for competencies after training.

A Wilcoxon Matched-Pairs Signed Ranks test was used to assess whether the 'before' and 'after' ratings for each of these competencies were statistically significant. The Wilcoxon Test is a non-parametric test and was used because such tests do not make assumptions about how normal, even, or regular the distribution of scores will be, and non-parametric tests can also be used on small samples.[3]

The 'before' and 'after' ratings for each of the four sets of ratings were found to be statistically significant (p=0.000).

IMPACT DATA

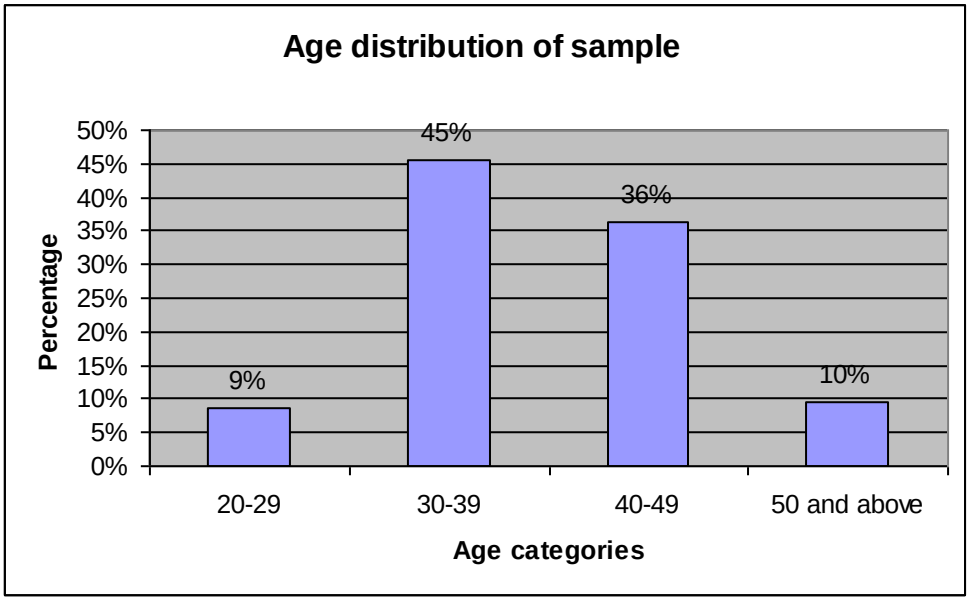
While the post-training results presented above provide an indication of participants' experiences of the Intel® Teach to the Future training and also their self-reported ratings with respect to core competencies developed through the training, the impact survey provides an indication of how teachers implement what they have learned at the classroom level. Further, since at least six months have passed between completion of training and survey completion this data provides a longer term perspective on the impact of Intel® Teach to the Future training.

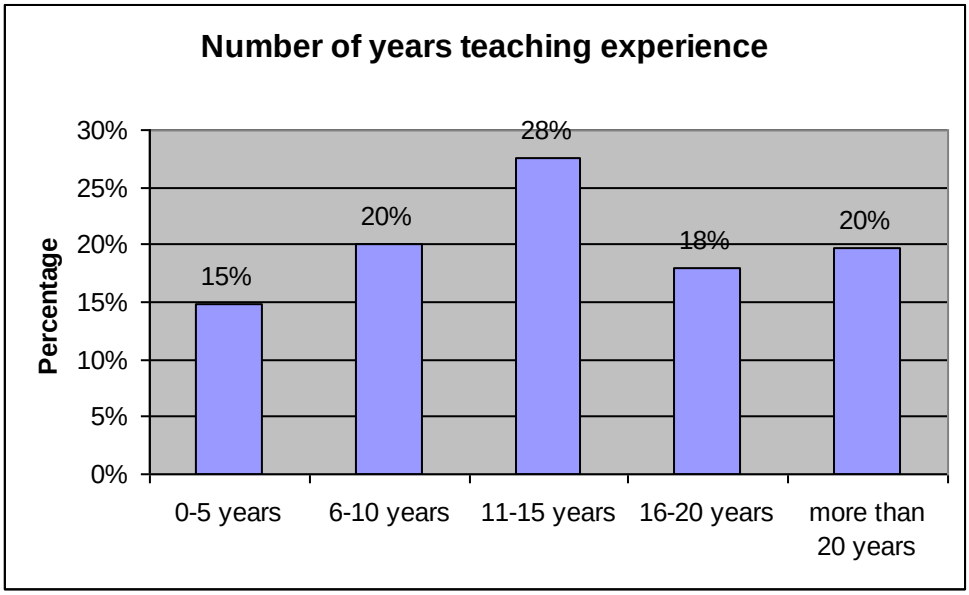
A total of 231 impact questionnaires were completed during the month of data collection. It is difficult to define the total population from which this sample was drawn since, as noted above, not all facilitators make use of the online database. As such, for the survey, a list of all facilitators who had completed their training by March 2004 was drawn. The end of March was set as the cut off for inclusion in the survey sample as this allowed for a minimum of six months between taking part in the Intel® Teach to the Future training and completion of the survey (as specified in the survey administration instructions). A total of 288 facilitators were listed at the end of March 2004. Each of these facilitators was contacted, either via e-mail or telephone, and asked how many educators they had trained. According to facilitators' responses, the 790 educators were trained. The total sample size was thus 1,078. As such, with 231 responses, the estimated response rate for this survey was 21%. This is lower than planned, especially since prizes were provided as incentives and several reminder e-mails and telephone calls were made. This low response rate notwithstanding, a data set of 231 responses provides a useful dataset with which to begin to measure impact.

Sample Description

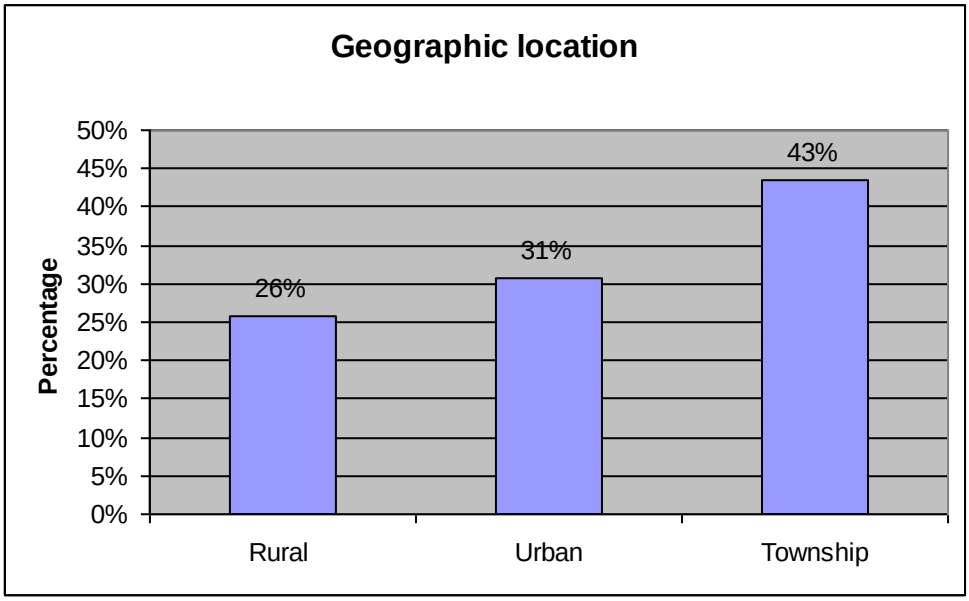
The sample was made up of 48.5% men and 51.5% women. 59% of the sample were General Education and Training (GET) educators and 41% Further Education and Training (FET) educators. Facilitator training had been completed by 45.9% and educator training by 54.1%. The diagrams below show the age distribution and number of years of teaching experience of the sample.

[3] See for example, Cohen, L; Manion, L & Morrison K (2000). *Research Methods in Education*. 5th Edition. London: RoutledgeFalmer and; Bless, C & Kathuria, R (1993). *Fundamentals of Social Statistics. An African Perspective.* Johannesburg: Juta and Co, Ltd.





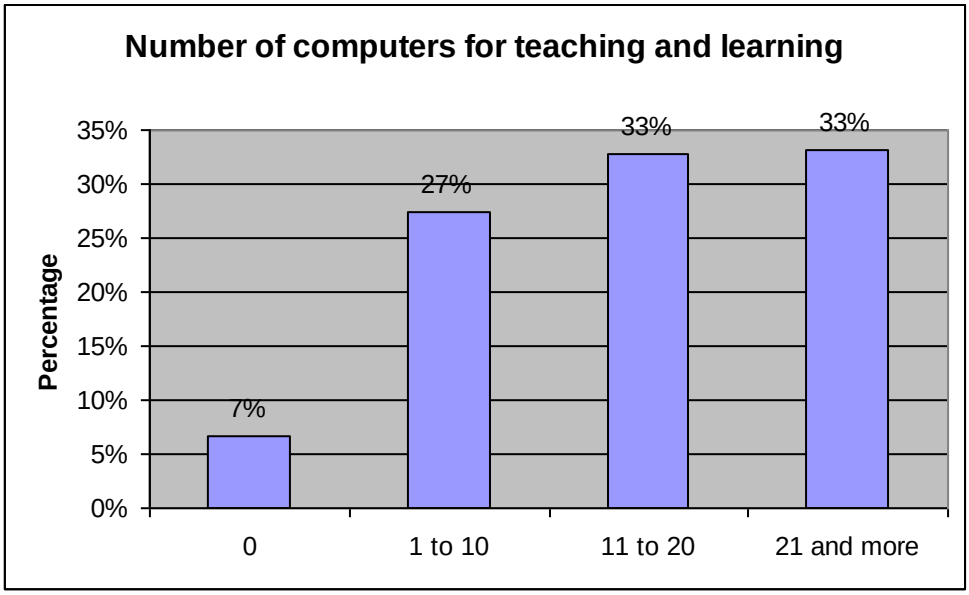
Respondents came from rural, urban, and township areas as follows:



A surprising statistic was the number of respondents who reported having a computer at home (71.9%) compared to 28.1% who did not. Since experience of South African schooling implies that few teachers have computers at home, we expect that this statistic may reflect a bias in the data, with those who have a computer at home being more likely to complete the survey. However, when tested statistically using a Chi-Square Test for association there is no significant association between having a computer at home and implementing a technology-integrated lesson (p=0.672).

Overview of ICT access

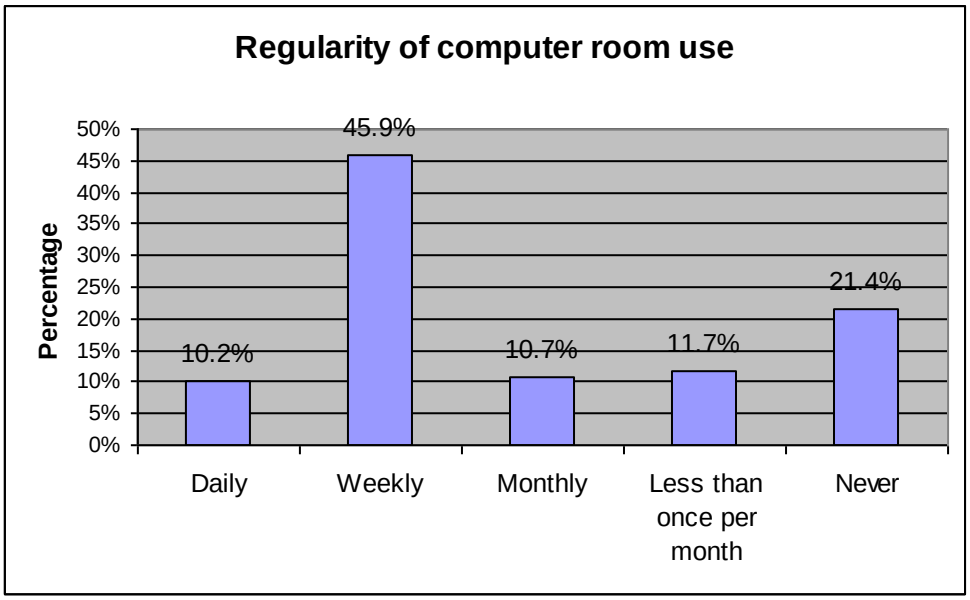
The following graph shows the numbers of computers available for teaching and learning in the schools from which this sample of teachers came.



Having eleven and more computers was the most common response. We see that 7% of respondents have no computers in their school for teaching and learning. As such, these teachers should not have taken part in the Intel® Teach to the Future training as access to computers is a prerequisite for selection. However, it could also be that the computers from

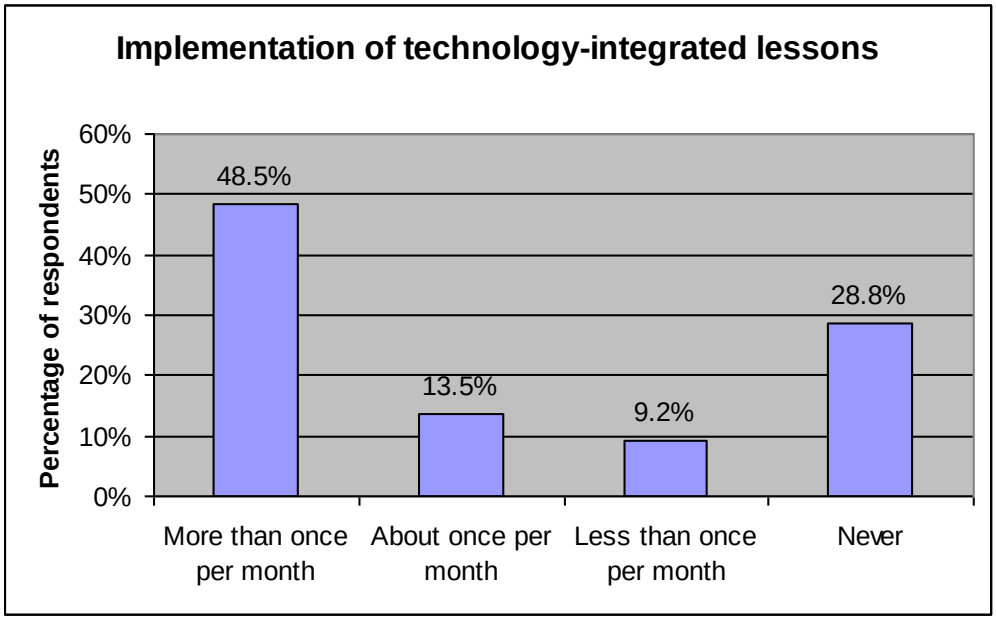
these schools might have been stolen or perhaps are not working. Similarly, 79.1% reported having access to a computer laboratory, while 20.9% do not. In the computer laboratory, 63% reported having Internet access, while 37% do not. With respect to computers in the classroom (as opposed to the computer room), 80.7% reported that they had no computers available in the classroom; 11.2% had one computer available, and 7.2% had more than seven computers. This latter group is most likely to be made up of computer studies teachers or teachers who make use of computer rooms as their classrooms.

Respondents were asked about how regularly they make use of the computer laboratory. The responses provided are presented below. We see that weekly use of the computer laboratory is most common. What the data does not tell us, however, is for how long each week the computer laboratory is used. Qualitative evidence (see case study) indicates that, in some cases, only one period (sometimes as little as half an hour) per week per class is available. This makes implementing a technology-based lesson a challenge for teachers, especially in schools where large classes are common.



Implementation of Technology-Integrated Lessons

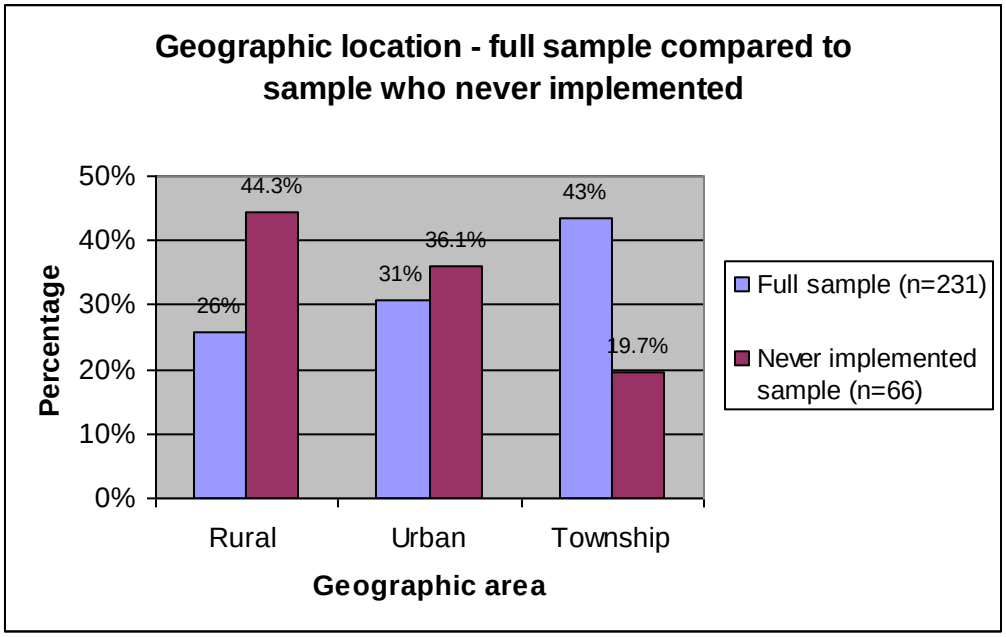
The core aspect of this impact survey is to assess the extent to which technology-integrated lessons have been implemented by those who have completed Intel® Teach to the Future training. The following graph provides an overview of the regularity of implementation of technology-integrated lessons. We see that 48.5% of the sample had learners use technology within their lessons more than once per month. This can be contrasted with 28.8% of the sample who have yet to implement a technology-integrated lesson.



While we see that approximately half of the sample have implemented what they learned in the Intel® Teach to the Future training (a reasonable number given the various contextual constraints at South African schools), in order to ensure that all teachers who are trained go on to implement what they have learned, it is important that we try to understand who makes up the 28.8% who have never implemented a technology-integrated lesson. This was done by selecting only those who fell into the 'never' category (a total of 66 respondents) and then doing a descriptive analysis of demographic data available.

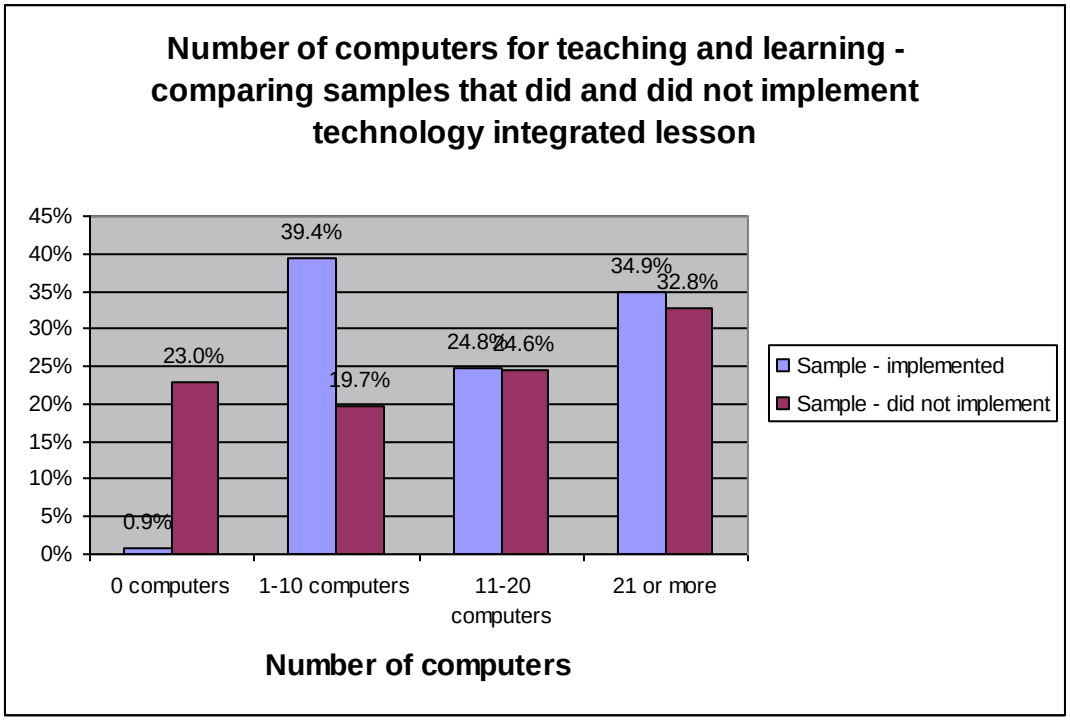
Exploration of Sample who have NEVER Implemented a Technology-Integrated Lesson

Analysis of the 66 respondents who had not implemented a technology-integrated lesson showed that this group was 59.1% female and 40.9% male. The ratio of female to male is slightly higher than for the full dataset, but the difference is small. A larger difference was found when we consider those who are GET and FET educators. In the 'never' implemented group 75.4% of respondents were GET educators and 24.6% FET educators. Similarly, with respect to geographic location, we found that 44.3% of those who have never implemented a technology-integrated lesson live in rural areas, 36.1% in urban areas, and 19.7% in township areas. The graph below shows geographic location, as a percentage, for the whole sample and for those who have never implemented a technology-integrated lesson.

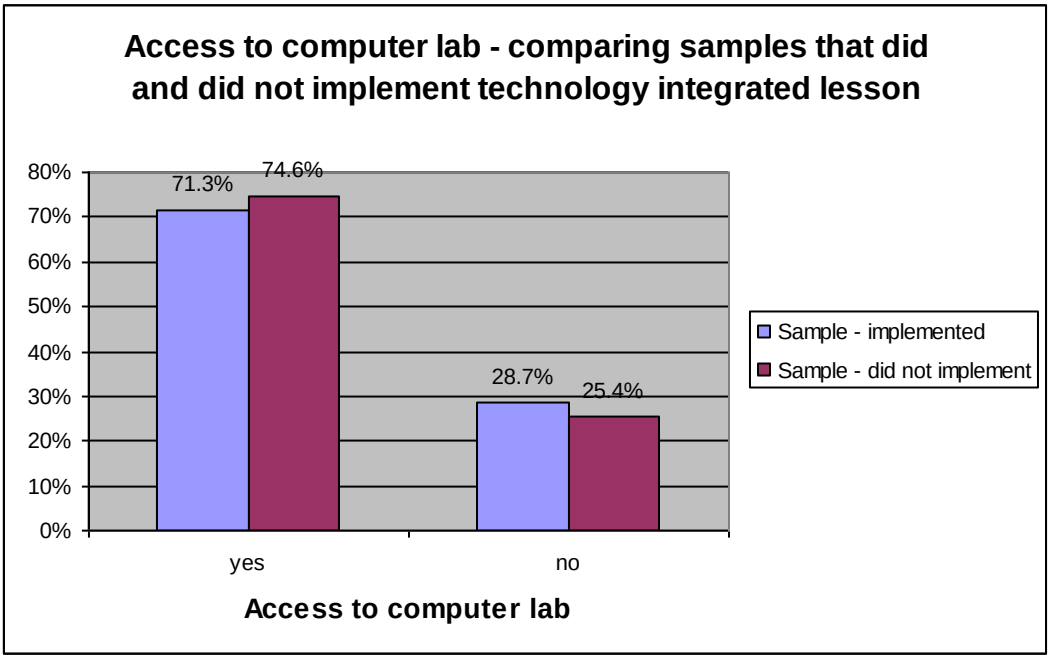


We see the sample of those who did not implement a technology-integrated lesson has a much greater percentage of rural respondents and smaller percentage of township respondents than the overall sample. Thus, living in a rural area might be a factor affecting implementation following Intel® Teach to the Future training.

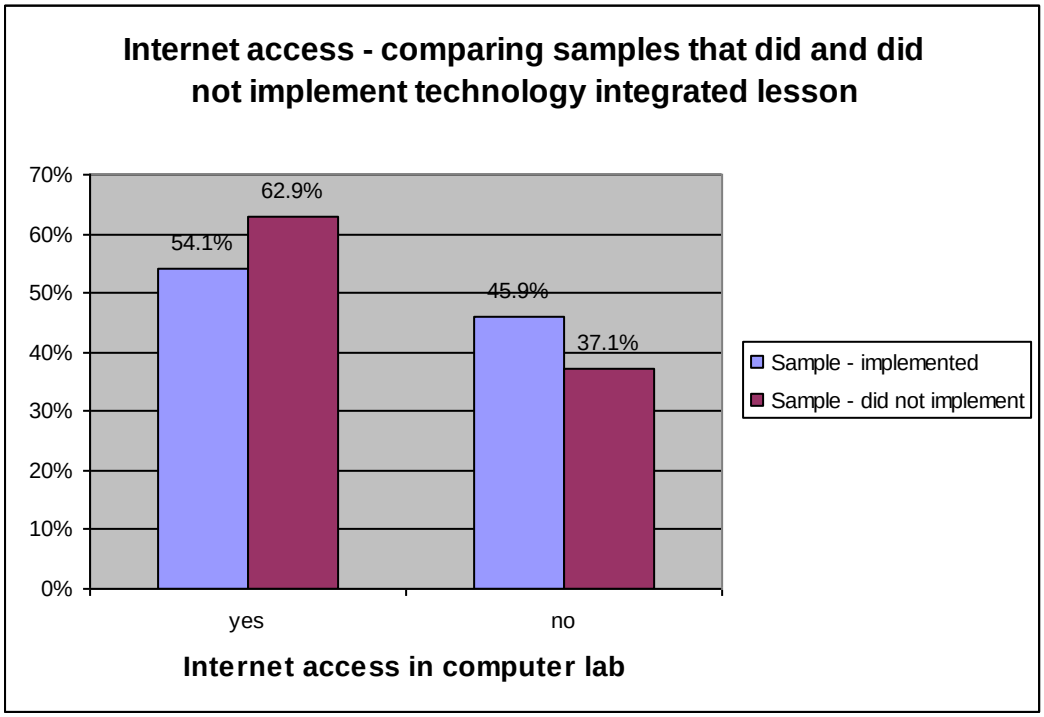
In the first section of impact data results, a series of graphs was presented showing access to ICT resources. In order to understand the influence of ICT access on the group of educators who have never used technology in their lessons, it is helpful to compare access statistics for this group with access statistics for those in the sample who did implement a technology-integrated lesson. The following graphs compare these two groups with respect to computer laboratory access, number of computers in the school for teaching and learning, access to the internet in the computer laboratory, frequency of computer laboratory use, and access to a computer at home.



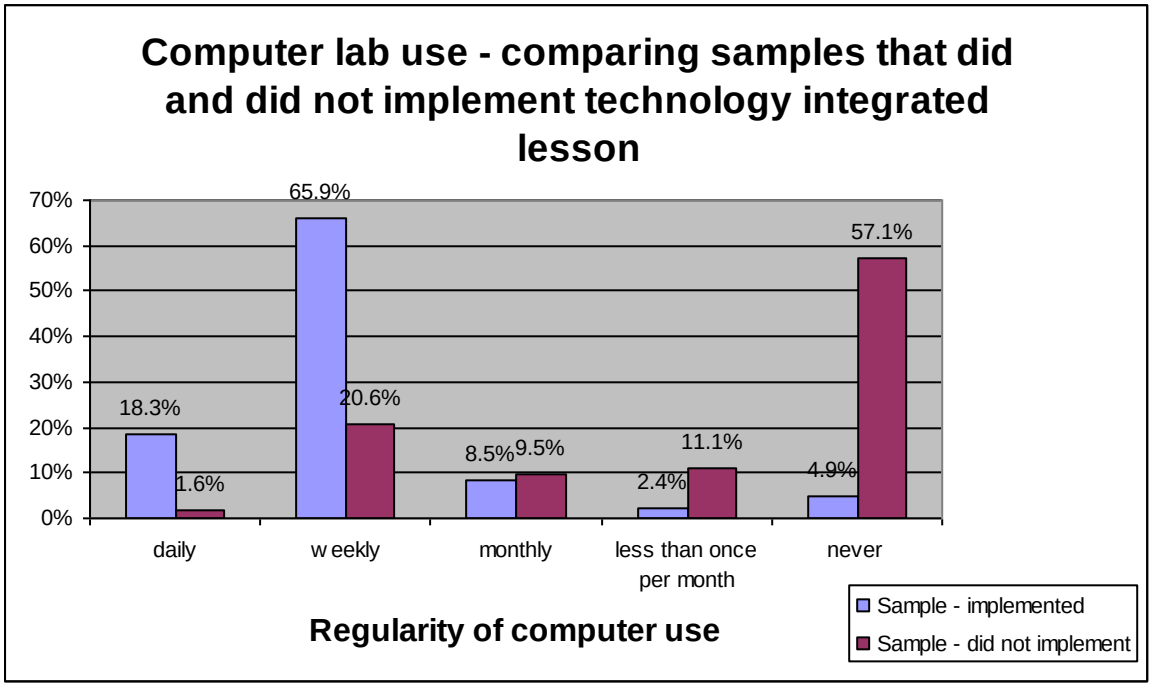
Unsurprisingly, within the sample who did not implement, we see a greater percentage of respondents who come from schools with no computers for teaching and learning. In schools with between one and ten computers we see a greater percentage of educators who did implement. However, we also see that 77.1% of those who have never implemented do have computers available for teaching and learning in their school, and, when we look at the categories '11-20', '21 and more' computers, we see that the differences between implementers and non-implementers are in fact very small. These statistics are supported by the following comparison.



There is very little difference with respect to those who did and did not implement when we consider access to a computer laboratory. Of particular interest is that those who did not implement appear to have slightly better access to a computer than those who did. This indicates that the presence of a computer laboratory does not seem to have an effect on whether or not technology-integrated lessons are implemented (although, as will be shown later, access to a computer laboratory does affect how often those who do implement are able to do so). Very similar results are found we compared these two groups with respect to Internet access.

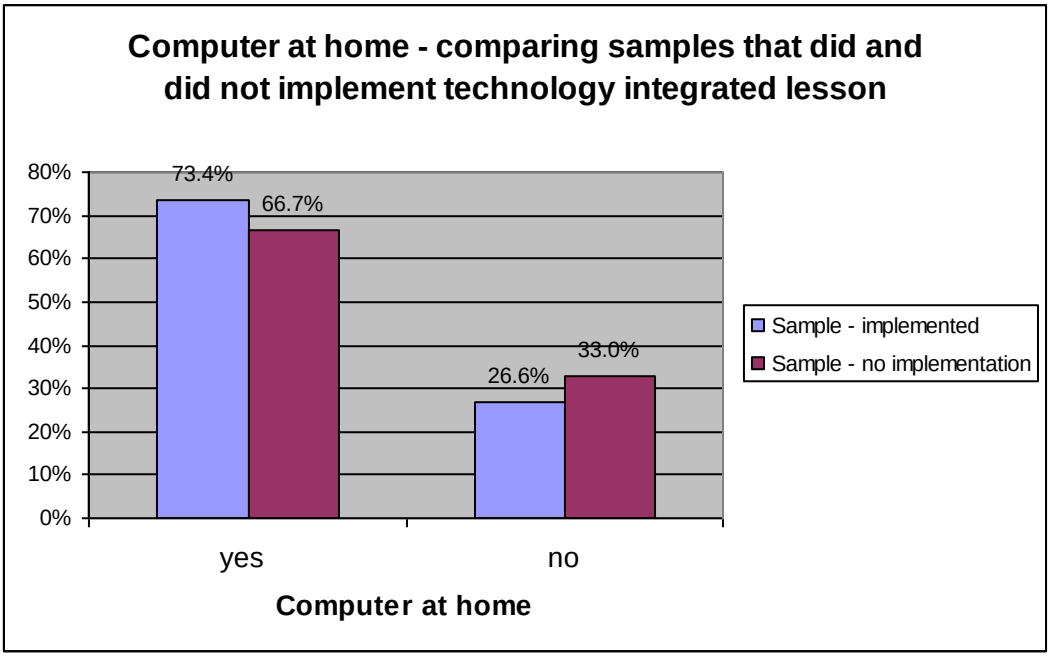


Again, we find that those who do not implement technology-integrated lessons have slightly better access to the Internet than those who do, although the difference is again very small. Thus it appears that Internet access does not influence decisions of whether or not to implement such a lesson. Clearer differences are however found when we compare these two groups with respect to regularity of computer laboratory use.



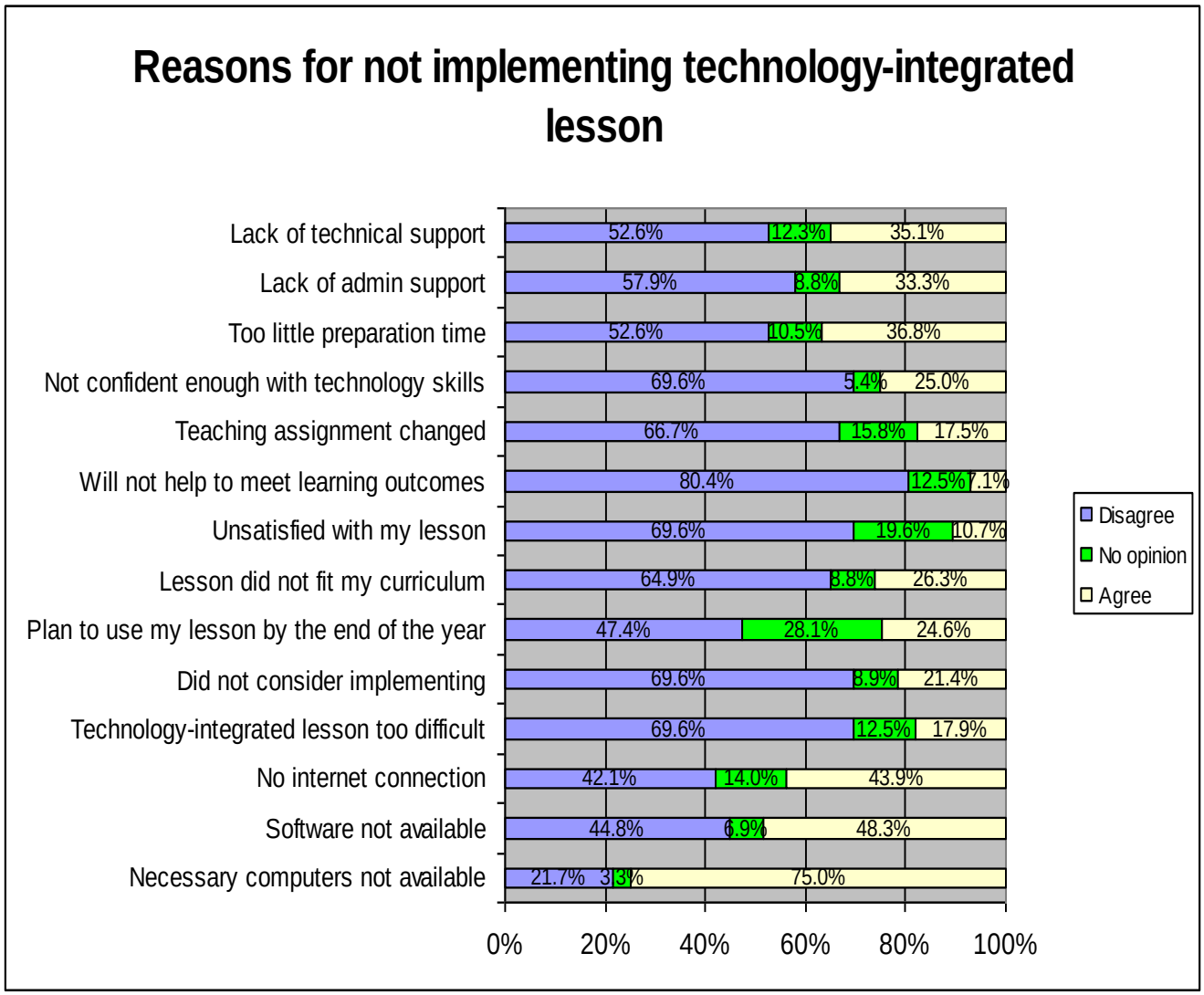
From the above graph it is evident that 57.1% of those who have not implemented what they learnt in their training never use their computer laboratory. This survey does not provide information to explain this, but reasons might include a lack of interest in using computers for teaching and learning, or difficulties with respect to timetabling when schools have limited computer resources. This is especially the case for teachers who do not teach computer studies. This issue is explored in more detail in the case study. Still working with the group who did not implement their Intel® Teach to the Future lessons, we see that 42.9% do in fact make use of their computer laboratories, although for Intel® Teach to the Future related lessons. The questions included in the survey about reasons for not implementing new technology-integrated lessons provide some possible answers to this finding. As presented below, in addition to access to computers, other reasons that people did not implement included lack of access to required software, too little preparation time, and also both administrative and technical support available.

A final comparison with respect to ICT access was made between the implementing and non-implementing groups. This was access to a computer at home.



This graph shows that, while the difference is again small, those who did implement Intel® Teach to the Future lessons were slightly more likely to have a computer at home. Having a computer at home would help with the challenge of too little preparation time.

Those respondents who had not implemented a technology-integrated lesson were asked a series of questions about reasons why they had not yet made use of technology in their teaching. These responses are summarized below.



The main reason for not implementing a technology-integrated lesson was that 'necessary computers were not available' (75% agreed with this statement). The other three reasons noted by 30% or more of the sample included:

- Software not available (48.3%);
- No Internet connection (43.9%);
- Too little preparation time (36.8%);
- Lack of technical support (35.1%); and
- Lack of administrative support (33.3%).

Similar trends were found in the global data analysis presented by the EDC,[4] where 59.4% of the sample agreed with the statement 'necessary computers were not available', 53.2% agreed that they had 'too little preparation time', 47% agree that they 'did not have adequate technical support' and 44.5% agree that they 'did not have adequate administrative support'.

To further explore factors effecting frequency of implementation of technology-integrated lessons across the whole sample, a series of Chi-Squared analyses were carried out. This statistical test allows one to measure the association between two variables. A significant

[4] Martin, W & Light, D (2004). How to Move from Data Gathering to Richer Evaluation. Presentation at the 2004 Curriculum Roundtable.

result implies that there is a relationship between the two variables in question. It should be noted that a significant association does not necessarily imply causation. The table below presents the results of these analyses.

Table Two: Chi-Square Analysis Results

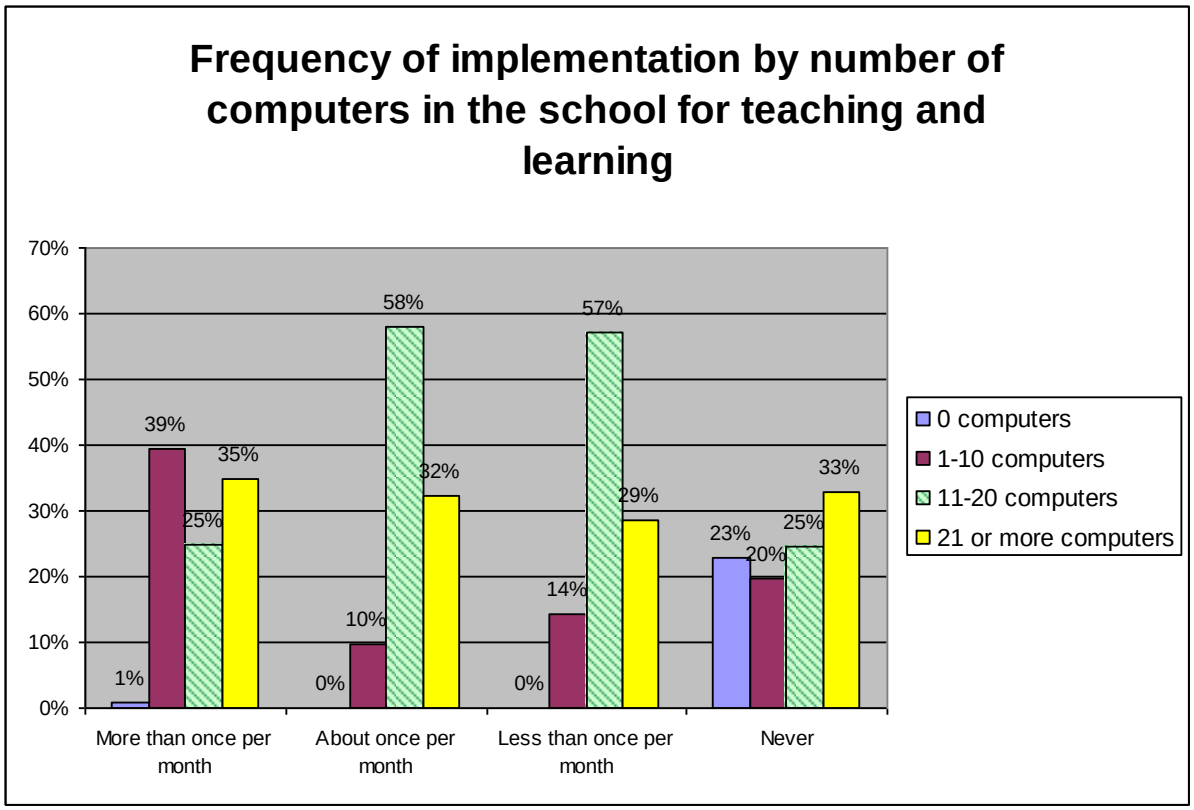
VARIABLE TESTED FOR ASSOCIATION WITH 'IMPLEMENTATION OF TECHNOLOGY-INTEGRATED LESSON'	STATISTICALLY SIGNIFICANT (YES/NO)
Access to a computer laboratory at school	Yes, at 0.001 level
Regularity of computer laboratory use	Yes, at 0.001 level
Number of computers in school for teaching and learning	Yes, at 0.001 level
Internet access in computer room	Yes, at 0.05 level
Computer at home	No
Geographic area	Yes, at 0.001 level
GET or FET educator	Yes, at 0.05 level
Sex of educator	No
Number of years of teaching experience	No

Thus, highly significant associations were found with the various measures of computer access at schools and with geographic area. Significant results were also found for Internet access in the computer room and being a GET versus an FET education. Further analysis was done with respect to the effects of ICT access and these results are presented in the following section.

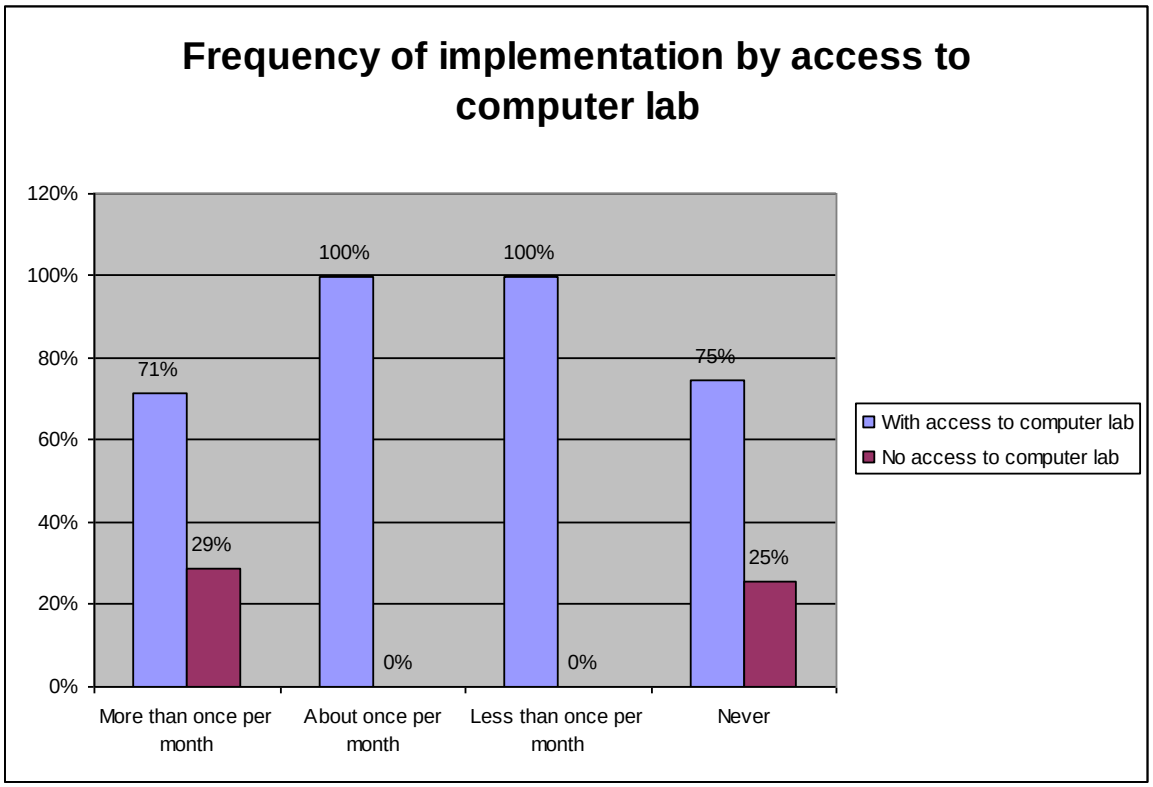
Exploring Implementation and Computer Access

Given the significance of measures of computer access when tested for association with implementation of a technology-integrated lesson, together with the interesting comparative access statistics presented above, in this section we further explore these effects – focusing now on the whole sample.

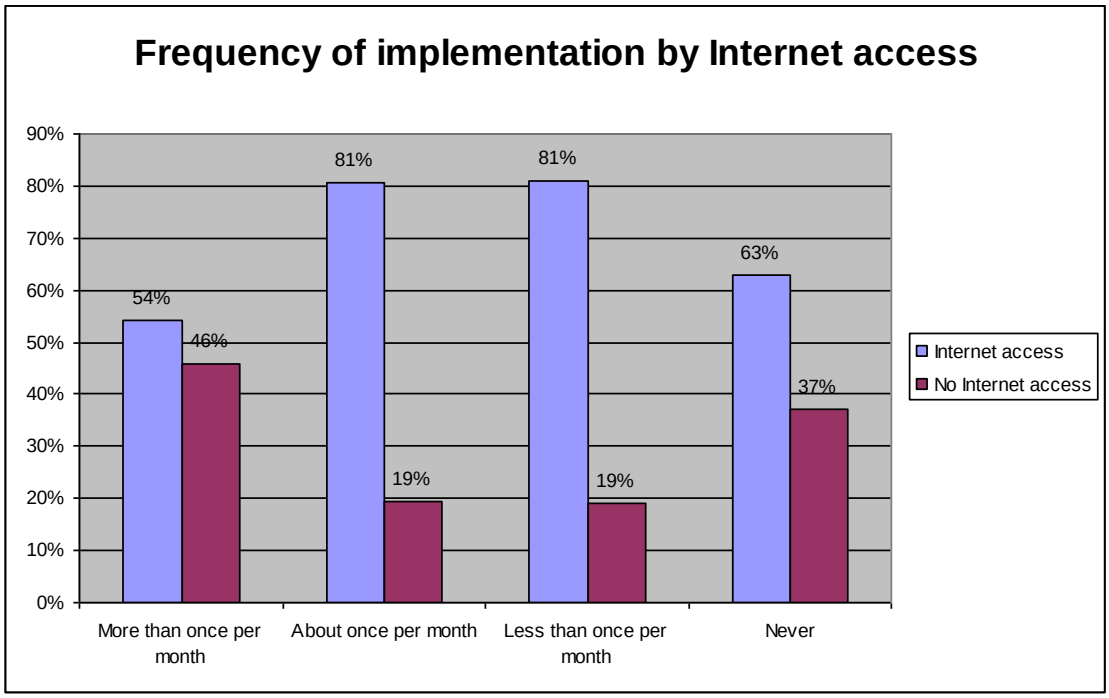
The first graph below shows the frequency of technology-integrated lessons by number of computers in the schools for teaching and learning.



This presentation of the data supports the comparative statistics presented above, as we see that, within the 'never implemented' category, although the percentage of respondents having no computer is much higher than for the other categories, many respondents do have access to computers for teaching and learning. It is interesting to note that 1% of those who implement more than once per month do not have access to computers for teaching and learning. This is likely to be teachers who make use of a computer centre as was described in the case studies conducted in year one. From this data, it appears that once 21 and more computers are available, the number of computers does not have much impact on the frequency with which teachers implement technology-integrated lessons (note that the percentage of 21 or more computers remains fairly constant across implementation categories). Those who implement in the region of once per month (including slightly less and more) tend to come from schools that have between 11 and 20 computers for teaching and learning, a common number of computers for South Africa schools with computer laboratories.



As was reported in the comparative data above, access to a computer laboratory does not seem to have an effect on those who never implement, with 75% of those who never implement technology-integrated lessons having access to a computer laboratory. But we see that those who do implement in the region of once per month all come from schools with computer laboratories. Interestingly, 29% of those who implement technology-integrated lessons more than once per month do not have access to a computer laboratory. In this instance, these educators are likely to make use of a computer centre, perhaps computers available at a cluster school, or some may have a limited number of computers in the classroom. A question about access to computers in the classroom was included in the survey and it was found that 80.7% have no computer access in the classroom, 11.2% have one classroom computer, 0.4% have 2-4 classroom computers, 0.4% have 5-7 classroom computers and 7.2% have more than seven classroom computers (most likely teachers whose classroom is the computer laboratory).

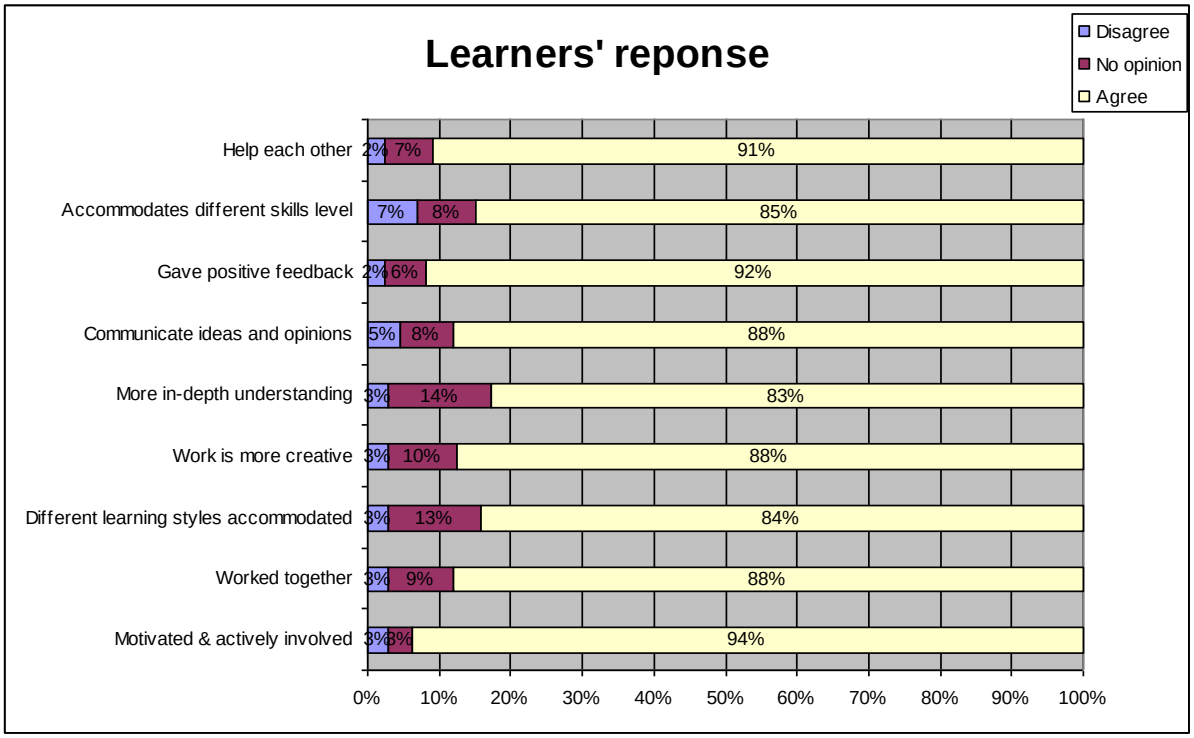


With respect to influence of Internet access on frequency of implementation, also a statistically significant association, we see that lack of Internet access is unlikely to be a reason that some teachers do not implement their Intel® Teach to the Future lessons. The graph does show that, for those who implement about once per month, most do have Internet access in the computer laboratory. For those who implement more than once per month, the difference between those who do and those who do not have Internet access is much smaller. We might speculate – but as yet do not have data to support this – that when teachers first start integrating technology, they do so about once per month and then tend to focus on information-gathering activities using the Internet. Once technology integration becomes a more integral part of their teaching, then reliance on the Internet is reduced and a wider range of computer applications is used. This would be an interesting hypothesis to test in further studies.

Impact of Technology-Integrated Lessons

For those respondents who did implement a lesson in which they integrated technology in a new way, a series of questions was asked about their experience of implementing this lesson and the response of learners to these lessons.

Teachers gave the following responses with respect to how learners responded to the lesson(s) they had implemented:

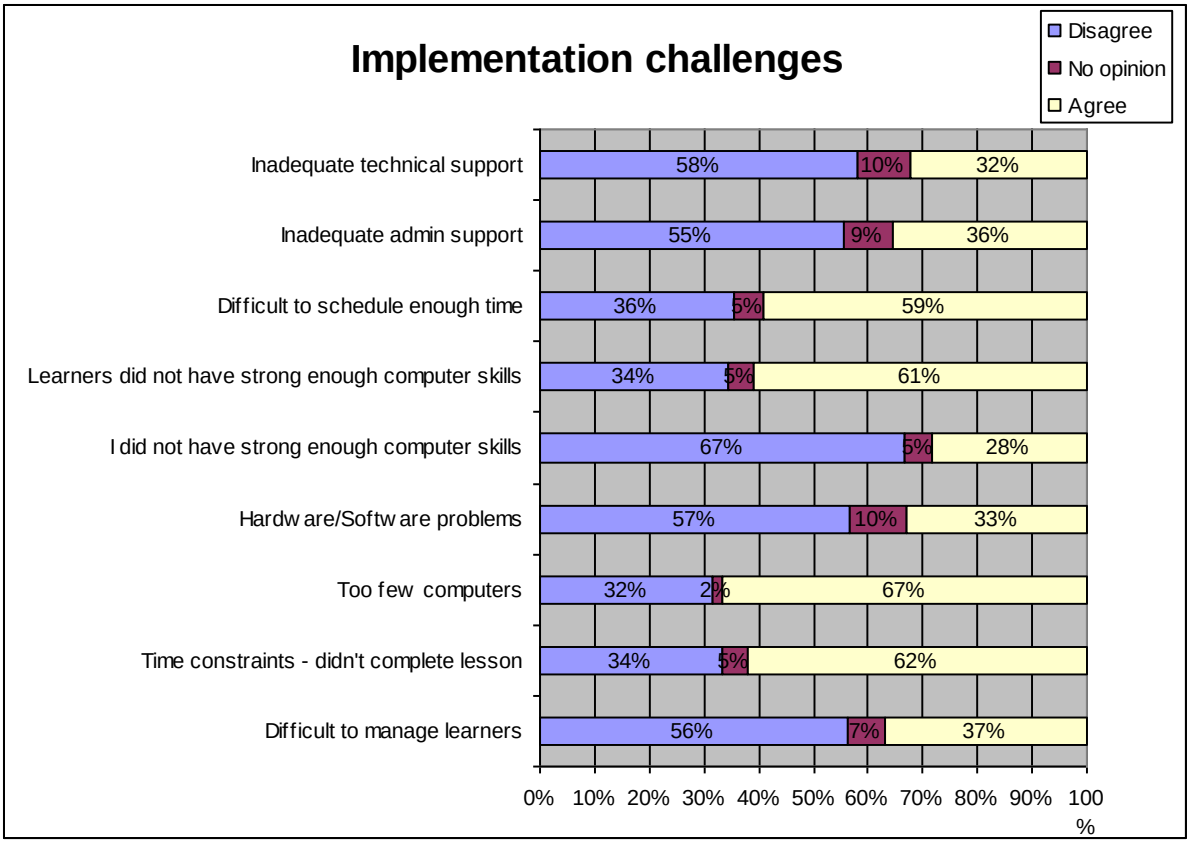


Overall, learners have responded very positively, both in terms of how they responded during the lesson and also with respect to feedback given. Based on these statistics, it appears that the goals of the Intel® Teach to the Future programme with respect to impact on learners are being realized.

When asked about the challenges that were experienced whilst implementing technology-integrated lessons the most common responses included:

- Too few computers;
- Time constraints and hence lesson not completed;
- Learners did not have enough computer skills; and
- Difficulties with scheduling enough time to complete the lesson.

The full set of responses is presented graphically below.

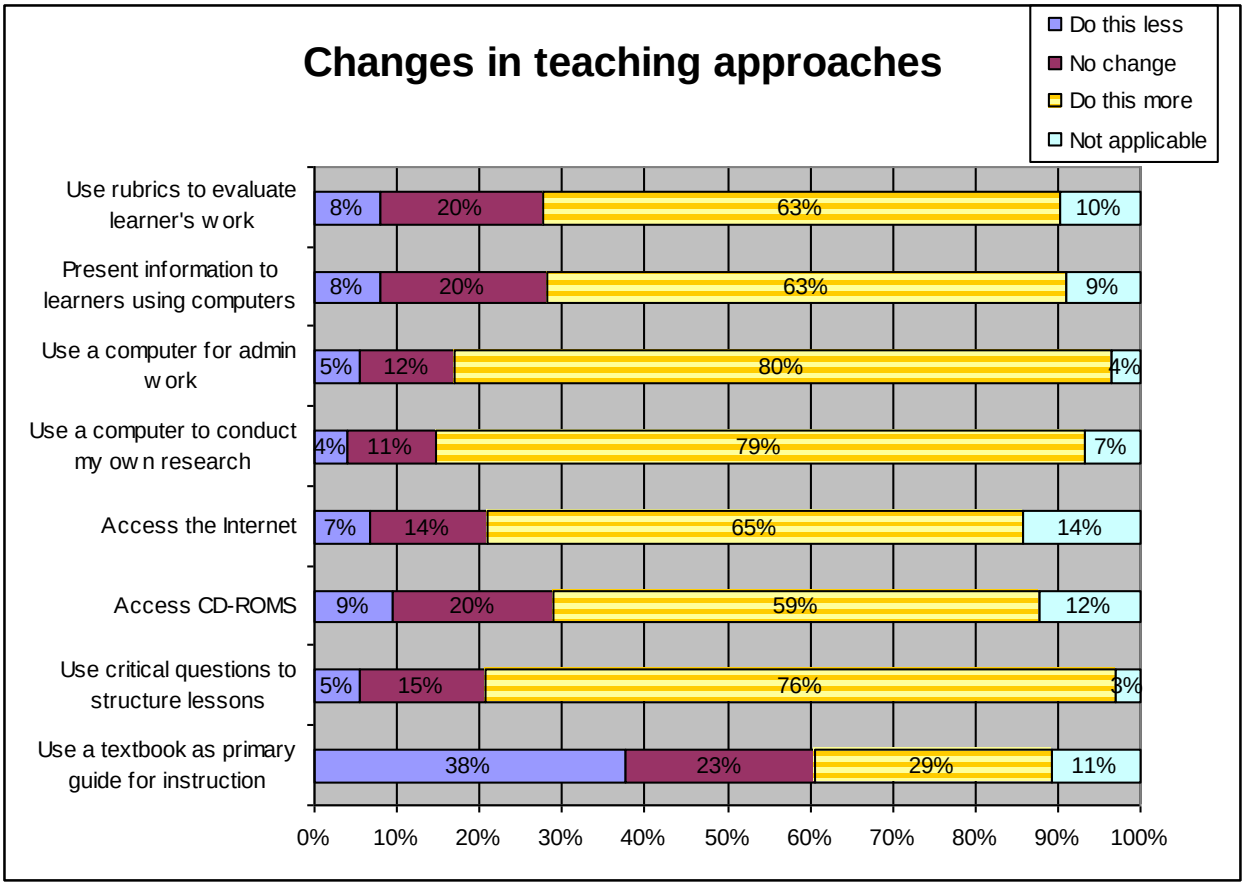


Impact of Intel® Teach to the Future Training on Teachers' Pedagogy

The Intel® Teach to the Future training is about much more than learning ICT skills and integrating technology into one's lessons. A core focus of the programme is on the pedagogical aspects of using technology in the classroom and on new teaching strategies, including approaches such as project-based learning and use of open-ended questions that help learners to develop higher-order thinking skills. In the South Africa context, such a pedagogical approach is well aligned with the moves to Outcomes Based Education (OBE).

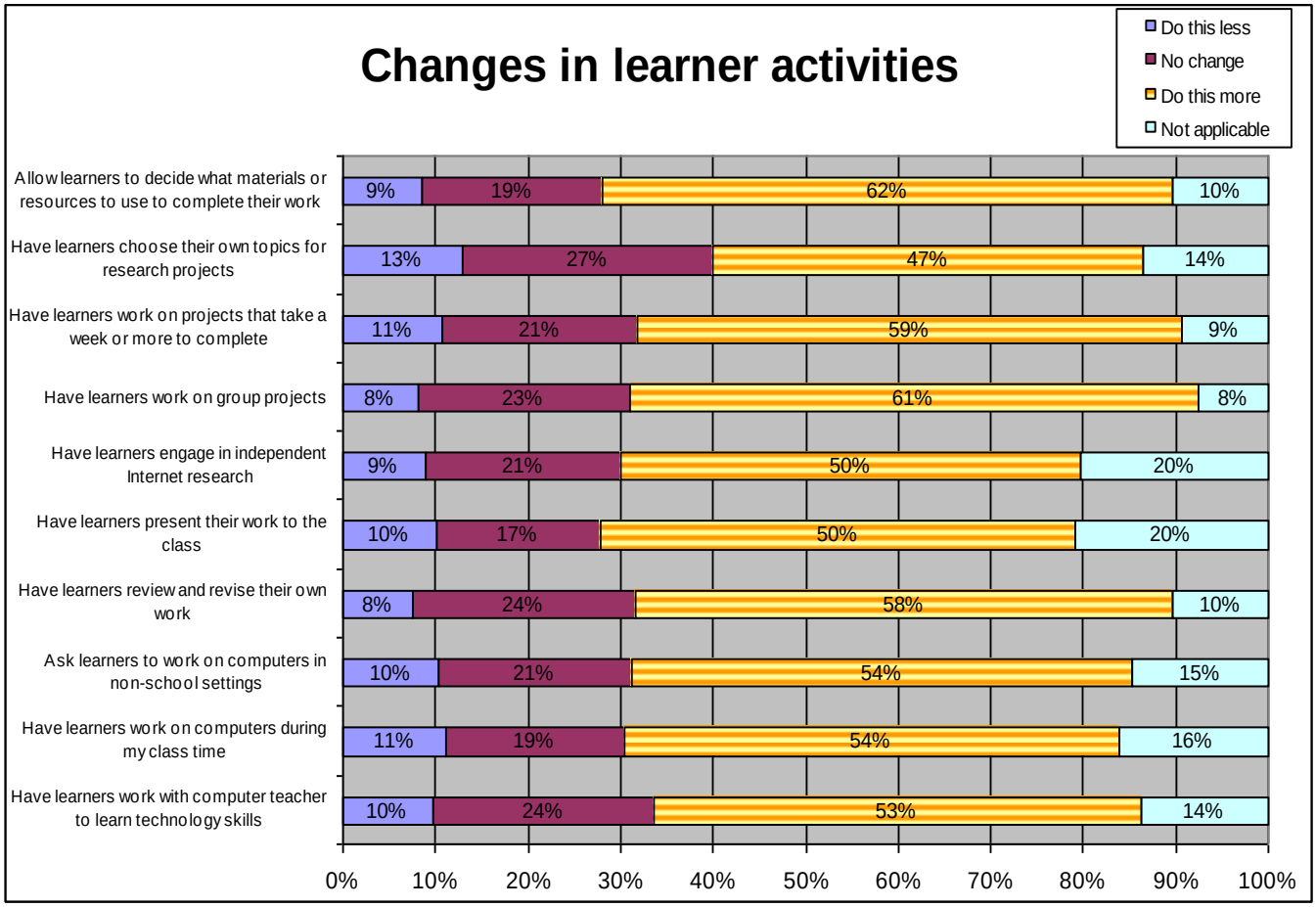
In this final section of impact data results, we consider how taking part in the Intel® Teach to the Future training has impacted on teachers' approaches to teaching and learning. The first set of questions asked teachers whether the teaching strategies that they learnt in the Intel® Teach to the Future programme were new to them. In this regard, 48% of teachers reported that the teaching strategies were somewhat new and 35.1% found the teaching strategies to be very new. When asked about how relevant the teaching strategies were to their teaching goals, 35.0% thought the strategies were somewhat relevant and 62.8% very relevant. With respect to the extent to which the teaching strategies helped with integrating technology in to one's teaching, 24.3% found the teaching strategies somewhat helpful and 74.3% found then to be very helpful.

Respondents were then asked to indicate how various pedagogical practices had changed since completing the Intel® Teach to the Future training. Responses are presented graphically below.



As this graph illustrates, 38% of teachers report using a textbook less as their primary guide for instruction. This is noteworthy since, in South Africa, many schools and teachers continue to rely heavily on, often outdated, textbooks as their primary learning material. As OBE requires a more learner-centred approach to teaching and learning, use of a range of learning materials becomes increasingly important. Also interesting is that 29% reported using a textbook more following training. The details of other changes in teaching approaches are not discussed individually here as they are clearly presented in the graph. However, we can note that the majority of respondents appear to be making use of improved teaching practices following Intel® Teach to the Future training. This is, however, self-reported data and the lesson observations conducted as part of the case study (see Appendix One) show that what is reported and what happens in practice are not always the same.

Participants were also asked to reflect on changes in the kinds of activities they do with learners in the classroom following Intel® Teach to the Future training:



Once again, self-reported ratings on changes in the kinds of learning activities given to learners show the positive impact of the Intel® Teach to the Future training. These data are also realistic in that between 19 and 27%, depending on the specific activity, report that there has been no change in the activities they use in the classroom. Given the difficulty of implementing such changes and the many contextual factors that affect whether these teaching methods can be implemented, we would expect quite a few respondents not to have implemented these new approaches.

CASE STUDY[5]

In addition to the post-training and impact surveys administered as part of this evaluation, a case study was also completed to provide more detailed contextual information about implementation of Intel® Teach to the Future. During the first year of the Intel® Teach to the Future evaluation, case studies were conducted at eight schools. The aim was to continue the case studies at these eight schools during the second year evaluation in order to develop an understanding of implementation of the programme over time. However, due to budget constraints, it was not possible to do this. Instead, only one case study was continued into year two. The school selected was one of the original eight schools, and was selected as an example of a 'typical' South African township school. In addition, the evaluator had built up a good relationship with the school during the 2003 evaluation, and the school was particularly accommodating of the research.

[5] Please see Appendix Two for full case study. Main conclusions only are presented here.

In 2003, the school was visited by one researcher in July and October. During 2004, the same researcher visited the school, again in August and October. During these school visits, interviews were conducted with the principal, Intel® Teach to the Future facilitator, and teachers taking part in the training. During the 2004 visits, the focus was turned to learners, with informal class discussions following a computer-based lesson and questionnaires completed by learners. The researcher observed technology-integrated lessons and conducted further interviews with teachers and the facilitator. Intel® Teach to the Future training sessions were also observed and portfolios completed by teachers were collected and evaluated using the standard rubric used to evaluate trainee facilitators' portfolios.

One set of Intel® Teach to the Future training was held in 2003, with ten educators taking part. In 2004, another round of training was held. This time eight educators started the training, but this group was not as enthusiastic as the original group, and the facilitator had some difficulty in maintaining interest in the training. Further, during this training there had been several interruptions, including workshops and staff meetings that were held at the same time as the Intel® Teach to the Future training was due to take place.

This school is an interesting one at which to explore in more detail both successes and barriers to implementation of the Intel® Teach to the Future programme at the classroom level. The educators generally have the required levels of ICT skills. The school is lucky to have a very committed and experienced ICT champion, their facilitator, who is involved in a range of community initiatives and provides basic ICT training to community members and educators from other schools without computers. The principal is very supportive of the Intel® Teach to the Future programme and any other professional development initiatives. However, all the educators have raised serious concerns about the practicalities of implementing what they have learned during the programme. During lesson observations, the researcher was able to observe some of the challenges of integrating technology in a lesson with very large classes of learners and in contexts where learners have few computer skills.

These reservations notwithstanding, many successes have also been noted. The case study has shown that expectations of impact need to be flexible. While the training may not yet have produced the desired impacts at this school, with respect to quality of portfolios, learner activities that support higher-order thinking, and implementation of technology-integrated lessons, clear changes in use of computers to support teaching and learning can be noted. Several teachers now make use of PowerPoint presentations, which allow for more engagement with learners than writing notes on the blackboard. Some teachers are also beginning to use websites as a revision tool, and learners have used computers to search for information for projects across a range of subjects. Perhaps the best evidence in support of the positive impact of the Intel® Teach to the Future training comes from the learners themselves, as reflected in their comments about how computers support learning.

DISCUSSION

The results presented in this report are mostly very positive. With respect to the Intel® Teach to the Future training itself, we saw that trainees found the training to be very useful and noted vast changes with respect to both ICT and pedagogical competencies before and after training. The impact data and case study also provided evidence of the value that this programme is adding in South African schools.

As was noted at the outset of this report, the year two evaluation sought specifically to answer the following two research questions:

- Is there evidence of the use and integration of technology at the classroom level after taking part in the Intel® Teach to the Future training?
- Is there evidence that ICT supports changes in pedagogical practice?

In this section we discuss the array of results presented above by dealing with each question turn.

Is There Evidence of the Use and Integration of Technology at the Classroom Level After Taking Part in the Intel® Teach to the Future Training?

Both the survey data and case study provide evidence on the basis of which we can conclude that use and some degree of integration of technology at the classroom level is taking place. From the impact survey, we saw that 48.5% of respondents indicated that they implemented a technology-integrated lesson more than once a month. From the survey data, we saw that 63% of respondents use computers more for presenting information to learners, 65% access the Internet more than before, 59% make use of CD-ROMs in lessons more than before. Further, 53% reported that they have their learners work with the computer teacher to learn computer skills more than before training, and 54% ask learners more often than before to do work on computers in their own classes.

During the case study research, several lessons were observed during which technology was being used as part of a non-technology or computer studies lesson. More use of technology for subject lessons was in evidence in 2004 than in early 2003 before the Intel® Teach to the Future programme was started at the school. Further, in the pre-training questionnaire completed by teachers at the case study school prior to Intel® Teach to the Future training, not one teacher reported using computers for teaching and learning, despite basic ICT skills levels being high. By the final visit in October 2004, the researcher was able to observe seven of the eight teachers who had been trained using technology in their lessons. Short descriptions of the lessons observed are provided in the full case study report (see Appendix Two). The most common use of technology in lessons observed and those reported by teachers during interviews, was as a presentation tool (PowerPoint). The case study school had been donated a data projector in mid 2004, thus lessons in which computers were used for presentation were more effective than in 2003 when a standard computer screen in front of the class, which learners could not see, was used. In most lessons (excluding computer studies), the learners, although sitting in front of computers, did not make use of them at all during the class. One exception was an economics lesson, in which the teacher had learners work through a website he had designed for revision purposes.

When the researcher asked teachers why learners did not use computers themselves during the lessons, two common responses were noted. The first was that there are too many learners in the class to make effective use of computers. This was especially so for lower grades in which class sizes are large. In some cases, teachers noted that they spilt their class in two, with one group working in the computer room and the other in the classroom. During the next lesson, the two groups would swap. The second reason for learners not using computers was that, especially in classes where learners do not do computer studies, it takes too long for the whole class to switch on the computer and locate the material to be used. One teacher noted that half of the lesson is then spent getting everyone ready to use the computers and then no

one is able to finish the activity before the class ends. Thus she finds it more effective to use PowerPoint to present a lesson, especially because of the pictures that one can include, and then have learners complete activities that do not require a computer.

Thus, while technology is being used and, in some instances, integrated, at the classroom level following training, we need to remain aware that schools and teachers pass through different stages along a continuum as they come to integrate technology fully into all aspects of their functioning. Thus, while in a survey, respondents may report that they do technology-integration type activities in their classrooms, it is important to remember that what this means to different teachers is not the same and will depend on the imagination that they have for what ICT can contribute. A 2002 UNESCO report on ICT curriculum and teacher development for schools provides a useful four-stage continuum of ICT integration at both school and teacher levels.[6]

The four stages[7] are:

- *Emerging*

  Schools at the beginning stages of ICT development demonstrate the emerging approach. Such schools being to purchase, or have donated, some computing equipment and software. In this initial phase, administrators, and teachers are just starting to explore the possibilities and consequences of using ICT for school management and adding ICT to the curriculum…Schools at this emerging phase are still firmly grounded in traditional, teacher-centreed practice.

- *Applying*

  Those schools in which a new understanding of the contribution of ICT to learning has developed exemplify the applying approach. In this secondary phase, administrators and teachers use ICT for tasks already carried out in school management and in the curriculum. Teachers largely dominate the learning environment.

- *Infusing*

  At the next stage, the infusing approach involves integrating or embedding ICT across the curriculum, and is seen in those schools that now employ a range of computer-based technologies in laboratories, classrooms, and administrative offices. Teachers explore new ways in which ICT changes their personal productivity and professional practice.

- *Transforming*

  Schools that use ICT to rethink and renew school organization in creative ways are at the transforming approach. ICT becomes an integral though invisible part of daily personal productivity and professional practice…ICT is taught as a separate subject at the professional level and is incorporated into all vocational areas. Schools have become centres of learning for their communities.

Based on this classification, the case study school could perhaps be placed in between the applying and infusing stages. Some of the teachers, the Intel® Teach to the Future facilitator in particular, have moved on to the infusing stage, while other teachers and the school as whole are still at the applying stage.

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[6] Several authors and studies have put forward different stages through which ICT adoption takes place. Most models are very similar, making use of different terminologies and sometimes different numbers of stages. For other examples, see UNESCO (2002). *Information and Communication Technologies in Teacher Education. A Planning Guide*; and Haddad, WD & Draxler, A (2002). *Technologies for Education. Potentials, Parameters, and Prospects*. UNESCO/AED.

[7] Descriptions of each stage have been taken directly from UNESCO (2002). *Information and Communication Technology in Education. A Curriculum for Schools and Programme of Teacher Development*, pp. 15-16. This resource presents a very detailed matrix of different aspect of each stage. The matrix can be used to classify schools in terms of the components of technology-integration.

In conclusion then, with respect to this particular research question, use and integration at the classroom level are indeed in evidence, but the nature and quality of that use is variable.

Is There Evidence That ICT Supports Changes in Pedagogical Practice?

When discussing pedagogical practice in the context of a programme such Intel® Teach to the Future, we need to focus on two different aspects of pedagogy. The first is how teachers can make use of ICT to support their teaching and learning and the second is whether ICT training and use supports changes in pedagogical approach more broadly, in the South African context particularly a move away from teacher-centred 'chalk-and-talk' approaches, to more learner-centred and outcomes-based approaches as required in the new curriculum. The pedagogy promoted through the Intel® Teach to the Future programme focuses on learner-centred teaching, project-based learning, and the role of open-ended questions in developing high order thinking skills.

Various statistical analyses presented of ICT access and implementation of technology-integrated lessons showed that number of computers for teaching and learning and also access to a computer laboratory were significantly associated with more regular technology use in lessons. Yet, we also saw that among those who had not implemented a technology-integrated lesson, many did have access to computers, yet were not using them. Access is a complex concept and implies much more than the number of computers in a school, including such factors as who has access within the school, class size, and how the school priorities access to the computer laboratory. For example, in the case study school, learners who do computer studies tend to have more access to the computer laboratory, both in school time and also after school and breaks. These nuances need to be taken into consideration as we discuss the extent to which ICT supports changes in pedagogical practice.

Both the impact survey and case study research show that introducing ICT, with teacher training, does appear to have an impact on pedagogical practice. This evidence can be seen in the impact survey results showing changes in learner activities, such as an increase in group work, projects, independent Internet research, learners choosing own topics for projects, learners presenting their work, and others. Other examples include a reduction in the use of a textbook as the primary guide for instruction and a reported increase in the use of critical questions to structure lessons. During lesson observations at the case study school, some evidence of better learner engagement was found.

On this basis, we could conclude that ICT appears to support changes in pedagogical practice. However, we need to consider further whether it is the technology itself or the training of teachers to use ICT in a particular way that leads to these changes. The evaluation data available do not allow us to answer this question conclusively, but at the case study school, we saw in 2003 that, despite access to computers and relatively high levels of ICT skills among teachers, no teachers had implemented a class lesson in which computers had been used (excluding computer studies). By the end of 2004, researchers observed seven educators implementing lesson in which they made use of computers. With respect to number of computers in the school, nothing had changed from 2003 to 2004, besides the addition of a data projector which did make ICT lessons more effective and hence attractive for teachers. However, it does appear that it was the pedagogical aspect of the Intel® Teach to the Future training that supported changes in pedagogical practices. Further evidence for this claim can be taken from the post-training data presented above. We saw large differences in 'before' and 'after' ratings with respect to both use of ICT for teaching and learning and pedagogical

practices. Again, since participants who take part in Intel® Teach to the Future training should have computer access at their schools, it seems that the training in how to use the computers, not the introduction of computers themselves, underlies changes in pedagogic practice.

Thus, on the basis of the data available, we can conclude that ICT does indeed support changes in pedagogical practice, but as a teaching tool and most effectively when training is provided to illustrate how this tool can be used to support changes in pedagogic practice.

CONCLUSION AND WAY FORWARD – YEAR THREE EVALUATION (2005)

This evaluation report has presented a wealth of data on the of computers in schools, as well as data about the impact of the Intel® Teach to the Future programme at the school level. The post-training data provided evidence of the positive response to the Intel® Teach to the Future training. The case study research provided rich contextual information that was helpful in interpreting the statistical data from the two surveys. In general terms, we have seen that the Intel® Teach to the Future programme in South Africa is adding value to teaching and learning within South African classrooms.

The results have explored the complex issue of ICT access and have shown that there are no simple answers. Increased access was significantly associated with regularity of implementation for those who did implement a technology-integrated lesson. However, for those who did not implement such a lesson tended to higher levels of access to a computer room and also to the Internet. Thus, access discussions are not simply about providing a set of computers to a school, but how the school makes use of them, who has access, when and for how long that is important. Further, class size and learners' ICT skills levels are also important, especially when large classes need to make use of a relatively small number of computers.

The value of providing training, like that of the Intel® Teach to the Future programme, is highlighted in this evaluation, and it evidence for both use of computers for teaching and learning and the role of ICT in supporting pedagogical changes was found. However, the nature of quality of ICT use in classroom varies widely and impact expectations need to remain flexible and take account of the fact that schools and teachers pass through several stages as they work towards computer integration.

Given that we have focused much attention during year one and two on school level implementation of the programme, we propose during year three to direct the research at the programme and education system levels, to assess sustainability of the programme going forward. The main purpose of the year-three evaluation will be to evaluate the extent to which Intel® Teach to the Future has been integrated into the education system in South Africa, to understand enabling and inhibiting factors with respect to involvement of education departments at provincial and district levels, and hence to understand the potential for the programme to become sustainable over time.

Appendix One: Year One Evaluation Report Executive Summary

The Intel® Teach to the Future programme was launched in South Africa in January 2003. In July 2003 an independent evaluator, Neil Butcher and Associates, was appointed to conduct the evaluation for the first year of the programme. The first phase of the evaluation, of which this report is the final output, took place from July 2003 to January 2004. Phase one of the evaluation was designed to explore the range of schooling contexts in South Africa in order to understand factors supporting and impeding Intel® Teach to the Future in South Africa at the school level. In addition, the background of Intel® Teach to the Future in South Africa has been documented and the implementation model of the programme assessed.

The evaluation research had three overall objectives, being to:

1. Document and assess the implementation of the Intel® Teach to the Future programme across a range of schooling contexts within South Africa;
2. Assess the extent to which the aims of the Intel Teach to the Future programme are being achieved thus far; and
3. Develop an evaluation plan for year two of the project that focuses on impact.

The following three research questions were asked in the South African Intel® Teach to the Future year one evaluation.

1. How is the Intel® Teach to the Future programme implemented in a range of South African schooling contexts?
2. What are the experiences (positive and negative) of participants (project management, senior facilitators, facilitators, and educators) in the programme?
3. What opportunities and pitfalls can be identified in implementation of the Intel® Teach to the Future programme?

A case study approach has been adopted for this phase, focusing on eight schools in KwaZulu-Natal, Gauteng, and Limpopo provinces. The schools were chosen to represent as wide a range of South African schooling contexts as possible. This means there is a mix of rural, urban, and peri-urban schools, a range of socio-economic contexts, and a spread of primary, secondary and high schools. In addition, the community centre model of computer provision is included in the case study sample. The case studies have been documented in detail and provide rich contextual descriptions of how the Intel® Teach to the Future programme is being implemented at the school level. In addition to the case studies, pre-training questionnaires, and post-training questionnaires completed by educators and facilitators have been analysed.

At the time of writing this report,[8] 347 schools had been accepted into the programme and 36 had been rejected. In addition, 250 facilitators had successfully completed training, and 237 potential facilitators had indicated their interest to be trained. Further, 426 educators had successfully completed training, 1102 were taking part in training programmes, and 84 educators had dropped out.

[8] As per Intel® Teach to the Future South Africa database, available at http://teach.schoolnet.org.za, 29/01/04. It should be noted that participants in the Northern Cape are not able to access the online database, thus these statistics do not include a small section of participants.

Overall, this evaluation research has shown that the Intel® Teach to the Future programme is regarded very favourably by those taking part in the programme. Much learning has taken place, and many educators who previously did not know how to use computers for teaching and learning now have a range of creative ideas and new skills. All participants reported increases in both their ICT skills and pedagogic understanding. In addition, awareness of the potential of computers and the value of linking technology and curricula has been raised at the educator and school levels. The Intel® Teach to the Future materials and educational approach are sound and are valued by participants.

In the post-training questionnaire, 82% of participants reported that the skills they learned would 'definitely' help them to successfully integrate technology into learners' activities. 92% will definitely recommend the course to a friend or colleague (and some noted in their optional comments that they already have). The facilitators and senior trainers were also highly rated. In no instance was a rating of 'poor' given, and most responses clustered in the 'good' and 'excellent' categories. With respect to the pedagogical outcomes of the Intel® Teach to the Future training, 85% of respondents reported that the training focused on integration of technology into the curriculum to a 'great extent', 65% reported that training provided teaching strategies to apply with learners to a 'great extent', 76% felt that the course illustrated effective uses of technology to a 'great extent' and 64% noted that the training provided opportunities to collaborate with other educators to a 'great extent'. In addition, there were clear self-reported improvements after training for all ICT skills.

The case studies highlighted the range of contexts in which the Intel® Teach to the Future programme is being implemented in South African schools. The range of factors affecting the success of the Intel® Teach to the Future programme were evident. While all schools were very positive about the Intel® Teach to the Future programme, several challenges were also noted. The main challenges faced by schools include the time constraints of the training, the low levels of ICT skills of the majority of educators, and the poor ICT resource levels at many schools. The lack of sufficient computers is likely to remain a constraining factor for some time, as will the ICT skills and general educational level of educators. However, as efforts to develop ICT infrastructure and capacity within the education sector proceeds the importance of having educators trained at the level offered by Intel® Teach to the Future should not be underestimated. The Intel® Teach to the Future programme has an extremely valuable role to play – particularly in bringing technology and pedagogy together, and this value was recognized by all in the research process.

In general, the Intel® Teach to the Future programme was found to be most effectively implemented at the very well resourced independent school facing few of the same challenges as the majority of South African previously disadvantaged schools. A poor rural school was also doing very well with respect to conducting Intel® Teach to the Future training, however, many concerns were raised by educators about implementing what is learnt during training because of the poor ICT resources of the school. This contextual detail is essential as it helps to interrogate the assumptions underlying the Intel® Teach to the Future programme and also highlights that in South Africa there are many factors affecting implementation at the school level over which the Intel® Teach to the Future programme has little or no control.

In addition to factors over which the programme has little control, the findings have shown that the Intel® Teach to the Future programme in South Africa faces two main challenges to

success. These are the relatively low numbers of educators taking part and the overall low level of ICT skills (and general poor quality of educator training in the past) in the country, which means that the majority of educators taking part in the training do not come prepared with the requisite skills levels. There is a shortage of appropriate candidates to be trained as senior facilitators and as facilitators at the school level. Some facilitators fail to start training in their schools. In addition, the participating educators often come with lower than ideal levels of ICT skills. As a result, training at the school level takes place very slowly and the time commitment expected of both facilitators and educators becomes increasingly taxing. Recommendations for dealing with the low ICT skills levels included adding a module 0 that covers basic ICT skills; supporting schools to take part in other basic ICT training options; and to develop an online tutorial for educators who require additional support.

The case studies revealed that while all school principals were supportive of the Intel® Teach to the Future programme few were aware of exactly what the programme is about. Developing more active support at the school management level is important and may also help to encourage more educators to take part in training.

Although the complex education landscape in South Africa is a challenge to implementation, by bringing ICT skills and curriculum together, the Intel® Teach to the Future Programme is well placed to play a role in supporting the achievement of national ideals as reflected in the 2003 draft White Paper on e-Education. In fact, the Intel® Teach to the Future programme is listed in the draft White Paper as one of three professional development initiatives in the country supporting efforts to bridge the digital divide in schools.

Appendix Two – Case Study Report

INTRODUCTION

During the first year of the Intel® Teach to the Future evaluation, case studies were conducted at eight schools. The aim was to continue the case studies at these eight schools during the second year evaluation in order to develop an understanding of implementation of the programme over time. However, due to budget constraints, it was not possible to do this. Instead, only one case study was continued into year two. The school selected was part of the original eight schools, and was selected as an example of a 'typical' South African township school. In addition, the evaluator had built up a good relationship with the school during the 2003 evaluation and the school was particularly accommodating of the research.

METHODOLOGY AND DATA COLLECTED

During 2003 the school was visited by one researcher in July and October. During 2004, the same researcher visited the school again in August and October. During these school visits, interviews were conducted with the principal, Intel® Teach to the Future facilitator, and teachers taking part in the training. During the 2004 visits, the focus was turned to learners, with informal class discussions following a computer-based lesson and questionnaires completed by learners. The researcher observed technology-integrated lessons and conducted further interviews with teachers and the facilitator. Intel® Teach to the Future training sessions were also observed and teachers' completed portfolios were collected and then evaluated using the standard rubric used to evaluate trainee facilitators' portfolios.

During 2003, one set of Intel® Teach to the Future training was held with ten educators taking part. In 2004 another round of training was held. This time eight educators started the training, but this group was not as enthusiastic as the original group, and the facilitator had some difficulty in maintaining interest in the training. Further, during this training there had been several interruptions, including workshops, staff meetings etc that were held at the same time as the Intel® Teach to the Future training was due to take place.

OVERVIEW OF CASE STUDY SCHOOL CONTEXT

The school is situated in a small township called Ngwelezane, approximately 5 kilometres outside of Empangeni in KwaZulu-Natal. The school has water, electricity and sanitation facilities. This is a co-ed school, which caters for learners from grades 8 to 12. In 2003, there were 948 learners of which 428 were boys and 520 were girls. In 2004, it was reported that there were about 850 learners. Reasons for the lower enrolment include a poor grade 11 class from 2003, many of whom did not progress to grade 12, and a reduction of the number of learners who were admitted to the school in higher grades, having completed lower grades elsewhere.

The educator to learner ratio is approximately 1:40 as there are 24 educators, one of whom is a temporary member of staff. All of the permanent staff members have M+3 qualifications or equivalent. The school has four non-teaching staff members: a secretary, two caretakers and

one cleaner. In 2004, a local young man who did not have funding to continue his information technology studies at the University of Zululand, volunteered his services at the school and was providing excellent support in the running of the computer room and additional support when lessons were taught in the computer room. He also supported the computer studies teacher, taking lessons of lower grades for computer studies.

The school is fenced and secure. There is a tarred parking area at the entrance and the buildings are very neat and in good condition. Learners are required to assist with cleaning so that they learn to value having a clean and neat school. There are a total of 31 classrooms of which 26 are in use at present. Specialist rooms include: staff room, safe/strong room, library, home economics laboratory, physics laboratory, separate administration offices, a sick room and a computer laboratory.

Table One: Technological Resources

TYPE OF RESOURCE	NUMBER AVAILABLE	NUMBER IN USE	NUMBER UNUSABLE
Tape Recorders	0	0	0
OHP	1	1	0
Computers	30	30	0
Computers with Internet Connections	20	20	0
Data projector	1	1	0
Television Sets	1	1	0
Photocopiers	1	1	0
Fax Machine	1	1	0
Type Writer	1	1	0
Other			

During the 2003 school visits the school did not have a data projector. This was donated by Telkom in early 2004. As such, the researcher was able to observe attempts at technology-integrated lessons before and after introduction of the data projector. The value of a data projector is discussed below.

ICT skills and use

For the 2003 case studies, educators completed a pre-training questionnaire. This was not done in the 2004 case study as the new group of educators had already begun training at the time of the first research visit. As such, this section is based on 2003 data.

While eight out of the ten training participants have taken part in previous ICT professional development programmes (Educators Network – EDN) not one educator reported using computers for teaching and learning or for lesson planning prior to the launch of the Intel® Teach to the Future programme, although computers are used for administration purposes. This is largely due to lack of computer resources and high demand for the computer room, as most of the participating educators also showed high self-reported levels of ICT skills prior to training.

Table Two: Educators' Self-reported ICT skills pre-training (2003)

ICT SKILLS	NUMBER ANSWERING YES (N=10)	PERCENTAGE ANSWERING YES
1. Open an new file in a word processing programme (i.e. Microsoft Word) and save it	10	100%
2. Troubleshoot computer problems (i.e. Solve minor problems such as when somebody can't get a document to print, or when one of the toolbars suddenly 'disappears')	9	90%
3. Insert a table into a document in a Word Processing programme	9	90%
4. Insert page numbers into a document	9	90%
5. Use a spreadsheet programme such as Lotus or Excel – add a column of numbers, for example	9	90%
6. Activate the Internet and search the Worldwide Web for information	10	100%
7. Send an email message	10	100%
8. Connect to the Internet and find a specific site you are looking for (i.e. type in a particular address)	10	100%
9. Attach a document to an email message	9	90%
10. Design your own learning materials on the computer	5	50%
11. Create overhead transparencies	1	10%

From the above table we see that ratings of ICT skills are high, in many cases due to the training provided via EDN. Yet, despite these high skills ratings, teachers were not using computers for teaching and learning purposes in 2003.

INTEL® TEACH TO THE FUTURE PROGRAMME

During 2003 and 2004 the Intel® Teach to the Future training was held after school on a Wednesday and Friday. On both of these days the school day ends at 13h00 for sport. This provides a space for educators to take part in programmes like Intel® Teach to the Future training. Each training session runs from 13h00 to 14h30, so educators are able to leave at the same time as a standard school day. 12 educators signed up for the programme in 2003. At the time of the second research visit three had dropped out. One person was too busy as he was also doing technology facilitation. One person was expected to drop out because of ICT skill levels, and the third was reported as, and laughing admitted to, 'being lazy'. At the time of the second visit (October 2003) the educators were working on Module 6 (Creating learner websites).

With respect to the 2004 training group, eight teachers signed up. This group had lower levels of ICT skills, with most not having completed EDN training. As such, the facilitator reported that the training process was far more challenging and a great deal slower than the previous year. By the second visit (October 2004) only three teachers were regularly attending training and the group had only reached module three. Several reasons were noted for this, including that many other events had taken place at the same time as the training and as such momentum had not built up. The lower levels of ICT skills meant that for some teachers the training was more challenging than they had anticipated. Further, many of the teachers in this group decided to sign-up for training following the presentation of certificates (which was done at a school function) to the first group of teachers. Originally, many of these teachers

had not been interested in taking part but were inspired by the first group, and as such, upon learning the level of the course had decided to drop out.

During the training observations the atmosphere of sharing among the educators and the facilitator impressed the researcher. Each educator took the researcher through his or her work. PowerPoint was the favourite programme and most educators had produced elaborate slide shows with much whizzing and spinning of text and sounds. It was noted that several of the participants had some difficulty with formulating critical questions. Whilst a consideration of critical questions only might seem to indicate that certain pedagogical outcomes were not achieved, talking to the educators and looking at their portfolios shows that even if question formulation is somewhat problematic, some of the key concepts are indeed taken on board and reflected in the participants' work. The facilitator also reported that at the outset of training educators are expecting to learn about computers and not do curricular work. This was given as one reason for why educators did not feel comfortable with the concepts of different types of questions. In addition, the facilitator also noted that explaining these concepts is quite a challenge.

Publisher was noted by all as the most difficult programme with which to work, especially the creation of hyperlinks. One of the reasons for this, noted by the facilitator, was that in order to complete all his work during the Intel® Teach to the Future facilitator training he 'stuck to programmes he knew'. As such during his training he worked with FrontPage not Publisher. Most of the educators at his school however decided to use Publisher. The facilitator's difficulty with providing guidance here was a frustration for all, although the educators and facilitator had learnt a lot together whilst troubleshooting.

The educators worked mostly from the CDs which were perceived to be more user friendly than the manuals. Many of the educators reported that the manuals were too long and too thick, although they would become a useful support resource once training was completed. Educators were also very positive about their facilitator, and noted that they 'have the best teacher'. Many of the educators indicated that they would have liked to communicate with other educators doing the Intel® Teach to the Future programme at different schools so that they could share ideas and find out what others were doing.

Understanding of critical and unit questions

As noted above, during 2003 visits it was noted that several teachers had some difficulty in applying the concept of critical and unit questions. As such, it was decided to explore this issue further during the 2004 research. During individual interviews, teachers were asked to explain what they understood by critical questions, unit questions, and content questions as well as open and closed questions. Some of the responses given are noted below.

Intel® Teach to the Future facilitator

> Critical questions…this is the big question covering a variety of things; it cannot be tackled in one or two lessons only.
>
> Unit questions…these are more curriculum based, more focused and the learners will provide more specific answers.
>
> Content questions…these require specific answers, similar to the unit question and based on the curriculum.

> Open questions require a person to think broadly and not just answer yes or no or true or false. These questions pick up on a person's knowledge of a subject.

Educators who had completed training

- Critical questions…global, umbrella type questions. These questions help to encourage critical thinking for both the teacher and the learners.
- Unit questions are a sub-topic of the bigger question and can be used to divide broad topics into lessons, based on the unit questions.
- Content questions have only one answer and they are usually closed questions.
- Open-ended questions are useful because the child can explain more and not just say yes or no. It accommodates many answers.
- Critical questions make learners think deeply about the parts of the question – it is not just about one word answers. You should not use who and where, but rather use why in these questions.
- These kinds of questions are helpful because they help learners to be creative, e.g. when we did compound interest I could ask learners why they had to think about things like equipment and depreciation. It worked well with learners when they apply what they learn to practical situations.

The above responses show a reasonable grasp of the concept of different kinds of questions, although some of the examples, such as the compound interest example, perhaps show the challenges of implementing these ideas. Five of the teachers interviewed were not able to provide any explanation, with one teacher not even remembering that he had learnt about these terms. [The facilitator later explained that this particular teacher had not attended training regularly, and was very busy with other school related activities because of his role in school management].

In terms of using this questioning approach in the classroom, several educators noted that they had not yet really done this. One teacher noted that,

> We have not used the questioning approach that much because the computer room is too small and there are not enough computers. Time is also a problem – we are always rushing to complete the syllabus in time so we have to focus on the content and can't include too many projects.

Some teachers explained that although they are not using technology they still use questions (not critical questions) in their day to day teaching to assess whether learners understood what they were teaching. They reported that the Intel® Teach to the Future training had helped them with this. However, when the researcher probed for examples, none could be remembered.

It seems that in many cases, the more complex pedagogic components of the Intel® Teach to the Future training are not yet adequately understood nor implemented. A review of the portfolios developed during Intel® Teach to the Future training provides further evidence in this regard.

REVIEW OF PORTFOLIOS

During the 2004 school visits, the researcher collected copies of portfolios of teachers who had completed their training in late 2003. These were evaluated using the rubric used to

evaluate portfolios of trainee facilitators. The rubric is presented bellow, followed by a table summarising ratings of the portfolios evaluated.

Table Three: Facilitator Assessment Rubric

SKILLS	SCORE	4	3	2	1
ICT integration					
Variety of ICT skills used		Many different skills are developed by means of a variety of applications	Fair amount of variety	Some variety	Only a few skills developed
Curriculum Integration		Seamless integration: ICT is used as an essential tool to transparently achieve curricular aims	Fairly good attempt at integration for a beginner	Some integration	ICT taught for the sake of it; no curricular links. Learners will know a few technical tricks and nothing more.
Age Appropriateness		Really understands the way learners of this age think and have fun	Fairly good attempt at making age appropriate materials, but with minor lapses.	Some attempts at making age appropriate materials.	No understanding of learners of this age
Learning					
Critical question		Clear, engaging, open-ended; promotes higher order thinking	Fairly open-ended.	Question too loaded towards specific syllabus aims	Closed, uninspiring question
Outcomes		Carefully chosen, well linked to Unit Question	Too few/too many, not clearly focused	No link up with Unit Question, random	No obvious outcomes
Project Questions		Well worked out, engaging, lead well into learners' use of ICT, link to outcomes and Unit Question; promotes development of cognitive skills	Fairly engaging, but not clear enough; don't link well to ICT, outcomes and Unit Questions	Weak, unengaging, not well linked to ICT, outcomes and Unit Questions	No obvious questions.

SKILLS	SCORE	4	3	2	1
Assessment					
Rubric		Clear, appropriate, easily understood by learner; good use of colours	Clear and useable, but not specific enough	Strangely inappropriate criteria; probably copied from somewhere without much attempt to change it	Very weak rubrics, not much use at all
Implementation Plan					
General		Has creatively thought of all necessary preparations and eventualities	Some good ideas, but not much that's creative or different	Some ideas, but a bit out of touch	No idea at all as to how to implement this
Classroom		Useful, realistic ideas; this will really work, and will get the learners excited about learning	Good, solid plan, but not very creative or challenging for learners	Some ideas, but a bit out of touch with realities in class	Totally impractical in classroom

Note that several of the portfolios are incomplete. As such, where it is not possible to provide a score when the relevant work is missing, the block is left empty. This is particularly relevant to the implementation plan and assessments, neither of which was included in any of the portfolios. Only one educator included rubrics in her website. Further, only one educator appears to have clearly understood approaching the work from a learner's perspective. There is only one clear example of a presentation from a learner perspective, portfolio 7 and several of the learner presentations are the presentations that the researcher saw being used by educators during the lessons observed. It also appears that many of the educators did not complete all the work in the training, or did not save it in their portfolio files which were provided to the researcher. Total scores per educator have not been calculated due to the number of categories left out; however, total scores per competency are presented in the second table.

Table Four: Assessment of case study school teachers' portfolios[9]

COMPETENCIES	PORTFOLIO 1	PORTFOLIO 2	PORTFOLIO 3 – EMPTY	PORTFOLIO 4	PORTFOLIO 5	PORTFOLIO 6	PORTFOLIO 7	PORTFOLIO 8
ICT integration								
Variety of ICT skills used	1	2		2	1	2	3	2
Curriculum Integration	2	3		2	2	2	3	2
Age Appropriateness	2	2		3	2	2	3	2
Learning								
Critical question	2	4		2	3	4	3	1
Outcomes	3	4		3	2	1	3	3
Project Questions	1	1		1	1	1	1	1
Assessment								
Rubric					3			
Implementation Plan								
General								
Classroom								

[9] Note, although the standard assessment rubric has been used, this assessment has been done by one researcher, and as such are likely to be affected by individual biases of the researcher. This limitation not with standing, this assessment should provide an overview of the quality of educator portfolios.

Selected examples to illustrate scoring

- Critical question (Portfolio 2, Maths, score 4) – Why is maths a necessity in our everyday life?
- Critical question (Portfolio 4, English, score 2) When is it proper and improper for one to use pronouns in the every day life written or spoken?
- Critical question (Portfolio 6, Zulu, score 4). Is it culture that makes a person what he is?
- Critical question (Portfolio 9, Life Orientation, score 1). Child Abuse in South Africa (Unit question was somewhat better than critical question – How can child abuse be reduced?)

Table Five: Total scores per competency

COMPETENCIES	TOTAL SCORE PER COMPETENCY PERCENTAGE[10]
ICT integration	
Variety of ICT skills used	37.1%
Curriculum Integration	45.7%
Age Appropriateness	45.7%
Learning	
Critical question	54.3%
Outcomes	54.3%
Project Questions	20.0%
Assessment	
Rubric	8.6%
Implementation Plan	
General	0
Classroom	0

This evaluation of educators' portfolios does not paint a very good picture of the quality of work produced during the training. While this may point to a lower than expected outcome of the training, the lesson observations (particularly from 2004) below highlight the value the teachers' new skills have added to the classroom. Thus, although the outcome of training in this instance is below what would be desirable, this is not to imply that no impact is achieved. Research[11] shows that teachers pass through several stages in the integration of technology. What this analysis shows is that teachers with very little experience of integrating technology have certainly moved along the continuum but still have some way to go.

LESSON OBSERVATIONS

Year One (2003)

Two educators decided that they would make use of what they had produced during their training for a lesson, which the researcher observed. These lessons took place in the computer room with half of the standard class in attendance so that learners could each have their own computer or work in pairs. While the learners were excited to be in the computer room and

[10] Percentages have been calculated out of a total of 35 (7x5), rather than 40 (8x5) since one portfolio did not contain any work and hence was not scored.

[11] See full evaluation report.

the educators excited to try out their new materials these lessons were not too successful. This was mostly because the educators had not progressed far enough with their training. In both instances the educators used a computer at the front of the class almost as a 'blackboard' on which they presented their PowerPoint slides. It was not possible for most learners to see the screen. Because the educators were still busy with training the presentations had not been put on the server for all to view. As a result the learners merely sat passively in front of a computer, and did not make use of the computer at all.

These examples, whilst illustrative of possible implementation difficulties, should not be taken as evidence that the training had not achieved its outcomes. To the contrary, the excitement of the educators to try new ways of using computers, even when still busy with training, shows their commitment and enthusiasm to make use of what they have learnt. In addition, informal discussions with the educators and the facilitator revealed many creative ideas about how computers and various programmes could be used within the context of specific subjects and learning areas, and to develop learner-centred approaches.

Discussions about implementation after completion of training largely focused on the limited number of computers at the school. During the focus group all of the educators raised concerns about how they would be able to make use of the computer room given the current timetabling arrangements and the demand for the computer room for computer studies classes. This concern is real, and evidence of the difficulty can be seen in the fact that although several educators have taken part in EDN training and ICT skills are generally high, no educators reported using ICTs for teaching and learning to any great extent. The facilitator suggested that perhaps the school could consider equipping one computer on a trolley so that it could be taken from classroom to classroom, rather than the class always having to use the computer room. One educator also suggested that educators should make websites that learners could use after school when the computer room was not busy.

Year Two (2004)

As in the year one research visits, educators continued to raise the concern about having too few computers to make use of them for teaching and learning. However, since 2003, the school had been donated a data projector by Telkom. The researcher noted a vast improvement in the lessons observed, many still using PowerPoint for presentations instead of writing on the blackboard, but with a large screen, this method, especially when diagrams were used, appeared to support teaching and learning processes. Both teachers and learners made positive comments about using such presentations. Positive points included that time was not wasted writing everything on the blackboard, one can go back to previous slides when needed, slides can be updated continuously and slides can be printed out as handouts for learners who are then able to focus on listening to what the teacher is saying, rather than writing notes from the blackboard.

Further, as was noted above, in 2004, a student volunteer was supporting work done in the computer room. This meant that where teachers did not feel confident with technology there was someone to help them, and also someone who was able to move around the room helping learners with technological problems, whilst the teacher could focus on the lesson being taught.

The table on the following page describes and evaluates the lessons observed.

All lessons took place in the computer lab, and all lessons were taught by a teacher who had completed Intel® Teach to the Future training[12]. Teachers were informed prior to the researcher's visit that such lesson observations would be taking place. In addition to keeping a detailed lesson narrative, each lesson was rated with respect to teaching and learning processes. The following questions and five point scales formed the basis for this rating:

1. Do learners interact ***meaningfully*** with the educator and with one another?

Hardly ever					A lot
1	2	3	4	5	

2. Do valuable learning opportunities arise from these interactions?

Hardly ever				A lot
1	2	3	4	5

3. Does the educator exploit these learning opportunities as they arise?

Hardly ever				A lot
1	2	3	4	5

4. Are the learners negotiating the solution to a problem/exploring an issue meaningfully?

Hardly ever				A lot
1	2	3	4	5

5. Is the educator acting as a facilitator for the learners as they negotiate/explore?

Hardly ever				A lot
1	2	3	4	5

[12] The researcher also observed several lessons, all computer studies classes, taught by the student volunteer. These are not reported on here since the volunteer had not taken part in the Intel® Teach to the Future training.

Table Six: Summary of lesson observations

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
17/08/04	Grade 8, Science	Topic – static electricity. Lesson started with revision questions from previous lesson. Teacher presents questions on the screen using PowerPoint (ppt). Lesson based on ppt presentation. Learners do not make use of computers.	43	3	2	2	1	2

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
18/08/04	Grade 12, Economics	Topic – macroeconomics, unemployment. Lesson starts with ppt presentation on unemployment. There is much engagement with learners who ask many questions, often related to what they see on the TV news or in newspapers. E.g. 'What is the effect of international investment on unemployment?' 'How can it be that our economy is growing, but so many are still unemployed?' Presentation formed the basis of the entire lesson. Learners did not use computers.	17	5	5	3	4	3

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
18/08/04	Grade 12, Computer Studies	Topic –operating systems. Lesson based on ppt presentation. Mostly focused on covering content. Following presentation, learners each complete a revision test, created by the teacher in Excel. Each learner works on their own computer. Most enjoy the test, which indicates whether an answer is correct or incorrect.	13	4	2	2	1	1

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
17/08/04	Grade 11, Economics	Topic – Money. Lesson starts with revision of previous points about money. Revision based on ppt slides used in previous lesson. Move on to new presentation entitled 'Money – associated instruments'. Learners are not using computers. The lesson is based on ppt presentation. Learners engage with teacher, and ask many questions.	31	3	4	3	2	1

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
12/10/04	Grade 11, Computer Studies	Revision lesson. Learners open revision website from server. The teacher has developed this website which forms the basis of revision activities for this subject. The website is structured using a question (in red) at the start of each page. Learners are able to work through those sections that they most need to revise. Each learner works on own computer. Opening of the website from server to computers to on average about 10mins, with some learners struggling and needing much assistance to find the files they needed. Some learners take notes from the website as they work through it.	16	4	3	3	2	4

DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
12/10/04	Grade 11, Biology	Topic – revision of angiosperms. Teacher uses ppt presentation as basis of lesson. Learners do not use computers, and are sitting two or three per computer. Learners have printed out notes and some follow in their notes during the lesson. Teacher uses the ppt to facilitate revision by asking a question, learners answer, then answer is presented on screen. Colours are used to highlight specific key words and important points learners need to remember for examinations.	43	2	2	2	1	2

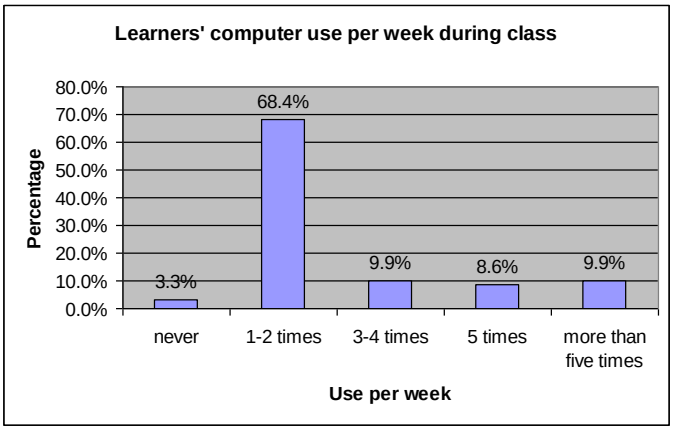
DATE	SUBJECT/ GRADE	LESSON DESCRIPTION	NO LEARNERS	LEARNERS INTERACT MEANINGFULLY WITH EDUCATOR AND EACH OTHER	VALUABLE LEARNING OPPORTUNITIES ARRISE FROM THESE INTERACTIONS	EDUCATOR EXPLOITS THESE LEARNING OPPORTUNITIES	LEARNERS NEGOTIATING THE SOLUTION TO A PROBLEM OR EXPLORING AN ISSUE MEANINGFULLY	EDUCATOR ACTING AS FACILITATOR FOR LEARNERS AS THEY NEGOTIATE OR EXPLORE
12/10/04	Grade 10, English	Topic – 'Love potion', focus on cultural issues raised in short story by Herman Charles Bosman. Teacher uses ppt as a tool and engages learners in a discussion about love and culture. He interacts well with the class, and uses the ppt as a guide and to reinforce key points. Learners do not use computers, but actively engage in discussion. Some learners, however, play card games on the computer nearest too them (reprimanded when discovered). Teacher makes use of examples from learners' lives to raise discussion points.	60	4	3	3	3	3

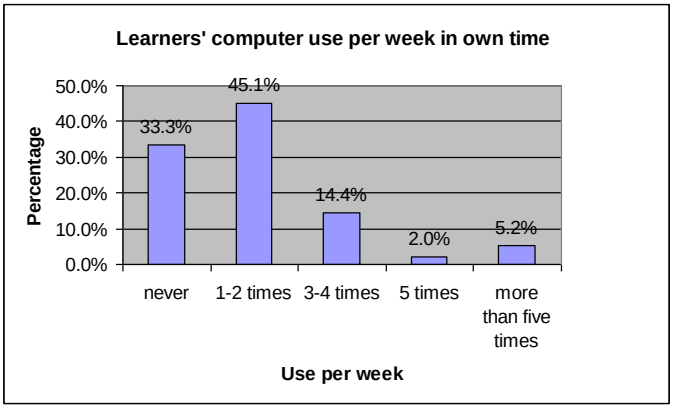
Table Six above provides an overview of the lessons observed during the research process in year two. We see that the most common use of technology remains as a presentation tool. Since the school now has a data projector, this use of computers is much more effective than previously when learners were not able to see the presentation. In most lessons, except for computer studies classes, learners do not make use of computers themselves. In one example, the teacher made use of a website that he had created for revision purposes, and learners each worked through the website using their own computers.

When the researcher asked teachers why learners did not use computers during the lessons, two common responses were noted. The first was that there are too many learners in the class to make effective use of computers. This was especially so for lower grades in which class sizes are large. In some cases, teachers noted that they spilt their class in two, with one group working in the computer room and the other in the classroom. During the following lesson the two groups would swap. The second reason for learners not using computers was that, especially in classes where learners do not do computer studies, it takes too long for the whole class to switch on the computer and locate the material to be used. One teacher noted that half the lesson is then spent getting everyone ready to use the computers and then no one is able to finish the activity before the class ends. Thus she finds it more effective to use PowerPoint to present a lesson, especially because of the pictures that one can include, and then have the learners complete activities that do not require a computer.

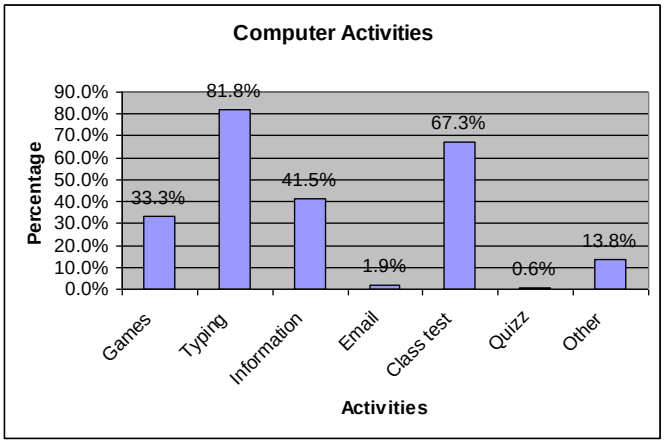
LEARNER RESPONSE

As noted above, during the 2004 case study research the focus was turned to the response of learners to the use of computers and also to gaining an insight into possible impact of the Intel® Teach to the Future training at the learner level. Data was collected during informal class discussions following a lesson in the computer room (see quotations below). These discussions were supported by a self-administered learner questionnaire which learners completed in the last ten minutes of a lesson that had been observed by the researcher. The researcher answered any questions the learners had whilst completing their questionnaires, and where needed, explained the meaning of specific questions. A total of 160 questionnaires were completed, but one was discarded, because the learner had drawn pictures instead of completing the questions. Thus the analyses conducted were based on 159 questionnaires. The learner sample was made up of 56% girls and 44% boys. Ages ranged from 13 to 22, with an average of 17 years. 58.8% of the sample took computer studies and 41.2% were not in a computer studies class. Learners were asked to rate how regularly in an average week they used the computer as part of a class, and also in their own time. Responses can be summarised as follows.





From these two graphs we see that the majority of learners use computers 1-2 times per week, both in class time and also in their own time. We see that 33.3% of learners never use computer in their own time, e.g. at break and after school. Of the sample, 36.3% of learners had made use of the Internet at the time of the research. The following graph shows the activities for which learners reported using computers. Note, more than one option could be chosen, hence percentages add to more than 100.



The most common activity completed using computers is typing (81.8%). Many teachers require that learners type some of their work. Several learners have also done class tests using computers. This is likely to be a biased statistic since many of the learners who completed questionnaires are computer studies learners, and as such do make use of computers for tests. This is unlikely to generalize across the school. However, as of 2005, computyping is being introduced across the entire school so that all learners have some computer experience when

they leave school. Responses in the 'other category' included music, calculations, designing event programmes and developing presentations.

When learners were asked if they thought computers could help them to learn, 98.7% said 'yes'. When asked to explain, learners commonly noted the following reasons:

- Makes learning easier and quicker (mostly in relation to less time spent copying information from the board);
- Because of the information that can be found;
- Computers are important for jobs (not a way that learning is supported, but this was noted by many learners); and
- It makes learning fun.

Some examples from questionnaires include:

> Because it is easy to learn with something you can see on screen and there are no unclear words. It's fast and quiet.
>
> Yes, because computers, according to my own view make learning fun, and that's exactly what makes learning easier.
>
> Because it is like a teacher to me when I write something it underlines it to show it is wrong and gives me the right spelling.
>
> There is more information than the books can carry and when it comes to jobs and future plans computers play a big role, there is not much a book and teachers can do for you.
>
> Because it will help me to learn especially about the things that are happening in the world and other countries worldwide, how they live, how they feel, how they communicate to each other.

The following responses were made during informal discussion with classes following their lessons in the computer room.

Grade 12 learners when asked if they think computers help them to learn:

> Yes! They are fast so we can cover more. We also don't have lots of papers that can get lost. We can see things graphically on screen and we can also find information that we were not able to find before.

Grade 12 Economics learners:

> We did a project on the budget speech and we could find lots of information about this on the internet. It was very interesting and we learnt so much. There was much more information than what is in the newspapers.

Grade 11 learners following a lesson when educator was using PowerPoint:

> We are not drowsy, the blackboard makes us drowsy. We concentrate more when we use computers.

Educators also noted the positive effect of computer use on learning. For example, when asked about learner's response to lessons using computers, the following answers were given:

> With much excitement! They love using computers, it is something new, and they concentrate more and don't forget what they have learned as easily.

> Learners tend to remember content of lessons using the computer better than normal lessons, and when we do revision they say things like 'remember we did that on the computer….'

Thus, overall, we find very positive responses from learners with respect to using computers for learning. The aim was to collect data that would allow for conclusions to be made about impact of Intel® Teach to the Future at the learner level. However, while we see a positive response from learners with respect to using technology, and also teachers' reports of the value of computers for learning, there are many learners who have only sporadic or little access to computers. Further, impacts on learning continue to be influenced by the number of computers available and the size of the class. As such, while it appears that training teachers in the integration of computers into their teaching and learning has a positive effect on learners, it is still too early to make conclusive comments about impact from a learner perspective.

ADDITIONAL QUOTATIONS FROM CASE STUDY DATA

Intel® Teach to the Future facilitator when asked how he personally had benefited from taking part in the programme:

> Oh, a great deal! I have learnt new skills. Although I knew about them I was not using them for teaching, and now I see their potential. They have spoilt me – I don't want to use anything else! I have learnt a new approach to teaching.

Educator's explaining how they have used what they learnt from Intel® Teach to the Future:

> I have also developed a website – putting all lessons on website, one is completed for grade 12, busy with another for grade 11. Learners can go back to it over and over again until the information is in their minds. I am trying to present the information in a way that will help learners to remember. Learners love it!

> Biology teacher: I downloaded 3-D pictures from the internet of all the components of the cell. Before explaining the components to learners they looked at the picture on the screen and had to explain how they thought each structure worked and they also had to identify the structural differences. We also did a project on the SARS disease and the learners used the internet to find information.

> Economics teacher: When learning about the three main types of industries I gave the learners an assignment in which they looked for information about the industries. They did this in between being taught about the content and found out many interesting things that will help them remember what they learnt.

Educator on how computers support teaching and learning:

> Computers help because you can spend more time actually teaching than writing on the board.

CONCLUSIONS

This school is an interesting school at which to explore in more detail both the successes and the barriers to implementation of the Intel® Teach to the Future programme at the classroom level. The educators generally have the required levels of ICT skills. The school is lucky to have a very committed and experienced ICT champion, their facilitator, who is involved in a range of community initiatives and provides basic ICT training to community members and

educators from other schools without computers. The principal is very supportive of the Intel® Teach to the Future programme, and any other professional development initiatives. However, all the educators have raised serious concerns about the practicalities of implementing what they have learned during the programme. During lesson observations the researcher was able to observe some of the challenges of integrating technology in a lesson with very large classes of learners and in contexts where learners have few computer skills.

However, these reservations not withstanding, many successes have also been noted. This case study has shown that we need to be flexible in our expectations of impact. While the training may not yet have produced the desired impacts, with respect to quality of portfolios, learner activities that support higher-order thinking, and implementation of technology-integrated lessons, clear changes in the use of computers to support teaching and learning can be noted. Several teachers now make use of PowerPoint presentations which allow for more engagement with learners than writing notes on the blackboard. Some teachers are also beginning to use websites as a revision tool, and learners have used computers to search for information for projects across a range of subjects. Perhaps the best evidence in support of the positive impact of the Intel® Teach to the Future training comes from the learners themselves as reflected in their comments about how computers support learning.