



## White Paper

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# Preparing Future Teachers for 21<sup>st</sup> Century Learning:

*Partnerships that  
enhance the capacity of  
pre-service education*

## Executive Summary

*'The creation of an educational system capable of preparing people to live in the changing world is one of the crucial tasks of modern society'. (Kinelev 2000)<sup>1</sup>*

This paper focuses on a pre-service program designed to equip future teachers for their role in preparing students to live in a changing world. It draws from a three year study of the *Intel® Teach Program Essentials Course*, pre-service curriculum, conducted by evaluation teams in ten Asia Pacific countries and coordinated by Deakin University, Australia.

In particular, it highlights the positive impact of the *Essentials Course* on Teacher Education Institutions, teacher educators, pre-service teachers and new teachers who completed the program during their pre-service training. It also identifies the factors that underpin success.

Across the participating countries, there is increasing recognition of the role of technology in preparing students for the 21st century. In many cases this is leading to the alignment of vision, goals and policies across governing education bodies, schools and Teacher Education Institutions. At the same time it is acknowledged that to adequately prepare future teachers, teacher educators need professional development, not only in technology skills and applications, but also in new pedagogical methods of incorporating technology into the classroom.

The *Intel Teach Essentials Course* is a teacher professional development program with a focus on using technology to support student centered inquiry driven, project based learning. Over 5 million current and future teachers have participated in the program in more than 40 different countries.

The development of partnerships between country based Intel Teach teams, the Ministries of Education, pre-service governing bodies and the Teacher Education Institutions has been instrumental in promoting, driving and sustaining the increasingly robust implementation of the *Essentials Course* across the pre-service sector.

Leadership commitment and a coordinated and collaborative approach within the Teacher Education institution have helped to overcome some of the significant challenges around technology resourcing, resistance to change and an already crowded pre-service curriculum. The links established with local schools have benefited teacher educators, pre-service teachers and teachers.

The *Essentials Course* is localized at the country level and the scope for implementation in the Teacher Education Institution is flexible enough to address the needs of the vastly different pre-service approaches and contexts.

However, key aspects for effective implementation were identified. These include providing all or most components of the course and ensuring that the learnings are modeled, discussed and reinforced across a range of learning areas by Teacher Educators who have undertaken the *Essentials Course*. This provides pre-service teachers with sufficient depth of understanding and the capacity to transfer their knowledge and understanding across the different teaching contexts they may face in their future teaching role. Formally accrediting the program within the pre-service qualification increases its status and attracts greater commitment at all levels.

Feedback from a range of Teacher Education Institutions has highlighted that, for many, the Intel Teach Program *Essentials Course* has transformed their teaching approach and content. For some, involvement in the *Essentials Course* has also significantly lifted their status, activity and influence within their broader education community. Their graduates are considered 'more employable'.

It has also had immense personal and professional impact on many Teacher Educators. Many have begun to change from lecture style approaches in their teaching to student centered, collaborative

approaches. Perceptions of 'technology in teaching' have changed from technology skill development to the use of technology as part of an innovative approach to teaching.

As a result, the pre-service teachers have changed the way they learn as well as understanding how they can use technology effectively to implement student centered, project based teaching and learning in their future classrooms.

Evaluation teams involved in the study are from the following organizations:

**Vietnam:** Centre for Education Evaluation and Accreditation (CEER) Institute for Educational Research (IER) Ho Chi Minh City University of Pedagogy (2007)

Research Centre of Pedagogy, Hanoi University of Education (2006)

**Philippines:** Department of Sociology, College of Social Sciences and Philosophy, University of the Philippines

**Pakistan:** Neilson Company

**Malaysia:** University of Malaya, Kuala Lumpur, Malaysia

**Korea:** Korean Institute of Curriculum and Evaluation, Chuncheon National University of Education and Suncheon National University

**Japan:** Nikkei Research Inc.

**India:** Jamia Millia Islamia University, New Delhi, India (2007)

IRMB International, New Delhi Australia (2005-6)

**China:** Working Group for China Pre-service Training Evaluation

**Australia:** Deakin University, Melbourne

## Introduction

The rapid move over recent decades to a global knowledge economy, driven by constantly evolving information and communication technologies, has created significant economic and social opportunities. Equally it is creating enormous challenges, confronting countries with the need to rethink their educational and social systems. (Kozma 2005)<sup>2</sup>.

To participate in this global knowledge economy and improve their standard of living, Kozma stresses the need for students to 'leave school with a deeper understanding of school subjects and with the skills needed to respond to an unbounded but uncertain 21st century – skills to use their knowledge, to think critically, to collaborate, to communicate, to solve problems, to create and to continue to learn'.<sup>2</sup>

Increasingly, the onus is on **Teacher Education Institutions** (TEI) to 'rethink' how they can most effectively prepare future teachers to teach these skills for success in a complex, rapidly changing world.

This paper details a partnership approach that enhances the capacity of pre-service education providers to prepare teacher educators, pre-service teachers and ultimately students, for 21<sup>st</sup> century learning.

### Technology in teacher education – the challenge

The integration of information and communication technologies (ICT) in the pre-service teaching and learning process is progressively being acknowledged as a vital and necessary step forward.

*Recognition and respect for teaching as a profession will depend to a considerable extent on whether the objectives, content, methods, and assessment of teacher education, induction, and professional development alter to take full advantage of these new technological capabilities. Dede et al (2004)<sup>3</sup>*

To achieve this, it is well recognized that Teacher Educators need professional development, not only in technology skills and applications, but also in new pedagogical methods of incorporating technology into the classroom. (Carlson and Gadio 2002, Snider, 2003)<sup>4 5</sup>.

Currently most pre-service teacher education courses include a Technology Education Unit. But for many, the focus of these units is typically on technology skills and applications rather than the integration of technology across the curriculum. (Smith 2001)<sup>6</sup>. This has been referred to by Pelgrum and Law (2003)<sup>7</sup> as the 'learning about ICT' phase. Many Teacher Education Institutions have also progressed to the 'learning with ICT' phase, whereby teacher educators are using their computer capabilities to enhance instruction without necessarily changing beliefs about the approach and methods for teaching and learning. The third phase, 'Learning through ICT' is not commonly practiced in pre-service teacher education. In this phase, ICT is 'integrated completely as an essential tool in the curriculum, so that the teaching and learning of that curriculum is no longer possible without it'.<sup>7</sup>

Moving to this level of integration, where technology infiltrates all aspects of the teacher education curriculum, is perceived as out of reach for a large proportion of Teacher Education Institutions. Many of their teacher educators do not have sufficient skills or knowledge to model the use of technology in their classes. Opportunity to use technology across a range of pre-

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<sup>i</sup> Teacher Education Institution (TEI) is the generic term used to cover Universities, teachers colleges and other institutions providing teacher education

service classes is further restricted in countries where a more traditional (and crowded) teacher education and school curriculum is delivered, with its focus on lecture style, rote learning and exam based results.

Inability to gain access to the required technology hardware and software, infrastructure and connectivity creates further barriers, particularly in teacher education institutions in rural areas.<sup>8</sup>

However, some significant shifts are occurring, stimulated by a growing recognition of the need for educational reform at a range of levels. Positive change is particularly evident in teacher education institutions that are establishing more robust and productive technology focused relationships with Ministries of Education, business, schools and communities.

Such relationships are resulting in stronger alignment of educational policies and practices across government, TEIs and schools, more relevant professional development for teacher educators, improved access to technology and infrastructure and greater sharing of knowledge and resources. The barriers to effective integration of technology are being reduced and some considerable benefits for all involved are emerging.

### A Catalyst for Change

The value and underpinning features of a partnership approach have been highlighted through a three year study of the **Intel Teach Program Essentials Course**, which is being delivered in various pre-service teacher education institutions across ten Asia Pacific Countries.<sup>169</sup>

For almost a decade, Intel have been establishing partnerships with governments, education systems, schools and Teacher Education Institutions to support student centered learning through the integration of technology and project based learning in the curriculum. In line with its Corporate Social Responsibility commitments, the focus is on providing a range of teacher professional development offerings, referred to as the **Intel Teach Programs**. Central to their suite of programs is the **Essentials Course**.

Although predominantly conducted with in-service teachers, the Essentials Course is increasingly being implemented successfully in the pre-service sector. As a result, over 5 million current and future teachers from more than 40 countries have now undertaken the course.

*Global evaluation of the in-service Essentials Course since 2002 has highlighted its impact on practicing teachers. Analysis of the most recent global data, drawn from 15,000 participating teachers across 20 countries, indicated that since their training: 77% have engaged students in new ICT based activities, 82% increased their use of technology for their own lesson planning and preparation and 59% increased their use of project based approaches with their students<sup>10</sup>*

The 40 hour Essentials Course extends over ten separate modules. It provides teachers with the capacity to integrate technology effectively into a curriculum that generates student centered, inquiry driven, project based learning. Throughout the course participants develop a unit of work for implementation in their classroom. This involves the development of student samples, evaluation tools, resources to support the unit and an implementation plan. It provides a context in which the participants can further develop their technology skills and their understanding of the impact and implications of using technology to enhance 21<sup>st</sup> century learning.

## A sustainable and scalable approach

The Essentials Course is implemented through a 'train the trainer' model, designed to extend its reach across schools and teacher education institutions as well as increase its ownership and relevance at the local level. Country based Senior Trainers (trained by expert Intel Trainers) deliver the training to Master Trainers. In the **in-service** course, these Master Trainers are selected teachers in schools, who then train further teachers at their school. In the **pre-service** course the Master Trainers are Teacher Educators. They may train additional faculty at their Teacher Education Institution but are also modeling and teaching the effective use of technology in education to **cohorts of pre-service teachers passing through their classes from year to year**.

In the Asia Pacific region in particular, adopting the Essentials Course at the pre-service level is progressively being seen as a **sustainable and scalable** way to reach the large numbers of teachers in these countries.

First introduced in the region in 2002, the number of **overarching pre-service institutions** implementing the Essentials Course has reached over 150<sup>ii</sup>. This figure is far higher when also counting the number of Teachers Colleges involved due to their attachment to participating universities.

Across the participating countries, there is increasing recognition of the role of technology in preparing students for the 21st century. Although to differing degrees, in many cases this is leading to the alignment of vision, goals and policies across governing education bodies and Teacher Education Institutions and the planning and implementation of a strategic approach that values and builds on these interdependencies.<sup>11</sup>

In Malaysia, for example, the government's Ninth Malaysia Plan 2006-2009 emphasizes greater use of ICT as the strategic driver to support and contribute directly to the growth of the Malaysian economy as well as enhancing quality of life for the population. This was reflected in the Ministry of Education's Educational Development Master Plan 2006-2010 which leveraged earlier initiatives, such as the Smart Schools Initiative (2003), and intensified efforts to harness ICT by providing ICT facilities and infrastructure to schools, reviewing the existing school curriculum and increasing teaching and utilization of ICT in schools, universities and the teacher education institutions.<sup>11</sup>

In Korea, where technology infrastructure improvement within households has been a strong government focus, the Government is also driving ICT in education through both policies and funding. All K-12 classrooms are networked, teachers have personal computers and all K-12 students have computers networked at home. K-12 teachers must use ICT in education in at least 10% of all classes and a third of all teachers must be trained in ICT annually.<sup>12</sup>

The government in Vietnam is also 'embarking vigorously on improving learning and teaching methods in its educational system'; although in contrast to some other countries the process is still in 'an infancy phase'.<sup>13</sup>

Sustained change, however, takes time and resources to extend across the broader education spectrum. In many cases rote learning and emphasis on examinations persists as the dominant method within schools and teacher education institutions. The development of students' inquiry, collaboration and teamwork skills is rare.<sup>13</sup>

The pre-service Essentials Course, is increasingly being seen as a catalyst for the significant change needed in teaching practice, particularly in countries with more traditional practices.

## A partnership approach

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<sup>ii</sup> Based on figures collected in 2005

**The development of partnerships** between country based Intel Teach teams, the Ministries of Education, pre-service governing bodies and the Teacher Education Institutions has been instrumental in promoting, driving and sustaining the increasingly robust implementation of the Essentials Course across the pre-service sector.

In all countries the Intel Teach country based team engages with key stakeholders at each stage of implementation. In the initial decision making and adoption period, this involves orienting leaders to the approach, offerings and outcomes of the course, through forums and workshops, and working with them on the localization and adaptation of the course to their particular needs. Beyond this, Intel has provided ongoing support as well as updating and adding to the resources and information available at a country and global level. These ongoing relationships have generated confidence, enthusiasm and commitment at all levels.

Within some countries, the partnerships have evolved into more formal reference groups or central 'hubs', with representatives from the government, private sector, teacher education institutions and schools. Such groups are focused on promoting and steering technology in education research and reform. The widespread adoption of the Intel Teach Essentials Course is central to their approach.<sup>14</sup>

**Localization** of the Essentials Course is fundamental in its acceptance across the range of countries. While maintaining its core concepts and integrity, local education experts collaborate with the Intel Teach country based team to tailor the course and its resources to the contextual and cultural needs of their country. This takes into account, for example, the local language and terminology, education systems and policies and the level of infrastructure and resourcing.

In addition to country level localization, **vast differences between Teacher Education Institutions** across and within countries have increased the need for greater flexibility in delivery to incorporate the program successfully into the pre-service qualification. Such differences revolve around governance structures, level of autonomy, the length and nature of the teacher education qualifications and access to resources.

As a result, a range of implementation models have emerged. These vary in the location of the course within the qualification. For example, the curriculum may be:

- o embedded in an existing unit,
- o provided as a standalone unit, often as an addition to the existing qualification rather than an accredited part of it, or
- o spread across different units.

Consideration is also given to whether it is compulsory or elective, in what year of the qualification it should be delivered and the number of hours involved.

While positive gains have been made within this range of implementation models, findings over the three year study showed the program was least successful when:

- o it focused on developing computer skills, rather than improving teaching and learning through effective use of technology,
- o a limited number of modules was covered, and
- o there were few opportunities for pre-service teachers to discuss or see the approaches modelled in other classes.

## The impact

Feedback from a range of Teacher Education Institutions highlighted that, for most, the Intel Teach Program Essentials Course **provided a new approach to teaching** in their institution, particularly with its focus on student centered, project based learning.

By becoming involved, the Teacher Education Institutions hoped to improve and update the pedagogy and curriculum in their courses. They saw it as a way to produce more qualified, competent and globally competitive graduates, proficient in the use of modern facilities and innovative teaching techniques and equipped with the necessary skills and knowledge to effectively integrate technology into their teaching practice. They also recognized an opportunity to access and develop technology based resources for teaching and to enhance the computer skills and confidence of their faculty.

*'Technology integration in its academic programs has completely transformed the whole personality of the institution and has influenced every aspect of its life'. TEI Principal, India<sup>15</sup>*

**The impact study of the Intel Teach Program Essentials Course** in the pre-service sector drew together the data and findings from individual country evaluations that were based on common (although localized) data collection strategies and instruments. In 2007, the final year of the evaluation, the focus was on greater in-depth exploration of the factors that were influencing the impact of the program.

Over the three years, substantial quantitative and qualitative evidence highlighted the very positive impact of the Essentials Course on teacher educators and on the pre-service teachers both during their teacher training and when they gain teaching positions in schools.

In **Teacher Education Institutions** where the Essentials Course has infiltrated the curriculum at all levels, it has transformed their teaching approach and content to one in which inquiry driven, interactive learning through the use of technology is integral to the pre-service qualification. Involvement in the Essentials Course has also significantly lifted the status, activity and influence of many of the Teacher Education Institutions within their broader education community.

It has also had immense personal and professional impact on many **Teacher Educators**. For those with limited exposure to technology, it has opened new opportunities for communication and knowledge access, resulting in, for example, increased research, publication, paper presentations at national seminars and improved content presentation.

*The intensive Essentials Course training was so thorough that it made me a more effective teacher, made me feel more empowered and confident and made my self expectation go up". Teacher Educator, Vietnam<sup>13</sup>*

Many have begun to change from lecture style approaches in their teaching to student centered, collaborative approaches. They more readily encourage greater probing and self learning in their pre-service teachers. Perceptions of 'technology in teaching' have changed from technology skill development to the use of technology as part of an innovative approach to teaching and assessment that involves guiding pre-service teachers towards improvement, self and peer evaluation.<sup>16</sup>

As a result of their involvement in the Essentials Course 'many (Teacher Educators) now understand the meaning of life-long learning and its connection to improving the quality of their teaching. Furthermore ... the attitudes and perceptions have changed so they no longer ask if they should use IT in teaching and learning. Instead they ask questions about how to use IT most effectively when teaching'<sup>13</sup>

The leader of one Teacher Education Institution, describing the changes in his teacher educators, noted their continuing desire to be 'always ready to learn, acquire new skills and grow' and to 'work collaboratively rather than competitively, enriching their abilities in the areas of pedagogy and technology'.<sup>15</sup>

The Teacher Educators were further motivated by the changes they were seeing in their **pre-service teachers**. This included an ability to communicate ideas and opinions more confidently and collaboratively, a deeper understanding of content, improved presentation skills, better quality of work and greater understanding of the connection between teaching and learning and technology.

The opportunity for technology skill development was also important for many of the pre-service teachers and in some cases teacher educators, particularly those from rural areas. Often the Essentials Course provided their first exposure to computers.

*Having computer and ICT knowledge makes a teacher so well equipped that she becomes a permanent self learner'. Pre-service Teacher, India<sup>15</sup>*

Overall, **67%** of current pre-service teachers involved in the evaluation felt they had been well prepared, through the Essentials Course, to implement technology based lessons in their future teaching. In countries where the program was strongly embedded throughout the pre-service course, this figure was notably higher.<sup>16</sup>

Pre-service teachers also noted their increased confidence in using technology, and their better understanding of learning theories and other content across a range of subject areas. They felt technology had 'equipped them for continued self learning', and now regarded themselves as 'better learners' with improved communication and management skills. In one Teacher Education Institution, some were now contributing to the development of resources and materials written in association with their teacher educators.<sup>15</sup>

In addition, the Essentials Course increased opportunities for pre-service teachers to gain teaching positions in schools following graduation. According to a school Principal they were 'better groomed, more techno-savvy and highly committed to their profession'.<sup>15</sup>

Following their graduation, many of the '**new teachers**' involved in the study indicated they were applying their learnings from the Essentials Course in their teaching practice.

**Table 1: New teacher feedback on the impact on their students**<sup>16</sup>

Extent to which new teachers apply their learnings from the Essentials Course	
<b>76%</b>	Engaged in technology based lessons since they commenced their teaching positions, (6% daily and 25% weekly) and many in conjunction with project based learning approaches.
<b>56%</b>	Had used all or part of the unit plans they developed during their training.
<b>73%</b>	Developed new unit plans based on the Intel Teach approach

In particular, the high percentage of respondents who developed new unit plans based on the Intel Teach approach provides strong indication that their learnings from the pre-service Essentials Course were being applied to their new teaching contexts.

*Before, we had never worked in groups...Attending the Intel Program, I could observe the high effectiveness of group work. We have more conditions to exchange ideas and perception, help each other and develop our critical thinking. At present, I use lots of group work for my*

93% of new teachers indicated that the Essentials Course had been a valuable addition to their pre-service program. However, many were limited in the extent to which they could implement their learnings as they were teaching in schools where there were few technology resources and no flexibility in the approach to curriculum development and delivery. Case studies in the final year of the study highlighted the difficulties faced by these teachers and in many cases their persistence in attempting to bring about change.<sup>16</sup>

In contrast, the study also highlighted the unexpected influence of some new teachers in stimulating an interest in technology based teaching practices in their schools:

- o 72% had shared their learnings from the Essentials course with other teachers and had influenced other teachers to integrate technology into their teaching practice.
- o 80% had noted, since commencing at their new school, an increase in whole school support for and commitment to technology based learning.<sup>16</sup>

Even in countries where curriculum changes at the school level were still in an early phase, changes in attitude were evident. In one school, for example, the Principal was most impressed with the *'cadre of young and enthusiastic teachers who can apply new, active teaching strategies and ICT and who can change the learning atmosphere of students positively at the school'*. He intended to consider more of these graduates, who had completed the Intel Teach course at the local university, for future teaching positions at his school.<sup>13</sup>

As indicated in the table below, the new teachers who were implementing technology based lessons agreed that it was having a very positive effect on student learning and motivation when compared to lessons in which technology was not used.

Table 1: New teacher feedback - impact of technology based lessons on their students<sup>16</sup>

Agree or strongly agree	Impact on Students
90%	Students were motivated and actively involved in the lesson
87%	Students developed greater skills and confidence in using computers
84%	Technology based lessons addressed students' different learning styles
83%	Students worked together more often
82%	Students were able to communicate their ideas and opinions with more confidence
79%	Students showed more in-depth understanding of content
84%	Students learned more independently
85%	Students took more responsibility for their own learning
80%	Students demonstrated greater critical thinking and construction of ideas
84%	Students demonstrated greater creativity than in previous comparable assignments

### Influencing levels of success

The study, particularly during the 2007 phase, provided examples details and insights regarding the impact of the Essentials Course on individuals and the differences and similarities across countries and institutions. It also identified contextual factors and a range of practices most likely to influence positive outcomes and impact. Effective partnerships and teamwork underpinned many of the strategies and successes.

**Government influence** was in some cases powerful in bringing about change through the Intel Teach program. The Ministries of Education or the pre-service governing bodies were often driving reform towards technology based teaching and learning and the development of 21<sup>st</sup> century skills. The extent of their influence over the pre-service curriculum could determine the rate and extent of change occurring at a country level. In some countries they were able to encourage or direct the institutions to adopt the Essentials Course.

In Malaysia, for example, where the Teacher Education Division of the Ministry of Education sets the pre-service curriculum requirements, the Intel Teach Essentials Course is a requirement in the pre-service qualification. In particular, it is regarded as a way to introduce a Project Based Learning approach. All Teacher Education institutions are currently adopting the program, although the model of implementation within the qualification is determined at the institution level.<sup>11</sup>

In a State in India, which is recognized as being open to all 'proposals and plans that may directly or indirectly influence the growth of the state and its economy in the field of technology', the State Council of Higher Education directed all of its Universities and affiliated Teachers Colleges to adopt and integrate the Intel Teach Essentials Course Curriculum in their Bachelor of Education program. This was based on their understanding that the course 'successfully synthesizes latest technological developments with educational methodologies, is globally and temporally tested by Intel, is in line with the global technological trends' and clearly identifies 'what is to be taught to teachers to make them ICT competent' across all areas.<sup>15</sup>

Where the TEIs have far greater autonomy in the delivery of their pre-service curriculum, such as Australia, Vietnam and Pakistan, the program is being implemented more gradually, in some cases explicitly encouraged and supported by the Ministries of Education.<sup>13 17</sup>

*(the Teachers College) is recognized now as a dynamic, progressive, future oriented, competency focused and professionally equipped teacher preparation institution. Principal TEI India<sup>15</sup>*

**Leading teacher education institutions** are often encouraged or nominated to be early adopters, which not only lifts the profile and status of the program, but also instills more confidence in other TEIs exploring the option of involvement. It also increases the likelihood of successful implementation, which then sets the standard for other TEIs. In the Philippines, leading universities were strategically selected by the Philippines Ministry of Education to optimize and publicize the benefits of the course and increase its sustainability in their country. Their selection gave these TEIs the status of 'Centers of Excellence' and they considered themselves privileged to be involved. The subsequent involvement of some of them on a Commission of Higher Education Task Force, responsible for reform in the use of ICT in the pre-service, has led to the recent adoption of the Essentials Course as a required component in the undergraduate Teacher Education curriculum.<sup>14</sup>

**Leaders at the teacher education institutions** have strongly influenced the success of the Essentials Course, whether or not the impetus for involvement has come from the government. Leaders seeking new, innovative approaches recognized the potential benefits of being involved. Their confidence in the suitability of the Course led to greater flexibility in positioning the Essentials Course appropriately within what is typically a crowded curriculum. Timetabling modifications were made, additional budgeting allowed technology resources to be increased or upgraded and alternative solutions to increase access for pre-service students were found.

The commitment of leaders, when accompanied by inclusiveness and collaboration, has also shaped the attitudes of the Heads of Departments, Teacher Educators and administrative staff, further increasing the likelihood of smooth and successful implementation.

Leadership support is most likely where the leadership team

- o is fully briefed on the Essentials Course,
- o has strong evidence of the program's success,
- o recognizes its advantages over other approaches and
- o sees it as aligned to their goals and visions for moving forward.

They need to feel confident that they will be well supported in taking on the course, that it has the flexibility to be adapted to their needs, and that the outcomes will be positive for their TEI, their teacher educators and their pre-service teachers.

Country based leadership forums, which bring together leaders and influencers from different TEIs and governing organizations, have provided Intel with the opportunity to inform leaders about the program and provide evidence of success through global and local evaluation outcomes.

In some countries this has expanded to regular meetings in which Teacher Education leaders and often representatives from other sectors involved in the program share and are exposed to new and updated developments, resources and ideas. Providing key leaders with opportunities to participate in global or regional forums has further increased understanding and commitment.

**Meeting the specific needs of the individual Teacher Education Institutions** has been addressed through site based sessions, whereby Intel works with each leadership team to inform, initiate and support the development of an implementation plan that addresses their local requirements and context.

The development of clear implementation plans in the establishment phase has guided staffing, timetabling and resourcing requirements, particularly where the program is spread across different learning areas.

**Establishing an Intel Teach management team** within the TEI to oversee and promote the conduct of the Essentials Course has raised the profile and credibility of the course, providing ongoing planning, implementation and support, and ensuring that the decisions made are acted upon. Typically members have included leaders (Heads of Department for example), key teacher educators and sometimes outside stakeholders.

The appointment of an Intel Coordinator as part of the team was also an effective strategy adopted in some countries. They have provided a central liaison person between management, the Teacher Educators and Intel personnel, with the potential to promote the benefits, drive changes that enable more effective and efficient delivery, and support and galvanize others to implement the program.

**The drive and dedication of individual Teacher Educators** was detailed in many of the stories told over the study period. They gave considerable time and energy (sometimes out of hours and unpaid) to ensure their pre-service teachers could access and gain the most from the Essentials Course. Their contribution cannot be overestimated.

However, **developing and sustaining widespread commitment across a broader range of Teacher Educators** is essential for long-term impact. In some countries and individual TEIs a range of strategies were identified that support and increase Teacher Educator involvement, teamwork and efficacy. These strategies engendered broad understanding and support for the course across the faculty rather than confining it to one or two committed teacher educators. Continuing to increase the number of Teacher Educators trained through the 'train the trainer' model, even though not all formally deliver the course to the pre service teachers, has increased the number of classes in which the Intel Teach approaches are modelled and discussed. Generating opportunities for collaboration between the Teacher Educators to discuss the implementation of the program across the TEI stimulates further interest and cohesion.

*After two years of curriculum construction and program training, one of the Universities has successfully embedded Intel® Teach Program Pre-service Training Program into their curriculum. The program training's requirements are strictly adhered to and its core focus on inquiry based, interactive learning has become an integral part of the teaching content across the pre-service course China Evaluation Report (2007)<sup>18</sup>*

### Positioning the Essentials Course in Pre-service

Deciding how to integrate the Essentials Course into the existing qualification can be challenging for TEIs, particularly when coupled with an overcrowded curriculum, complex accreditation requirements for new units and the need to ensure access to sufficient computers to conduct the course. The different approaches adopted were based on the needs and contexts of each institution, the length and nature of their qualification and the specific teaching areas of the Teacher Educators delivering the course.

- o The 'stand alone' option was selected by some TEIs as a way to pilot the course before more formally embedding it into their mainstream subjects.
- o Others included it in their existing Technology in Education Unit, which provided the impetus for moving the emphasis from skill development to improving pedagogy through technology and also allowed better access to computer resources.

- o When placed in a general education unit, the course provided an opportunity to introduce 21st century pedagogies previously not covered.
- o Integrating the Course into one or more specific methodologies resulted in unit plan development that related to the specific learning areas.
- o In some Teacher Education Institutions, different modules of the course were spread across the range of curriculum areas, and the learnings were typically drawn together through the development of one or more unit plans.

Examples of good practice were seen across this range of delivery options, reinforcing the notion that 'no one size fits all'. However, over the three year study, substantial data has increased understanding of the overarching requirements for success.

Firstly, the delivery of the course needs to be **in keeping with the aims and intent of the course** i.e. a focus on integration of technology into the curriculum, a student centered, project based learning approach and unit plan development, rather than on the development of technology skills.

Secondly it needs to provide pre-service teachers with sufficient depth of understanding and the capacity to **transfer their knowledge and understanding** to the development of unit plans across the range of teaching contexts they may face in their future teaching role.

This was more achievable when the **full course** was provided, rather than selected modules over a limited time span, and when the **learnings were being modelled, discussed and reinforced across a range of methodologies**, by Teacher Educators who had undertaken the Essentials Course.

**Formal assessment and credit for completion** of the Essentials Course is also important. It ensures that the pre-service teachers and the TEIs recognise its importance and are willing to give it priority in regard to time and resourcing. Most commonly, the inclusion of the unit plan development (and in some cases its delivery in the practicum) as part of the formal 'project', 'academic paper' or 'assessment task' provided the necessary credit towards the qualification. The unit plans developed by the pre-service teachers were also recognised in various teaching excellence awards organised at the TEI level and, in some cases, wider competitions at a State or National level.

Further recognition was given in countries where graduating teachers were required to gain registration before entering the teaching profession. The increasing need for technology in education qualifications, as part of this registration process, added significant status to the Essentials Course, particularly where it was specifically listed for recognition. Evidence of completion and the inclusion of the unit plan in their job application, also assisted many pre-service teachers to gain new teaching positions.

**Fully embedding the Essentials Course** across their Bachelor of Education Curriculum was, for one TEI, considered the most effective way to reap the full benefits. As a result, the leaders and teacher educators consider they now have 'a teaching and learning process that is more meaningful, interactive and interesting across all components of their Bachelor of Education program, more effective teaching of foundation and elective subjects and a college that has become a flagship institution among the colleges of teacher education across the State'. The course carries significant credit, across all areas of the B.Ed and also features in practical assignments and activities, and in their school experience program.<sup>15</sup>

### Addressing the technology needs

The level of technology resourcing, infrastructure and reliable connectivity available (both at a country level and an individual TEI level) has a strong influence on the way in which and the extent to which the Essentials Course can be delivered effectively. The variations between and

within countries, particularly when contrasting rural and city areas, is immense. Differences between TEIs are not only due to their level of resourcing and infrastructure, but often the priorities that determine the timetabling of these resources.

In TEIs with a strong commitment to the Intel Teach program, particularly at the leadership level, strategies have been put in place to improve accessibility. This has involved reassessing budget allocations and in some cases enlisting government and business assistance to increase the hardware and software, improve and expand internet connections, improve power back up to reduce interruptions and provide technical support.

More creative options have also been explored, driven by the need to ensure equity for all of their pre-service teachers as many have no access to computers outside the TEI. Increasing access has involved the following:

- o Extending the hours in which the computer laboratories are available (including early morning, evenings, weekends and holidays).
- o Conducting classes out of normal hours, when computer labs are freed up and access to technology in other faculties is allowed.
- o Splitting classes and adjusting the timetable so that only half the class use the computer laboratory at the one time while the others undertake theory work.
- o Making arrangements with local internet cafes and local schools.

Lack of prior exposure to technology means lower computer skills. Where possible, many TEIs therefore support skill development through additional computer skill classes and, for example, pairing low skilled pre service teachers with high skilled peers.

The expanding knowledge and interest in the potential of technology, initiated by their involvement in the Intel Teach Program, has also taken some TEIs to a higher level of application. One TEI, for example, has created a web based 'curriculum center', providing online learning options, study tools, forums and blogs for interaction between teachers and students and the sharing of teaching ideas and resources. It is considered to be both 'an open platform for study communication...and a stage for sharing knowledge, experience and academic research'.<sup>18</sup>

Another TEI has developed a similarly rich, interactive website, which not only increases connection, communication and learning within the TEI but also extends to the global education community.<sup>15</sup>

### **The importance of practice**

Opportunities for classroom practice were vital in helping pre-service teachers contextualize their learnings and understand the importance of using technology in the classroom. Extensive data collected over the three year study showed, however, that traditional teaching practices and lack of technology resources in many schools have limited their opportunities to observe or implement the Intel Teach approaches. Even in some of the schools where technology was given a high profile, its use was not necessarily underpinned by the teaching practices promoted in the Essentials Course.

*'Intel Teach Program has successfully improved ..... practice teaching. Each student teacher is required to prepare two technology aided or digital lesson plans which are used in their practice teaching. Students feel that subject matter is well organized and presented through the Intel recommended unit planning steps. Through these plans their questioning skill improves from lower order to higher order questions leading to reflective teaching'. Teacher Educator India.<sup>15</sup>*

Overall, **57%** had the opportunity to conduct technology integrated lessons during their practicum. The impact on these pre-service teachers was marked, as indicated in the table below. Well over **90%** of them, for example, felt that their confidence, understanding and ability to integrate technology effectively in the curriculum were further increased through these opportunities, particularly when they involved the implementation of the unit plan they had developed. Most were convinced that technology would be part of their future teaching practice, and that it would be underpinned by sound pedagogy that includes inquiry driven, project based learning and collaborative student group work.

**Table 2: The impact of opportunities to practice technology based teaching during the practicum<sup>16</sup>**

The impact of opportunities to practice on pre-service teachers	
93%	gained confidence in their ability to integrate technology in their curriculum
96%	gained a better understanding of the requirements for effective technology based teaching
95%	felt that the students were motivated
96%	saw positive outcomes for the students
96%	consider technology will be part (most to a moderate or large extent) of their teaching practice when they become a teacher
97%	consider project based learning, Essentials Questions and group work will be part of their teaching practice (most to a moderate or large extent)

Opportunities for pre-service teachers to practice their learnings were strongly enhanced when the pre-service teachers were placed in schools with high levels of technology and infrastructure, the school curriculum aligned with the Intel Teach approach and there was openness to new ideas.

#### Extending the reach – the broader impact

In some countries, the Intel Teach Program is providing the foundation for establishing strategic partnerships between schools and TEIs. In particular, some TEIs are training and supporting their local schools in the Intel Teach in-service Essentials Course, strengthening relationships and cooperation and generating opportunities and benefits for all involved.

There is greater sharing of ideas and resources between TEIs and schools, resulting in closer alignment of teaching and learning approaches. This leads to more productive and structured practicum experiences for pre-service teachers, often with opportunities to implement technology lessons and in some cases their full unit plan during the practicum. Schools have been able to access TEI technology resources to undertake the training and in some cases use with their students.

*Building linkages among stakeholders at various levels, strengthening ties between schools and pre-service institutions, harmonizing Intel Teach with other technology integration efforts in the country, and mobilizing support from government and civil society are the ways to go to ensure long-term, nationwide sustainability of the program.* Philippines Evaluation Report<sup>14</sup>

Broader links between the in-service and pre-service Essentials Course have in some countries been strengthened through the establishment of more formal forums and online networks for joint planning, communication and research for teachers, teacher educators and the pre-service teachers.

In Japan, for example, a university established a study group with three boards of education from neighbouring cities to work together for effective classroom implementation. The university is training teachers from local schools in the Essentials Course, which in turn generates better opportunities for the pre-service teachers to use their unit plan during the practicum. This also opens opportunities for information sharing and support between the schools and the universities, including feedback on how to improve pre-service curriculum.<sup>19</sup>

In India, the close interaction between the school and the local Teachers College enabled pre-service students to deliver their Essentials Course unit plan to a class during their practicum. This was done as part of an interactive, online Action Research Project (established by the Teacher Educator). It enabled ongoing interaction with and support from the Teacher Educator over the period of the practicum as well as formal assessment of the unit plan delivery which counted towards their pre-service qualification.<sup>16</sup>

In the Philippines, TEIs can also become a 'hub' for Intel Teach programs in their education communities. TEI based Intel Coordinators manage not only the pre-service program but have established networks that include local schools, TEIs and other relevant groups. The impetus for this approach stems from a recognition of the need to 'reinforce community-building efforts, explore alliances with multilateral donors and private sector groups and harmonize and link Intel Teach with other ICT initiatives and projects in education and the community'. A National Intel Teach Forum with the theme, 'Fostering Collaboration and Commitment with a Broader Community' has provided further opportunities for Intel Teach in-service and pre-service communities to 'share implementation experiences, foster collaboration, and deepen their commitment in achieving maximum student outcomes through technology integration.'<sup>14</sup>

*Many cooperating schools have offered jobs to student teachers when they observed effective technology integration in teaching done by them during practice teaching. TEI Leader India<sup>15</sup>*

The relationships built between the schools and the TEIs and the resulting alignment of teaching practices is not only raising the prospect of teaching placement for the new teachers once they have graduated, but is also increasing their opportunities to apply and further develop their learnings in their new school.

### **Sustainability**

For many Teacher Education Institutions, the Intel Teach Essentials Course has addressed what Snider (2003) refers to as 'a critical need to provide teacher educators with training and instruction in cutting-edge pedagogical methods of incorporating technology into teaching', so that they can model these methods for their pre-service teachers.<sup>5</sup>

Partnerships between government, business, TEIs, schools and community have been instrumental in driving the successful implementation and outcomes of the Intel Teach pre-service Essentials Course. Importantly, the course has opened up opportunities to generate new partnerships, resulting in learning communities at a local, country and global level that are generating and sustaining positive outcomes at all levels. As noted in one country's evaluation report, the results show that the Essentials Course has 'taken on a look of sound and sustainable development'.<sup>14</sup>

*'Clearly, a new breed of teachers has emerged, imbued with new pedagogical principles and strategies, and with enhanced competencies for the school of the future'. Philippines Evaluation<sup>14</sup>*

According to Pelgrum and Law (2003), 'new models of teacher education foster the establishment of learning communities of teachers that will in turn generate, refine, consolidate and disseminate emerging pedagogies and professional competencies'.<sup>7</sup> The pre-service Intel Teach Essentials Course is clearly showing its potential as a model which will have a profound effect over the long term, equipping each generation of new teachers to implement and upgrade teaching practices that will shape the 'learning atmosphere' and equip students for the rapidly changing needs of the 21st century.

For further information regarding the Intel® Teach Program Essentials Course visit:

<http://www.intel.com/education/teach>

**For further evidence of the impact of the course visit:**

<http://www.intel.com/education/evidenceofimpact/index.htm?iid=teach+impact>

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