

KNOWLEDGE MAP: TEACHERS, TEACHING AND ICTs

GUIDING QUESTIONS:

- What do we know about successful pedagogical strategies utilizing ICTs for teaching and learning?
- What is known about effective teacher professional development?
- What do we know about the impact of ICTs on teacher performance?
- What do we know about the impact of ICTs on teacher motivation?

CURRENT KNOWLEDGEBASE

*What we know, what we believe
— and what we don't*

General

■ **Training is key**

Teacher training and on-going, relevant professional development are essential if benefits from investments in ICTs are to be maximized.

Role of the teacher

■ **Teachers remain central to the learning process**

A shift in the role of a teacher utilizing ICTs to that of a facilitator does not obviate the need for teachers to serve as leaders in the classroom; traditional teacher leadership skills and practices are still important (especially those related to lesson planning, preparation and follow-up).

■ **Lesson planning is crucial when using ICTs**

Teacher lesson planning is vital when using ICTs; where little planning has occurred, research shows that student work is often unfocused and can result in lower attainment.

Pedagogy

■ **Introducing technology alone will not change the teaching and learning process**

The existence of ICTs alone does not transform teacher practices. However, ICTs can enable teachers to



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transform their teacher practices, given a set of enabling conditions. Teachers' pedagogical practices and reasoning influence their uses of ICTs, and the nature of teacher ICT-use impacts student achievement.

- **ICTs seen as tools to help teachers create more 'learner-centric' learning environments**

In OECD countries, research consensus holds that the most effective uses of ICT are those in which the teacher, aided by ICTs, challenge pupils' understanding and thinking, either through whole-class discussions or individual/small group work using ICTs. ICTs are seen as important tools to enable and support the move from traditional 'teacher-centric' teaching styles to more 'learner-centric' methods.

- **ICTs can be used to support change and to support/extend existing teaching practices**

Pedagogical practices of teachers using ICTs can range from only small enhancements of teaching practices, using what are essentially traditional methods, to more fundamental changes in their approach to teaching. ICTs can be used to reinforce existing pedagogical practices as well as to change the way teachers and students interact.

- **Using ICTs as tools for information presentation is of mixed effectiveness**

The use of ICTs as presentation tools (through overhead and LCD projectors, television, electronic whiteboards, guided "web-tours", where students simultaneously view the same resources on computer screens) is seen to be of mixed effectiveness. While it may promote class understanding of and discussion about difficult concepts (especially through the display of simulations), such uses of ICTs can re-enforce traditional pedagogical practices and divert focus from the content of what is being discussed or displayed to the tool being utilized.

Teacher technical abilities and knowledge of ICTs

- **Preparing teachers to benefit from ICT use is about more than just technical skills**

Teacher technical mastery of ICT skills is not a sufficient precondition for successful integration of ICTs in teaching.

- **'One-off training' is not sufficient**

Teachers require extensive, on-going exposure to ICTs to be able to evaluate and select the most appropriate resources. However, the development of appropriate pedagogical practices is seen as more important than technical mastery of ICTs.

- **Few teachers have broad 'expertise' in using ICTs in their teaching**

Even in the most advanced school in OECD countries, very few teachers typically have a comprehensive knowledge of the wide range of ICT tools and resources.

- **In OECD countries, the use of ICTs to promote 'computer literacy' is seen as less important than in using ICTs as teaching and learning tools**

In OECD experience, the use of technology in everyday teaching and learning activities appears to be more important than specific instruction in "computer classes". While the development of technology skills is seen to have a role in the teaching and learning process, it is more important as an enabler of other teaching and learning practices, and not too important in and of itself. Schools that report the highest levels of student ICT-related skills and experience are often not those with heavy computer course requirements, but rather ones that made use of ICTs on a routine basis throughout the teacher professional development and the teaching and learning process.

- **Students are more sophisticated in their use of technology than teachers**

In OECD countries, there appears to be a great disconnect between student knowledge and usage of ICTs the knowledge and abilities of teacher to use ICTs. This suggests that teacher inexperience and skill deficiencies may often be an important factor inhibiting the effectiveness of ICT use in education by students.

Teacher usage of ICTs

- **Teachers most commonly use ICTs for administrative tasks**

Teachers most often use ICTs for 'routine tasks' (record keeping, lesson plan development, information presentation, basic information searches on the Internet).

- **More knowledgeable teachers rely less on "computer assisted instruction"**
Teachers more knowledgeable in ICTs use utilize computer assisted instruction less than other teachers who use ICTs, but utilize ICTs more overall.
- **How teachers use ICTs is dependent on their general teaching styles**
Types of usage of ICTs correlate with teacher pedagogical philosophies. Teachers who use ICTs the most—and the most effectively—are less likely to use traditional 'transmission-method' pedagogies. Teachers who use more types of software tend to practice more "constructivist" pedagogies.
- **Teaching with ICTs takes more time**
Introducing and using ICTs to support teaching and learning is time consuming for teachers, both as they attempt to shift pedagogical practices and strategies and when such strategies are used regularly. Simply put: Teaching with ICTs takes more time (estimates vary on how much extra time is required to cover the same material; 10% is a common estimate).

Teacher confidence and motivation

- **Few teachers are confident users of ICTs**
Few teachers are confident in using a wide range of ICT resources, and limited confidence affects the way the lesson is conducted.
- **Fear prevents many teachers from using ICTs**
In OECD countries, many teachers still fear using ICTs, and thus are reluctant to use them in their teaching.
- **ICTs motivate (some) teachers, at least at the start**
At least initially, exposure to ICTs can be an important motivation tool to promote and enable teacher professional development.
- **Incentives must be developed to promote effective teacher participation in continuing professional development**
Teachers require additional motivation and incentives to participate actively in professional development activities. A variety of incentives can be used, including certification, professional advancement, pay increases, paid time off to participate in professional development, formal and informal recognition at the school and community levels and among peers, reduced isolation, and enhanced productivity.
- **Access to ICTs is the most significant factor in whether teachers use them**
The most significant factor for continuing the development of teachers' ICT-related skills is for them to have regular access to functioning and relevant ICT equipment.

Subject knowledge

- **Teachers' subject knowledge influences how ICTs are used**
The way ICTs are used in lessons is influenced by teachers' mastery of their subjects, and how ICT resources can be utilized and related to them.
- **Teacher content mastery and understanding of student comprehension make ICT use more effective**
The evidence shows that when teachers use their knowledge of both the subject and the way pupils understand the subject, their use of ICTs has a more direct effect on student achievement.
- **Exposure to new/additional information via ICTs is not enough**
The effect on attainment is greatest when pupils are challenged to think and to question their own understanding, rather than on exposure to new and additional information.
- **ICTs can aid teacher self-learning in subject matter**
By providing access to updated and additional learning resources, ICTs can enable teacher self-learning in his/her subject area.

Teacher professional development

- **On-going teacher training and support is critical to the successful utilization of ICTs in education**
Teacher training and professional development is seen as the key driver for the successful usage of ICTs in education.
- **Teacher professional development is a process, not an event**
Traditional one-time teacher training workshops have not been seen as effective in helping teachers to feel comfortable using ICTs, let alone in integrating it successfully into their teaching. Discrete, 'one-off' training events are seen as less effective than on-going professional development activities.
- **Introducing ICTs expands the needs for on-going professional development of teachers**
Effective ICT use in education increases teachers' training and professional development needs. However, ICTs can be important tools to help meet such increased needs, by helping to provide access to more and better educational content, aid in routine administrative tasks, provide models and simulations of effective teaching practices, and enable learner support networks, both in face to face and distance learning environments, and in real time or asynchronously.
- **Successful teacher professional development models can be divided into three phases**
Successful on-going professional development models can be divided into three phases: 1) pre-service, focusing initial preparation on pedagogy, subject mastery, management skills and use of various teaching tools (including ICTs); 2) in-service, including structured, face-to-face and distance learning opportunities, building upon pre-service training and directly relevant to teacher needs; and 3) on-going formal and informal pedagogical and technical support, enabled by ICTs, for teachers, targeting daily needs and challenges.
- **Effective teacher professional development should model effective teaching practices**
Effective teacher professional development should approximate the classroom environment as much as possible. "Hands-on" instruction on ICT use is necessary where ICTs are deemed to be vital components of the teaching and learning process. In addition, professional development activities should model effective practices and behaviors and encourage and support collaboration between teachers. On-going professional development at the school level, using available ICT facilities, is seen as a key driver for success, especially when focused on the resources and skills directly relevant to teachers' everyday needs and practices.
- **Training in assessment methods is important**
Professional development should include methods for evaluating and modifying pedagogical practices and expose teachers to a variety of assessment methods.
- **Effective professional development requires substantial planning**
A needs assessment should precede the creation of and participation in teacher professional development activities, regular monitoring and evaluation should occur of these activities, and feedback loops should be established, if professional development is to be effective and targeted to the needs of teachers.
- **On-going, regular support for teachers is crucial**
On-going and regular support is essential to support teacher professional development and can be facilitated through the use of ICTs (in the form of web sites, discussion groups, e-mail communities, radio or television broadcasts).

Enabling factors

- **A variety of changes must be implemented to optimize teacher use of ICTs**
Shifting pedagogies, redesigning the curriculum and assessment, and providing more autonomy to the schools help to optimize the use of ICT. With sufficient enabling factors in place, teachers can utilize ICTs in as 'constructivist' a manner as their pedagogical philosophies would permit.
- **Functioning technical infrastructure is (obviously) crucial**
Teachers must have adequate access to functioning computers, and be provided with sufficient technical support, if they are to use ICTs effectively.

■ **Introducing ICTs takes time**

Adequate time must be allowed for teachers to develop new skills, explore their integration into their existing teaching practices and curriculum, and undertake necessary additional lesson planning, if ICTs are to be used effectively.

■ **Support from school administration and the community can be important**

Support of school administrators and, in some cases, the surrounding community, for teacher use of ICTs is seen as critical if ICTs are to be used at all, let alone effectively. For this reason, targeted outreach to both groups is often necessary if investments in ICTs to support education are to be optimized.

■ **Communities of practice can be important tools to support teacher professional development**

The existence of formal and informal communities of practice and peer networks can be important tools to support ICT in education initiatives and activities. Such support mechanisms can be facilitated through the use of ICTs.

■ **Lessons learned from introducing ICTs in education need to be shared**

As the introduction of ICTs to aid education is often part of a larger change or reform process, it is vital that successful uses of ICTs are promoted and disseminated.

COMMENTS

General comments

- There appears to be general consensus from OECD experience as to the most effective pedagogical practices for teachers when using ICTs.
- In addition, the barriers impeding the successful development and delivery of effective pedagogical practices are also generally agreed upon.

Applicability to LDC/EFA context

- ICTs are used in education in two general ways: to support existing ‘traditional’ pedagogical practices (teacher-centric, lecture-based, rote learning) as well as to enable more learner-centric, ‘constructivist’ learning models. Research from OECD countries suggests that both are useful, but that ICTs are most effective when they help to enable learner-centric pedagogies.
- However, studies of ICT use in LDCs suggest that, despite rhetoric that ICTs can enable new types of teaching and learning styles, for the most part they are being used to support traditional learning practices.
- Additional barriers to effective use of ICTs in education may well be present in LDCs beyond those identified from OECD experience.

Some areas for further investigation and research

- Can the same types of pedagogical practices and transformations thought to be enabled by the introduction of ICTs be introduced and maintained in environments where ICTs are not used?
- How can we measure outcomes of ICT use by teachers resulting from participation in professional development activities?
- Which types of ICTs can provide the most effective and relevant support for professional development, including enabling peer networks, and how?
- How are ICTs currently being used at the pre-service level (if at all) to train teachers in LDCs, and what can we learn from such use?
- What are the most successful and relevant strategies for using ICTs to change pedagogical practices?

Some Recommended Resources

to learn more

- *Breaking Down the Digital Walls: Learning to Teach in a Post-Modem World* [Burniske 2001]
- *Building Capacity of Teachers/Facilitators in Technology-Pedagogy Integration for Improved Teaching and Learning* [UNESCO 2003]
- *E-learning for Educators - Implementing the Standards for Staff Development* [National Staff Development Council 2001]
- *Enabling Teachers to Make Successful Use of ICT* [Peter Scrimshaw 2004]
- *ICT and pedagogy: A review of the research literature* [Cox 2003]
- *ICT Supporting Teaching - Developing Effective Practice* [Becta 2002]
- *Impacts of ICT in education. The role of the teacher and teacher training* [Jager 1999]
- *Information Technology: Underused in Teacher Education* [Milken Family Foundation 1999]
- *The Missing Link in Educational Technology: Trained Teachers* [Carlson 2002]
- *Multichannel Learning Maximizes Scarce Resources in Developing Countries: A theory evolves from years of practical experience* [EDC 2001]
- *Teacher professional development on ICT Use in Education in Asia and the Pacific: Overview from Selected Countries* [UNESCO-Bangkok 2004]
- *Teachers ... Training ... and Technology* [Haddad 2000]
- *Technology, Innovation, and Educational Change—A Global Perspective* [Kozma 2003]
- *Teacher professional development on ICT Use in Education in Asia and the Pacific: Overview from Selected Countries* [UNESCO 2004]
- *Teacher Professional Development in the Use of Technology* [Carlson 2002]
- *Technology in Teacher Education: A Closer Look* [Bielefeldt 2001]
- *Towards a Strategy on Developing African Teacher Capabilities in the Use of ICT* [Schoolnet Africa 2004]
- *What styles of computer training enhance teachers' competence and confidence to use ICT?* [Edmondson 2002]
- *What the Research Says about ICT and Teacher Continuing Professional Development* [Becta 2003]

About these Briefing Sheets:

infoDev's Knowledge Maps on ICTs in education are intended to serve as quick snapshots of what the research literature reveals in a number of key areas. They are not meant to be an exhaustive catalog of everything that is known (or has been debated) about the use of ICTs in education in a particular topic; rather, taken together they are an attempt to summarize and give shape to a very large body of knowledge and to highlight certain issues in a format quickly accessible to busy policymakers. The *infoDev* knowledge mapping exercise is meant to identify key general assertions and gaps in the knowledge base of what is known about the use of ICTs in education, especially as such knowledge may relate to the education-related Millennium Development Goals (MDGs).