

## Multi-level ICT Integration for Diffusing Complex Technology-mediated Pedagogical Innovations

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### KEY IMPLICATIONS

- Inculcation of perceptive and synergistic design thinking at the teacher and organizational level must be considered in totality to support a novice teacher's Technological-Pedagogical-Content Knowledge (TPACK) development.
- Traversing the boundary of different learning communities requires teachers to earnestly interact and work collaboratively with different stakeholders who had different, and at times, competing priorities.
- Surfacing disjuncture between decoupled communities is the prerequisite for agreed rules/norms to be formed, so as to facilitate teacher learning across contexts.

### BACKGROUND

Teaching with technology has long been a “wicked problem”. Davis (2010) contends that teachers’ concerns often start with technology but become increasingly intertwined with content and pedagogic knowledge”. This blend of different types of knowledge is known as TPACK, as articulated by Mishra and Koehler (2006). Building up teachers’ TPACK is an imperative as teachers are at the heart of pedagogical innovation. However, the complexities are exacerbated when the use of technology is situated within the

broader socio-cultural context of varied and diverse school/classroom ecologies. These challenges, as posited by literature, can be mitigated through the coupling of schools with high and nascent innovation capacity. This project examines such a context.

### FOCUS OF STUDY

This research seeks to understand how teachers’ TPACK can be holistically developed so that the core ingredients of success at the seeding school can be sustained when the innovation is diffused to different contextual situations. In this study, we foreground teachers’ teaching practices and track its interplay with other sub-systems of learning ecology.

### KEY FINDINGS

1. School leaders feel that the expectations regarding the use of information and communication technology (ICT) cannot be left to the prerogative of individual department, but orchestrated at a school level to ensure coherence across all departments instead. External stimulus can be introduced to perturb the prevailing sluggish teaching and learning landscape, while providing capacity building strategies—some of which can be transferred from the champion school with high

- innovation capacity but the need for context-bounded translational efforts largely remains.
2. Disjuncture between communities can be a result of entanglement between two different ecologies of routines, incompatible cultural orientations, differences in policy stances, limited conflation of needs across different learning communities, and muted participation and insufficient engagement of stakeholders.
  3. Teacher learning effects are not proportionally enhanced by the number of professional learning communities (PLCs) one participated in. Contextual factors such as organizational coordination, cultural congruency and diffusion demands also play important roles in transitioning learning across contexts.
  4. Role ambiguity and high power distance can dampen the diffusion enthusiasm of teacher leaders and result in identity displacement as the teacher struggles with the multiple roles he or she is expected to live out.

## SIGNIFICANCE OF FINDINGS

### Implications for Practice

An instructional framework has been developed. Teachers can use the principle-based rubrics to guide them to design inquiry science lessons that integrate ICT and scientific thinking across different learning spaces.

### Implications for Policy and Research

We have distilled the affordances and pitfalls that will influence the outcomes of professional learning during

diffusion efforts. It highlights the kind of organisational support needed for teachers to be able to capitalise on the benefits of various learning spaces.

## Proposed Follow-up Activities

Schools need to adopt an ecological perspective rather than piecemeal approach towards diffusion efforts.

## PARTICIPANTS

The main research site is a mainstream primary school. Core participants include school leaders, middle managers, teachers and students from the school. Other participants include members of the joint-school professional learning community.

## RESEARCH DESIGN

Qualitative case study approach was used as the main inquiry method. Data include interviews, observations of lessons and teachers' learning spaces, teachers' self-evaluation of TPACK and documentary analysis. Supplementary quantitative data such as examination results and science learning questionnaires were also used.

## REFERENCES

- Davis, N. (2010). *Global interdisciplinary research into the diffusion of information technology innovations in education*. London, United Kingdom: Routledge.
- Mishra, P., & Koehler, M.J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108(6), 1017–1054.

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