Chapter 2
Research Design and Methods

In recent years, various educational researchers and theorists have promoted the study of educational institutions or systems as ecosystems (e.g., Bransford, Slowinski, Vye, & Mosborg, 2008; Davis, 2008; Lemke & Sabelli, 2008). The ecosystem provides a framework for studying educational change because it highlights the hierarchical relationship between components in a nested structure, for example, classrooms are nested in schools, and schools are nested in regional districts and educational systems. All are interdependent and interconnected elements in the educational ecosystem. However, empirical studies in education adopting such a framework are still rare. A notable example is Zhao and Frank's (2003) study of computer use in four school districts in the United States. They explicitly designed their study according to a framework in which computer use is seen as one invasive species in the education ecosystem. Using a survey to collect their data, Zhao and Frank explored the adoption of ICT in the four school districts at classroom, school, and district levels, and found significant relationships between different statistical parameters based on a theoretical model of the interrelationships among various elements in the educational ecosystem.

In the present study, we are not interested in hypothesis testing, but rather in gaining a deeper understanding of the interdependencies between factors and features that are located at different levels of the educational system. In particular, we are interested in studying technology-supported pedagogical innovations (which we refer to as innovations for short) as emerging varieties of the pedagogical practices species in the educational ecosystem. New varieties of a species naturally emerge through the processes of evolution and adaptation or mutation. However, whether specific emerging varieties will prosper and survive in significant numbers depends on the local ecological environment – on whether the environmental conditions match the specific ecological niches[1] of the varieties.

[1]In ecology, niche is a term that describes the relational position of a species or population in its ecosystem. The total resources and physical conditions required by a species are referred to as its ecological niche and determine where it can live and how abundant it can be in a particular location or environment. The notion of ecological niche also involves consideration of how an organism or a population responds to the distribution of resources (e.g., food supply), competitors, and enemies (e.g., predators, parasites, and pathogens) and how it, in turn, alters those same factors.

N. Law et al., *Educational Innovations Beyond Technology: Nurturing Leadership and Establishing Learning Organizations*, DOI 10.1007/978-0-387-71148-5_2,

The sociocultural, economic, and technological changes taking place in our increasingly globalized world suggest potential for new emerging varieties of pedagogical practices to become dominant, replacing varieties that were successful relative to earlier environmental conditions. Our purpose, in our "ecological study," is to examine the varieties of technology-supported pedagogical practices that have emerged against the changing social and educational contexts at the turn of the twenty-first century, and to identify which features at the individual classroom, school, and system levels may be associated with different varieties of innovations. We are particularly mindful that an ecological perspective does not mean seeing the sustainability or scalability of an innovation as an intrinsic property of the innovation per se; that property depends on the extent to which the match between the contextual conditions and the environmental niches allow the innovation species to prosper.

From the outset, we were aware that our study needed to capture the diversity in characteristics of the innovations at the classroom level. We knew that we also needed to explore possible links between differences in pedagogy and classroom-level characteristics with contextual factors at the school level, such as leadership and school culture, as well as at the system level (e.g., related government policies and strategic initiatives). We considered comparative case study method the most appropriate method for this purpose because it allows the researcher to collect rich contextual information and to uncover the complex relationships among the various contextual factors involved in the situation or phenomena under study.

In this chapter, we describe and explain the methodological design (i.e., comparative case study at classroom and school levels, using the SITES-M2 case reports) we adopted when conducting our ecological study. We begin by briefly describing case study method and explaining why it is appropriate for ecological studies of this kind. We then describe the sampling and data-collection design used in SITES-M2. This is followed by a description of how we selected, for our study, the cases from the collection of SITES-M2 case reports. In the final part of the chapter, we briefly describe the analytical approaches that we adopted to analyze the case study reports, and how the ecological framework revealed new insights into ways of sustaining and transforming innovations.

Case Study Design in SITES-M2

Case studies are intensive descriptions and analysis of bounded systems or units (Smith, 1978). They are conducted in order to provide in-depth understanding of the situation and meaning for those involved in these systems and units. Research interest is generally focused on studying the process rather than the outcome, on describing and analyzing the context rather than specific variables, and on discovery rather than confirmation (Merriam, 1998). Case studies are particularly suited to uncovering the interaction of significant factors characteristic of situations or phenomena where it is impossible to delineate the variables involved from their context (Yin, 1994). They are useful in providing heuristic insight into the problems or situations studied, as the knowledge resulting from them is concrete and contextual, as opposed to the generally abstract and formal knowledge derived from other research designs (Stake, 1981). The SITES-M2 case studies were designed and analyzed using an *instrumental* approach, which means that the analysis focused on generalizing beyond specific case-bound issues, relationships, and causes in order to address targeted research questions (Kozma, 2003).

The key methodological decisions in case study design are the definition of a case (i.e., specifying the case boundary), case selection method, the kinds of data to be collected and how, the nature, structure and content of the case report, quality assurance, and data analysis. All of these decisions have to be made in relation to the central research questions to be addressed.

Having a clearly identifiable boundary for the object of study is arguably the single most definitive characteristic of case study research (Merriam, 1998). Such boundaries often have a commonsense obviousness (Adelman, Jenkins, & Kemmis, 1983). Miles and Huberman (1994) suggest that a case can be represented graphically as a circle with a heart in the center, with the circle defining the edge of the case (i.e., that which will not be studied) and the heart representing the focus of the study.

Case "Boundaries" in SITES-M2

The focus of the SITES-M2 study was *pedagogical practice*, which includes the organized or patterned set of activities or interactions used by teacher(s) and students to support and promote learning. Hence, it was the classroom and its associated context that defined each case. Here, "classroom" was interpreted loosely as a group of students learning together, organized as part of the school curriculum. Class activities may go beyond the physical classroom, for example, to situations involving interactions with individuals and groups outside school.

While the key focus of the SITES-M2 cases was pedagogical practice, a complete case study included studying the contextual factors at the school level. The concept used in the definition of a case was that of "zooming out": in order to really understand the conditions for emergence, sustainability, and transferability for pedagogical practices, one needs to find out about important aspects of the school context – the goals and vision of the school and the ICT implementation history and strategy, including infrastructure, funding, staffing provisions, staff development and other related initiatives in the school.

Case Selection

The researchers involved in SITES-M2 were concerned with studying innovations that represented the aspirations of each participating country and not just what happens in a typical classroom that was using technology. Case selection therefore required identification of the kinds of ICT-enabled practices that each country valued and wanted to showcase nationally and internationally. Because of the number of educational systems (28) participating in the study, the study design had to meet the dual requirements of providing a standardized methodology necessary for an international comparative study and of accommodating national contexts, goals, values, and national policy needs. To achieve this, the designers of SITES-M2 devised a common set of study procedures, instruments, and guidelines, the key elements of which were these:

- Establishment of an expert panel by the national research coordinator (NRC) of each system. The panel's task was to review and select the cases for study according to a set of common international criteria. The panel membership covered a range of backgrounds. It included professors or researchers at universities or research institutes who were experts in the use of educational technology, officials from education ministries with an excellent overview of the current status of and trends in educational provision, and practitioners from schools (principals and other administrators, computer coordinators, and teachers). This diversity ensured that the selected cases represented the aspiration of a wide range of educational stakeholders familiar with innovative pedagogical practices related to ICT.
- Adherence to a common set of international criteria. All selected cases had to demonstrate evidence of (1) technology playing a substantial role, (2) significant changes in the roles of teachers and students, the goals of the curriculum, assessment practices, and/or the educational materials or infrastructure, (3) measurable positive student outcomes, and (4) sustainability and transferability.
- Opportunity for each educational system to determine (define), albeit within a common frame of reference, what constituted an innovative pedagogical practice. One aspect of the common frame of reference was that the practice should prepare students for lifelong learning in the information society. This flexibility for each system to define its own criteria for innovation made it possible to accommodate the circumstances and cultural differences in each country.

In total, 174 cases were selected by the 28 participating systems.

Data Collection

The multiple types of qualitative data collected from multiple respondents on pedagogical practices at the classroom level and on contextual details at the school level allowed triangulation of the features or characteristics identified from the various sources. The following were the main types of data collected for each of the case studies:

- Interviews with administrators, technology coordinators and innovation teachers

- Focus group discussions with students, teachers not directly involved in the innovation, and, where relevant, parents, community members and other people involved with the innovation
- Classroom observations describing teacher and student behaviors, physical and technological settings, resource allocations, and the like
- Documents or archival or historical data, such as school plans, policy documents, curriculum guidelines, project proposals, assessment instruments, lesson plans, curriculum resources/instructional materials, and students' products (e.g., assignments)

Case Report Format

In case study research, much of the analysis takes place during writing of the case report (Miles & Huberman, 1994). In SITES-M2, the case reports formed the sole basis for the international cross-case analyses, as it was not possible, for reasons of language and resources, to refer back to the original data. Each case report was submitted in two formats – narrative and data matrix. The narrative format is the most common in case study research, and usually comprises a combination of description and analyses. In the SITES-M2 design, the main emphasis of the narrative report was on description. The data matrix component of the report involved a "slot-filling" approach, which meant that the report comprised short answers to a series of structured questions organised around the conceptual framework and presenting evidence of classroom practice.

All NRCs received a set of case report guidelines, and the recommendation that the report writing should be a two-step process. The data matrix was to be used during the first step, which involved reducing and organising the various data sources collected. The second step involved converting the matrix to a case narrative. This process necessitated following a standardised, highly structured format, comprising sections on curricular goals, teachers' and students' practices and outcomes, context, sustainability, and transferability (Kozma, 2003). All of the 174 case reports can be found at the SITES-M2 website, http://sitesm2.org/sitesm2_search/.

Selection of Cases for the Ecological Study

The international nature of the SITES-M2 case studies, and the fact that these were selected by national panels comprising individuals of diverse backgrounds rather than according to a particular pedagogical paradigm, gave the cases the diversity and the emergent nature that made them particularly suitable for use in an ecological

Table 2.1 Number of cases from each educational system included in the 83 cases analyzed in this study

Country/region	Abbreviation	Cases analyzed
Australia	AU	4
Canada	CA	1
Chile	CL	5
China Hong Kong	CN	9
Czech Republic	CZ	1
Denmark	DK	3
England	UK	2
Germany	DE	6
Finland	FI	5
France	FR	1
Israel	IL	2
Italy	IT	1
Korea	KR	1
Latvia	LT	2
Netherlands	NL	6
Norway	NO	6
Philippines	PH	5
Portugal	PT	2
Singapore	SG	4
Slovak Republic	SK	3
Spain (Catalonia)	ES	4
Thailand	TH	4
Taiwan	TW	2
USA	US	2
South Africa	SA	2
Total		*83*

study of innovations. However, when we began analyzing the case reports, we found that the level of detail in their description of pedagogical practice differed widely across cases. While all the case reports were sufficiently detailed to meet the analysis requirements of SITES-M2, some did not have the amount of detail in their classroom-level descriptions that would allow us to reliably conduct the coding necessary for our ecological study. In the end, we were able to code only 83 of the cases on all aspects required for our study. These 83 cases came from 25 of the 28 educational systems participating in SITES-M2 (see Table 2.1).

Analysis Design for Revealing Features of Technology-Supported Pedagogical Innovations and Their Relationship with Other Elements in the Classroom Ecology

Because the purpose of our study centered on analyzing and understanding technology-supported innovations from an ecological perspective, we needed to understand the environmental niche associated with the different case studies. In particular, we needed to "test" the assumption that the innovations were emerging in response to the changing needs of society in the twenty-first century. If that was the case, we then needed to understand the environmental niche associated with the innovations because the sustainability of those innovations depended on the "success" of that "habitat" niche in gaining dominance over the niche associated with traditional practices.

We use the term "ecology" as the study of networked relationships among individuals and communities and of the hierarchies, connections, and interrelationships among all components within an environment. Ecology, therefore, is the conceptual framework we use here for understanding and researching human, social, economic, and contextual issues, interactions, and interrelationships. The educational ecology includes all of the above components. These components, in turn, all need to be considered when researching the potential sustainability and transferability of innovative uses of technology in pedagogical practices.

In order to make the different analysis methods more understandable, we will begin with an ecological metaphor. We take the butterfly as an analogy for the species of pedagogical practices. Caterpillars, as the young phase of the butterfly, feed on the leaves of plants. As the caterpillars mature and metamorphose into the fully-grown butterfly, they help plants to propagate by pollinating their flowers. Should climate change bring about changes in temperature and amount of precipitation, these changed conditions might favor some species of plants to prosper more than others, or even the growth of plant varieties not previously seen in the area.

However, other aspects of the local conditions may not be sufficient for the new plant varieties to survive and compete successfully with the existing dominant varieties over the long term. The propagation of the new plant varieties would depend on their flowers being pollinated by the butterfly population living in that ecology. The predominant species of butterflies that have traditionally lived in the local ecology may not be able to pollinate the flowers of this "improved" plant species (improved in the sense of being more suited to the new climatic and environmental conditions) because its flowering season is earlier than the breeding season of the commonly found species of butterflies in the area. There may be some rather rare species of butterflies in that locality that breed earlier, but these will need to find plants that start growing new leaves earlier after the winter in order to provide sufficient food for the caterpillars. In essence, the mutual interdependence between the plants and the butterflies means that both need to co-evolve to ensure the long-term survival of the plant species under the changed environmental conditions. The interdependence includes not only the leaves and flowers but also whether the seeds of the new variety can germinate more easily under the new conditions.

If a form of pedagogical practice is a butterfly variety, then what constitutes the interdependent niches of its corresponding educational/social ecology? We propose that the role of the teacher is similar to the leaves that feed (or support) the pedagogical practice. The students' role is like the flower, which, through engaging in the activities of the pedagogical practice, will be "pollinated" and develop knowledge, skills, and capacities as learning outcomes, just as pollinated flowers will lead to seed-bearing fruits. The learning outcomes (seeds) need to be able to germinate to ensure the continued development of the society (the equivalent of the wellbeing of the plant species). Certain nutrients in the soil may be important for plant growth, just as the availability of certain technology infrastructure may be important for the development of particular skills.

Another important ecological concept we draw on in our study is that of "carrying capacity." Predation[2] or feeding is a key ecological dependence. While the number of plants and animals that can be found in any given habitat may fluctuate, there is a limit on the average number of species that can be supported because the amount of food produced is bounded by the photosynthesis process (the process that converts carbon-dioxide and water into glucose and oxygen). The mean number of a species that can be supported by a given habitat is referred to as its carrying capacity for that species; capacity is limited by factors such as food availability, weather, space, competition, predation, diseases, and accumulation of toxic wastes.

While the carrying capacity is always a positive number, the actual number of species "carried" varies due to random fluctuations. When the magnitude of the random fluctuation is larger or comparable to the carrying capacity for a species, the species becomes "endangered," as there is a possibility that the species will become extinct during the random fluctuation process. Urbanization is often a cause of extinction for some species because it breaks up a habitat into a number of small, isolated habitats. The carrying capacity of each isolated habitat may become lower than the magnitude of natural fluctuations. Hence, one conservation strategy is to build "ecological corridors" that allow animal species to move between habitats, effectively increasing the carrying capacity through reconnection of the isolated ecologies.

In our study of pedagogical innovations, one dimension we examine is the "connectedness" of the case study classroom – the extent to which the teachers and students in the case study interact with peers, experts, and/or community members during the teaching and learning process. In an earlier analysis of the SITES-M2 case studies, Law, Kankaanranta, and Chow (2005) found that the case studies from Finland had much higher levels of sustainability and transferability than did the case studies collected in Hong Kong. The reason was that all of the former case studies had, from the initiation stage, built-in connectedness, such that all of the case studies involved the collaboration of many partners and multiple classrooms.

What all of this meant with respect to our ecological study of pedagogical innovations was that we needed to study the interdependent environmental niches associated with the newly emerging practices, which is why we devote Chaps. 3–5 to analyses of the innovations at the classroom level (i.e., as classroom ecologies). We begin Chap. 3 by comparing the types and degree of innovativeness evident across the case studies. This comparison required us to determine how different the niches of these innovations were from those associated with traditional pedagogical practices. We identified six dimensions for comparison: the role of the teacher, the

---

[2]Predation is a term used in ecology to describe "a biological interaction where a *predator* (an organism that is hunting) feeds on its *prey* (the organism that is attacked)." The act of predation is always not to the benefit of the prey (*Wikipedia*).

role of the student, the kinds of learning outcome observed, the curriculum goals, the ICT used, and the connectedness of the classrooms with the outside world. While habitats can differ from one another on any of the ecological dimensions[3] involved at any given point in time, we can categorize them into a number of typical profiles, such as equatorial rainforest, marshland, temperate savannah, and so on. Each habitat thus has its own profile of plants and butterflies, "acting" in combination with the other ecological dimensions of these habitats. In the second part of Chap. 3, we also describe a few typical classroom ecologies as frequently found profiles of the innovation dimensions in the case studies analyzed.

In Chap. 4, we examine two key interdependent species associated with pedagogical practices – teachers' roles and students' roles. While we analyze, in Chap. 3, the extent to which the characteristics of these two sets of roles align with or differ from the characteristics associated with traditional pedagogical practices, we take, in Chap. 4, a more holistic approach. Again using the butterfly ecology as an analogy, we endeavor in this chapter to describe the major observable forms of leaves and flowers in the newly emerging varieties of plants, and to examine the co-occurrence of these varieties in the case studies. The analytical method that we used at this point was an application of *K*-means cluster analysis (Milligan, 1980, 1981; Morey, Blashfield, & Skinner, 1983) on the coding of role-related teacher behavior and role-related student behavior we did on the case reports. From there, we were able to identify the major patterns of role-related teacher activity and role-related student activity reported in the case studies.

The focus in Chap. 5 is on holistic descriptions of the innovations as they would appear to someone observing them as classroom interactions and activities. Using the butterfly analogy, we describe what these varieties of butterfly look like – the wing patterns and color, size, shape, and so on. These descriptions are very helpful because they allow us to recognize the emergence of new varieties of butterfly. Moving the analogy over to the classroom, we identify, in this chapter, patterns of observed classroom activities, which we refer to as types of pedagogical practice. Teacher education programs tend to refer to types of pedagogical practice as "teaching methods." One example of a pedagogical practice gaining popularity in many parts of the world is project work. The kinds of pedagogical practice found within the 83 case studies analyzed inform much of the fifth chapter.

Analysis Design for Revealing the Interactions Between Features of School Ecologies and the Classroom Ecologies that Foster the Different Varieties of Pedagogical Innovations

Classrooms are embedded inside schools. We thus extend the ecological study of innovations to examine the contextual conditions at the school level. Chapters 6–8 report our analyses of the innovations at a higher level of ecological scale – the

[3]Environmental conditions constituting the ecological niches of the species.

school (i.e., school ecologies). A school is an institution designed for students to learn under the guidance of teachers. To extend the metaphor of classroom ecologies, we take the garden as an analogy for a school. A garden is a piece of land with different kinds of plants under the care of a gardener. But a garden is more than a collection of plants; we also find, for example, butterflies, earthworms, and the like. The presence of some of these may have been planned or accounted for; the presence of others may not have been considered.

What can be grown also depends on the natural conditions, such as the specific location, the local climate, and soil conditions, although, with appropriate gardening practice, these conditions can be changed to various extents over time. There are different kinds of gardens. Some are like parks, with different trees, flowers, grass, and ponds that people can visit and walk around. Some produce fruits and vegetables. Others are just for ornamental purposes. Gardening is the activity of managing and maintaining a garden, and can be done by an amateur or a professional gardener. Gardens located close to one another share similar climatic and other environmental characteristics, although there can still be large local variations. Gardeners may work in isolation, but also share experience or even collaborate with others to achieve their gardening goals.

Many established gardens adopt an eco-friendly approach to gardening, which takes account of the interactions among various environmental conditions in order to bring the garden to a state where it remains sustainable with the minimal amount of intervention in the longer term. Soil and water are among the most important conditions in gardening. Fertilizers, either organic or inorganic, added to the soil provide additional nutrients to support plant growth. Water is also necessary for plants to stay alive and to grow. However, the quantity and type of fertilizer matters for viability, and many gardening problems arise from incorrect watering.

Other conditions, such as wind, temperature, sun and shade, can also be manipulated to create a microclimate suitable for certain kinds of plants in specific parts of the garden. For example, pruning can be used to improve light levels around the bases of the plant; greenhouses are useful in cool climates because they allow sunlight to enter and prevent heat from escaping; leafy ground cover under certain plants, such as clematis, keeps roots cool and moist; and wind-breaks from hedges or other infrastructure can be created or modified to provide shelter from strong winds.

Different plants attract different species of bees and butterflies. Some plants may attract birds and other creatures to prey on pests and are thus beneficial. Birds can, in turn, be encouraged to visit if there are plants offering perches, shelter, and food (fruits and berries). Most gardeners know that it is important to plan and choose plants that have additional properties and functions beyond simply being ornamental or a food supply. Strategic use of different plants in combination with one another in order to repel harmful insects, attract birds and other creatures, and support desired insect populations such as bees and butterflies is the major role of a gardener, in addition to giving each plant the right type of soil, fertilizer, shelter, aspect, and treatment.

If a garden is a school, then what constitutes the interdependent factors of the corresponding school ecology? Gardens are situated in different geography and soil conditions, making them more suitable for certain plants than others. Likewise, schools have different histories, demographic backgrounds, and culture. We take school background as the soil, which cannot achieve high productivity without cultivation. School infrastructure, such as digital-resources and ICT infrastructure, are like fertilizers, hedges, and greenhouses, which can be applied to modify the local microclimate. Government and community support is like the irrigation system that supplies water so that plants grow and thrive. Some plants may need more of certain fertilizers, or more water, or less sun. Gardeners (and their teams) must plan and provide water, needed nutrients, and other environmental conditions to make the plants and animals in the garden flourish as a holistic whole. Thus, we take the school principal and his or her leadership team as the gardener who cultivates, manages, and looks after the wellbeing and development of the garden. In Chaps. 6–8, we use the lens of gardens and gardening to "view" (report on) studies of school-level factors associated with the technology-supported pedagogical innovations.

We begin Chap. 6 with a review of literature on innovation implementation and educational change. Drawing on this review, we propose five themes to frame analysis of school contextual conditions, namely, school background, school strategies, principal leadership, school ICT infrastructure, and government and community support. These themes represent the types of environmental conditions in schools that are contextually related and which strongly influence the pedagogical practices present in the school.

The 83 case reports that we analyze in Chaps. 3–5 came from 82 different schools. In these chapters, we analyze the sections on school conditions in order to understand the features of innovation schools. In Chap. 6, we report on the thematic coding and grounded approach (Miles & Huberman, 1994) that we used to analyze the 82 schools described in the case reports. This analysis led to the generation of 64 contextual categories characterizing the innovation schools. We also used one-way ANOVA (analysis of variance) to explore the interactions between school-level factors and classroom practices. The descriptions of various school-level categories arising out of these analyses provide us not only with an understanding of the contextual conditions but also with a possible conceptualization that allows us to unpack the ecological features of innovation schools as well as the complexity of school ecologies and their connections to the innovations in the classroom ecologies.

Chapter 7 examines the opportunities for organizational learning provided by different types of innovations. The innovations collected in the SITES-M2 study, although differing in their levels of innovativeness, are emerging practices that reflect the changing ecological conditions in their local education contexts. These innovations were, by virtue of their being identified as such, rare practices within their own educational systems, and often uncommon even within the schools in which they took place. While these innovations are in the minority, they do influence the education ecology within their schools and beyond through the many interactions between the classroom ecologies associated with these innovations and the broader ecological environment.

The schools hosting these innovations did not have the option of standing still: they either had to move "forward" by developing environmental conditions more suited to the innovations, or they had to go "backwards" by restricting or preventing environmental changes, such that the innovations became non-sustainable. Bringing about change in school ecological conditions, such as assessment methods, teacher appraisal, and curriculum goals, requires changing the beliefs and practices of the people involved, which can only be effectively achieved through organizational learning of the schools concerned. How was organizational learning taking place in the innovation schools? Were the differences in the organizational learning taking place in the innovation schools associated with different innovation profiles? We attempt, in Chap. 7, to provide answers to these questions. We provide, through our in-depth study of four SITES-M2 case studies, portraits of the four school ecologies associated with the four profiles of teacher-role and student-role combinations. We also explore the contextual differences associated with those innovations relating to aspects of organizational learning.

It is generally recognized that scaling up innovations is even more difficult than developing the first working prototype. It was evident from the SITES-M2 cases that many promising reform prototypes failed during efforts to transfer or to maintain these prototypes over extended periods of time in a manner that continued to create productive changes while retaining the initial values of the reform. A major challenge in education is thus how to sustain and scale up innovations. In Chap. 8, we consider the process of emergence and development of the SITES-M2 innovations collected in Hong Kong and Finland, which differed greatly in terms of their reported sustainability and scalability. We examine and compare these two sets of innovations in an effort to identify crucial factors that may account for such difference.

Given that the education sector worldwide is facing major challenges and rising expectations for schools and schooling in an environment characterized by rapid and constant change, we explore, in the final section of this book, holistic ways of using the SITES-M2 case studies to nurture and scale up change in the educational ecology. In Chaps. 9 and 10, we consider how the case studies can be used to help education gardeners develop their understandings of complex systems and the interrelationships of various parts within the changing environment. Our particular aim is to stimulate thought among these gardeners on what could thrive in their own gardens. We adopt Yin's (2009) emphasis on the value of comparing rich datasets from multiple case studies organized in similar ways. The SITES M-2 database of cases[4] hosted by the Centre for Information Technology in Education of the University of Hong Kong (CITE) contains case summaries and coding information for each of the cases listed. This material is designed to facilitate exchange of ideas and exploration of possible pathways for sustaining and scaling up ongoing change among education gardeners.

Our focus in Chap. 9 is on how the case studies can act as a catalyst to advance and change educational practices. The methodology of using the case studies is not one of "farming" or trying to replicate innovations, but one of observation,

[4] The URL for this database is http://sitesdatabase.cite.hku.hk/online/index.asp.

interpretation, and analysis. It is furthermore, where appropriate, one of adapting (through an evolving, developmental process) the ideas taken from the case studies so that they suit varied environments. In Chap. 10, leaders as head gardeners are recognized as key players in effecting change in the educational environment, at classroom, school, system, and cross-system levels. In addition, multilevel perspectives on leadership are viewed as an essential component of successful innovation adoption that is both scalable and transferable (Spillane, 2006; Yuen, Fox, & Law, 2004). Leadership is also seen as the key role in establishing networks among practitioners (Hargreaves, 2003). This chapter also outlines examples of trial networks within and across schools and systems to sustain the agenda of ongoing transformation.

To summarize, we use, in this book, a range of quantitative and qualitative methods to systematically study and compare the SITES-M2 case studies at classroom, school, and system levels. Our aim, in this regard, is to identify the characteristics of the emergent varieties of innovative pedagogical practices and how these relate to the vision for education to equip students with twenty-first century skills. We also consider how these practices intersect with the roles of teachers and students and what conditions are needed for their emergence, sustainability, and scalability. We pilot a multilevel network model, constructed on the basis of our findings from the SITES-M2 case studies and designed to foster, sustain, and scale ICT-supported pedagogical innovations.

Springer

http://www.springer.com/978-0-387-71137-9

Educational Innovations Beyond Technology
Nurturing Leadership and Establishing Learning
Organizations
Law, N.; Yuen, A.; Fox, R.
2011, XVIII, 243 p., Hardcover
ISBN: 978-0-387-71137-9