Executive Summary of the Report on the Research Study on the Pilot Scheme on e-Learning in Schools

Education Bureau

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Executive Summary of the Report on the Research Study on the Pilot Scheme on e-Learning in Schools

1. Purpose of the study

1.1 The Education Bureau (EDB) commissioned the Centre for Information Technology in Education of The University of Hong Kong (CITE HKU) and the Department of Mathematics and Information Technology of The Hong Kong Institute of Education (MIT HKIEd) to conduct a research study on the Pilot Scheme on e-Learning in Schools in order to identify, among others, evidenced-based benefits, limitations and good practices of implementing e-learning in schools. Schools can consider the relevance and applicability of these practices according to their context, policy and development of harnessing IT in education.

2. Background of the study

2.1 The Pilot Scheme on e-Learning in Schools (the Pilot Scheme) was taken place in schools since 2011/12 and it was completed in 2013/14. There were 21 school projects[2] selected involving 61 schools (details in Appendix 1) to participate in the Pilot Scheme which aimed to chart the way forward for policy consideration and recommendations for wider adoption e-learning in schools. To this end, the pilot project schools were encouraged and supported to develop and try out when and how e-learning would work best to bring about effective learning and teaching as well as to explore viable collaborative partnerships between the pilot schools and the other sectors for the development of e-learning. To identify good school practices for sustainable development and gauge findings of the benefits achieved and lessons learnt, including pedagogical and logistical arrangements, EDB commissioned the two research teams above to conduct the research study.

[2] The 21 selected projects came from the primary, secondary and special school sectors. There were 12 projects involving school clusters, highlighting close collaboration among schools, while 9 schools were working independently in the Pilot Scheme.

3. Methodology

3.1 The study consisted of two parts that CITE HKU was engaged in Part 1 which was a longitudinal study to track the overarching progress of all the 21 pilot projects starting from September 2011 to December 2014 and MIT HKIEd was involved in Part 2 for an in-depth case study in 11 pilot projects from May 2013 to December 2014. The conceptual frameworks for conducting the study are in Appendix 2 and Appendix 3(a) respectively. In gist, the Pilot Scheme was evaluated at the following levels:

(a) **Classroom level** focusing on students' learning outcomes, in particular, information literacy (IL) and self-directed learning (SDL) as well as changes in teachers' pedagogical practices of e-learning;
(b) **School level** emphasizing on leadership in building up the architecture for school to become a learning organization to enhance the development and implementation of e-learning; and
(c) **System level** focusing on partnerships among schools and with the other sectors to scale up and sustain the development of e-learning.

3.2 Various statistical methods and instruments, including questionnaires, interviews, documentary analysis, for example, students' work and assignments, relevant teachers' lesson plans and school's curriculum materials, class observations and etc., were deployed for data collection and analysis. The qualitative and quantitative data were also triangulated for valid research results.

4. Major findings

4.1 Findings of the study generally supported the following:

- With the appropriate use of technology and pedagogical designs, teachers were able to articulate e-learning in the classroom context bringing out its maximum potential to support positive student learning outcomes, including IL, SDL, catering learner diversity, critical thinking, and peer collaboration;
- Students had learning gains over the three years, including the increase in their motivation to learn, improvement in 21st century skills, for example, IL and communication skills as reported by teachers, principals and parents;

- With the use of IT as a tool for information access and sharing, students had more opportunities to learn beyond classroom and they enjoyed the possible flexible arrangements to learn at anytime and anywhere. Group interactions among student peers were also being enhanced; and
- E-learning was applicable to all learning subjects and experiences of the pilot project schools showed that both student-centered and teacher-centered practices co-existed despite of teachers' beliefs in teacher-centered approach.

4.2 Specific findings at the classroom, school and system levels are reported below focusing on both students' learning outcomes of IL / SDL and changes in teachers' pedagogical practices, emphasis on school leadership as well as partnerships among schools and with the other sectors respectively. Also, the gist of recommendations proposed by the research teams and the conclusion will be presented.

(a) Classroom practices of e-learning - student performance and teachers' pedagogical practices

(i) Student performance

(1) Changes in the use of information and communications technology (ICT)

4.3 Results from the analysis of student work over the three school years (2011/12 – 2013/14) indicated that at the beginning of the pilot project, students mostly deployed some office and desk-top computers for learning. Later, more pilot schools had used more digital tools, including, interactive whiteboards to present information, a computing spreadsheet to keep track of student attainment, video clips on the Web or other web-based materials to help illustrate key concepts and use of the digital cameras to help record students' work. Students had also increased the use of mobile technologies, including tablets, mobile phones, etc. to support their self-evaluation and collaboration among student peers for project completion by making use of the cloud-based technologies. In this light, applications of ICT transformed and contributed much to the process and effectiveness of learning and teaching (Haythornthwaite & Andrews, 2011).

4.4 When comparing the level of ICT use, primary pilot school students demonstrated a higher level of usage than their secondary counterparts. Besides, students' survey results also indicated that they had used the Internet more

frequently for school work and they commonly learnt the skills in using the computers more than raising their awareness of validating the web information. Regarding the 21st century skills capability, both primary and secondary students considered they had higher competence in "agency of learning"[3] despite of the statistical variations within the research period.

(2) Impact of ICT use

4.5 On the impact of ICT use, primary students indicated that they had raised their learning interests especially in 2011/12 (i.e. the first project-year) with deeper understanding of the subject knowledge while secondary students perceived that they had improved their ICT skills in the first two years before migration to deeper understanding of the subject matter in the third year.

(3) Students' learning experiences and outcomes

4.6 As revealed in the students' assignment collected in 2011/12, most of them were engaged in relatively traditional tasks such as completing some well-defined instructional exercises, drill-and-practice work, as well as searching and presenting information, etc. Most of the assignments were individual tasks and mostly in paper-and-pencil format. However, starting in 2012/13, teachers had assigned more digital-tasks to students and there were some outstanding school cases that they had designed tasks to get their students involved in creating solutions in the context of solving daily life problems with the use of various multimedia.

4.7 Five secondary schools under the Pilot Scheme were engaged in the International Computer Information Literacy Study (ICILS)[4] in 2013. When comparing their results with those overall of Hong Kong, the participating students of the pilot schools had a higher tendency in using ICT for learning. Table 1 and Table 2 below are referred.

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[3] Agency of learning refers to the performance of self-directed learning with students to decide on what and how to learn in achieving their long-term goal.
(Source:https://principlesoflearning.wordpress.com/dissertation/chapter-4-results/themes-identified/agency)

[4] The International Computer Information Literacy Study (ICILS) 2013 was the first large-scale international comparative study on junior secondary students' ability to make use of computer and information technology for learning. The Hong Kong component/part of the ICILS 2013 study was funded by the Quality Education Fund and it was conducted by CITE HKU.

Table 1 Teachers' Perceptions of Students' Use of ICT[5]

e-Learning Tasks for Students	Hong Kong Secondary Students Participating in ICILS 2013 (Percentage)	Secondary Students of the Pilot Schools Participating in ICILS 2013 (Percentage)
Student centred SDL-oriented tasks[6]	41%	58%
Traditional pedagogy/ learning tasks[7]	57%	81%
Inquiry learning[8]	63%	75%

Table 2 Students' Self-proclaimed Competence in 21st Century Skills[9]

21st century skill competence	Mean (S.D)	
	Hong Kong Secondary Students Participating in ICILS 2013	Secondary Students of the Pilot Schools Participating in ICILS 2013
Agency of learning[10]	3.14(0.52)	3.21(0.46)
Agency of solving problems	2.79(0.40)	2.83(0.39)
Views on dealing with uncertainties	2.20(0.70)	2.19(0.72)

[5] The study of ICILS 2013(Hong Kong component) was introduced in coincidence with the second-year implementation of the Pilot Scheme in 2012/13. The research team (Part 1) compared the results of the five secondary pilot schools participating in the ICILS with the average data of the Hong Kong component (http://icils.cite.hku.hk/en/resources.htm). The data source of Table 1 is a survey on teachers' perceptions. Due to the limited number of participating pilot schools, the figures may not be statistically significant and they are presented mainly for reference.

[6] The SDL-oriented tasks included: students' undertaking open-ended investigations/field work, reflecting on their learning experience, communicating with students in other schools on projects, seeking information from external experts, planning a sequence of learning activities for themselves, answer tests or respond to evaluations and self and/or peer evaluation, and reflecting on their own learning experiences.

[7] Traditional pedagogy/ learning tasks included: students' working on short assignments (i.e. within one week), explaining and discussing ideas with other students, submitting completed work for assessment and working individually on learning materials at their own pace.

[8] Inquiry learning included: students' working on extended projects, processing and analyzing data, searching for information on a topic using outside resources, evaluating information resulting from a search, .giving presentations, determining their own content goals for learning (e.g. theme/topic for project).

[9] The data source of Table 2 is a survey on students' self-proclaimed competence in 21st century skills. Due to the limited number of participating pilot schools, the figures may not be statistically significant and they are presented mainly for reference.

[10] Student questionnaire on agency of learning included: "I decide what to learn in the learning process", "I prefer to decide on how to learn in the learning process", "I try to relate what I have learned to my long term goal", "I know where to retrieve information that I need", " I know what to learn", "If I do not learn well, it is my fault", and "It is better to use the learning methods which we know that it works instead of trying new ones".

4.8 Additional learning outcomes associated with IL and SDL were also observed, including students' self- and peer- assessment, group work and activities beyond classrooms, etc. Towards the end of 2013/14 (the third year of the Pilot Scheme), teachers' advancement in learning designs was observed that students were engaging actively in their own learning. They were required to plan and set their own work schedule, work collaboratively with their peers, collect and interpret data, use multimedia to present their findings, engage in peer and self-evaluation, and to revise their learning products after receiving peers' evaluation feedback. Details are as follows.

- ***Students' achievements in IL***

4.9 As reflected, primary students had made progressive improvement in IL during the research period. Among the eight IL dimensions[11], "manage" and "create" were commonly observed in students' work whereas "evaluate" and "ethical use" were rarely observed. Besides, students of cluster-school projects (both coordinating and partnership schools) had better performance with 10% having achieved all of the eight IL dimensions as shown in their assignment. At the secondary school level, "manage" was the most frequently observed dimension whereas the "communicate", "evaluate" and "ethical use" dimensions were relatively uncommon. Nevertheless, the secondary students from both singleton and cluster-project schools showed they had better improvement not only in IL, but also in terms of the number of IL dimensions exhibited in the second year of the Pilot Scheme.

4.10 In addition, the research team (Part 1) compared the pilot schools with the student performance of other countries on making use of the computer and information technology in learning in the ICILS 2013. The results indicated that our students had different performances, spreading across from below Level 1 to Level 2 (with Level 4 at the top).

[11]The eight dimensions of IL include: "Define", "Access", "Manage", "Integrate", "Create", "Communicate", "Evaluate" and "Ethical use". Details are at: http://iltools.cite.hku.hk/.

- ***Students' achievements in SDL***

4.11 There were fewer students engaged in SDL dimensions[12] despite there was progressive performance being observed in areas of goal setting, self-evaluation and use of new assessment approaches, in particular, the primary school teachers gave more opportunities for students to demonstrate their SDL skills. For secondary schools, goal setting was the most frequently observed SDL dimension. In general, the performance of primary schools was better than their secondary counterparts.

(ii) Teachers' pedagogical roles

4.12 As observed, teachers had made good efforts on learning designs to cater for students' diversity which was evident in students' work throughout the three years of the Pilot Scheme and they also adopted new approaches in assessing students, such as encouraging students to make self-evaluation, peer-evaluation and using rubric-based assessments as well as reflective learning log. Technologies were also deployed as a tool to support the assessment as learning in some school cases. Results from the teacher interviews (Part 1) study showed that teachers had developed a better understanding of e-learning and the necessary changes in pedagogy for achieving student-centered learning and teaching with IL and SDL elements incorporated.

4.13 During the course of implementation, teachers had also become more competent in using ICT in supporting learning and teaching. The results of the teachers' interviews were also triangulated with the findings in the teacher surveys, which indicated that the use of ICT had been significantly increased for both 21st century lifelong learning practices and traditional practices by the primary school teachers. Although increases were also found in the secondary school teachers for both types of practices, the changes were not statistically significant.

4.14 For teacher professional development (PD), findings from the principal survey indicated that courses on the use of ICT in teaching provided by

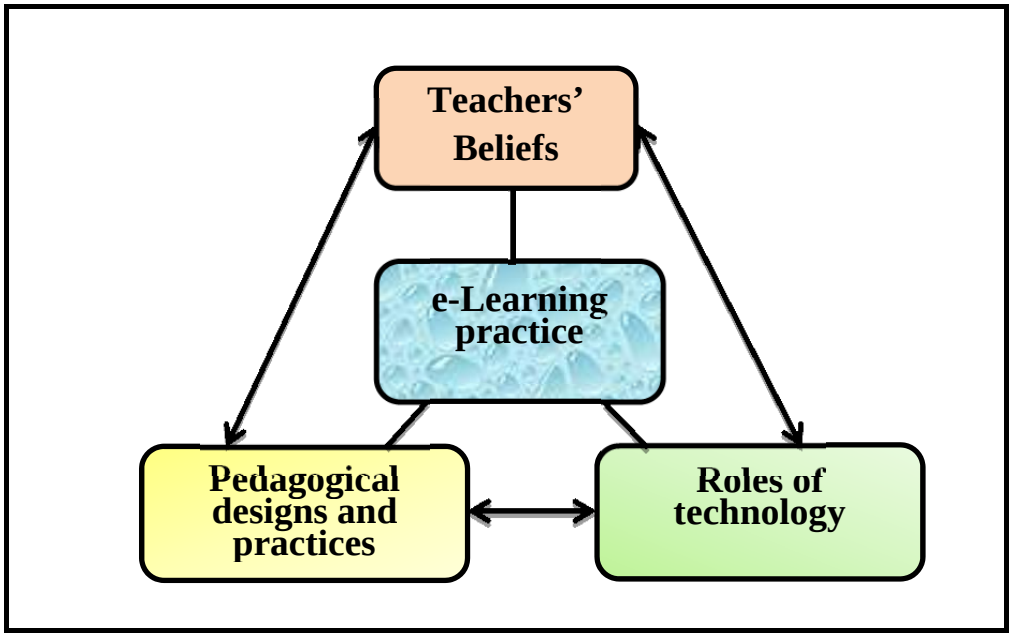
[12] The SDL dimensions included: Goal setting, i.e. opportunity for students to establish goals with the learning activities such as planning, creating outline of schedule; Self-monitoring, i.e. opportunity for students to monitor the repertories of learning strategies and modify learning according to the learning goals; Self-evaluation, i.e. opportunity for students to have self-evaluation about their work according to a clear assessment criteria beforehand and Revision, i.e. based on the feedback, students can examine his or her own work and revise their work (Black & William, 1998; Brockett, 2002; Candy, 1991; Clarke, 2001; Garrison, 1997; Guglielmino, 1977; NCREL, 2003; SRI, 2009).

the school in the first two years of project implementation were the most commonly offered for teachers at primary schools, while observing colleagues using IT in their teaching become the most commonly observed PD for teachers in the final year. For secondary schools, courses on the use of ICT in teaching provided by the school were the most commonly observed PD program for teachers throughout the three years.

4.15 Results from the teacher interviews also revealed that their competence in IT skills had increased and they were more confident in integrating e-learning in their learning designs since more emerging pedagogies were being used. They also mentioned it would be necessary to adopt e-assessment in coherence to the changing pedagogical arrangements. Besides, they valued much of the professional exchanges with the teacher peers in lesson observations and co-planning for learning and teaching.

4.16 Classroom practices revealed from the case study (i.e. Part 2 of the study) were consistent with the results above that there was an inter-locking relationship among teacher's beliefs, pedagogical designs and practices, and the application of technology in determining the pattern of e-learning which is illustrated below:

Figure 1 Key components of e-learning practice



4.17 The three perspectives identified in Figure 1 were interrelated in resulting effective e-learning practice. To determine the e-learning practice,

teacher's belief is significant in leveraging the pedagogical designs and use of technology for learning and teaching. When conducting classroom observations in the 11 project schools, the Part 2 research team had generalized teachers' pedagogical/classroom practices (in terms of frequency counts) from the cases with adapted protocols (Ertmer, 2012).

Table 3 Teachers' pedagogical practices of e-learning

Types of classroom practice	**Teacher-centered**		**Student-centered**	
	• Teacher-directed (primarily didactic)		• Student-directed (primarily interactive)	
Teacher's role	10 8	Present information Manage classroom	3 11 0	Guide discovery Model active learning Collaborator (sometimes learner)
Student's role	3 6	Store, and retrieve information Complete tasks individually	6 10	Create knowledge Collaborator (sometimes expert)
Curricular characteristics	8 0 3 2	Breadth – focused on mandated curriculum Focus on standards Fact retention Fragmented knowledge and disciplinary separation	1 10 8 1	Depth – focused on student interests Focus on understanding of complex ideas Application of knowledge to solve authentic problems Integrated multi-disciplinary themes
Classroom social organization	1 3	Independent learning Individual responsibility for entire task	10 9	Collaborative learning Social distribution of thinking
Assessment practices	1 7 1 0 3	Fact retention Product oriented Traditional tests Norm referenced Teacher-led assessment	9 10 2 8 4	Applied knowledge Process oriented Alternative measures Criterion referenced Self-assessment and reflection
Technology role	2 3 0	Drill and practice Direct instruction Programming	8 9 5	Exploration and knowledge construction Communication (collaboration, information access, expression) Tools for writing, data analysis, problem-solving
Technology content	0 0	Basic computer literacy Skills taught in isolation	6 7	Emphasis on thinking skills Skills taught and learned in context and application
Total of the frequency counts on the types of pedagogical /classroom practices	61	Teacher-centered practices	137	Student-centered practices

4.18 In sum, the teachers had made efforts for the following **good practices for e-learning and teaching, including:**

- **Trying out assessment rubrics** for students' self-assessment and peer assessment for achieving SDL;
- **Capitalising on technology** to promote student interactions through collaborative and enquiry learning, group discussions and project-based activities ;
- **Building learning networks** among schools for professional sharing of experiences in e-learning implementation, lesson co-planning and observations; and
- **Catering for students' individual differences** with different teaching strategies, such as making use of multi-media presentations to enhance understanding, classroom games and artwork productions to motivate student learning and use of e-learning resources to enable their learning at individual paces.

4.19 The research team remarked that **project success was determined by school visions and their beliefs in e-learning**. That said, some observations of the pilot projects[13] made by the research team are cited below for illustration. The visions/beliefs of the 11 project cases are also briefed in Appendix 3(b).

- Project C31 (involving Chinese Language learning) was successful in bringing out the effect of student collaboration with creativity in the writing process on an e-platform;
- Project C41 (involving English Language learning) – the teachers deliberately encouraged students' active learning with emphasis on peer support learning (communication and interaction) for engagement in SDL;
- Project S10 (doing Mathematics) generated effects of peer support learning which was created with the use of an interactive whiteboard, apps and peer sharing in various algebraic problem-solving tasks;
- Project S40 (engaging in Integrated Humanities) – the teachers developed students' IL and critical thinking skills in group tasks and discussions, such as under the topic of global warming with the use of e-platform, internet, and i-tools; and

[13] The project schools were coded for data privacy purposes.

- Project C61 (involving Personal, Social and Health Education) – the teachers well demonstrated the effect of technology, use of Learning Management System (LMS), e-platforms, the Internet, and presentation tools, etc. in catering for students' learning diversity during the lessons on The Great Wall of China.

4.20 As regards **teachers' PD programs**, the contents included:

(i) Use of technology for learning and teaching
(ii) Planning of e-learning classes, for example using design-based approach;
(iii) Development on e-learning pedagogy; and
(iv) Development of e-learning resources.

4.21 In gist, five **models of teacher development** commonly adopted by the pilot project schools were one-shot workshop, case-based best practices, mentoring, design-based practice and collaborative apprenticeship. The research team remarked that the collaborative apprenticeship model would be more desirable for sustainable e-learning development as it encompassed the key features of mentoring, principle-based understanding and design-based practices contributing to the formation of Community of Practice (CoP)[14].

(b) The school level conditions to enhance the implementation of e-learning

(i) Vision and beliefs of school leaders

4.22 Survey results indicated that both the primary and secondary school principals considered students' learning motivation was being enhanced with the use of IT, and hence they encouraged teachers to promote more active e-learning strategies. Secondary school principals envisioned various ICT uses to help "prepare students for the world of work", "promote their active learning strategies", "do exercises, practise skills and procedures", and "increase students' learning motivation with more learning interest" while primary school heads

[14] A CoP is an efficient teacher network for resources sharing, information exchange and knowledge development, due to its many-to-many approach of teacher involvement in cohering larger-scale online resources for sharing, refinement and applications.

believed that e-learning would be beneficial to "foster teachers' collaborative and organizational skills when working in teams" and "develop students' independence and responsibility for their own learning".

(ii) Implementation strategies for organizational learning and change

4.23 During the initial stage of the project development, the pilot schools had limitations, including the try-out of a "new" mode of learning in addition to the existing school curriculum with tests and examinations, insufficient IT hardware and software for learning and teaching, students' difficulty in Chinese inputs and frequent turnover of the Technical Support Staff (TSS).

4.24 Interviews with the school heads/principals and the core team members in charge of the pilot projects revealed **their experiences in building up the "architecture for organization learning and innovation"** listed as follows:

- **Building common goal and shared vision with major stakeholders,** in particular, teachers and parents, through openness and transparency of school policy as well as good communications for active engagement;
- **Establishing a core team** with members from the senior management, including principal, vice principal and curriculum leader(s), teacher(s) in charge of IT, subject panel(s) as well as supporting staff to smoothen the operation;
- **Setting monitoring measures** including the implementation timeframe, expected project outcomes to evaluate the effectiveness of e-learning and ensure smooth collaboration with the business partners;
- **Fostering administrative actions for change**, including the reduction of teachers' workload by providing them with space and time for co-planning of classes and preparation of materials for e-learning, arranging PD activities (lesson observations within and across schools), reallocating resources (the arrangement of technical assistance in classroom) and seeking additional funding support from various sources for enhancement of e-learning;
- **Forming community of practice** with teacher peers to share and exchange their experiences in e-learning practices. In some cases, teachers could act as the mentor to provide their peers with support

and guidance. This was also a kind of professional development for teachers; and

- **Collaborating with parents** who shared that e-learning is a global trend allowing students to learn beyond textbook and equip them as life-long and self-directed learners. In some schools, parents were invited to attend lesson observations and they also had active engagement in e-learning field trip activities.

(c) The system level conditions to scale up and sustain the development of e-learning

(i) Collaborations among schools and schools in partnership with the other sectors[15]

4.25 With reference to the 12 pilot projects involving cluster-collaborations, they had formed themselves into two major types of partnership, namely center-periphery[16] and equal participation[17]. As regards the partnership with the other sectors, most schools had business services with the tertiary institutions, IT sector, educational publishers, and other IT content providers. To illustrate the partnerships, two cases of the cluster-school projects are quoted below.

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15 To meet the needs of schools, teachers and students, the Pilot Scheme aimed, among others, to explore the commercially viable business models for the development of e-learning resources. In this regard, participant schools had to collaborate in partnership with the other sectors, including the tertiary institutions, information technology (IT) sector, educational publishers, and other content providers, etc.

16 For partner schools adopting the centre-periphery structure, the coordinating school(s) was responsible mainly for the project administration, developing, enacting and modifying the teaching pilot units and materials, and negotiating with different involved parties, such as EDB, business partners, etc. The partner schools were responsible for trying out the lesson plans developed by the coordinating school(s), and giving feedback.

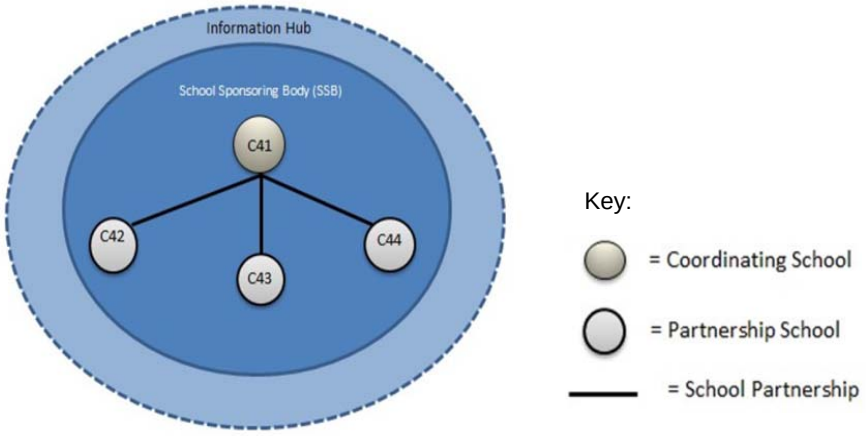
17 As regards project schools practicing equal participation, apart from the coordinating school(s) responsible for the project administration and liaison, etc., the other partner schools were also equally active in developing and enacting the teaching pilot units and resources for sharing among all schools. They always had regular meetings and other project development activities.

(1) Project Case C41

4.26 There were four secondary schools working together in this project with a view to enhancing their students' 21st century skills, in particular, the promotion of self-directed learning. The schools came from the same School Sponsoring Body (SSB) with school (C41) leading and coordinating with the other partner schools (C42, C43, and C44) and the senior teacher involved was greatly appreciated by his teacher-peers for his efforts and contributions to the project formulation. Their partnership mode was initially center-periphery as the other partner schools were mainly trying out the e-resources developed by the business partners and giving feedback for enhancement, if required.

- ***School partnership***

Figure 2 The school partnership structure of project case C41



4.27 During the initial project development, the teachers had information exchanges, whether success or failure and reflections on e-learning, with the use of social media communication tools, including WhatsApp, email, and video conferencing, etc. The e-resources developed were uploaded on free open-source platform (for example, Moodle) for easy sharing among the schools. They were also running workshops together for the school community at the local Learning and Teaching Expo and participating in overseas training, etc. In gist, their collaborations had captivated the four schools to form a learning CoP.

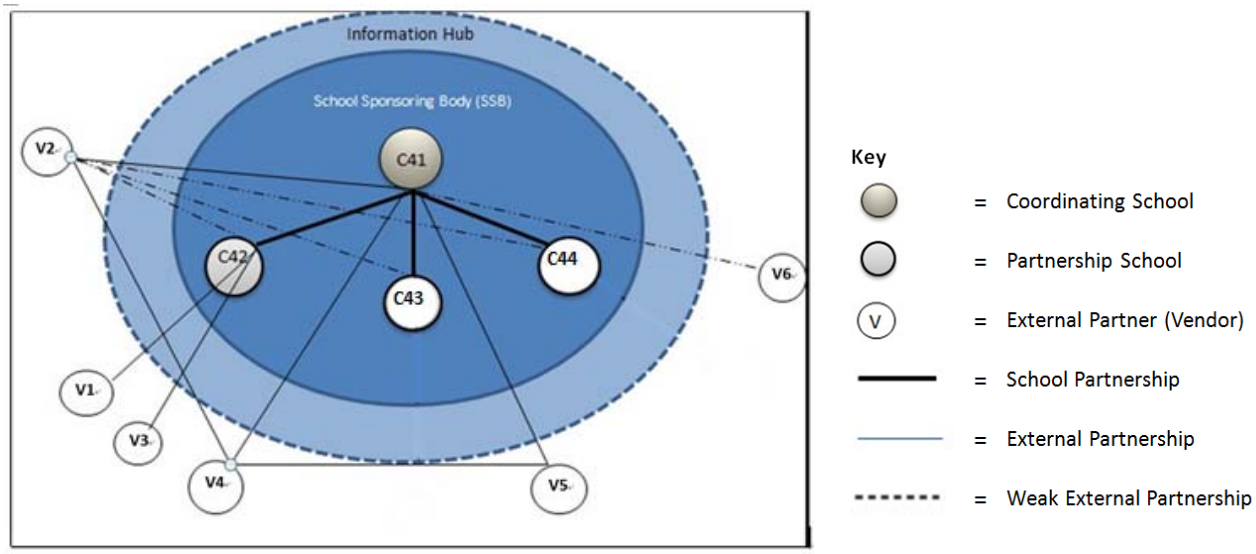
4.28 Towards the third year of the project, this learning group was open to all interested parties, including teachers and principals from other schools.

Within which, the developed teaching materials, e-resources, professional development course materials, useful apps, photos and videos of e-learning classes, etc. were uploaded and shared. At this stage, all schools of this project cluster had made active contributions to and distributed their leadership in strengthening the CoP. That had shaped the initial center-periphery partnership into one with an equal participation structure.

- ***School partnership with the other sectors***

4.29 The school project had involved six business partners for service provision to build up a new LMS support system for storing teaching contents developed by publishers, facilitating the practice of "flipped classroom" teaching approach and students' access to materials for self-directed learning.

Figure 3 The school partnership structure of project case C41 with the other sectors



4.30 Some of the business partners provided professional training to the project teachers, for example, webpage design and production, apps for learning and teaching of the English Language subject, as well as concepts of pedagogical change, paradigm shift, and ways to elevate learning motivation, school policy on BYOD, with reference to the US experiences.

4.31 The project teachers said that the services provided by the business vendors varied. Some were supportive as mentioned above as they were looking forward to maintaining a more sustainable market relationship while others had just offered barely contractual services.

(2) Project Case C31

- ***School partnership***

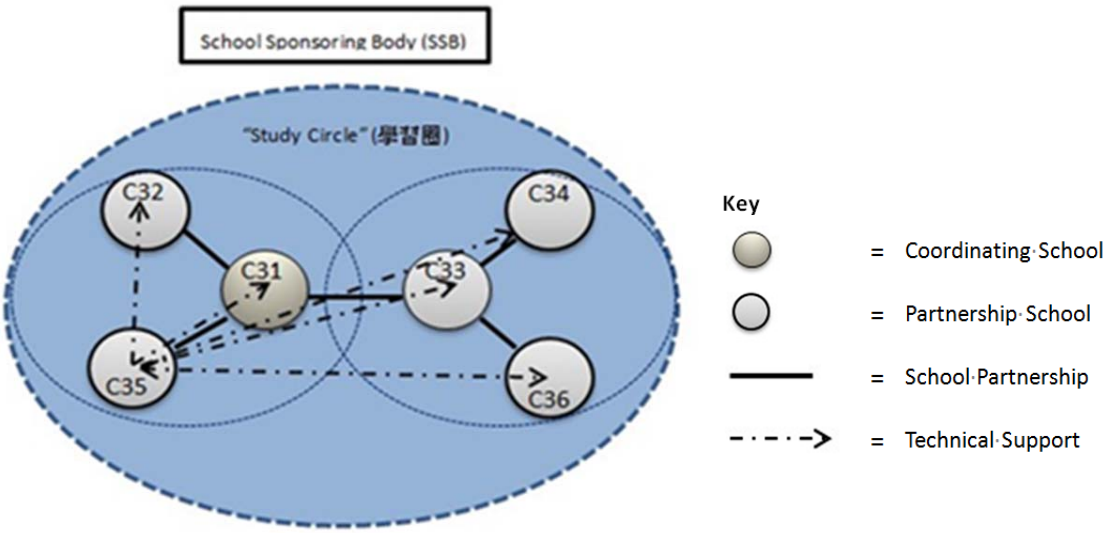
4.32 Similar to the secondary school case above, this primary school project had involved six schools of the same SSB and they aimed to develop e-resources and e-textbooks tailored-made for their students and shared use among the schools.

4.33 In this project case, it was the school heads (supported by the senior teachers) who initiated the pilot programme with two schools (C31 and C33) taking up the leading and coordinating roles of each sub-group. The schools had agreement on clear roles and responsibilities that C31 and its partner schools (C32 and C35) were responsible for the development of e-learning materials for Chinese Language in Putonghua while the other group leading by C33 together with C34 and C36 were engaging in General Studies. As each school/sub-group had to make active contributions for the material development, they had formed a "study circle" among themselves with a structure of equal participation and distributed leadership[18].

[18] The schools believed that work divisions and specifications would be beneficial to the development that:

- C31 was responsible for the entire public relation/contact with EDB, business partners, NGOs, or other schools and to convene meetings/ professional development activities for the project schools;
- C32 and C34 were the major schools to try-out the materials developed and returned feedback;
- C33 deliberated on software and apps to use for the project development; and
- C36 convened and provided technical support to C35 which rendered technical support services to other schools.

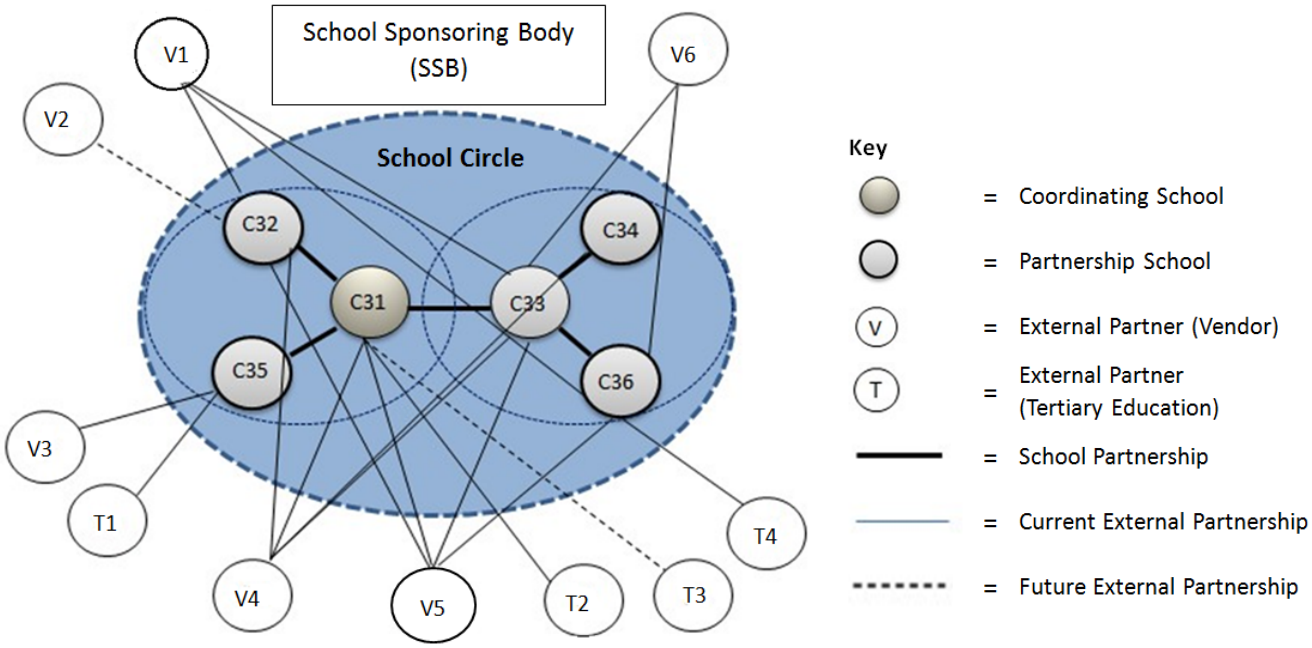
Figure 4 The school partnership structure of project case C31



4.34 During the development process, the six schools, apart from having regular face-to-face meetings for frequent communication to keep track of the project progress and maintain good relationship among teachers and school heads, they had close contacts with the business partners, particularly, the publishers and IT sector. Furthermore, all parties concerned, including teachers, publishers, IT content providers, tertiary institutes and EDB, etc., were welcome to join the classroom observations which were being held regularly. Following the observations, debriefing sessions would be held to discuss issues including the e-pedagogy adopted, use of e-resources, classroom management, performance of the teacher and students, etc. In this light, their collaborations had captivated not only the six project schools to form a "study circle", but also scaled up into a learning CoP synergizing participation and expertise of the other professionals.

➢ ***School partnership with the other sectors***

Figure 5 The school partnership structure of project case C31 with the other sectors



4.35 The school project had involved ten business partners, including four from the tertiary institutes for service provisions. Some provided schools with free tablets, e-learning system, e-books added with e-learning activities, apps related to Chinese language, client-side software and a Learning Management System (the "Digital Travel") for mobile learning, tailor-made teaching materials, for example, the Chinese Language education and web-based learning system fields, etc.

4.36 Overall, the project teachers reflected that the services provided by the business vendors and tertiary institutes were largely satisfactory. Some were supportive as mentioned above since they were looking forward to maintaining a sustainable market relationship and transfer the technology tested in the project to the industry. However, there were problems encountered by the schools, including the question of copyright of the e-materials if they were to be stored on the platform of the business vendors.

4.37 Research results of the project partnership revealed the following **good practices in sustaining partner-collaboration**:

- **Setting clear roles and responsibilities** among the partner schools, for example, which school(s) to lead and coordinate;
- **Ongoing communications and close contacts** among schools and with the business partners; and
- **Delivering and sharing of the project experiences** with the assistance of EDB among the pilot schools and with the school community.

4.38 However, there were obstacles encountered for schools to join into partnership:

- Schools at different geographical locations without seeking IT solutions to maintain communications across time and space; and
- Copyright issues on the e-materials developed had to be settled first before usage.

5. Recommendations

5.1 Referring to the research results and experiences generated from the Pilot Scheme, the research teams made the following recommendations at (a) school and (b) system levels for sustainable development of IT in education.

(a) At the school level

- To set clear goals and consistent policy for the development of e-learning with shared commitment among teachers to manage the necessary changes (Fullan, 1982; NCREL, 2001; Senge, 1990). The implementation of e-learning at the school level would be more effective if it can be developed progressively in alignment with the school policy and development strategies;
- To enhance teachers' competence in e-learning designs to incorporate learning activities that nurture students' IL skills, particularly the higher order IL skills such as how to compare, analyze, synthesize and evaluate the quality, relevance, and trustworthiness of the information;

- To provide teachers with more time and space in co-planning classes alongside with the of TPACK[19] mode and conducting mutual lesson observations among teacher peers;
- To provide students with more opportunities to use ICT for learning;
- To build multi-school partnership for various contributions for scaling up good practices and e-resources across subjects and geographical boundaries, etc. Schools under the same SSB or within the same geographical region can formulate their teachers into learning circles / CoPs with the deployment of communication technologies such as video-conferencing, Facebook, WhatsApp groups and etc.;
- To adopt LMS in support of teachers for the learning innovations by storing students' learning data, tracking their developmental trajectories, sharing of e-learning designs and resources among teachers, supporting students' learning both within and outside classrooms, as well as capture, analyze and provide visualizations of learning data to give just-in-time feedback/assessment to both teachers and students as an integral part for / of / as learning; and
- To foster home-school collaboration by providing parents with guidance, for example, through open classroom observations, workshops/seminars on e-safety and other important facets for student learning at home using the Internet and mobile devices.

(b) At the system level

- To provide clear vision and consistency in the development of IT in education, EDB may consider the findings of the study in formulating the Fourth Strategy on IT in Education (ITE4) for policy direction and support, including to:

  - Adopt a holistic approach for the implementation of e-learning across the curriculum for enhancing students'

[19] The Technological Pedagogical and Content Knowledge (TPACK) framework is considered a useful organizational structure for defining the knowledge and skills that teachers are able to make sensible choices in their use of technology when they have to teach specific content for a specific target group effectively.
Source at: www.tpack.org .

learning effectiveness in subject matter knowledge/skills as well as the 21st century competences;

- Encourage partnership among schools and with the business / tertiary sectors; and
- Include research and development (R&D) as a core element in ITE4 for evaluations and exploration of innovative ideas in addressing problems and providing exemplars and statistics to the school community on the e-learning process at classroom, school and system levels for scaling up and sustaining the development of e-learning.

- To support CoP practice in schools by involving school leaders, curriculum leaders and teachers in making contributions to develop e-learning pedagogies and implementation strategies. This may include a repository being built on the platform of the Hong Kong Education City Limited for more interactive participations by teachers;

- To develop teachers' TPACK for nurturing students' 21st century skills/competency and adoption of new assessment practices using emerging technology. The PDP programmes provided for teachers should include both technical and pedagogical elements;

- To seek viable solutions to alleviate teachers' workload arising from the implementation of e-learning, for example, to provide TSS with career development support as a professional staff in schools, more technical support services and other cloud-based solutions, as appropriate; and

- To mediate with the software developers and publishers concerned on the Intellectual Property right issue of the e-learning materials for use by teachers.

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Appendix 1

The Pilot Scheme on e-Learning in Schools
List of Pilot School Projects

Primary school projects

Project Title	School Name
1. The Youth of Creative Media Education	Chi Hong Primary School Kowloon Tong Bishop Walsh Catholic School Taikoo Primary School Laichikok Catholic Primary School Dr. Catherine F. Woo Memorial School
2. e-Learning resource depository for Primary English Language of Key Stage One	HHCKLA Buddhist Wong Cho Sum School HHCKLA Buddhist Chan Shi Wan Primary School
3. Genesis Era	St. Edward's Catholic Primary School Tsz Wan Shan Catholic Primary School
4. Innovative e- Learning Project	Fung Kai Innovative School
5. Innovative i-Teach Programme " A leap of e-Learning"	The Church of Christ in China Heep Woh Primary School (Cheung Sha Wan) The Church of Christ in China Kei Tsz Primary School The Church of Christ in China Kei Wa Primary School The Church of Christ in China Heep Woh Primary School The Church of Christ in China Mong Wong Far Yok Memorial Primary School The Church of Christ in China Kei Faat Primary School (Yau Tong)
6. New Trend for e-Learning – The Network of Information Literacy	Po Leung Kuk Chee Jing Yin Primary School Xianggang Putonghua Yanxishe Primary School of Science And Creativity Po Leung Kuk Riverain Primary School S.K.H. Kei Fook Primary School Lei Muk Shue Catholic Primary School Yuen Long Long Ping Estate Tung Koon Primary School
7 e-Learning, easy learning	Tai Po Old Market Public School (Plover Cove)

Project Title	School Name
8. Development of an 'adaptive' e-Learning platform for Chinese Language learning	Sacred Heart Canossian School Hong Kong Taoist Association the Yuen Yuen Institute Chan Lui Chung Tak Memorial School
9. Blending Formal and Informal Learning in Schools with Situational Activities	Tin Shui Wai Catholic Primary School Yaumati Catholic Primary School (Hoi Wang Road) Pui Tak Canossian Primary School Pak Tin Catholic Primary School
10. Learning enhancement through Mobile & e-Learning	Fanling Public School Yan Tak Catholic Primary School
11. Primary Literacy Programme-Reading & Writing @ e-Learning	Po Leung Kuk Tin Ka Ping Millennium Primary School

Secondary school projects

Project Title	School Name
12. Information literacy education: a practice in Integrated Humanities through e-Learning	Lai King Catholic Secondary School
13. Learning for Life: Self-directed e-Learning Model and Self-evaluation System	Yan Chai Hospital Wong Wha San Secondary School
14. Moodle e-Learning Plus Mobile & Social Elements @Campus Scheme	Ling Liang Church E Wun Secondary School
15. Borderless Campus – an Intelligent Tutoring System for SEN students on Mathematics and Liberal Studies	Tung Wah Group of Hospitals Mr & Mrs Kwong Sik Kwan College

	Project Title	School Name
16.	Collaborative Learning Platform for Liberal Studies	Christian Alliance S W Chan Memorial College Henrietta Secondary School Tuen Mun Government Secondary School Pui Kiu College
17.	Writing 2.0 (寫作 2.0)	Fukien Secondary School St. Margaret's Co-educational English Secondary and Primary School St. Margaret's Girls' College, Hong Kong Po Leung Kuk Laws Foundation College Pui Kiu Middle School
18.	We S.A.W. Why!	United Christian College (Kowloon East)
19.	Language Acquisition for the 21st Century Learners - Building student centric experience through technology integrated instructional design and outcome	The True Light Middle School of Hong Kong Hong Kong True Light College True Light Girls' College Kowloon True Light Middle School

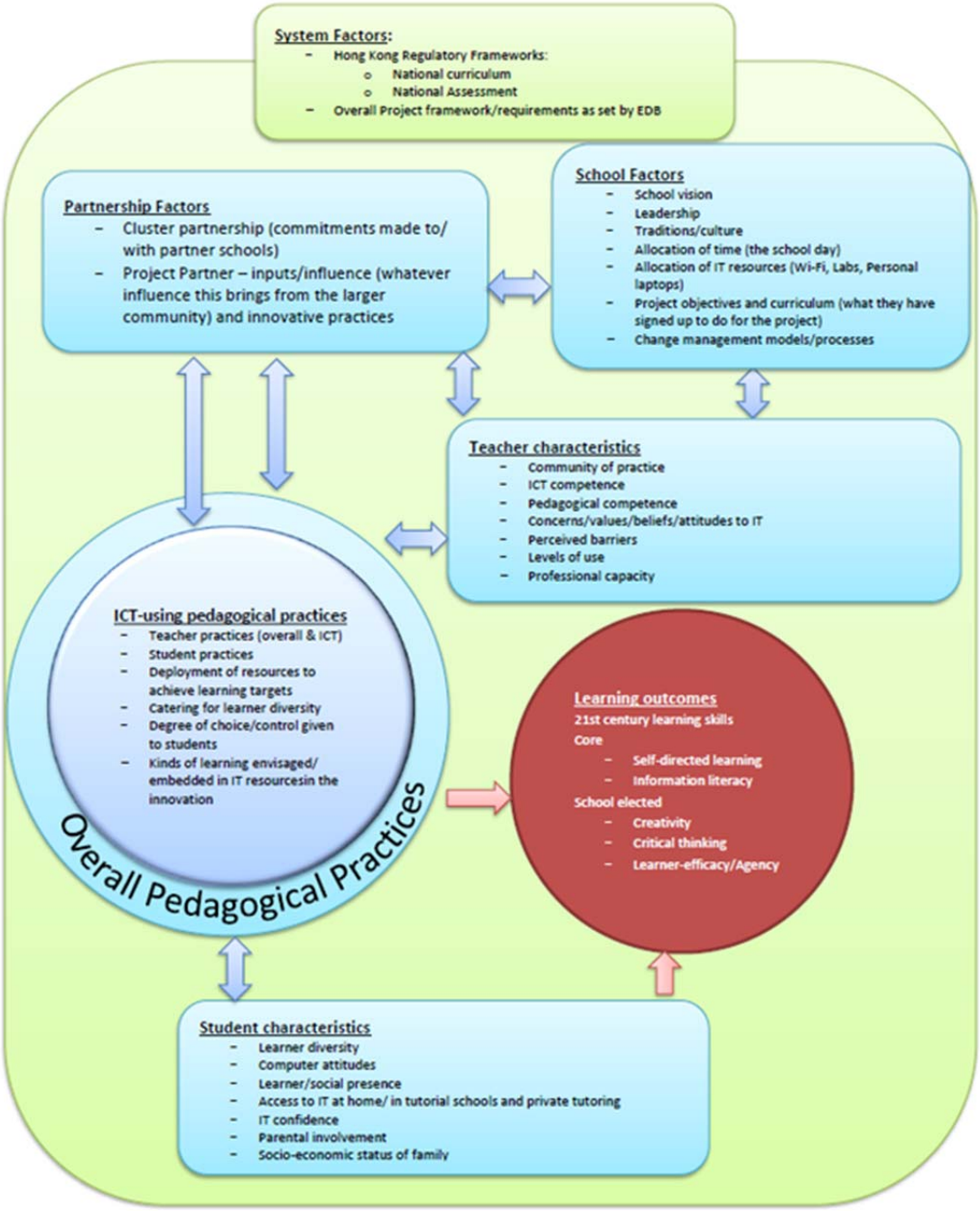
Special school projects

	Project Title	School Name
20.	Mutual Active Learning System for Students with Dyslexia – Starwish Digital Language Laboratory	Sam Shui Natives Association Lau Pun Cheung School
21.	A Joint-school Project for Developing an E-enhanced Learning, Teaching and Assessment System for Students with Intellectual Disabilities to learn effectively within the framework of the general curriculum	Buddhist To Chi Fat She Yeung Yat Lam Memorial School HHCKLA Buddhist Po Kwong School Ebenezer New Hope School Haven of Hope Sunnyside School Po Leung Kuk Mr. & Mrs. Chan Pak Keung Tsing Yi School HKSYC&IA Chan Nam Chong Memorial School Hong Kong Red Cross John F. Kennedy Centre Hong Kong Red Cross Margaret Trench School Tung Wah Group of Hospitals Kwan Fong Kai Chi School Chi Yun School

Appendix 2

Conceptual Framework of the Study (Part 1)

This part was a longitudinal study to track the overarching progress of all the 21 pilot projects and the study was being conducted (2011/12 to 2013/14). The conceptual framework is illustrated in the figure below. It is adapted from SITES 2006[1] with indicators, including system factors, school factors, partnership factors, teacher characteristics, ICT-using pedagogical practices, learning outcomes and student characteristics.



Note 1: SITES 2006 took the view that ICT-using pedagogical practices are part of the overall pedagogical practices of the teachers. Also, pedagogical practices are not determined solely by teacher characteristics, but also by the school ecology, i.e. the school and system level factors.
Source: Law, N., Pelgrum, W. J., & Plomp, T. (Eds.). (2008). Pedagogy and ICT Use. Hong Kong: Springer/IEA.

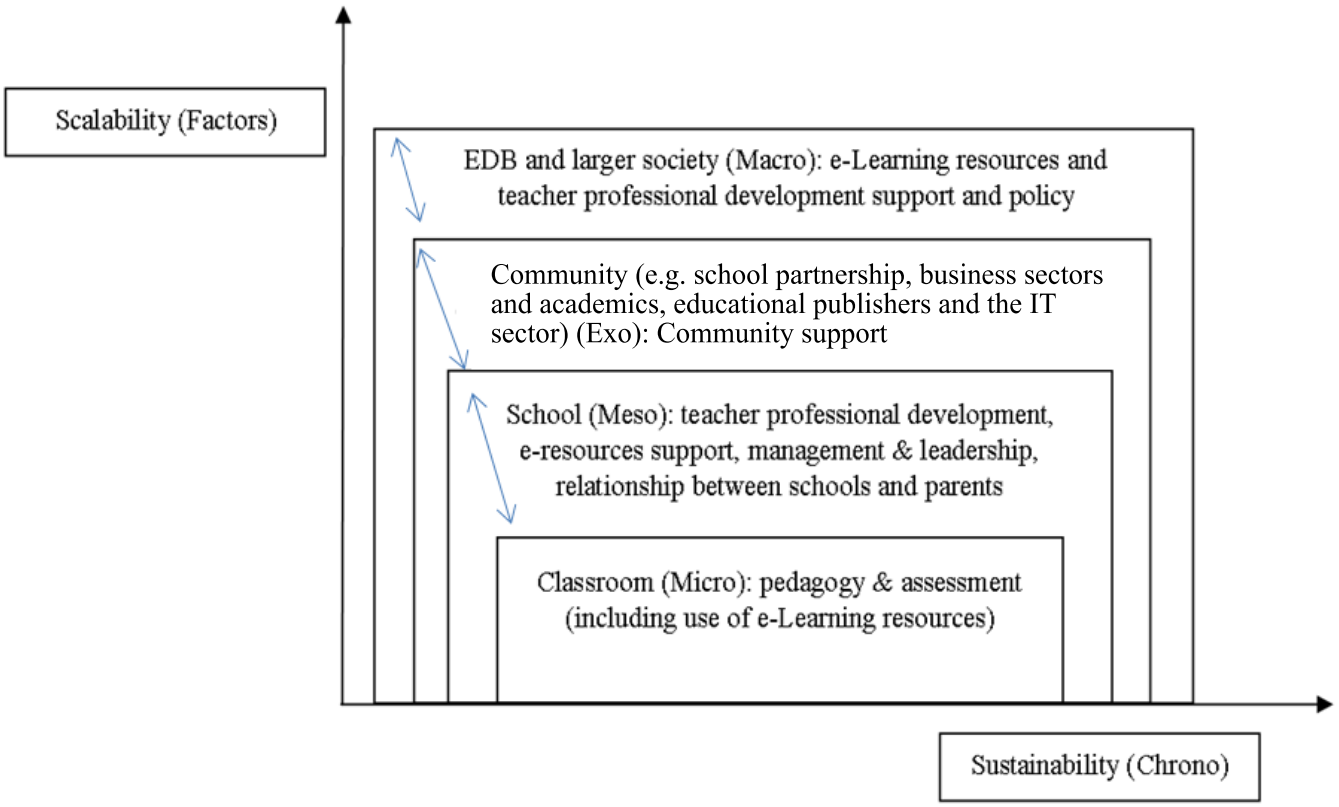
To collect both qualitative and quantitative school data (2011/12 – 2013/14), the research team (Part 1) had:

- Conducted annual interviews with various stakeholders of the 21 pilot projects including the core teams, project coordinators, principals, business partners, parents as well as EDB officers;
- Conducted annual surveys with principals, teachers, teachers in charge of IT, and students;
- Collected exemplars of students' authentic work at three different levels of outcome quality (three high, three medium and three weaker level), teachers' lesson plans and completed assignment coversheet templates associated with the collected student work and school project progress reports on joining the Pilot Scheme; and
- Analyzed the qualitative and quantitative data with various statistical methods, including descriptive statistics and inferential statistics to describe associations and model relationships within the data and verification of the conclusions.

Appendix 3(a)

Conceptual Framework of the Study (Part 2)

This part was an in-depth case study to gauge a deeper understanding of the processes and outcomes of the implementation of e-learning in the pilot schools. To streamline, 11 pilot school projects were selected and the case study was being conducted (2012/13 -2013/14). The research framework is illustrated in the figure below.



To collect data, the research team (Part 2) had conducted:

- Examinations of lesson plans and teaching materials to triangulate the data;
- Lesson observations with post-class interviews with the teachers and student involved, class videos, semi-structured individual interviews with the teachers concerned;
- Focus group interviews with the students involved, principals / teacher representatives, parents from case pilot projects and business partners as well as questionnaire surveys for students, teachers and parents;
- Content analysis and cross-case analysis of the data collected from all interviews and class observations; and

- Data analysis involving:
  - (i) A preliminary exploratory analysis in understanding the data of each case;
  - (ii) Categorizing strategies to code cases in relation to the research questions;
  - (iii) Cross-case analysis in comparing and contrasting the findings; and
  - (iv) Quantitative analysis in processing the surveys.

Appendix 3(b)

Visions and beliefs of the Pilot Projects Participated in the Study (Part 2)

The visions and beliefs of the 11 pilot projects are tabled below:

Project Case*	Visions and Beliefs
S10	• To increase students' self-autonomy, motivation and learning interest • To achieve a paradigm shift of student-centered learning optimizing existing e-learning materials • To develop an e-platform to foster communication between students and encourage their interactions
S20	• To nurture students' self-directed learning and cater learners' diversity • To tailor-make e-learning and teaching materials to allow flexibility in teaching • To extend student learning outside classroom with ICT
S30	• To cater student learning diversity by facilitating assessment for learning • To promote mobile learning with social media elements to extend learning outside classroom • To increase student peer interactions and their learning motivation • To inspire students to have early contact with IT for career development
S40	• To extend student learning outside lesson time through self-directed learning • To achieve paradigm shift from teacher-centred to learner-centered learning • To cultivate students' information literacy and critical thinking ability • To enhance teacher-student interaction and student peer collaboration
S50	• To help students with dyslexia to improve writing and reading skills, as well as to enhance their self-confidence and motivation in language acquisition • To enrich and promote the use of e-learning platform
C11	• To integrate IT into teaching for catering students' individual learning needs • To improve student's information literacy • To adopt rubrics for e-assessment
C21	• To achieve a student-centered paradigm shift through e-learning implementation • To enhance the school's curriculum structure with practices of self-directed learning • To establish a student-centered e-learning community via a virtual game platform • To motivate students to learn outside classroom and explore extra knowledge outside school syllabus

Project Case*	Visions and Beliefs
C31	• To engage students in active learning with elements of self-directed learning • To address individual students' learning needs • To strengthen students' problem-solving skills
C41	• To bring about a student-centered paradigm shift • To promote self-directed learning through the Bring-your-own-device initiatives • To improve student-teacher interactions • To encourage students to become active learners
C51	• To equip students' information literacy • To cope with students' learning differences • To accentuate subject learning objectives by designing a learning ability framework • To develop a systematic online learning resources management system
C61	• To promote student-centred e-learning model and paradigm shift • To enhance teachers' professional development in e-learning • To set common assessment standard for special schools • To extend the use of e-learning platform for schools in the community

* Note: The project schools were coded for data privacy purposes.