

HONG KONG HOME ECONOMICS TEACHERS' ADOPTION OF ICT FOR LEARNING AND TEACHING

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Abstract: The Hong Kong government has implemented policies to increase both the availability of ICT in schools and the capabilities of teachers for using them. This paper reports the responses of Hong Kong Home Economics teachers using a theoretical framework informed by educational change theory and prior research about the adoption of ICT by teachers. A questionnaire distributed to 350 Hong Kong secondary schools elicited 252 responses that appeared to be representative of the population. Data revealed that typical respondents had attained at least the intermediate level on the HK IT competence standards for teachers, held positive attitudes toward the use of ICT in teaching, and had access to ICT in their teaching spaces. However, the mean rate of use of ICT for teaching was 1.5 hours per week and the major uses were for lecturing or explanation. Although most had encountered problems when using ICT in their teaching they generally agreed that technical support was adequate. A large proportion saw a need for additional subject specific ICT resources and professional development in pedagogy.

Background

In common with governments of many countries around the world, the government of the Hong Kong Special Administration Region (HKSAR) has recognized the significance of Information and Communication Technologies (ICT) for education and has developed related initiatives. Commencing from 1998, these have included substantial investments in computers and Internet access for schools and professional development for teachers with the broad goal of preparing students to be creative, inquisitive learners, with a broad knowledge base, global outlook, attitudes for life-long learning and ability to process information effectively (Education and Manpower Bureau, 1998). In short, the goal was to prepare students with twenty-first century skills while encouraging teachers to switch from traditional didactic pedagogies to constructivist approaches incorporating ICT in ways consistent with the new skills (Partnership for 21st Century Skills, 2007).

An early review of the initiatives (Law, 2001) found that they had a clear focus on providing ICT infrastructure in schools, enhancing teachers' ICT competency, and supporting ICT use in schools with curriculum resources and support personnel. By that time there was clear evidence that ICT infrastructure in schools had been improved and that teachers' skills had improved. The initiatives had included development of four levels of IT competency (Education and Manpower Bureau, 1998):

- Basic level (BIT) requiring 18 hours of training for word processing, Internet, and common educational software use;
- Intermediate level (IIT) requiring 30 hours of training for basic ICT tools and use of teaching resources from Internet and intranet for lesson preparation and teaching;
- Upper Intermediate level (UIT) requiring 30 hours of additional training for networking, simple computer problems and understanding IT tools and resources; and
- Advanced level (AIT) requiring part-time studies of up to 120 hours over two years to understand computer managed instruction systems, evaluate instructional software, design instructional materials using IT, and select appropriate equipment for a school's needs.

By the end of the 2002/2003 school year all 50600 teachers in Hong Kong had successfully completed the BIT program, 77% had passed the IIT, 27% had achieved the UIT and 6% had achieved the AIT (Education and Manpower Bureau, 2004).

Law (2001) found that, although Hong Kong teachers had started using ICT in teaching, their use was



predominantly an expository pedagogical approach. More than 70% of the teachers used computers mainly for preparing teaching materials; more than half of the teaching time was spent on lectures and explanations; and there was little time for students' individual work and even less for small group work incorporating ICT. To that time implementation of the policies had made no noticeable changes in terms of the anticipated new learner-centred paradigm or in achieving the goal of developing the attitudes and capabilities for lifelong learning.

Educational Change and ICT

Educational change is a complex process that involves changes in teachers' beliefs and teaching style that come about through personal development in a social context (Fullan, 2007). According to Fullan, numerous factors affect implementation of change. They can be considered in groups as characteristics of the change process itself (need, clarity, complexity, practicality), characteristics of the local context (district, community, principal, teachers), and external factors (government and other agencies). Any effort to understand and effect change in a school system will need to take account of these factors.

Previous research into the integration of ICT in education identified numerous barriers that need to be addressed. Ertmer (1999) classified barriers to integration of ICT as first- and second-order. First-order barriers are extrinsic to teachers and include lack of technical support and inadequate skills. Second-order barriers are intrinsic to teachers, such as attitudes toward teaching, beliefs about computers, and willingness to change. More recently, Hew and Brush (2007) reviewed a large number of studies and arrived at a set of six barriers, which they were able to group according to Ertmer's (1999) typology. They listed as first-order barriers, lack of resources, institutional factors, subject culture and assessment, and as second-order barriers, attitudes and beliefs, and knowledge and skills.

Home Economics teachers share a distinct subject culture associated with the interdisciplinary emphasis on skills across the major areas of Food and Nutrition, Dress and Design, and Family Studies. The practical nature of the subject and its relationship to everyday life make it important that the way it is taught should reflect societal trends, including the application of ICT (Keane, 2002). Studies of ICT adoption by Home Economics teachers in New Mexico found that they did not incorporate ICT regularly but were willing to do so when they were given access to equipment and facilities with the major perceived barriers to adoption being lack of hardware and software (Croxall & Cummings, 2000). The study reported in this paper was designed to investigate the adoption of ICT by Home Economics teachers in Hong Kong in the light of prior research about educational change, barriers to ICT use by teachers, and adoption of ICT by Home Economics teachers in other contexts.

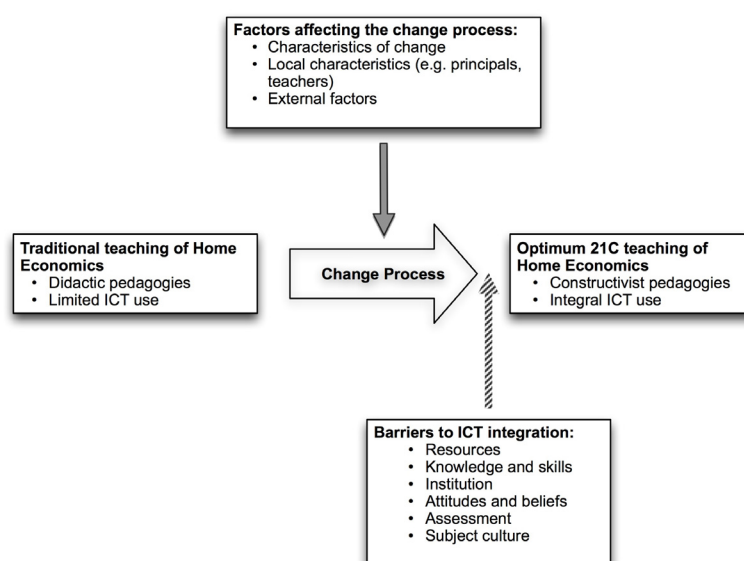


Figure 1: Theoretical Framework

Figure 1 shows a theoretical framework representing change from traditional teaching to 21st century approaches influenced by the factors identified by Fullan (2007) and the barriers described by Hew and Brush (2007). Although Home Economics is identified as the particular subject culture for this study the framework would apply equally well to other subjects in the school curriculum.

Within the context of the wider study, the focus of this paper is on the uptake of ICT among Hong Kong Home Economics teachers and their perceptions of the barriers to more extensive adoption.

Method

The study was intended to be exploratory and used a mixed methods approach, collecting quantitative data using a questionnaire followed by interviews with a small representative group of teachers. This paper presents only data from the questionnaire, which was developed from consideration of the elements in the theoretical framework (Figure 1) and prior studies of ICT adoption in Hong Kong and elsewhere. The questionnaire was designed in six sections covering demographics including IT background, school ICT facilities and use, ICT use by teachers outside school, perceptions of the effect of ICT on learning in Home Economics, perceived barriers to ICT integration, and general attitudes to computers. Printed questionnaires designed to facilitate optical scanning were used.

A single copy of the questionnaire was distributed to each of 350 Hong Kong secondary schools that were known to offer Home Economics, with a request to the teacher in charge of Home Economics to provide copies to other Home Economics teachers if there were any in the school.

Results

A total of 252 questionnaires were completed and returned, representing 58% of the 435 Home Economics teachers known to be in the schools. Of the 250 teachers who responded to the question about gender, 248 (98.4%) identified themselves as female and 2 (0.8%) as male, corresponding closely to the relative proportions of gender among Home Economics teachers in Hong Kong.

Table 1 presents the age profile of the respondents together with their reported levels of IT competence on the model established for Hong Kong teachers (Education and Manpower Bureau, 1998). There is a significant relationship between age and reported level of IT competence [$\chi^2 = 45.7$, $p < 0.001$], reflecting the expected trend of higher levels of competence among younger teachers except for the over 50 years group in which 25% had achieved UIT (compared to 8% for the 41 – 50 years group). This apparent anomaly may result from the very small number of responses in this age group. Alternatively it may be that older teachers without IT skills have left or that more experienced teachers require less time for preparation and can spend more time gaining IT skills.

Table 1
Distribution of Reported IT Competence Levels by Age Group

Age	IT Competence Level				N
	Basic (BIT)	Intermediate (IIT)	Upper Intermediate (UIT)	Advanced (AIT)	
21–30	2	27	38	0	67
31–40	6	66	32	0	104
41–50	14	44	5	0	63
Above 50	2	7	3	0	12
Total	24	144	78	0	246

Consistent with all teachers having achieved BIT and 90% having reached at least IIT, teachers in all age groups agreed that they had adequate IT skills to facilitate teaching, with a mean rating of 3.47 on a 5 point scale. Younger teachers typically reported significantly higher levels of agreement [$F(3, 244) = 6.8$, $p < 0.001$] (Table 2), which is consistent with the general trend evident in Table 1.



Table 2
Teachers' Perceptions of Having Adequate IT Skills for Teaching by Age Group

Age	N	Mean	SD
21–30	67	3.78	.60
31–40	104	3.49	.88
41–50	64	3.22	.97
Above 50	13	2.92	.86
Total	248	3.47	.87

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

Table 3 summarises reported use of computers for teaching in class (hours per week) and outside of school hours (hours per day), typically at home. No significant relationship was found between teachers' age, years of teaching experience or level of academic qualification and their use of computers for teaching but there was a significant relationship between age and computer use outside of school [$F(2, 243) = 11.2, p < 0.001$] with higher levels of use reported by younger teachers.

Table 3
Computer Use In and Out of School by Age Group

Age	N	Teaching with computers (h/wk)		Computer use outside (h/d)	
		Mean	SD	Mean	SD
21–30	67	1.51	.79	2.3	1.32
31–40	104	1.53	.74	2.7	1.07
41–50	63	1.54	.91	1.3	0.91
Above 50	13	1.38	.77	1.0	0.78
Total	247	1.52	.80	1.7	1.16

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

No significant relationship was found between reported level of IT competence and either frequency of computer use for teaching in class or requirements for student use of computers and Internet to complete homework. However, higher levels of IT competence were significantly associated [$F(2, 245) = 14.5, p < 0.001$] with daily hours of computer use at home as shown in Table 4.

Table 4
Daily Hours of Home Computer Use by IT Competence Level

IT Competence Level	N	Mean (h/d)	SD
Basic (BIT)	24	1.1	0.8
Intermediate (IIT)	144	1.5	1.0
Upper Intermediate (UIT)	80	2.2	1.3
Total	248	1.7	1.2

Respondents were generally positive about the application of ICT for teaching Home Economics but those reporting higher levels of competence were likely to report significantly higher agreement with statements about the usefulness of ICT in teaching Home Economics (Table 5).

Table 5
Teachers' IT Competence and Perceptions of Application of ICT in Home Economics

IT use ...	Overall	BIT	IIT	UIT	F (2, 245)	Post Hoc Tests (S-N-K)
	N=247	24	144	80	p	
... made Home Economics more interesting	3.9	3.7	3.9	4.0	3.3 p=.038	BIT < IIT, UIT
... made Home Economics resources easier to locate	4.1	3.9	4.0	4.2	3.2 p=.042	BIT < UIT

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree



Further evidence of the general consistency of responses is apparent in Table 6 where respondents reporting higher levels of IT competence were significantly more likely to agree that they had adequate skills for teaching with ICT [$F(2, 246) = 15.4, p < 0.001$]. Teachers reporting higher levels of competence were also significantly more likely to report that they had access to sufficient professional development opportunities for integrating ICT in Home Economics [$F(2, 237) = 4.5, p = 0.012$] but more than half (51.5%) of the teachers thought there was insufficient opportunity for relevant professional development and a further 29% were unsure about the availability of professional development opportunities.

Table 6
Teachers' IT Competence and Self-Reported Adequacy of Skills for Teaching with ICT

IT Competence Level	Overall	Mean	SD	Post Hoc Tests (S-N-K)
Basic (BIT)	24	2.9	0.93	BIT < IIT < UIT
Intermediate (IIT)	145	3.4	0.87	
Upper Intermediate (UIT)	80	3.9	0.66	
Total	249	3.5	0.86	

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

Most of the teachers (79.4%) reported that there were computers available in the Home Economics classrooms, most commonly one computer per room, and most of those computers (77.4%) were connected to the Internet. Other than a small proportion (1.2%) who reported never having used a computer in the classroom, teachers who did not have computers in their classrooms nominated strategies including bringing their own laptop or booking other computers within the school for those occasions when they might want to use a computer for teaching. Each school had a Multimedia Learning Centre (MMLC) with 40 networked computers but these facilities were in heavy demand by other subjects and not often available for Home Economics use. Other computer-related hardware reported as available in Home Economics classrooms included data projectors (67.5%), printers (43.3%), and scanners (2.8%).

As shown in Table 7, the most common classroom uses of computers by these teachers were consistent with a traditional expository pedagogy. This is similar to what was reported in a previous study of general use of ICT in Hong Kong schools (Law, 2001). Frequency of reported use was low with 40% reporting computer use at least weekly, 53% once or twice per month or term, and the remainder once or twice a year or not at all. As shown in Table 3, average use of the computer for teaching was about 1.5 hours per week or less than 20 minutes per day.

Table 7
Teachers' use of Computers in the Home Economics Room

Uses of computer	% of Teachers
Lecturing or explanation/illustration	88.9
Preparing notes for teaching	83.7
Student learning activities or student presentation	54.8
Communicating with students	8.3
No use	1.2
Other	2.0

Almost all (93.3%) of the respondent teachers had access to an Internet connected computer at home which is a substantially higher proportion than for the wider Hong Kong community for which recent data suggests the penetration rate of broadband Internet exceeds 77% (Hong Kong Trade Development Council, 2009). Of the teachers who reported having computers at home, daily use was reported as less than 1 hour (30%), between 1 and 2 hours (36%), between 2 and 3 hours (20%), or more than 3 hours (13%). Commonly reported uses were word processing or typing (93%); email, newsgroups or sending e-cards (54%); and preparing lessons or other work related activities (33%).



The survey asked about teachers' perceptions of the usefulness of ICT for achieving particular educational outcomes and for Home Economics teaching specifically. Table 8 presents the results, demonstrating strong agreement with the proposition that ICT is useful for achieving educational outcomes and specifically in Home Economics.

Table 8
Teachers' Perceptions of the Usefulness of ICT for Outcomes in Home Economics

Statements	% of teachers choosing the option (N = 252)					Mean score
	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	
ICT is useful in improving students' ...						
... problem solving skills	0.4	6.7	37.7	52.4	2	3.5
... research and study skills	0.8	2	7.5	71	17.5	4.0
... self-learning skills	0.4	0.8	4.8	73.8	19.8	4.1
... creativity	0.8	6.3	32.5	56.3	3.6	3.5
... academic achievement	0.4	9.5	36.9	47.6	4.4	3.4
... communication skills	2	19	25.8	46	6.3	3.3
... participation in discussion	0.8	19	41.3	36.1	2	3.2
... motivation towards learning	0	7.5	24.2	61.1	6.3	3.6
... collaboration skills	0	11.9	37.3	47.6	2.4	3.4
The use of ICT has...						
... made my Home Economics lessons become more student-centred e.g., cooperative and group work	0	14.3	31.7	49.6	4	3.4
... made the Home economics lessons more interesting	0	3.6	11.9	71	13.1	3.9
... made locating Home Economics and related resources easier	0	0.4	9.5	72.2	17.5	4.1

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

Table 9 presents data for an item on which participants were asked to rate a series of statements on a scale from 1 to 7 with 1 indicating that the statement was untrue of them and 7 indicating that it was very true of them. Overall the teachers expressed a positive attitude toward computers, with those who had achieved higher levels of IT competence generally reporting more strongly positive attitudes. The only item to return an overall mean lower than the mid-point score (4.0) was one related to strength of technical knowledge for which the mean was less than the mid-point value for all but the UIT group. Attitude was not significantly related to either age or years of teaching experience.

Table 9
Teachers' IT Competence Levels and Attitudes Toward Computers (N = 246)

Attitude statements	Overall (n=249)	BIT (n=24)	IIT (n=145)	UIT (n=80)	F p	Post Hoc tests (S-N-K)
My attitude to computers is very positive	5.26	4.92	5.21	5.45	F(2,246) = 2.6 p = .073	
I strongly enjoy working with computers	4.65	3.96	4.51	5.12	F(2,246) = 11.0 p = <.000	BIT < IIT < UIT
I am highly confident in my computer abilities	4.18	3.13	4.01	4.79	F(2,246) = 23.3 p = <.000	BIT < IIT < UIT
Computers strongly motivate students to do better work	4.37	3.75	4.35	4.59	F(2,245) = 5.0 p = .007	BIT < IIT, UIT
My technical knowledge is very strong	3.87	3.04	3.66	4.49	F(2,245) = 22.4 p = <.000	BIT < IIT < UIT
I am very independent with computers	4.12	3.42	3.88	4.76	F(2,246) = 18.4 p = <.000	BIT, IIT < UIT

Note: Mean for 7 point scale, 1 = untrue to 7 = very true



Table 10 presents data from a series of items that asked about levels of agreement with a series of statements about problems related to ICT resources in the schools. The statements were worded positively so that the default response was that resources were adequate. Low levels of agreement were recorded for all but one statement, indicating that the teachers perceived problems related to the provision of ICT resources. The only statement that attracted mean agreement higher than the mid-point score of 3 was one indicating that the school had good ICT support, presumably a reflection of the government commitment to providing such support as part of its initiatives.

Table 10
Teachers' Levels of Agreement Regarding Problems Related to ICT Resources

Variables	% of teachers choosing the option					Mean score
	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	
My school has good ICT support	2.4	17.9	18.3	56.3	4.0	3.4
Plenty of Home Economics software	10.3	56.3	19.8	11.5	0.5	2.3
Plenty of hardware facilities in the Home economics rooms	10.7	49.2	15.1	23.8	0.8	2.5
Plenty of time to practise ICT skills	15.1	61.5	11.9	11.5	0	2.2
Strong leadership in using ICT at school	3.2	49.6	25.4	21.0	0.4	2.6
Have skills to implement ICT in Home Economics	3.2	36.1	30.2	29.4	0.8	2.9
Have time to implement ICT in teaching	6.7	54.0	19.0	18.7	0	2.5
Plenty of professional development in integrating ICT in Home Economics	6.7	44.8	29.0	15.5	0.4	2.5
Plenty of support from the school management	2.4	33.7	32.1	29.8	1.2	2.9
Plenty of financial support in Home economics to purchase any hardware and software	7.9	44.8	28.2	17.5	0.8	2.6
Plenty of Home Economics resources in the local educational portal site	9.1	51.6	27.4	10.7	0.4	2.4
My students do not have problems accessing computers at home	7.1	37.7	26.6	26.6	1.6	2.8

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

Table 11 presents data from a series of items concerning teachers' needs in relation to ICT. Although teachers generally agreed that they had adequate IT skills for teaching Home Economics they also saw the need for further training in both specific software and the use of IT in teaching. Consistent with the data in Table 10, teachers agreed that there was sufficient technical support but admitted to encountering problems when using ICT in teaching and saw deficiencies in resources for teaching specific aspects of Home Economics.

Table 11
Teachers' Levels of Agreement Regarding ICT Needs

Statements	% of teachers choosing the option					Mean score
	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	
I have adequate IT skills to facilitate the teaching of Home Economics	0.4	19.8	16.3	59.5	4.0	3.5
I need further IT training in using some computer software	0.0	5.6	8.3	74.2	11.9	3.9
I need further IT training in how to integrate ICT in the teaching and learning of Home Economics	0.4	4.8	8.7	71.8	13.5	3.9



Statements	% of teachers choosing the option					
	1	2	3	4	5	Mean
There are enough IT resources for teaching the Food and nutrition area of the Home Economics syllabus	6.7	41.7	30.2	21	0.4	2.7
There are enough IT resources for teaching the Textiles area of the Home Economics syllabus	8.3	47.2	36.9	7.1	0.0	2.4
There are enough IT resources for teaching the Family area of the Home Economics syllabus	7.9	48	34.1	9.5	0.0	2.4
There is enough technical support in my school for the use of ICT in the Home Economics classroom	2.8	29	14.3	52.8	1.2	3.2
I have encountered problems when using ICT in teaching Home Economics	0.4	15.9	20.6	61.1	2.0	3.5

Note: Mean for 5 point scale, 1 = strongly disagree to 5 = strongly agree

Discussion

Although none of the respondents reported having reached the AIT competency level, 90% had achieved at least the IIT and 32% had gone on to complete the UIT. On average they agreed that they had adequate IT skills for teaching, with younger teachers and those who had achieved higher levels of IT competency reporting stronger agreement. However, only 20% agreed that they had access to sufficient professional development activities for integrating ICT in Home Economics, suggesting that, despite having the basic skills for teaching with ICT, they were conscious of a need for continuing development especially in relation to pedagogy appropriate to integration of ICT.

Compared to the general population of Hong Kong, these teachers were more likely to have Internet connected computers at home. Those with computers at home reported using them for a variety of purposes with the most common being word processing and communication. About one-third reported using their home computer for work related activities including lesson preparation. Younger teachers and those who had achieved the higher levels of IT competence (IIT and UIT) reported higher mean levels of home computer use. However, time spent using computers for teaching in school was not related to age or competence level, suggesting that some factors other than ICT skill level were affecting use for teaching.

A lack of positive attitude toward ICT and its use in teaching Home Economics was not an impeding factor. There was strong agreement of respondents that ICT made Home Economics more interesting and made it easier to locate relevant resources and that ICT was useful for improving a variety of student outcomes. General attitudes toward ICT were positive, with higher values reported for those with higher levels of IT competence. However, only the group with the higher level of IT competence (UIT) agreed that their technical knowledge was very strong.

In general these Hong Kong Home Economics teachers possess better than basic ICT skills, are regular users of ICT in selected circumstances, and have positive attitudes toward ICT in general and the application of ICT in Home Economics in particular. However, their self-reported use of ICT for teaching in their Home Economics classes is modest and apparently little affected by age or ICT skill levels. Reported uses of ICT in class were dominated by practices associated with traditional didactic pedagogies such as lectures and explanations, or preparing notes for teaching. Uses such as better quality presentations may capture learners' attention and make teaching more effective but are not transformative in the development of 21st century skills. The extent of computer-based activities in the Home Economics classroom is likely to be always limited by the nature of the subject, which requires considerable time to be reserved for practical activities. Computers may find more use in theoretical components of the subject and in researching and designing practical projects than in the actual practice. A further limitation is imposed by the typical availability of only a single computer in each Home Economics room. However, it is possible to use a single computer for more learner-centred



activities than lectures and to extend learning beyond the limits of the class using online resources and activities such as discussion forums.

In terms of the framework presented in Figure 1, although there is strong pressure for change from government and teachers are generally positive about the possible value of the change, the change that has occurred to date is limited, suggesting that there are barriers yet to be overcome. On the items that sought responses about problems related to ICT resources, there was wide agreement that schools had good ICT support, that school management was supportive, and that students had adequate access to computers at home. Teachers saw problems with a lack of time to practise their ICT skills and limitations in the availability of Home Economics software. The latter was confirmed in the questions about perceived ICT needs on which respondents registered strong desire for more resources for specific areas of the Home Economics syllabus. As noted above, despite a general sense of adequacy of skills on other parts of the questionnaire there was strong agreement about the need for further training in the specifics of working with ICT in Home Economics.

Overall there are some similarities evident to the findings reported by Cuban (2001) in which secondary school teachers in Silicon Valley had positive attitudes to computers and used them extensively to support their work through preparation and administration but relatively seldom for actual class work. Teachers in that study also reported that there was a lack of time to incorporate computers because time is needed for locating and previewing resources, developing additional skills, and planning. Cuban suggested that the limited use of computers for actual teaching, as distinct from planning for teaching, could be explained, at least in part, by teachers making a reasonable decision to avoid the risks of working 'live' with potentially unreliable technology because they could use their backup plans made to cope with technology failure to achieve their teaching goals without needing to plan twice.

Similar considerations may provide a partial explanation of the patterns of ICT use by Home Economics teachers in Hong Kong with the balance apparently related to the need for more specific teaching resources and professional development, together with time for familiarisation with resources and for planning. The general IT competency development efforts appear to have been successful as far as they go in providing teachers with a sense of having adequate basic skills but do not answer the need for how they should change their pedagogy in the presence of ICT. Respondents indicated a desire for professional development with a specific focus on using ICT in Home Economics classes and for opportunities to share approaches with other Home Economics teachers. The challenge for those responsible for Home Economics education in Hong Kong is now to develop the resources and pedagogical professional development to capitalise upon the reservoir of skills and positive attitudes already developed among the teachers by assisting them to conceptualise, and make, the relevant changes in their pedagogy.

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