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## INFORMATION NOTE

### Use and development of electronic learning resources for school education in selected places

#### 1. Background

1.1 The prices and use of school textbooks have been a public concern in Hong Kong, primarily due to the financial burden they place on parents and the physical burden on students' schoolbag load.<sup>1</sup> According to the annual price surveys of the Consumer Council, the average prices of textbooks have kept on rising in recent years, at a rate from around 2% in 2004 to over 7% in 2008. With the implementation of the new senior secondary curriculum in September 2009, it is expected that expenditures on textbooks would continue on the rise. For example, the recommended core-subject textbooks, including Chinese Language, English Language and Mathematics, will cost 8% more on average<sup>2</sup>. Regarding the weight of textbooks, a previous study<sup>3</sup> indicated that the average schoolbag load of Hong Kong students was 20.2% of their body weight, exceeding the Department of Health's recommendation of not more than 15% of a student's body weight.

1.2 In view of the financial and physical burden of textbooks placed on both parents and students, the Education Bureau established the "Working Group on Textbooks and E-learning Resources Development" (Working Group) in October 2008. The Working Group is tasked to address these concerns by examining the future development and prices of textbooks, and the use of electronic learning (e-learning) resources, including electronic textbooks (e-textbooks). The Working Group aims at completing its study by 2009.

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<sup>1</sup> *Minutes of Meeting of the Panel on Education of the Legislative Council* (1998); Legislative Council Secretariat (2007); and *Official Records of Proceedings of the Legislative Council* (1998, 2001, 2008).

<sup>2</sup> Education Bureau (2009) and South China Morning Post (2009).

<sup>3</sup> Hong Kong Society for Child Health and Development (1988).

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1.3 The Working Group will report its interim work progress to the Panel on Education at its meeting on 11 May 2009. To facilitate the Panel's deliberations on this issue, this information note aims to provide information on the experiences of three overseas places relating to the use and/or development of e-learning resources for schools. The three selected places, namely Texas of the United States, Australia and Singapore, have embedded e-learning into school classrooms since the 1990s. Texas has launched a pilot project in selected public schools across the state on the use of wireless laptops for learning online instructional materials, including e-textbooks. Both Australia and Singapore have been actively developing online or digital curriculum resources since the past decade to enrich and diversify the teaching and learning process, and to reduce the sole reliance on the use of textbooks.<sup>4</sup> In particular, this note looks at their practices in developing and promoting the use of such resources, and covers the following aspects:

- (a) major characteristics of the initiative or strategic plan for developing e-learning resources;
- (b) major outcomes achieved, including implementation outcomes and student learning outcomes;
- (c) cost for developing and using the e-learning resources; and
- (d) future plans relating to the development or promotion of the use of e-learning resources, particularly for the purpose of reducing reliance on printed textbooks.

## **2. Use of electronic textbooks in Texas**

2.1 Electronic textbooks or "e-textbooks", also called web-textbooks, online textbooks or digital textbooks, refer to the digital or electronic equivalent of the conventional printed textbooks.<sup>5</sup> In general, the content of e-textbooks can be read on desktop computers, laptops, personal digital assistants (i.e. PDAs), handheld reading devices, through web browsers, or stored on CD-ROMs and DVD-ROMs.

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<sup>4</sup> Info-communications Development Authority (2006) p. 14 and Spring Consulting Services Pty Limited (2004) p. 79.

<sup>5</sup> Lau (2008).

2.2 According to the opinions of some field experts<sup>6</sup>, the exclusive use of e-textbooks by schools is rare. Initiatives of e-textbook adoption are often pilot projects being sponsored by the governments or commercial companies such as publishers and software and hardware development houses. The ensuing paragraphs report on the relevant information of a pilot programme of e-textbooks introduced in Texas for selected public schools.

2.3 Texas is required by the Texas Constitution to provide free textbooks for school students. The state has been exploring the use of emerging technologies for delivery of textbooks. For example, the delivery media of textbooks has been expanded to encompass CD-ROMs, diskettes, audio and video-cassettes, and laser discs. In 1995, the definition of "textbook" was formally expanded to include "electronic textbook", where the latter is referred to as a system of instructional materials that conveys information to students through electronic means.<sup>7</sup>

### *Technology Immersion Pilot*

2.4 Texas introduced the Technology Immersion Pilot (TIP) programme in 2004. TIP is a legislative mandated programme<sup>8</sup> with funding secured through grants until 2011. It is characterized by its relatively large-scale implementation at the state level, and the systematic inclusion of digital content in core-subject areas to encourage more use of technology in the classroom and reduced use of textbooks<sup>9</sup>, as well as ongoing scientific-based research to examine the impact of the programme.

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<sup>6</sup> Center for Children and Technology (2006) and Lau (2008).

<sup>7</sup> Texas Education Code, Sections 31-32.

<sup>8</sup> Senate Bill 396, enacted by the 78<sup>th</sup> Texas Legislature in 2003, and codified in the Texas Education Code, Sections 32.151-32.157.

<sup>9</sup> The state spends millions of dollars each year on public school textbooks (US\$271 million or HK\$2.1 billion as at 2008, according to the *Texas Annual Cash Report 2008*). There has been consideration of using e-textbooks to replace printed textbooks to reduce cost, but such provision has not yet been made.

2.5 TIP is implemented on 29 campuses in 23 school districts. Funds were available to schools on a competitive grant basis. For 2004-2006, the total funding for TIP was around US\$16.5 million (HK\$128.5 million<sup>10</sup>), whereas for 2006-2008, a total of US\$11.4 million (HK\$88.8 million) was allocated for TIP continuation. There was an additional grant of US\$1.9 million (HK\$14.8 million) for project evaluation.

2.6 TIP experiments on the effects of different levels of "technology immersion"<sup>11</sup> on student learning (i.e. from minimal to full immersion). Students and teachers in the participating schools are provided with a learning package developed by commercial vendors, consisting of a wireless mobile computing device, online instructional resources including e-textbooks, and appropriate software and e-learning tools. The costs of these learning packages range from around US\$1,100 to US\$1,600 (i.e. HK\$8,566 to HK\$12,459). Professional development and ongoing technical support are provided by the commercial vendors.

2.7 Evaluation studies on the outcomes of TIP are conducted annually. A variety of data are collected from questionnaire surveys, site visits, as well as students' test scores and other records. The major findings of the first three years' evaluations (2004-2007) are summarized as follows:<sup>12</sup>

- (a) TIP students generally scored higher on mathematics tests than control students, particularly for economically advantaged and higher achieving students. Further, TIP students who reported more frequent uses of laptops for learning, and especially outside of school, had significantly higher scores in both reading and mathematics tests. The positive effects of technology immersion on students' reading and mathematics achievement were found to increase over time as teachers and students both became more accomplished technology users;
- (b) TIP students attended school less regularly than control students. Their school attendance was found to decline with each implementation year, with lower attendance rates observed with economically disadvantaged students. While the reason for such results was not known, the research team considered that some students might occasionally skip school to study at home;

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<sup>10</sup> The average exchange rate in 2008 was US\$1 = HK\$7.787.

<sup>11</sup> "Technology immersion" means providing, at one time, all of the products and services necessary to successfully incorporate technology into the teaching and learning process.

<sup>12</sup> Texas Education Agency (2008).

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- (c) effects of technology use on students' achievement in other subject areas such as social studies, science and writing were insignificant;
  - (d) level of "student access and use"<sup>13</sup> of laptops remained stable, but at a relatively low level. Students at more than two-thirds of schools used their laptops for classroom learning from once or twice a month to once or twice a week, whereas students at about one-third of schools had minimal access and use. Students generally used their laptop less frequently for learning outside of school; and
  - (e) in the third year of TIP implementation, teachers showed slight increase in their use of technology-enabled student activities in the classroom, with a more positive attitude towards the use of technology in the teaching process.

#### *Future development of Technology Immersion Pilot*

2.8 It is noted that a bill that attempted to expand TIP to high schools and authorize the state authority to make use of the general revenue funds for the pilot project was not supported by the Senate Education Committee.<sup>14</sup> TIP remains a pilot project with the same number of participating schools until 2011. The major concerns raised by the state legislators included:

- (a) a large start-up cost of more than US\$100 million (HK\$779 million) was required;
- (b) the preliminary evaluation results showed relatively low levels of technology use by teachers and students. The impact of the programme on students' academic achievements was yet to show; and
- (c) the rapid changes of technology would make the results of the project obsolete, before the educational value of the technology use could be ascertained.

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<sup>13</sup> "Student access and use" is defined by the extent to which a student had access to a laptop throughout the school year (number of days), the frequency of technology use for learning in core-subject classes, and the extent of laptop use for homework and learning exercises.

<sup>14</sup> House Bill 1632, Legislative Session 80(R).

### 3. Use and development of e-learning resources in Australia and Singapore

3.1 Tables 1-4 provide information on the use and development of e-learning resources in Australia and Singapore.

**Table 1 – Characteristics of the initiative or strategic plan of e-learning resources development in Australia and Singapore**

	Australia	Singapore
Major government initiative or strategic plan	The Learning Federation (TLF) Initiative (2001-2009). <sup>15</sup>	Masterplans for ICT (Information and Communication Technology) <sup>16</sup> in Education, being implemented in three phases: (a) Masterplan I (1997-2002); (b) Masterplan II (2003-2008); and (c) Masterplan III (2009-2014).

<sup>15</sup> The TLF Initiative supports the national e-learning strategy for school education, "Learning in an Online World", in the development of e-learning resources. The current phase of the TLF Initiative will be completed by July 2009. The Australian government is currently undergoing a review of the online curriculum resources. As further action plan has not been finalized, information provided in this note is primarily based on the TLF Initiative. See The Learning Federation (2008b) and Department of Education, Employment and Workplace Relations (2009).

<sup>16</sup> ICTs can be divided into two groups: traditional or old ICTs (e.g. radio and TV) and the new ICTs (e.g. the Internet and telecommunications). Learning through new ICTs is also called e-learning. See Sanyal (2001).

**Table 1 – Characteristics of the initiative or strategic plan of e-learning resources development in Australia and Singapore (cont'd)**

	<b>Australia</b>	<b>Singapore</b>
Goal of the initiative or strategic plan	To develop a national pool of online curriculum content for schools <sup>17</sup> to facilitate teaching and learning, and deliver it electronically to enable teachers and students to gain efficient access to quality-assured resources.	To acquire and develop ICT resources relevant to the curricula objectives, and deliver them through the Internet.
Responsible agent	The Learning Federation (or TLF), a joint venture of two ministerial agencies, namely the Curriculum Corporation and education.au Limited. <sup>18</sup> TLF collaborates with Education Ministers in Australia and New Zealand <sup>19</sup> to develop the pool of online curriculum content.	The Education Technology Division (ETD) of the Ministry of Education (MOE), which is responsible for driving the development of ICT resources for teaching and learning.
Model of development	A government-led approach is adopted, emphasizing collaboration and cost-sharing among the Australian and the New Zealand governments, at both federal and state levels, with a view to achieving economies of scale and avoiding duplication of efforts.	The Singapore government provides top-down support to the ground-up initiatives of schools, emphasizing capacity building of teachers and schools, sharing of best practices, and allowing varying degrees of autonomy and ownership based on individual schools' ICT capabilities and needs.

<sup>17</sup> Australia has a dual school system of government schools (administered by the state or territory governments) and non-government (independent) schools (administered by religious, community or private organizations). Both types of schools receive public funding. The government school sector receives most of their funding from the state or territory governments (over 80%), whereas the non-government school sector receives substantial funding from the Commonwealth government (over 30%). See Independent Schools Council of Australia (2007) and Dowling (2007).

<sup>18</sup> The Curriculum Corporation specializes in curriculum content development, while education.au Limited specializes in online systems development.

<sup>19</sup> The New Zealand Ministry of Education joined the TLF Initiative in July 2002.

**Table 1 – Characteristics of the initiative or strategic plan of e-learning resources development in Australia and Singapore (cont'd)**

	<b>Australia</b>	<b>Singapore</b>
Major contributors of content	<p>(a) National and overseas content providers (including private and commercial vendors);</p> <p>(b) appropriate e-learning resources developed by all education and training sectors, including schools, the vocational education and training sector and the higher education sector;</p> <p>(c) teacher-initiated content; and</p> <p>(d) cultural and community agencies, e.g. museums.<sup>20</sup></p>	<p>(a) Ready-made ("off-the-shelf") e-learning resources, e.g. CD-ROM learning packages available from local and overseas markets;</p> <p>(b) subscription-based e-learning resources, e.g. learning management systems and e-learning portals;</p> <p>(c) teacher-initiated content; and</p> <p>(d) ETD.</p>
Target user groups	Primary and secondary school sectors, i.e. 10 385 schools, with 3.4 million students and 245 777 teachers (as at 2008).	Primary and secondary school sectors, i.e. 351 schools, with 534 737 students and 27 505 teachers (as at 2007).
Target uptake for	No explicit targets for uptake of the online curriculum content in schools have been specified.	ICT was expected to be integrated into 30% of the curriculum at all levels, and as far as possible into all subjects by 2002. <sup>21</sup>

<sup>20</sup> The Learning Federation (2006b).

<sup>21</sup> Koh & Lee (2008) p. 173.



**Table 1 – Characteristics of the initiative or strategic plan of e-learning resources development in Australia and Singapore (cont'd)**

	<b>Australia</b>	<b>Singapore</b>
Incentive for uptake	Nil. Teachers and students generally use the online curriculum content on a voluntary basis.	<p>(a) Recognition schemes were introduced to acknowledge teachers' efforts, e.g. the "Microsoft-MOE Professional Development Award" sponsored by Microsoft in 2004, and the "Lenovo Innovation Award" sponsored by Lenovo launched in 2007; and</p> <p>(b) additional support and resources (e.g. in terms of devolved funds) would be given to schools for innovative use of ICT. For example, the LEAD ICT@Schools Scheme provides eligible schools with funding of up to S\$100,000 (HK\$551,000<sup>22</sup>) over a period of three years for practicing or researching into the innovative use of ICT.</p>

<sup>22</sup> The average exchange rate in 2008 was S\$1 = HK\$5.51.

**Table 2 – Major outcomes relating to the development of e-learning resources in Australia and Singapore**

	Australia	Singapore
Number of reusable or sharable resource items developed	8 600 by June 2009 under two categories, namely learning objects (i.e. interactive multimedia materials) and digital resources (i.e. digitized items licensed from cultural and scientific institutions in Australia and New Zealand).	As at December 2008, the number of school- or teacher-initiated resource items exceeded 80 000. <sup>23</sup>
Major benefits of e-learning resources on student learning	Based on surveys conducted by the University of Sydney, <sup>24</sup> <ul style="list-style-type: none"> <li>(a) students using TLF resources achieved significantly higher scores on Mathematics test items than those who learnt the same content under a traditional classroom condition, particularly when the content dealt with difficult concepts;</li> <li>(b) the use of TLF resources impacted positively on students' motivation and engagement in learning; and</li> <li>(c) students found TLF resources "easy to work through" and "interesting and fun", with the most helpful feature of facilitating self-paced learning.</li> </ul>	According to a survey conducted by MOE, <sup>25</sup> <ul style="list-style-type: none"> <li>(a) over 70% of the students surveyed considered that the use of technologies helped increase their knowledge, and over 80% found the lessons to be more interesting; and</li> <li>(b) based on teachers' comments, the use of CD-ROMs or interactive multimedia resources such as animation, simulation, videos and graphics allowed students to better understand and visualize the concepts and theories, and enhanced students' creative and critical thinking, problem solving skills and independent learning abilities.</li> </ul>

<sup>23</sup> Paid or subscribed products are not included. See Ministry of Education (2009b).

<sup>24</sup> Freebody et al. (2007, 2008).

<sup>25</sup> Ministry of Education (2004).

**Table 2 – Major outcomes relating to the development of e-learning resources in Australia and Singapore (cont'd)**

	<b>Australia</b>	<b>Singapore</b>
Extent of use of e-learning resources	<p>According to several studies conducted among teachers and students across Australia on their use of TLF resources<sup>26</sup>:</p> <p>(a) there was an increase in the use of TLF resources by teachers over time, but the overall usage rate was low;</p> <p>(b) around 30% of the teachers surveyed used TLF resources between once a term and once a week in the classroom, and over one-third had never used TLF resources;</p> <p>(c) the reported number of TLF resources used by teachers ranged from within 10 to over 100, with the largest proportions (30% to 40%) used less than 10 items in total;</p> <p>(d) TLF resources were used more often with classes of years 3 to 7 (i.e. senior primary to junior secondary); and</p> <p>(e) both teachers and students reported higher rates of use of TLF resources in Mathematics, Literacy, and Science than in Innovation, Enterprise and Creativity (especially those related to Arts), and Language Other Than English (e.g. Chinese, Japanese and Indonesian).</p>	<p>(a) According to MOE, ICT was integrated into at least around 30% of the curriculum time;</p> <p>(b) from 2006 to August 2008, over 12 540 teachers (around 45%) have used the school networks to share and gain access to e-learning resources developed by the teachers themselves;<sup>27</sup> and</p> <p>(c) according to other researchers, as at November 2006, around 85% of schools used subscribed services from e-learning resources providers, and 100% of junior colleges (pre-university level) developed their own e-learning content.<sup>28</sup> Subscribed e-learning resources were used more often in Mathematics, Science, and English than with subjects like Mother Tongue (Chinese, Malay, Tamil), and Humanities.<sup>29</sup></p>

<sup>26</sup> See Freebody (2006); Freebody & Muspratt (2007); and Freebody et al. (2007, 2008).

<sup>27</sup> Ministry of Education (2008b).

<sup>28</sup> Powell & Patrick (2006).

<sup>29</sup> Lim (2006).

**Table 3 – Costs related to the development and use of e-learning resources in Australia and Singapore**

	<b>Australia</b>	<b>Singapore</b>
Cost for development	The total estimated cost was around AUS\$73 million (HK\$484 million <sup>30</sup> ) for 2001 to 2006, and AUS\$55 million for 2006 to 2009 (HK\$365 million). <sup>31</sup>	The cost specifically related to content development is not available. However, for the 2008-2010 triennium, MOE's expenditure estimate for "ICT development projects by schools" is around S\$9.6 million (HK\$52.9 million). <sup>32</sup>
Cost for using the e-learning resources	Nil. The nationally funded online curriculum content is free for use for both government and non-government schools.	Subscription fees may be required. Students need to pay for commercially available e-learning resources if these resources are used by their schools. As at 2008, the annual subscription fees ranged from around S\$10 (HK\$55) to S\$50 (HK\$276) per student for access from home and school, depending on the schools' arrangements with the vendors and the scope of the subscribed content. Singaporean students may pay the fees from the Edusave Pupils Fund <sup>33</sup> . Part of students' subscription fees may be subsidized by their schools. <sup>34</sup>

<sup>30</sup> The average exchange rate in 2008 was AUS\$1 = HK\$6.63.

<sup>31</sup> The above cost for development includes the New Zealand's contributions of AUS\$4,864,666 (HK\$32 million) for 2002 to 2006 and AUS\$3,473,496 (HK\$23 million) for 2006-2009. See The Learning Federation (2006a, 2008a).

<sup>32</sup> *Singapore Budget* (2008).

<sup>33</sup> The Edusave Pupils Fund is provided annually by the Singapore government to every Singaporean pupil of six to 16 years for participation in enrichment learning activities. In 2009, the Singapore government contributes S\$200 (HK\$1,014) and S\$240 (HK\$1,217) to the Edusave account of each eligible student at primary and secondary levels respectively. The funds cannot be used to pay for textbooks. The schools also receive annual Edusave Grants for organizing enrichment programmes or purchase additional resources which benefit students. See Ministry of Education (2009a) and Powell & Patrick (2006).

<sup>34</sup> For example, some schools may provide partial subsidies of around 30% to 50% of the subscription fees to students.

**Table 4 – Future plans relating to the development or promotion of the use of e-learning resources in Australia and Singapore**

	<b>Australia</b>	<b>Singapore</b>
Future plans	<p>(a) The Australian government will continue to develop online curriculum content, given the widely recognized value of TLF resources and the potential demand for additional resources for all subject areas and year levels;<sup>35</sup></p> <p>(b) AUS\$32.6 million (HK\$216 million) has been set aside for the development of online curriculum resources, tools and supporting technical frameworks for two additional years;<sup>36</sup> and</p> <p>(c) consideration has been given to accelerating actions in areas of policy and implementation measures necessary for overcoming barriers to the adoption of e-learning resources in classroom.<sup>37</sup></p>	<p>(a) The Singapore government has introduced the "Future Schools" Scheme, a four-year, S\$80 million (HK\$441 million) worth public-private collaboration<sup>38</sup>, in which five schools will take the lead to gradually shift from the reliance on printed textbooks to the use of a variety of highly innovative learning environments to enable learning to take place anytime and anywhere. There may be up to 15 Future Schools by 2015 (i.e. around 5% of schools in Singapore); and</p> <p>(b) new forms of learning content and services have been planned, which primarily include:<sup>39</sup></p> <p>(i) interactive textbooks, which will be available in a one-to-one computing environment (i.e. each student is equipped with a personal computer device for flexible and independent learning);</p> <p>(ii) digital games, which will be used to facilitate experiential learning (e.g. strategy planning, and community-based problem solving and collaboration);</p> <p>(iii) live video broadcast, avatars and three-dimensional (3D) content, which will be used to enable student-teacher interaction in both real-time and virtual learning environments; and</p> <p>(iv) "Learning Digital Exchange", which will provide a network of supplementary digital learning resources on top of the interactive textbooks, covering resources created by teachers, schools and commercial vendors, as well as public resources available from libraries, MOE and other higher institutions.</p>

<sup>35</sup> The Learning Federation (2006a).

<sup>36</sup> Department of Education, Employment and Workplace Relations (2009).

<sup>37</sup> The Learning Federation (2006a).

<sup>38</sup> The development of highly innovative learning resources is one of the components of the "Future Schools" Scheme. See Info-communications Development Authority (2006).

<sup>39</sup> The new learning content and services will be first adopted by the Future Schools, and their experiences and practices will be shared with other schools later on. See Info-communications Development Authority (2006, 2008).

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