e-Textbook Writing Guidelines for
Science Education Key Learning Area

1. Introduction

The purpose of this set of guidelines is to familiarise interested e-textbook publishers with the curriculum aims and objectives, guiding principles for writing e-textbooks of Science Education Key Learning Area (KLA) in a bid to ensure that the e-textbooks are written in accordance with the specific requirements of the curriculum and "The Seven Learning Goals for Secondary Education" (www.edb.gov.hk/en/curriculum-development/7-learning-goals/about-7-learning-goals/secondary.html) (For details, please refer to *Secondary Education Curriculum Guide* (2017)). For the general principles and requirements for writing textbooks, publishers should refer to the latest edition of the *Guiding Principles for Quality Textbooks* available from the Education Bureau's Textbook Information website (www.edb.gov.hk/textbook).

Remarks: Publishers should submit at least three Elective topics, in addition to the Compulsory Part, of Physics (S4-6) for review.

2. Curriculum Aims and Objectives

Publishers should refer to the latest Science Education KLA Curriculum Guide, as well as the Curriculum and Assessment Guide, curriculum documents and supplementary documents of the respective subjects.

3. Guiding Principles

3.1 Content

- Publishers should refer to the latest Science Education KLA Curriculum Guide, as well as the Curriculum and Assessment Guide, curriculum documents and supplementary documents of the respective subjects.

- Both the Compulsory and Elective Parts or the Core and Extension Parts of each subject should be covered by the e-textbooks.

3.2 Learning and Teaching

- Curriculum, pedagogy and assessment form a trio. e-Textbooks prepared for the Science curricula should reflect this trio and support student-centred learning, help our students to construct knowledge and promote understanding of important scientific models and theories.

- e-Textbooks should be designed to be comprehensible and self-contained, and should:

- ➢ provide a sense of purpose and direction for learning;

- ➢ address students' prior knowledge;

- ➢ provide students with a variety of phenomena and help them understand how the phenomena are related to scientific ideas;

- ➢ provide resource materials such as hyperlinks to websites, hyperlinks to videos, online news articles, extracts from articles, flow-charts, photos, diagrams, statistical tables or graphs, etc. for students' reference;

- ➢ guide students' interpretation and reasoning;

- ➢ provide practice in applying scientific ideas;

- ➢ provide assessment tasks to facilitate assessment for learning and assessment as learning; and

- ➢ encourage students to explore science beyond the classroom.

- • Practical work, activities and exercises

  - ➢ Practical work, either integrated with the main text or compiled as a separate section, should be included in e-textbooks to facilitate the development of scientific concepts and understanding, as well as science process skills. Involving students in the planning of investigations would enable them to better understand how variables are controlled, what data have to be collected, how frequent measurements have to be taken, etc. The use of data loggers (or suitable devices such as single-board computers or smartphone devices) and suitable sensors for experiments should be included, as alternatives or in parallel, wherever appropriate.

  - ➢ The instruction, diagrams or photographs, etc. in relation to practical / field work should meet with the necessary safety requirements.

  - ➢ Advice on potential hazards, risk assessment and appropriate control measures for open-ended investigative study, scientific investigations or practical-based projects should also be provided.

  - ➢ In the study of science, practical work is important, but it is not the only type of learning and teaching activity. A range of activities, such as discussion, information search, "reading to learn", writing learning journals, role-play, debate, design and make, project learning, etc. should also be included for the attainment of the objectives outlined in the Curriculum and Assessment Guides.

  - ➢ Suitable exercises should be included to help students learn to locate and process important information from the text. They could help

students assess their attainments of important learning objectives and check their own progress.

- ➢ Learning tasks of different types and demands could be included to embrace learner diversity. Student-centred and interactive approaches are recommended, as they are useful in providing suitable learning experience for stimulating and developing higher order thinking.

- ➢ Application of IT tools could be introduced to enhance the effectiveness and efficiency of doing practical work, and facilitate students to conduct scientific investigation.

- ➢ STEM activities could be introduced to provide opportunities for students to integrate and apply STEM-related knowledge and skills to solve daily life problems.

3.3 Structure and Organisation

- Publishers should refer to the latest Science Education KLA Curriculum Guide and Curriculum and Assessment Guides of the respective subjects.

3.4 Language

- The language used should be appropriate to students' language ability. For the Chinese translation of English terms commonly used in the teaching of science, publishers should refer to the *English-Chinese Glossaries of Terms Commonly Used in the teaching of Science Subjects in Secondary Schools* compiled by the Education Bureau.

- The International System of Units (SI) should be used. For detailed guidance on units and symbols, please refer to *Signs, Symbols & Systematics: The ASE Companion To 5-16 Science* published by the Association for Science Education (1995), UK: ASE, or《高等學校教學參考書——物理量與單位》杜荷聰、王啟堯、袁楠 (1986) 著，中國計量出版社出版。

3.5 Pedagogical Use of e-Features

- The e-features of Science e-textbooks should include:

- ➢ appropriate multimedia such as video clips and animation of experiments / practical activities that could not be demonstrated in school laboratories;

- ➢ interactive simulation tools and animations for appropriate topics that can help to arouse students' interest and consolidate learning; and

> ➤ simulations of experiments that are too fast, too slow, too hazardous or too expensive to be performed in schools.

- Where appropriate, the e-textbooks of Science subjects could include:
  - ➤ e-features to facilitate the development of mathematical skills essential for the understanding of science concepts and solving problems; and
  - ➤ interactive assessment items to facilitate assessment for learning.

3.6 Learning Elements/Skills Not Replaceable by Digital Means

- The use of simulated experiments should not deprive students of the opportunities of engaging themselves in hands-on activities for the acquisition of science process skills.

3.7 Technical and Functional Requirements

- Refer to the latest edition of the *Guiding Principles for Quality Textbooks* for the relevant requirements.

4. Others

4.1 When writing e-textbooks, publishers have to ensure that the contents and information provided in the materials should be correct, complete, up-to-date, objective and impartial. The source and the date of the information should be provided as appropriate. The information in the illustrations and images should avoid showing brand-names of commercial items unless it is necessary.

4.2 Publishers should avoid putting excessive hyperlinks in the e-textbooks so as not to violate the self-containment principles. The contents of the hyperlinks should be placed in the Teacher's Book or the publisher's online learning platforms as far as possible for teachers and students' reference. The hyperlinks should link to the websites with high credibility, such as the official websites and the websites of academic institutions, and avoid linking to commercial or social media platforms.

4.3 It is incumbent on the publishers to ensure that all proof-reading work, including the language, information, punctuation, illustration, pagination, etc., is completed and accurate before submitting the e-textbooks for review.

4.4 Publishers should clear all copyright issues of the e-textbooks as appropriate.

4.5 Publishers should pay attention to the curriculum time allocation suggested in the curriculum documents of this subject to ensure that the learning contents are designed with an appropriate quantity and level.

4.6   If publishers submit other versions (such as Chinese version or printed version) of the same textbook title for review at the same time, they should duly check the consistency of the contents among all the versions. If another version will be submitted at a later stage, the suggestions in the review reports for the previous submitted version should be thoroughly followed before submission.

4.7   Safety precautions for laboratory work and outdoor activities should be concise and precise and should be included wherever appropriate. In particular, helping teachers and students to exercise care and good judgement in safeguarding against laboratory accidents is of paramount importance. Students should always be alerted of potential hazards in laboratory work and activities so that accidents might be avoided. More information on laboratory safety can be found in *Safety in Science Laboratories (EDB, 2013)*.

4.8   Publishers are required to provide relevant information to show the feasibility of the practical activities, including the detailed design, implementation details for facilitating student learning as well as necessary measures for enhancing safety, in the form of guidelines, teachers' handbook/guide, sample results, etc. wherever appropriate, for the EDB's reference in reviewing the e-textbooks.

Science Education Section
Curriculum Development Institute
Education Bureau
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