

METHODS OF TEACHING SCIENCE, BASIC TECHNOLOGY AND COMPUTER STUDIES



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CHAPTER 5

GUIDING PRINCIPLES FOR SELECTION OF COMPUTER SCIENCE TEXTBOOKS

Prof. Samuel Onasanya, Emmanuel Adebayo Alimi & Adekola Aderoju

Though textbooks are not the only learning resources, they still play an important role in student learning. Textbooks are not only teaching materials for teachers, but also students' self-directed learning materials for preparation and revision purposes. Learning may take place beyond the boundary of textbooks and the classroom. It may take place through a diversity of learning materials and experiences. Students can learn in different environments and through different ways (The Education Bureau (EDB), 2014).

Quality textbooks, including both printed and electronic textbooks, which support a learner-focused curriculum, contain the core elements of the subject curriculum, as well as learning strategies useful for the study of the subject. Being important sources of reading for students, quality textbooks help develop students' ability to learn through reading. The amount and quality of the texts to be included therefore deserve greater attention. Other desirable features of a good textbook include interactivity, the ability to arouse the interest of students, and the capacity to actively engage and involve them in the learning process. In other words, good textbooks tell, involve and interact with students.

According to EDB, (2014) in the United Kingdom, the Guiding Principles for selecting a textbook in appropriate subjects cover the following areas:

- a. Content
- b. Learning and Teaching
- c. Structure and Organization
- d. Language
- e. Textbook Language (for printed textbooks only)
- f. Pedagogical Use of e-Features (for e-textbooks only)
- g. Accessibility and Operational Design (for e-textbooks only)

a. Content:

A textbook of a particular subject area manifests or translates the four components of the curriculum that is, aims, content, learning or teaching strategies and assessment for the purpose of student learning. The aims, targets and objectives align with those laid down in the relevant curriculum or subject guide. The content is self-contained and sufficient to address effectively the learning targets of the curriculum without requiring the use of additional supplementary materials associated with the textbooks. The core elements of the subject curriculum are included. No superfluous information is covered, in order to leave room for students to learn how to learn. If the materials included are non-core, non-foundation topics or serve to provide enrichment opportunities only, they should be properly indicated.

The content is current. Information and data are relevant and accurate. The sources of information are appropriately indicated. Concepts are correct and precise. Ideas are coherent. There are adequate examples and illustrations. Such examples

and illustrations are interesting and relevant to students' experience. In the development of concepts, new ones are built on old ones and are introduced when and where appropriate. There is an appropriate balance between depth and breadth in the treatment of the subject content. The level of difficulty of the content is consistent with the curriculum requirements and the cognitive level of students. Appropriate consideration is given to students' prior knowledge and learning experience. There is continuity in the development of concepts and skills to facilitate a smooth transition between different key stages of learning or year levels. Connections between related topics or concepts are highlighted. There is no unnecessary repetition in content. There are multiple perspectives and balanced viewpoints on issues. There is no any bias in content, such as over-generalization and stereotyping. The content and illustrations do not carry any form of discrimination on the grounds of gender, age, race, religion, culture, disability etc., nor do they suggest exclusion. To encourage and facilitate students to read larger amounts of materials on their own, selected further reading lists or related websites are included to let students read extensively. An index is included to make easy reference.

Learning and Teaching:

The development of generic skills is fostered by engaging students in various learning activities to help students learn how to learn. There is a balanced coverage of cognitive skills of all levels, for example, skills in information gathering, remembering, focusing, organizing, integrating, analyzing, generating, etc. Generic skills are developed through learning and teaching in the contexts of different subjects. There is a balanced coverage of cognitive skills of all levels. Higher order thinking skills which require analysis, evaluation and judgment, and not just recalling and comprehension of facts, are progressively incorporated taking into consideration students' ability and developmental needs. Deep processing, critical and creative thinking are encouraged through involving students in less structured problems and more open-ended questions, and further reading. Students are required to experience the process of learning such as by searching for information from various sources. Metacognitive skills, which include the ability to analyze, evaluate and control one's own thinking processes and to plan one's action strategically, are also developed. Learning strategies are included, for example, in the student's guide, or suggested in learning activities.

Positive values and attitudes are cultivated through the learning and teaching in the contexts of different subjects. The content is arranged in suitable learning chunks, which can be used independently or flexibly linked together to form alternative learning paths to cater for student diversity. The strategies and activities on learning, teaching and assessment allow flexible use to cater for students' ability and learning styles, etc. Appropriate support and challenging tasks are provided to cater for students' different ability. Learning activities which are essential to achieving the learning targets are included. Students' performance in these activities provides feedback on how well they learn and directions for further learning and teaching. Learning activities are designed to facilitate students to actively integrate, practice and apply new knowledge. To achieve such purposes, the CORE or other similar models are used in designing learning tasks. CORE refers to: Connect to

students' prior knowledge, Organize new content, Reflect on what has been learned, and Extend by transferring knowledge to new contexts. They foster life-long and life-wide learning, with real life exposure and use of authentic materials and community resources where appropriate. The learning activities are interesting. They involve and motivate students to learn. The learning activities have clear instructions. A range of varied and meaningful activities is provided. Tasks and exercises are appropriate, balanced in number, and congruent with the instructional strategies and learning targets. Suggestions for reflection, self-, peer- and group-assessment can be incorporated as appropriate to the learning objectives and learning activities in order to help improve learning. Activities requiring extended and open-ended responses and a variety of response styles with considerable elaboration are included. The activities help students recognize the objectives of the chapters or units as well as their own learning goals, assess their own learning, and reflect on what and how they have learned so as to enable them to take further steps to improve their learning.

Structure and Organization:

An appropriate structure of the content is provided to facilitate learning. The content sequence is appropriate and logical. Key words and concepts are identified and highlighted. The structure of the content is made apparent by means of functional devices including table of content, chapter titles, headings and outlines. An overview of the learning targets can be put at the beginning and a summary at the end of each unit of study. A simple student's guide can be put in an introductory section to teach students how to use the textbook.

Language:

Textbooks are important sources of reading for students. The amount and quality of texts to be included therefore deserves attention. The texts are of high quality and facilitate students to learn directly and independently from them, and construct meaning on their own. The level of difficulty of the language is commensurate with the language ability of the target students, with new vocabulary progressively introduced in context at appropriate times. Coherent passages are included to help students process text content. Students are provided with opportunities to make good use of language to study the subject, i.e. to use reading, writing, listening and speaking as tools to discover, clarify and extend meaning for constructing knowledge in a given subject. Familiar and interesting language is used to motivate learning and understanding. The text connects with students' prior knowledge, for example, by including analogies and examples that are familiar to students' experience. The language is accurate and precise and students are provided with help in understanding and using the vocabulary and specific patterns of discourse of the subject.

Textbook Layout – for printed textbooks only:

The layout is logical and consistent. The materials are well-organized, with appropriate use of space and margin for ease of reading, but avoiding unnecessary use of blank space. Illustrations such as photographs, pictures and graphs are accurate, appropriate, effective and suitably annotated to stimulate and facilitate

learning. They serve to direct students to the instructional focus rather than distract them from it. A number of factors come into play to make the graphics useful for learning. Specifically, the graphics are relevant to the text. Photographs and illustrations are not just added to lighten up the presentation. Their reference to the text is obvious, either through direct cueing or proximity to the relevant text segment; the sequencing of the graphics is appropriate to show a developmental process; or an appropriate balance is struck between text and graphics. Illustrations such as photographs, pictures and graphs are accurate, appropriate, effective and suitably annotated to stimulate and facilitate learning. They serve to direct students to the instructional focus rather than distract them from it. A number of factors come into play to make the graphics useful for learning.

To help reduce the weight of textbooks, lightweight paper is used. Textbooks can be separated into a few thin volumes, printed in separate modules or bound in loose-leaves. This can help develop in students the ability to manage information as part of their learning. They are thin and compact in size. The relative ease of completion can help create a sense of satisfaction in students. The design facilitates the reuse of textbooks. For example, materials for one-off use – for example, stickers that can be used only once and tearing off pages from the textbook should be avoided as far as possible. The sources of figures and statistics, etc. are appropriately indicated so that students can search for the most up-to-date information if necessary. The font type is one that is commonly used. To avoid confusion, the font type and font size are consistent throughout the textbooks. Based on the “Eyecare” Circular issued by the former Education Department - now the Education Bureau, the minimum font size is equivalent to font size 12 in “Microsoft Word” for legibility. However, in order to avoid eye strain and for more comfort of reading, larger size fonts are recommended, especially for lower levels.

Pedagogical Use of e-Features – for e-textbooks only:

Multimedia content such as photographs, pictures, graphs and video clips are accurate, appropriate, effective and suitably annotated to stimulate and facilitate learning. They serve to direct students to the instructional focus rather than distract them from it. The sequencing of the multimedia content or interactive activities for learning, teaching and assessment is appropriate to show a developmental process; and an appropriate balance is struck between text and multimedia content or interactive activities. Multimedia, interactive activities and learning tools are easy to operate in consideration of the needs and abilities of learners with a view to enhancing learning and teaching effectiveness.

Key topics or terms within the e-textbook and their hypertexts shall be available. The glossary of terms is selected in line with the curriculum aims and objectives. Appropriate interface for accessing the glossary or free online dictionary shall also be provided. Availability of Print on Demand (POD) function incorporated for users to create one or multiple hard copies of the primary reading materials. The POD should be employed wherever necessary according to pedagogical needs. The text on POD shall be searchable.

Accessibility and Operational Design – for e-textbooks only:

The e-textbook shall be accessible with a multitude of common computing devices and common contemporary operating systems. The entire e-textbook shall be capable of being used online with free-of-charge application software such as various contemporary browsers. The e-textbook shall also be compatible with common screen readers. The availability of appropriate interface and features for navigation and search, such as Table of Contents, links to the Table of Contents, location of current page, as well as the next and the previous page buttons, etc. Hypertext, index and full text search function are available. All hyperlinks are valid and copyright cleared. For browser-based e-textbooks, full keyboard operation shall be supported. Alternative text for buttons, images and other non-text elements shall be available. Consistent and intuitive layout of content. Use common font types with larger font sizes and high contrast colour schemes. Content is fit into one page for easy reading. All text can be enlarged without the loss of content or functionality.

Tools for annotation or note-taking, book marking and highlighting which are shareable and synchronisable to more than one computing device when connected online shall be included. Highlighting and note-taking are easy to apply and remove with simple text tool box. Appropriate content shall be capable of being downloaded to a computing device for offline reading with free-of-charge application software. Users can use the tools including annotations or note-taking, book marking and highlighting under offline condition and share via the work Internet. Single sign-on account experience across all e-textbooks shall be made available to users. Adequate capacity and bandwidth shall be ensured to cater for concurrent access of multiple users with reasonable performance.

In conclusion, knowledge transmission alone is no longer adequate, as the realm of knowledge is infinite. Providing students with knowledge alone is inadequate. Rather, we have to equip them with a repertoire of skills for acquiring and building up knowledge and instill in them a positive attitude for life-long learning. Textbooks play an important role in supporting learning and teaching in schools. Textbooks should enable students to learn how to make use of different ways of learning. They should also provide an appropriate amount of quality text for students to “read to learn” independently. It is also important to ensure that no excessive information is covered, in order to leave room for students to learn how to learn. Students will then have opportunities for developing diverse skills of learning according to their interests, needs and abilities(The Education Bureau (EDB), 2014).

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