

# Importance of TPACK-Based Textbook in Neuroscience for Early Childhood Learning

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**Abstract.** Textbooks are a collection of sheets containing information that's used as a reference in the learning process and arranged by experts in their fields. Textbooks are expected to contribute for learning process and improving the quality of education. The preparaton of the textbooks should be arranged based on needs of the student . Neuroscience are courses that require pictures, videos, and animations in their explanations. Therefore, an appropriate approach is needed so that the learning obtained from various sides (audio, visual, and audio-visual), namely the TPACK approach equipped with a QR Code. This study discusses about the importance of TPACK-based textbooks in Neuroscience courses in early childhood learning. This research is a library research that focused on the importance of TPACK-based textbooks in Neuroscience for Early Childhood Learning.

**Keywords:** Textbook, TPACK, Neuroscience, Early Childhood

## 1. Introduction

Neuroscience in early childhood learning is one of the mandatory courses in curriculum of early childhood education teacher study program. In general, students will be taught how to develop the potential of early childhood based on the principles of how the brain works. In other words, discussion of the structure of the brain and nervous system will be related to growth and development and potential development in early childhood. Neuroscience explains human behavior from the perspective of various activities that occur in the human brain<sup>[7]</sup>. In the learning process, lecturers play an important role in delivering these materials so that the information received by students does not deviate from the objectives in the RPS.

Government Regulation No. 19 of 2005 article 20, firmly explains that teachers/lecturers are expected to be able to develop material. Minister of National Education Regulation Number 41 of 2007 concerning process standards also regulates learning process planning for educators at the educational unit level to develop SAP and teaching materials. As facilitators in the learning process, lecturers are required to be able to apply learning that suits students' needs<sup>[9]</sup>.

To align the quality of learning with student learning outcomes, learning media is needed that is able to facilitate student needs. In this case, it can be done by developing textbooks as a component of learning tools. Textbooks are one of the factors that support the achievement of learning objectives<sup>[7],[9]</sup>. The availability of

textbooks that are in accordance with the applicable curriculum and in accordance with student needs will optimize the learning process, thereby having a positive impact on student learning outcomes.

## **2. Method**

In this study, the author uses library research method which is a series of activities related to the method of collecting library data from books, magazines, articles or other sources in the form of available documents. Information from many different sources is collected and synthesized to draw conclusions.

## **3. Results and Discussion**

### **3.1 Textbook development**

Textbooks are books containing a collection of material arranged in a structured manner, intended by students as basic knowledge, and used as a learning tool and used to accompany the lecture process<sup>[9]</sup>. Textbooks contain knowledge resulting from analysis of the curriculum in written form<sup>[5]</sup>. In preparing textbooks, lecturers must also pay attention to the syllabus, learning methods, presentation techniques, and prepare material that is not included in the curriculum<sup>[9]</sup>. Textbooks not only contain a collection of information, but also a structured design which becomes a useful, concise but meaningful work.

### **3.2 Textbook function**

Textbooks function as reference or reference material that can be used as a guide for students in understanding learning. Apart from that, textbooks function as tools to help lecturers in implementing learning, as well as standard evaluation material. With textbooks, students will not be dependent on lecturers in understanding the learning process.

Greene and Petty stated the function of textbooks, namely<sup>[3]</sup>:

- 1) Reflects a robust and modern perspective on learning and demonstrates its application in the learning materials presented
- 2) Presents a source of basic issues, easy to read and varied, which suits the interests and needs of students
- 3) Adapting a well-organized and gradual source regarding expressional skills that address the main problems in communication
- 4) Presents learning methods and tools to motivate students.
- 5) Provides a necessary initial fixation (deep feeling) and also as a support for practical exercises and tasks.
- 6) Providing appropriate evaluation and remedial materials/means.

### **3.3 Textbook characteristics**

A good textbook is a book that is arranged in a structured and systematic manner so that the message conveyed can be well received by students. The information contained in books can be facts, concepts, laws, or theories that support students' understanding of learning content. A good textbook must also be able to facilitate students learning anywhere and anytime. Apart from that, a good textbook has the criteria of being accurate, appropriate (relevance), communicative, complete and systematic, oriented towards students (students) so that they can discover new concepts, in accordance with the Pancasila ideology, using writing rules and good language, and true<sup>[1]</sup>.

In general, textbooks have 3 main components, namely introduction, text (body) and conclusion (cover). The introduction contains a title page, table of contents, list of figures, list of tables, introduction from experts, and foreword. The body or body of the book contains the components of the learning objectives/general description, material, conclusion, and each chapter is equipped with a summary and exercises. Meanwhile, for the conclusion there are appendices, bibliography, index and glossary.

According to Prastowo<sup>[6]</sup>, the characteristics of textbooks are that they have an ISBN (International Standard Book Number), optimize the development of declarative and procedural knowledge, and must refer to programs determined by the ministry of education. Meanwhile, according to Tarigan<sup>[8]</sup>, textbooks must have a clear concept, be relevant to the applicable curriculum, attract student interest and motivation, stimulate student activity, contain clear and interesting illustrations, be easy to understand, and have a clear point of view (POV)

### **3.4 Neuroscience courses in early childhood learning**

The Neuroscience in Early Childhood Learning course that must be taken by students of the PG PAUD graduate study program. This course contains a study of neuroscience concepts including the human brain and nervous system and its disorders, children's brain growth and development, brain-based learning, and the relationship between brain development and parenting (neuroparenting).

Based on the analysis of graduate learning outcomes (CPL) and course learning outcomes (CPMK), the competencies that students must master are understanding the structure of the brain and parts of the nervous system, analyzing abnormalities in the human nervous system, knowing the process of growth and development of a child's brain from in the womb. to toddlers, mastering and applying brain-based learning for early childhood, and analyzing forms of neuroparenting trends.

### **3.5 TPACK-based textbook development equipped with QR Code**

In general, all the material in neuroscience courses in early childhood learning cannot be explained using writing alone, but must be accompanied by pictures and videos, so that conveying the information will be easier to convey to

students. Textbooks that use digital media will be more interesting books, because they allow for programmed interactions, so that they can easily measure the achievement of learning objectives<sup>[9]</sup>.

One approach that can be used in developing textbooks is TPACK (Technological Pedagogical And Content Knowledge). TPACK is a complex framework and its constituent components are interconnected, namely TK (Technology Knowledge), PK (Pedagogy Knowledge) and CK (Content Knowledge)<sup>[4]</sup>. The interaction of these three components has the power and attraction to foster student activity and focus on learning.

TPACK-based textbooks are not only printed teaching materials, but can also be used online using the QR (Quick Response) Code provided. QR Code is a two-dimensional barcode that can provide information directly through scanning. When scanned, this QR Code will be forwarded to a web page for articles, images or videos related to the material content in the textbook. Firmansyah<sup>[2]</sup> stated that the existence of new technology, namely QR Codes which are integrated in textbooks, can support the process of learning activities.

#### 4. Conclusion

TPACK is a technology integration framework that identifies three types of knowledge that instructors must incorporate to successfully integrate educational technology: technological, pedagogical, and content knowledge. A QR code is a type of barcode that can be easily read by digital devices and stores information as a series of pixels in a square grid. The development of TPACK-based textbooks equipped with QR Codes is needed for neuroscience courses in early childhood learning. This is because the available textbooks do not suit the needs and character of students. Textbooks are not yet equipped with digital technology that can facilitate students learning anywhere and anytime, and are not yet able to facilitate audiovisual learning. This will affect the process of conveying information to students.

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