

# The Implementation of Total Physical Response Method to Build Database of Modality Multimedia Learning Using Cognitive and Affective Parameters

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**Submission date:** 11-Jun-2023 05:22PM (UTC+0700)

**Submission ID:** 2113514614

**File name:** 125945327.pdf (631.89K)

**Word count:** 2242

**Character count:** 12482

# The Implementation of Total Physical Response Method to Build Database of Modality Multimedia Learning Using Cognitive and Affective Parameters

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**Abstract.** Multimedia is an alternative media that can be used as learning aids. So that learning using multimedia can be understood better by students, multimedia learning must have a modality aligned with the lesson content. Determining a multimedia learning modality can be done in various ways. After multimedia learning is discovered, the storage design that is made can also use multiple models. In this research, a storage design model will be created to store the multimedia learning modality found by using the Total Physical Response method. The first stage of the research is determining the lesson content to be included in the Multimedia Learning content. The second stage is choosing the cognitive and affective aspects of the learning content. The third stage is determining modality by synchronizing cognitive and affective aspects obtained from the results of the research in step 2. Synchronizing modality with cognitive and affective aspects is done by using the Total Physical Response method. The fourth stage, looking for patterns of the database to accommodate the needs of data in multimedia learning. The research results obtained a database pattern as storage to store all modalities and parameters of cognitive and affective aspects of a content lesson for multimedia learning to be built.

**Keywords:** entity, data storage, conceptual data model, synchronizing, lesson content

## INTRODUCTION

The modality component that will be used in multimedia learning has to be in sync with the content of the lessons that will be created for multimedia learning [1] Because the modality of multimedia learning describes the content of a lesson in a multimedia learning. Education also has a domain of taxonomic aspects [2]. In taxonomic aspects, it is known that the lesson content has cognitive aspects and affective aspects [3].

In this research, the modality component will be built using a method based on cognitive aspects and affective aspects of the lesson content. Based on the several parameters of cognitive and affective aspects resulted, they can be used as the design basis of the desired modality. The modality component that has been resulted requires storage as a storage media. All modality component data stored in the storage must have effective and efficient storage management so that the data stored can be accessed easily and quickly, which is known as a database [4].

Based on the data storage requirements for the multimedia learning modality component, the current research will design a database that can store modality components that have cognitive and affective aspects by synchronizing using the Total Physical Response method. By doing a database design that meets the norms of normalization based on the needs of the appropriate entity, it would be easier to access data quickly and accurately [5].

The following section will explain theories that will be used as the reference for the current research.

## Database

Database is a collection of related entities, where these entities interact with each other to produce a goal based on the information requirements that the user wants to obtain [4]. The stages of doing database design are started at the concept level. The results of the concept level can then be transformed into the physical level. In designing databases at the concept level, it can be described using Entity-Relationship Diagrams. Furthermore, the results of the transformation from the concept level to the physical level are defined using the Entity-Relationship Schema.

## Multimedia

Multimedia has the meaning of a combination of three components. The components include sound, images, and text. Multimedia can also be called as a combination of at least two input or a combination of output media of data. [6].

**Concept of Modality**

The concept of modality is a principle which explains a lesson content not only using text components. Explanation of lesson content using a text component will usually be difficult for students to understand, especially when the lesson content is complicated. Thus, additional components are needed, such as sound, graphics, images, etc. [7]. The modality principle, when applied in education, could have positive impacts on students' understanding of the content of a lesson [8].

**Bloom's Taxonomy**

The term taxonomy in education is used to classify educational goals. As stated, current educational goals are divided into several domains. These domains include cognitive domain, affective domain, and psychomotor domain. From the existing domains, each domain is split as "Bloom's Taxonomy" [3].

**Cognitive Theory**

The Cognitive Domain is one of the domains in education taxonomy. In building multimedia learning, paying attention to cognitive aspects could affect the success of the objectives of multimedia learning. Therefore it is essential to first know the cognitive aspects of a before creating multimedia learning [9]. Because in reality, cognitive aspects are used to explore the abilities of a person in interacting with people around them, animals, plants, and nature [10]. Therefore, it is necessary to design multimedia learning by knowing effective cognitive strategies [11]. Thus, the role of modality is critical in multimedia learning that is built based on cognitive principles [12].

**Affective Theory**

Affective is the ability to express emotions. Neutrality in affective is shown by someone who can hold back [3]. Most learning systems focus on the cognitive aspect as part of the realm to consider [13]. Hence, it has to be taken into account when creating multimedia learning [14].

**Total Physical Response**

The Total Physical Response Method is a language learning method based on the coordination of speech and action. In other words, the Total Physical Response method is a method that carries out language learning using physical movements. The physical movements are used to react to input verbally and are used to reduce barriers and students' affective. James Asher is a psychology professor from San Jose University, California, who first introduced the total physical response method [15].

**METHOD**

This section will explain the 18 stages that will be carried out in the research. The stages of the research are shown in Figure 1.

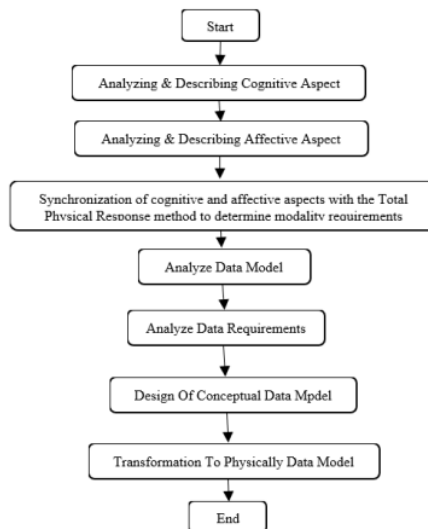


Figure 1. Research Stages

**Analyzing and Describing Cognitive Aspects**

At this stage of the research, cognitive and affective aspects of the lesson content will be analyzed, and then followed by describing each value of the cognitive and affective aspects. The current research uses lesson content for language learning as a research trial material.

**Synchronization of cognitive and affective aspects with the Total Physical Response method to determine modality requirements**

An initial stage of the research is finding a modality component for multimedia learning. The search for modality is based on parameters in the cognitive and affective aspects of the lesson content using the Total Physical Response method [16].

The type of responses will then be processed and synchronized cognitive and affective aspects. The modality of multimedia learning that will be built is obtained based on the results of synchronization between cognitive and affective aspects with the Total Physical Response method, as shown in Table 1 [1].

Table 1. The synchronization results

No	Type of Response	Modality
1	Physical	Image, Picture
2	Verbal	Sound
3	Action	Animation, Video

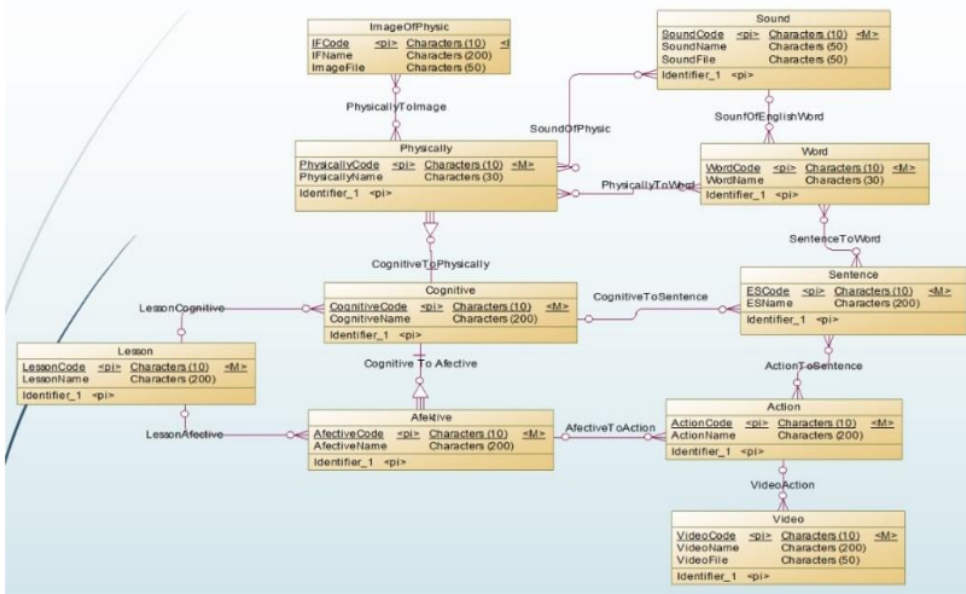


Figure 2. Entity Relationship Diagram of Modality Components

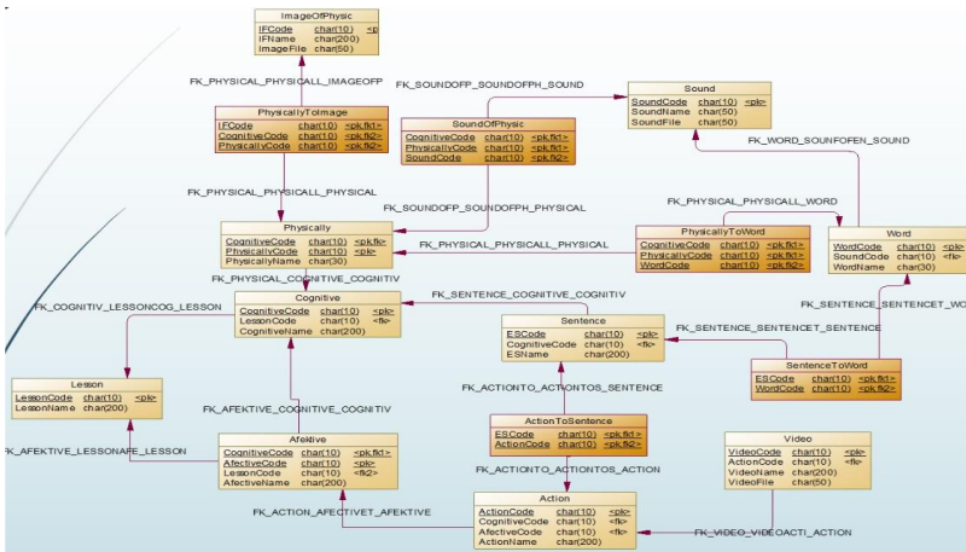


Figure 3. Entity Relationship Schema of Modality Components

21 Analyzing Data Models

Based on the results of the analysis, the data model used is the Relational Data model. The relational data model is a data model [17] uses tables in later database implementations. Rows in the table are called records. The columns in the table are called fields [4].

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Analyzing Data Requirements

The next research phase is analyzing the data requirements needed. The data requirements obtained will result in a collection of entities. Each entity obtained has several attributes according to

the characteristics of each entity—the type of data needed is shown in Table 2.

Table 2. Data requirements

No	Type of Data
1	Cognitive Aspect
2	Affective Aspect
3	Physical Data
4	Verbal Data
5	Action Data
6	Image/ Picture Data
7	Sound Data
8	Animation/ Video Data

**Designing a Conceptual Data Model**

The design of predetermined data models is based on the data requirements that have been obtained. The design of a conceptual data model is described using the Entity Relationship Diagram. In this research, all entities are obtained based on data requirements that have been analyzed and defined earlier. The steps to design are as follows:

1. The process of getting-entities is the process of finding all entities that will be used as raw materials for the design of model data on the conceptual data model. In this research, all entities obtained are based on data requirements, as shown in Table 2.
2. The process of finding attributes is an activity to find the characteristics of each entity. Besides, this process also defines the types of data for each attribute that has been found.
3. The process of defining relationships between entities is an activity to find relationships that exist in each entity.
4. The process of determining the cardinality of each relationship is an activity to determine the weight of the mapping on each relationship.

**Transformation to Physically Data Model**

The next stage of research is to transform Conceptual Model Data to Physical Model Data. The Entity-Relationship Schema illustrates the results of the transformation.

**RESULT & DISCUSSION**

From the trials conducted, several results have been obtained as follows:

**The Component of Modality**

The modality component of multimedia learning is produced from cognitive aspects and affective aspects of the lesson content. A trial to produce the modality component uses Total Physical Response—the results of research trials are shown in Table 3.

**Entity Relationship Diagram**

During research trials, Entity-Relationship Diagrams have been generated. In the Entity-Relationship Diagram, there are 10 Entities related to each other. The figure of the Entity-Relationship

Diagram is shown in Figure 2. From Figure 2, it can be seen that the results of the design of the Conceptual Model Data generated 10 entities.

Table 3. The modality component of multimedia learning

No	Response	Modality Component	Data
1	Physical Response	Text	Vocab
		Image	Vocab
2	Verbal response	Text	Vocab, Sentence
		Audio	Vocab, Sentence
3	Action	Text	Vocab, Sentence
		Video/ Animation	Vocab, Sentence

**Entity Relationship Schema**

In the research trials, the Entity-Relationship Schema has been generated. In the Entity-Relationship Schema, there are 15 tables. The tables are obtained from entity transformations and from the results of relationship transformations that have many cardinals. The result of the Entity-Relationship Schema is shown in Figure 3.

**CONCLUSION**

Based on each trial and the results of the research, some conclusions can be drawn as follows:

1. Some taxonomies of lessons such as cognitive and affective aspects can be adopted into multimedia learning.
2. Finding the modality of lesson content with cognitive and affective aspect can use Total Physical Response.
3. The modality resulted from synchronization between Taxonomy and Total Physical Response can be stored in the database.
4. The database pattern, as the data storage of the modality multimedia with taxonomy, can be designed using requirement data resulted from the synchronization between taxonomy and Total Physical Response.

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