

INTEGRATING SEGMENTING PRINCIPLES INTO TEXT AND VIDEO ELEMENTS OF AN EDUCATIONAL APP

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ABSTRACT

The core idea of segmenting is based on empirical evidence that learners learn better when learning materials are divided into bite-size chunks that can be ingested at learner's own pace. This paper discusses the integration of segmenting principle into an educational app that contains instructions in performing early literacy intervention towards children with reading difficulties such as dyslexia. The learning contents are delivered using textual and video representation. Video act as a modeling tool to complement the textual elements, thus enhancing visualization of an actual teaching-learning activities. Segmenting principle primarily dictates the presentation of textual descriptions of the intervention technique, and the division of videos into smaller, but meaningful segments. The results of preliminary testing indicate encouraging effects of the app toward target learners, the pre-service teachers.

Keywords: segmenting principle; educational video; literacy intervention; pre-service teachers.

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1. INTRODUCTION

1.1. Segmenting Principle

In multimedia presentations, in [1] claimed that learners' cognitive load can be managed effectively by reducing extraneous processing (cognitive processing during learning that does not serve the instructional goal), managing essential processing (cognitive processing during learning that serves to represent the essential material in working memory) and foster generative processing (cognitive processing during learning that makes sense of the essential material).

One of the principles under managing essential processing is segmenting. Segmenting principle suggests that a lesson be divided into smaller, yet meaningful units that would enable learners to ingest the presented concepts one at a time [2]. Additionally, in [2] suggested that the chunks should keep pace with the user rather than as a large continuous piece. When an essential material is too complex, it will consume more cognitive efforts of the learners. In this situation, learners might be able to grasp only a fraction of the lesson, and unable to construct a solid understanding towards the subject matter. Hence, by presenting contents in smaller segments that allow user control, learners can make independent and practical choices that suit their learning preferences.

Past research in segmenting principle, for example, in [3-4] indicated that it is beneficial to improve learning performance as compared to continuous pacing. Besides that, in [5] revealed that segmenting had strongest impact towards novice learners, while in [6] discovered that segmenting an animation produced positive outcomes among both the novices and experts.

1.2. Video as a Modeling Tool for Exemplary Teaching Technique

In teacher training and teacher professional development, video modeling has been employed to expose exemplary teaching technique, and the approach has been effective to enable teachers to observe and analyze the teaching of others, or for practice and self-reflection where the teachers learn to analyze their own classroom behavior [7-10]. A pilot study on the use of instructor-made video in a university online learning environment found that video was able to clarify confusing concepts in certain problematic topics and to provide in-depth information that is usually insufficient if presented using text only [11]. Among other advantage of video is its capability to portray the tone of voice, facial expressions, body

language and gestures of the teachers and students [12]. Besides, video modeling may be used as a tool in gaining attention from pre-service teachers to focus on specific skills or behavior [13]. In the context of the study, video modeling was chosen to illustrate some examples of literacy intervention technique for children with dyslexia, as performed by experienced teachers. The videos are embedded into a learning app that can be run on Android platform.

1.3. Background of Dyslexia Reading Difficulties, Social Consequences and Recommended Intervention

Dyslexia is a lifelong condition that affects people into old age. Dyslexia has been researched under the medical, psychology and education domains for over 100 years, and there has been mixed findings about how to best understand and define the disorder [14]. Individual with dyslexia has deficit in language processing component of the brain, thus making it difficult to connect letters and sounds which is an important process in word recognition. Consequently, difficulty in reading will impede understanding of what has been read [15]. Dyslexia is not at all a weakness that hinders a person's opportunity to flourish. With proper intervention and support, children with dyslexia could take advantage of their strengths and gifts to become successful later in life.

More than a decade ago, in [16] revealed that dyslexic children in certain schools in Malaysia did not receive specific attention in general education as well as in special education; for example, these children were usually placed in remedial class along with other children who did not possess any dyslexia characteristics. For that reason, they emphasized the urgent need to expose teachers to good teaching technique for dyslexics to improve the quality of education for this often neglected group of special needs children. Similarly, in [17] discovered that most special education teachers in their case study did not possess sufficient knowledge about dyslexia symptoms, its associated difficulties and effective intervention technique; therefore advocated that children with dyslexia should be taught by teachers who are trained in the area. Likewise, in [18] insisted that teachers should receive specific training on dyslexia so that they could teach the children successfully.

Pre-service teachers who are majoring in special education degree were chosen as the subjects of the study because they are the prospective teachers for special education schools, remedial classes and special education integration program at mainstream schools.

Among the courses offered for pre-service teachers are introductory course to learning difficulties and a general course about teaching strategy for individuals with learning difficulties. These are theory-based courses with less concentration on teaching strategy for children with dyslexia, even though they require specific intervention that addresses the underlying cause of their reading problems, for example, confusion in matching an alphabet to its sound. Therefore, the study aims to bridge the gap by developing learning app that could portray some real-world examples of the literacy intervention strategy towards children with dyslexia.

2. METHODOLOGY

This section discusses the design and development of the educational app which is steered through the combination of Mayer's Cognitive Theory of Multimedia Learning, Mayer's Principle of Multimedia Learning [2] and Social Cognitive Theory [19]. Segmenting principle [2] is chosen as the main principle that drives the design of the learning app contents for both text and video elements.

2.1. Integrating Principle of Multimedia Design

The principles of Multimedia Design were derived from the Cognitive Theory of Multimedia Learning. It supports instructional designers in the design of multimedia instruction that manage the cognitive load of the learners. The principles serve as a benchmark to ensure design of multimedia learning environment that could support these cognitive processes: (i) reducing extraneous processing, (ii) managing essential processing, and (iii) fostering generative processing. Segmenting falls into principles for managing essential processing - the processing of the essential material in working memory. The use of videos to show examples of intervention technique is driven by Bandura's Social Cognitive Theory that promotes observational learning, where people could learn by observing the actions of a more experienced person or a more knowledgeable others, often possessing similar characteristics or situations of the observer.

2.2. Integrating Segmenting Principle for Textual Elements

Performing the literacy intervention towards children with reading difficulties is not a simple and straightforward activity. It poses multifaceted challenges to any teachers, especially the

novice teachers. For example, the complex process requires skills in initiating interest to learn, in sustaining effective two-way interaction, and in sensing the child's level of motivation. Furthermore, teachers need to be patient with the child's progress and need to know how to motivate the child by praising them even though the reading achievement may seem small to an adult. The intervention incorporates multisensory technique that requires teachers to be competent and confident in using its related teaching aid. Therefore, segmenting principle guides in designing the presentation of textual information to ensure learners (i.e. the pre-service teachers) could grasp the basic ideas quickly. There are three major steps that should be followed by teachers. Each step is depicted by a lesson unit. Thus, there are three lesson units in the apps. By chunking the long and complex activity into these units, learners would be able to learn the technique in a step-by-step approach. The first unit represents the first step which is identifying shapes of letters. The second unit describes about identifying letter sound, and finally the third unit describes about pronouncing syllables. The contents for every lesson unit are further divided into three consistent sub-topics which are (i) Introduction; (ii) Preparation and (iii) Technique.

As a result, the screen of each lesson unit is divided into three tabs. The introduction tab contains general information about the intervention step, the preparation tab outlines necessary preparation before executing the technique, for instance, samples of teaching aid, setting of classroom environment and duration of the activities. The Technique tab contains corresponding video for the respective step of the intervention.

2.3. Integrating Segmenting Principle for Video Elements

No vast amount of texts could completely convey information about human acts and expressions than a video does. Accordingly, video related to each intervention step is embedded under the Technique tab. The video is used to model or visualize the technique that has been described in texts via Introduction and Preparation sub-topics. Beyond that, in support of observational learning, video is able to capture facial expression and eye-contact that teachers should adopt while teaching a child to learn reading. Furthermore, the voice intonation and positive words for communication can also be exemplified. On top of that, video could portray the emotion of the teacher and the child while undergoing the session, for instance, the patience shown by the teacher when the child repeatedly make the same mistakes

in reading words even though he/she has made substantial progress in recognizing letters and letter-sounds.

Initially, a lengthy video of actual intervention activities was recorded at an established and renowned center for children with learning difficulties. The activities are inherently complex to understand, therefore a video with continuous pacing may entail extra cognitive efforts for novice teachers or anyone who has just begun to learn the technique. Additionally, via video, learners could see exactly how a teacher manipulate teaching aid and implement multisensory technique. Thus, the video was divided into few smaller but meaningful and manageable segments. Each video segment corresponds to a specific technique for each step of the intervention. There is more than one video segment for each lesson unit. Every video is equipped with a video controller that can be used to play, pause, stop, as well as to navigate backward and forward. As such, the learner will be able to track and replay any desired scene in each video. The degree of freedom to navigate around the lesson unit and the video would likely reduce learners' cognitive load to ingest new materials since they are able to make connection with previously learned concepts by revisiting any sub-topic in the app.

3. RESULTS AND DISCUSSION

This section discusses the user interface of the learning app, developed after careful consideration of the theories and principles mentioned in Section 2.0. By employing segmenting principle, every screen has navigational arrows and buttons that allow learners to move forward and backward in the lesson, thus supporting user-paced learning.

3.1. User Interface Design

Fig. 1 shows the description of the first lesson unit using textual elements. The sub-topics are segmented into three categories. Fig. 2 illustrates an example of segmented video in the second lesson unit. In the Technique (*Teknik*) tab, the intervention activity is modeled using two videos (each representing different teaching aid) that can be watched independently.

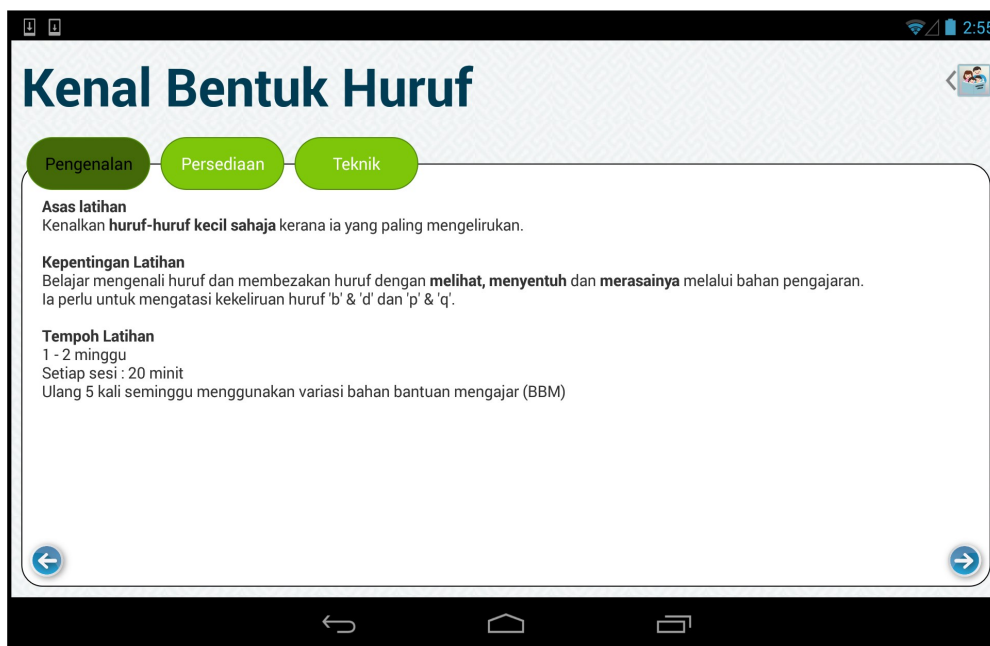


Fig.1. Integration of segmenting principle for textual elements



Fig.2. Integration of segmenting principle for video elements

3.2. Preliminary Testing

The learning app was used as a treatment in a preliminary testing with pre-service teachers ($n = 30$) using pre-test and post-test to measure its effect towards subjects' knowledge in dyslexia reading intervention and perceived self-efficacy beliefs in performing literacy intervention. Two instruments, developed by the researcher of the study were used to collect the data. Subjects were administered with the instrument during pre-test. After receiving

treatment using the app, during post-test, they were administered with the same instruments but with items restructured. The preliminary evaluation, as discussed in [20], revealed that subjects recorded considerable mean increase in their knowledge and perceived self-efficacy beliefs after learning from the app. This may indicate that by dividing the learning contents (texts and videos) into more manageable pieces and providing freedom to recap, learners were able to gain deeper understanding of a complicated topic involving teaching technique for children with reading difficulties.

4. CONCLUSION

This study describes the strategies in integrating segmenting principle into an educational app. It was revealed that employing segmenting principle into textual and video elements of an instructional material resulted in knowledge gain and increase of self-efficacy beliefs among pre-service teachers who participated in the preliminary testing. Video in particular has demonstrated its ability to provide a sense of mastery via observational learning, whereby pre-service teachers observed actual skills of experienced teachers in performing literacy intervention. It is hoped that the learning app could be used as an additional material that connects between theory and practice.

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