

# Scaffolding Augmented Reality Model to Enhance Deep Reading Skill

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**Abstract** – Deep Reading (DR) is an advance reading skill which requires the learners to immerse themselves in what they read to get its concept and details. For new learners it's difficult to acquire DR skill. This research designs Scaffolding Augmented Reality Model (SC-AR Model) as a scaffolding tool to create an immersive learning environment to enhance DR skill for new learners. The process of SC-AR Model consists of: 1) teaching about the theory of DR; 2) using Augmented Reality (AR) as visual media overlaying on the text while reading; and 3) testing after reading. The researcher implements SC-AR Model to the sample group and the result shows that the progress scores of learners are significantly higher, and higher than the group that read only the text, without SC-AR. The conclusion, therefore, is that SC-AR Model effectively improves learner's DR skill. This Model can also be applied to improve DR skill in any other foreign languages.

**Keywords** - Scaffolding, Augmented Reality, Immersive Learning, Deep Reading

## 1. Introduction

Immersive learning environment allows learners to immerse themselves in an interactive digital environment. Platforms such as Augmented Reality (AR), Virtual Reality (VR) and Mix Reality (MR) create sound, images, video, or other medias to give learners a full sensory experience, which help them engage with the content.

DOI: 10.18421/TEM94-58

<https://doi.org/10.18421/TEM94-58>

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*Received: 19 July 2020.*

*Revised: 03 November 2020.*

*Accepted: 09 November 2020.*

*Published: 27 November 2020.*

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They are learning and feel it. Learners can experience, explore and navigate real world subject and destination within the comfort of their classrooms [1]. Immersive learning also enhances learners' understanding of abstract concepts and their relationships by providing them a context. In addition, with Immersive learning tools such as AR support independent learning; learners can learn at their own pace. For instructors, the use of virtual medias supplements lectures, creates a safe and controlled learning environment, which allow learners to make and learn from mistakes or trial and error.

AR integrates digital information with the user's environment in real time [2]. AR is taking computer generated information (e.g. images, videos, and audios) and overlaying it simultaneously over the real environment. In other words, AR supplements reality, rather than completely replacing it. In Education, Using AR provides a number of advantages: AR enhance learner's perception of and interaction with the real world. Using AR in printed text book one can consider a dynamic source of information. Displaying information by using virtual things that the learners cannot directly detect with their own senses can enable them to understand better and feel more engaged in what they are learning, in other words, AR enhances the effectiveness and attractiveness of teaching and learning [3]. AR provides opportunities to practice and learn.

Scaffolding is considered a method used to assist learners during the early stage of learning. It can be in form of pictures, diagrams, guidance, etc.

This research is designing Scaffolding Augmented Reality (SC-AR) Model and applies in the improvement of Deep reading (DR) skill as a scaffolding for new learners. DR is the process of reading carefully and concentrating on a text to increase understanding and enjoyment [5]. To achieve DR skill is to understand the concept of the text, to be able to read between the lines and to get the details. This research creates AR with visual elements such as diagrams, illustrations and explanation texts, overlaying on the paper-based text to create immersive learning environment which leads to the improvement of DR skill.

## 2. Research Objectives

- 1) To design Scaffolding Augmented Reality (SC-AR) Model
- 2) To improve DR skill of learners after using SC-AR Model
- 3) To compare DR between experimental group (learners who use SC-AR Model while reading) and control group (learners who do not use IL-SCAR Model while reading).

## 3. Research Framework

This research designs **Scaffolding Augmented Reality (SC-AR) Model** for learners who are new to reading. AR, is used as the scaffolding tool to create immersive learning environment for reading for new learners so that they can achieve DR.

To acquire DR, it is important to comprehend the text, to feel engaged with the text, and to understand the concept of the text. DR, therefore, is considered a complicated process of reading for beginners. The challenge is how to create a Scaffolding for those beginners to help them understand DR, and have the ability to read deeply on their own in the future reading.

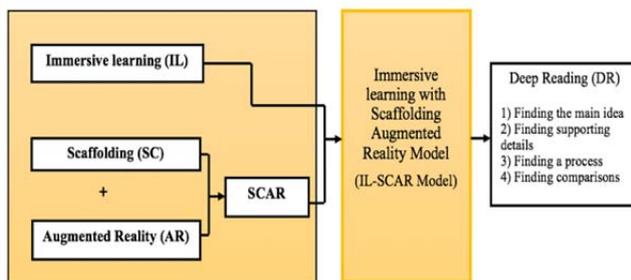


Figure 1. Research Framework

## 4. Literature Review

### 4.1. Deep Reading

Deep reading (DR) is defined as “the active process of thoughtful and deliberate reading carried out to enhance one’s comprehension and enjoyment of a text, contrast with skimming or superficial reading, also called slow reading”. [4]. As it is stated in ref. [5], DR is the slow and meditative possession of a book, we do not just read the words, we dream our lives in their vicinity.” (in *The Gutenberg Elegies*, 1994).

DR means the sophisticated process including comprehension, inferential, deductive reasoning, analogical skills, critical analysis, reflection, and insight. While experts need less time to get through this process, beginners need years to develop it [6]. Attentional skill is highly required to understand DR process [7].

To conclude, DR is a slow process of reading. Readers need to concentrate on what they read in order to acquire the understanding and enjoyment of the text, then to use thinking skills (e.g. critical thinking) to get the concept and details of reading.

### 4.2. Scaffolding

Instructional scaffolding is a teaching method used to assist learners during the early stage of learning through outside assistance such as illustrations, diagrams, guidance or explanations from teachers. Scaffolding will be faded out gradually as learners develop their understanding and ability to think about the lesson on their own, and finally, become self-regulated and independent learners.

The term “scaffolding” first appeared in the ref. [8]. Bruner studied the role of mothers while supporting the child to learn new things, especially a language, through reciprocal activities. In ref. [9], the idea of scaffolding was developed to the context of instruction at school. Teachers provide scaffolding that helps a student to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts.

The idea of Bruner, which corresponds to Vygotsky’s Zone of Proximal Development [10], focused on the social nature of learning: other peoples should help a child develop skills through the process of scaffolding. “Scaffolding refers to the steps taken to reduce the degrees of freedom in carrying out some task so that the child can concentrate on the difficult skill she is in the process of acquiring” [11].

Scaffolding was, traditionally, implemented in person; between learners and teachers in the classroom. Currently, Scaffolding can also be applied using technology as a tool. Social Networks, Online LMS or Online classroom are some examples of common platforms in which teachers provide scaffolding for learners. Nowadays, AR, VR, and other immersive technology are also used as platforms for instructional scaffolding.

### 4.3. Augmented Reality

Augmented Reality (AR) is defined as “an enhanced version of the physical world through the use of virtual, audio and sensory stimuli elements. In other words, augmented reality integrates digital information with the user’s environment in real time” [2]. AR is taking computer generated information (e.g. images, videos, and audios) and overlaying it simultaneously over the real environment. In other words, AR supplements reality, rather than completely replacing it. In Education, Using AR provides a number of advantages: AR enhance learner’s perception of and interaction with the real

world. Using AR in printed text book is considered a dynamic source of information. Displaying information by using virtual things that the learners cannot directly detect with their own senses can enable them to understand better and feel more engaged in what they are learning, in other words, AR enhances the effectiveness and attractiveness of teaching and learning [3]. AR provides opportunities to practice and learn. For example, to understand a text we create visual elements, such as diagrams or illustrations. AR can create those visual elements that corresponds to the text and overlays it on the paper-based text.

#### 4.4. Immersive Learning

The word “immersive”, according to the Cambridge Dictionary, means *seeming to surround the audience, player, etc. so that they feel completely involve in something*. The word comes from verb “immerse” which means *to involve someone completely in an activity*. Therefore, Immersive learning refers to the process of learning in which learners feel immersed or engaged to what they are learning. Simulated or artificial environment is used in order that learners feel like experiencing a real learning environment. Those simulated or artificial environment can be created using immersive technology. According to ref. [1], “*Immersive Technology is any technology that extends reality or creates a new reality*”. There are various types of technological platforms to create immersive learning environments, for example AR, VR and MR can create sound, images, video, or other medias to give learners a full sensory experience, which help them engage with the content they are learning and feel it. Learners can experience, explore and navigate real world subject and destination within the comfort of their classrooms. Immersive learning also enhances learners’ understanding of abstract concepts and their relationships by providing them a context.

AR or Augmented Reality relates real material (e.g. paper-based texts) with simulated virtual images. This can have an impact to the thinking skill of students, including thinking process and emotions. In addition, with Immersive learning tools such as AR, learners can learn at their own pace, in other words, these tools support independent learning. For instructors, the use of virtual medias also supplements lectures, creates a safe and controlled learning environment, which allow learners to make and learn from mistakes.

## 5. Research Methodology

### 5.1. Population and Samples

The population of this research is a group of 98 undergraduate students of Burapha University from various faculties who registered in Collegiate English course.

The Sample group consists of 60 students, divided in two groups, 1) control group and 2) experimental group, by simple random sampling technique.

### 5.2. Methodology

This research is an Experimental Research with two-group post-test only design. The process of this research consists of 6 steps:

- 1) Literature and research review on the current challenges and needs analysis key elements of this research to develop a conceptual framework and to design Scaffolding Augmented Reality (SC-AR) Model
- 2) Analyzing input factors: (1) Expected leaning outcome: DR (2) instructor (3) learners (4) Content (5) 4 reading (from the English textbook LEAP1 as AR marker) (6) 4 tests (after reading each passage) and (7) Smartphone (With AR application as AR scanner)
- 3) Developing the lesson plan for SC-AR Model.
- 4) Implementation of SC-AR Model in the class.
- 5) Assessment of students’ ability while learning with SC-AR Model from the progress of the students through 4 key reading skills: 1) Finding the main idea, 2) Finding supporting details, 3) Finding a process, and 4) Finding comparisons. These 4 skills are assessed by the achievement test method. The test includes multiple choices questions designed to assess reading skills and DR (finding the concept of passage).
- 6) Analyzing and comparing students’ DR scores after using SC-AR Model.

## 6. Research Results

### 6.1. SC-AR Model

Immersive Learning with Scaffolding Augmented Reality Model

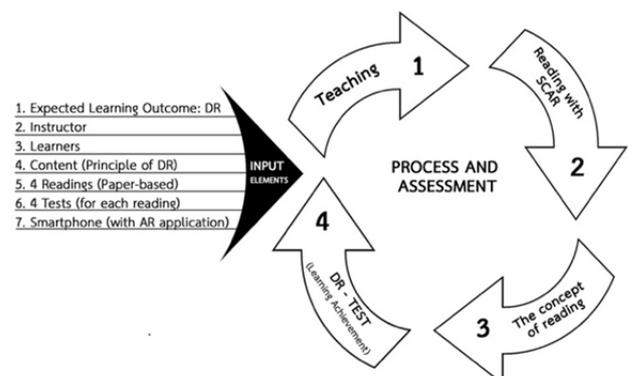


Figure 2. SC-AR Model

This model is designed for learners to acquire DR through reading with Scaffolding Augmented Reality (SC-AR) while reading. **Input elements** of SC-AR Model are:

- 1) Expected learning outcome: DR
- 2) Instructor
- 3) Learners
- 4) Content about principle of 4 selected reading skills and DR (finding the concept of reading)

The 4 selected skills are:

- 4.1 Finding the main idea
- 4.2 Finding supporting details
- 4.3 Finding the process
- 4.4 Finding the comparison

Content about AR application and how to use it is also taught.

- 5) 4 paper-based readings to assess the 4 selected reading skills and DR. All readings are extracted from the textbook LEAP1:

Reading 1: *A woman business (Finding the main idea)*

Reading 2: *We're wrong (Finding supporting details)*

Reading 3: *A robot you can swallow (Finding the process)*

Reading 4: *The future of Education (Finding the comparison)*

- 6) 4 tests corresponding to the 4 readings above. The test is multiple-choice, created in Google Forms.

- 7) Smartphone with AR application

SC-AR Model is designed to teach 4 passages to assess 4 reading skills and DR. One selected skill is taught per week in classroom by using SC-AR Model (in total, 4 skills take 4 weeks). **The process and assessment** of this model is divided in 4 following steps:

- 1) Teaching  
Instructor starts teaching the principles of one selected skills and DR skill (Finding the concept of the reading). Instructor also has to teach how to use AR application on smartphone as AR for reading.
- 2) Reading with SCAR  
Learners are assigned to read one reading per week. Each reading is corresponding to each skill and DR. While reading, learners can use AR application on smartphone and scan on the reading (from the textbook LEAP1) and the scaffolding AR will appear on screen.

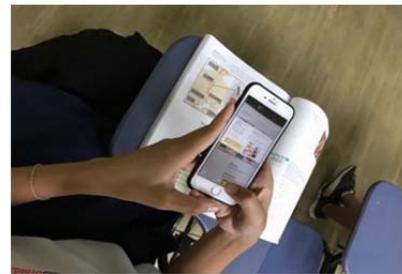


Figure 3. A student using SC-AR while reading

- 3) Getting the concept of reading  
The scaffolding AR appearing on screen is about the concept of each reading. Learners are allowed to learn how to get the concept of reading from this Scaffolding, and in consequence, get DR.
- 4) DR Testing  
After each reading, learners are assigned to do a multiple-choice test about the reading they just read. The test is designed to assess reading skill and DR.

The process is repeated for 4 readings. After finishing the 4 readings and tests, instructor will collect and analyze the scores (learning achievement) of the 4 tests.

## 6.2. Results of SC-AR Model implementation:

Table 1. Time series score of Control Group

N	Time series score				Sum score	
	1	2	3	4	$\bar{X}$	S.D.
30	3.53	4.1	3.76	4.26	15.67	3.34

Table 2. Experimental Group's time series scores

N	Time series score				Sum score	
	1	2	3	4	$\bar{X}$	S.D.
30	5.36	5.73	5.36	5.7	22.17	1.49

Table 1 and 2 shows that the mean scores ( $\bar{X}$ ) of control group in each test is lower than experimental group. Table 1 and 2 also show that experimental group's sum score is progressively higher from the first passage to the last one. These scores reflect the improvement of learners' DR skill.

Table 3. Control and Experimental Groups' comparative sum scores

N	Control group		Experimental group		t	sig
	$\bar{X}$	S.D.	$\bar{X}$	S.D.		
30/30	15.67	3.34	22.17	1.49	9.75**	0.00

Table 3 shows comparative DR skill between control group and experimental group: the sum score of experimental groups are significantly higher than control group (22.17 and 15.67 respectively).

## 7. Conclusion and Discussion

From the results, this research concludes that:

- 1) Learning achievement (test scores) of experimental group is significantly higher than control group. This means SC-AR Model can help learners to develop their DR ability better than reading without scaffolding. Moreover, learning achievement (test scores) of experimental group is progressively higher in each test (1-4), while Scaffolding used is less. This can be interpreted that learners develop their DR skill: they can gradually read more deeply by their own.
- 2) In comparative, both experimental and control group have progress (the scores are higher in each test). However, experimental group has a higher overall test scores than control group (see table 1-2).

To sum up, SC-AR Model is appropriate for new learners as it help them develop their skill better than learning without the Model.

DR is an important reading skill because it allows readers to have more understanding and enjoyment while reading. Readers have more understanding because they get the concept of reading and have enjoyment because they feel engaged with the reading. This research assesses learners understanding after using the model through the test, and the result (learning achievement or test scores) shows that learners understand the passage and its concept. Plus, from instructor's observation, learners concentrated and keen on reading activities in classroom.

AR is used as the Scaffolding for developing DR in creating an Immersive learning environment, and to scaffold the learners while they read. Learning with scaffolding also gives learners more confidence and motivation. In ref. [12], "Delicate Scaffolding" is used to set up the challenging reading environment to develop critical thinking of university students in English for Academic Purpose (EAP) courses.

In [12], Scaffolding tasks and worksheets, for example, are provided to students while they read in order to encourage them to understand the meaning and to engage them with the ideas. Short and easy exercises are used to motivate students to practice reading strategies as well. Once learners acquire the ability to read deeply on their own, the scaffolding will be gradually faded.

In further researches, the researcher suggests that, apart from images, other media like videos and audios can be added to AR Scaffolding to enhance DR skill. Also, SC-AR Model is appropriate to apply to enhance DR in other foreign languages.

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