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Enhancing Speed Reading Of Poor Vision Students With Mobile Augmented Reality Model: A Comparative Analysis Of Main Components

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Who are the Poor Vision?

- A person who need vision aid such as **glasses or reading lenses**.
- There were **4.95 billion people** worldwide expected to have poor vision by 2050 (Chandrasekhara Reddy & Thevi, 2017; The Star Malaysia, 2017).
- A survey by the National Eye Society of Malaysia (2016) reported an increase in people wearing glasses because of having poor vision **of 5% annually in Malaysia** (Chew et al., 2018).
- National Eye Society of Malaysia (NES I) (2016) reported a drastic increase of 5% annually in people wearing glasses because of having vision loss, due to **the increasing use of gadgets.**

Issue/Gaps

- A recent study also found that three out of four students did not wear glasses because of **discomfort ness, psychological and emotional changes.**
- Hence , have hindered their **reading activities** and demotivating their **learning activities**, affecting their **academic and emotional achievement** due to visualization barriers.
- There is **a lack of reading aid and an appropriate model** to ease reading for poor vision students.

How to motivate them to read?

- Janu and Hari (2015) stated that using **technology-based tools** can improve learning motivation and positively affect academic achievement.
- Assistive technology which **involves products, resources, methodologies, strategies, practices and facilities** is aimed at supporting roles and capabilities related to autonomy, self-reliance, quality of life and social life for the poor vision.
- The latest advancements in mobile technology with **Augmented Reality (AR)** have eased the use of reading aid for the visual impairment

AR Technology

- Baloch, Qadeer and Memon (2018) stated that AR implements technology to increase space or physical objects with relevant information in a digital medium and integrates virtual objects into the real world
- The emergence of AR technology with mobile aka **mAR** has incorporated **with cooperative and collaborative** features among students (Liarokapis & Anderson, 2010).
- At present, there are quite a number of **mAR models** are developed, however there is lack of models especially for people who have vision problems.
- The existing models for improving speed reading are less prominent because most of these models do **not emphasize on poor vision users** who are facing **slow reading and inability to read.**

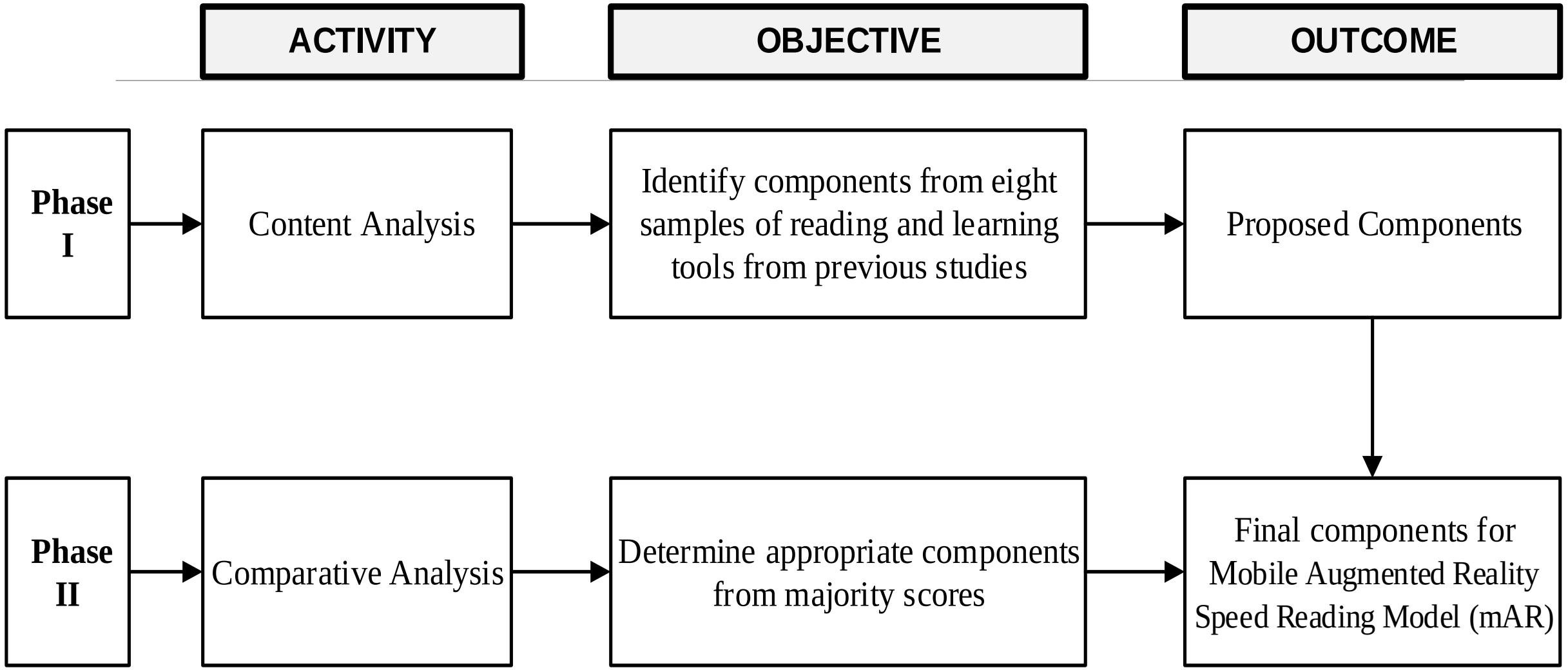
mAR Technology

- Besides, there is **lack of applications** that help them to read.
- The proposed model will be designed to **enhance speed reading and academic achievement** using mAR technology.
- Reading content is the core resource of knowledge, however students do not have the ample time to read a lot of reading materials.
- Recent innovation studies suggest that the key components of **the integration of user experience, universal mobile screen readers and mobile phones** are for the poor vision users (Syed Masum, Vikas ashok, Porter, & Ramakrishnan, 2017)

Research Objective

The purpose of this study is to determine the components for a conceptual model that can enhance speed reading with the Mobile Augmented Reality (mAR) technology

Methodology



Reading and learning tools for poor vision (Content Analysis)

No	Source	Summary on Reading and Learning tools	Component
A	Roth, Petrucci, Assimacopoulos, & Pun, (2000)	A 3D web browser that uses audio for visually impaired users to explore webpages, fill out forms, and more, using a 3D sonic rendering technology and Web Sound, a generic tool that permits to associate with each HTML tag with a given sonic object (ear icon or auditory icon).	Content Interactivity: Audio and touch Time delay User experience
B	Wall & Brewster, (2006)	A tangible pie chart with accessible interface to allow visually impaired users to access graphical information using touch and audio. The system uses a graphics tablet which is augmented with a tangible overlay tile to guide user exploration. Dynamic feedback is provided by a tactile pin-array at the fingertips, and through speech/non-speech audio cues.	Content Interactivity: Audio and Touch Time delay User experience
C	Bocconi, Dini, Ferlino, Martinoli, & Ott (2007)	An educational stand-alone apps or ALFABET5 designed to mastering abilities in dictionary search and alphabetical ordering.	Content Interactivity: Audio User experience Time delay
D	Nurulnadwan, Ariffin, & Siti Mahfuzah, (2015)	Apps designed to help visually impaired people by using the right size of text and audio to read on a computer screen	Content Interactivity: Audio Time delay User experience

Reading and learning tools for poor vision continue ….

No	Source	Summary on Reading and Learning tools	Component
E	Uilka Chandini, Syamsul Bahrin, & Juliana Aida, (2015)	A mobile augmented reality application, named as AR@Melaka, is developed to help visitor to have enjoyable informal learning in Melaka heritage sites with audio and video	Content Interactivity: Audio Video User experience
F	Nazatul Naquiah, Fariza Hanis, & Wan Adilah (2017)	The map apps use the tactile symbol which is associated with audio command.	Content Interactivity: Touch and Audio User experience Time delay
G	Zhao, Hu, Hashash, & Azenkot (2017)	Augmented Reality glasses designed to read larger text for the visually impaired	Content Time delay User experience
H	Doiphode, Ganore, Garud, Ghuge, & Guide, (2017)	A voice apps using Android system based on voice interfaces, voice recognition, and voice dialogue management, focussing on using hands or eyes. The apps help students with visual	Content Interactivity: Audio Time delay

Findings: Comparative analysis

Component	A	B	C	D	E	F	G	H	Total Score
Content	✓	✓	✓	✓	✓	✓	✓	✓	8
Audio	✓	✓	✓	✓	✓	✓	×	✓	8
Touch	✓	✓	×	×	×	✓	×	×	3
Time delay(read	✓	✓	✓	✓	×	✓	✓	✓	7
User experience	✓	✓	✓	✓	✓	✓	✓	✓	8

✓: the component is applied

×: the component is not applied

A: Roth, Petrucci, Assimacopoulos, & Pun, (2000)

B: Wall & Brewster, (2006)

C: Bocconi, Dini, Ferlino, Martinoli, & Ott (2007)

D: Nurulnadwan, Ariffin, & Siti Mahfuzah, (2015)

E: UilkaChandini, SyamsulBahrin, & Juliana Aida, (2015)

F: Nazatul Naquiah, Fariza Hanis, & Wan Adilah (2017)

G:Zhao, Hu, Hashash, & Azenkot (2017)

H: Doiphode, Ganore, Garud, Ghuge, & Guide, (2017)

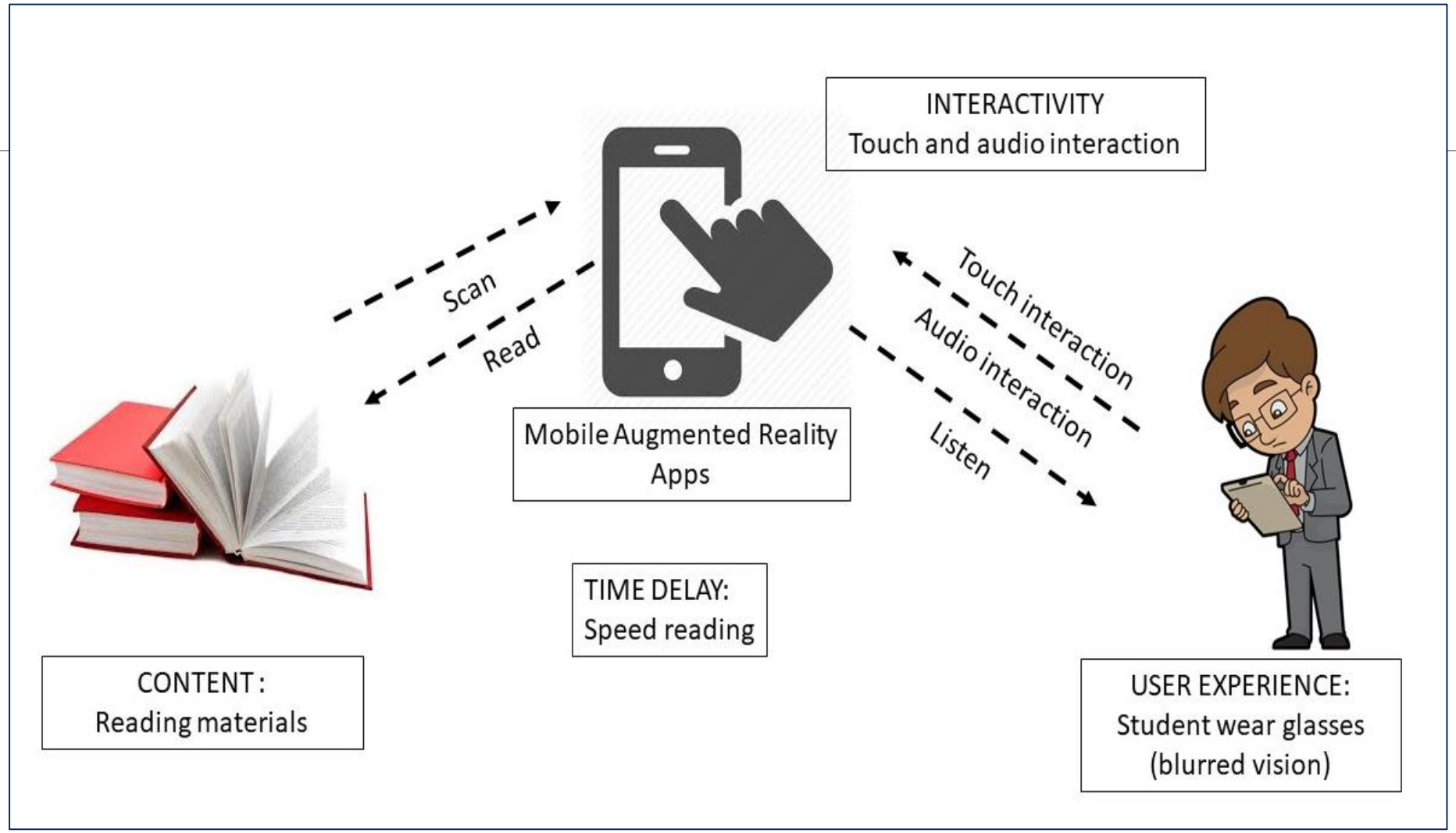
Conditions for classification of generic components

Condition (Total score)	Indicator
6 to 8	Compulsory
3 to 5	Recommended
0 to 2	Discarded

Main findings

Four comprehensive components namely interactivity, user experience, time delay and reading content are proposed components to model speed reading with mobile Augmented Reality (mAR) technology.

The proposed speed reading of poor vision students with mAR model



The suggested model is expected to offer a positive user experience with interactive and engaging aspect to increase learning motivation

Conclusion/Future Works

- Based on key issues for students with eyesight problems and in order to stimulate reading interest, mAR applications is the best choice for **better learning experiences, interactivity and academic performance.**
- With the explosion of advanced technology, gadget users particularly students prefer to use **simple and engaging apps** that ease their learning tasks.
- The suggested model offers enjoy reading
  - **with various and unlimited learning materials**
  - **faster without using glasses**

Conclusion/Future Works

- The proposed components in this study that are **content, time delay, user experience and interactivity** will initiate the right choice of learning, concept and interaction to encourage positive learning experiences.
- This study will also lead to **an in-depth study in determining the development of a conceptual model** which provides effective reading activities and improve academic performance.
- The model will offer a **positive user experience through interactive and enga**ging support by **increasing learning motivation** with effective reading method.

THANK YOU