

## Conference Paper

# ReadyRead: App-based Supplementary Materials for Reading Comprehension

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**Abstract**

English coursebooks for senior high school do not sufficiently cover topics related to natural and social sciences, so students have to find material to supplement the books. Yet, finding digital language learning material for practising reading on the Internet that suits their level of proficiency as well those that fit the curriculum is not always easy. To address this common problem, the study researched and developed *Readyread*, a mobile application-based supplementary material for reading comprehension. Educational Design-based Research (DBR) was employed in the study. Experts review conducted during the formative evaluation stage of the product yielded constructive feedback for the refinement of the product, more specifically, those concerning material development and multimedia presentations of the app. Students who tried out the product also gave positive feedback on the use of the app. They were delighted with the multimedia assistance and features built in the app, such as videos, popped-up glossaries, games, as well as reading materials which are closely related to the topics they learn at school. They also suggested more texts to be added into the apps so that they can learn more independently whenever they have the time.

**Keywords:** reading comprehension, supplementary material, app-based reading platform

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## 1. Introduction

Digital reading has been part of students' daily life activities. It is because digital devices have been so ubiquitous that it cannot be detached from students' hands. The intensity of using digital devices, particularly smartphones, had been significantly increased as it is reported that one could use one-third of 24 hours per day to connect to the Internet and accessed various media (Data Reportal, 2019). The increase in the use of smartphones is mainly affected by the role of mobile apps that addressed their various needs in a hand (Hockly, 2012; Machmud, 2018; Walker, 2013). Being exposed to various media automatically made the students not only watch, hear, and touch but also read on screen. There had been numerous investigations discovering the merits of digital

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reading for students aiming at realizing the goal of reading tasks yet many of them see this reading trend challenging for some reason.

In conventional classes, coursebooks have been used as the main source of learning. However, according to the needs analysis of this study, the materials given in the coursebooks, particularly English for senior high school, could not sufficiently fulfil students' needs. First, it is because the coverage of reading topics, specifically ones that discuss explanation text, did not fairly accommodate the topics that were tailored to both majors, natural and social sciences. The reading texts were not equally presented in the books as most topics are closely related to natural science majors such as Earthquake, Tsunami, Flood, Typhoon, How Rainbow is Formed, How the Warning Light on Modern Vehicles Work, How Plants Pollinate, etc. These add up to the difficulty of reading comprehension particularly for students majoring in social science as the vocabulary used were decontextualized, particularly in understanding the technical terms as they were not commonly applied in their field of study.

To deal with the constraints of the materials, students usually searched for suitable materials through the Internet. Indeed reading materials can be easily found on the Internet as there was a rich number of texts provided online. Besides, the presentation of the materials is relevant to students' styles today that 73% of 183 respondents of the preliminary survey of this study prefer digital reading which is highly supported with technology that could scaffold their learning (Dobler, 2015; Shang, 2015). Several features that encourage digital reading are such as "manipulation of font size, text-to-speech options, and note capabilities" (Larson, 2010), digital dictionary assisted with pictures and sound which is more effective than a paper-based dictionary (Koyama & Takeuchi, 2013), game-based activities and tasks (Boyinbode, 2018), and the other multimedia support, such as videos assisting the texts, which are essential in building and activating students' background knowledge that will help them build the meaning of a text (Alkhateeb Hayashi, Rajab, & Hirashima, 2015; Amadiou, Lemarie, & Tricot, 2017; Chen, Cheng, Chang, Zheng, & Huang., 2014; Duke, Pearson, Strachan, & Billman, 2011; Mayer, 2017). Nevertheless, students needed assistance from those who are capable of sorting the materials so that they are not only fulfilling students' interest but also relevant to the curriculum used at school, the level of students' proficiency level, and the framework used for learning (Tomlinson & Masuhara, 2017).

Language learning mobile applications (hereforth, LL apps) are other tools that provide learning materials as well as activities in it. Despite the ample LL apps available in application stores, there were very few of them which could cater to students' needs as well as pedagogical requirements. Popular LL apps focus on teaching multi-languages

in one app which is followed by activities that commonly provide users to learn language components (grammar and vocabulary) and receptive skills (reading and listening) (Heil, Wu, Lee, & Schmidt, 2016; Rosell-Aguilar, 2016). The core activities of these apps are translation and word recognition, delivered through drilling and dictations. Therefore, the commercial LL apps are criticized adapting teacher-centered method in a mobile learning basis that let the students having one-way teaching with the system (Heil et al., 2016; Hockly, 2015; Reinders & Pegrum, 2016). It is perceived as traditional and behaviourist which was irrelevant to the goal of language learning in this 21st Century (Oakley, Pegrum, Faulkner, & Striepe, 2012).

Further, according to the result of the needs analysis in this study, the use of LL apps for reading in class is considered rare. Based on the students' survey, the most frequently used apps are translation tools and dictionaries such as Kamusku, Google Translate, and U-Dictionary. From the teacher's point of view, it is difficult to integrate the use of language learning apps in classroom activities as they do not have the idea to do so especially on the reference of the appropriate apps. Therefore, generic apps, those which are not developed for language learning, are attempted to be used (Oakley et al., 2012). Although the use of generic apps is flexible, the synchronization of the content and activities still need a teacher's guidance. In Indonesian context, there is one application that is known to be popular among the students. It brings a concept of digitizing the private course by providing all materials taught at school that suit the curriculum. Students could learn through the app by watching the video first then directly do the graded open-ended exercises. This method is applied to all subjects including English. However, not all skills in English could be taught in the same way as each skill has distinct macro and micro-skills. Thus, realizing that students' needs and complexities are varied, research on the evaluations of LL apps expected for better development. It is recommended that LL apps are developed for specific use for a particular group of students with certain context and appropriate contents that tailored to the curriculum as well as the learning framework (Jiang et al., 2017; Oakley et al., 2012; Reinders & Pegrum, 2016; Tomlinson & Masuhara, 2017).

The omnipresence of using smartphones and the pervasiveness of digital reading indicated a new interest in learning. Further, the inadequacy of LL apps that address students' needs for suitable materials as well as bridges reading activities in the classroom signifies a need for developing a new LL app. Thus, this study aims at developing a mobile-based language learning apps for reading comprehension that aims to supplement students' reading with appropriate curriculum and activities.

## 2. Methodology

The recent product was developed by following a framework of Educational Design-based Research. The framework was adapted from Van den Akker (1999) and Plomp and Nieveen (2013) which covers 4 stages of development, i.e. problem analysis, design and development, formative evaluation that includes double, and the finalization of product development. Each stage was a collaborative work. The detailed process of application development in this study is presented in Figure 1.

Phase	I	II	III	IV
Procedure	Problem Analysis	Design & Development	Formative Evaluation & Revision	Final Product
Details	Analysis of practical problems in reading classes	The development process of the digital materials, multimedia assets, & the app	The iterative cycle of product reviews, validations, & tryout	The ultimate revision of the product which is ready to be published
Collaboration	Researcher Teacher Students	Researcher Designer Animator Programmer	Researcher Experts Practitioners Teachers Students	Researcher Designer Animator Programmer

**Figure 1:** The framework of Educational Design-based research employed in this study.

As the product developed in recent study is a further development from the previous research by Maulida (2015), there are several parts improved and maintained. The main difference is that the new app, named *ReadyRead*, is used *Online* as several data must be accessed Online. The improvements were made by addressing the shortcomings of the previous app, named *PRIME*, and adding some more features that could make the collaborative learning possible and independent learning more enhanced. While the maintained features in the new app are such as popped up glosses and translation.

The limitation of this study lies on the subject of this research. Subject of this research is limited to students who are in grade eleven from a certain state senior high school in West Java. The total students participating in this research is 34, from social and natural science majors. The materials developed in this study is also limited to a particular type of reading text taught to the eleventh graders which are perceived insufficiently exposed in the coursebook and need to be supplemented with more materials. The app is made for *Android* smartphones.

The data of this study was mixed between the quantitative and qualitative data, as the data collected from each stage of the development were in the form of close ended and open ended questionnaires delivered Online and offline. The data were also enriched by conducting semi structured interviews with the teachers and students. Thus, they were analysed by using concurrent triangulation strategy as both types of data were

collected concurrently. The qualitative database were used to confirm and strengthen the quantitative data which are calculated by using basic statistics (mean, mode, and median) and then converted into percentage. The analysis of qualitative data were coded and labelled the similarities based on the theme used in the quantitative data as it is used as support. Thus, in the discussion section, the result of quantitative data will be followed by qualitative data.

### 3. Findings and Discussion

The purpose of this study was to develop an Android-based reading application that provides supplementary reading materials for the eleventh graders of senior high school. The app developed in this study was designed to enrich the reading exposure which tailored to students' majors beyond what had been provided in coursebooks mainly used at school. In addition to that, the content and activities of the app were also developed by referring to the applied curriculum at state senior high schools and the learning framework which was suitably applied for mobile learning. The findings of this study have provided a rich amount of data particularly obtained from the evaluation processes. Thus in this section, the discussion will focus on interpreting the findings obtained from several stages, i.e. design and development, formative evaluations from the experts, and the product try out.

#### 3.1. Design and development of ReadyRead

Process of developing the app in this study followed a framework by Jolly and Bolitho (2011) that starts with exploration, pedagogical realization, contextual realization—parts of researcher's work and physical production—which collaborates the with programmer, visual designer, video editor, and voice over artists.

Exploration was done by referring to the needs analysis which have been explained in the introduction of this paper. It was revealed that the reading material which were insufficiently provided in the coursebook was related to Explanation text. Thus, the content of the app to be developed is materials enrichment for Explanation text. Contextual realization is linked to the choice of reading topics which had been surveyed from students that resulted four highest choices, i.e. culture, social, environment, and psychology. As the requirements of Curriculum 2013 to connect these reading topics to other subjects, four titles were decided to be raised in the app, that are (1) *Conventional to Online Retails* that is a cultural phenomenon of online shopping which is also related

to subject of economy, (2) *Hoax*, a social phenomenon that links to sociology, (3) *Plastic Trash in the Ocean*, related to chemistry, biology and geography, and (4) *Bullying and Mental Breakdown*, related to psychological issues that also linked to self-development and counselling.

The pedagogical realization of this app concerns with deciding the teaching strategy implemented in the app. Scaffolded reading experience (SRE) is a recommended strategy to teach and learn reading as it can be flexibly applied to digital reading activities (Shang, 2015). Further, it is also found effective for students and able to encourage them be active readers as well as enable them to learn independently, as part of their lifelong learning journey (Huang, 2018). SRE consists of three-phase reading activities that covers pre-, during-, and post-reading activities (Graves & Graves, 1995). The activities of each phase in this app is briefly explained in Table 1.

Several features are provided to support the activities in each phase. In the pre-reading activity, video which is linked to *YouTube* is provided to help students activate their background knowledge that will ease their process in comprehending the text. Within during-reading activities, popped-up glosses are maintained in the recent app. Additional feature provided in the text is adjustable font size intended to address the constraint of small screen size. Feedbacks provided in the quiz and games are also improved in the recent app by not only showing the users the right and wrong answer but also providing them with graded hints that guide them to find the right answers. Sharing feature is fresh in the recent app that let the students share their opinions as part of quiz answers to social media that opens for more opportunities to have further discussions with friends, work collaboratively, and peer assessment. In the post reading activity, the word game is assisted with comic illustration as the content of game is delivered through short conversations.

As part of the physical production, the researcher handled the wireframing of the app, the making of rough design of popped-up glosses, the narration of videos, the storyboard of videos, and comic illustrations. The process of digitizing these concepts were executed by the programmer, visual designer, video editor, and voice over artists.

### 3.2. Formative evaluations from the experts

There were two main aspects evaluated by the experts. First, it concerns with the content of the app thus the validators were the content expert and English teachers. Second, the multimedia presentation and usability of the app were evaluated by the multimedia

TABLE 1: The comparison between *PRIME* (the previous app) and *ReadyRead* (the recent app).

FEATURES	PRIME (Offline)	ReadyRead (Online)
<i>Pre-Reading Activities</i>		
Illustration	Motion graphic illustration	Animation video
<i>During Reading Activities</i>		
Text	<ul style="list-style-type: none"> <li>• Descriptive Text / Grade X</li> <li>• 3 topics</li> </ul>	<ul style="list-style-type: none"> <li>✓ Explanation Text / Grade XI</li> <li>✓ 4 topics</li> </ul>
	Assisted with Popped up Glosses	<ul style="list-style-type: none"> <li>✓ Assisted with Popped up Glosses</li> <li>✓ Font-Size adjustment</li> </ul>
Quiz	<ul style="list-style-type: none"> <li>• Multiple Choice</li> <li>• True-False</li> </ul>	<ul style="list-style-type: none"> <li>✓ Multiple Choice</li> <li>✓ Short Answer</li> <li>✓ Short Paragraph</li> </ul>
<i>Post Reading Activities</i>		
Review	Summary	Summary
Game	Drag and Drop	Word Game
<i>Additions</i>		
Sharing	Unavailable	Available
Feedback	Complementary Words	<ul style="list-style-type: none"> <li>✓ Graded Hints</li> <li>✓ Complementary Words</li> </ul>
Translation	Available	Available

expert and start-up practitioner. The recommendations from them are summarized in Table 2.

The total score given by the content expert for content evaluation of the app is 78% while from the English teacher is 99%. This implies a major evaluation as well as revisions on the content of the app, particularly on the learning objectives. The objectives of learning were expected to be arranged in a more detailed manner. Further, this impacts to the rearrangement of quiz, games, and feedbacks in the app. Several improvements to the popped up glosses should also be made for so that the pictures could represent the word better than before. In addition to that, the narration of the videos was recommended to be reorganized to prevent it from explicitly giving all information related to the text. Besides, the videos were also suggested to present the real pictures by exposing what really happens among society and environment related to the issues raised. The English teachers recommended that more materials be covered in the app and more types of grammar be covered in the game.

The total score for multimedia and usability of the app according to evaluations from the multimedia expert and the practitioner is 98% and 90%, respectively. The concerns from multimedia expert lies on the presentation of videos related to volume normalization, as the volume of music and narration sound were unbalanced. Besides, the design of the front page of the app should be redesigned to make it look familiar for the users. Further, the practitioner suggests several points including adjusting the

TABLE 2: Summary of recommendations from the experts.

	Content expert (78%)	English Teachers (99%)	Media expert (98%)	Practitioner (90%)
Learning objectives	Rearrangement on the detail of the objectives and made in line with the whole content			
Reading Materials	Rewriting some texts, rearrangement on text structure, and editing on grammar mistakes, typos, and diction choice	Adding more topics with different genre		Considering the length of the texts
Popped-up Glosses	Redesigning some pictures			
Quiz	Rearrangement and adjustment with the new learning objectives and the required Cs			The availability of quiz bank
Games	Rearrangement on the contents	Accommodation of all types of grammar		
Feedback	Rearrangement and adjustment with the newly made content			Accompanied with answer key which explain the reason why the answer is wrong
Videos	Rearrangement on the narration and type of the videos		Volume normalization	
Format & Layout			Redesigning the front page of the app	Adjustment of text alignment with font size

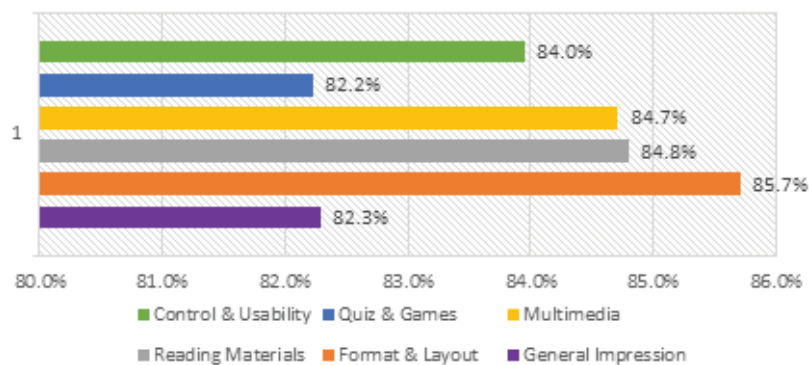
length of the text, the availability of quiz bank, giving detailed feedback, and adjusting font size.

The revision process was done by considering the urgency of the recommendations, the capability of the development team, and time as well as financial constraint. Thus, according to Table 2, the green blocks are recommendations which were addressed in this research. Particularly for videos, the type of videos were still animation as it is decided based on students' preference. Students were given suggestions for more videos that deliver the real exposure of related issues in the field. Regarding the content of games, not all grammar types are covered yet additional type of grammars were added based on its common use in an Explanation text. The orange blocks are recommendations which could not be addressed in the present development of the app, but will be in the future development.



### 3.3. Product try-out by students

The product try-out by students yielded surprising results. There are six evaluation aspects, i.e. general aspect of the app, format and layout, reading materials, multimedia, quiz and games, and control and usability. The total score given to the app is 84.2%. The calculated responses from 34 students for each aspect is presented in Figure 2 below.



**Figure 2:** Students' responses on the use of *Readyread*.

The total score for general impression of the app is 82.3%. This aspect comprises the user friendliness of the app, the clarity of learning objectives, and the general appearance of the app which are highly rated by the students. However, the process of downloading the file of the app becomes the issue. Students stated, “*It needs 4 to 5 times downloading the file of the app until finally I could successfully install and use the app in my phone.*” After being analysed, there are several causes. First, the app is uploaded in a cloud storage which is not specifically for application thus the security issues is unconfirmed thus complicated the downloading process. Second, some students also reported the full loaded phone memory so that they could not smoothly download the file. Third, Internet connection also affects this process.

Another inconvenient was when a student expressed “*The app suddenly closed*” during the try-out. This bombproof issue was caused by obsolete Android version installed in the app. Thus, the students need to update their Android with the latest version to have the best experience using *ReadyRead*. This is considered as a technical problem, a part of the obstacles in using online mobile apps. These issues had been noticed by several researchers such as Burston (2014), Klomova and Prazak (2018), and Singer & Alexander (2017). Further, Chinnery (2006) affirms that such technicalities were

inherent from the devices. Although there were very few students experiencing such inconvenience, this is worth an improvement in the future.

On the other hand, the user-friendliness of the app is perceived excellent as the score reached 85.7%. Students stated their opinion by stating *"I like learning through this app because it can be easily and quickly accessed"*. The user-friendliness of a language learning app shows that its usability and functionality were intensified through speed access of touchscreen (Godwin-Jones, 2017). It is also the popular reason of using a mobile application for reading exposed by students after the efficiency and immediacy (Dilevko & Gottlieb, 2002). Further, it is predicted that the user-friendliness of the app could influence students' willingness to use the app regularly (Bansal, 2010). This also implied a significant interest in the use of language learning application in the future.

The language used in the app is another factor that boosts user-friendliness, particularly ones used in learning objectives. It implies that the app has provided sufficient comprehensible input for the students particularly in important sections such as learning objectives and instructions (Reinders & Pegrum, 2016). Understanding the goal of learning is crucial for the students particularly when learning independently to make them aware of what to learn and achieve (Fisher et al., 2011, 2012). Furthermore, translation feature is provided only for translating the learning objectives and instructions to address students' language proficiency which are varied.

The format and layout of the app showed the highest rate of all aspects (85.7%). It is worth noting a comment that say, *"the appearance of the app is the main reason why I want to install an app"*. Further, 88.6% showed positive responses that the design of the app is suitable for independent learning. It is because students stated that *"I enjoy using this app because I can learn it in a quite situation as I do not like to learn English in a crowd. It seems that I have deeper understanding on the materials learned when learning individually"*. This indicates that this app could accommodate students' individual learning. Besides, it also implies flexibility of the app that allow the students to decide when and where are best to learn. Students could also adjust their speed of reading without being restricted within a certain period of time as comprehending and building meaning from a text needs to be slow that let them activate their background knowledge, relate, visualize, infer, predict and decide whether they are about to agree or disagree with the idea of the text (Fisher, 2011). Further, students also expressed that user-friendliness of the app make them more comfortable in learning and the simple design of the app makes it not boring for learning.

Previous studies showed that after learning through mobile applications, students performed increased skill in autonomy (Leis et al., 2018; Sato et al., 2015). Besides,

when the students are aware of the benefits of using the app (particularly from its layout and format) thus becoming more motivated, they could maintain their interest and willingness to complete the activities in the app (Roh, 2019). The aforementioned findings echo previous research that found out user-friendliness and flexibility are proven to be able to support and ease students to be responsible in actualizing the learning goals by deciding which strategy suit them best when learning independently (Hazaea & Alzubi, 2018; Leis et al., 2018). Further, a good learning habit will be gradually improved (Leis et al., 2018). Although the use of language learning app could not make students become skilled autonomous learners, it provides an immense opportunities for students to believe in themselves by learning individually, become more motivated, and experience the easiness of learning that have been a starting point to becoming autonomous (Godwin-Jones, 2019).

The overall response for the presentation of reading materials in the app is 84.8%. The reading topics being raised in the app is perceived contextual and close to students' lives. This is supported by students' opinion that said, "*Besides up-to-date, the texts of the app is related to our daily life, such as case of bullying that surround us*". On the other hand, as the materials are tailored to the needs of curriculum used at school, students felt that this app could bridge what have been taught by teacher at school. Thus, it reinforces their understanding as well as enriches their exposure to the explanation texts beyond what has been delivered in the coursebook. This is relevant to some of the SLA principles of materials development by Tomlinson (2011) that materials should achieve impact to students by providing novelty and appealing content. The connection of the topics to students' life that can be seen daily could also increase their confidence when reading the text. Further, the relevance of the materials with their academic demand and daily life make it useful as it is part of their interest and things they really want to learn. The length of reading materials in the app is also perceived sufficient for reading digitally. Acceptable length of the text is likely to avoid students from excessive scrolling activities that would ill repute digital reading as it negatively impacts students' reading comprehension (Dundar & Akcayir, 2012).

As part of the reading texts, popped-up glosses present the materials in attractive way. It is so because students can have interaction with the glosses whenever they need it by tapping the reddened words. It makes this feature becomes the topmost favourite that students expected for more words to be facilitated with this gloss. Tomlinson and Masuhara (2017) stated that the availability of popped-up glosses assisted with multimedia is such breakthrough in digital materials presentation which is previously criticized monotonous as it is seen as the comparable version of non-digital materials

presented in the form of scanned coursebook in .pdf file (Kurata, et al., 2017). Further, the availability of popped up glosses are proven effective for students to learn vocabulary as the glosses help them remember the word which had been cued with pictures and easily refer to the text without interruption so that they could grasp the meaning contextually (Khezrlou et al., 2017).

In terms of multimedia presentation, the animation video presented in the app is found beneficial for the students. Video is the second highest favourite element of the app rated by the students. *“The video that gives preview on the materials to read is a brilliant idea! It helps me a lot in understanding the text. Besides, I like the design and words that emphasizes important information on the video”*. Indeed, the videos in the app function as the pre-reading activity that aims at activating background knowledge. Videos are chosen as by referring to the dual channel theory, the cognitive process could easily build schemata (Richard E. Mayer, 2002). Fortunately, students could gain more advantages from watching the videos. Some more students expressed their excitement by stating that *“By watching videos, I could practice my listening skill at the same time”* and *“...I could learn how to pronounce English words better by watching them”*. In general, this finding is contradictory to a stereotype of common mobile reading applications which are perceived too traditional and rigid (Heil et al., 2016). Without being explicitly taught, the presentation of videos before reading gives the app a potential to integrate other skills, not only receptive but also productive.

Furthermore, as the availability of videos preceding the reading activities that follow is found beneficial for students, it is suggested for providing the subtitles for the videos. On the other hand, subtitles are found to be contributing to the cognitive load for students (Richard E. Mayer & Moreno, 2003). Considering their benefits for EFL students, subtitles are addressed in the final revision. As suggested by Amadiou et al. (2017) and R.E. Mayer (2017), providing user control over the video may help reduce the cognitive load, the app has granted control for its users to activate and deactivate the subtitles in the videos whenever they want it.

Concerning quiz and games of the app, the total score was 82.2%. Several inputs were given by the students for the improvement on the feedbacks, answer key, and sharing features. The feedbacks of this app used to be a one-time feedback system which is incapable for analysing various mistakes made by the users. Thus, it is suggested that the feedback is made more adaptive in the future. It is also recommended that the answer keys validate different answers that have similar meaning with the main key answers. Last but not least, the sharing feature gives students the opportunities to work collaboratively by sharing their opinions on social media. Further online discussions

are expected to happen to realize the collaborative learning through language learning app.

## 4. Conclusion and Recommendations

This paper presents the result of designing and developing a mobile-based application for reading comprehension which provides supplementary reading materials for students in grade eleven of Indonesian senior high school. The design and content of the app were developed to address several issues of material insufficiency in the classroom and to take benefits from the challenges of digital reading which has been ubiquitous among the students.

The design of the app comprises the materials development, multimedia assets development, and application development which were done collaboratively. This process of development was conducted by referring to the principles of materials development by the experts and theories underpinning the multimedia learning. The process of developing the product was tightly attached to the formative evaluations from the experts in content, multimedia as well as the English teachers and start-up practitioner. The inputs and recommendations from the experts were significantly constructive for the improvement of the product in this study.

Further, the product try out with students gathered rich data and information related to the strengths and weaknesses of the app. Technical errors happened were minor defect as very few students experienced this. Although this finding contributes to the disadvantages of using language learning app, types of errors made by students were unique like a compatibility issue between the app and the new type of Android used in the smartphone. The rest of the result in this study exposed the benefits of using the app.

It can be concluded that the features made in this app is to assist students to have better learning experience, particularly reading, which could not be obtained through coursebook. It turned out that the design of the app supports the autonomous learning. The strategy used in the app also stimulates the students to become active learner. Further, the language learning app developed in this study could address students' learning styles, individually and collaboratively.

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