

Hydrocarbon Compounds Learning Application

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Abstract—Hydrocarbons are the simplest class of carbon compounds. They consist only of the elements carbon (C) and hydrogen (H). Although they only consist of two elements, hydrocarbons are a large compound, as well as one of the most important sources of energy on earth. The main use is as a fuel source. In their solid form, hydrocarbons are one of the asphalt-forming compositions. By seeing the importance of learning hydrocarbons, we made a mobile application to facilitate student learning from some of the learning materials. Users are confronted with hydrocarbon compounds and are asked to identify the compound's name. Users are also faced with a hydrocarbon's name and they are asked to draw the compounds.

Index Terms—hydrocarbons, mobile application, compounds.

I. INTRODUCTION

There are three hydrocarbon compounds, namely alkanes, alkenes and alkynes. These are a simple hydrocarbon chains with no functional groups. Alkanes are hydrocarbons whose carbon chains consist of only a single bond. Alkenes are unsaturated aliphatic hydrocarbons with a double bond between carbon atoms. Alkynes are also unsaturated hydrocarbons that have a triple bond. Researches on hydrocarbon's learning application show that it enriches the learning resources [1] [2].

In this research, we propose an application that contains material about hydrocarbon. Moreover, there are some questions in order to facilitate learning in the form of guessing names and guessing pictures. To guess the name, the opposite applies, where the application provides a picture, then students answer by choosing the given choice. To guess the picture, the application provides the name of the compound, then students draw the compound with the drag and drop feature.

II. LITERATURE REVIEW

A. Mobile Application for Learning

Mobile applications tend to bring valuable results to learning in challenging learning environments [3] [4]. Farrah's research shows that most students use mobile applications because of the ease of accessibility and flexibility that helps them in the teaching and learning process.

Moreover, Sulisworo and Maulana combine cooperative learning and mobile technology. This system was developed to enable teachers to organize learning more effectively. The results showed that the application of cooperative learning can be used to increase student interest in learning [5] [6].

B. Learning Application of Hydrocarbon

Student learning can be improved with instructional media that use models. For hydrocarbon compounds, the use of ball-and-stick models can improve student performance in naming and using structural hydrocarbon formulas that form part of the IUPAC nomenclature concept [7].

Other researches that had been done are modelling hydrocarbons' compound using augmented reality. This facility has a very good criteria to use as learning resources [1].

Chiu was also doing research on chemical compound via augmented reality. She found out that there are three advantages to using ARs: First, ARs can help students to visualize unseen structures and enable them to arrange compounds from different perspectives; secondly, this helps students learn without the teacher and outside the classroom; and finally, students' perceptions about mobile phones have changed from mere communication devices to learning tools [2].

III. APPLICATION DESIGN

The application is divided into three menus, which are material menu, guessing names menu and guessing pictures menu. The material menu consists of three sub menus, namely chapters, videos and practice questions. In the chapter menu, information is displayed and divided into several slides, where the user can press the previous and next buttons. In the question exercise menu, users can run multiple choice questions in accordance with the selected material. When it comes to the last question, the next button changes to 'finish', which displays a review of the answers.

The guessing names menu entails multiple choice questions with the same feature like the practice questions menu found in each chapter. In this menu, the questions cover all chapters. The process can be seen in Fig 1.

The guessing pictures ask the user to draw hydrocarbon compounds in accordance with the questions given. Users draw on the box provided by dragging and dropping. When the user presses the answer button, the system checks the image, and displays the message in the form of an alert box after arriving at the questions answered by drawing in the box provided. Checking answers is done by examining interconnected chains. It is followed by an examination of the C atom, where the C atom is ended and where is the longest chain. Next is an examination of the child in the answer chain. The process can be seen in Fig 2 and Fig 3.

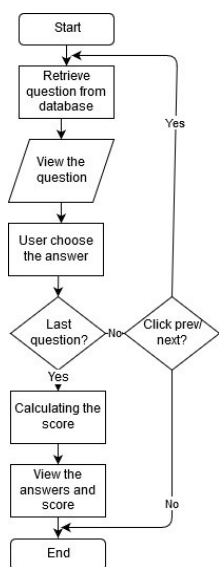


Fig. 1. Process of

guessing names menu

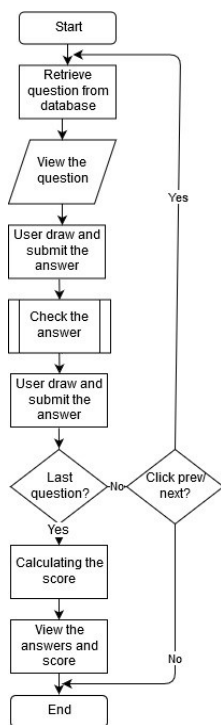


Fig. 2. Process of guessing pictures menu

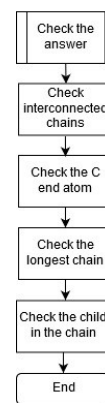


Fig. 3. Check the guessing pictures answer

IV. IMPLEMENTATION

A. The material menu

The material menu page displays the material. The slide is divided into several pages where the user can press the previous and next buttons. The slide menu page can be seen in Fig 4.

Users can also tap on the image to see a list of image slides. The list of images is display in the form of thumbnails. The video page can play mp4 videos properly. Videos are downloaded and saved on internal memory of the smart phone. As a result, the internal memory in the application is greater because it is used to store videos from this learning application

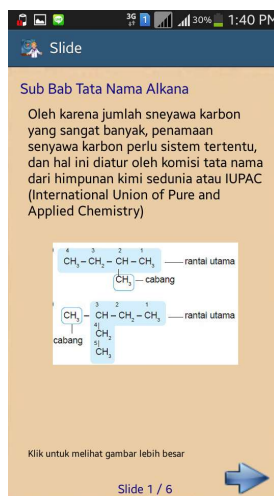


Fig. 4. The material menu

B. The guessing names menu

The guessing names menu is a page that displays the multiple choice questions. Questions can be selected from all the chapters. At the end of the questions, there is a review page that

displays the selected answer, the correct answer and the explanations. The guessing names menu can be seen in Fig 5.

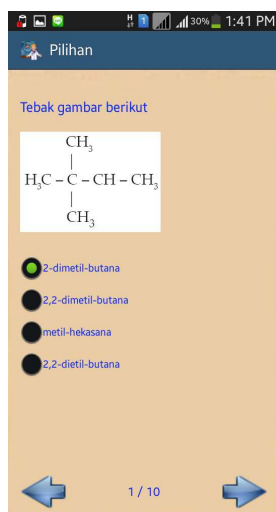


Fig. 5. The guessing names menu

When the user finishes drawing the answer, the user can press the answer button. The system will display the answer to the problem (Fig 7).

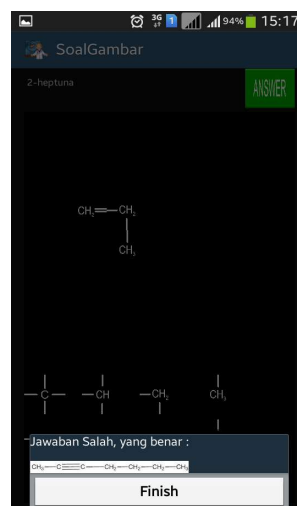


Fig. 7. The guessing pictures review of

C. The guessing pictures menu

The guessing pictures menu is a page that displays a compound name and asks the user to draw the answer. On this page, the user can select and pair images according to the questions displayed. Users can press the answer button to find out the answer. When the user selects an image and places the image on the grid, there is an alert menu to move or rotate the image. Fig 6 shows that the user must answer some questions (for example 2-metil 1-butena) by drawing the compounds. If the user needs help, he/she can press the answer button.

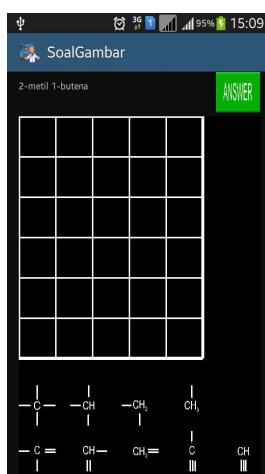


Fig. 6. The guessing pictures menu

D. Versioning testing

The android application is tested on Lollipop (Android 5.1), Marshmallow (Android 6.0), Nougat (Android 7.0), Oreo (Android 8.1.0) and Pie (Android 9). The application runs well on Nougat, Oreo, and Pie. On the contrary, some images cannot display perfectly on Lollipop.

Referring to Fig 7, Fig 8a displays the page perfectly. However, Fig 8b had some display issues; the width of the right answer area was bigger than the original.

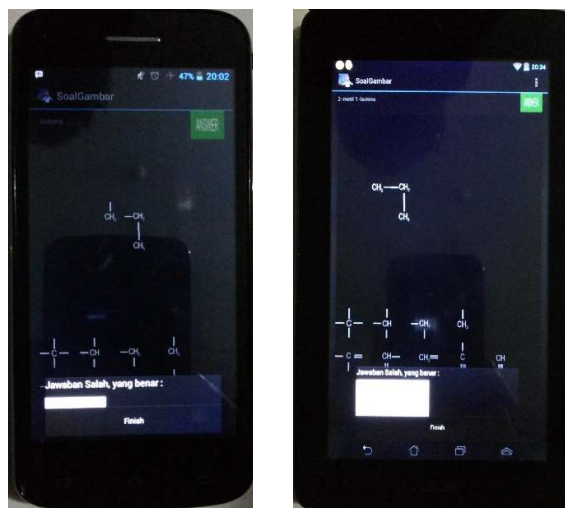


Fig. 8. (a) Marshmallow, (b) Lollipop

V. CONCLUSION

Applications can display chapters, multiple choice questions and picture problems. The application can also display images and videos properly. The application can do the drag and drop feature well in the practice of drawing problems. The application can run well on the minimum specs on Marshmallow (Android version 6.0).

VI. ACKNOWLEDGMENT

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REFERENCES

- [1] D. Ernawati and J. Ikhsan, "The Development of Monograph with 3-Dimensional Illustrations Titled "Augmented Chemistry: Hydrocarbon" as Learning Enrichment Materials," *Journal of Physics: Conference Series* 812, pp. 1-6, 2017.
- [2] M.-H. Chiu, C.-C. Chou, Y.-H. Chen, T.-M. Hung, W.-T. Tang, J.-W. Hsu, H. L. Liaw and M.-K. Tsai, "Model-based learning about structures and properties of chemical elements and compounds via the use of augmented realities," *Chemistry Teacher International.*, vol. 1, no. 1, 2018.
- [3] A. M. Ahmed, M. S. Ghareb and M. S. Al-Ani, "Design and Implement Mobile Learning Application for Students in Higher Education," *Asian Journal of Information Technology*, vol. 17, no. 2, pp. 177-188, 2018.
- [4] M. Farrah and A. K. Abu-Dawood, "Using Mobile Phone Applications in Teaching and Learning Process," *International Journal of Research in English Education*, vol. 3, no. 2, pp. 48-68, 2018.
- [5] K. D. Maulana, K. D. and N. Widiarti, "Influence of Learning Media Using with Joyful Learning and Guided Discovery Approach for Hydrocarbon Subject at Ten Class of SMA Negeri 1 Pracimantoro," *Journal of Scientific and Engineering Research*, vol. 5, no. 3, pp. 14-22, 2018.
- [6] D. Sulisworo, I. and K. Firdausy, "The Development of Mobile Learning Application using Jigsaw Technique," *International Journal of Interactive Mobile Technologies*, vol. 10, no. 3, pp. 11-16, 2016.
- [7] K. Adu-Gyamfi and P. A. Sarkodie, "Improving students' performance in naming and writing structural formulae of hydrocarbons using the ball-and-stick models," *Chemistry: Bulgarian Journal of Science Education*, vol. 24, no. 2, pp. 203-219, 2015.