C-BOND : Mobile Augmented Reality for Learning Chemical Bond

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Highlights: This manuscript presents the C-BOND which is mobile augmented reality (MAR) application which developed to help in visualizing the abstract concept in the topic of Chemical Bond. This mobile application will act as one of the tools that may help the teacher in their teaching instead of using textbook alone. The apps are specially designed according to the Principles of Designing Visualization Tools by Wu and Syah (2003) and the Cognitive Theory of Multimedia Learning (CTML) by Mayer (2003). Instead of the mobile application, there will be a minibook provided as the kit of the mobile application.

Key words: *Mobile Augmented Reality; Chemical Bond; Technology; Education*

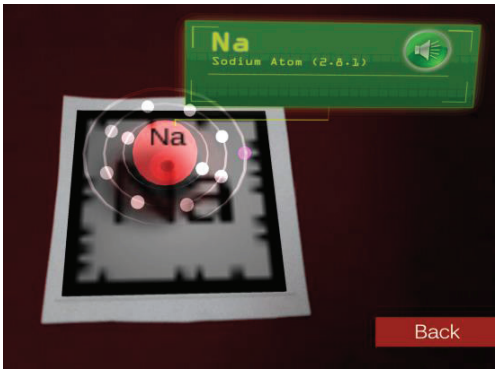
Introduction

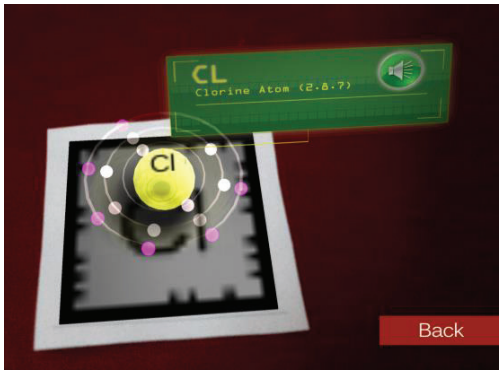
C-BOND is a mobile augmented reality (MAR) application (mobile apps) which developed to help in reducing the misconceptions in the topic of Chemical Bond. The misconceptions exist due to difficulties in visualize the abstract concepts in this topic. From the review conducted by Saidin, Abd Halim & Yahaya (2015), augmented reality (AR) technology has been applied in several fields include education and give more positive influences to teachers and students. Therefore, this mobile app will act as a tool that may help teachers in their teaching instead of using textbook alone which displayed the 2D model compared to 3D. For students, this is a new way to attract their attention, increase their motivation and make the learning process more enjoyable.

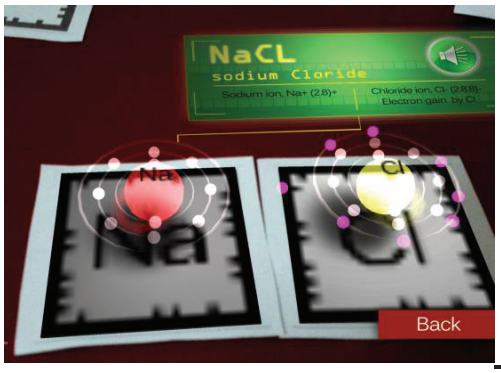
Besides, this mobile augmented reality also proven can help students in improving the student's visualization. The MAR technology is a new trend that emerged in the education nowadays since teachers and students can be used it anytime and anywhere. The apps is specially designed according to the Principles of Designing Visualization Tools by Wu and Syah (2003). These principles focus on reducing cognitive load by making information explicit and integrated. Other than that, the MAR also applied the Cognitive Theory of Multimedia Learning (CTML) by Mayer (2003) which emphasized to learn using multimedia elements (audio, animation, text, graphic and video) and also variety sensory (ear and eye) where finally the information can be stored in long term memory.

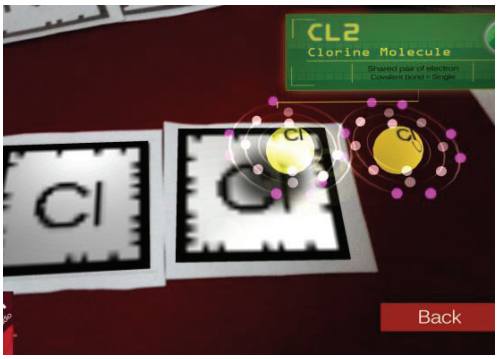
Instead of the mobile application, there will be a minibook provided as the kit of the mobile application. The minibook is needed as a guideline to make sure that the flow of the students learning process is on the right track. The marker of mobile augmented reality will be attach together in the minibook. The apps can be downloaded from Apple Store and Google Play with USD 4.99.

C-BOND Application

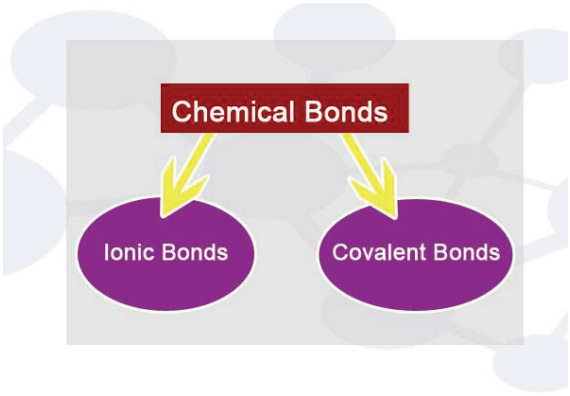


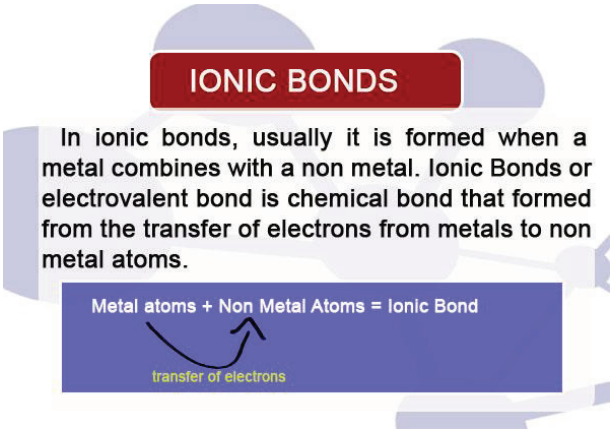


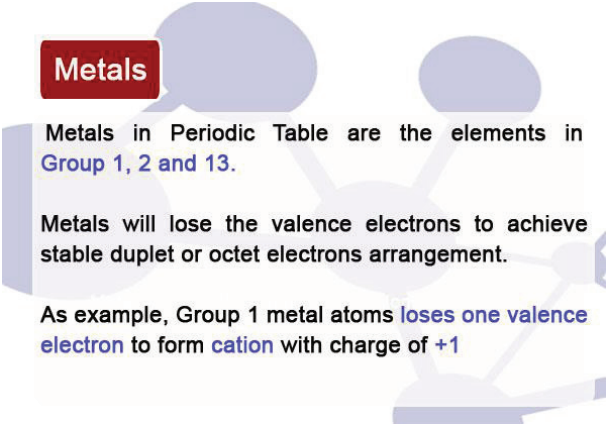


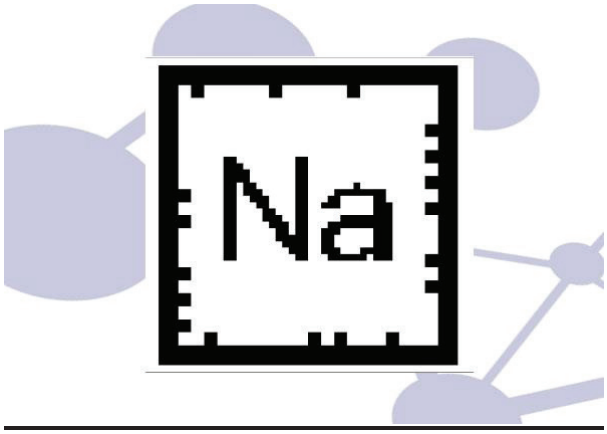


C-BOND Minibook









Content

Advantages

- Specially designed according to the Principles of Designing Visualization Tools by Wu and Syah (2003) (reducing cognitive load by making information explicit and integrated.).
- Applied Cognitive Theory of Multimedia Learning (CTML) by Mayer (2001) which emphasized to learn using multimedia elements (audio, animation, text, graphic and video) and also variety sensory (ear and eye) where finally the information can be stored in long term memory.
- MAR for C-BOND is designed followed the syllabus of KBSM.

Important to education

- **Teachers:** New way of teaching and learning instead of using the textbook alone.
- **Students:** Help in visualizing the abstract concepts and new way to attract student's attention by learning in a fun way.
- **Schools:** Provide the schools with a new tool which may help the process of teaching and learning which later may improve students' performance.
- **Other User:** Attract users to know and learn Chemical Bond in a simple way.

Commercial Value

- Can be commercialize by collaborate with other publisher such as PELANGI and SASBADI to market the mini books together with the revision books.
- Can be downloaded free trial version at apple store and play store. For full version user need to buy the mini book from the information provided.
- Can be commercialize by promote to the school for their learning especially to the class of Form 4 and Form 5 who taking Chemistry Subject.

Acknowledgement

The authors would like to thank the Universiti Teknologi Malaysia and Ministry of Higher Education Malaysia for their support in making this project possible. This work was supported by the Research University Grant (Q.J130000.2731.0K63) initiated by the Universiti Teknologi Malaysia and Ministry of Higher Education.

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