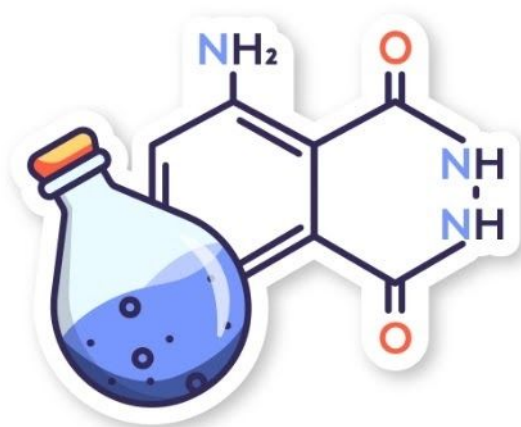


The Great App Assignment: MEL Chemistry



Start exploring the world of
chemistry!

For EDCI 767

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1. Specifications

1.1 Introduction

MEL Chemistry is an educational application for mobile and desktop that acts as a resource for chemistry and science teachers teaching at the high school level. The app features experiments (complete with safety and troubleshooting guides), news from MEL science, and 3D renderings of selected molecules. There is also a VR extension that can be used to simulate a chemistry laboratory and to view a molecule's structure.

1.2 Cost

The application itself is free, but there is an option to pay \$46.80 every month to have physical experiments set sent to you . A virtual reality (VR) headset is also included so that students can use the VR extension along with the app. This review will not be evaluating the educational benefits of the experiment set since the first set would not arrive before the deadline for this paper.

1.3 Version and Updates

The current version of MEL Chemistry available on Google Play and the Apple App store is version 2.21.1. It was last updated on September 3rd, 2020 and was released on June 2nd, 2020. This application gets regular updates occurring in intervals of a few months on average.

1.4 Permissions

When the app is being installed it asks for the following permissions: access to the camera (for taking pictures and video), making changes to device storage (reading, modifying, and deleting data associated with the application), and several others (running foreground services, vibration control, running at startup, network access, preventing sleep mode, and receiving data from the internet). None of these permissions are unusual or unnecessary for this type of application; no access is being requested for services that handle personal data such as contacts, email, or passwords repositories.

1.5 Platforms

MEL Chemistry can be viewed using a desktop or by downloading the application from either Google Play or the Apple App Store.

2. BC Curriculum Recommendations

2.1 Grade Level

This application is appropriate for all grade levels but is most useful for grades 10 through 12.

2.2 Suggested Courses

Science 10, Chemistry 11, Chemistry 12

3. Summary of App

3.1 Integration into a Unit Plan

This application is a powerful resource for teachers looking to have a diverse repertoire of experiments. It contains over 50 experiments, a section titled “news” demonstrating the experiments, a section to view chemical reagents at a structural level, and the option to use a virtual reality extension. The experiments can be done within a highschool lab setting or at home if they are registered with the MEL Science monthly- experiment kit subscription. The virtual reality extension allows students to play games, look at molecular structures, engage in lessons, and take quizzes. The experiments, demonstrations, and reagent list are all available in the free version. The virtual reality extension is available after purchasing a subscription. Teachers can use this application to incorporate more experiments into their daily Science 10, Chemistry 11, or Chemistry 12 lectures or labs. Teachers can also use the reagent section in the application to assign readings for specific reagents that will be used in future labs or have students read about the experiment prior to performing them.

The experiment section contains over 50 experiments that range in difficulty and risk. For example, the experiment “Magic Liquid” is rated easy with minimal risk. After selecting it, the app brings you to the main page of the experiment where users can read about safety, FAQ and troubleshooting, expected result, disposal, and scientific description. The safety precautions

recommended for this experiment are protective glasses and a plastic tray. The FAQ section answers questions such as, “Can I use a plastic instead of a glass beaker?” and, “The liquid in the third cup is hissing! What is happening?”. The answers are well-written, scientific, and easy to understand. The expected result describes the expected outcome; the disposal informs users how to safely clean up, and the scientific description provides an in-depth explanation of the main point and scientific processes behind the experiment. The scientific description in this example explains the properties of pH. This supports the idea that assigning this section as reading homework in preparation for a future lab could be a helpful strategy for teachers.

The second section of the app contains demonstrations of the experiments, infographics for elements of the periodic table, and fun facts related to chemistry. The experiment previews serve as advertisements for the kits they sell. These short demonstration videos could be used to perk student interest for future experiment plans. The infographics frame chemical elements in a more approachable way by adding color, cartoons, and fun facts. Exploring this page could increase student interest towards conducting experiments and learning more about chemical elements.

The reagent section lists all the reagents that are part of the experiments. It is arranged in alphabetical order, beginning with acetic acid and ending with

zinc sulfate. Each reagent is listed with an icon of its molecular structure. For example, ammonium carbonate has a small image of two nitrogen atoms and a calcium carbonate atom ((NH₄)₂CO₃). After selecting the reagent, an information page appears with a 3D-animated molecular structure of the compound, a skeletal diagram, some of the common names, a description (heat properties, stability), a link to its' wikipedia page, and hazard information. This particular section could be useful for Chemistry 11 when introducing organic compound geometry and structure.

4. Concerns and Cautions

This application raises a few concerns, the first of which relates to the app's somewhat predatory attempt to coerce users into purchasing a subscription. While it is expected that a free app would try to get users to pay into

Please sign in for full access to the
MEL Chemistry app

Sign in



Skip



it, teachers that recommend this app to their students should be aware of the morally "gray" marketing techniques that MEL Science utilizes. The first of which is

pictured to the left; when starting an experiment, the user is presented with a pop up that requests the user "sign in." After going to the desktop version of the MEL Chemistry, it was apparent that to get credentials to sign in, one would have to purchase a subscription. This should be noted only as an extremely mild caution since the subscription provides the materials to complete the experiments. In

other words, asking users to pay for materials that are required for an experiment they are about to complete is absolutely warranted. Though, while warranted, buying materials from MEL Science is not necessary since most labs can be completed with easily obtained reagents and materials. While this method of subscription poaching isn't malicious, the next method is far less benign.

The more reprehensible method this application uses to gain subscriptions is through the use of "lures." Pictured to the right is an example of an ad that can be found on most pages in MEL Chemistry. "Learn more" takes you straight to a page that requests you subscribe so that you can get the experiment sets. This ad is targeting parents (usually higher buying power) to spend money through a guilt mechanism; implying implicitly that they aren't spending enough

Spend educational time together with your kids



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Learn more

Want to perform even more cool experiments?



Learn more

educational time with their children. It is also important to note that there are plenty of ways to spend educational

time with your children that don't require you to spend money (consumerist, capitalist ideologies). Pictured above is a lure that targets children. This ad also leads directly to a subscription page.

Another concern associated with MEL Chemistry is the possibility for students to attempt the experiments without adequate supervision. A strong feature of this application is the simplicity of the procedures; each step usually

has a few lines of text and a drawing. The consequence for this expediency is the lack of safety information at steps where it is relevant. Safety information is presented in a tab on the main page of the experiment, the same page that features the eye-catching “Start experiment” button. The issue with this is that it is far too easy to imagine a student, eager to begin, forgoing the safety information and having an accident that could have been prevented.

The final concern that was raised in this review is the “news” tab. This tab is populated solely with articles posted by MEL Science. This is certainly misleading since you would expect a tab marked “news” to have several sources of information. Since this issue isn’t within the scope of this review, evaluating MEL Science’s articles for scientific accuracy and bias is left as an exercise for the reader.

5. Conclusion

Often students in later grades approach science with dwindling motivation and with the assumption that science class will be boring (Potvin, Hasni 2014). By incorporating more demonstrations into lectures, teachers have the opportunity to null this misconception. We have found some practical applications for this app with respect to Science 10, Chemistry 11, and Chemistry 12:

MEL-Chemistry Experiment	Content	Grade level
Acidic Patterns	Acid & base chemistry	Science 10; Chemistry 12
Foil etching	Oxidation & reduction	Chemistry 12;
Sugar snake	Energy transformation	Science 10
Fire foam	Stoichiometry	Chemistry 11

Figure 1: How teachers could use MEL Chemistry experiments to demonstrate content from different grade levels.

In addition, teachers also have the opportunity to introduce students to detailed information pages concerning the reagents they intend to use in an upcoming lab. With this approach, both the experiment and components used in the lab can be made more approachable for students. While we recommend teachers to look into this application to supplement their current lectures of lab sessions, some concerns exist. Throughout the app there are imploring attempts to have users purchase a subscription. Also, safety measures may not be taken seriously if student's attempt these experiments without supervision. Lastly, the app uses a "news" tab which is oddly misleading and only leads to more advertisements for their products. Despite these shortcomings, MEL Chemistry may be valuable to Science 10, Chemistry 11 and Chemistry 12 teachers in British Columbia.

References

Potvin, P., & Hasni, A. (2014). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in Science Education*, 50(1), 85–129.

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