COVID-19

The transition from the biochemistry laboratory to home discovery during COVID-19

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Abstract
As a result of the COVID-19 pandemic, it is crucial for an introductory course in biochemistry to move from in-person instruction to total remote learning. There are four transferable skills in the course: problem-solving, laboratory psychomotor skills, data analysis and interpretation skills, and presentation skills. Since all lab buildings were closed for learning activities, we responded quickly to ensure the transferability of the skills. We modified the laboratory activity as a home discovery approach to achieve the desired skills. Students showed confidence and gratitude as they learned in a new way. In summary, modifying the laboratory activity helped students acquire laboratory-related skills but presented challenges in using laboratory equipment. This suggests that Home Discovery can be considered a hybrid approach to learning biochemistry.

KEYWORDS
biochemistry education, COVID-19, home discovery

Principles of Biochemistry is a fourth-semester undergraduate biology course at Universiti Pendidikan Sultan Idris. The course includes hybrid learning and laboratory work. Laboratory activities included five experiments on enzymes, carbohydrates, proteins, and lipids, which required analytical equipment, chemicals, and a laboratory environment. The pandemic required significant changes in the curriculum, especially in the laboratory activities.

We used the On-POINT method of thinking by following the problem (P), objective (O), idea (I), novelty (N), and action (T) phases. In step P, we selected laboratory skills that could be taught remotely, namely problem solving, data analysis and interpretation, and presentation skills. In step O, we set the goal of finding alternative lab tasks that would enable skill learning. In step I, ideas were kitchen labs, online simulations, home discovery, video-based learning, and live lab demonstrations. Phase N is about weighing the most appropriate and meaningful solution. Therefore, we decided that Home Discovery was the best solution. This is in line with the concept of enhancing students' knowledge through a workshop learning environment. Finally, in step T, a home discovery activity is developed to enhance skill acquisition by practicing scientific process skills.

The home discovery concept combines theory discussions with self-discovery activities. There were two phases: Home Discovery 1 (HD1) and Home Discovery 2 (HD2). In the HD1, the principles of biochemistry were discussed via online learning. Twenty-four students were divided into eight groups of three. For example, in one of the simulations, students were asked to determine which metabolism affects endurance activity. They were to look for other facts to support their claims and present them on the Google Jamboard.

In HD2, each student was required to create a meal that they believed would supply them with enough energy to complete a fitness test. They used the Malaysian Food Composition Database (https://myfcd.moh.gov.my/myfcdcurrent/) to estimate the quantity of
calories and nutritional values based on available data. They ate their meals and rated their performance using the Cooper 12-minute test or the 3-minute step test.\textsuperscript{3,4} They repeated the process and recorded the data for a week using a data collection template (Figure 1). Each group reviewed and evaluated their data, converted the results into visual graphs, drew a conclusion, and reflected on their discovery at home in an online presentation. The accuracy of the experimental design, correct data analysis and interpretation, and presentation were assessed.

In their reflections, all students agreed that Home Discovery motivated them and changed the way they learn. Behavior change was noted (Figure 2). Students valued their bodies (85.7\%) and paid more attention to their health (95.8\%) by continuing to exercise and eat healthily. The change was a new success, although these results were not expected in the proforma of the course.

Laboratory activities, however, remain essential to developing science work skills in a supportive learning environment.

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**CONFLICT OF INTEREST**

The authors declare no conflict of interest.

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![FIGURE 1](image1.png)

A template for data collection.

![FIGURE 2](image2.png)

Percentage of students’ response to the benefits of home discovery activity.