COVID-19 is an infectious disease that adversely affected the world in an instance in 2020. As a novel viral infection, there is so much to know and understand about its biology, transmission, diagnosis, prevention, and the like, and this reflects the bulk of the latest scientific information being added every day. To help in its dissemination and in promoting COVID-19 awareness, “COVID-19 and Biotechnology” has been integrated as a topic in an undergraduate Basic Biotechnology course offered by the Department of Biological Sciences, College of Arts and Sciences, Cavite State University, Philippines to its BS Biology students. This generally aims to present to students the important roles of biotechnology in addressing COVID-19, and help them better understand the biology of this disease. Here, several important discussion points are included:

1 | COVID-19, ITS CAUSATIVE AGENT, AND ITS MODE OF INFECTION

This gives a background on COVID-19 and its current worldwide status as a pandemic. It also describes its causative agent, SARS-CoV-2, in terms of its taxonomy, structure, genomic organization, and mode of replication. As a supplement, a recently published review article on the biology of this disease is made available for students to read (Supplementary Material 01).

2 | AVAILABLE AND EMERGING COVID-19 DETECTION KITS

This presents and makes a comparison of the different diagnostic tools being used to detect COVID-19 including RT-PCR swab, rapid antibody, ELISA, and antigen test kits. This also describes the other detection kits (e.g., RT-LAMP assay, paper COVID-19 test, and saliva test) that are currently being developed.

3 | AVAILABLE COVID-19 TREATMENT DRUGS AND THEIR MODES OF ACTION

This enumerates the different medical drugs (e.g., hydroxychloroquine, remdesivir, baricitinib, etc.) that are reported to be used against the disease, and discusses their modes of action against their respective targets.
(e.g., virus and manifested symptom). Their proven efficiency or non-efficiency, and their FDA approval status are also indicated. In addition, a background about the Solidarity Clinical Trial being conducted by the WHO is presented.

4 | GENETICS OF IMMUNITY

This introduces the adaptive and innate immune responses of humans, and the different levels of immune protection. It presents the structure and production of antibodies, and its important role in combating COVID-19.

5 | COVID-19 VACCINE DEVELOPMENT

This describes the different types of COVID-19 vaccines (i.e., genetic, viral vector, protein-based, inactivated/attenuated, and repurposed vaccines) based on their structure, mode of action, advantages and disadvantages, required dosage, and existing examples. It also discusses the different phases of the vaccine testing process and describes how it reaches approval for public use.

6 | PLANTS OR ITS DERIVATIVES, AND THEIR POTENTIAL USE IN ADDRESSING COVID-19

This presents the importance of plants and its secondary metabolites in the discovery of COVID-19 treatment drugs and adjuvants. It highlights some related local investigations such as those that look into the anti-COVID-19 potential of Virgin Coconut Oil (VCO), Vitex negundo, and Euphorbia hirta which are known to contain antivirals. Here, the properties and the proposed mechanisms of action of these antiviral compounds, and the status of current research involving these plants are discussed. As a supplemental activity, students are tasked to search for a plant or a plant derivative that has been or is being tested for pharmaceutical use against COVID-19 (Supplementary Material 02). They are asked to provide a background information about the plant or its derivative, its possible interaction with the virus or the disease, and the major findings of some related studies.

7 | APPLICATION OF THE CRISPR TECHNOLOGY

Under this subtopic, students analyze using their established knowledge on CRISPR (or clustered regularly interspaced short palindromic repeats) how this emerging gene editing tool can be used in addressing COVID-19. It also makes use of published research articles to support such claims.

In addition to these discussion areas, students are given an activity that will test and extend to the public their understanding of the topic. They are asked to make digital informational materials about COVID-19, either a general information or a research update, that can easily be understood by laymen (Supplementary Material 02). The outputs are graded based on clarity of topic presentation, accuracy of details, creativity, grammar use, and inclusion of references. These infographics can then be posted in social media to promote awareness about COVID-19.

In summary, the inclusion of COVID-19 as a topic in an undergraduate biotechnology course can be an effective way to introduce the latest updates about COVID-19, and to involve students in the promotion of COVID-19 awareness.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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