International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 3, Number 6, June 2024, *Page. 3319– 3329*
Email : editorijhess@gmail.com

Inclusion of Anti-COVID-19 Related Research Highlights into the Classroom: Why, What and How?

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Abstract

Bringing recent research highlights into the classroom has drawn an intense amount of interest because it can show students what are being discovered, especially those anti-COVID-19 works. Therefore, we aim to study the feasibility and share the thoughts on the relevant innovation in education during the pandemic of COVID-19. To do so, we first examine participants' (consisting of bachelor, master and PhD students at different universities) attitudes of towards the inclusion of anti-COVID-19 related research highlights into the classroom via the survey questionnaires. It is found that students mostly preferred such an innovative move. We then feature multiple anti-COVID-19 research highlights, ranging from the anti-fog materials, new inhalation treatment approach, antiviral 2D materials, efficiency enhancement of mask materials, rapid detection methods to vaccine development. Next, we elaborate the class design such as contents, objectives, difficulty level and learning outcomes with two specific examples. Lastly, suggestions for better implementation of including anti-COVID-19 related research highlights into the classroom are provided. The findings of this study can help universities and teachers to further improve the class design, thereby creating strong anti-COVID-19 related theory-practice linkages for students.

Keywords: COVID-19, Undergraduate, Chemistry, Physics, Materials Science, Biology, Lab Demonstration.

INTRODUCTION

COVID-19 has infected more than 200 million people and its mortality rate is about 2% worldwide (Cron, Caricchio, & Chatham, 2021; Westerlund, Chugai, Petrenko, & Zuyenok, 2023). Long COVID will continue to have profound social impacts, albeit COVID-19 is no longer a public health emergency of international concern (Davis, McCorkell, Vogel, & Topol, 2023; Hall, 2024). To prevent the spread of the virus, especially among students of different age groups, numerous schools or universities went remote at the height of the epidemic (Yun, 2023). According to the latest figures released by the United Nations Educational, Scientific and Cultural Organization (UNESCO), over a billion students worldwide were not able to attend school or university as of March 23, 2020. Important reports about the huge impact of the COVID-19 on the global education were also recently released (Mok, Xiong, Ke, & Cheung, 2021; Tesar, 2020). A 'new normality' in education has emerged, for example, i) the transition to online teaching and learning from face-to-face ones; ii) the cancellation or restriction of physical events and activities; iii) the immersive training by the utilization of virtual reality technology (Mok et al., 2021; Ogunji et al., 2022; Singh et al., 2020). In addition to the above changes, a good question has been raised: what kinds of COVID-19 related knowledge should be included during and beyond COVID-19 pandemic? This timely, significant and appropriate research question is also firmly supported by the recent literature (Elsner, Sadler, Zangori, Friedrichsen, & Ke, 2022; Lathifaturrahmah, Nusantara, Subanji, & Muksar, 2023; Najeb & Om Prakash, 2020; Tapia, Ochoa de Alda, Jeong, & Gómez, 2020) in which the inclusion of COVID-19 knowledge is highly recommended. Back in 2020, Tapia and coworkers investigated the ways to integrate COVID-19-related knowledge in the science-related curriculum, which allows teachers to frame the relevant content into each curriculum level. Yet there was no clear picture on the most interesting or essential topics of COVID-19. Elsner et al. then surveyed 224 high school students and found that students expressed the most interest in topics related to the origin of COVID-19 and vaccines (Elsner et al., 2022). We aim to provide a more specific answer to this research question; therefore, a series of follow-up or correlated questions begin with why, what and how are logically designed and studied. It is believed that the findings from such a study can help educators and their institutes to further improve the class design, thereby creating strong anti-COVID-19 related theory-practice linkages for students.

As discussed in one of the later sections (i.e., Anti-COVID-19 Research Highlights), plenty of exciting anti-COVID-19 research highlights have been recently reported. Many of them are strongly interlinked to our courses of current Chemistry and Materials Science and other branches in Science. Integrating anti-COVID-19 related real examples and their underlying mechanisms with the contents delivered in the classroom could i) make the contents or concepts to be easily understood and memorized; ii) provide students with a solid understanding on the applications to knowledge and skills learned in the classroom; iii) stimulate students' critical thinking about the complexity and unpredictability of real-life issues; iv) enhance students' problem solving skills; v) let students know what scientists do on the frontlines of fighting against COVID-19. In addition, such an adjustment should be implemented for both online course and in-person contents, especially in a specific educational context like chemistry education. This is because Chemistry is highly correlated to COVID-19 research, and it plays an important role in understanding the structure and pathogenesis of COVID-19, isolation of vaccines and therapies, as well as in the development of materials and techniques used by basic researchers and health care workers (Ramos & Towns, 2023). It is a common sense that the more you know, the less you fear. As educators, we therefore should include up-to-date anti-COVID-19 related knowledge into the classroom and make students learn something new. Nevertheless, such an educational research topic has rarely been investigated. Herein, anti-COVID-19-related knowledge is defined as the theoretical or practical understanding related to i) basics, symptoms, causes, infection mechanism and prevention of COVID-19; ii) anti-COVID-19 materials or products; iii) COVID-19 treatment methods; iv) COVID-19 detection methods.

In this article, we firstly examine students' attitudes towards the inclusion of anti-COVID-19 related research highlights into the classroom. Secondly, we feature different anti-COVID-19 related research highlights. Thirdly, we elaborate the class design such as contents, objectives, difficulty level and learning outcomes with two specific examples. Finally, suggestions for better implementation of including anti-COVID-19 related research highlights into the classroom are provided. This work aims to share our thoughts with the worldwide teaching community during the special time

RESEARCH METHODS

This study applied the survey questionnaires as data collection instrument to examine students' attitudes towards the inclusion of anti-COVID-19 related research highlights into the classroom. The questionnaires were distributed in August 2022 via the Chinese "Wenjuanxing" online survey system to the anonymous students in Mainland China and the information were collected from respondents. All participants in the study gave their prior consent to conduct the anonymous questionnaire survey, while maintaining their confidentiality. Until February 2024, 161 valid responses from the online survey system were successfully collected and the approximation results were shown for simplicity. From the demographic details of our respondents, amongst all of them, 51% are males, and 49% are females (Fig. 1a). In terms of the

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study levels at government-owned universities, there are 57 bachelor students (36%), 52 master students (32%) and 52 PhD students (32%) (Fig. 1b). In addition, the majority of participants majored in Materials Science at the time of the survey. Noted that there was no special rationale reason to choose the participants unless otherwise specified.

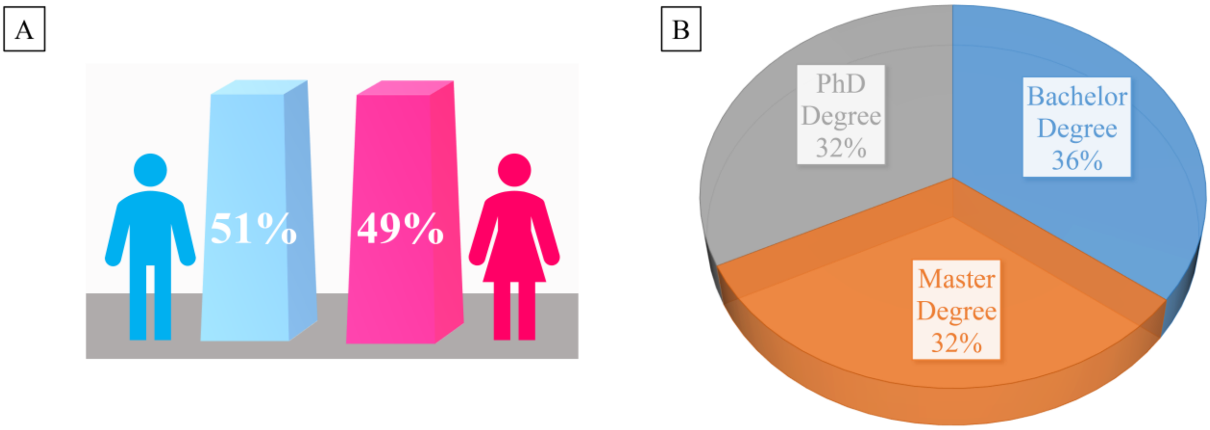

Fig. 1. Gender of the participants (a) and degree of study undertaken by the participants (b) in percentage.

To collect quantitative information from participants and eliminate unnecessary complexities in data collection, we mainly applied close ended questions like dichotomous (e.g., yes or no questions) and multi-choice questions to the online questionnaire (10 questions in total). All of them are designed based on a thoughtful discussion. Specifically, 1 of them (i.e., Q1) was designed to unveil students' thoughts regarding to the effect of COVID-19 on students' personal and career development; 1 of them (i.e., Q2) was designed to investigate how well do the students know about the fundamental knowledge of COVID-19; 1 of them (i.e., Q3) was designed to check the current status of the anti-COVID-19 education in the classroom; 3 of them (i.e., Q4-Q6) were designed to know students' thoughts on the benefits of including anti-COVID-19 related research highlights into the classroom; 2 of them (i.e., Q7-Q8) were designed to explore the correlation between anti-COVID-19 research highlights and students' research projects; 1 of them (i.e., Q9) was designed to research the best teaching method students like the most; and the very last one (i.e., Q10) was designed to examine which research fields of interests are much more popular. Simply speaking, the main purpose of such question designs is to acquire students' opinions about the inclusion of anti-COVID-19 related research highlights into the classroom. By doing so we can easily have a full picture around this specific topic. Before the formal survey, we also did a quick study among a small group of students to ensure the questionnaire was understandable, reliable and valid. The contents of the questionnaire and the results are shown in Table 1. Although yes or no questions have been also used (Munkebye & Staberg, 2023; X.-M. Zhang et al., 2019), it is recommended that Likert scale questions should be applied for the similar research in the future if a greater degree of nuance is needed (Butt, Lodhi, & Shahzad, 2020). This can lead to better reliability and validity.

RESULT AND DISCUSSION

As shown in Table 1, participants were asked to indicate which response choices they preferred with a series of research items (i.e., Q1-Q10) pertaining to various aspects of the inclusion of anti-COVID-19 related research highlights into the classroom. The datasets generated during and/or analyzed during the current study are all included in this article.

Referring to Q1, a majority of the participants (70%) indicated that COVID-19 could pose negative effects on their study and future career, whereas the others (30%) did not think so. Noted that the choice was made under the circumstance of China's Omicron (e.g., the Omicron 5.B variant) threat under control. There is no doubt that the differences in infection control solutions among countries is one of the key factors affecting the choice of Q1. Not surprisingly, 88% of participants checked "Yes" to Q2 about the fundamentals of the COVID-19 infection mechanism and control. The remaining 12% checked "No" could be due to they set a higher "standard" for this question. Years since the outbreak of COVID-19 pandemic, it is quite certain that teachers more or less have included anti-COVID-19 knowledge or/and research highlights in the classroom. For example, a novel option of using hydrogen/oxygen mixed gas inhalation in COVID-19 treatment (more details are shown in the latter section) was introduced in author's classroom (*Hydrogen Science: Fundamentals & Applications*, course code MSE8608 @ SJTU). However, it is found from the result of Q3 that roughly 42% of the participants did experience some classes involving the knowledge and recent research highlights of anti-COVID-19. The rest of the participants did not have such experience. Noted that multiple cognitive interviews were also conducted after author's classroom, and the participants expressed that the anti-COVID-related knowledge imparted was helpful to broaden their horizons as well as acquire the information, but detailed instruction was preferred. It is believed that students' cognitive changes were more profound with the combination of the knowledge applications and recent research highlights, thus promoting the development of students' critical thinking skills. In fact, up to about 60% participants were interested in the anti-COVID-19 knowledge and research highlights (Q4). More importantly, the majority (~70%) expressed that the inclusion of anti-COVID-19 related research highlights into the classroom was necessary and beneficial (Q5-Q6). Additionally, more than half of the participants (most likely to be research-based graduate students) thought such anti-COVID-19 related research highlights could also be correlated to their research works and even useful (Q7-Q8). Therefore, we should include the anti-COVID-19 related research highlights into the classroom. Interestingly, the order of the teaching method, from the most popular to the least, was found to be mixed lecture/lab demo, lecture, lab demo (Q9). Amongst the responses which indicated an interest in the anti-COVID-19 related research highlights, the top two most popular research fields are Medicine (55%) and Materials Science (31%), whereas Chemistry and Physics accounts for 9% and 5%, respectively (Q10). Overall, the results of this questionnaire showed that students mostly preferred the inclusion of anti-COVID-19 related research highlights into the classroom.

Table 1. The contents and results of the questionnaire

Research Items	**Choices**	**Results**
Q1: Do you worry about the negative effect of COVID-19 on your study and future career?	Yes No	70% 30%
Q2: Do you know the fundamentals of the COVID-19 infection mechanism and how to protect yourself?	Yes No	88% 12%
Q3: Did you experience any classes in which the knowledge and recent research highlights of anti-COVID-19 are shared?	Yes No	42% 58%
Q4: Are you interested in acquiring knowledge on anti-COVID-19 and knowing the recent research highlights in the field of anti-COVID-19 in the classroom?	Yes No	57% 43%
Q5: Do you think it is necessary to include the knowledge and recent research highlights of anti-COVID-19 in the classroom?	Yes No	68% 32%

Q6: Do you think it is beneficial to include the knowledge and recent research highlights of anti-COVID-19 in the classroom?	Yes No	70% 30%
Q7: Are there any relationships between your research works and the recent research highlights of anti-COVID-19?	Yes No	55% 45%
Q8: Do you think knowing about the underlying mechanisms of the anti-COVID-19 research highlights is useful for your study and research?	Yes No	63% 37%
Q9: Which teaching method is the best for you to acquire the knowledge and information about the recent research highlights of anti-COVID-19?	Lecture Lab Demo Mixed	34% 10% 56%
Q10: Most of the anti-COVID-19 research works have been done in the research fields like Medicine, Chemistry, Physics and Materials Science. Which field's highlights do you like the most?	Medicine Chemistry Physics Materials Science	55% 9% 5% 31%

Main Findings

Based on the results obtained through this questionnaire survey, main findings are briefly summarized as follow:

First, a certain number of students do not take the anti-COVID-19 knowledge and research highlights seriously enough. Those students are simply not interested in them, despite the fact that they possibly can provide students with benefits in daily life and research (Billingsley, Heyes, & Nassaji, 2021). We note that the large, diverse groups of students have different interests and levels of motivation, and this fact inevitably makes teachers difficult to promote interest for all students (Harackiewicz, Smith, & Priniski, 2016). Keys for teachers are to creatively promote interest and share appropriate anti-COVID-19 research highlights, thereby contributing to a more engaged, motivated, learning experience for students. One more key is to make teachers responsible for multiple disciplines or have multi-disciplinary teaching teams.

Second, it is generally believed that the mixed lecture/lab demo teaching method can be used to make the learning environment of such lectures more effective and boost student engagement. In other words, teachers are required to actively design the anti-COVID-19 related classes in which interactive elements and activities are included.

Third, most students show high preference for the anti-COVID-19 research highlights in the fields of Medicine and Materials Science. This also implies that teachers in these two fields should act as soon as possible and correlate the recent anti-COVID-19 research highlights with the current curriculum or knowledge.

The above main findings are conclusive; however, the fundamental questions of "what to share" and "how to share" remained to be addressed. The following three sections are dedicated to addressing these specific questions, and it is believed that the related contents/discussion will enable educators with different professional backgrounds to introduce anti-COVID-19 knowledge to their students more efficiently.

Anti-COVID-19 Research Highlights

The emerging threats caused by COVID-19 and its variants (especially Omicron and Delta variants) continue. It is noted that hyper-inflammation with features of cytokine storm syndrome and associated acute respiratory distress syndrome are the leading causes of mortality (Fajgenbaum & June, 2020). Yet, researchers at the forefront of the fight have also been working hard against this virus. They have made invaluable contributions to the fight against COVID-19, ranging from the anti-fog materials (e.g. goggle & wet tissue), new inhalation treatment approach, antiviral 2D materials, efficiency enhancement of mask materials, rapid detection methods to vaccine development. There are three main reasons for the design of this section: i) to provide readers, most likely educators, with relevant up-to-date information and research highlights, so that they can more effectively design the course content; ii) to share the important and interesting anti-covid-19 research highlights summarized by authors; iii) to highlight and appreciate the outstanding contributions made by the scientists, which will help students form a kind of reverence for scientists and establish correct values.

As nurses and other health care workers are at the front line of the COVID-19 outbreak response, it is important for them to have appropriate personal protective equipment, for example goggles or face shield. It is known that the reason behind the fog formation on the inside of the goggles is the accumulation of sweat vapors that condense on the cold glass (Shrivastava et al., 2021). Sun's group developed a modified zirconium phosphate based coating on glass substrate with high transparence and superhydrophilicity (Fig. 2a) (Lei, Chen, Sun, Han, & Sun, 2021). This technique has been successfully applied to the anti-COVID-19 products like disposable anti-fog disinfectant wipes and spray.

Noted that a key mechanism to dyspnea and disease progression in COVID-19 patients could be the increased work of breathing caused by the high airway resistance (Guan, Wei, Chen, Sun, & Zhong, 2020; L. Zhang, Yu, Tu, He, & Huang, 2021). Zhong's group performed a multicenter randomized clinical trial for the first time to verify the efficacy and safety of hydrogen/oxygen mixed gas (H_2-O_2) inhalation in COVID-19 patients (Fig. 2b) (Guan et al., 2020). Evidence suggested that H_2-O_2 inhalation significantly improved the severity of COVID-19 and the clinical benefits were likely attributed to the lower inhalation resistance.

Two-dimensional (2D) nanomaterials have been exploited for a wide range of biomedical applications, and a pilot study by Yilmazer's group recently demonstrated the antiviral activity of MXenes (e.g., $Ti_3C_2T_x$) against COVID-19 (Unal, Bayrakdar, Fusco, Besbinar, & Yilmazer, 2021). As shown in Fig. 2c, $Ti_3C_2T_x$ treatment led to the interference with viral life cycle through the interaction with certain COVID-19 that involved in different pathways and biological processes such as membrane trafficking, G-protein coupled receptor signaling, mitochondrial function, metabolic pathways and viral replication.

N95 respirators are essential for protecting healthcare workers and the public who may directly, indirectly, or closely contact with COVID-19. Cui's group recently reported that particle filtration efficiency could be improved by charges generated from the triboelectric effect (Fig. 2d) (Liao et al., 2020; Zhao, Liao, Xiao, Yu, & Cui, 2020).

The quantitative reverse transcription-polymerase chain reaction (qRT-PCR) analysis is the current standard for the diagnosis of COVID-19, which is time-consuming and requires expensive instrumentation (Chaibun, Puenpa, Ngamdee, Boonapatcharoen, & Lertanantawong, 2021). Lertanantawong's group developed an electrochemical biosensor based on multiplex rolling circle amplification for the rapid detection of the N and S genes of COVID-19 from clinical samples (Chaibun et al., 2021), in which the functionalization with redox-active labels was the key for the detection by differential pulse voltammetry (Fig. 2e). Satisfyingly, a rapid detection of viral N or S genes at a low concentration (i.e., 1 copy/μL) within 2 hours could be achieved.

Safe and effective vaccines are critical to ending the pandemic, and now more than 90 vaccines are being developed against COVID-19 across the world (Callaway, 2020; Li & Li, 2021). The vaccine candidates could be grouped in five categories, i.e., virus, nucleic acid, viral vector, protein-based vaccines and others (Fig. 2f). All these vaccines aim to trigger the immune response to the infection of COVID-19. In addition, an automated and modular On Demand Pharmaceuticals platform was recently developed for the synthesis of COVID-19 intensive care unit medications or their intermediates from chemical wastes (Wołos et al., 2022).

Without doubt, these aforementioned successful anti-COVID-19 research works are strongly interlinked to our courses of current Chemistry and Materials Science and other

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branches in Science. So, here is a question. How can teachers actively include these recent research highlights into the classroom?

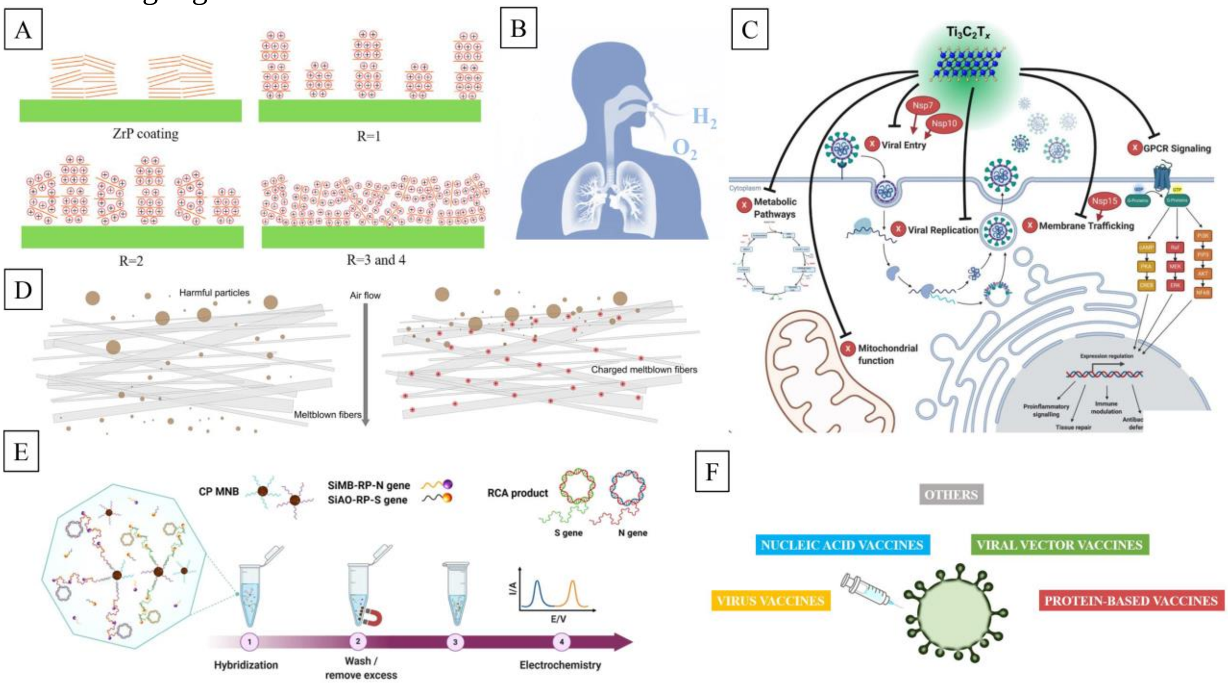

Fig. 2. A summary of recent anti-COVID-19 research highlights. (a) Schematic illustration of different hydrophilic coatings on glass substrates. Here, R represents the molar ratio of tetra-nbutylammoniumhydroxide (TBA^+OH^-) to α-zirconium phosphate (ZrP). Reproduced from ref. (Lei et al., 2021) with permission. Copyright 2021, Elsevier B.V. (b) The effectiveness of hydrogen/oxygen mixed gas inhalation against COVID-19. (c) The mechanism of MXene-dependent anti-COVID-19 activity. Reproduced from ref. (Unal et al., 2021) with permission. Copyright 2021, Elsevier B.V. (d) Schematic illustration of N95 Respirators' meltblown fibers (left) without and (right) with electret charging. In the left figure, smaller particles can pass through to the user, whereas particles are electrostatically captured in the case of an electret (right). Reproduced from ref. (Zhao et al., 2020) and the permission is not required. Copyright 2020, American Chemical Society. (e) Detection workflow of COVID-19 from clinical samples using the electrochemical biosensor with rolling circle amplification of the N and S genes. Reproduced from ref. (Chaibun et al., 2021) and the permission is not required. Copyright 2021, Springer Nature. (f) An illustrative drawing of COVID-19 vaccine candidates.

Examples of the Class Design

To answer the above question, the authors include two examples in this section. Both aim to actively and properly correlate the fundamental knowledge acquired in classes with the anti-COVID-19 research highlights. And the key points are to make students feel attractive and provide them with a better understanding on the knowledge or concepts, etc. The below two class designs are to share ideas on the class design in which anti-COVID-19 research highlights are included. Although they are not compared comprehensively, it is expected that students will acquire the knowledge and experimental skills accordingly. In addition, to attain better effectiveness, students should be majored in relevant subjects.

Take the anti-fog material research highlight for example, its technical core is mainly related to hydrophilicity. In an undergraduate integrated lecture/lab class (approximately 45 mins for each) on Interfacial and Surface Science, one focus is hydrophilicity that refers to the affinity that a material has in relation to water. It is also commonly correlated to the terms, concepts and specialized knowledge like wettability and contact angle, etc (Fig. 3a). To let students know the practical value of the knowledge and help them gain a better understanding on it, a lab demonstration is highly recommended after lecturing. The first thing a teacher needs to do is prepare the necessary materials (e.g. chemical reagents and apparatus) for the lab demonstration. Details can be accessed from ref. (Lei et al., 2021). Then, a clear and concise manual of laboratory instruction should be provided to get the lab done in simple and speedy manner. Here, lab safety rules and guidelines should be also included. During the lab, control systems can also be used for a better comparison to elaborate i) why the presence of water droplets on the goggle's surface could decrease the transparency (Notes: due to the strong reflection and scattering of light); and ii) why a superhydrophilic surface could enable a high transparency (Notes: a water film is formed instead of water droplets). Lastly, water contact angles for the resultant samples can be measured by an optical tensiometer (OneAttension, Biolin Scientific Instrument) using the sessile drop method. For kids and teenagers, the anti-fog material should be ready before the class and a quick demonstration during the lecture can still be "eye-catching".

Another example is about the research highlight of rapid electrochemical detection of COVID-19. It fits very well to a laboratory class (approximately 90 mins) on Bioelectrochemistry or Electrochemistry for senior undergraduates, in which key themes like voltammetry, redox activity and electrode potential are included (Fig. 3b). This demonstration is designed to encourage students to think critically about the practical value of the knowledge and develop important skills. In addition, it could serve as an attractive alternative to some electrochemical experiments where commonly used electro-active materials (e.g., ferrocyanide/ferricyanide, ascorbic acid/dehydroascorbic acid and glutathione/glutathione disulfide couples) are used. Due to the students may struggle with understanding the principles of the COVID-19 detection platform reported in ref. (Chaibun et al., 2021), lecturing must be done before the lab demonstration. To have a successful lab demo, the most important thing a teacher needs to do is make sure that all needed materials (e.g. chemical reagents, pre-prepared solutions and instruments) are ready for use. Detailed information can be found in ref. (Chaibun et al., 2021). Then, a proper lab manual should be provided to make the lab simple and speedy. Again, lab safety rules and guidelines should be also included. In addition to the main differential pulse voltammetric study using methylene blue and acridine orange redox dyes, control experiments without redox labels and with another commonly used label (say, ferrocyanide/ferricyanide (Aoki & Tao, 2008; Lee, Kim, & Chung, 2021) along with those reported ones in ref. (Chaibun et al., 2021)) are highly recommended, and doing such a comparison study helps students improve divergent thinking. For kids and teenagers, visual lab demonstration would be a great choice.

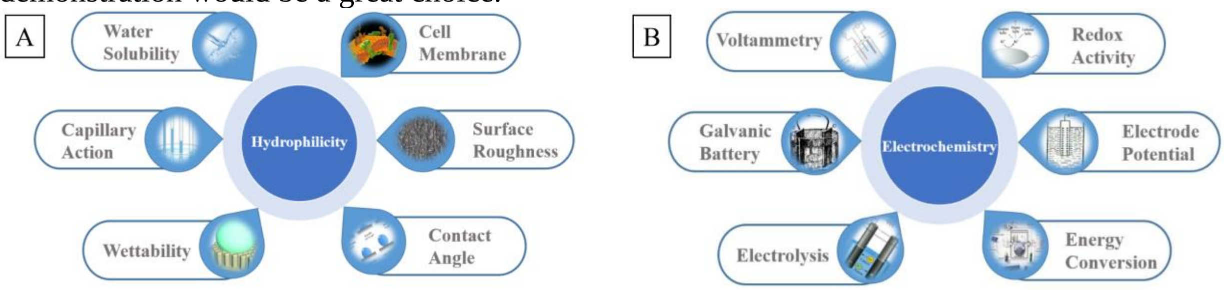

Fig. 3. Proposed knowledge maps of hydrophilicity (a) and electrochemistry (b).

Suggestions for Better Implementation

The fact of the matter is, to our best knowledge, many teachers around us are aware of the necessity of including anti-COVID-19 related research highlights into the classroom. However, achieving a broader impact is not as easy as we expected. There are many different participants involved in this process, and some key actions should be taken by each of them in order for it to implement better (Table 2). Clearly, teachers should take the lead by developing their own knowledge and ability about anti-COVID-19, creating activities for students and sharing thoughts among colleagues with different majors; while students should actively participate in the activities and use critical thinking skills. Moreover, internal and public funds (from university and government, respectively) should be used to support some related projects. This can further develop better activities and strategies for learning, teaching and assessment, etc. Further, conference meetings hosted by universities and nonprofit organizations can provide opportunities to exchange ideas and share experiences on a common platform. Last but not least, innovation in both the classroom and daily life can lead to better overall outcomes.[25] It is impossible to create a suitable environment without government support and social media platforms.

Table 2. Proposed key actions taken by the main participants for a better implementation of including anti-COVID-19 related research highlights into the classroom.

Participants	Key Actions
Teachers	Develop Knowledge and Ability; Create Activities; Exchange Ideas (Among Teachers); Publish Popular Science Articles.
Students	Engage in Activities; Collaborate Effectively; Think Critically.
School/University	Initiate Seed Fund Projects; Organize Training Camps and Panel Discussion; Exchange Ideas (Among Schools/Universities).
Social Media	Broadcast More Updates; Publish Popular Science Articles; Provide Platforms for Exchanging Ideas.
Nonprofit Organization	Produce Visual Lab Demonstration; Organize Meetings or Conferences.
Government	Initiate Seed Fund Projects; Promote Innovation in the Classroom.

CONCLUSION

To summarize, an online questionnaire survey was conducted, and we found that students mostly preferred the inclusion of anti-COVID-19 related research highlights into the classroom. We then featured multiple anti-COVID-19 research highlights and showed two class design examples in which related research works were included. Some proposed key actions were also recommended for a better implementation. All the above contents were dedicated to addressing the questions of "why to share", "what to share" and "how to share" around the inclusion of anti-COVID-19 related research highlights into the classroom. This work provides significant findings on the feasibility and thoughts of the COVID-19 related innovation in education during the special time. More importantly, this work could lead to more interesting class design as well as more efficient transfer of anti-COVID-19 knowledge and research highlights in the classroom worldwide. Hopefully, this tiny action we take will in fact make a big difference in education.

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