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Navigating the "COVID hangover" in physiology courses

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Abstract:

Undergraduate educators and students must navigate lingering after-effects of the COVID pandemic on education in the 2021-2022 academic year even as COVID continues to impact delivery of undergraduate science education. This article describes ongoing difficulties for undergraduate STEM students and educators and suggests strategies and easy-to-use resources that may help educators navigate the "COVID hangover" and ongoing COVID-related disruptions.

Article:

The 2020-2021 academic year was the "COVID year". After the extreme disruption of spring 2020, and with continuing pandemic conditions, institutions implemented many different approaches in 2020-2021. Some moved instruction entirely online, others implemented hybrid instruction, and still others maintained in-person class and lab meetings. Masking, COVID testing, and quarantine requirements varied among institutions as well. Now, in 2021-2022, undergraduate instructors and students may continue to wear masks and have heightened safety precautions in class and lab spaces. Other institutions and locales have relaxed or removed COVID-related regulations such that life is seemingly "back to normal"—at least superficially. Vaccination rates vary widely from region to region. Even in locations where life appears "normal", with high student enthusiasm for face-to-face learning, students and educators must navigate after-effects of COVID's impact on class and lab instruction. In this article I'll address ongoing difficulties for undergraduate science students and educators based on observations from my own institution as well as discussions with colleagues at other institutions. I'll also suggest strategies and resources for dealing with these difficulties (Table 1).

The impacts of COVID on undergraduate science education reflect impacts to education more broadly, but also include considerations unique to STEM disciplines. Undergraduate science educators may face challenges in the remediation of inquiry skills, material, and self-regulated learning skills. The remediation takes place as students (and instructors!) are faced with social re-engagement, ongoing COVID-related disruptions to academic and personal life, and high rates of stress, trauma, and burnout.

Importantly, each of these difficulties may be more likely to affect underrepresented, underprepared, underserved, or otherwise disadvantaged students and educators. Therefore, it is important to consider each difficulty with attention to equity and to actively pursue inclusive solutions.

I bullet strategies for dealing with each challenge beneath the challenge description. Suggested strategies often derive from principles of Universal Design for Learning (UDL) (1–3) and of Trauma-Informed Pedagogy (TIP)(4–7). Two key suggestions that address multiple difficulties and that are integral to both UDL and TIP practices, include:

1. Be explicit. More explicit than that. No, even more explicit. Don't assume that students understand expectations as we return to "normal" or that they know when and how to apply foundational content and skills. This requires science educators to examine the hidden curriculum of their courses and programs (8–10). It requires detailed syllabi (11) and continued explanation of expectations.

2. Have empathy and be flexible. Try to understand students' difficulties. Course and laboratory work should still be challenging with high performance standards. But recognize that a student may need extra help, extra time, or a safe and welcoming ear. Be flexible to the degree possible given the course context.

Remediation of inquiry skills

Laboratory investigations were often necessarily curtailed during 2020-2021 due to requirements for physical distancing and online instruction. This was particularly true for human physiology laboratory investigations in which physical distancing would have been impossible or where respiratory droplets were likely to be generated. Students may have engaged in "virtual" laboratories that developed intellectual understanding of laboratory skills but not hands-on ability to carry out a given technique. In many cases, lab projects were abbreviated unintentionally, as courses moved online and students were forced into isolation/quarantine. Other instructors found it necessary to intentionally transition away from projects requiring long incubation times or gradual development of dexterity and technical proficiency (for example, sensitive electrophysiology techniques or precise dissections) given the uncertainty of when and how frequently lab meetings would be forced online. As a result, students may be less familiar with techniques and less practiced in the patient, inquisitive, and analytical mindset that they normally develop with increasing investigation experience.

Suggestions

- Don't assume what students know. Incorporate skills assessments or other pre-tests at the beginning of the course and include regular formative feedback throughout.
- Provide explicit descriptions of scientific thinking and inquiry processes during labs, in the context of the particular laboratory investigation.
- Provide explicit learning goals for labs.
- Develop laboratory projects that afford students ownership of the work so that they internalize the importance of scientific thinking and increase their sense of investment and reward.
- Be realistic. Identify laboratory priorities and focus on those skills and artifacts. Additional assignments or projects may need to be reduced or removed.

Remediation of material

Learning losses due to COVID disruptions may have occurred in undergraduate STEM education for a variety of reasons (12). Many educators were required to quickly adapt courses and laboratories to online, hybrid, or physically-distanced modes of learning. Importantly, these adaptations were often short-term fixes rather than intentional, well-developed transitions, and we may have been unable to deliver the quantity or quality of instruction that we desired. Students encountered technological difficulties including slow or spotty internet and unreliable home computing resources. Students may have been unable to dedicate sufficient time to academics due to intensified responsibilities for household members. Some students may have taken leave for a semester or more. Technical

difficulties, leaves of absence, and intensified caregiving responsibilities are most likely to have affected disadvantaged students. In addition, many assessments were somewhat hastily moved online and converted to open-book and, while open-book assessments have many strengths, the stop-gap nature of some adjustments coupled with student distraction and technical limitations may mean that students under-retained material or exam preparation strategies. Some courses have returned to closed-book assessments, such that students now need to relearn successful strategies for closed-book exams. Finally, institutions may have altered term schedules to navigate COVID precautions. For example, my institution switched from a standard semester schedule to a "block" schedule in which students completed one course at a time—each course met for three hours per day four times a week, with additional meeting times for laboratory components. Schedule alterations initiated a learning curve that may have (at least temporarily) reduced student learning and faculty effectiveness in 2020-2021.

Suggestions

- Provide explicit learning goals for both content and competencies.
- Incorporate frequent connections between new material and previous material.
- Emphasize relevance. Why should students care about material?
- Attend to the big picture by connecting content to physiology core concepts (13).
- Provide primer resources for key foundational content and skills.
- Put COVID instructional materials to use! Many educators developed pre-class instructional videos, innovative assessments, and other tools that may be more inclusive and effective than pre-COVID materials.
- Incorporate multiple ways for students to demonstrate mastery and competency through varied assessment formats and options. For example, consider whether assessments need to be a particular format or closed book.
- Ensure that assessments align with content and competency learning goals.

Remediation of self-regulated and collaborative learning skills

Science is a collaborative discipline. But students' collaborative learning and problem-solving skills may have suffered last year given that many courses and laboratories took place (at least partially) online. It is possible to carry out high quality collaborations online, but it requires well-developed assignments, LMS resources, and pedagogical support. In addition, study habits suffered for many students amid COVID. Students often completed class and laboratory work at home, where they navigated increased disruptions by household members. Further, sports, other extra- and co-curricular activities, and work were often cancelled or greatly reduced and now students struggle to balance academic demands with extracurricular and other obligations. At my institution, the block schedule meant that students were able to focus on one class at a time which, while beneficial in other ways, reduced the need for time management and planning. Even senior undergraduates find it difficult to return to the juggling and planning required in a normal semester schedule. Finally, students may have experienced decreased belonging and self-efficacy in STEM (14). Students often operated in semi-isolation last year—often

seeing black boxes on a Zoom window rather than truly engaging classmates and faculty. Such isolation, coupled with reduced hands-on laboratory opportunities, means students may not have built a sense of STEM identity and belonging in the way they did before. This is particularly problematic for minoritized and underrepresented groups with already lower STEM identity and belonging pre-pandemic (15–17).

Suggestions

- Provide explicit training in the components of self-regulated learning, the purpose and process of metacognition, and course-specific study skills.
- Provide explicit training in the mechanistic nature of physiological thinking and how to read or construct typical structures for representing physiological processes, such as flow charts.
- Help students build organizational frameworks for studying and applying physiological content by connecting it to physiology core concepts (13).
- Demonstrate time-management and planning strategies. For example, help struggling students to write weekly and monthly schedules.
- Provide clear expectations about due dates, rubrics, and expectations for independence vs. group work.
- Assign reflection tasks that ask students to consider their motivations, difficulties, successes, and strategies that may help improve the difficulties they encounter in the class or lab.
- Utilize LMS discussion boards for non-content questions. For example, what strategies are working well for you in this course/lab? What struggles are you encountering in this course/lab?
- Audit your course materials for inclusivity. Are diverse scientists represented?
- Provide explicit encouragement for individual students that they belong in STEM.

Ongoing challenges

Remediation may be occurring amid continuing challenges and COVID disruptions. Students are learning how to re-engage socially, face-to-face, after months of relative isolation. This re-engagement may be both exciting and stressful and creates time demands that were not present last year. For science educators this means that students may struggle with both time-management and group work during collaborative projects.

Suggestions

- Explicitly frame science as a team-based endeavor to help students understand that collaboration is an important professional skill.
- Incorporate group contracts and other team-building components into group assignments.
- Teach Tuckman's team development stages (storming, forming, norming, and performing) and strategies for navigating each stage (18).

Students continue to deal with ongoing COVID disruptions. Quarantines and isolation for themselves or dependents may require students to miss class and laboratory meetings. Students may have symptoms

of long COVID. Other students may struggle with emotional and mental well-being due to loss of family/friends or the stress and trauma of the past year.

Suggestions

- Be flexible while maintaining clear expectations.
- Make your classrooms, laboratories, and offices safe spaces for students. Communicate to students that you are a willing resource.
- Advertise campus counseling and other well-being resources. Normalize use of these resources and discussions of mental health.
- Introduce students to the affective component of self-regulated learning (19) as a way of encouraging them to attend to their mental and emotional health.

Educator stress and burnout

Last, but certainly not least, recognize that educator stress and burnout levels are high as we navigate the "COVID hangover". Like students, we continue to experience quarantines, isolation, COVID, long-COVID, social re-engagement, poor mental health, and remediation of professional productivity. Research productivity for some may have decreased dramatically amid dependent obligations, course revisions, limited access to laboratory spaces, and increased safety precautions (physical distancing, respiratory constraints, etc.). Educators may also be more dissatisfied with our institutions and have lower job security than prior to COVID. Importantly, these difficulties are likely to be amplified for underrepresented colleagues. Unfortunately, I don't have a list of suggestions for this concern. We should recognize, though, that this stress and burnout will color our responses to students and colleagues and will affect our judgements. Therefore, it might be more important than ever to be intentional when selecting strategies for addressing student challenges in STEM education.

References

1. **CAST**. Universal Design for Learning Guidelines version 2.2 [Online]. 2018. http://udlguidelines.cast.org [28 Oct. 2021].

2. **Equity and Excellence (E&E) in Higher Education**. Tips to Reach All Students with a Universally Designed Syllabus [Online]. [date unknown]. http://www.eeonline.org/images/stories/eeonline_docs/ud_syll_tips.pdf [28 Oct. 2021].

3. **Schreffler J**, **Vasquez III E**, **Chini J**, **James W**. Universal Design for Learning in postsecondary STEM education for students with disabilities: a systematic literature review. *IJ STEM Ed* 6: 8, 2019. doi: 10.1186/s40594-019-0161-8.

4. **McMurtrie B**. What Does Trauma-Informed Teaching Look Like? [Online]. *The Chronicle of Higher Education*: [date unknown]. https://www.chronicle.com/newsletter/teaching/2020-06-04 [4 Dec. 2021].

5. **Imad M**. Seven recommendations for helping students thrive in times of trauma [Online]. [date unknown]. https://www.insidehighered.com/advice/2020/06/03/seven-recommendations-helping-students-thrive-times-trauma [4 Dec. 2021].

6. **Imad M**. Trauma Informed Teaching & Learning (for teachers) - YouTube [Online]. [date unknown]. https://www.youtube.com/watch?v=XqcTbipuFDQ [4 Dec. 2021].

7. **Minahan J**. Trauma-Informed Teaching Strategies - ASCD [Online]. [date unknown]. https://www.ascd.org/el/articles/trauma-informed-teaching-strategies [4 Dec. 2021].

8. **Orón Semper JV**, **Blasco M**. Revealing the Hidden Curriculum in Higher Education. *Stud Philos Educ* 37: 481–498, 2018. doi: 10.1007/s11217-018-9608-5.

9. **Price D**. Laziness Does Not Exist. Psychological research is clear: when… | by Devon Price | Human Parts [Online]. *Medium*: 2018. https://humanparts.medium.com/laziness-does-not-exist-3af27e312d01 [4 Dec. 2021].

10. **AdvanceHE**. The Hidden Curriculum of Higher Education [Online]. 2020. https://www.gcu.ac.uk/media/gcalwebv2/student/wellbeing/AdvHE_Hidden%20Curriculum.pdf [28 Oct. 2021].

11. **Gin LE**, **Scott RA**, **Pfeiffer LD**, **Zheng Y**, **Cooper KM**, **Brownell SE**. It's in the syllabus … or is it? How biology syllabi can serve as communication tools for creating inclusive classrooms at a large-enrollment research institution. *Advances in Physiology Education* 45: 224–240, 2021. doi: 10.1152/advan.00119.2020.

12. **Donnelly R**, **Patrinos HA**. Learning loss during Covid-19: An early systematic review. *Prospects*, 2021. doi: 10.1007/s11125-021-09582-6.

13. **Michael J**, **McFarland J**. Another look at the core concepts of physiology: revisions and resources. *Advances in Physiology Education* 44: 752–762, 2020. doi: 10.1152/advan.00114.2020.

14. **Camfield EK**, **Schiller NR**, **Land KM**. Nipped in the Bud: COVID-19 Reveals the Malleability of STEM Student Self-Efficacy. *CBE-LSE* 20: ar25, 2021. doi: 10.1187/cbe.20-09-0206.

15. **Estrada M**, **Burnett M**, **Campbell AG**, **Campbell PB**, **Denetclaw WF**, **Gutiérrez CG**, **Hurtado S**, **John GH**, **Matsui J**, **McGee R**, **Okpodu CM**, **Robinson TJ**, **Summers MF**, **Werner-Washburne M**, **Zavala M**. Improving Underrepresented Minority Student Persistence in STEM. *CBE-LSE* 15: es5, 2016. doi: 10.1187/cbe.16-01-0038.

16. **Cooper KM**, **Brownell SE**. Coming Out in Class: Challenges and Benefits of Active Learning in a Biology Classroom for LGBTQIA Students. *CBE-LSE* 15: ar37, 2016. doi: 10.1187/cbe.16-01-0074.

17. **Cooper KM**, **Krieg A**, **Brownell SE**. Who perceives they are smarter? Exploring the influence of student characteristics on student academic self-concept in physiology. *Advances in Physiology Education* 42: 200–208, 2018. doi: 10.1152/advan.00085.2017.

18. Tuckman's Stages of Group Development - West Chester University [Online]. [date unknown]. https://www.wcupa.edu/coral/tuckmanStagesGroupDelvelopment.aspx [4 Dec. 2021].

19. **White W**. The Relationship between Affect and Cognition in Teaching and Learning (A Case Study) [Online]. *The Learning Scientists*: [date unknown]. https://www.learningscientists.org/blog/2017/11/1-1 [4 Dec. 2021].

Graphical abstract. This article provides suggestions for undergraduate STEM educators who must remediate inquiry skills, content, and learning skills lost to COVID-19-related disruptions since spring 2020. Trauma-Informed Pedagogy and Universal Design for Learning emphasize the importance of explicit expectations while maintaining empathy and flexibility. These principles are particularly important as students and instructors face ongoing COVID-19 disruptions and mental health struggles during the "new normal" of the 2021-2022 academic year.