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Possible benefits of regular, short, mind-calming exercises within undergraduate courses: A 10-year Synthesis and Retrospective analysis

Paul Grogan

groganp@queensu.ca

Queen's University

Research Article

Keywords:

Posted Date: October 7th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10844755/v1

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Additional Declarations: No competing interests reported.

Possible benefits of regular, short, mind-calming exercises within undergraduate courses: A 10-year Synthesis and Retrospective analysis

Abstract

Objectives: 1) To determine student perceptions of the appeal, appropriateness, potential learning benefits, and life-skill value of regular, short, voluntary, in-class, mind-calming exercises within a range of undergraduate courses; 2) To retrospectively investigate if those perceptions reported immediately after each course change over the longer term.

Methods: Mind-calming exercises (generally 3-5 minutes) were conducted at the beginning of every lecture/seminar in fourteen different 2nd, 3rd and 4th-year biology courses from 2017-2026. Voluntary, anonymous, carefully-worded, ten-statement surveys were completed immediately after the courses (by 43-87% of the total class enrolments, which ranged from 15-335 students), and retrospectively (by 13-47% of enrolled students) for 7 courses that had been completed 1-4 years earlier.

Results: The data unequivocally demonstrate that the vast majority of respondents enjoyed and looked forward to the exercises, considered them appropriate within class-time, felt that they improved the quality and depth of their learning, and appreciated them as an introduction to a useful life-skill coping strategy. The retrospective surveys yielded almost identical results, indicating that perceptions of the benefits persisted for years afterwards.

Conclusions: Overall, although whether this practice actually enhanced learning remains uninvestigated, many students clearly believed that it did, suggesting that their 'frame of mind' for learning was improved at the beginning of each class. Together, the results strongly suggest that regularly experiencing such exercises has multiple benefits that may contribute to enhanced student attention, engagement, and well-being. Furthermore, for some, the experience of actually participating in mind-calming may be a very effective initial introduction to mindfulness.

Introduction

The 'frame of mind' of a student attending a lecture or participating in a seminar is a crucial determinant of his/her potential for deep, active, engaged, learning in that class. Although it is reasonably well established that mindfulness enhances individual well-being, quality of life, and in particular, one's capacity to cope with stress (Brown et al., 2007; Kabat-Zinn, 1990; Nhat Hanh, 1975, 1991; Williams & Penman, 2011), its value in formal education has not yet been fully and unequivocally demonstrated (Shapiro et al., 2011; Haberlin & Bradshaw, 2025). Yes, the research has shown much promise, but most studies have been based on: i) correlational approaches rather than experimental with an 'active' non-meditative control group that accounts for instructor attention, time commitment, and an equivalent "expectation of improvement" to that of the meditation group; ii) participants' self-reported data only, rather than including objective physiological or neurological measurement variables; iii) a very wide variety of different mindfulness/meditation practices in multiple different ways—making comparisons among studies difficult; iv) small numbers of participants that often don't reflect the general student population in terms of culture, gender, mental health status, neurodivergence, etc.; v) very simple, quick, 'shallow' pedagogical measures of knowledge retention and application, which do not reflect the deep learning and potential for changed behaviour that are the hallmarks of true education (Barbazet and Bush, 2014; hooks, 1994; Whitehead, 1929). Nevertheless, despite these ongoing methodological concerns, mindfulness-based exercises and programs have become a mainstay in schools from kindergarten up through high school level in many countries across Europe, North

America, and Oceania (Rechtschaffen, 2014; Schoerberlein & Sheth, 2009; Fagioli et al, 2023; Lee et al, 2024). By contrast, at the university/college education-level, student exposure to the practice and potential benefits of mindfulness is generally confined to extracurricular options such as specific mindfulness-based courses that are primarily aimed at stress management and promoting good mental health (Haberlin & Bradshaw, 2025; Canby et al., 2015). Furthermore, some professional programs where compassion and empathy are critical such as medicine, nursing and psychology now require their students to take a separate, stand-alone, 6-8 week mindfulness-based training course (e.g. Britton et al., 2013; deBruin, Meppelink, & Bogels, 2015).

The study described here will not address any of the methodological issues outlined above. Instead, it focuses on the possible benefits of regular, short, mind-calming exercises at the beginning of each lecture or seminar *within* undergraduate core courses to optimize the students' 'frame of mind' for deep, engaged, active learning. The relevance to mindfulness is that directly experiencing and participating in these simple exercises may not just help a student's current 'frame of mind', but be the 'tip of the iceberg' that introduces him or her to a basic practice that may entice them to go deeper and investigate the foundations of mindfulness as a practice and as a 'way of being'.

More broadly, the value and benefits of a wide variety of contemplative teaching and learning practices are becoming more recognised by college and university teachers. "Placing students at the heart of their education fosters a rich environment for learning and provides the opportunity for students to cultivate attention, deepen their understanding of their studies, engender richer relationships with themselves and others, and stimulate

profound inquiries into the nature of themselves and the world around them" (Barbezat & Bush, 2014, p. 20). Hence, although the actual use of contemplative teaching practices directly in class within regular core courses for undergraduate programs is rare, a small but growing number of faculty across a wide range of disciplines have been making diverse attempts for at least the past 15 years (Barbezat & Bush, 2014; Zajonc, 2013; Gardner & Grose, 2015). In particular, regular, short, mindful awareness meditation exercises at the beginning of each class are the most common method for proponents to directly implement contemplative practice into post-secondary courses (for a video example of this practice, see link at Brock University Health Services, 2017). Consequently, there is substantial qualitative and anecdotal information indicating considerable benefits to this type of practice in terms of promoting deeper, higher quality, more engaged student learning in university and college classrooms (Barbezat & Bush, 2014; Chase-Cantarini & Christiaens, 2019), but quantitative data on their impacts are scarce (Ramsburg & Youmans, 2014; Shapiro, Brown, & Astin, 2011; Lee et al., 2024; Haberlin & Bradshaw, 2025).

Here, I report a systematic study of student perceptions on the impacts of doing a regular, short (typically ~3-5 minute) mind-calming exercise at the beginning of every lecture and seminar discussion session in 14 different Biology undergraduate courses over the period 2017-2026. Multiple types of courses were evaluated including:

a) six iterations of a very large second-year biodiversity half semester lecture/tutorial course (enrolment typically ~300 students)

b) a medium-sized third-year ecology full semester lecture/lab/field trip course (n=68 enrolled students)

c) four iterations of various small fourth-year full semester lecture/lab/field trip/seminar courses (enrolment 16-28)

d) three iterations of a very small seminar course (enrolment maxed at 15).

A detailed, anonymous, voluntary student survey with ten carefully-worded and value-balanced statements was conducted immediately at the end of each course, and 1-4 years afterwards for a follow-up retrospective analysis of 7 of those courses, to address the following questions:

1. What proportions of students in these courses enjoyed the in-class mind-calming exercises?
2. Do students think these in-class exercises are appropriate within their courses?
3. Do students think the exercises promote more engaged in-class learning?
4. Do students think that introduction to such mind-calming exercises provides a useful life-skill?
5. Looking back one to four years later, do students think that introduction to such mind-calming exercises was valuable?

Method

The Mind-calming Practice

At the beginning of each lecture or seminar, I first spent about four minutes outlining the core themes of the day's class, how they related to the overall structure and conceptual framework of the course, and their biological significance (See Table 1 for descriptions of each course). This initial introduction is obviously pedagogically valuable, but it also allowed some time for latecomers to arrive without disrupting the ensuing mind-calming exercise. Once it was complete, I initiated the mind-calming exercise by closing the lecture hall doors (if necessary), dimming the lights, and sitting facing the audience at the front. I began by first stating that this is an entirely voluntary exercise aimed at calming the students' minds to potentially enhance their subsequent participation and active learning in the ensuing lecture/seminar discussion, and then asked that those students who prefer not to participate remain quiet so as not to disturb their neighbors. Then I invited the participants to close their laptops, sit straight upright with their backs away from the chair support, hands on their knees, and feet planted firmly on the ground. Participants were encouraged to bow their heads slightly and close their eyes if they felt comfortable doing so, or to make a soft gaze at some nearby point in front of them. I then conducted one of the mind-calming exercises described in detail in Appendix 1, each of which directs the mind's attention to a particular focus (e.g. awareness of various aspects of breathing; a body scan; contemplation of the hand or one's feet; a mind-calming moment centered on the maxim 'This too shall pass'; a reflection on temporal relationship

aspects of the human hand; a google-earth zooming out perspective on us in our universal context. See Appendix 1 for full detailed descriptions).

During several of the mind-calming sessions for each course, I emphasized that becoming distracted during the exercises is almost inevitable and very normal for most of us. I explained that the value of mind-calming is not so much in holding the focus, but in becoming aware that the mind has been distracted from that focus, and then gently, but firmly, bringing the attention back to whatever is the exercise's particular focus. In the initial mind-calming sessions I spoke quite a lot, but allowed more silent time within the exercise as the course progressed. Finally, I took care initially to explain that there was some evidence to suggest that such mind-calming exercises may enhance student learning capacity, but that little of it was conclusive. I also made clear that this was an entirely secular activity, and deliberately avoided saying or making any explicit links to 'loaded' words such as 'mindfulness', 'meditation', 'therapy', 'Eastern', 'Buddhism' (or any other religion) that might bias students' perspectives toward the exercise. Once the particular mind-calming exercise for each session was completed, I asked the students to gently reawaken themselves to the present environment by slowly wriggling their toes and fingers, or stretching their neck and shoulder muscles, and then thanked them while raising the room light level. Afterwards, I immediately launched into a typical interactive question and answer-based lecture/seminar session. Example video recordings of three such sessions are available as weblinks in Appendix 1.

The typical time-length devoted to the mind-calming exercises varied depending on the course and on its allocated class time. In the very large second-year course (50 minute

sessions), I did a 2-4 minute version of the exercises at the beginning of every lecture in the half semester for which I was the instructor (14 classes). In the medium-sized third-year course (also 50 minute sessions), the exercises were 3-5 minutes in length for all 24 classes. Finally, in the small and very small fourth-year courses (80-minute sessions), I did extended versions (5-9 minutes) of the exercises for all 24 classes of the full semester. Note that although the mind-calming exercises were conducted in other iterations of these courses in the intervening years, the students in those courses were often not surveyed because I felt they were probably experiencing significant 'online overload' due to the immediate and follow-on impacts of the COVID-19 pandemic restrictions. Finally, note that there is some evidence of gender differences in responsiveness to mindfulness-based activities, with females being more favourably disposed (Haberlin & Bradshaw, 2025). Across the undergraduate biology courses listed in this study, 73-79% (median 77) of the students in BIOL 200 and 47-100% (median 92) in the 4th year courses self-identify as women.

Data Collection

At the completion of my teaching in each course (i.e. within ~1 week of the end of both the half-semester and full-semester courses), except for BIOL 411 2021 which was surveyed mid-way through the course, I assessed students' perceptions of the exercises using an online survey tool (Qualtrics^{XM}) with ten statements to which respondents would answer: 'strongly agree', 'agree', 'neutral', 'disagree', or 'strongly disagree'. Survey statements (see Appendix 2 for the full text of each) were grouped according to perceived

enjoyment, appropriateness, in-class learning value, and life-skill value. The sequential order of the statements in the surveys was deliberately chosen to present the survey participant with a sequence of diverse and challenging statements, in order to reduce the potential for one response to bias subsequent responses. Furthermore, the statements were deliberately worded so that they varied in terms of the positivity of their logic (i.e. 'strongly agreeing' or 'agreeing' indicated a favourable perception of the exercise for some statements, but a negative perception for others). In addition, at the end of the survey, students were encouraged to write comments to "help me understand how this experience has been for you, and to offer suggestions or criticisms of the exercise and of its potential for you."

Once my teaching in a course was completed, an initial e-mail was circulated to all students inviting them to complete the online survey within a window of about one week, and one e-mail reminder was sent out two days before closing them (see Appendix 3 for examples of the e-mail circulation texts). Most importantly, the students were provided with the appropriate ethics clearance information, and assured that the surveys were voluntary and that the responses were being collected entirely anonymously. Furthermore, I emphasized in both e-mails that the goal was to evaluate the full spectrum of responses across the range from those who felt very positively to those who severely disliked the exercise practice. No indications of the survey results were provided back to the students at any point during (or after) the survey collection window period so as to avoid biasing any subsequent data collection.

In addition to the primary surveys collected immediately after completion of my teaching in the 14 courses over the period 2017-2026 that are listed in Table 1, I also conducted a retrospective set of surveys in May 2026. This retrospective investigation was done for all courses for which the students' university-based e-mail address accounts were still active (i.e., a total of 7 courses taught between 2022 and 2025 – Table 2). The same format with almost identically texted survey statements (Appendix 1) was used in all of the primary as well as the retrospective surveys. However, although all of the primary surveys contained 9-10 statements, their composition varied because some survey statements exploring alternative themes were included in the early year surveys, resulting in the exclusion of others. Accordingly, there are occasional absences of data for particular statements in the primary survey dataset (-but not in the retrospective surveys).

Survey data presentation format and course response rates

All course survey statement results data are reported as percentages of student responses for each answer category relative to total class enrolment. Course survey response rates varied from 43-87% of total enrolment in the 14 primary surveys and from 13-47% in the 7 retrospective surveys (Tables 1,2). Actual attendance was estimated at 60% on average per year in the multiple iterations of the large second year course, and 85-95% on average in the small 4th year courses (Tables 1,2). Accordingly, for the large course data in particular, it is very likely that response rates relative to those who were regularly attending the classes were substantially higher than reported here. For example, BIOL 200 in 2024 had a survey response rate of 43% relative to total enrolment (i.e. 139 responses

from a possible total of 321; Table 1). However, assuming attendance was 60% on average (i.e. 192 students), and that those regularly attending were the survey respondents, this suggests a response rate of ~72% from those students who were actually experiencing multiple mind-calming exercises through the course.

Compliance with Ethical Standards

Since this study involved human participants (total summed course enrolments = 2777 students; total summed survey responses = 1276 students), all procedures were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Specifically, the students were informed in writing (and orally) that their participation in each of the surveys was voluntary, and that no IP address information would be collected from any respondents by the survey software in order to ensure that all data would be entirely anonymous (Appendix 3). The Queen's University General Research Ethics Board reviewed and approved the original survey protocol used in this study (GREB-GBIOL-018-18), and renewed that approval for each subsequent year of the study up to and including 2025.

Results

What proportions of students in these courses enjoyed the in-class mind-calming exercises?

86-100 percent of the respondents across the 14 course surveys that were conducted immediately after my teaching was completed either 'agreed' or 'strongly agreed' with the statement "The mind-calming exercise is enjoyable and relaxing" (Figure 1; Table 3). Furthermore, 69-94% of the respondents 'agreed' or 'strongly agreed' with the statement "I looked forward to the mind-calming exercise in each class session" (Figure 1; Table 3). Finally, although many were unperturbed by initial introduction to the practice, 0-11% of the survey respondents indicated that they did feel uncomfortable during the very first mind-calming exercise (Figure 1), suggesting they only began to enjoy the experience after multiple sessions. Overall, these results together indicate that most responding students enjoyed and looked forward to the mind-calming exercises.

Do students think these in-class exercises are appropriate within their courses?

In an effort to provide balance across the survey, the following negatively-framed statement was included: "The mind-calming exercise in this course was inappropriate and should not be repeated in future courses." The statement met with an extraordinarily strong and consistent response across the 14 course surveys with 85-100% of the respondents either 'disagreeing' or 'strongly disagreeing', while up to 3% indicated agreement (Figure 2; Table 3). Next, the issues of perceived appropriate class size and

appropriate stage in the undergraduate program for the mind-calming exercises were investigated. Interestingly, there was some split in response patterns on the appropriateness issue among respondents for the very large 2nd year course compared to the few small 4th year courses. Specifically, 81-94% of respondents in the 5 iterations of the big course (BIOL 200) either 'disagreed' or 'strongly disagreed' with the statement that "this exercise is really only appropriate for 4th year courses with small class sizes (<20 students)", while the corresponding range for the two surveyed 4th year courses (BIOL 411 2025, BIOL 510 2024) was only 40-50% (Figure 2). Nevertheless, the broader statement "Mind-calming exercises may be useful to some students, but they should be provided as an extracurricular university-supported activity because they are not course-related material and therefore are inappropriate within class time" resulted in widespread consensus across all 14 courses with 61-100% of respondents 'disagreeing', or 'strongly disagreeing' (Figure 2; Table 3). Furthermore, six of the seven 4th year course surveys contained no respondents at all who 'agreed' or 'strongly agreed', with only BIOL 416 2019F reporting any agreement (totalling 7%).

Together, these results strongly support the conclusion that the vast majority of responding students felt these short exercises at the outset of each class were appropriate for a wide range of courses across their biology-focussed undergraduate programs.

Do students think the exercises promote more engaged in-class learning?

59-93% of respondents across the 14 surveyed courses indicated that they either 'agreed' or 'strongly agreed' with the statement "The exercise was a valuable use of my

time in the class time-slot because I feel it enhanced the depth and quality of my learning." (Figure 3; Table 3). Interestingly, again there was some split in response patterns among respondents for the very large 2nd year course iterations compared to the small 4th year courses; support was particularly strong among the latter students with only one of the seven courses reporting any disagreement at all (BIOL 416 2019F at 8%), while 4-16% of the very large 2nd year course survey respondents indicated 'disagreement' or 'strong disagreement' (Figure 3). In summary, although there were clearly some dissenters, and some that were neutral (7-26%; Table 3), the above results suggest that a strong majority of respondents (median 82%) believed that the exercises were benefitting their learning.

However, in response to the more probing statement that the impact of the mind-calming exercises might be a contributory cause of their perceived enhanced learning, the responses across the 14 courses were unusually evenly distributed among all categories with 31-60% agreeing, 20-46% neutral and 14-28% disagreeing (Figure 3; Table 3).

Do students think that introduction to such mind-calming exercises provides a useful life-skill?

71-100% of respondents across the 14 course surveys indicated that they either 'agreed' or 'strongly agreed' with the statement "This exercise has introduced me to a valuable perspective that has been useful outside the course in learning how to achieve calm/balance in my life" (Figure 4; Table 3).

In response to the final survey statement "I have used this mind-calming practice to help me cope with nervous or stressful situations in my life", 55-83% of respondents either

'agreed' or 'strongly agreed' (Figure 4; Table 3). Overall, therefore, it is very clear that a large proportion of the respondents (median 83%; Table 3) valued the potential stress-coping benefits of being able to use mind-calming practices, and well over half of them (median 66%) had actually used this practice outside the classroom as a coping strategy.

Looking back one to four years later, do students think that introduction to such mind-calming exercises was valuable?

Student responses to all of the above statements were surveyed retrospectively one to four years after they had originally taken their first course that included the mind-calming exercises. As expected, participation in these retrospective surveys was lower than for those for the primary surveys described above that were conducted immediately after my teaching in each course was completed. Nevertheless, at least 13 and up to 47% of enrolled students in each class completed the retrospective surveys (compared to 43-87% for the primary surveys), and proportional participation was similar across large and small courses (Tables 1, 2). In summary, the pattern of results for each of the 10 statements for the retrospective surveys was remarkably similar to that of the primary surveys (Table 3; see Appendix 4 for full details on responses to statements 1-8). Here, we focus on statements 9 and 10: Looking back one to four years later, do students think that introduction to such mind-calming exercises has provided a useful life-skill?

52 -100% of respondents across the 7 retrospective course surveys indicated that they either 'agreed' or 'strongly agreed' with the statement "This exercise has introduced me to a valuable perspective that is useful outside the course in learning how to achieve

calm/balance in my life" (Figure 5; Table 3). Although this range is larger than for the primary surveys, the medians were almost identical (82% and 83%; Table 3), indicating that most respondents continued to value having been introduced to the exercises even 1 and up to 4 years later. Furthermore, 46-100% of respondents in the retrospective surveys either 'agreed' or 'strongly agreed' with the final survey statement "I have used this practice to help me cope with nervous or stressful situations in my life" (Figure 5; Table 3). As for statement #9, and most of the others (see Table 3 and Appendix 4), this range is larger than for the primary surveys, but the medians were again almost identical (63% and 66%; Table 3). In summary, these results suggest that ~2/3^{rds} of respondents used this mind-calming practice as a coping strategy not just within weeks of being introduced to it, but presumably were continuing to use it 1-4 years later.

Discussion

The 'frame of mind' of a student attending a lecture or participating in a seminar is a crucial determinant of his/her potential for deep, active, engaged, learning in that class. My analysis of students' perceptions of the impacts of short mind-calming exercises at the beginning of each class across 14 different undergraduate Biology courses strongly suggests that the vast majority of respondents experienced benefits in terms of improved 'frame of mind'. More specifically, the study provides clear and unequivocal quantitative data demonstrating that large proportions of the responding students 'enjoyed' and 'looked forward to the exercises', considered them 'appropriate within class-time', felt

that they 'improved the quality and depth of their learning', and 'appreciated them as an introduction to a useful life-skill coping strategy'. This pattern of results was almost identical for the primary surveys (i.e. conducted immediately after my teaching in the courses had finished) and the retrospective surveys (i.e. conducted 1-4 years after the students had originally taken their first course that included such mind-calming exercises). Together, these results therefore indicate that the students' perceptions of the benefits were not confined to immediately after completion of the courses, but persisted for multiple succeeding years. In particular, and perhaps most importantly overall, 2/3^{rds} of the respondents in both the primary and retrospective surveys indicated that they had actually used mind-calming to help them cope with nervous or stressful situations outside the classroom (Table 3 - statement #10). In other words, a total of at least 750 people across the study (a conservative estimate based on the assumption that the same students completed both sets of surveys) found that this introduction to mind-calming had a long-lasting impact in terms of helping them develop a fundamentally important life-skill.

Finally, more broadly, the study's results suggest that short, mind-calming exercises at the beginning of all sorts of regular group meetings (e.g. not just academic classes, but also business, industry, and institutional departmental meetings and specialised training sessions) may be a very effective way to 'set the stage', get the attention of one's audience members, and optimize their 'frame of mind' for appropriate subject matter.

Did Student Responses Differ Among the Courses?

Even though the 14 courses differed substantially in class size, in the academic stage at which they occurred in the undergraduate program, and in the typical duration of the mind-calming exercises, the overall patterns in survey responses were remarkably similar (Figures 1-4). I had anticipated that there might be some positive bias in the data from the 4th year courses because those students would most likely have already experienced the mind-calming in earlier courses, and may have deliberately chosen subsequent follow-up courses taught by me on that basis. However, the data clearly show that no matter how large the class, nor the academic depth of the course material, nor previous exposure to such exercises, students generally considered the mind-calming equally enjoyable, appropriate, and valuable across all courses. What were the common features of its appeal? A word cloud analysis across all respondents' comments from the two sets of surveys indicated that the most frequent theme centered on the word 'focus' in the context of 'helping me focus', and the second-most common theme related to 'mental health' (Appendix 5; similar results for each course separately – data not shown).

Nevertheless, there were some interesting distinctive trends in the data for certain courses. For example, survey statements #1, 6, 7, and 9 relating to enjoyability, appropriateness, valuable use of class time, valuable perspective that has been useful outside the course to achieve calm/balance were particularly positive for BIOL 411 (2021) which was the only fully online course necessitated by the COVID-19 pandemic implications (see Figures 1-4 where this particular course often had the absolute highest percentages of respondents 'strongly agreeing/disagreeing' as appropriate; and note too the corresponding similar trends for BIOL 510 (2020) which had to go online for the second

half of the course). The pandemic restrictions that forced a completely online academic environment clearly strained many students, and my data suggest that the mind-calming exercises were particularly appreciated by them compared to all the other in-person courses surveyed in this study. Secondly, within the temporal sequence of six iterations of the very large second year course (BIOL 200) between 2017 and 2026, there were clear and consistent declining trends in the responding cohorts that 'strongly agreed' with the statements that the exercise was 'enjoyable', and that they 'looked forward to it' (Figure 1). More specifically, a whopping 77% of the enrolled students (suggesting almost all regularly attending students) 'strongly agreed' that the exercises were 'enjoyable' in the 2017 iteration of the course, and this proportion consistently declined over subsequent years, eventually reaching 42% by 2026 (Figure 1). Likewise, those who 'strongly agreed' that they were 'looking forward' to the exercises dropped from 76 to 38% over the same period. Interestingly, no other similar temporally consistent declines occurred for any of the other BIOL 200 survey statements, and note too that these declines in 'strongly agreed' for statements 1 and 2 were largely offset by corresponding increases in the proportions indicating 'agreed'. In other words, the initial overt enthusiasm for the exercises seems to have weakened over the 2017-2026 period. Perhaps this trend reflects a decline in the 'novelty' of the exercises due to increasing awareness and media communication of this approach (-especially in relation to focussing attention on one's breathing) over the past decade.

Did the potential impacts differ among the courses?

From a pedagogical perspective, the potential benefits of such mind-calming exercises in the very large second year courses undoubtedly grew substantially in depth and breadth for the students taking the small fourth year courses (e.g. Global Change Biology - BIOL 411; and especially The Biology of Sustainability – BIOL 510). For example, the longer class session time and smaller group allowed for longer and deeper, more probing, versions of the exercises (e.g. see descriptions 'f' and 'g' in Appendix 1). Furthermore, the core content material of such courses—which are centered on self-driven, independent learning to understand, synthesize and critique our environmental and societal sustainability issues—is best addressed by incorporating a mindfulness foundation. To their merit, Buddhist leaders Thay Nhat-Hanh and the Dalai Lama have been highlighting this fundamental connection for at least 25 years ago (Nhat Hanh, 1991), but their message is only very recently starting to inculcate its way into formal educational systems and global policy institutions (e.g., Intergovernmental Panel on Climate Change, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (IPCC, 2022a,b; IPBES, 2024). There are two fundamental reasons why mindfulness is so relevant in the context. First, the root cause of our current 'polycrisis' of interacting threats (Wamsler et al, 2026)—the escalating ecological destruction of our planet, intertwined with a global mental health crisis, rising proportions of people living in poverty, increasingly intense political turmoil/nationalism, and soaring individualism—is primarily human behavior. Second, teachers in this topic area have a specific responsibility to the students to not just explain and discuss the situation, but to address the ecoanxiety that may be enhanced by exposure to such course material. In that context,

I feel I have a responsibility to help the students "use the learning achieved in the course to develop lasting personal solutions for coping with, and constructively responding to, the major environmental and social sustainability issues of the 21st century" (e.g. Grogan, 2022).

In a truly seminal recent paper on the potential of specific mindfulness-based teaching interventions to promote not just individual human but also planetary well-being, Wamsler et al (2026) propose that if society is to move toward more sustainable living, the transformation will need to be "grounded in the inextricable connection between our inner lives and the living planet." They explain that "facilitating deeper understanding of the polycrisis and its interconnections with inner life involves creating learning environments, approaches, practices, and guidance that foster holistic insight, emergence, and sustained engagement—enabling participants to move beyond a focus on individual well-being toward empowered participation in cultural and systems change".

Accordingly, my students and I have found the mind-calming exercises described in this study naturally provided the initial context for introducing deeper and more subtle aspects of mindfulness such as interconnectedness, impermanence, compassion, and gratitude in these 4th year seminar courses. For evidence, see various survey comments below for evidence of their particular value, and also Appendix 6 comments # 64, 65, 72, 80):

i. *In second year when we did the mind-calming exercises, I didn't gain much. However, in the past few years this type of exercise has become a regular part of my*

life (-a big inspiration was you introducing them in second year) and now I really benefit from doing them in class. (BIOL 411, 2021)

ii. *Since participating in the mind-calming exercises in class, I have started using similar exercises outside of class when I'm struggling to focus or can't fall asleep at night. They've been really helpful in my everyday life! - The mind calming exercises made me feel like my professor cares not just about my performance in the class, but also about my mental health and general happiness outside of class. It makes me feel like I'm being treated as a person instead just as a student. - I found the exercises to be more effective when done in a small group (BIOL 510) rather than in a large lecture hall (BIOL 201) where there is always noise and plenty of distractions.* (BIOL 510, 2022)

iii. *This is such an insightful course and is very useful. It can provide wonderful information for those who are interested in sustainability or even just regular people. I think everyone could learn a lot from the lessons in this class, especially in a world like ours. It encourages powerful and meaningful reflection on how we interact with our environment and with each other, offering ways to encourage us to make informed and introspective choices. Additionally, the ideas and perspectives shared in this course can inspire positive changes in daily life, helping individuals contribute to a more sustainable and connected world.* (BIOL 510, 2024)

iv. *I think the most valuable thing I learned relates to what it means to be mindful, and how I now want to live my life with mindfulness. The first time I was exposed to the idea of mindfulness was during the initial mind-calming exercise where we focused*

on our breathing, and on being in the present moment. Then we went on the field trip where we experienced and acknowledged 'the present moment' in nature. I began the course with the mindset of "Why is this important?", and realised that it had to do with being aware of my surroundings, revelling in the interconnected nature of everything in life, slowing down and accepting things as they are (i.e. relating to societal themes of progress and development). And also being mindful to have compassion for myself. (BIOL 510, 2024)

Does the use of mind-calming exercises actually enhance learning?

This study did not attempt to determine if these short exercises actually enhanced learning; however, many students undoubtedly perceived that it did. Perception is fundamentally important: How one feels about something affects how one thinks about it (and vice-versa) (Frederickson, 1998). Hence, I suggest that the positive feelings associated with enjoying, and valuing, the mind-calming exercises at the beginning of each class probably contributed to a positive 'frame of mind' for potential learning in the ensuing lecture or seminar. At the very least—even for the students who chose not to participate in the (explicitly voluntary) mind-calming exercises—this 'quiet time' allowed them to 'transition' and settle down into the class from whatever was happening previously, and from wherever they had come (e.g., see specific respondent's comments #1, 17, 18, 21, 45, 47, 48, 51, 59, 74, 77 from the retrospective surveys reported in full in Appendix 6). For participants, actually trying (i.e. 'setting the intention' in mindfulness

parlance*)* to calm their minds (and perhaps some success in doing so) prior to the beginning of core subject teaching in each class may have directly benefited their potential for learning.

In conclusion, the very positive and consistent survey results reported here are an important quantitative indicator that students believed their learning was enhanced, and so follow-up comprehensive pedagogical research is now warranted and needed to determine if such exercises actually did achieve that goal. In other words, properly designed experimental studies (e.g., Ramsburg & Youmans, 2014) that focus not just on simple knowledge retention capacities (Haberlin & Bradshaw, 2025) but on measurement variables that are more indicative of deep, conceptual, transformative learning (hooks, 1994) such as 'Romance-Generalization-Precision' (Whitehead 1926) and 'Ideas-Connection-Extension' (Fostaty-Young and Wilson, 2000) will be required to fully and properly evaluate the potential learning benefits of such practices (Barbazat & Bush, 2014; Shapiro et al., 2011, p. 517; Haberlin and Bradshaw, 2025).

Does the use of such practices enhance teaching quality?

Many faculty and lab instructors will feel too busy and stressed to take on this extra activity. However, those emotions are exactly what the mind-calming exercises are attempting to alleviate, and therefore undertaking such exercises in class may assist not only the students, but also the teacher. There is a small but growing body of literature by proponents of contemplative teaching methods that highlights the perceived benefits of such exercises for the quality of one's teaching (Barbazat & Bush, 2014; Berg & Seeber,

2016; Hooks 1994; Shapiro et al., 2011; Schoerberlein & Sheth, 2009; Rechtschaffen, 2014), but quantitative evidence is rare. In an earlier study (Grogan, 2019), I reported data for university-administered student assessments of teaching from one of my courses which indicated significantly higher performance after implementing these exercises compared to the previous year's iteration. Although these performance increases could be due to more effective teaching and learning as a direct result of the mind-calming exercises, I suggested that they were primarily a consequence of student perception that their implementation was an indicator of how much their professor cared about them as learners and as individuals (e.g., see comment ii above, comments #13, 14 and 30 in Appendix 6, as well as Appendices 2, 3, and 4 in Grogan (2019) for numerous students' responses in the comments section of the online surveys that support this contention). Experts in education have long recognized that a sense of 'connection to the teacher', and overall 'atmosphere' in the learning environment, fundamentally affect the learners (Whitehead, 1929).

What are the principal constraints on implementing such in-class mind-calming exercises within regular courses in college and university programs?

1. Time: Post-secondary academic activities are generally severely time-stressed. Hence, the devotion of class time to the exercises necessarily reduces the time available to actually teach the course's core content. Both teachers and students feel that stress intensely (e.g., see Appendix 6 comments # 27, 37, but also 23, and 51). However, many leaders in undergraduate education are highlighting the 'tyranny of content' that is

pervading post-secondary teaching, and this trade-off between quantity and quality of learning is growing in intensity as the knowledge base increases (Berg & Seeber, 2016; Mazur, 1996). They argue that we should be redirecting our teaching efforts away from cramming knowledge content, and instead actively engaging students with the fundamentals of the material and whatever questions, problems, or arguments it addresses (Mazur, 1996). This redirection toward deeper, more actively engaged learning that is focussed on skills such as critical thinking and synthesis may be assisted by the adoption of contemplative approaches such as mind-calming exercises (Barbazet and Bush, 2014 p.4).

2. Expertise: The capacity to incorporate mind-calming exercises directly into undergraduate courses will obviously depend on the outlook and training of the faculty and program associates/lab instructors involved. It is absolutely critical for a successful outcome that the person leading contemplative exercises such as those described in this study is fully familiar with the practice and its underlying goals. On the one hand, for those faculty who are already have experience with meditation/mindfulness, leading such short sessions may seem relatively straightforward. For the vast majority who are presumably not familiar, my hope is that those who are inspired by the data and hence might be inclined to give it a try will avail of the detailed exercise descriptions and example videos supplied here (Appendix 1), and/or the in-person and online courses on meditation practice and even specific sustainability-related offerings (see Wamsler et al. 2026) that are now widely available.

Overall conclusions

The phenomenon of mindfulness has been booming in western society over the past few decades (Kabat-Zinn, 1990; Nhat Hanh, 1975; Williams & Penman, 2011; Suzuki, 2006). Contrary to many published definitions arising from this boom, mindfulness is not just about trying to keep one's consciousness focussed on being aware and attentive to one's immediate environment in the present moment, in a non-judgmental way. It is a much deeper 'way of being' that includes: i) constantly and deeply contextualizing oneself in place and time (i.e. flipping one's attention between being a participant in life and an observer of that participant); ii) acknowledging the interconnectedness and impermanence of all things (including one's own mortality); iii) focussing the mind less on what one is experiencing and more on how one is relating to those experiences; iv) accepting and embracing the fundamental realities of life (i.e. avoiding delusion); and v) striving to make behavioural decisions on the basis of compassion combined with wisdom (Nhat Hanh, 1975, 1991; Goldstein, 2013; Dalai Lama, 2001; Amaro, 2015). Its principles extend back for thousands of years in Buddhist philosophy (Batchelor, 1998), and also most likely in many other cultures including Sufism (e.g. the poetry of Rumi and Omar Khayyam - see publications of translations from 2004 and 2010 respectively), and those of Indigenous peoples such as the Inuit and First Nations of North America (François, 2007; Wagamese, 2016). The current manifestation of these principles in western society could be deemed a fad (Purser, 2019). Numerous websites and practitioners suggest mindfulness meditation—'even for 5-10 minutes a day'—can be a panacea to all sorts of physical and mental ailments. Although such practices may be helpful, they are unlikely to

be fundamental ‘game changers’, and many of the claims are unjustified and not sensible. However, prolonged and deeper engagement with meditation can clearly have significant impacts on the structure and physiological functioning of the brain (Cahn & Polich, 2006; Hölzel et al., 2011), and meditation combined with mindfulness can clearly reduce stress (Goyal et al., 2014; Shapiro et al., 2011), and improve cognitive abilities (Brown et al., 2007; Tang et al., 2007).

At the very least, the short-term exercises in the fourteen courses in this study introduced the students to the concept and practice of calming the mind, with some clear evidence of not just ephemeral, short-lived benefits in terms of enhanced enjoyment and perceptions of deeper learning ability, but long-term life skill value (e.g., see Appendix 6 comments #17, 43, 50, 58, 62, 65, 73, 75, 76, 78, 79, 80). There’s no harm in those outcomes for sure, and they alone probably justify efforts at some implementation of the practice in post-secondary education classes – no matter what the core academic subject topic. Nevertheless, although there are very likely some important and societally significant potential benefits, it is important to note that there are many substantive and fundamental concerns about whether it is appropriate, and what would be the most effective ways to implement the deeper foundations of mindfulness into education (Lee et al, 2023; Ainsworth et al, 2023). In any event, my study suggests that maybe for some students at least, the experience of actually participating in regular, short, in-class mind-calming exercises may be a valuable initial catalyst to start them on a pathway toward exploring the whole, all-encompassing, phenomenon that underlies such exercises—mindfulness as a practice, and as a ‘way of being’.

Table 1. Overview information for the 14 courses since 2017 that were surveyed immediately after my teaching in those courses was completed.

Course title	**Course code**	**Stage in undergraduate program, and course-type**	**Year when course was taught**	**Class total enrol ment (#)**	**Survey responses (#)**	**Proportion of total class enrolment responding to the survey (%)**	**Notes (delivery mode; class lecture/seminar session length, total number of sessions (i.e. mind-calming exercises); estimated typical attendance)**
Diversity of Life	BIOL 200	2nd year (lecture/lab)	2017	335	220	66	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/lab)	2018	288	176	61	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2020	285	173	61	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2024	321	139	43	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2025	319	160	50	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2026	293	133	45	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Community and Ecosystem Ecology	BIOL 303	3rd year (lecture/ lab/field trip)	2017	68	29	43	In-person; 50 minutes; 24 sessions; est. attendance ~85%
Global Change Biology	BIOL 411	4th year (lecture/ seminar)	2021	28	24	86	Online (COVID-19); 50–80 minutes; 29 sessions; est. attendance ~90%
Global Change Biology	BIOL 411	4th year (lecture/ field trip/ seminar)	2025	24	15	63	In-person; 80 minutes; 24 sessions; est. attendance ~90%
Terrestrial Ecosystems	BIOL 416	4th year (lecture/ lab/field trip/seminar)	2019 (Fall)	16	12	75	In-person; 80 minutes; 24 sessions; est. attendance ~95%
Terrestrial Ecosystems	BIOL 416	4th year (lecture/ lab/field trip/ seminar)	2019 (Winter)	17	14	82	In-person; 80 minutes; 24 sessions; est. attendance ~95%
The Biology of Sustainability	BIOL 510	4th year (seminar)	2017	15	13	87	In-person; 80 minutes; 24 sessions; est. attendance ~95%
The Biology of Sustainability	BIOL 510	4th year (seminar)	2020	15	13	87	In-person first half, online second half (COVID-19); 80

							minutes; 24 sessions; est. attendance ~95%
The Biology of Sustainability	BIOL 510	4th year (seminar/ field trip)	2024	15	12	80	In-person; 80 minutes; 24 sessions; est. attendance ~95%

Table 2. Overview information for the 7 courses that were surveyed retrospectively in May 2026, which was one to four years after my teaching in those courses was completed.

Course title	**Course code**	**Stage in undergraduate program, and course-type**	**Year when course was taught**	**Class total enrolment (#)**	**Survey responses (#)**	**Proportion of total class enrolment responding to the survey (%)**	**Notes (delivery mode; class lecture/seminar session length, total number of sessions (i.e. mind-calming exercises); estimated typical attendance)**
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2024	321	50	16	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Diversity of Life	BIOL 200	2nd year (lecture/tutorial)	2025	319	58	18	In-person; 50 minutes; 16 sessions; est. attendance ~60%
Global Change Biology	BIOL 411	4th year (lecture/seminar)	2023	27	8	30	In-person; 80 minutes; 24 sessions; est. attendance ~90%
Global Change Biology	BIOL 411	4th year (lecture/field trip/seminar)	2025	24	11	46	In-person; 80 minutes; 24 sessions; est. attendance ~90%
Terrestrial Ecosystems	BIOL 416	4th year (lecture/ lab/field trip/seminar)	2023	17	7	41	In-person; 80 minutes; 24 sessions; est. attendance ~95%
The Biology of Sustainability	BIOL 510	4th year (seminar/field trip)	2022	15	2	13	In-person; 80 minutes; 24 sessions; est. attendance ~95%
The Biology of Sustainability	BIOL 510	4th year (seminar/field trip)	2024	15	7	47	In-person; 80 minutes; 24 sessions; est. attendance ~95%

Table 3. Comparison of response data for each survey statement between the primary surveys carried out immediately after my teaching was finished in each course and the retrospective surveys carried out 1-4 years after the associated course had finished. Data are presented for each statement (numbered as in Figures 1-4; Appendix 2) as the median and range of the percentages of total enrolment for each course indicating agreement, neutrality, or disagreement across the 14 primary course surveys, and the 7 retrospective course surveys.

Survey statement number	**Survey timing**	**Strongly Agree/Agree (median, range)**	**Neutral (median, range)**	**Strongly Disagree/Disagree (median, range)**
1	Primary	93 (86-100)	7 (0-11)	0 (0-11)
	Retrospective	100 (84-100)	0 (0-12)	0 (0-9)
2	Primary	83 (69-94)	13 (3-27)	4 (0-10)
	Retrospective	86 (50-100)	9 (0-50)	0 (0-14)
3	Primary	8 (0-11)	9 (0-13)	85 (79-93)
	Retrospective	29 (9-50)	14 (0-29)	63 (43-72)
4	Primary	0 (0-3)	1 (0-15)	98 (85-100)
	Retrospective	0 (0-5)	0 (0-10)	100 (88-100)
5	Primary	6 (0-27)	10 (5-42)	82 (40-94)
	Retrospective	26 (0-54)	12 (0-25)	57 (36-100)
6	Primary	2 (0-12)	12 (0-31)	86 (61-100)
	Retrospective	0 (0-13)	12 (0-36)	84 (56-100)
7	Primary	82 (59-93)	16 (7-26)	4 (0-16)
	Retrospective	82 (50-88)	18 (0-50)	0 (0-20)
8	Primary	50 (31-60)	32 (20-46)	18 (14-28)
	Retrospective	48 (0-73)	25 (0-29)	29 (9-100)
9	Primary	83 (71-100)	15 (0-21)	6 (0-11)
	Retrospective	82 (52-100)	18 (0-43)	0 (0-22)
10	Primary	66 (55-83)	20 (8-31)	11 (7-23)
	Retrospective	63 (46-100)	20 (0-28)	14 (0-34)

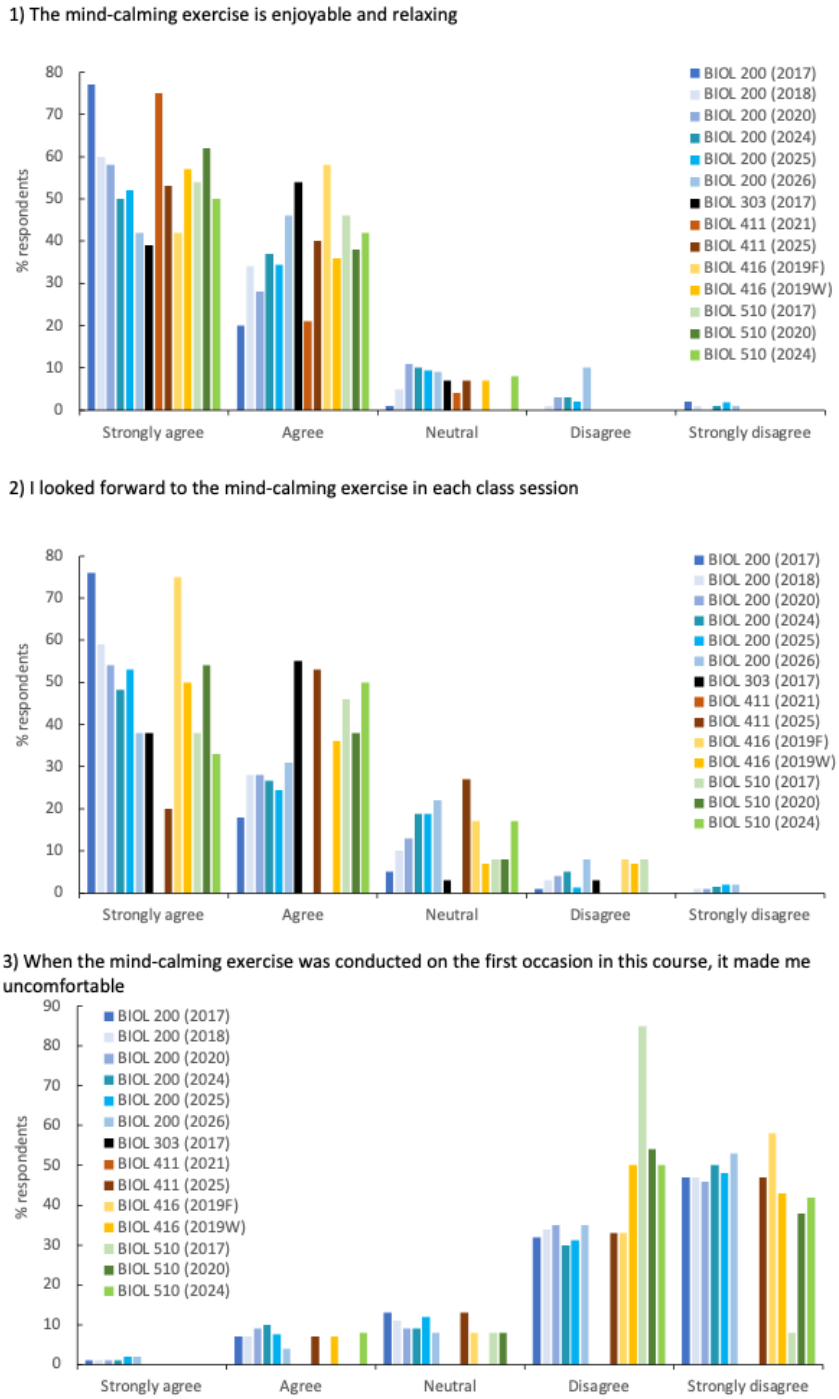


Figure 1. Survey responses to statements (#1, 2 and 3) relating to student enjoyment of the in-class mind-calming exercises for up to 14 different Biology undergraduate program courses between 2017 and 2026 (data are % respondents of total enrolment for each course – see Table 1 for full details including enrolment and attendance etc.). Individual courses are grouped by colour according to class size: Very large (lecture/tutorial) courses (enrolment ~300) are indicated in shades of blue; Medium (lecture/lab/field trip) course (enrolment ~68) in black; Small (lecture/ lab/field trip/seminar) courses (enrolment 16-28) in shades of yellow/brown; and very small (seminar) courses (enrolment 15 max) in shades of green. Data for statements #2 and 3 are missing for one course (BIOL 411 2021) because those statements were not included in that particular survey.

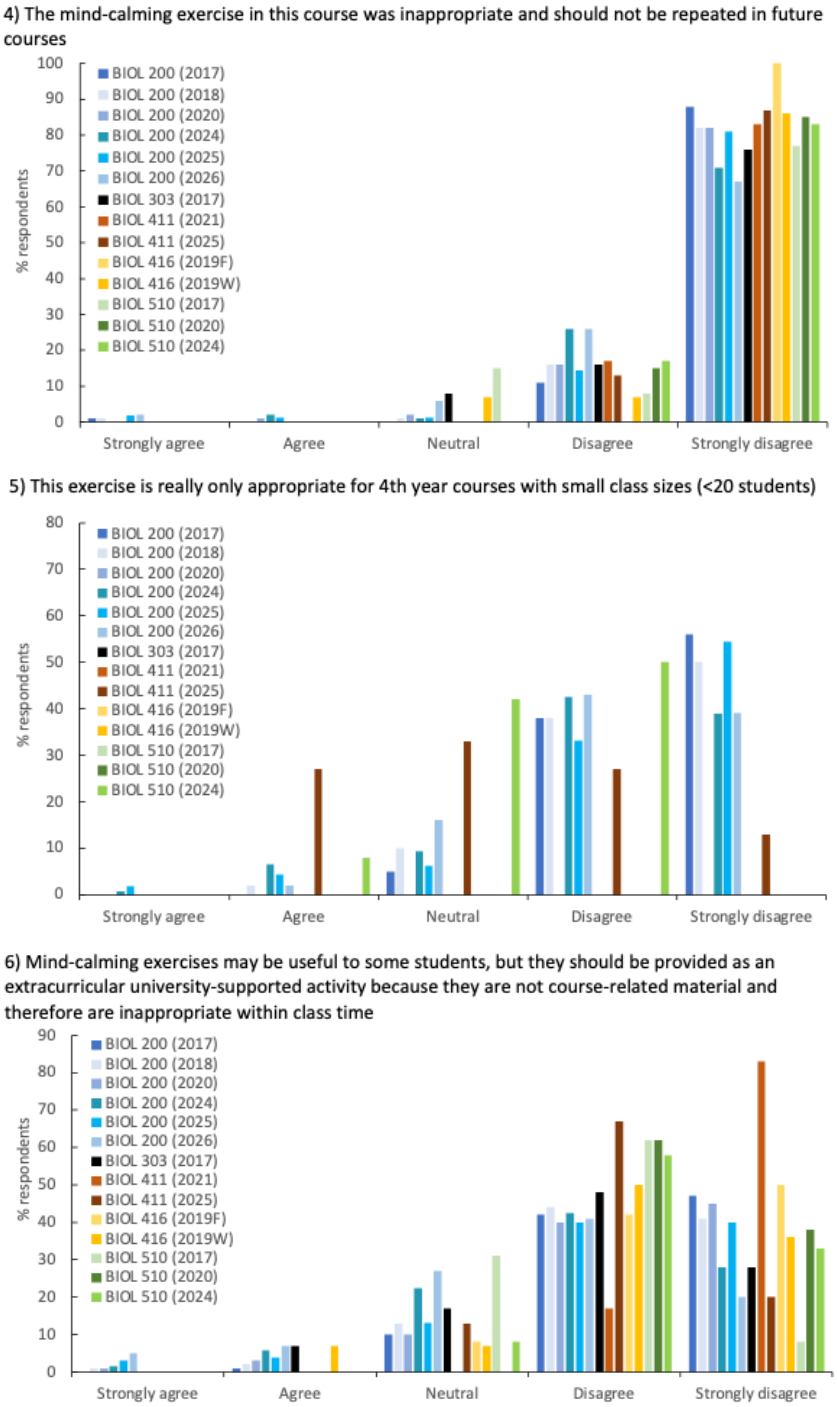


Figure 2. Survey responses to statements (#4, 5 and 6) relating to student perception of the appropriateness of the mind-calming exercises within class time (data are % respondents of total enrolment for each course – see Table 1 for full details including enrolment and attendance etc.). See Figure 1 legend for explanation of the colour shade groupings. Data for statement #5 are missing for 7 courses because it was not included in their particular surveys (see Methods).

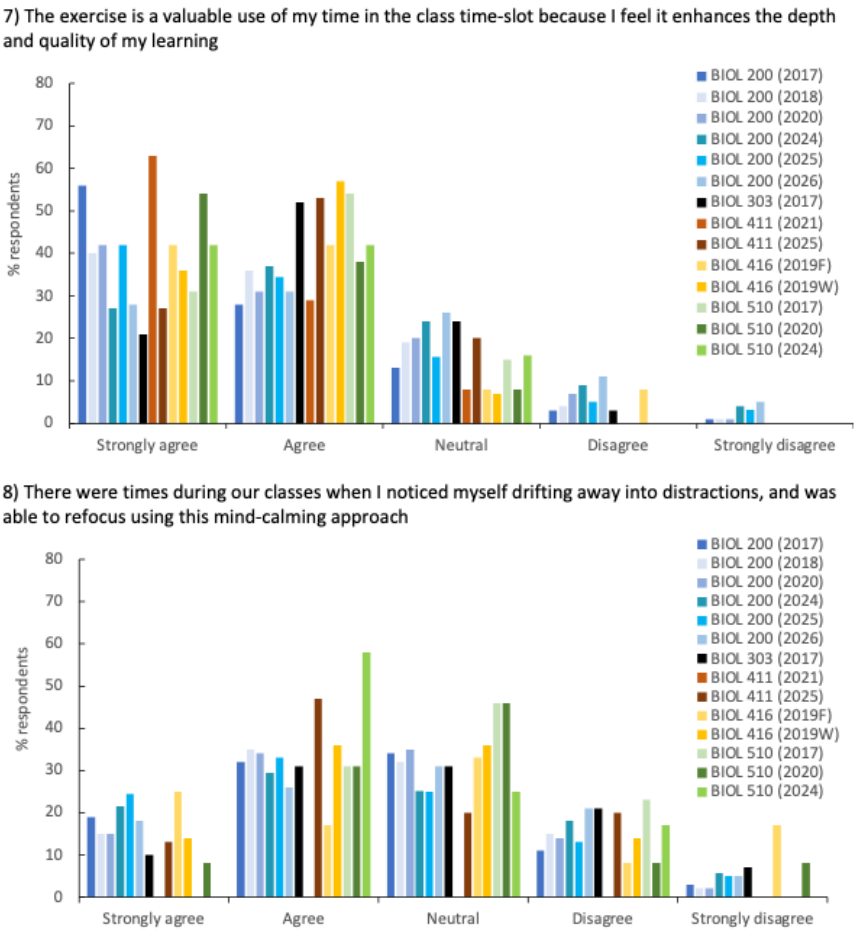


Figure 3. Survey responses to statements (#7 and 8) relating to student perception of the in-class learning value of the mind-calming exercises (data are % respondents of total enrolment for each course – see Table 1 for full details including enrolment and attendance etc.). See Figure 1 legend for explanation of the colour shade groupings. Data for statement #8 are missing for one course (BIOL 411 2021) because it was not included in that particular survey.

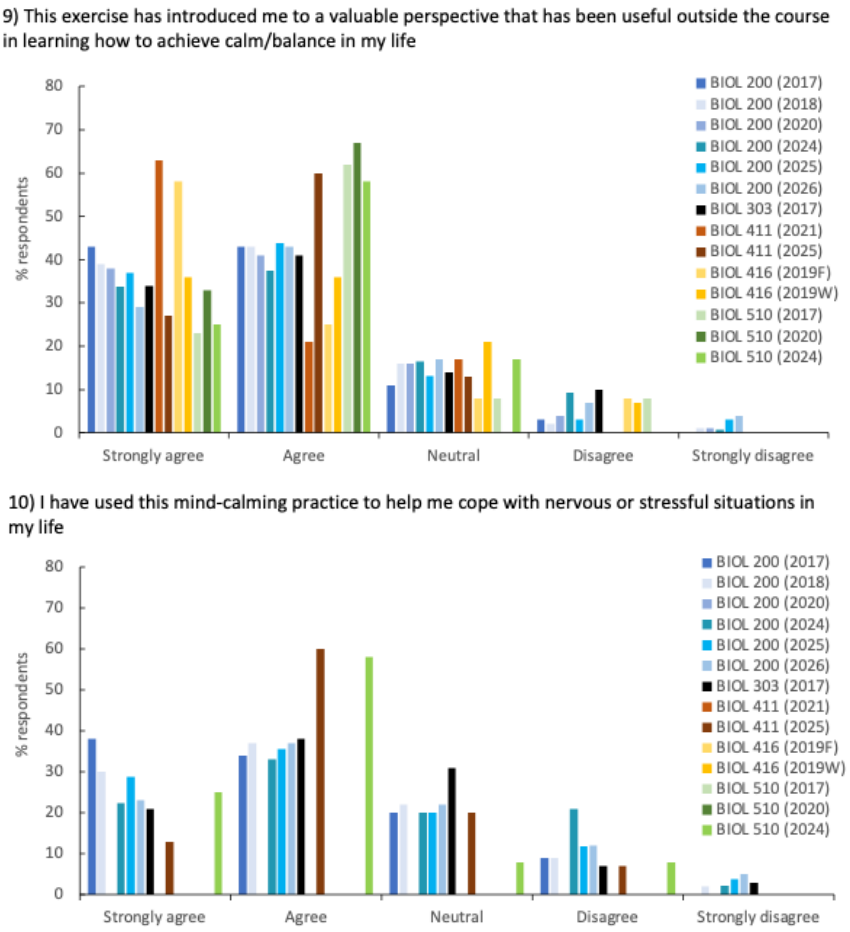


Figure 4. Survey responses to statements (#9 and 10) relating to student perception of the life-skill value of the mind-calming exercises (data are % respondents of total enrolment for each course – see Table 1 for full details including enrolment and attendance etc.). See Figure 1 legend for explanation of the colour shade groupings. Data for statement #10 are missing for 6 courses because it was not included in their particular surveys.

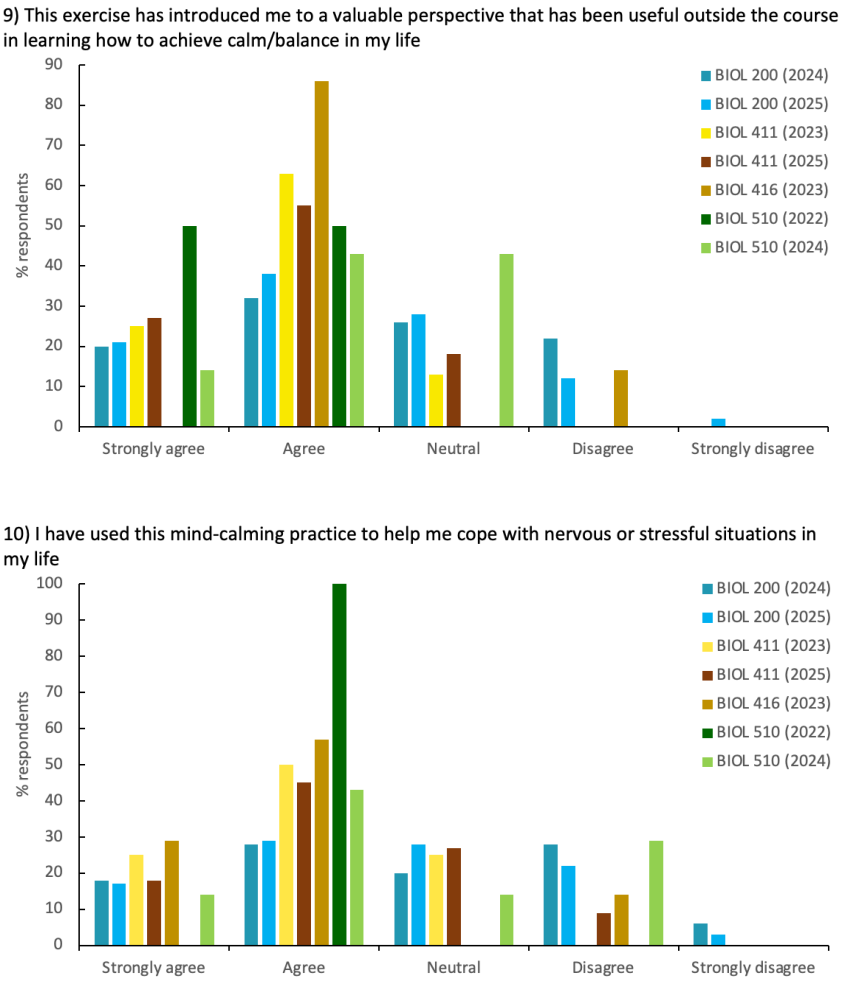


Figure 5. Retrospective survey responses to statements (#9 and 10) relating to student perception of the life-skill value of the mind-calming exercises for 7 different Biology undergraduate program courses between 2022 and 2025 (data are % respondents of total enrolment for each course – see Table 2 for full details including enrolment and attendance etc.). These retrospective surveys were conducted one to four years after the students had originally taken their first course that included this practice. See Figure 1 legend for explanation of the colour shade groupings, and note that additional shades compared to Figures 1-4 are present because some different courses were included in the retrospective survey investigation.

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