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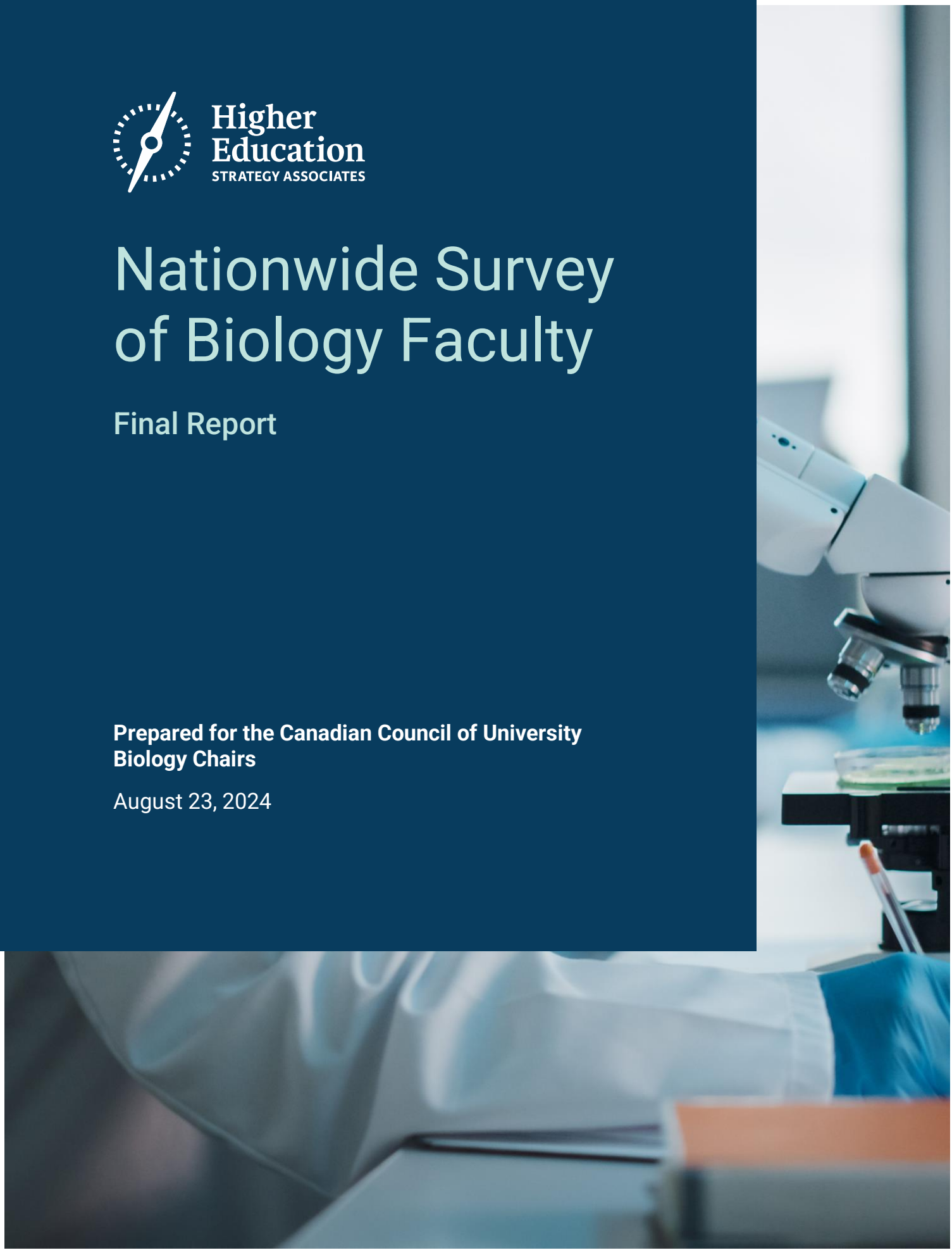
Nationwide Survey of Biology Faculty

Final Report

Prepared for the Canadian Council of University Biology Chairs

August 23, 2024



Higher Education Strategy Associates (HESA) is a Toronto-based firm providing strategic insight and guidance to governments, postsecondary institutions, and agencies through excellence and expertise in policy analysis, monitoring and evaluation, and strategic consulting services. Through these activities, HESA strives to improve the quality, efficacy, and fairness of higher education systems in Canada and worldwide.

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Work completed on behalf of: Canadian Council of University Biology Chairs (CCUBC)

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Any errors or omissions are the authors' alone.

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Executive Summary

HESA conducted a survey of over 200 university biologists on their views of the field. The results suggest that

- More biologists are optimistic than pessimistic about the future of the discipline, with women and members of equity groups more likely to be optimistic.
- A majority of biologists, especially younger biologists, women and members of equity groups, favour a 'broad church' future in which their departments teach in all subfields of biology. While a strong research record is top priority when hiring new colleagues, this is followed by choosing colleagues who have the expertise to ensure the department as a whole still offers teaching in all elements of biology.
- Biologists are split on whether instructors should all be research-active or if some instructors should specialize in teaching. However, there seems to be consensus that graduate students should be trained to a high level in both research and teaching.
- Biologists want to see more collaboration with other disciplines. They most commonly cooperate with chemists, but are most likely to want to see collaboration with computer scientists, medics and mathematicians.

Respondents suggested that they expect the discipline to move in a more computational direction. Informatics, quantitative approaches and genomics are expected to see increased emphasis in undergraduate teaching over the next decade.

A wide range of challenges were identified. The most common challenges are financial, but unprepared students were mentioned fairly frequently, especially by women.

Respondents spent slightly more time on service than their contracts suggested, and slightly less on research to compensate. Service was overwhelmingly to the university or to their field, not to the wider community.

Respondents had many ideas for how they could use additional money, but if their departments received a substantial injection of funds the most common use was increasing funding for each graduate student. If funding were substantially cut, the least painful way to make up the shortfall would be cutting back on cooperation with other departments including service teaching provided by biologists to cognate disciplines.

Introduction

The Canadian Council of University Biology Chairs has commissioned Higher Education Strategy Associates to conduct a nationwide survey of biology faculty and provide a report on how faculty across Canada see the future of the discipline.

CCUBC is comprised of the chairs or heads of biology departments from most universities in Canada. Members can benefit from understanding how their colleagues at other universities see the future of the field.

The results of a national survey bring several benefits to biology departments that they could not obtain independently, such as:

- Exploring how departments see each other, and whether there is scope for specialization or collaboration between different departments;
- Understanding trends in hiring strategies across Canada, which can inform their own hiring plans;
- Showing how relationships between biology and faculty in other disciplines are developing across the country;
- Exploring diversity in the profession while maintaining the privacy of members of equity groups (in a way that is not possible within individual small departments) and the workload of faculty who self-identify.

The results portray a field that is, on balance, optimistic and open to collaboration. They show that nationally there is an expectation that computational and quantitative approaches will increase in importance, but most respondents did not want to see their departments specializing in certain subfields of biology, suggesting that hiring plans will remain a matter for individual universities. The results also enable us to identify trends in priorities by age and gender.

Methodology

Higher Education Strategy Associates collected 194 responses from faculty across Canada, coming from 34 different institutions.

HESA developed a 54-question survey that covered the following areas:

- Profile of respondents
- Allocation of time between teaching, research and service
- Current collaborations with other academic fields
- Views on instructors' roles
- Desire for future collaborations
- Challenges
- Priorities (including in hiring)
- Preferences between specialization in certain fields of biology and breadth of the discipline
- Future of biology

The survey was reviewed by the executive team of CCUBC, and programmed by HESA. HESA hosts its surveys on the platform *QuestionPro*. The survey was then distributed by CCUBC to all Chairs (whether members of CCUBC or not), which were in turn asked to share the survey with all faculty. 216 participants from 34 different institutions started the survey, and 194 respondents completed it, representing a completion rate of 90%. No responses were collected from 24 of the institutions contacted.

Note that we will not report findings linked to demographic information which are based on very small numbers of responses (fewer than five responses) in our analysis to ensure that no individual's answers are identifiable from the reporting.

The distribution of responses for each of the components summarized below is available in the Appendix.

Profile of respondents

The survey collected responses from **216** participants

across **34** different institutions

90% of respondents completed the survey

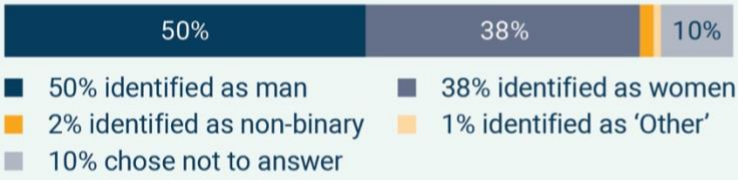
91% of respondents were working in the department of Biology or Biological Sciences within their institution

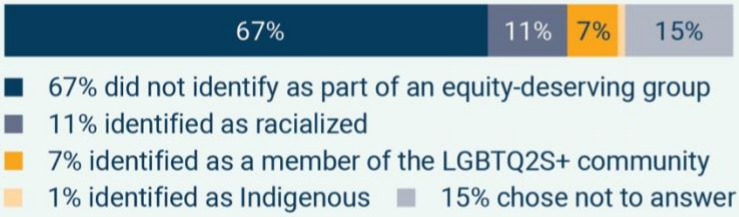
84% of respondents indicated being a part of the Research and Teaching stream, with a majority of those being full professors

Teaching and research specializations were fairly evenly distributed between Evolution and Ecology; Genes, Cells and Molecules; and Biological Systems and Functions.

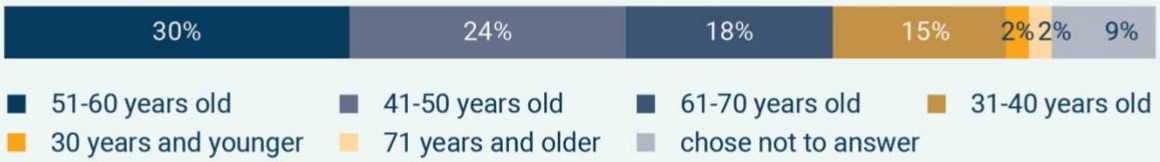
The majority of respondents regularly do lab work or field work as part of their research, but lab work appears more prevalent than field work.

57% of respondents had been in an academic staff or faculty position for over 15 years, with **45%** holding a position with their current department for over 15 years





Age range of respondents



Descriptive Statistics

Allocation of time

Respondents indicated that they spent more time on service and less time on research than expected based on their contracts. Their service time was mostly dedicated to service to the university rather than service to the wider community.

Based on their contracts, respondents need to spend on average 44% of their time on teaching, 36% of their time on research, and 20% of their time on service. In reality, in 2023 respondents indicated spending more time on service (25% of their time) and less time on research (31%) than expected. This is illustrated in Figure 1 below.

Figure 1: Percentage of working time spent on research, teaching and service according to contract versus actually spent in 2023

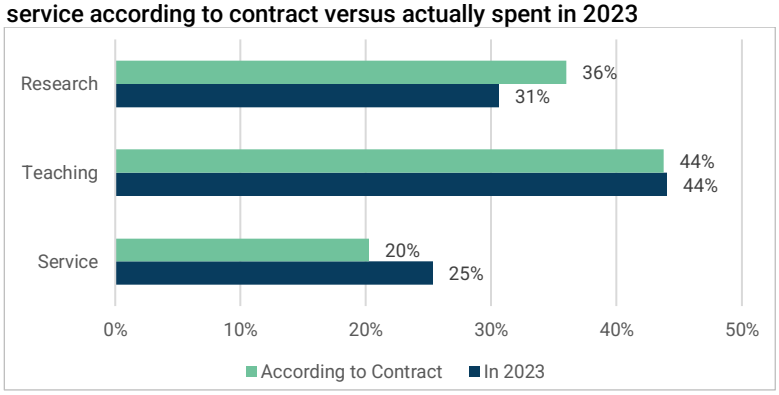
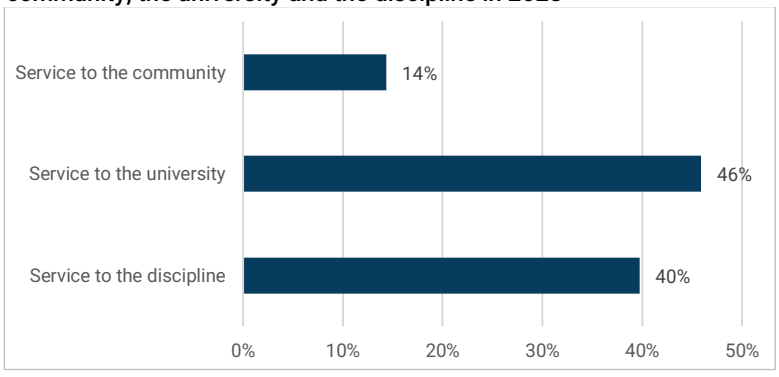


Figure 2 shows how respondents that indicated spending some time on service break down their time between service to the community (e.g., advising government or community organizations), service to the university (e.g., participation in institution-wide advisory councils or taskforces), and service to the discipline (e.g., program revisions, conferences).

Figure 2: Percentage of working time spent on service to the community, the university and the discipline in 2023



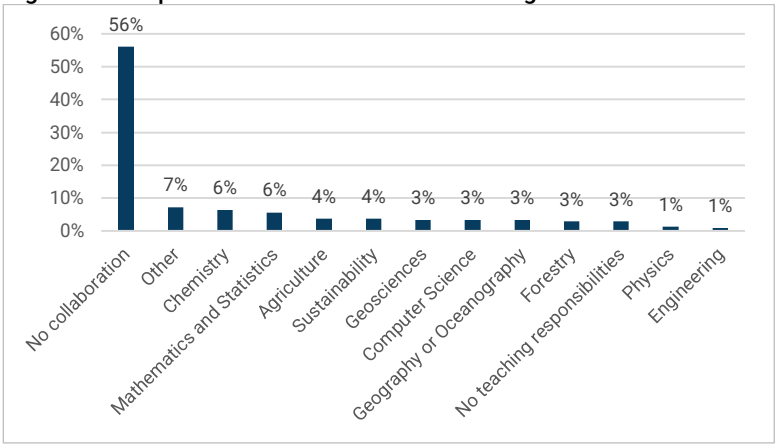
Respondents typically spend more time on service to the university and on service to the discipline than on service to the community.

Current Collaborations

Collaborations are more frequent in research than they are in teaching. Among those that did collaborate with other disciplines, the number one discipline with which there is most collaboration in both teaching and research is Chemistry.

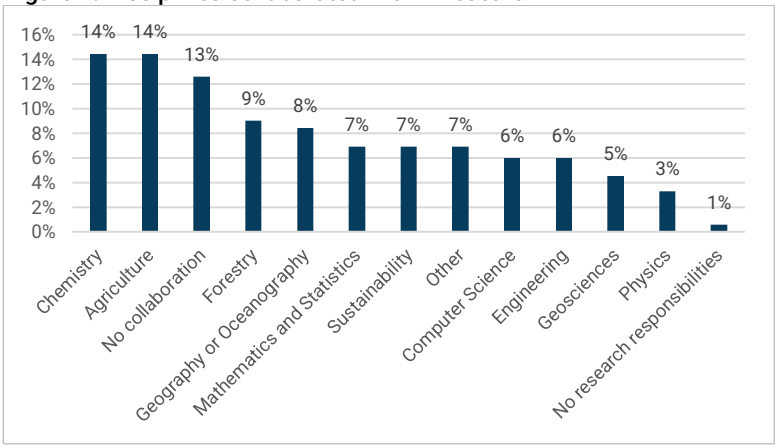
A majority of respondents indicated that they were not collaborating with other disciplines in their teaching, as illustrated by Figure 3. Those who *did* collaborate mostly collaborated with disciplines that were not captured by the options provided (7%), followed by Chemistry (6%) and Mathematics and Statistics (6%). The responses shared under the "Other" option included Environmental Science, Psychology, Science Communication and Literacy, Kinesiology, Anthropology, Health Science, Indigenous Affairs, Medicine, Microbiology, Neurobiology, Social Sciences and Humanities.

Figure 3: Disciplines collaborated with in teaching



However, the picture looks different when asked about their collaborations in research, where only 13% of respondents indicated that they did not collaborate with other disciplines, as illustrated by Figure 4. Chemistry and Agriculture are fields with which researchers collaborate the most (14%). The most frequent responses under "Other" were in Social Sciences (Policy and Law, Economics, Sociology, etc.), but others also included Kinesiology, Business, Medicine, Microbiology, Psychology, Anthropology, Biochemistry, Ecology, Health Sciences, Veterinary Medicine, Animal Biology, and Pharmacy.

Figure 4: Disciplines collaborated with in research



Views on instructors' roles

Views differ on whether all teachers should also be researchers, or if instructors should specialize in either research or teaching. However, a large majority of respondents still believe that all graduate students in their department should be trained to be both good researchers and teachers, instead of specializing in one of the two streams.

More respondents believed that all teachers in their department should also be researchers (60%), than think that instructors should specialize in either research or teaching (40%). However, that still means that a significant minority favor specialization.

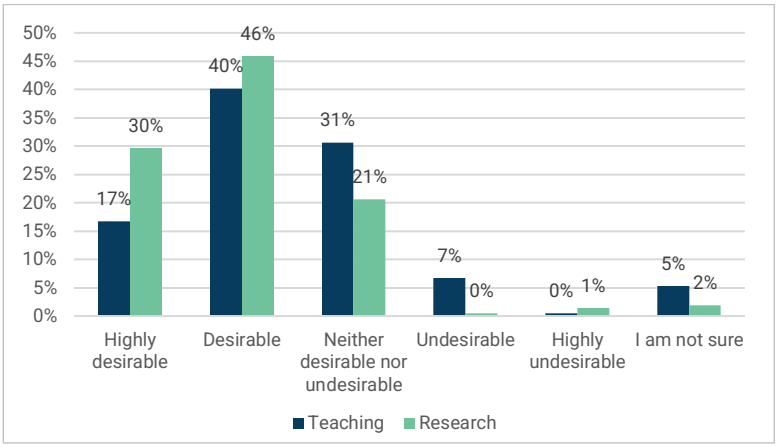
86% of respondents indicated that they had graduate students in their department. Within that number, a strong majority believed that all graduate students in their department should be trained to be good researchers *and* teachers (92%), instead of specializing in one or the other (8%).

Desire for Future Collaborations

Most respondents are in favor of their department increasing collaborations with other departments in their university for both research and teaching. Respondents are also in favor of increasing collaborations nationally. Disciplines with which they would like to see increased collaborations are mostly Computer and Information Science, Medicine, Life and Health Sciences, as well as Mathematics and Statistics.

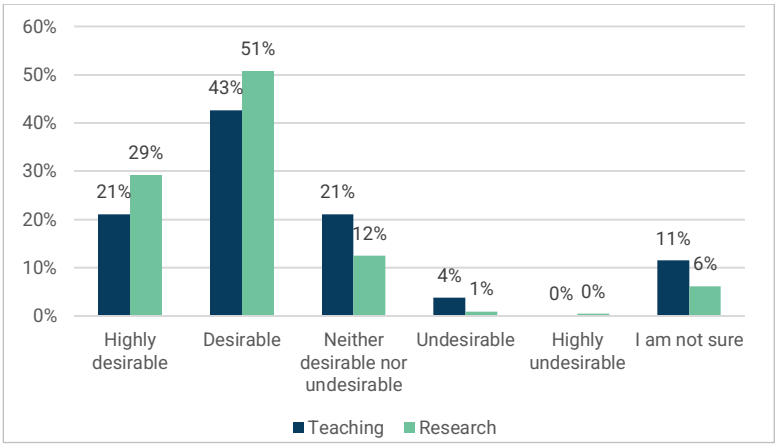
Respondents were then asked if they considered it desirable or undesirable for their department to increase collaboration with other departments in their university, in both teaching and research. Figure 5 below shows that the majority of respondents consider it either highly desirable or desirable to increase collaborations with other departments in their university for both research (76%) and teaching (57%). Interest in collaboration is higher for research than for teaching. Almost no one (1%) found it either undesirable or highly undesirable to increase collaborations in research, compared to 7% for teaching.

Figure 5: Respondents indicating the level of desirability to increase collaborations with other departments in their university, in teaching and research



The same questions were asked at the national level (whether it was desirable or undesirable for departments nationally to increase collaboration with other departments, in both teaching and research). The results are shown on Figure 6 below. Again, a majority of respondents believe it is either highly desirable or desirable to increase collaborations nationally, in both research (80%) and teaching (64%). Interest in collaboration is higher for research than for teaching.

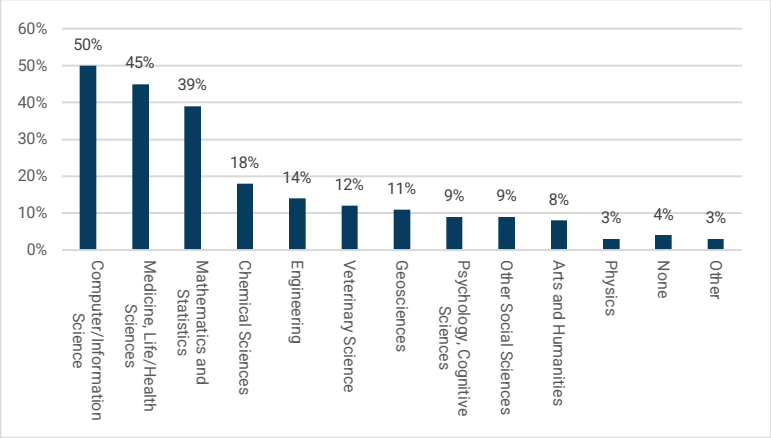
Figure 6: Respondents indicating the level of desirability to increase collaborations with other departments nationally, in teaching and research



These percentages are slightly higher at the national level than at the institutional level, indicating that while respondents typically believe it is desirable to increase collaborations nationally, they might not always perceive the same for their own institution. However, we also see an increase of "I am not sure" at the national level.

When asked with which disciplines they would like to see biology departments nationally increase their collaborations, respondents most commonly chose Computer and Information Science (50%), Medicine, Life and Health Sciences (45%), as well as Mathematics and Statistics (39%), as shown on Figure 7. Responses to "Other" included Environmental Science, Indigenous Studies, Forestry and Agriculture. Note that respondents could select up to three items.

Figure 7: Respondents interested in seeing collaborations increase between biology departments and each discipline at the national level



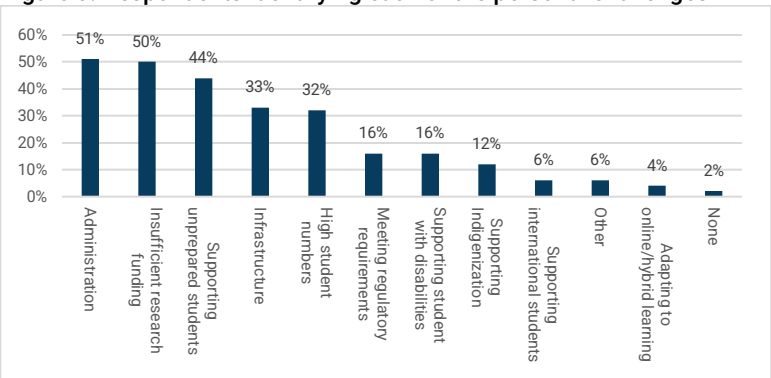
Challenges

Lack of financial resources, insufficient research funding and unprepared incoming students appear amongst the biggest challenges identified by individuals for themselves, their department and the field nationally.

Respondents were then asked what challenges they felt were the greatest for them, for their department, and for the field nationally. Note that they could select up to three challenges facing them, three facing their department and three facing biology as a national field.

The most commonly-cited challenge facing faculty is the administration required by the university (51%), closely followed by insufficient research funding (50%). The third most commonly mentioned is meeting the needs of students who are unprepared (44%). Infrastructure (conditions of building, equipment) and high student numbers were also frequently mentioned. The distribution of responses is shown on Figure 8.

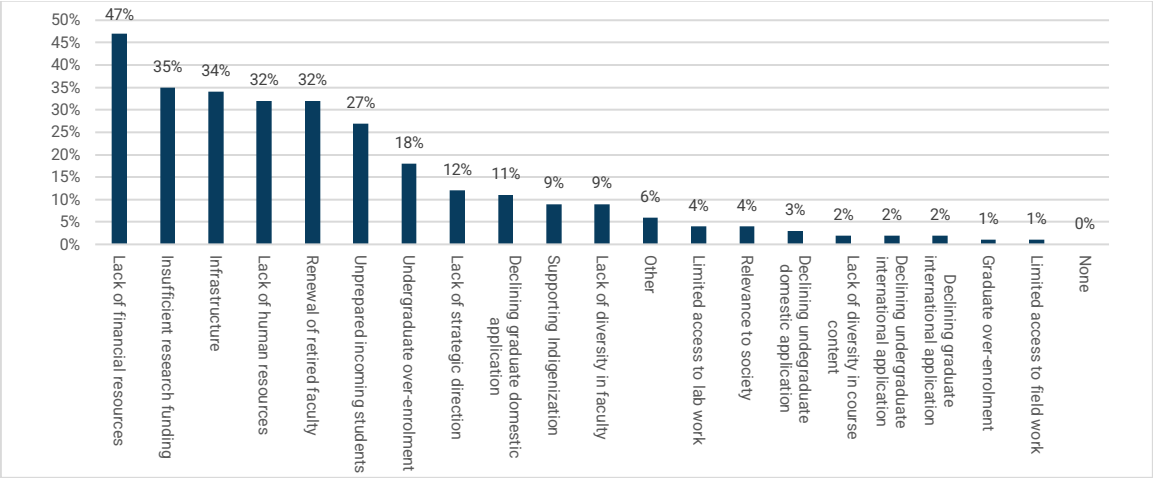
Figure 8: Respondents identifying each of the personal challenges



Responses under "Other" included high teaching load, administrative tasks, financial support for students, lack of freedom of speech, and supporting students with mental health issues. Some respondents also indicated "*not feeling supported or understood by [their] university anymore*", and that "*the biggest challenge is university and NSERC requirements to pledge allegiance to political goals to which [they are] opposed (DEI, Indigenization, decolonization)*".

The challenge to departments that respondents most commonly cited was the lack of financial resources (47%). Other common challenges include insufficient research funding (35%), infrastructure (condition of buildings, equipment) (34%), lack of human resources (not enough faculty members in certain fields) (32%), planning for renewal of faculty in view of retirement (32%), and unprepared incoming students (27%). The distribution of responses is shown on Figure 9.

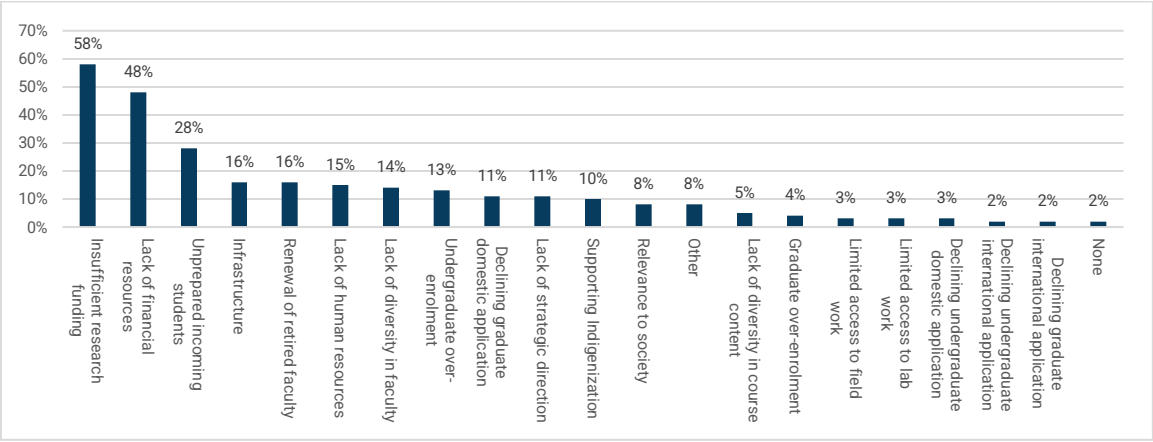
Figure 9: Respondents identifying each of the challenges to their department



Responses under "Other" included high teaching load, understaffing, insufficient graduate student funding, insufficient departmental operating funding, an increase in student accommodations and limited time. Individual respondents also indicated "*the lack of awareness about the ineffectiveness of our teaching*", "*supporting other departments who do not offer labs or enough mentors to train students*", and "*too much emphasis on DEI, indigenization, and decolonization goals that are not part of my department's academic mission*".

In the opinion of respondents, the biggest challenge that the field of biology, nationally, is currently facing is insufficient research funding (58%), followed by the lack of financial resources more generally (48%). Although in lesser importance, unprepared incoming students collected a significant number of responses as well (28%). The distribution of responses is shown on Figure 10.

Figure 10: Respondents identifying each of the challenges faced by the field of biology nationally



Responses under "Other" included declining trust or interest in science, a decline in the credibility and reputation of universities and scientists, insufficient graduate student funding, lack of

outreach, limited time, and limited post-graduate career opportunities. Individual respondents also indicated a "*deemphasis of excellence and using quota systems that interfere with hiring practices*", a "*lack of support by universities as they become more and more corporate and operate like businesses*", an "*over-emphasis on strategic direction from above*", and "*institutional capture by social justice ideologies who have created an environment where no-one can criticize their ideology publicly*".

Priorities

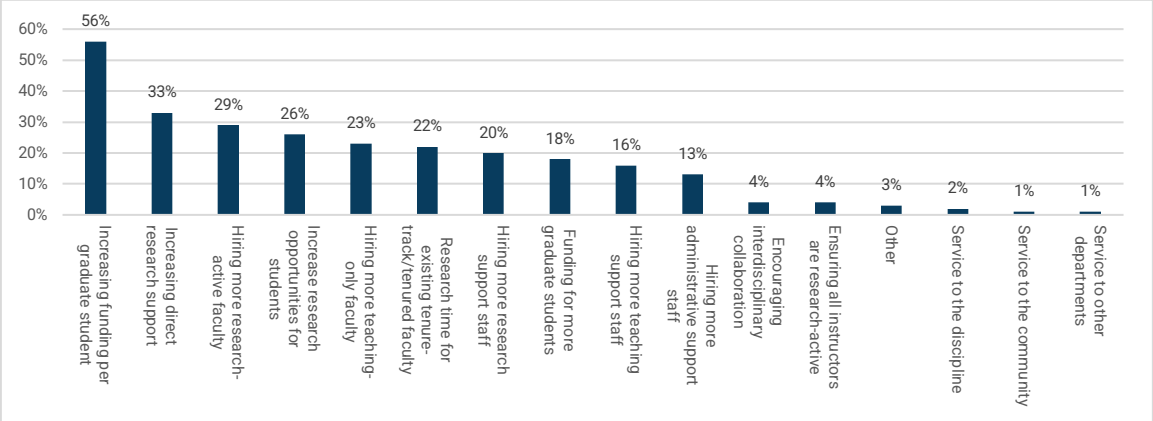
If more money were to suddenly become available, a clear priority for respondents was increasing funding per graduate student. Other priorities that were often mentioned were replacing faculty that retire and ensuring breadth of knowledge within departments.

On the contrary, respondents were most open to cutting service to other departments, interdisciplinarity and ensuring all instructors are research-active.

Respondents were asked how their department could best spend a sudden 10% increase in financial resources. Note that they could select up to three items per question.

By far the most common priority was increasing funding per graduate student (56%). Other frequent responses included increasing direct research support (e.g., equipment, service units, field stations, etc.) (33%), hiring more research-active faculty (29%), and offering more research opportunities to students (field and/or lab) (26%). The distribution of responses is shown on Figure 11.

Figure 11: Respondents by prioritized area in the scenario of a 10% increase in departmental financial resources

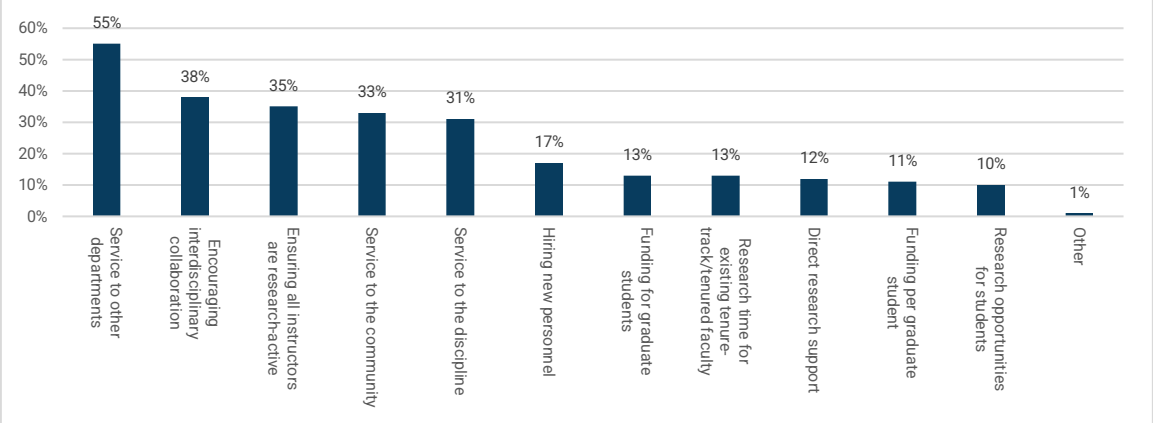


Responses under "Other" included a decrease in teaching load, funding for field schools, increased budget for courses, increasing funding per undergraduate student, and replacing lost faculty positions (due to retirement).

Conversely, respondents were then asked what they would find least difficult to cut in the scenario of a 10% budget cut. Note that they could select up to three items per question.

The number one element that respondents would find least difficult to cut in the event of a 10% decrease in departmental financial resources was service to other departments (e.g., teaching in other disciplines) (55%). Other items with high response rates include encouraging interdisciplinary collaboration (38%), ensuring all instructors are research-active (35%), service to the community (33%), and service to the discipline (e.g., participation to conferences) (31%). The distribution of responses is shown on Figure 12.

Figure 12: Number of respondents by deprioritized area in the scenario of a 10% decrease in departmental financial resources



The "Other" response was that "many of these options are not controlled at the departmental level".

Respondents who had selected "Hiring new personnel" on the previous question were then asked to rank, from 1 to 3, which type of hiring they would find the least difficult to cut (1 being the least difficult).

Figure 13 shows the average ranking for the different types of hiring. Hiring new administrative staff appeared to be the least difficult to cut (with the lowest average), with hiring new teaching support staff the most difficult to cut (with the highest average).

In some cases the overall score below reflects polarised responses: notably, several respondents gave 1st or 3rd priority to "Hiring new research-active faculty", while few respondents put this in 2nd place.

Figure 13: Priorities in hiring based on the difficulty of cutting back (1 being the least difficult to cut)

Respondents were then asked to identify, in open-ended answers of maximum 500 characters, what their department's priorities should be over the next five to ten years.

The most common answers (20 respondents and over) related to:

- graduate student funding;
- replacing retirees;
- prioritizing certain subfields (subfields that were referred to include Ecology, Biodiversity, Information Science, Organismal Function, Evolution, Conservation, Climate Change, and Taxonomy).

A significant proportion of respondents (between 10 and 15 respondents) also responded:

- hiring more faculty;
- a review of the undergraduate curriculum;
- mentorship;
- reducing teaching load;
- EDI (such as increasing the diversity of faculty);
- and graduate student success.

Other responses included research funding, research opportunities and labs, lessened administrative duties, hiring more teaching faculty, technology, and pedagogy (between 5 and 9 occurrences); and teaching funding, strategy, recruitment, sense of community, experiential learning, faculty funding, hiring more research faculty, external funding, building on existing clusters of strength, staying relevant in a quickly evolving and ever-changing environment, infrastructure and resources, graduate recruitment, work-life balance, and allocating time to support underprepared students (below 5 occurrences). Some mentioned that their priority was "*survival*" and to "*continue to exist*".

Some answers were also against EDI initiatives ("*eliminate all indigenization initiatives, foster freedom of expression*" and "*stop diverting resources (time and $$) to useless DEI initiatives*") – however there were more responses that identified EDI as a priority.

Should biology departments specialize?

Most respondents believed that their department should give equal emphasis to all subfields of biology rather than specializing in certain subfields.

A majority of respondents (61%) believed that their department should give equal emphasis to all subfields of biology, compared to 39% who believed their department should specialize in certain subfields of biology and de-prioritize others.

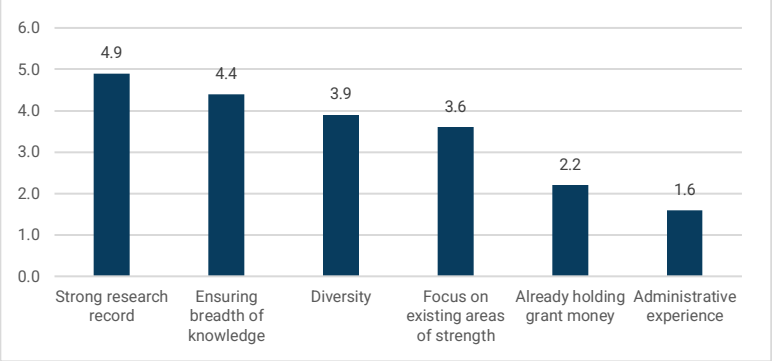
Hiring

Respondents seem to value a strong research record most when hiring, as well as ensuring a breadth of knowledge within the department. Subfields mentioned as priorities included Ecology and Plant Biology. Demographic diversity was also listed as an important criterion to consider when making future hiring decisions in the department, as well as teaching, and collegiality.

Respondents were asked to rank from 1 to 6 what should be prioritized in future hiring in their department (1 being the least important). Figure 14 shows the average rank for each factor in hiring.

Respondents indicated that the most important factor should be a strong research record (for stage of career) (with the highest average), followed by the ability to teach in specific subfields of the discipline to ensure breadth of knowledge. The least important was administrative experience (with the lowest average), followed by already holding grant money. However, the distribution of ranks was fairly divided for some items. While a strong research record and administrative experience ranks as first and last factors to prioritize in future hiring, respectively, were the most commonly selected by participants, the ranks attributed were more evenly distributed for items such as diversity (gender identity, sexual orientation, race, Indigenous status, disability), as well as the ability to teach in specific subfields of the discipline to focus on existing areas of strength.

Figure 14: Average rank obtained (between 1 and 6) for the level of importance of different factors for future departmental hiring (1 being the least important)



Those that ranked either “Ability to teach in specific subfields of the discipline to ensure breadth of knowledge” or “Ability to teach in specific subfields of the discipline to focus on existing areas of strength” first or second were then asked, in an open-ended question, which subfields should be prioritized in future hiring.

The most common answers (30 respondents and over) related to Ecology and Plant Biology.

A significant proportion of respondents (above 10 occurrences) also responded:

- Bioinformatics (Computational Methods, Big Data, AI, etc.);
- Cell and Molecular;
- Evolution;
- Genetics;

- Molecular; and
- Organismal.

Other responses included Climate Change, Physiology, Biochemistry, Biodiversity, Conservation, Developmental, Environment, Genomics, Cell, Medicine and Health, Microbiology, and Animal Physiology (between 5 and 9 occurrences); and Synthetic Biology, Systems Biology, Botany, Cancer, Immunology, Indigenous Science, Neurophysiology, Neurobiology, Wildlife, Agriculture, Anatomy, Microbiome, Toxicology, and Water (below 5 occurrences).

A number of responses included notes about moving away from a perceived prioritization of medical sciences.

Some respondents seemed to be against specializing and responded "*All of them! We are a biology department!*" and "*Protect current broad expertise from molecules to biodiversity. Can we look far enough into the future to maintain an excellent breadth in both? Avoid BS about specializing on a few 'strengths'*". Someone also indicated that industry experience should be taken into consideration as a factor in hiring.

Regarding demographic diversity, there were again conflicting views. For example, while one individual said "*Why not hire for diversity instead of discipline? Hire the best people and then build on their research and teaching strengths*", someone else stated "*I find the emphasis on diversity in hiring in the previous question to be really discouraging. Nobody needs affirmative action to succeed in university hiring.*"

When asked in an open text box if there were any other criteria that should be treated as important when making future hiring decisions for their department, the most common answers were EDI and diversity.

A significant proportion of respondents (above 10 occurrences) also responded teaching, and collegiality.

Other responses included the fit with existing faculty, mentorship, soft skills, the balance between teaching and research, and collaboration (between 5 and 9 occurrences); and research space, community focus, research and secure research funding, competence, leadership, productivity, adaptability, communication, doing some research within the province, experience outside of the university, fairness, flexibility, the mental health of applicants, and philosophy about supervision (below 5 occurrences).

Someone also indicated a desire to "de-prioritize medical sciences".

Future of biology

Respondents believe that subfields like Bioinformatics, Quantitative Approaches and Genomics will gain in teaching emphasis over the next ten years. Other than Systematics and Taxonomy, most believe that no subfield will lose in teaching emphasis in the next ten years. On the research front, respondents believe that there will be an increase in applied research, and a need to embrace or adapt to the impacts of big data and AI.

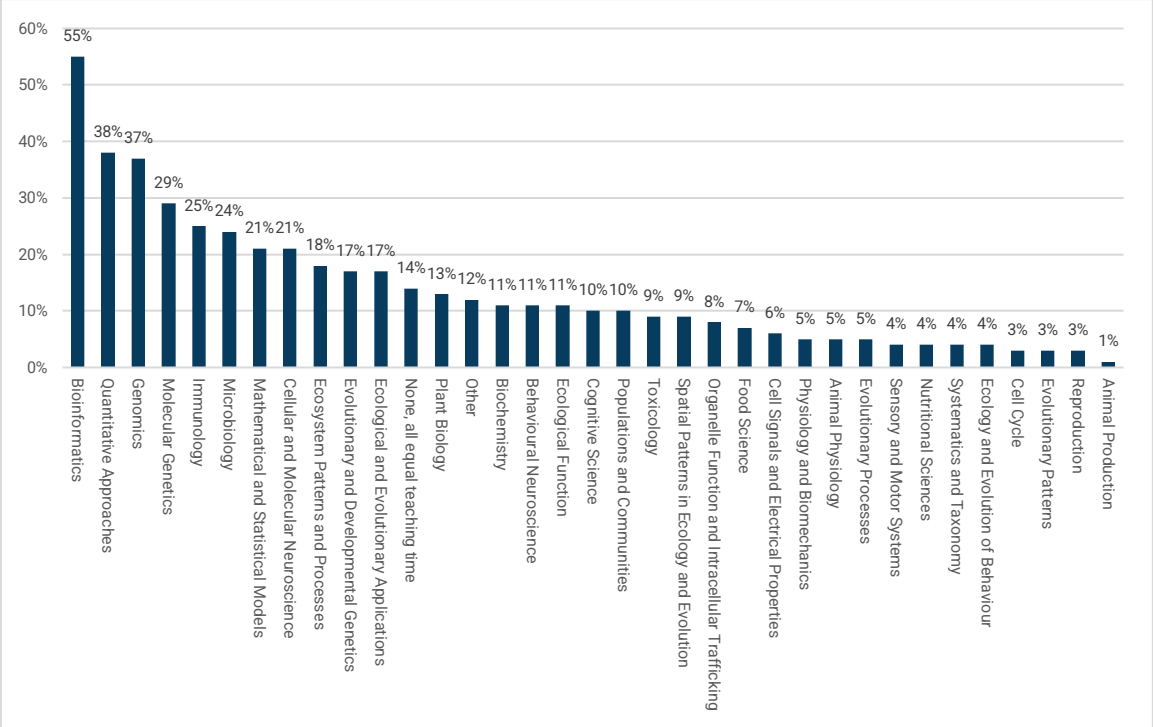
In general, respondents were more optimistic than pessimistic about the future of the discipline, for both their institution and nationally. However, views were stronger (both positive and negative) for their own university compared to the field in general.

This section focuses on the future of the field.

Firstly, respondents were asked which subfields of biology currently being taught to undergraduates they believed would be receiving more and less teaching time in ten years. They could select all items that applied.

The subfield that most respondents believed would receive an increase in teaching emphasis over the next ten years was Bioinformatics (55%). This was followed by Quantitative Approaches (38%), and Genomics (37%). The distribution of responses is shown in Figure 15.

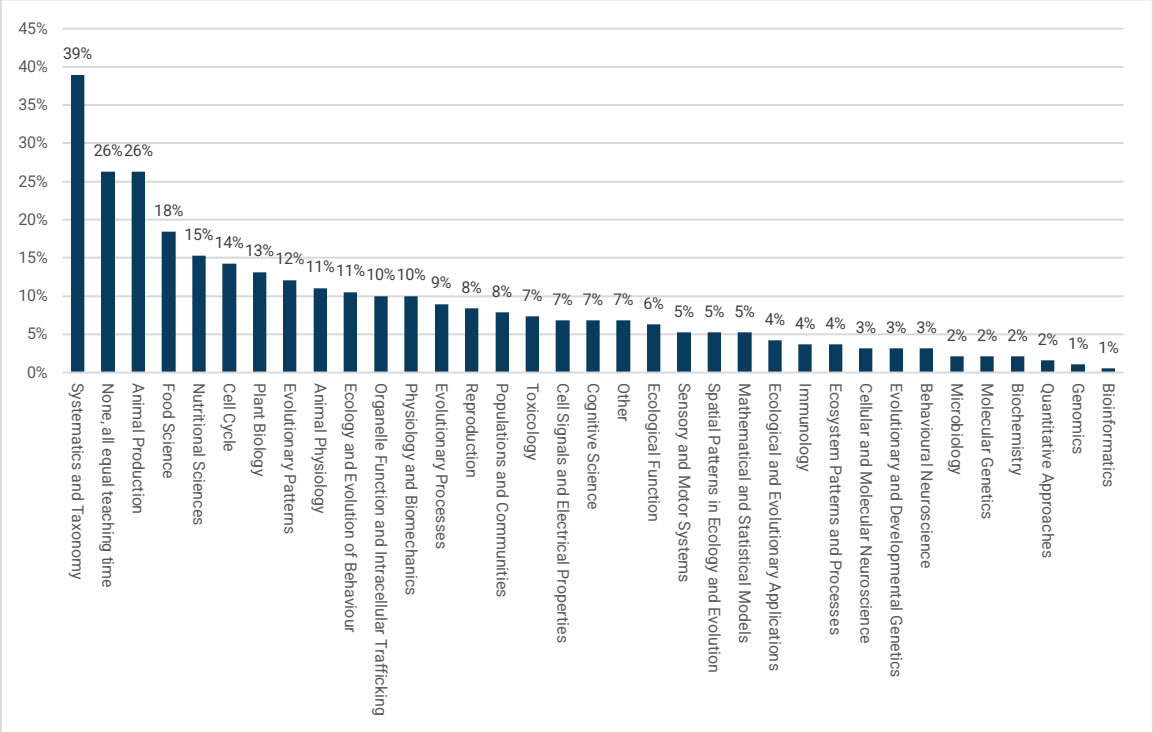
Figure 15: Respondents per subfields of biology in which they anticipate an increase in teaching emphasis over ten years



Responses under "Other" included Conservation, Data Science, Environmental, Anthropogenic Impacts on Biological Systems, Biodiversity Informatics, Biology of Complex Systems, Cancer Biology, Climate Change, Global Change Biology, Fisheries, Agriculture, Disease and Zoonotic, Critical Thinking in Biological Sciences, AI, Human / One Health, and Synthetic Biology.

The subfield that respondents most commonly expected to decrease in emphasis within biology teaching over the next ten years was Systematics and Taxonomy (39%). However, a significant proportion of respondents believed that all these subfields would receive equal teaching time in ten years (26%). The distribution of responses is shown in Figure 15.

Figure 15: Number of respondents per subfields of biology in which they anticipate a decrease in teaching emphasis over ten years



Most respondents that selected under "Other" indicated "*I don't know*", or mentioned that it would vary between departments.

Next, respondents were asked how they expected research in biology to evolve over the next ten years.

The most common answers (above 20 occurrences) revolved around the themes of:

- Increase in applied research (the applicability of research output for society); and
- The need to embrace, or the impacts of, big data and AI.

A significant proportion of respondents (between 10 and 20 occurrences) also responded elements on the themes of:

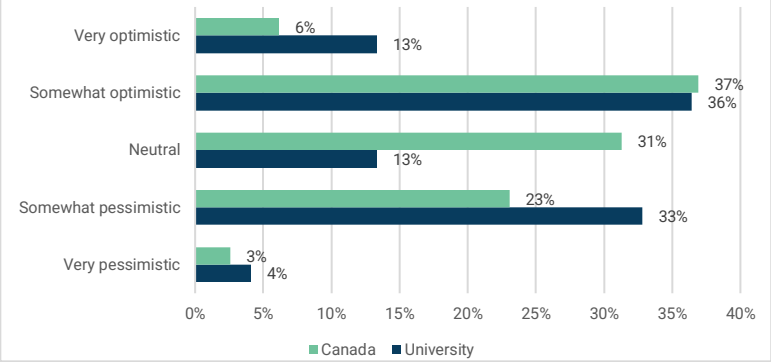
- Environmental issues (Climate Change, Biodiversity, Global Warming, Ecology, etc.);
- The field leaning towards Computational or Quantitative Methods;
- Interdisciplinarity;
- The evolution of the field depending on funding; and
- The field leaning towards Medical Biology and Human Health, or towards Molecular Biology.

Other responses touched on collaboration (e.g., with Social Sciences, Computer Sciences and Engineering) (between 5 and 10 occurrences); and Bioinformatics, machine learning, a growing importance of the private sector, increases in importance of the subfields of Genetics, Genomics and Synthetic Biology, and EDI (less than 5 occurrences).

Some respondents shared their concern that research will "*become more divisive*", "*driven by funding and politics versus information voids*" and that "*it will get cut and forced into narrow government priorities*". Someone stated that "*we must resist the trend to de-value fundamental research*". Someone shared their perception that "*in Canada, it will evolve poorly. Particularly Cancer Research (relative to industrialized countries elsewhere). Poor funding levels will prevent us from attracting great people (even Canadians). Without a considerable 'moon shot' approach, we will continue our downward spiral. Canada used to punch above its weight – it does not anymore. A ~10% CIHR funding line is the sole reason. In the 90s it was much higher. Our output will be a product of our input.*"

More individuals were either 'very optimistic' or 'somewhat optimistic' about the future of the discipline than were 'somewhat pessimistic' or 'very pessimistic', for both their institution and nationally. Respondents were both more optimistic and more pessimistic about the future of their own university, compared to their perceptions of the future of the field nationally that were significantly more neutral. The distribution of responses is shown on Figure 16.

Figure 16: Attitudes of respondents towards the future of biology within their institution and nationally



Analysis

After completing the analysis of the survey results, we then created cross-tabulations to identify if differences emerged between sub-groups of biologists, based on gender, identification with an equity-deserving group, and age. We analysed:

- Allocation of time
- Views on instructor's roles
- Challenges
- Specialization
- Future of biology

Note that to protect confidentiality, we removed data on demographic groups that collected fewer than five responses. Hence, no analyses were conducted with individuals that identified as being non-binary or of another gender than man, woman or non-binary; with individuals that identified as an Indigenous person; and with those that identified as being 30 years old or less, or 71 years old or older.

While the respondents were not strictly a probability sample of all biologists, significance tests were used for convenience to identify effect sizes large enough to be meaningful given the number of responses received. Most apparent differences between sub-groups were not statistically significant at the $p < 0.05$ level and were not reported, but a few differences between groups were clear enough to include.

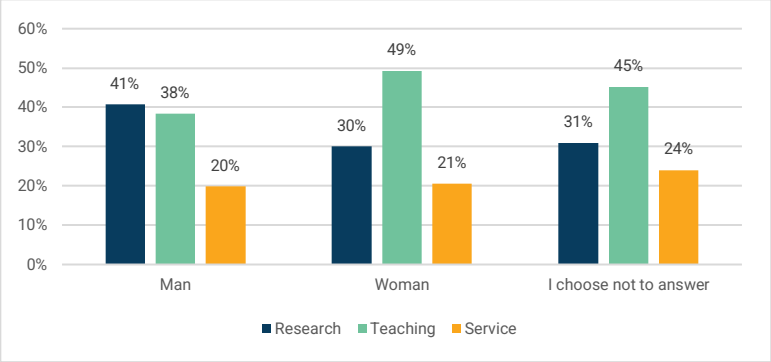
All charts in the body of the text are based on at least 150 responses to the survey.

Allocation of time

Based on their contracts, women are expected to spend more time on teaching than male colleagues, leaving less time for research. In reality, this gap is exacerbated, with women spending even more time on teaching than expected, and less time on research. Based on contracts, older respondents are expected to spend less time on teaching and more time on research compared to their younger colleagues. In general, notwithstanding gender, identification with an equity-deserving group or age, individuals spend more time on service and less time on research than expected in their contracts.

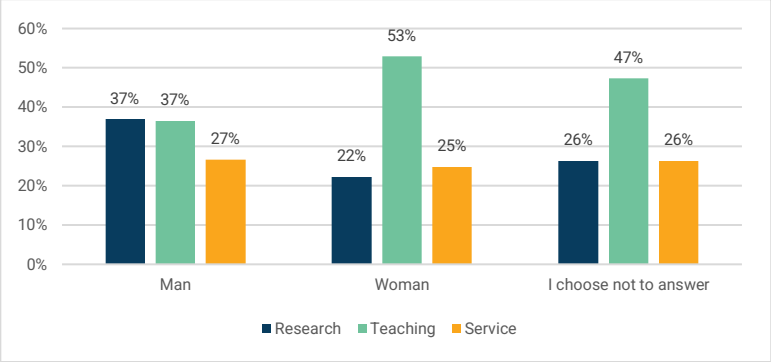
Based on their contracts, it appears that women need to spend higher proportions of their time to teaching (49%) compared to their male colleagues (38%), leaving less time for research for women (30%) compared to men (41%). This is illustrated in Figure 17.

Figure 17: Percentage of working time spent on research, teaching and service according to contract, based on gender



However, when looking at how they actually distributed their time in 2023, women responded taking even more teaching load than expected in their contract (53% compared to 49%) as well as dedicating more time to service (25% compared to 21%), leaving even less time for research (22% compared to 30%). Time dedicated to service was higher in reality than expected in the contract, notwithstanding the gender of respondents. This is illustrated in Figure 18.

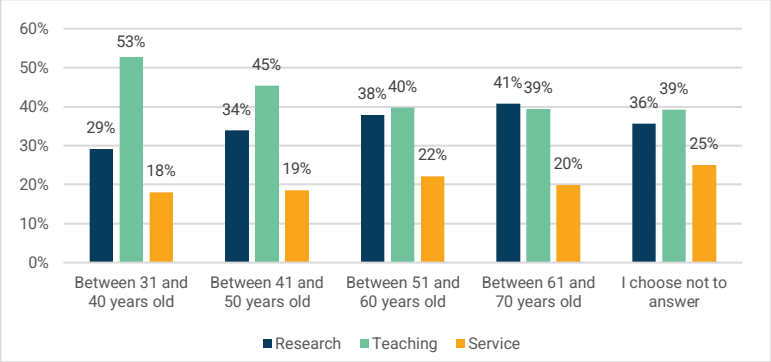
Figure 18: Percentage of working time spent on research, teaching and service in 2023, based on gender



There was not a clear difference in distribution of time (based on contracts and or reality) between respondents that identified as racialized and those that did not identify as racialized. Given the small numbers of members of the LGBTQ2S+ community and the modest size of the differences between these respondents and others, it was not possible to draw any conclusions.

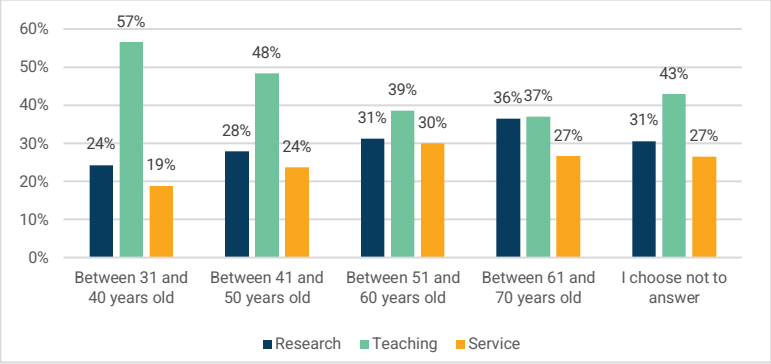
Finally, based on contracts, it appears that the proportion of time expected to be spent on teaching diminishes for older respondents, while time expected to be spent on research increases. This is shown on Figure 19.

Figure 19: Mean percentage (%) of working time spent on research, teaching and service according to contract, based on age



In reality, time dedicated to service in 2023 was higher than expected for everyone, while time dedicated to research was lower than expected for everyone, notwithstanding age, as shown on Figure 20.

Figure 20: Percentage of working time spent on research, teaching and service in 2023, based on age



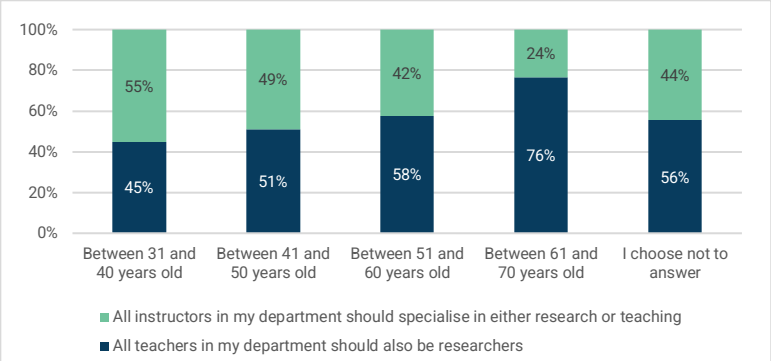
Views on instructors' roles

While views on instructors' roles did not seem to be impacted by gender and identification with an equity-deserving group, there seemed to be significant differences in views between younger and older respondents. The older the respondents were, the more likely they were to believe that all teachers in their department should also be researchers.

Views on instructors' roles (whether instructors should specialize in either teaching or research, or whether all teachers should also be researchers) were quite similar between male and female respondents, as well as those that identified as part of an equity-deserving group and those that did not.

However, Figure 21 illustrates that the older respondents were, the more they believed that all teachers in their department should also be researchers. Younger respondents were roughly evenly divided.

Figure 21: Views on instructors' roles based on age



Challenges

The biggest challenges identified seemed to vary based on gender and age.

The biggest personal challenge identified by men was insufficient research funding, while it was the administration required by the university for women. Meeting the needs of students who are unprepared as well as meeting the needs of international students seemed more challenging for younger respondents. Yet, older respondents seem to find administration required by the university and meeting regulatory requirements more challenging than younger respondents.

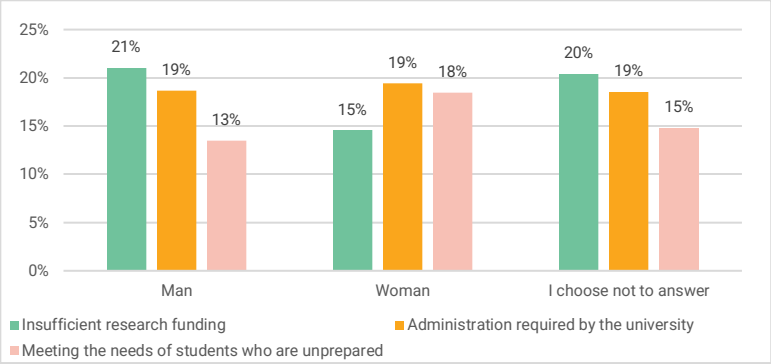
Insufficient research funding and the lack of financial resources appeared as the biggest national challenges for all groups. However, certain challenges appeared in higher prevalence for certain groups compared to others. Notably, relevance to society was a bigger challenge for men than women, but the lack of diversity in faculty was a bigger challenge for women than for men, as well as for younger respondents compared to older ones. The lack of diversity in course content was a bigger challenge for members of the LGBTQ2S+ community compared to other groups. Infrastructure was identified more as a challenge by older respondents.

Personal Challenges

While the biggest personal challenge identified by male respondents was insufficient research funding (21%) followed by the administration required by the university (19%), female respondents identified the administration required by the university as the biggest challenge (19%), followed by meeting the needs of students who are unprepared (18%).

Insufficient research funding was a bigger challenge for men (21%) than women (15%), and meeting the needs of students who are unprepared was a bigger challenge for women (18%) than for men (13%). This is illustrated on Figure 22.

Figure 22: Top personal challenges identified based on gender

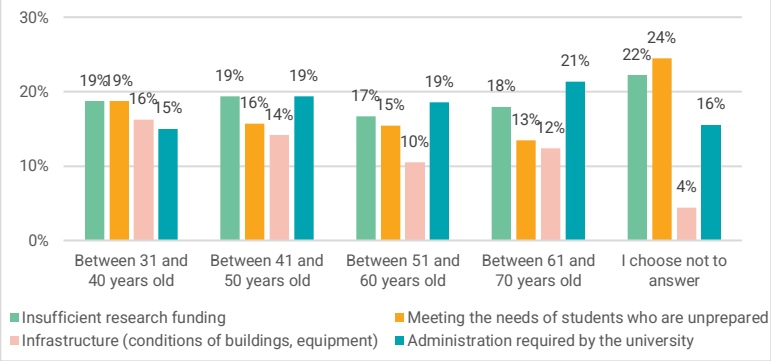


The difference between personal challenges identified by respondents that identified being a part of an equity-deserving group (LGBTQ2S+ or racialized), and those that did not, was not significant, given the modest effect sizes observed.

The biggest personal challenges identified by respondents between 31 and 40 years old were meeting the needs of students who are unprepared and insufficient research funding (19%), followed by infrastructure (16%). For respondents between 41 and 50 years old, the biggest personal challenges identified were the administration required by the university and insufficient research funding (19%), followed by meeting the needs of students who are unprepared (16%). Respondents between 51 and 60 years old identified the administration required by the university as the biggest personal challenge (19%), followed by insufficient research funding (17%), and then meeting the needs of students who are unprepared (15%). Finally, respondents between 61 and 70 years old also identified the administration required by the university as being the biggest personal challenge (21%), followed by insufficient research funding (18%), and meeting the needs of students who are unprepared (13%).

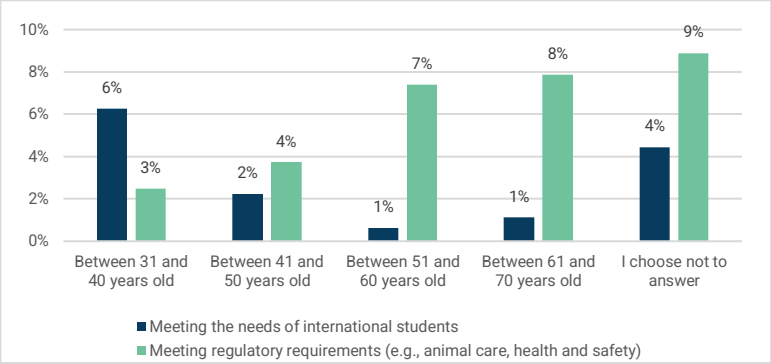
Younger respondents seem to be a little more likely to find meeting the needs of students who are unprepared challenging than older respondents, and older respondents seem a little more likely to find administration required by the university challenging than younger respondents. This is illustrated on Figure 23.

Figure 23: Top personal challenges identified based on age



Although they were not one of the main challenges identified, older respondents seem to find meeting regulatory requirements more challenging than younger respondents, and younger respondents seem to find meeting the needs of international students more challenging than older respondents, as shown on Figure 24.

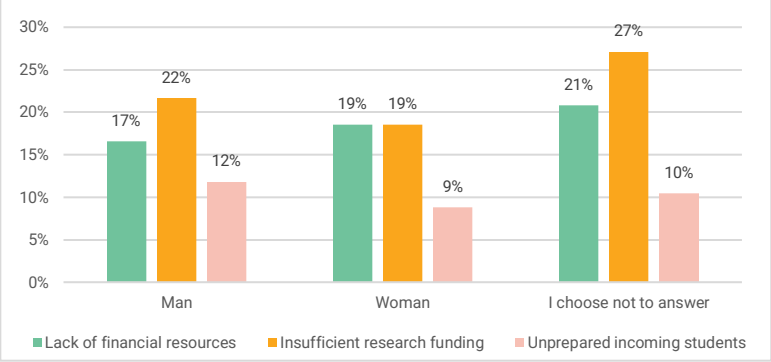
Figure 24: Differences in personal challenges identified based on age



National Challenges

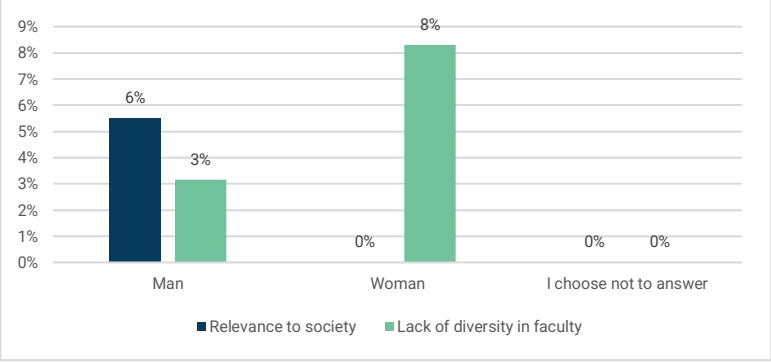
The biggest national challenge for male respondents was insufficient research funding (22%), followed by the lack of financial resources (17%), and unprepared incoming students (12%). For female respondents, insufficient research funding and lack of financial resources received equal responses (19%) as the biggest challenges, followed by unprepared incoming students (9%). This is shown on Figure 25.

Figure 25: Top national challenges identified based on gender



Although they were not one of the main challenges identified, male respondents were the only ones that identified relevance to society as a national challenge (6%), and the lack of diversity in faculty was more commonly identified as a challenge for women (8%) than for men (3%), as shown on Figure 26.

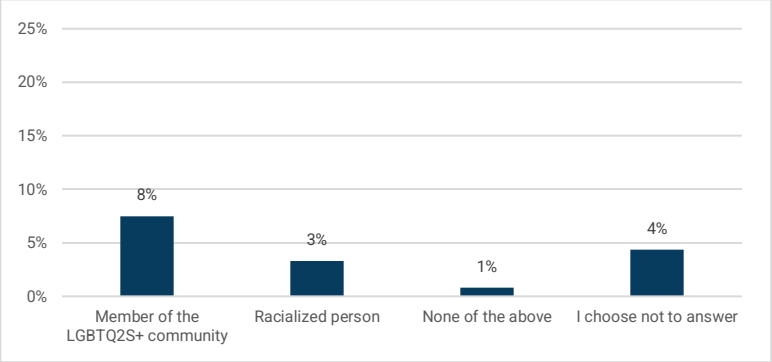
Figure 26: Differences in national challenges identified based on gender



Insufficient research funding appeared as the biggest national challenge for all groups, whether they identified as part of an equity-deserving group or not. The second biggest national challenge was also the lack of financial resources for all groups.

The differences in national challenges identified by respondents that identified being a member of an equity-deserving group (LGBTQ2S+ or racialized), and those that did not, were not significant for most variables. However, although it was not identified as a main challenge, members of the LGBTQ2S+ community were more likely to identify lack of diversity in course content as a top national challenge (8%) than racialized individuals (3%) and those that did not identify with an equity-deserving group (1%), as shown on Figure 27.

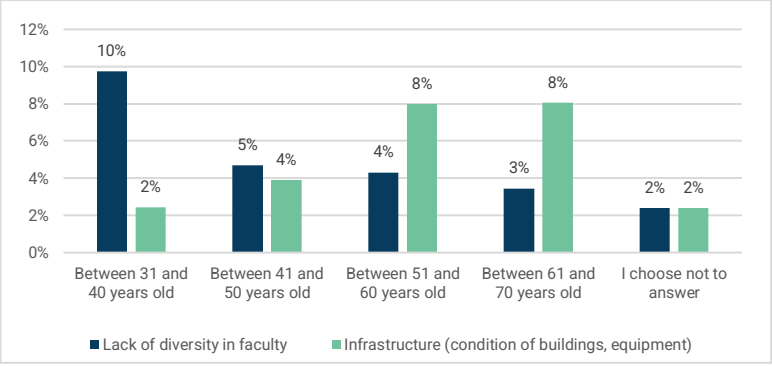
Figure 27: Identification of lack of diversity in course content as a top national challenge, based on identification with an equity-deserving group



Insufficient research funding and the lack of resources appear as the biggest national challenges at all ages.

Although they were not among the main challenges identified, older respondents were more likely to identify infrastructure as a top national challenge than younger respondents, and younger respondents were more likely to identify lack of diversity in faculty as a top national challenge than older respondents, as shown on Figure 28.

Figure 28: Differences in national challenges identified based on age

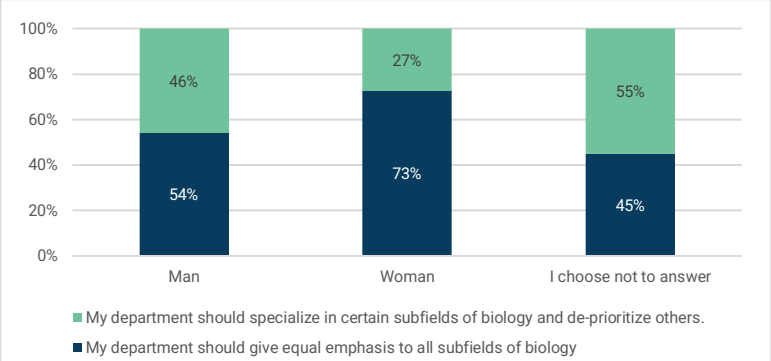


Specialization

In general, women and younger respondents were more inclined to believe that their department should give equal emphasis to all subfields of biology. The older the respondent, the more likely they were to believe their department should specialize in certain subfields of biology and de-prioritize others.

While men were evenly split between either thinking that their department should specialize in certain subfields of biology and de-prioritize others, or that it should give equal emphasis to all subfields of biology, women leaned more towards thinking their department should give equal emphasis to all subfields of biology, as illustrated by Figure 29.

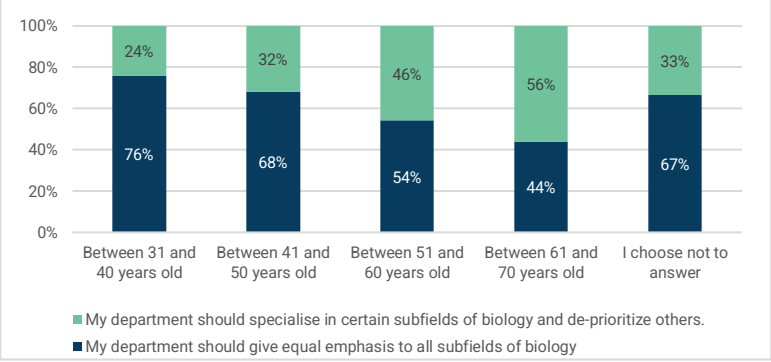
Figure 29: Distribution (%) of views on specialization in biology subfields based on gender



Perceptions of racialized individuals did not differ noticeably from other respondents, and the differences between members of the LGBTQ2S+ community and the other sub-groups was not significant, given the modest effect sizes observed.

Older respondents seem to be more likely to believe that their department should give equal emphasis to all subfields of biology. Indeed, while approximately 75% of respondents between 31 and 41 years old supported that statement, this diminished to around 45% for respondents between 61 and 70 years old, most of whom believed that their department should specialize in certain subfields of biology and de-prioritize others. The distribution of responses is shown on Figure 30.

Figure 30: Distribution (%) of views on specialization in biology subfields based on age

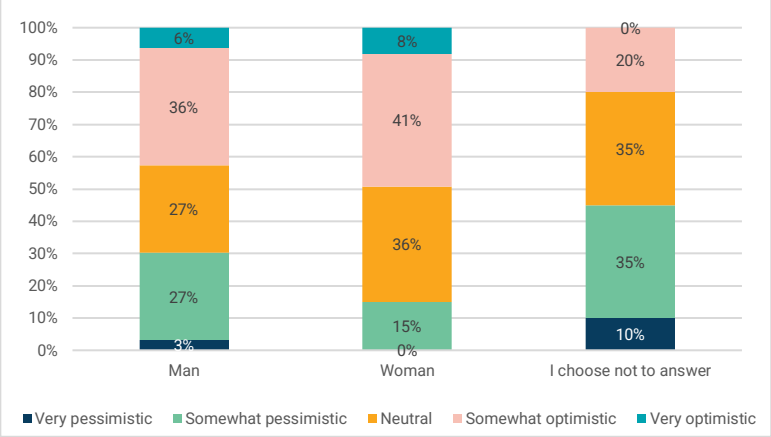


Future of biology

In general, respondents are more optimistic than pessimistic regarding the future of the field nationally. However, women as well as younger respondents are more optimistic than men and older respondents.

In general, men are more likely to be either very pessimistic or somewhat pessimistic than women (30% compared to 15%), as shown on Figure 31.

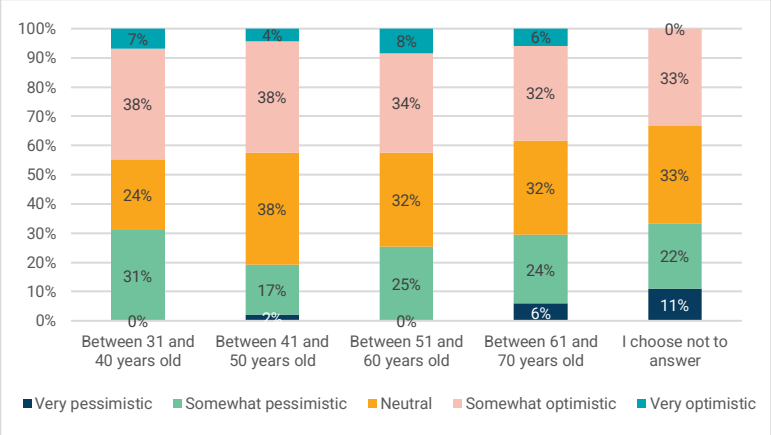
Figure 31: Distribution (%) of attitudes towards the future of biology nationally based on age



The differences in perceptions between members of the LGBTQ2S+ community and racialized individuals, compared to those that did not identify as part of an equity-deserving group, were not significant.

Younger respondents had more polarized views on the future of the field. They were more likely to be very optimistic or somewhat optimistic (45% for individuals between 31 and 40 years old, as opposed to 38% for individuals between 61 and 70 years old). However, respondents between 31 and 40 years old were also more likely to be either very pessimistic or somewhat pessimistic (31%). The distribution of responses is shown on Figure 32.

Figure 32: Distribution (%) of attitudes towards the future of biology nationally based on age



Appendix

Institutions, Roles and Specializations

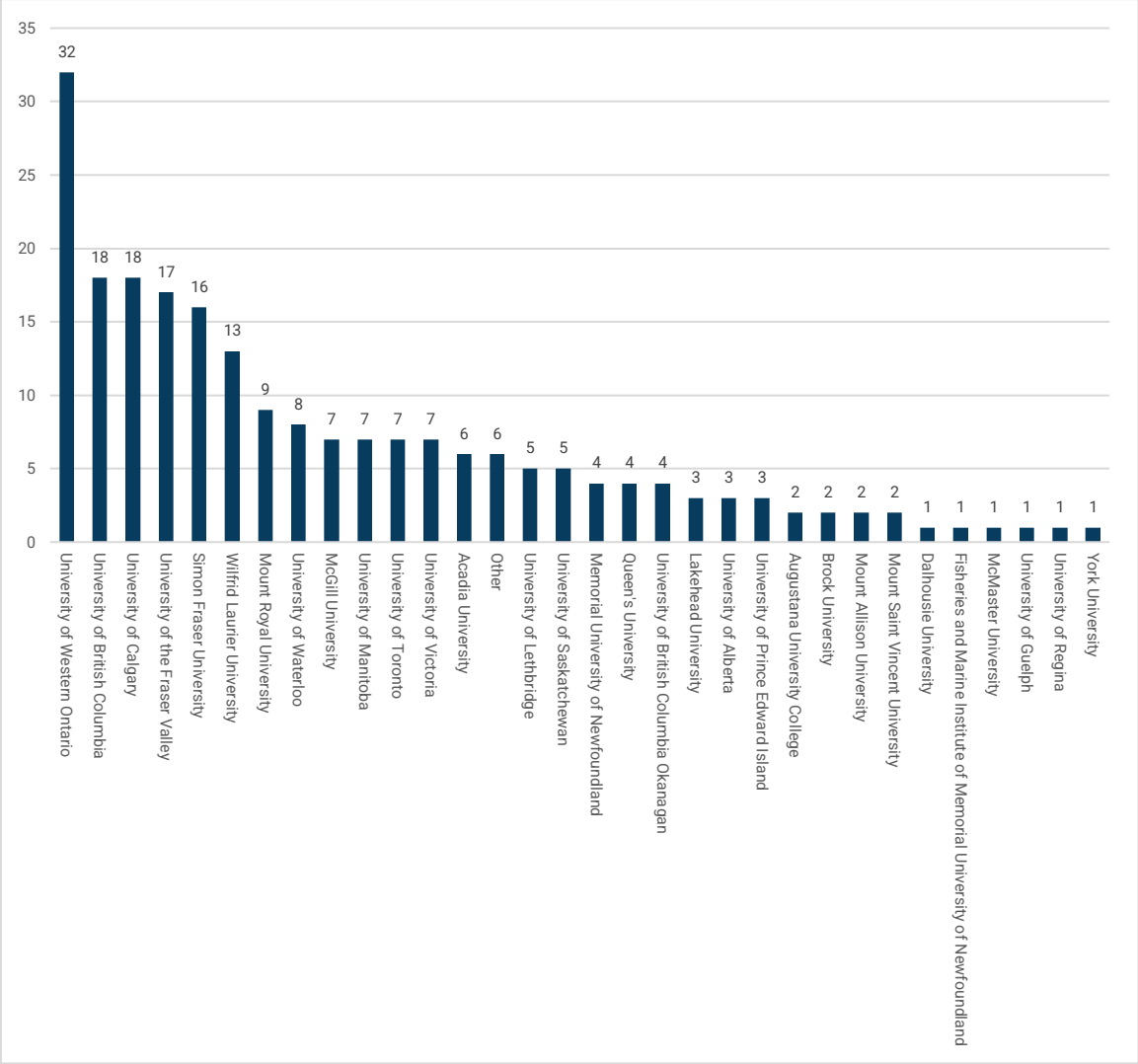
216 participants from 34 different institutions started the survey, and 194 respondents completed it, representing a completion rate of 90%.

CCUBC sent an invitation email containing a link to the English version of the survey on February 26th. A reminder was automatically sent to recipients who had not yet opened the email by February 29th. A second email was sent out on March 15th, which included access to the French translation.

Of the institutions that opened at least one of the outreach emails, 20 did not collect any responses. This includes a number of departments and institutes which are not currently CCUBC members.

The distribution of responses is illustrated on Figure 33 below.

Figure 33: Number of respondents by university (n = 216)

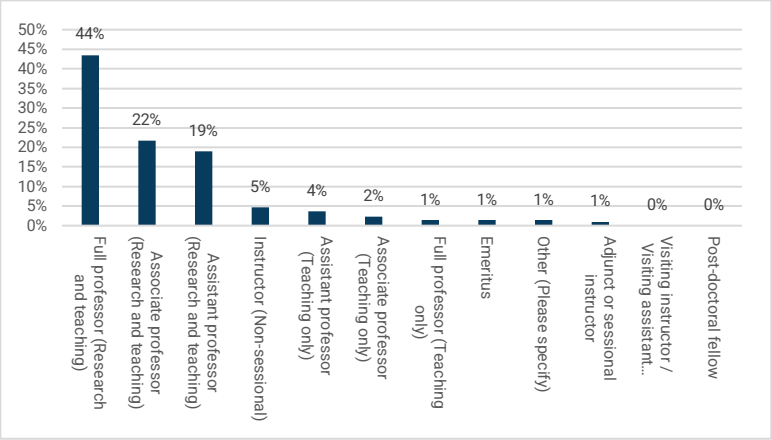


Respondents that chose the option “Other” indicated coming from Toronto Metropolitan University (4), Algoma University (1) and Ontario Tech University (1).

Most respondents (91%) identified working within the department of Biology or Biological Sciences. Other respondents indicated working in departments such as Botany, Cell, Chemistry & Biology, Ocean Science and Zoology.

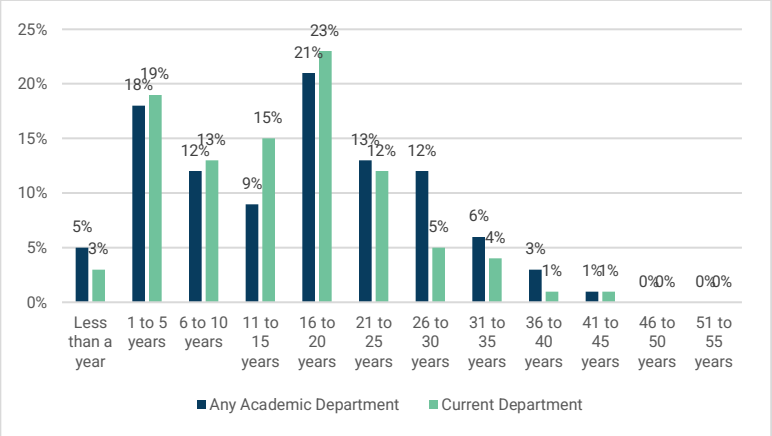
As illustrated on Figure 34, most respondents (85%) indicated being a part of the Research and Teaching stream, with a majority of those being full professors.

Figure 34: Distribution (%) of respondents by position held at university



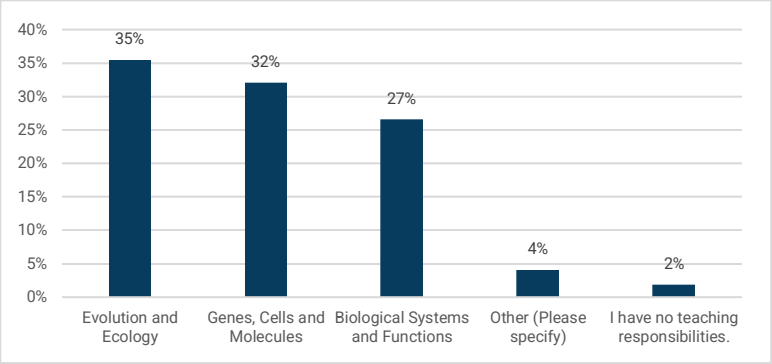
More than half of the respondents (57%) had been in an academic staff or faculty position at any department for over 15 years, with 45% holding a position within their current department for over 15 years. The highest proportion of respondents had been working in an academic staff or faculty position for 16 to 20 years, whether in general (21%) or at their current department (23%). This is illustrated in Figure 35.

Figure 35: Distribution (%) respondents by years in academic staff/faculty position within any academic department and in current department



The respondents were fairly distributed between specializing their teaching in Evolution and Ecology (35%), Genes, Cells and Molecules (32%), and Biological Systems and Functions (27%), as illustrated in Figure 36.

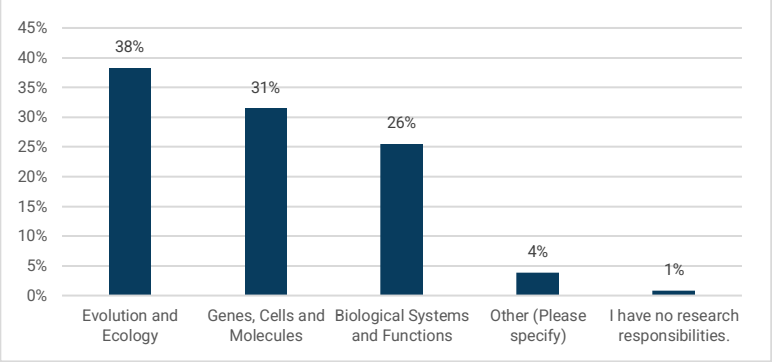
Figure 36: Teaching specializations based on NSERC categorization



Other specializations included Statistics, Organismal, Animal Physiology Neuroscience, Biochemistry, Chemistry, Microbiology, Natural History, Neurobiology, Plants, and Systematics.

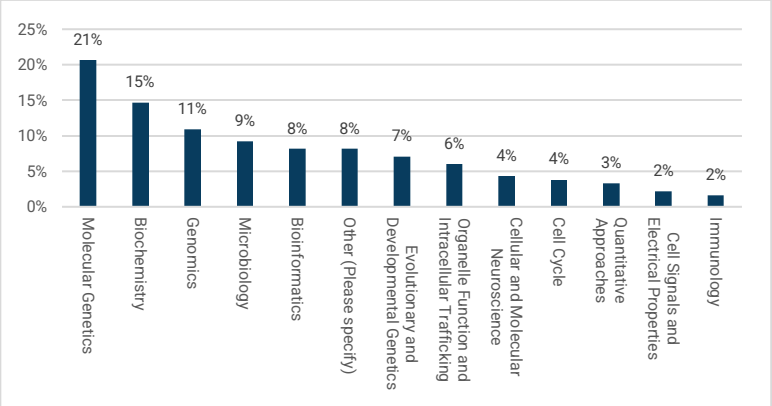
With respect to research, respondents were again roughly evenly distributed between specializing in Evolution and Ecology (38%), Genes, Cells and Molecules (31%), and Biological Systems and Functions (26%), as illustrated in Figure 37.

Figure 37: Research specializations based on NSERC categorization



Respondents were then asked to identify which sub-subfield they specialized in in their research, based on their first answer. The highest proportion of those specializing in Evolution and Ecology specialized in Molecular Genetics (21%), Biochemistry (15%) and Genomics (11%), as illustrated by Figure 38.

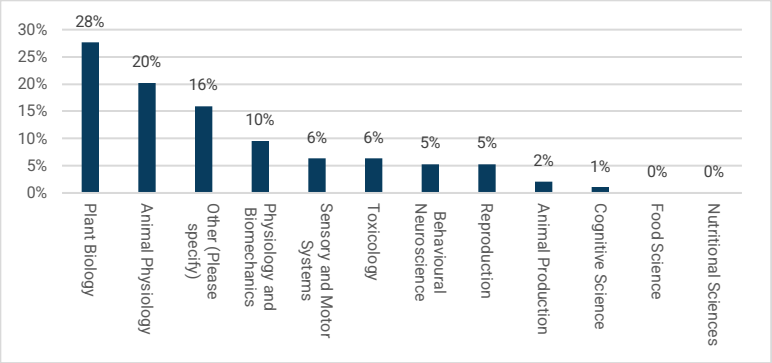
Figure 38: Research specializations within the Evolution and Ecology subfield



Other sub-subfields that were mentioned more than once included Plant Biology, Anatomy, Cell Biology and Developmental.

The highest proportion of those specializing in Genes, Cells and Molecules specialized in Plant Biology (28%), Animal Physiology (20%), and Physiology and Biomechanics (10%), as illustrated by Figure 39.

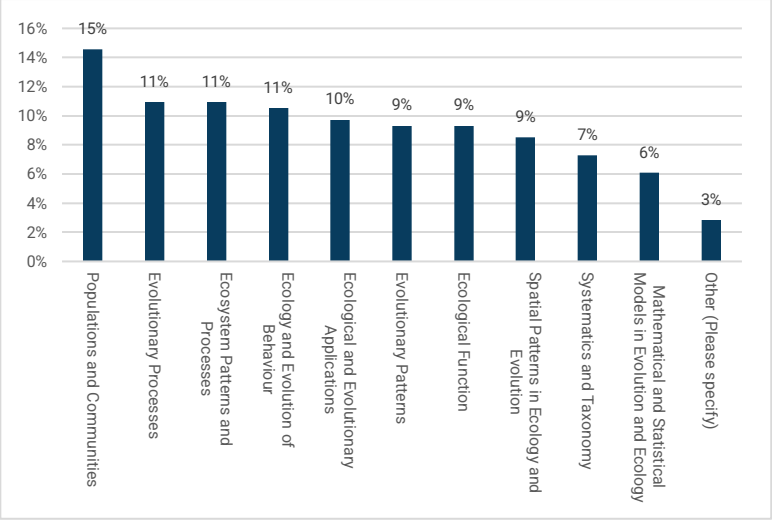
Figure 39: Research specializations within the Genes, Cells and Molecules subfield



Other sub-subfields that were mentioned more than once included Molecular Biology, Developmental Biology, and Ecology.

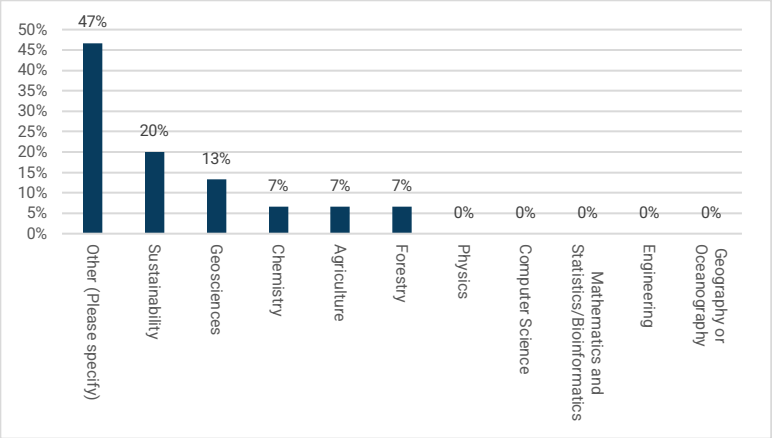
The highest proportion of those specializing in Biological Systems and Functions specialized in Populations and Communities (15%), Evolutionary Processes, Ecosystem Patterns and Processes, and Ecology and Evolution of Behaviour (11%), and Ecological and Evolutionary Applications (10%), as illustrated by Figure 40.

Figure 40: Research specializations within the Biological Systems and Functions subfield



The 15 respondents that indicated “Other” on Figure 41 were then asked what field they specialized in outside of the ‘typical’ fields of Biology based on the NSERC classification. Those results are illustrated in Figure 41.

Figure 41: Distribution (%) of 'Other' research specializations



7 respondents out of 15 still indicated "Other", which means that their subfield was not captured in the options presented. They indicated, by way of open-ended answer, that they specialized in Neuroscience, Aquatic Sciences, Biology, Ecosystems and Education.

Lab Work and Field Work

Most respondents (88%) indicated regularly doing lab work or field work as part of their research, as Figure 42 shows.

Figure 42: Distribution (%) of respondents regularly doing lab work or field work as part of their research

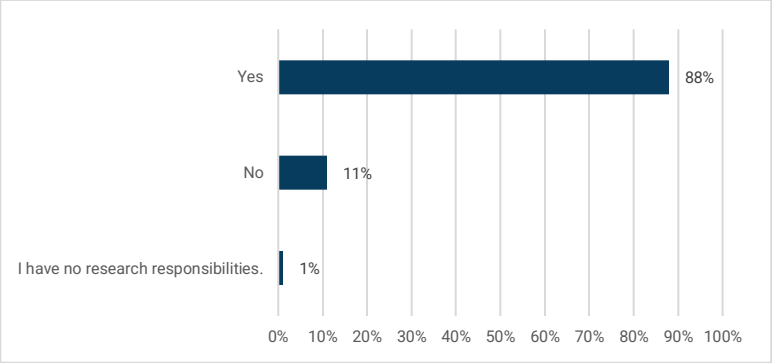
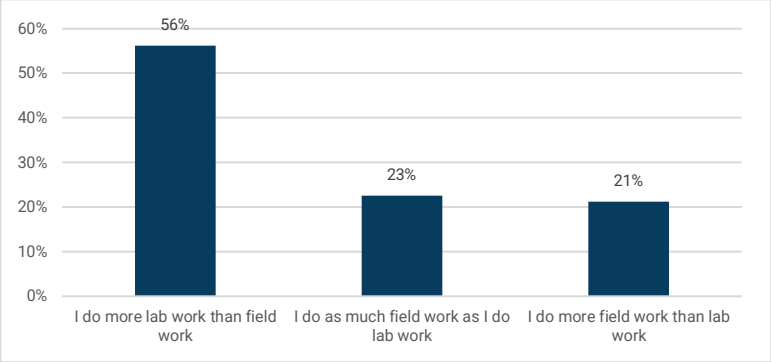


Figure 43 then shows that the majority of respondents (56%) do more lab work than field work. A little over a fifth of respondents indicated either that they do as much field work as lab work (23%), or do more field work than lab work (21%).

Figure 43: Distribution (%) of respondents based on whether they do more lab work or field work

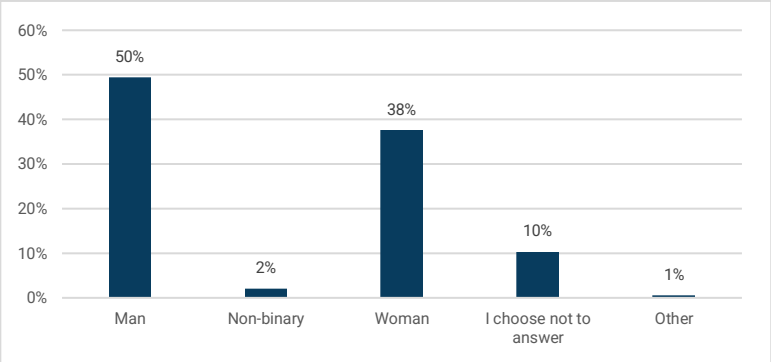


Demographics

The survey concluded with demographic questions, to provide an approximative portrait of the diversity in the profession, across Canada.

Half of respondents identified as men, a little over the third of respondents (38%) identified as women, one in tenth of respondents chose to not answer, 2% of respondents identified as non-binary, and 1% of respondents identified as 'Other'. This is illustrated in Figure 44.

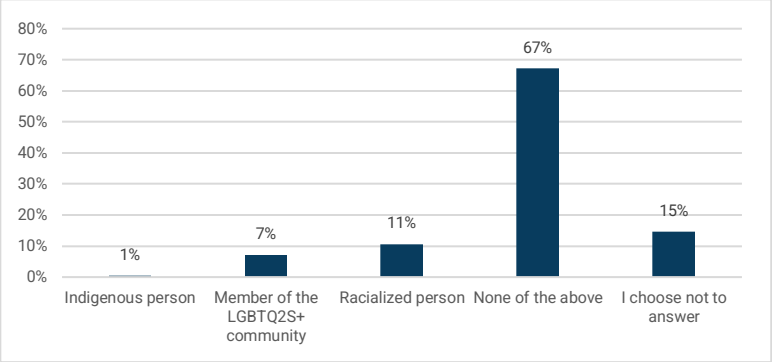
Figure 44: Distribution (%) of respondents by gender



While a majority of respondents (67%) did not identify as part of an equity-deserving group, just over a tenth of respondents (11%) identified as racialized, 7% identified as a member of the LGBTQ2S+ community, and 1% identified as Indigenous, as illustrated by Figure 45. 15% chose not to answer. In comparison, in the broader Canadian population, more than one person out of four is part of a racialized community[1], between 7% and 15% of individuals aged between 35 and 65 years old identify as part of the LGBTQ2S+ community[2], and 5% of Canada's population self-identifies as Indigenous[3].

[1] https://www150.statcan.gc.ca/n1/pub/36-28-0001/2023008/article/00001-eng.htm#
[2] https://www150.statcan.gc.ca/n1/pub/12-581-x/2022001/sec6-eng.htm#
[3] https://www.rcaanc-cirnac.gc.ca/eng/1100100013785/1529102490303

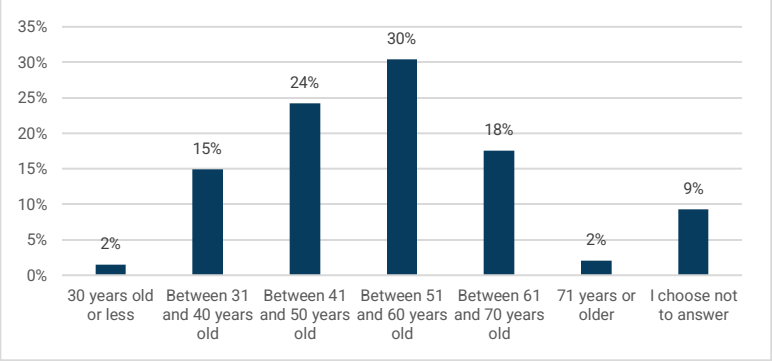
Figure 45: Distribution (%) of respondents by identification to an equity-deserving group



The option “Individual with a disability or chronic illness” was accidentally omitted due to a programming error. This data should be gathered in any future iterations of the survey.

Respondents were most commonly between 51 and 60 years old (30%), or between 41 and 50 years old (24%), as illustrated by Figure 46.

Figure 46: Distribution (%) of respondents by age



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