University of Colorado **Boulder**

2019 Program Review

Institute of Cognitive Science

Academic Review and Planning
Advisory Committee Report

Approved   *Russell L. Moore*   9/24/2020

Provost and Executive Vice Chancellor for Academic Affairs | Date

Contents

Process Overview

The Academic Review and Planning Advisory Committee (ARPAC) review of the Institute of Cognitive Science (ICS) was conducted in accordance with the 2019 program review guidelines. Self-study responses were prepared by the unit and checked by an internal review committee composed of two CU Boulder faculty members outside of the unit. The internal reviewers submitted a summary of findings derived from the self-study and from interviews and/or surveys with faculty, staff, and student unit members. An external review committee, consisting of three experts from outside of the University of Colorado Boulder, visited the unit and submitted a report based upon review of relevant documents and interviews with faculty, staff, and student unit members and university administrators. Internal and external reviewer comments and recommendations are shared when relevant throughout this report.

Academic Review and Planning Advisory Committee (ARPAC)

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Ann Schmiesing, Executive Vice Provost for Academic Resource Management and Professor of Germanic and Slavic Languages and Literatures

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Staff

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Unit Overview

The campus' standardized description of ICS is available on the website [of the Office of Data Analytics (ODA).](#) ODA updates the profile annually in the fall semester. This report cites data posted in October 2018, reflecting the state of the Institute of Cognitive Science as of the academic year (AY) 2017-2018.

Disciplinary context

The Institute of Cognitive Science (ICS) has been part of the CU Boulder campus for more than 50 years with a mission that has remained focused yet dynamic, adjusting and expanding over time to continually explore relevant questions in cognitive science. As reported on the ICS website, the institute's mission is to "understand and enhance human cognition, learning, and development through the creation of interdisciplinary partnerships." Partners include the departments of Linguistics, Psychology and Neuroscience, Computer Science, Philosophy, and the School of Education, among others. ICS thrives as a multidisciplinary center with connections to more than 240 affiliated faculty and staff members and students. The external reviewers praised ICS as a highly supportive context for collaboration across traditional department lines as reflected in the variety of multidisciplinary projects currently funded, the highly successful interdisciplinary graduate program, and excellent administrative staff.

Research and scholarship

ICS is one of 11 CU Boulder research institutes and is supported by grant funding and indirect cost returns. According to the self-study report, ICS manages 55 grants with a grant budget of $24.7 million and annual expenditures between 2012 and 2018 averaging $6.2 million per year. The number of grants grew slightly over that time period. ICS-affiliated faculty members received 102 new grants and subawards between 2012 and 2018, totaling $60,759,889, and led work on 137 unique grants totaling $80,794,209. Approximately 80% of funding comes from federal sponsors (two thirds from NIH and NSF) but the diverse portfolio includes funding from a wide

array of sources including school districts, industry, not-for-profit companies and foundations.

Research is currently focused in three areas: learning and education; brain health and wellness, and cognitive development. The self-study report emphasizes a shift towards using "data-intensive research methods involving large quantities of data and/or multimodal data (brain, physiology, speech/text, performance), which provides rich opportunities for us to build on and expand our capacity in machine learning, natural language processing, and other computational methods."

ICS-affiliated faculty members and students conduct research as part of four institute-hosted centers:

- The Intermountain Neuroimaging Consortium (INC)
- The Center for Research and Education Addressing Cannabis and Health (CU REACH)
- The Center for Research on Training
- Inquiry Hub: A Research + Practice Partnership with Denver Public Schools

The institute is committed to engaging in 'translational' research and research + practice partnerships that inform the creation of innovative interventions, practices, and programs in schools, companies and communities.

According to ODA, the average per year publication rate of ICS-affiliated faculty members in refereed journals or book chapters is 30.6 (18/66) and 41.7 in conference presentations (19/66), bringing ICS into the top 29% of all CU Boulder academic units. The self-study reports that since the last academic review in 2012, institute faculty and students disseminated research findings through 417 academic presentations, colloquia,

keynote talks, and invited presentations (an average of 64 presentations annually). Since 2012, ICS also disseminated its research to the larger community through 12 popular press articles and television news stories. The self-study notes that in addition to faculty publications and presentations, 22 of the institute's affiliated professional research assistants, research associates, and graduate research assistants published an additional 216 peer-reviewed journal articles, conference proceedings, book chapters, invited presentations from 2012 to 2018, many as primary authors and presenters. These numbers are limited to ICS-rostered faculty and researchers and do not include additional work by affiliated faculty fellows. The self-study also highlights prominent textbooks and a published professional development guide authored by an ICS faculty member; several patents for applied technologies and intellectual assets; and a number of conferences, events, and workshops that were sponsored by ICS since the 2012 ARPAC review. In that time, 79 awards and honors were bestowed to ICS members. Of these many awards, those granted in 2017-18 include the Tom Trabasso Young Investigator Award from the Society for Text and Discourse, the 2017 Woman of the Year Lifetime Achievement Award by the Boulder chapter of the Business and Professional Women of Colorado, and the Distinguished Research in Teacher Education award from the Association of Teacher Educators.

Collaborations

Given its interactive research program, ICS collaborates heavily with other CU Boulder units. For instance, the self-study reports that The Center for Research on Training "was developed with the explicit intention of complementing the Role and Mission of the CU System, the Boulder campus, the Department of Psychology and Neuroscience, and the Institute of Cognitive Science." The self-study cites 84 unique collaborations on campus and nationally, including:

- Within CU: ATLAS Institute, Computer Science, School of Education, Institute of Behavioral Genetics, Integrative Physiology, Linguistics, Psychology and Neuroscience, Institute for Arctic and Alpine Research, National Snow and Ice Data Center.

- Universities: 36 institutions here and abroad.
- Federal and state organizations: University Corporation for Atmospheric Research, Colorado Department of Human Services, Colorado Department of Public Health and Environment
- School districts and educational agencies: Denver Public Schools and Oklahoma State Department of Education (OSDE)
- Industry: BBN/Raytheon, Google, IPSoft, SparkFun Electronics, Oculus, Samsung, PainQx, and Intel
- Not-for-profit companies and foundations: Gordon and Betty Moore Foundation, Hewlett Foundation, John Templeton Foundation, NARSAD, Raikes Foundation, Walton Family Foundation.

National and international context

The broad range of funding sources in the ICS portfolio, the multitude and wide range of cross campus and national research partnerships, and the innovative focus of each ICS research center speak to its reputation. Further, because ICS prioritizes partnerships and outreach efforts, its work reaches not only other researchers, but community members, educators, learners, and industry partners, among others.

Campus context

Founded in 1968, ICS is focused on building expertise in cognitive neuroscience and artificial intelligence. Their recent research has contributed to cognitive development, brain health and wellness, cognitive modeling, emotion detection and processing, education and training, educational technology, and speech and language processing. ICS collaborates with

nine academic units: Psychology and Neuroscience, Computer Science, Linguistics, Education, Philosophy, Integrative Physiology, Information Science, and Speech, Hearing and Language Science (SLHS). As noted earlier, the institute hosts four research centers: The Intermountain Neuroimaging Consortium (INC); The Center for Research and Education Addressing Cannabis and Health (CU REACH); The Center for Research on Training, and the Inquiry Hub: A Research + Practice Partnership with Denver Public Schools. ICS offers two combined PhD programs (a cognitive science combined PhD and a cognitive neuroscience combined triple PhD), two graduate certificate programs (a cognitive science graduate certificate and a human language technology certificate), and an undergraduate cognitive sciences certificate. The combined PhD programs provide students with interdisciplinary training through a customized curriculum offered by ICS in collaboration with academic departments such as the Department of Psychology and Neuroscience. The institute either employs--or has an affiliation with--close to 240 faculty and staff members, research personnel, and students, representing a wide range of expertise around the institute's shared mission. There is a strong emphasis on research, outreach and partnerships with outside stakeholders such as educators, businesses, learners, and physicians.

Faculty and research personnel

According to the AY 2018-2019 ODA unit profile, the institute employs one tenure stream faculty member whose top appointment is ICS, nine research professors, 16 research associates, 19 professional research assistants, three of whom are senior professional research assistants, one institute director, and 18 affiliated tenure stream faculty members. The ODA profile also shows that ICS employs 14 graduate research assistants. The institute's self-study shows a personnel count of 8.5 tenure stream faculty members whose tenure homes are in the Department of Psychology and Neuroscience (3.5) and

the Department of Computer Science (5). The self-study also counts 42 research faculty and visiting scholars along with 46 faculty fellows who are from more than a dozen CU Boulder departments and centers. The self-study also reports that 57 students are employed with almost half of them as graduate research assistants. Mentoring for tenure stream faculty occurs in the members' home departments. The internal reviewers recommend increased mentoring for research faculty and notes that some faculty would like formal tracking to ensure shared responsibility for mentoring.

ICS has had its current director since 2016. According to the internal reviewers, "faculty noted that [the director] . . . encourages shared governance, takes into account feedback of her colleagues, and demonstrates good business understanding and good stewardship of the institute." The ODA unit profile does not describe ICS salaries or salary comparisons.

ICS personnel conduct cutting edge research and their work is in high demand at other institutions and in industry. ICS is requesting shared support from the Research and Innovation Office and the university for two tenure-track hires in strategic growth areas, such as computational research, to be phased in over three years. In light of the loss of four (possibly soon five) computational cognitive scientists and neuroscientists, the external reviewers suggest prioritizing hiring in these specializations.

Staff   According to the AY 2018-2019 Office of Data Analytics (ODA) unit profile, ICS employs ten exempt professional staff members, five classified staff members, and 21 student hourly employees.

The self-study requests additional staff support from the university in the following areas:

- .5 FTE staff member (university match with ICS) to support interdisciplinary educational programs that serve students across nine departments and four colleges.
- .25 FTE administrative position so that ICS can contribute to the CU IDEA plan to transform the institute into a campus leader supporting inclusion, diversity and equity collaborations across campus.
- .25 FTE to increase the time for a marketing, communications, and outreach specialist that is currently staffed at .50 FTE per an arrangement between ICS and two of its centers.

The external review report concurs with the institute's staff request.

Undergraduate education

The cognitive sciences undergraduate certificate involves core cognitive science courses and advanced skills courses selected from six different academic departments. The certificate program is described in detail on the ICS website. According to ODA, ICS awarded 60 undergraduate certificates between AY 2013-14 and AY 2017-18. The external reviewers note that a popular introductory course is taught in ICS without compensation from the university. They write, "we find this situation unfair, and urge that it be changed." The self-study also reports that 30% of students in 2018 who wished to take the Introduction to Cognitive Science course were unable to get in. There appear to be no structures in place between departments and ICS to consistently assign TAs to support large classes. ICS offers a strong program for undergraduate interns from underrepresented backgrounds to help researchers run imaging studies.

| Graduate education | As previously mentioned, ICS offers two combined PhD programs (cognitive science combined PhD and a cognitive neuroscience combined triple PhD) and two graduate certificate programs (cognitive science graduate certificate and a human language technology certificate). ICS offers three unique graduate courses. Students therefore create a course of study from the ICS courses and approximately 100 cross-listed courses. The self-study provides a clear learning outcomes assessment plan that adds to what the institute already gleans from course grades and program plan tracking. However, the self-study notes that ICS will be unable to carry out robust assessments without additional administrative support. |

Based on data reported in the self-study, between 2012 and 2018, on average, four students per year participated in the double PhD in cognitive science, 1.5 students per year in the triple PhD in cognitive neuroscience, and 7.1 students per year earned graduate certificates. ICS graduate degree and certificate programs average between 30 and 40 students each year. Currently, 38 students are employed in ICS as graduate research assistants. When reporting on career trajectories of students who have received doctorates in ICS since the last ARPAC report, 17 are professors, 14 are in other higher education positions, 14 work in industry, four in government, four in research consulting, six in other associated fields and two do not show outcomes.

The self-study reports that ICS is struggling to sustain its academic programs, despite high demand, saying:

From 2012-2018 we have approximately 100 active students in any given year in the various programs. ICS manages these programs and students without any of the support that academic units enjoy—no secretarial support to prepare class materials, advise students, or monitor program data; no

Teaching Assistantships to assist faculty who offer cognitive science courses; no graduate fellowships to attract better students.

The external reviewers report that the graduate students they met were enthusiastic about ICS PhD offerings, though they noted that students said that information about ICS was often "haphazard" and varied from department to department. Further, the external reviewers recommend that "ICS should be receiving resources to support what is demonstrably a highly successful interdisciplinary graduate program." Overall, as measured by a March 2018 ARPAC-administered climate survey and a follow-up student town hall meeting conducted within ICS, students are generally satisfied with the ICS programs and research opportunities. The students shared constructive suggestions for ICS improvement (see Climate and Culture).

Budget   According to the self-study, in FY 2018 ICS managed a rolling grant budget of $24.7 million, with annual research expenditures averaging $6.2 million per year between 2012 and 2018. The majority of funding is from 55 active awards and indirect cost recovery associated with those grants. The 2018 budget represented approximately a $200,000 budget decline since 2012. The self-study indicates that diminished federal funding drove the budget drop as did the departure of a research active senior faculty member. Overall, ICS has a robust funding structure that includes a diverse portfolio that has been relatively stable over time. Nearly 80% of funding is from federal agencies, mostly from the National Institutes of Health and the National Science Foundation, about 9% from not-for-profit companies and foundations, about 10% from state agencies, school districts and universities, and 5% from industry. As per the ICS bylaws, the associate director manages budget decisions, with the approval of the director. Budgets for

funded work are administered by project directors and overseen by the ICS associate director.

The external reviewers recommend a re-examination of the indirect cost recovery policy to allow more monies to flow back to institutes such as ICS. Several requests for additional staff would involve a cost share with other CU units.

Space and infrastructure

Space is a significant issue for ICS. As noted by the external reviewers, "there was not a single interaction that the committee members had with ICS faculty, fellows, affiliates, students or staff that did not include a discussion of space." Muenzinger on the main campus is the site of the institute's administrative offices, some conference/meeting rooms and a new human data collection lab. Facilities at the Center for Innovation and Creativity (CINC) house the institute's research projects, including an MRI scanner. The distance between ICS facilities along with limited transportation from CINC to Main campus has had negative impacts on community, collaboration and institute coherence. Also, CINC's location makes it difficult for undergraduates to participate in, or volunteer to work in, ICS studies. The self-study also notes that some of the CINC space "is currently uninhabitable by humans and resembles a cement holding bay." Further, the institute is required to pay rent for the space at CINC ($7,666.25/month) whereas academic departments do not pay rent there, an equity issue noted by the external reviewers. ICS should be applauded for conducting a space survey in September 2018 and for analyzing how its spaces are used and what its current and future needs are. The external reviewers echo the self-study and ask that "vigorous pursuit of a long-term solution that achieves co-location of ICS's various components be given top priority."

Support needs

As noted above, the ICS self-study makes a case for improved transportation between Muenzinger and the off-campus CINC

building as well as a long term plan for a space that can house all of the institute's operations at a single site.

Governance

The institute significantly updated its bylaws in the Spring, 2018. The bylaws delineate institute member voting rights, the terms of faculty and fellow ICS membership, tenure stream faculty and research professor merit review rules, mentoring requirements, budget processes, and faculty/staff grievance procedures. The institute is led by a director who is an institute fellow and a member of a CU Boulder academic department. The director chairs an executive committee that sets institute policy. An associate director serves as the chief operating/financial officer. An academic director is responsible for the ICS training mission, and coordinates the institute's relationship with the Graduate School and CU departments, student courses, and other activities that promote the ICS interdisciplinary mission.

Inclusive and excellence

The ODA unit profile indicates that two ICS faculty members identify as women (equal to 22% of the total faculty cohort) and one faculty member as belonging to a "minority" racial/ethnic group. The ICS self-study report does not provide a specific breakdown of faculty, staff, and student diversity, but does report that approximately half of ICS affiliates identify as women and a large majority as white. The ICS Inclusiveness Policy was updated on April 22, 2018. The self-study notes that the institute has historically emphasized a welcoming environment for intellectual diversity but that ICS needs to expand its inclusion efforts, noting that there may be a lack of awareness of needs. The self-study lays out a thoughtful plan to address diversity issues, including: more education and assessment to understand barriers that may inadvertently create discriminatory practices; work to ensure that institute policies do not impede forms of individual self-expression and meaning, and efforts for, as noted in the self-study, "openly recognizing systematic

'otherism' and its negative impacts on faculty, staff, and student success" (p. 79). The self-study also cites efforts to address inclusive excellence among students including a four-year project with an ICS faculty member in which CU students from underrepresented-in-STEM groups taught neuroscience lessons to students in K-12 schools across Colorado. ICS has developed an internship program with guidance from the Student Academic Success Center (SASC) with the goal of increasing the number of research assistants from underrepresented backgrounds in the Intermountain Neuroimaging Consortium Center. The self-study also offers the following recommendations:

- Develop internal processes and leadership to coordinate the institute's inclusion, diversity, and equity efforts, identify and lead the work that needs to be done, communicate transparently with all of ICS, and stay abreast of university-wide diversity and inclusion efforts.

- Extend and regularly refine the ICS Inclusiveness Policy to reflect the institute's emerging vision for inclusion, diversity, and equity excellence.

- Use the CU IDEA plan as a foundation to develop a vision and 10-year strategic plan for ICS to become a model of diversity, inclusivity, equity, and anti-discrimination, including identifying hidden biases and barriers (if they exist), and generating specific outcomes and benchmarks to monitor progress toward goals.

- Work with campus experts to assist the ICS community in assessing and then regularly measuring and monitoring inclusion, diversity, and equity.

Climate and culture	Surveys conducted by ARPAC staff in March 2018 and addressed to ICS faculty, staff and graduate student appointees portray an institute that has a positive climate with strong support for the institute director. That said, according to the self-study report, the surveys also revealed two areas of potential growth. First, there were a number of respondents who answered "Don't Know/Not Applicable" to questions related to the experiences of women, people of color, LBTQIA community members, and persons with varied political and religious beliefs. Second, while overall ICS-employed graduate students feel respected by most of their peers and by faculty members, there was a wide range of responses related to how supported or valued the students feel. Because graduate students in the ICS orbit but employed elsewhere did not take the ICS climate survey, the institute conducted a student town hall style meeting to gather their input. That meeting, facilitated by the ICS executive committee student representative in September 2018, drew 14 student participants. The self-study reports that students at the townhall shared positive climate experiences. Student feedback included a request for more interdisciplinary collaboration between CU Boulder units. The students said it can be difficult to learn about ICS from their home departments, to get to know ICS faculty and students, or to 'break into' the ICS community. As a testament to students' positive experiences, participants also indicated that they would like to connect with ICS alumni and that they would like to stay involved with the institute after they graduate.

Past Reviews

ICS made a concerted effort to address recommendations put forward by ARPAC following the 2012 review, though implementation was limited by a lack of collaboration across departments and the university. Highlights from the 2012 review include:

- Of the four new faculty lines requested by ICS in the 2012 review, ICS has received and made a recent offer on only one.
- ARPAC asked ICS to work with departments to increase students interested in cross-disciplinary study. The self-study indicates that ICS currently has more students than they can support without additional university resources (e.g., listing courses under the institute, admitting their own students, administrative support, TAs for large classes).
- ARPAC recommended that ICS find ways to increase information to students about courses and on their certificate and degree programs. Since 2012, ICS has increased its social media presence, updated its website, and engaged CU communications specialists to further awareness.
- ARPAC requested that ICS grow graduate students' sense of community and interaction across research initiatives. ICS held discussions with students to elicit ideas but notes that bandwidth for additional meetings and research funding is a limiting factor. For instance, a summer interdisciplinary research program was initiated in 2015 but is no longer being offered due to lack of funds.
- ARPAC ICS-related recommendations directed to the Graduate School have not been addressed. These include assessing admissions requirements to attract and admit more students in cross-disciplinary research and degree programs; encouraging affiliated departments to provide better information about ICS programs; and committing to funding the ICS director through the graduate school. As

already noted, only one of four requested faculty lines was provided. Space allocation continues to be a major challenge both in terms of transportation to and from CINC and the main CU Boulder campus, the fact that ICS must rent space for their research programs, research personnel, and graduate students, and that researchers are spread across spaces.

Analysis

Strategic vision and planning

ICS projects a clear and coherent vision for its future as a self-sustaining driver of innovative interdisciplinary programs in cognitive science research and education that will further campus inclusivity, diversity, and equity goals. The institute proposes to focus on leading the campus in interdisciplinary research and in inclusive excellence by, in part, reimagining interdisciplinary educational programs and developing a robust resource engine to support future growth.

The ICS strategic plan outlines projects that leverage everyday uses of technology, involve the newly upgraded neuroimaging facility, and tackle real-world problems through interdisciplinary partnerships.

The ICS focus on interdisciplinary partnerships is both a strength and a challenge. The institute's research and teaching goals along with its vision for the future relies on university partnerships that have not always been reciprocated. ICS should continue efforts, such as via social media, to clearly and consistently communicate with academic departments about its programs and research. The self-study notes that enhanced communication efforts will require additional staff. The external reviewers support these requests. However, so far, the institute's request for additional faculty and staff help in support of enhanced collaborations have gone unmet by university leadership.

Research faculty

Both the external and internal reviewers note a lack of formal research faculty mentoring within ICS. ARPAC urges the institute to extend its mentoring resources to include its many research associates and research assistants.

Undergraduate education	The ICS undergraduate certificate provides a unique opportunity for students to explore cognitive science with a focus in their own disciplines. But a course that serves as the certificate's cornerstone is heavily oversubscribed. Because ICS faculty are not provided TAs, classes must be capped so they are manageable to teach. ARPAC sees a need for ICS, along with the Research and Innovation Office, and participating departments, to generate solutions so that more students can enroll. The external reviewers note that students have difficulty fulfilling cognitive science requirements in their own departments. Paradoxically, increased outreach to departments about the undergraduate certificate (described earlier in this report) could make the oversubscribed courses worse. Perhaps a series of agreements would permit ICS to students to gain priority access to the classes they need. The external reviewers also find it unfair that the university does not compensate ICS for teaching undergraduates. ARPAC supports the plans ICS details in its self-study to "reimagine" its interdisciplinary educational programs, in collaboration with RIO and affiliated departments.
Graduate education	The opportunities ICS affords graduate students are unique and innovative and its degree programs have grown over time. As previously noted, ICS offers PhD degrees and graduate certificates. These are highly regarded with alumni going on to fill desirable academic and industry positions. Despite this success, students note a need for an expanded sense of community (especially for sharing research findings and learning across ICS centers and projects). The students also note that information about ICS programs and research opportunities is spotty among faculty members in other departments. While ICS has increased its social media presence the institute knows it would like to do more but needs additional support. As is emphasized in the self-study, and by the internal and external reviewers, and by the 2012 ARPAC

review, university structures and support for ICS educational programs is lacking. There is not one clear answer, but it seems critical that conversations, along with a commitment of resources, take place between ICS and the Graduate School and/or individual departments. Guidance might be found by exploring programs at other universities that have established and successful interdisciplinary graduate studies models.

Budget

Over the 50-year tenure of the institute, its researchers have garnered consistent grant funding, and ICS appears poised to continue to nurture outside funding to support its research initiatives. That said, recent faculty departures, and the upcoming retirement of several senior faculty members might leave the institute's funding model in a tenuous position. Still, the self-study is clear that the institute would like to grow and it knows university support for additional faculty lines will be required to enable this growth to happen. ARPAC feels that ICS should continue efforts to fill current open and approved positions and to work on fundraising opportunities, including to nurture possible fundraising collaborations with others at CU Boulder.

Space, infrastructure, and support needs

ICS has expressed a clear need for improved transportation between Muenzinger and the off-campus CINC building as well as a long-term plan for a space that can house all of its operations. The university should consider why and if ICS must pay rent for CINC space and should re-examine policies related to indirect cost returns that are provided to the institute.

Governance

ICS has recently updated its bylaws with clearly outlined governance practices. The external reviewers emphasize the need for ICS to establish more formal agreements with other departments and university administrators regarding, in their words:

The manner in which [indirect cost recovery monies] are split between ICS and departments; faculty teaching obligations, and which courses "count" as fulfilling ICS vs. departmental teaching obligations; whether ICS hires "count" against departmental faculty counts; and the degree to which ICS needs and criteria are considered when ICS faculty are assessed by department in which their tenure is located.

Additionally, ICS might benefit from a more systematic approach to defining its collaborations with departments in such matters as program information distribution, coursework, and graduate student research appointments.

Inclusive excellence

The ICS self-study describes the institute's commitment to inclusive excellence and details a strategy to assess and act on potential shortfalls and to sustain ongoing work in support of inclusion, equity and diversity by way of a proposed .25 staff position. ICS should continue efforts to increase outreach to students and faculty from underrepresented backgrounds, especially to seek their involvement with its undergraduate and graduate programs. The institute might consider securing funding support focused on enhancing inclusive excellence. ARPAC is concerned, however, that ICS does not have an inclusive excellence narrative on file with the Office of Diversity, Equity and Community Engagement (ODECE). ARPAC urges the institute to undertake this work as a top priority. The inclusive excellence narrative needs to be completed and submitted to ODECE.

Unit culture

ICS appears to be aware of both strengths and challenges regarding its culture. Surveys conducted over the course of the review show that students and faculty associated with ICS find the institute to be supportive and engaging in general. The surveys also show, however, that students and faculty from underrepresented backgrounds might feel less appreciated and

the self-study acknowledges this. The external reviewers also note that students indicated a desire for greater interaction with ICS community members and that they sometimes expressed frustration related to finding information about the curriculum. ARPAC encourages ICS to address these issues purposefully.

Recommendations

The members of the Academic Review and Planning Advisory Committee address the following recommendations to the Institute of Cognitive Sciences and to the offices of responsible administrators:

To the Unit:

1. Initiate conversations with vice chancellor for research and innovation and the deans of the College of Arts and Sciences and the College of Engineering and Applied Science to:

   a. Clarify ICS' role in undergraduate education.
   b. Clarify how the required courses for the certificate are paid for and how TAs, administrative support and course size will be allocated.
   c. Generate an agreement with participating departments to provide equal credit to faculty who teach these classes.
   d. Increase clear and consistent communication to departments about ICS course offerings and research opportunities, including both affiliated departments and departments that have not historically partnered with ICS.

2. Collaborate with the vice chancellor for research and innovation and departments to clarify expectations for institute-department relations (e.g., outlining faculty teaching rules, communication about programs, TA allocation), especially with the psychology and neuroscience and computer science departments.

3. Design and implement plans for recruiting graduate students from underrepresented groups in collaboration with faculty from affiliated departments, RIO and the Colorado Diversity Initiative (https://www.colorado.edu/initiative/cdi/) that supports recruiting diverse graduate students in STEM fields. Target a portion of future funding proposals towards

retention and support efforts for underrepresented populations.

4. Develop and implement a concrete plan to improve diversity among tenure-track faculty members that lives up to CU Boulder's inclusive excellence standards. This should include, but not be limited to, consulting with the Office of Diversity, Equity and Community Engagement and Department of Human Resources' Diversity and Inclusive Excellence division.

5. Fill open and approved faculty positions with the assistance of the Research and Innovation Office.

6. Collaborate with the vice chancellor for research and innovation and associated departments to make a case to replace recent faculty vacancies and develop and execute the ICS faculty growth plan, with at least one computational cognitive science hire.

7. Establish a formal mentoring program for research faculty.

8. Partner with the Office of Advancement and their evolving plan for fundraising to address needs such as increased student scholarships and space improvements.

9. Continue ongoing efforts to improve the climate for faculty, students, and staff members, including developing and implementing the means to strengthen a sense of community among program faculty members and between graduate students.

10. Continue laudable recent efforts to study and address potential inclusive excellence issues as raised in the self-study.

11. Complete and submit an inclusive excellence narrative to the Office of Diversity, Equity and Community Engagement.

12. Make a case with the Research and Innovation Office and the executive vice provost for academic resource management for short-term and long-term improvements to space including the possibility of a move toward co-location for ICS.

To the Vice Chancellor for Research and Innovation and Dean of Institutes, the Dean of the College of Arts and Sciences, and the Dean of the College of Engineering and Applied Science:

13. Work with ICS leadership regarding requests for additional staff.

14. Work with ICS leadership to:

    a. Clarify ICS' role in undergraduate education.
    b. Clarify how the required courses for the certificate are paid for and how TAs, administrative support and course size will be allocated.
    c. Generate an agreement with participating departments to provide equal credit to faculty who teach these classes.
    d. Increase clear and consistent communication to departments about ICS course offerings and research opportunities, including both affiliated departments and departments that have not historically partnered with ICS.

15. Support efforts to create a workable solution for transportation between CINC and the main campus.

16. Engage in planning with ICS to address physical space issues.

17. Ask the Office of Advancement to help ICS with fundraising.

To the Executive Vice Provost for Academic Resource Management:

18. Re-examine the current policy for indirect cost returns to ICS.

19. Re-examine the policy to charge institutes rent for space that is used for funded research.

20. Improve and regularize transportation and parking options between CINC and main campus. This could take the form of more frequent bus and shuttle transportation, or of offering parking permits that are eligible to be used on main campus. Attend to these needs as they relate to faculty, staff, and students, including individuals with disabilities, with awareness that the needs of particular groups may be different.

21. Support ICS efforts for renovation and expansion to meet critical, immediate space needs.

Required Follow-Up

The director of the Institute of Cognitive Science shall report annually on the first of April for a period of three years following the year of the receipt of this report (i.e., April 1st of 2022, 2023, and 2024) to the vice chancellor for research and innovation and dean of the institutes, and to the provost on the implementation of these recommendations. Likewise, the vice chancellor for research and innovation shall report annually on the first of May to the provost on the implementation of recommendations addressed to the institute. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under their purview arising from this review year. All official responses will be posted online.