Evaluation of the Indiana University Undergraduate Program in Cognitive Science

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This report summarizes my evaluation of the Undergraduate Cognitive Science Program at Indiana University, Bloomington. It is based on interviews with students and faculty members during my visit there, February 21-23, as well as on examination of program descriptions, course descriptions, Web pages, and other material. In general, I think this is an excellent program, definitely one of the best cognitive science programs in the world. I will, however, make a few recommendations to deal with problems in the program that were identified by students and faculty.

Program structure

Indiana University’s Cognitive Science Program offers joint degrees at the graduate level, but my concern in this report is with the undergraduate program. It currently offers a B.A. degree in cognitive science, and will soon offer a B.S. as well. In addition, students taking other majors can minor in cognitive science. The B.A. degree has grown remarkably in just a few years to around 40 currently declared majors. The students I met with were bright, motivated, and very enthusiastic about the program which they have found to be intellectually exciting. The core of the program is four core courses, Q240, Q250, Q260, and Q270. These courses are rigorous and very well thought out as a way of providing students with a broad range of interdisciplinary skills (theoretical, computational, experimental) required to investigate the nature of mind and intelligence. The faculty teaching these courses are enthusiastic and knowledgeable, not only about their own courses, but about the whole interdisciplinary program. The new senior seminar, Q400, should provide the students with a valuable capstone to their undergraduate education in cognitive science. The Cognitive Science Program clearly benefits from energetic and thoughtful administrators and support staff.

Program problems

In my discussions with students and faculty, several problems became evident concerning the structure and staffing of the program. The most serious concerns the variation in level of background found among the students taking the core courses. This is not a problem in Q240, Philosophical Foundations, but it definitely arises in Q250, Q260, and Q270. In each of these courses, some students are put in the difficult position of observing other students with far more background flying through the material, while the students with advanced backgrounds are frustrated that the course does not move more rapidly or progress farther. To some extent, this problem is inevitable in an interdisciplinary program that students come to from different directions. There are at least three ways of dealing with it. The first would be to have multiple sections of the core courses, with more and less advanced sections for students of different backgrounds. This may become an option as the program grows and more sections of the course have to be added, but is not viable given the current size and funding of the program. The second way of dealing with the diversity problem would be to introduce prerequisites for the problematic courses, e.g. a discrete math course for Q250 (mathematics and logic), a programming course for Q260 (computation), and a statistics course for Q270...
(experiments). These three courses could then be taught at a uniformly more advanced level. I think, however, that it would be mistake to go this route, because adding prerequisites would deter students from entering and finishing the program and would make it difficult for students who only encounter cognitive science toward the end of their undergraduate years to pursue the cognitive science major.

Accordingly, I would like to recommend a third way of dealing with the problem of variability of students in the core courses – more extensive advising. Currently, Melinda Stephan advises students at their request, but it should be formally required that all students entering the program should meet with her or another advisor right at the beginning of entering the major. By attending to the strengths and weaknesses of different students, she could inform them of the kinds of difficulties (including both courses that would be very difficult and ones that would be very easy) that they are likely to encounter as they go through the program. For example, students who are new to psychology might be advised to take statistics before or concurrently with Q270, and students with no computational background might be advised to take introductory programming before or concurrently with Q260. In some cases, students could be advised that a particular core course might be too easy for them, and made aware of a more advanced course that could substitute, e.g. a computer science course in artificial intelligence substituting for Q260. I hope that extensive advising would lead the diverse students in the Cognitive Science major to find their own ways through the required core courses without undue difficulty or frustration. The advising could be valuably supplemented by putting summaries of typical cases on the program's Web page, telling students about appropriate courses to take before, along with, or instead of the core cognitive science courses.

The second problem identified by the students was lack of depth in the program. It is possible to satisfy the requirements for the Cognitive Science major by taking only a few courses in a “Concentration”, which does not involve going into nearly as much depth as taking a major. Indeed, many of the students in the Cognitive Science major are currently doing a second major as part of their undergraduate program. The depth problem might be dealt with by expanding the concentration requirements so that students would have to take many more courses in their area of concentration, or by requiring that students do a double major. Both these modifications, however, would make it difficult for many students to fit a Cognitive Science major into their undergraduate programs. I think the best solution is the one I just discussed: more advising. If all students in the Cognitive Science major met regularly (once a term or so) with an advisor, those students with a concern about depth could be informed about the natural procedure of extending their concentration into a minor or major in a traditional department. The program’s Web page could contain biographical templates that indicate possible trajectories through the program, e.g. students with an interest in philosophy and wanting more depth pursuing a double major in Cognitive Science and Philosophy. Students are already encouraged to get involved with the research projects of faculty members, but a systematic effort should be made to get students working as research assistants. This will improve the depth of their education and give them a good taste of what graduate work would be like.

The third problem with the Cognitive Science program concerns staffing of the course courses. As an interdisciplinary program with no departmental home, Cognitive Science has to depend on recruiting faculty from different departments to teach the core courses and therefore is subject to the needs and whims of the contributing departments. It is highly desirable that Cognitive Science receive more resources so that it can acquire faculty whose primary responsibilities will be more closely and permanently dedicated to the program.
Recommendations

1. All students admitted to the Cognitive Science major should be required in their first term in the major to meet with an advisor who will provide assistance in preparing for core courses and in choosing a concentration.

2. Subsequently, all students in the major should be encouraged to meet regularly with an advisor who will provide guidance in deepening the concentration along their lines of interest.

3. There should be university-level appointments in cognitive science to improve staffing of cognitive science courses.

Conclusion

Over the past two decades, I have visited many cognitive science programs in the United States, Canada, Europe, and Australia. The Indiana University program strikes me as one of the best, rivaled only by universities such as the University of California at San Diego that have established separate departments of cognitive science. Indiana has clearly made very good use of its National Science Foundation funding for undergraduate education in cognitive science. I hope that Indiana University will provide its Cognitive Science Program with enhanced resources that will enable the program to continue to thrive.