

Joint Ph.D. Degree in Psychology and Computer Science and Engineering

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Plan 1: Psychology Primary, Computer Science Secondary

1 Overview of Cognitive Science

Cognitive science is a multidisciplinary effort to understand the nature of mind, thought, and intelligence. This includes answering questions about cognition from several interconnected frameworks including: the modeling of behavior and perception, the abstract properties of computations and processing, the structure and physiology of neural systems, and the attendant philosophical implications of these inquiries. Cognitive science draws on a range of academic disciplines: psychology, computer science, philosophy, anthropology, and neuro- and biosciences. Concepts and models of human abilities that arise from cognitive science are often used to guide the development of projects in artificial intelligence and computer sciences. In general, cognitive science can be seen to cross-cut the behavioral, social, information, and life sciences.

2 Motivation

Top universities in the United States, Europe, and Japan have cognitive science departments, cognitive science centers, and/or degree programs in Cognitive Science (ranging from a minor in cognitive science, to a major, to a joint Ph.D. with another discipline, to a full cognitive science Ph.D.). Institutions that are held as peers or potential peers — including but not limited to Brown, Johns Hopkins, Princeton, Northwestern, Penn, Rice, Rutgers, and Stanford — have either a genuine cognitive science department or a cognitive science research center. Establishing a cognitive science presence at Notre Dame would facilitate the scientific study of mind in an environment co-existing with Catholic moral and ethical thinking; an environment that would be the only one of its kind in the world. A joint Ph.D. program between Psychology and Computer Science represents a concrete first step towards a full multidisciplinary Cognitive Science program.

Increased collaborative efforts between faculty in computer science and psychology over the past four years have led to several recent external grant proposals that would require graduate students being trained in both psychology and computer sciences. These proposals include Notre Dame's inclusion in the proposed NSF Center for Learning and Multimodal Communication, two NSF project grant proposals, one NIMH RO-1 project grant proposal and one grant proposal to the Department of Homeland Security. A joint Ph.D. program between Psychology and computer science will facilitate attracting applications from the top students graduating from interdisciplinary Cognitive Science undergraduate programs.

3 Specific Description

The Graduate School makes provision for the pursuit of joint Ph.D. degrees at Notre Dame. Among other things, it stipulates that a plan of study defining what will constitute the joint degree program must be agreed upon by the relevant departments and the approved written plan must be on file with the Graduate School before the student may begin the program. The provisions of the present document are intended to constitute that plan for students entering the joint degree program in Psychology and Computer Science and Engineering from the Department of Psychology.

Two basic principles govern the design of the proposed degree. The first is that it is a single, interdisciplinary degree rather than two separate degrees, one in psychology, the other in computer science. The second is that, though being a single degree, it nonetheless calls for a distinction of emphasis between the two disciplines. Each student will therefore designate one of the disciplines the primary emphasis and the other the secondary, with the curricular emphasis to be placed on the primary discipline.

The proposed degree program requires more by way of training than the ordinary Ph.D. in either of the participating departments. Since, however, it is a single degree and not two degrees, it does not and should not require the sum of the ordinary degree requirements for both departments. It is expected that it will take somewhat longer to complete than the ordinary Ph.D. in either department. Six to seven years is a reasonable estimate based on factors such as the extra requirements due to a qualifying exam in each department. Thus one would expect funding to be extended to a sixth year beyond the five years of funding currently provided by the Psychology Department.

3.1 Admission to Primary and Secondary Departments

Despite its being a single degree, the joint degree is nonetheless based on the idea that one of the two departments should be designated the department of primary interest and the other the department of secondary interest. The student will be admitted through the primary department and will do the majority of her/his work and derive the majority of her/his financial support from it. He or she must also in due course apply and be admitted to the secondary department for pursuit of the joint degree. This

application and admission, however, is not intended to follow the usual procedure. Admission by the secondary department signifies only admission to pursue the joint degree. It does not signify admission to pursue the regular Ph.D. in that department. Admission as a regular Ph.D. student in the secondary department may, of course, be sought, but it is not constituted by admission into the joint degree program.

3.2 Election of Program Area in Primary Department

The Psychology Department is divided into four main programs: cognitive, counseling/clinical, developmental, and quantitative. Each Ph.D. student in psychology is admitted into one of these program areas and their course requirements and qualifying examinations are set by the program area faculty with the approval of the Psychology Department Graduate Committee and Director of Graduate Studies. Each student in the joint degree program will be admitted into one of the program areas, with the expectation that cognitive and quantitative are the most likely areas of study.

3.3 Advising

Each student in the joint degree program will have two advisors, one from the faculty of the primary department, the other from the faculty of the secondary department. Choice of advisors will be mainly the student's prerogative.

3.4 Course Work

Ordinary Ph.D. students in psychology are required to complete a total of 55 hours of courses including directed readings and research hours in psychology. No more than 12 hours of the 55 may be dissertation hours and no more than 6 hours may be master's thesis hours. In addition, completion of Introductory Statistics (PSY 507 and 508), Advanced Research Methods (PSY 610) or Psychological Measurement (PSY 609), and one additional statistics course with a grade of B or better in each is required. Students in the Plan 1 program will be required to fulfill the 12 hours of statistics course requirements in the psychology department as well as 21 additional non-dissertation and non-thesis hours of credits in psychology that may include directed readings and research hours. All credits taken for the purpose of satisfying the general psychology and program area requirements for Plan 1 students are to be approved by the Graduate Director and Program Director respectively. The remainder of the credits will be satisfied in a way agreed upon by the student, the advisor and the Program Director of the student's elected program area.

Ordinary Ph.D. students in CSE are required to take a total of 36 hours of basic and advanced courses. Students in Plan 1 will be required to take 24. This will include three mandatory core courses (CSE 511, CSE 521, and CSE 542), one semester of research seminar, one additional course from the "analysis" area, and one additional course from the "application" area. The remaining credits will be filled in a way agreed upon by the student, his/her computer science advisor and the director of graduate studies in the

computer science department. In fulfilling the CSE requirement for Plan 1, a maximum of 9 credit hours of the required 24 may be awarded for courses taken outside of CSE.

While the required courses within Psychology and CSE must be fulfilled (12 hours in Psychology and 15 hours in CSE for a total of 27 total required hours), the remaining elective course credits may be taken either in Psychology or CSE as long as the general psychology and program area requirements are fulfilled as approved by the area Program Director and Graduate Director.

3.5 Thesis

Ordinary Ph.D. students in psychology are required to submit a proposal for a master's thesis and defend it before a thesis committee composed of a minimum of three faculty. The thesis work is then completed and defended before the same committee. This same requirement will apply to joint Ph.D. students in Plan 1 with the additional requirement that both advisors be part of the master's thesis committee and that a fourth member be added so that the advisors do not constitute a majority.

3.6 Written Qualifying Examinations

Ph.D. students in psychology are ordinarily required to pass a two part written qualifying examination in their chosen area of specialization in psychology. The constitution of this examination is provided by the requirements of the particular program area (cognitive, quantitative, developmental, or counseling). Students in Plan 1 will be required to pass only one part of the program area examination, the choice of which is to be determined by the Program Director of the chosen area of specialization in the Psychology Department in consultation with the student and the psychology advisor. The constituency of the examination committee for the basic examinations will be the two co-advisors and two additional examiners from the selected program area in psychology.

In addition to the written qualifying examination in psychology, students in the joint degree program will be required to satisfactorily complete one of the written qualifying examinations in the computer science department in an area determined jointly by the student, his/her computer science advisor and the Director of Graduate Studies in the computer science department. The constituency of the examination committee for the basic examinations will be the two co-advisors and two additional examiners from the area of specialization in computer science.

These written qualifying exams need not occur at the same time since preparation for two written qualifying exams in two fields is expected to be more time consuming than preparation in only one field. The co-advisors and student will decide the order in which the written qualifying exams are to proceed and how much time may elapse between examinations. Ph.D. students in psychology are ordinarily given a second opportunity to pass written qualifying examinations and this opportunity will be extended to students in Plan 1 as well. Plan 1 students must complete both written qualifying examinations no later than the end of the student's fifth year of graduate studies.

3.7 Dissertation

Since the program is a single degree program, there will be one dissertation, not two. There will first be an oral defense of the dissertation proposal, which will constitute the graduate school requirement for an oral candidacy exam and must be completed no later than the end of the fifth year of graduate studies. There will then follow a defense of the dissertation in the manner normally required in Department of Psychology with the following exceptions.

The dissertation will be co-directed by the advisor from the primary department and the advisor from the secondary department. It should have both significant psychological and significant computer science content and should be of such a quality as to make it suitable for publication in a good professional journal. Approval by both advisors will be required for acceptance of the dissertation.

The examination committee for Plan 1 dissertations will consist of the two co-advisors plus at least three additional members -- at least two from the Psychology Department (one of whom must be from outside the program area), and at least one from the Department of Computer Science and Engineering. The choice of the additional members will be made by the student in consultation with the two co-advisors.

3.8 Determination of Fitness to Continue in Plan 1

The progress decision for a Plan 1 student will follow whatever rule is effect for Psychology Ph.D. students as of the year of admittance of the Plan 1 student.

3.9 Financial Support

As mentioned above, it seems reasonable to expect the joint degree to require six to seven years for completion. Assuming a six year model, the primary department should provide support for five of those years and the secondary department for one year at the customary level of support for the primary department. The primary department will provide summer support for the first five years at the customary level for the primary department. Finally, the secondary department will provide sixth year summary support at the secondary department's customary level.