

# Student Learning Outcomes Assessment Summary

## Space Physics PhD

CNSM, UAF

2014-2016

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### 1. Assessment information collected

The graduate SLOA process in the Department of Physics has been revised significantly in this review period to incorporate new assessment tools and their analysis. The new metrics/tools developed in this review period are

- (1) Annual progress assessment form
- (2) Attachment to annual report
- (3) Thesis evaluation form
- (4) Teaching/communication evaluation form
- (5) Exit survey form
- (6) Alumni survey form

**Annual progress assessment.** This assessment is completed at every student's annual committee meeting and any other event (e.g. defenses and oral comprehensive exams). The assessment categories range from general knowledge of the field to knowledge of the publication process.

**Attachment to annual report.** Information about student publications, presentations, awards, applications, proposals, and teaching activities is collected electronically.

**Thesis evaluation.** The thesis evaluation is completed by all advisory committee members and the department chair. It is anonymous and not used to grade individual students. Evaluation categories cover all the major aspects of original scholarly activities from literature survey to quality of writing. No theses have been submitted since the form has been introduced and it is expected that all theses in Physics from this point will be evaluated against the criteria developed.

**Teaching/communications evaluation.** Most incoming graduate students undergo ~1 week of training followed by 2 semester-long teaching seminar classes of 1 credit each. The purpose of the training and seminar classes is: 1) Improve teaching skills (partially to turn students into good TAs but also good teachers), 2) introduce students to active learning techniques, 3) Improve ability to communicate to all audiences (from

general public to professional groups). The students are all evaluated based on the attached evaluation rubric during that first week, in the middle of the first semester, in the middle of the second semester and at the end of the second semester. In addition direct input from the students on what works and does not work is taken at the end of each semester.

**Exit survey.** In the past, surveys of graduates were conducted in person by the Department Chair, which was complemented by paper surveys sent out to students. This assessment tool has been redesigned for an easier delivery and processing and refocused to capture all exiting students.

**Alumni survey.** A new alumni survey has been developed based on the American Institute of Physics template. The survey is anonymous and questions range from alumni's assessment of advisors to their preparedness for various professional activities.

## **2. Conclusions drawn from the information summarized above**

**Annual progress assessment.** Following each committee meeting (annual meeting, defense, oral comprehensive exam) we evaluate the progress of the student. The assessment is anonymous and not used to grade individual students. 3 anonymous PhD students were evaluated by their committee members (9 individual anonymous assessors) as part of their annual report activities. The Department has approved the use of the Physics Graduate Assessment Questionnaire for all students to be evaluated in this way. Based on the currently available evaluations, all students are meeting or exceeding expectations relative to their year level in the following categories 1) general knowledge of the field, 4) technical abilities, 5) analytic abilities, 6) oral presentation skills, 7) written communication skills, and 9) ability to act as an independent researcher, although categories 2) and 3) were not assessed by at least 3 assessors. One assessor found one student below expectations in the 3 following categories: 2) specific knowledge of the literature, 3) ability to critically analyze literature, and 8) knowledge of peer-reviewed scientific publication process. This last result indicates that the process works well in a sense that assessors take this task seriously. This metric has only recently been implemented with numbers being too low for a more comprehensive analysis, so it is difficult at this time to draw any definite conclusions. All students must be properly informed about assessment categories and be prepared to demonstrate progress in all of them relative to their year level.

**Attachment to annual report.** There have been 6 student responses (all from PhD students), which is lower than desirable for a proper statistical analysis. From this point on, all students are expected to complete this report before the 15<sup>th</sup> of May deadline. Based on the currently available responses, 5 out of 6 students were in their second and following years and 4 of 5 had at least 3 presentations made at a major conference.

One student had a total of 33 presentations. In the current graduate SLOA plan, the Department expects all students to present their work as a conference paper or journal publication by the time they graduate and the student surveyed are well on their way to meet this expectation. 4 out of 6 students have reported publication of at least one journal paper.

**Teaching/communications evaluation.** Because the instrument to be used was only finalized and agreed on this semester, the conclusions will be more qualitative and anecdotal than quantitative this year, but will be better quantified in subsequent years. There was a large improvement in the students' teaching performance between the first presentations last August (2015) to the final presentations the first week of May (2016). The confidence and therefore presentation of the material was clearly better, as was the interactiveness (which led to more active learning attempts). However: 1) the Socratic dialog method of teaching was not successfully implemented by any of the students despite numerous attempts, 2) the students (and instructors) felt that better preparation for the first labs would be useful 3) more early emphasis on outreach and general public presentations would be valuable.

**Exit survey.** This assessment tool was only recently introduced in electronic format. No data from this interview are available for this report. However, the department chair has interviewed two graduating students who expressed general satisfaction with the program. In particular, they both commented positively on the content and breadth of offered courses, and the general atmosphere in the department. It was pointed out that the Physics Webpage could be improved and that one student perceived the need for a class that focuses on handling and repairing scientific equipment.

**Alumni survey.** We have adopted a new alumni survey to assess the long-term outcomes of graduates along with their impressions of our graduate program. In our survey, roughly 60% of the responses came from Ph.D. graduates with the majority (~85%) having conducted primarily computational and/or theoretical research. The average full-time equivalent years to graduation was 6.125 years and 100% of the respondents concurred that "if they had to do it all over again", they would still get a degree from the UAF physics department. This indicates that Ph.D. degree continues to be a particular strength of the Department.

The alumni survey evaluated the Ph.D. graduate experience in terms of the effectiveness of the advisor and the relevance and effectiveness of coursework. We summarize the results as follows (where 1=strongly disagree and 5 = strongly agree):

- My advisor encouraged me in my academic goals: 4.5
- My advisor encouraged me in my career goals: 4.25
- My advisor encouraged me to excel in research: 4.75
- My advisor was accessible: 4.25

- My advisor was easy to discuss ideas with: 5.0
- My coursework was challenging and engaging: 4.75
- The breadth of my coursework was adequate: 4.5
- My coursework prepared me for research: 4.0
- My coursework was vital for my professional and/or post-graduate activities: 4.0

With regard to advisor and coursework effectiveness, the survey results were largely positive (i.e., >4.0/5).

Our surveyed graduates are all employed. The number of months spent actively seeking employment was 8 months. Employment sectors include educational institutions (1/2), government (1/4), and private/industry (1/4). The surveyed alumni agree that their graduate degree was appropriate for their current employment (4.3/5). All of our recent Ph.D. graduates left UAF with employment.

### **3. Curricular changes resulting from conclusions drawn above**

The Department has only recently implemented new set of metrics to evaluate our graduate curriculum (see Sections 1 and 2 above). In the first iteration of our metrics, we have not identified many specific issues that require curricular changes at this point.

One potential area for improvement was revealed in evaluation of annual progress and research outcomes (#1 and 2 in the list in Section 1). The Department expects PhD students to make significant contributions to the peer-reviewed literature, with at least one first authored peer-reviewed publication or at least one conference abstract by the time of graduation. While many students have already met this expectation, some have not, and the student's knowledge of literature was also questioned or not assessed by some committee members. These skills are mostly developed in classes more closely related to the students' research and in working closely with students' research advisors. The Department will work hard to maintain and enhance class offerings in areas that are important for student progress in research.

To address the issues raised by in relation to development of teaching/communication skills, 3 changes will be implemented in addition to the consistent evaluations. 1) A practice first lab will be added to the training week. 2) Socratic Dialogue teaching will be introduced in the first week and discussed more in the first semester but there will be no pressure for the students to implement it as it was found to be difficult for beginning graduate students. 3) In the first semester there will be more emphasis on outreach presentations shifting a bit more of the active learning material to the second semester.

**4. Identify the faculty members involved in reaching the conclusions drawn above and agreeing upon the curricular changes resulting**

The Physics Graduate Student Learning Outcomes Assessment Committee:

Roman Makarevich (Chair)

Peter Delamere

David Newman

Martin Truffer

The summary form has been discussed and agreed to by the entire Physics faculty.