Review Panel Report
Oregon State University

Science and Mathematics Education Graduate Program

Graduate Review Panel

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OVERALL RECOMMENDATION

In light of the pending repositioning of the Science and Mathematics Education Department within the College of Education, the Review Panel’s focus was not exclusively retrospective. **Had the review been conducted under stable circumstances, the Panel’s recommendation would be to maintain the Science and Mathematics Education Graduate Program. Given the present context, however, the Review Panel recommends that the Program be restructured.** Restructuring efforts should highlight the pivotal role of the Science and Mathematics Education Graduate Program to the formation of a research-focused College of Education and the significant value of establishing a university-wide Science, Technology, Engineering, and Mathematics (STEM) Center. The challenge for the program is to maintain high quality MS and PhD degree offerings and provide evidence of effectiveness of program features and success of program graduates. Program continuity through the engagement of faculty outside of the Department of Science and Mathematics Education and aggressive recruitment of a diverse student population is essential for the future success of the program. The program faculty needs to play an active role in the restructuring of the College of Education, ensuring that adequate resources are available to sustain research-based science and mathematics degree offerings and provide for the collection and analysis of data to inform future program revisions.

**General Recommendations**

- The Department should incorporate under-represented populations into the applicant characteristics statistics, and begin tracking these statistics by degree option to accurately assess the diversity and quality of incoming students.
- Data should be gathered on an ongoing basis regarding the career success for all program graduates. This information should be collected and evaluated for programmatic improvement for all of the master’s and doctoral programs.
- The Department should track faculty workload across the different degree options in order to better understand how the workload is distributed.
- The Department should compile summary performance data to allow for a more informed assessment of the level and quality of faculty performance.
- Special attention should be given during the planned move to Education Hall to ensure adequate physical office space is available for both faculty and graduate students.
- Develop a plan and secure support from the Deans of the Colleges of Science and Education to regularly update computers and other forms of technology used for instruction and research.
- The Science and Mathematics Education faculty should pursue the establishment of a university-wide Center for Research on Lifelong STEM Learning, but be mindful of the impact of Center affiliation on both opportunities for and productivity of faculty and students.
Recommendations for Masters Students

- The availability of on-line courses should be increased; efforts should be made to communicate program needs to other departments that offer desired courses and work begun to develop online options of these courses.
- A course equivalent to history of science or philosophy of science should be made available for mathematics education students.
- The program should provide opportunities for all licensure students to work with grade 6-12 students from diverse cultural backgrounds, as well as students with special physical, emotional, and learning needs, and to incorporate information on these students into coursework.

Recommendations for the Doctoral Program

- The process of first year advising should be studied and modified to enhance the academic experience for the doctoral students and include student input.
- Consideration should be given to adding learning experiences in science and mathematics teacher education, grant writing, program evaluation, and international education to enhance the marketability of doctoral program graduates.
- Faculty members should evaluate their personal predilections for different didactic modes and assess the impact that they might have on student learning in doctoral courses.
- The program faculty should engage the OSU mathematics faculty in conversation about the relationship and overlap between the mathematics education doctoral programs offered in the two departments, with the conversation resulting in a statement that distinguishes the two doctoral degree options.
- The Dean’s Office of the College of Science should provide the Department with data on student credit hour generation.
- It is recommended that faculty monitor individual supervision loads and work to equalize the loads over the entire faculty and/or advocate for additional faculty lines.

NOTE: The Graduate Council requested some additional information from the Department which can be found in Appendix A to this report.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The Science and Mathematics Education Department supports a strong, focused and successful graduate program. This review comes at a critical time as the Department is to be repositioned within the College of Education. Even within this organizational transition, the Department’s faculty remains committed to its mission (developed in 2006) to “[b]etter understand and facilitate the variety of ways in which people of all ages and backgrounds engage in science and mathematics learning throughout their day and
lifespan.” This mission is reflected in the three foci for their degree programs: K-12, College Teaching, and Free-Choice Learning; and fits well with the implementation guidelines for the strategic alignment of academic and support units in the OSU Strategic Alignment and Budget Reduction Implementation Plan for 2009-2011.

The Department’s graduate program is populated by high quality students who are admitted based on a well-defined process, requiring additional qualitative information beyond the University graduate admission requirements. However, the Department has a limited number of internal scholarships and GTA/GRA positions that are available to students and seems to attract few students from underrepresented populations. To address these challenges, the faculty has initiated actions to obtain GTA/GRA positions for each of its PhD students and to seek scholarships to recruit and retain students from populations traditionally underrepresented in science and mathematics. In order to track the successes of these initiatives, it is recommended that the Department incorporate underrepresented populations into the applicant characteristics statistics, and begin tracking these statistics by degree option to accurately assess the diversity and quality of incoming students.

The curriculum across the Department’s PhD and MS degree options is very strong. The School-based Master’s for K-12 teachers and the Free-Choice Learning Master’s are innovative programs, in that they provide advanced learning opportunities for persons through online offerings. A limitation for both of these programs is the availability of online course offerings that might be used to fulfill program requirements beyond those offered through the Department. It is recommended that efforts be made to communicate program needs to other departments that offer desired courses and work begun to develop online options for students.

The Professional Teacher Education Master’s program (grades 6-12 science and mathematics) is well conceived and consistent with national recommendations and standards of science and mathematics teacher education programs. The requirement of a history of science or philosophy of science course is also commendable. Unfortunately, a comparable learning experience seems not to be available for mathematics education students. It is recommended that a course equivalent to history of science or philosophy of science in math education be made available for mathematics education students.

Among the PhD program’s strengths is the emphasis of science and mathematics learning opportunities from birth to death, reflecting the three program strands—K-12, college teaching, and free-choice learning—and an emerging trend in science and mathematics education programs. However, attention needs to be given to learning experiences to enhance the marketability of program graduates (e.g., science/math teacher education, grant writing, international education) and whether the personal predilections for different didactic modes of faculty may adversely impact student learning. In addition, it is recommended that the Department track faculty workload across the different degree options in order to better understand how the workload is distributed.
The Department faculty is highly qualified and well suited to fulfill the Department’s vision of establishing a Center for Research on Lifelong Science, Technology, Engineering and Mathematics (STEM) Learning and contributing significantly to building a research-focused College of Education. With Dr. Flick named the Associate Dean of Academic Affairs for the reorganized College of Education, the Department faculty may wish to learn more about how this new appointment will influence his administrative and instructional duties within the Department. The financial resources available to support the Department seem to be adequate, in large measure due to the faculty’s ability to secure external funds through grants and the income generated through online courses. However, the department’s infrastructure is in need of immediate attention. Special attention should be given during the planned move to Education Hall to ensure adequate physical office space is available for both faculty and graduate students.

Faculty and student productivity is very respectable, based on indicators provided. The Department faculty has almost $4 million in current grants and is highly ranked among PhD granting institutions. Students are satisfied with the financial support provided them by the Department. Students work with faculty to make professional presentations and generate scholarly publications. The scholarly community provided for students by the Department faculty seems exceptional for teacher licensure students, but not all that it could be for PhD students. PhD students seem to be disparate in their feelings of connectedness to each other and the Department. These feelings seem to be linked to the advising approach applied with students during the early semesters of their doctoral work. It is recommended that the process of first year advising be studied and modified to enhance the academic experience for the doctoral students.

Evaluation of the professional viability of graduates and student ratings and rankings was hampered by the lack of data. These data could serve an invaluable function for assessing program viability and guiding programmatic improvement. It is recommended that data be gathered on an ongoing basis regarding the career success for all program graduates.

DETAILED FINDINGS

Introduction

This review of the Science and Mathematics Education Graduate Program follows an earlier review conducted in 2001 and comes on the heels of an announcement that the Science and Mathematics Education Department will be repositioned within the College of Education as part of a University-wide reorganization. Consistent with the Guidelines for Graduate Council Program Reviews, the objective of the review was to identify and articulate positive suggestions for enhancing the Science and Mathematics Education graduate program.
The review site visit took place on December 6th, 2010, with an organizational meeting of the review panel on the evening of December 5th, 2010. Members of the review panel included: Dr. Thomas Koballa (Dean, College of Education, Georgia Southern University), Dawn Grander (Principal, Corvallis High School), and two members of the Graduate Council, Dr. Carolyn Aldwin (HHS) and Dr. James Coakley (Business). Members of the panel were provided with the program’s Self-Study Report prepared by Dr. Larry Flick (Department Chair) with significant assistant by department secretary Paula Dungjen and doctoral student Teresa Wolfe as well as Dr. Larry Enochs (previous department chair) prior to the site visit. Degree program advising sheets were made available during the visit. Dr. Martin Fisk, Interim Dean of the Graduate School, was present as an observer.

On December 6th, the review team first met with Dr. Larry Flick, Department Chair, who provided a summary of the Self-Study Report and context regarding the Department’s pending repositioning within the College of Education. The review panel then met with Dr. Sherman Bloomer, Dean of the College of Science, who described the Department’s current status within the College of Science. Next the panel met with the Graduate Program leaders and with the Graduate Program faculty. Following a working lunch, the team toured Department facilities and met separately with groups of doctoral students and licensure students. A teleconference was scheduled with distance education students, but no students called in to speak with the review panel. A closing meeting with Dr. Flick concluded the panel’s site visit.

All participants were extremely open and helpful. The review panel appreciated the professional conduct experienced during the site visit and the ample time provided to pose questions and to hear faculty and student opinions, comments, and suggestions for improving the program.

The remainder of the report is organized according to the outline provided by the Graduate School into four sections: Inputs, Productivity, Outcomes, and Conclusion.

**Inputs**

**a. Fit of the mission of the program with the college and university missions**

The Strategic Alignment and Budget Reduction Implementation Plan for 2009-2011 (http://oregonstate.edu/leadership/sites/default/files/budget-documents/implementation-plan-10-8-09.pdf) provides implementation guidelines for the strategic alignment of academic and support units within Oregon State University. These guidelines call for the creation of four divisions: Arts and Sciences; Business and Engineering; Earth Systems Science; and Health Sciences. The Division of Arts and Sciences is comprised of three Colleges: Science, Education, Liberal Arts. The proposed mission of the Division of Arts and Sciences is to become the intellectual center of Oregon State University, answering the fundamental questions that underlie the natural sciences, the arts, the humanities, and the social sciences (Report to the Strategic Alignment/Budget Reduction Review Committee, Mar 15, 2010, http://oregonstate.edu/leadership/sites/default/files/budget-
The Colleges of Science, Education, and Liberal Arts are currently undergoing internal college reorganizations with a proposed consolidation of education-focused departments across the university. The proposal also includes creation of a cross-disciplinary Center for Research in Lifelong STEM Learning. The Department of Science and Mathematics Education (SMED) within the College of Science is currently in a state of organizational transition with the ensuing uncertainty regarding the final organizational structure and form of the department. Our presumption is that the SMED will remain as a department within the new organizational structure and that SMED will continue to offer the existing graduate programs (PhD and Masters).

Even with this organizational uncertainty, the SMED faculty remain committed to their mission (developed on 2006) to “[b]etter understand and facilitate the variety of ways in which people of all ages and backgrounds engage in science and mathematics learning throughout their day and lifespan.” The faculty believes this mission is unique in that it is focused on investigating and supporting lifelong science and mathematics learning, which in turn supports all three Signature Areas of Distinction of the University. This mission is reflected in the three foci for their degree programs: K-12, College Teaching, and Free-Choice Learning.

b. Quality of students
The SMED has distinctly different degree programs: the PhD in science and mathematics education, the on-line Master’s degree for K-12, the online Free-Choice Learning Master’s degree, and the on-campus Professional Teacher Education Master’s degree. The “Applicant Characteristics” provided in the Self-Study Report (Table I, p. 12) reflects characteristics aggregated across students from all of the degree programs. Overall, the quality of the students appears to be high based on the average GPA of the matriculated students. It should be noted that students admitted to the Professional Teacher Education Master’s program are required to complete “teaching tests” administered by the Oregon Teacher Standards and Practices (OTSP) Commission (ORELA, CBEST and Praxis) by the end of September. Results of these tests may also be used to track the quality of the incoming students.

Over the past three years, 82% of the matriculated students have been female, and the students are predominately domestic (as would be expected for the K-12 and licensure programs). The Department does have a diversity initiative to recruit and retain students from underrepresented populations, and has submitted a proposal to use the Oregon Laurels Block Grant to provide scholarships to support the initiative. However, the Department does not appear to track underrepresented populations as part of the applicant characteristics. It is recommended that the Department incorporate underrepresented populations into the applicant characteristics statistics, and begin tracking these statistics by degree program to accurately assess the diversity and quality of incoming students.

Tables A1 and A2 in the Appendix to the report provide additional data on matriculation and graduation by program. As a whole, the numbers meet or exceed the current guidelines for numbers of students by program.
c. Admissions selectivity

The SMED has a well-defined process for selecting students into the PhD and Master’s degree programs, requiring additional qualitative information beyond the university graduate admission requirements. None of the graduate programs require the GRE or other standardized exam as part of the admissions criteria. Students admitted to the Professional Teacher Education Master’s program are required to complete tests administered by the Oregon Teacher Standards and Practices (OTSP) Commission, but these tests are not part of the admissions criteria. The admissions requirements for the licensure program are consistent with the requirements for licensure programs in the College of Education.

d. Level of financial support for students

The SMED has a limited number of internal scholarships and GTA/GRA positions that are available for their students. The stated goal of the faculty is to obtain a GTA/GRA position for each student within the PhD program. These positions offer full tuition support plus a monthly stipend. The Department faculty acknowledges that it is dependent on the availability of GTA/GRA positions in other departments to meet this goal.

Financial support for the Master’s degree programs tends to come from scholarships, both internal to the SMED and external scholarship support available through the University and other Foundations and Organizations (see p. 19 of the Self-Study Report). The SMED students earned approximately 20 scholarships per year over the past three years, suggesting that approximately 25 percent of the students in the Master’s degree programs earn some form of financial support.

e. Curriculum strength

The School-based Master’s for K-12 teachers and the Free-Choice Learning Master’s are innovative programs, in that they provide advanced learning opportunities for persons through online offerings. The Free-Choice Learning program also addresses the unique needs of persons choosing to work in non-formal science and mathematics environments. Both degree options clearly are developing a national audience for OSU programs. Online advising materials, available at the Department’s website, present sequences of required coursework for both degree options. Considerable efficiency is achieved by offering coursework required for both programs during the same semester.

The School-Based Master’s for K-12 option provides an excellent venue for mid-career professionals to extend their understandings of science and mathematics teaching and learning and to build leadership capacity in these fields. This degree option enrolls about 30 science/mathematics students, according to the Department faculty. This number should be considered the maximum allowable given the faculty resources allocated to the program and the demands associated with project supervision and the oral examination. Department documentation indicates that only Drs. Van Zee and Niess provide program
leadership and they teach many of the program courses. They also work directly with students during the oral examination and project phases of the program. Even though the continuous enrollment of 30 students brings the program close to its carrying capacity, the program courses tend to enroll few students each semester. [Tracking trends in enrollment was made difficult by the absence of fall 2009 course data in Table 5 of the Self-Study Report.]

The Free-Choice Learning Master’s option is at the forefront of programs that prepare individuals for working in free-choice science learning environments. However, the program enrolls few students. According to the Department faculty, only 17 students are enrolled in this degree option. Moreover, considerable overlap seems to exist among the three courses that constitute the option’s primary strand, SED 582, SED 583, and SED 584, and the nature of the projects (i.e., SED 506) in which students engage may need further clarification.

Regarding both the School-based and Free-Choice Master’s programs, the Department faculty expressed concern about the availability of online offerings that might be used to fulfill program requirements beyond those offered through the Department. They described the lack of available online offerings as a significant limitation in both programs. It is recommended that efforts be made to communicate program needs to other departments that offer desired courses, such as History of Science and Mathematics Education, and work begun to develop online options for students.

The Professional Teacher Education Master’s program prepares grades 6-12 science and mathematics teachers for public and private schools. Overall, the program is well conceived and consistent with national recommendations and standards of science and mathematics teacher education programs. Entrance into the program is facilitated through prerequisite coursework completed during a student’s undergraduate degree program or in the summer prior to beginning the program. Through this cohort program, students may seek subject matter endorsements in one or more science and mathematics content specializations. The program coursework, particularly that involving school-based experiences and the preparation and enactment of two Work Samples, is commendable. Interviews with students confirmed the strength of the program’s cohort model, stating that the model provides a mechanism for student support and collaboration. The requirement of a history of science or philosophy of science course is also commendable. Unfortunately, a comparable learning experience seems not to be available for mathematics education students. Also seemingly missing from the program are significant opportunities for students to learn how to work effectively with grades 6-12 students from diverse cultural backgrounds and with special physical, emotional, and learning needs. It is recommended that:

- a course equivalent to history of science or philosophy of science specifically targeted at mathematics education be made available for mathematics education students; and
- the program should provide opportunities for all licensure students to work with grade 6-12 students from diverse cultural backgrounds, as
well as students with special physical, emotional, and learning needs, and to incorporate information on these students into coursework.

The admission of 20-26 students annually, as reported by Department faculty, brings into question the program’s overall contribution to the State’s need for grades 6-12 science and mathematics teachers. Is the program’s production of teachers contributing substantially to the State’s teaching population? If not, perhaps the program should be presented as a model program, one that is carefully studied by faculty and students, and whose innovative processes and outcomes are publicized in order to inform the national discussion on science and mathematics teacher preparation.

The PhD includes coursework in research methodology and research content that one would expect in a highly-rated science and mathematics education doctoral program. The inclusion of research methodology courses outside of the department is commendable, providing students with opportunities for gaining diverse perspectives relative to quantitative or qualitative research methodologies. Another strength of the program is the emphasis on science and mathematics learning opportunities from birth to death, reflecting the three program strands—K-12, college teaching, and free-choice learning—and an emerging trend in science and mathematics education programs. Apparently missing from the program is coursework that is related to expectations associated with many science and mathematics education positions in higher education, including science and mathematics teacher education, grant writing, program evaluation, and international education. Also, the Department’s emphasis on the preparation and support of grades 6-12 teachers may provide less than an attractive learning environment for doctoral students interested in science and mathematics education in the elementary grades. It is recommended that consideration be given to adding learning experiences in science and mathematics teacher education, grant writing, program evaluation, and international education to enhance the marketability of doctoral program graduates.

The enacted curriculum, reflecting the expertise and interests of individual faculty, was a point of concern among students in the program. Students indicated that doctoral coursework is slanted by faculty expertise and interest. This sometimes adversely impacts the students’ course learning experiences. Some students felt that instructors’ interests sometimes led to focusing of courses on a narrow field that was outside of the interests of the students. It is recommended that faculty members evaluate their predilections for teaching styles and content and assess the impact that they might have on student learning in doctoral courses.

Moreover, faculty pointed out that two doctoral programs in mathematics education are offered at OSU, one by the Department of Science and Mathematics Education and a second by the Department of Mathematics. Conversations with the Science and Mathematics Education faculty suggest that overlap exist between the two doctoral degree options and students may be confused about the worth of the two degrees in terms of future employment. It is recommended that the program faculty engage the OSU mathematics faculty in conversation about the relationship and overlap between the
mathematics education doctoral programs offered in the two departments, with the
cornerstone resulting in a statement that distinguishes the two doctoral degree options.

The Department’s Self-Study Report does include information on the number of
graduate student committees chaired by individual faculty members, but it would be
helpful if the data were broken down by program. \textbf{It is recommended that the
Department track workload by program more carefully.}

\noptics f. Quality of personnel and adequacy to achieve mission and goals

The Department faculty is highly qualified and well suited to fulfill the Department’s
mission to “Better understand and facilitate the variety of ways in which people of all
ages and backgrounds engage in science and mathematics learning throughout their day
and lifespan.” In support of this mission, the faculty is distributed across the disciplines
of science education and mathematics education to support graduate programs and
engage in research that highlight the areas of K-12, college level, and free-choice
learning within the two disciplines. Additional information on faculty productivity and
awards is included in Appendix A.

With the repositioning of the Department within the College of Education, the
Department faculty is anxious to carve out an identity within this emerging unit. The
recent decision to appoint Dr. Larry Flick as the Associate Dean of Academic Affairs for
the reorganized College of Education should serve to reduce the anxiety and provide the
Department faculty with a voice in how the College is organized and the positioning of
the Department within the College.

The Department faculty should work with colleagues in the recognized College of
Education to addresses its short- and long-term goals. Support will likely be found across
departments that make up the new College for a vision of lifelong education in STEM
and other program areas and for integrating culture and linguistic diversity into
coursework and other student learning opportunities. In addition, the Department faculty
will want to be involved in the process that leads to the selection of a new Dean for the
College of Education, ensuring that the hire understands the history of the Department
and its important role in positioning the College as a unit in which research and efforts to
garner external funding for scholarly endeavors is highly valued and rewarded.
The Department’s faculty is well positioned to provide leadership to the creation of a
Center for Research on Lifelong STEM Learning. The Department’s goals to establish
the Center would leverage the talents of scholars across the OSU campus to build core
partnerships and serve to re-conceptualize the meaning of STEM learning at OSU. Great
care must be taken to consider the mission of the Department in creating the Center so as
not to identify an elite group of scholars and in so doing alienate Department and College
of Education faculty and students not invited to affiliate with the Center. If all
Department faculty members will be invited to affiliate with the Center, as suggested on
page 102 of the Department’s Self-Study Report, then it may be possible to allow the
Department to serve the function outlined for the Center, at least for the short-term and
until the College of Education is fully operational. Faculty from OSU units could be

identified as adjunct Department faculty and potential collaborators could be identified as Departmental partners. A true advantage of the Center organization would be to provide emphasis across the STEM disciplines, with attention to engineering and technology that are not noted in the Department’s current science and mathematics education degree programs. Creation of the Center will likely raise OSU’s profile as a leader in STEM education. It is recommended that the Science and Mathematics Education faculty pursue the establishment of a university-wide Center for Research on Lifelong STEM Learning, but be mindful of the impact of Center affiliation on both opportunity for and productivity of faculty and students.

### g. Level and quality of infrastructure

The OSU Libraries provide more than adequate support to the Department. Faculty and students cited no problems with securing books, monographs, and journal articles needed for coursework and research. Faculty offices, classrooms, and conference rooms are located on the second floor of Weniger Hall, with a graduate student office and the shared Departmental office on the third floor. Space in Weniger Hall is marginally sufficient for the needs of the Department. Computers and other forms of technology used for instruction and research seem to be adequate for current needs. However, plans for the regular updating of these items that do not rely exclusively on the faculty’s ability to secure external funds should be put in place.

The Department’s classrooms, laboratories, and conference rooms are in disparate need of new furnishings and updating. Tables and chairs used by students in the Department’s classrooms and laboratories are mismatched and in disrepair. Window blinds and overhead lighting fixtures in the Department’s classrooms, conference rooms, and laboratories are old and some are broken. Graduate student offices, particularly those on the third floor, are in needed of remodeling. Electrical and Internet cables need to be permanently mounted and heating ductwork repaired. Special attention should be given during the planned move to Education Hall to ensure adequate physical office space is available for both faculty and graduate students.

The financial resources available to support the Department seem to be adequate, in large measure due to the faculty’s ability to secure external funds through grants and the income generated through online courses. According to the faculty, no funds are available from the College of Science for instructional supplies and materials and computer technology. Purchases needed to support the instructional and research missions of the Department require the use of funds from other sources. The level of support provided Department faculty and students to attend professional meetings and the sources of any support were not disclosed during the panel’s site visit or in the Department’s Self-Study Report, although subsequent communication revealed that there is little, if any, university support.

### h. Quality of organizational support

The Department is currently positioned as a unit of the College of Science, with Dr. Larry Flick as the Chair. It has received strong support from the Dean of the College of Science, Dr. Sherman Bloomer. Evidence of this strong support includes approval for
recent faculty hires, the Department’s use of space in Weniger Hall, and Dr. Bloomer’s decision to maintain control of all science and mathematics education faculty lines as the Department is repositioned within the College of Education. The Department faculty feels most comfortable with Dr. Flick serving as Chair and the leadership that he has provided for programs, faculty and students. As Dr. Flick has recently been named the Associate Dean of Academic Affairs for the reorganized College of Education, the Department faculty may wish to learn more about how this new appointment will influence his role as Department Chair. Dr. Flick will want to clarify the relationship between these two roles—Department Chair and Associate Dean—and alert faculty to how his position as the Associate Dean will influence his administrative and instructional duties within the Department.

The level of organizational support provided to the Department as a unit of the College of Education is unknown at this time. While it seems reasonable to assume that the Department faculty will remain stable, it is unclear how instructor positions, those of visiting scholars, and office support staff will be situated within the new College. These matters will need to be negotiated with the new Dean of the College.

**Productivity**

**a. Level and quality of student performance**

Currently there are more than 100 graduate students, most of whom are in the master’s programs. There are two MS degrees in mathematics and in science education, each of which has three concentrations: a grades 6-12 teacher licensure program and two online programs, one of which is focused on free-choice learning. There are also two doctoral programs in mathematics and science education, respectively, which combined have about 30 active students.

To indicate the level of the productivity and performance of the students, the Department’s Self-Study Report listed their awards and honors for the past five years. Most of these take the form of tuition support from university sources. This support often averages over $100,000/year, suggesting that the program’s students are competitive financially with other programs.

Five members of the faculty submitted reports of student scholarly work, and the panel was not able to determine whether these works were the products of doctoral or master’s students. The panel estimated that there were 32 different students who reported at least one presentation, with some students having many presentations involving multiple faculty members. It would have been helpful to have lists for individual students, indicating whether they are doctoral students or master’s students. But it does appear that the faculty actively involves graduate students in their research activities.
b. Level and quality of faculty performance

Assessment of faculty performance was hindered by a lack of summary data within the Self-Study Report. For most of the categories – grants and contracts, awards and honors, and professional service and leadership – the report simply referred the reader back to the faculty vitae. Unfortunately, it is beyond the scope of the committee to provide these summary reports. The Department did provide summary information on request (see Appendix A). It is recommended that the Department compile summary performance data to allow for a more informed assessment of the level and quality of faculty performance for future reports.

However, the Self-Study Report did include two measures of faculty performance. First, the Report indicated that the program faculty is ranked 9th in the nation out of 375, but checking the website revealed that (a) the 375 was for all universities offering PhD programs, and it is not clear how many Science and Mathematics Education graduate programs are represented in the 375 and (b) the z-score (-.52) presented at the website suggests that the Department’s productivity rate was slightly below the mean (http://chronicle.com/stats/productivity/page.php?year=2007&institution=3008&byinst=Go). Nonetheless, being in the top ten in the nation among Science and Mathematics Education programs is certainly very respectable.

Second, the Self-Study Report also included a table of financial resources to support the program. The table showed that program faculty had almost $4 million in current grants (see p. 57), which is also very respectable.

c. Viability of the scholarly community for students

The cohort model for the on-campus teacher licensure program appears to work very well. Conversations with students suggest that they are actively engaged in coursework and school-based experiences and supportive of each other.

Unfortunately, none of the online master’s students called in during the scheduled teleconference, so the panel was unable to directly assess the effectiveness and needs of that community. The faculty expressed acute awareness of the relatively small number of faculty available to serve students enrolled in the free-choice learning program, and felt that more faculty lines are needed to adequately support this degree option.

The doctoral students appeared to be more disparate in their feelings of connectedness to each other and to the department. One student, a GRA, kept office space in her mentor’s lab located across campus from the department, and felt somewhat isolated. This may be an endemic problem for programs that have faculty scattered across departments. Nonetheless, the graduate students seemed reasonably content, but noted three major concerns. First, a relatively few number of faculty shouldered most of the burden for the doctoral students; having a greater number of faculty available as primary mentors would provide for greater diversity of opportunity. Second, students complained about the quality of some of the lectures, observing that the faculty sometimes provided
information about new learning approaches and techniques but did not always apply them. Third, stability of funding was a concern for these students. Indeed the Department Chair, Larry Flick, mentioned that there are few dedicated GTA for the doctoral students, and the rest were provided from contributing departments on an *ad hoc* basis or through grant funding secured by Department faculty. The students do appear to enjoy a fairly high level of GRA support. Of these three concerns, the panel saw the heavy burden of doctoral student supervision as a potential weakness to the program. **It is recommended that faculty monitor individual supervision loads and work to equalize the loads over the entire faculty or advocate for additional faculty lines.**

**Outcomes**

**a. Professional viability of graduates**

Doctoral students in the program have completed a variety of dissertations that represent current issues facing education in the K-12, collegiate, and community setting. They appear to be well prepared for a variety of leadership positions in their chosen fields.

The graduates of the on-campus teacher licensure master’s program are often placed in local schools for their student teaching. It seems from the data presented in the Self-Study Report that many are also hired in these districts. Although the Report did not provide retention data for these teachers, judging from the experience of the Corvallis School District, there is longitudinal success for those teachers hired. **There needs to be data gathered on an ongoing basis regarding the career success for all graduates. This information should be collected and evaluated for programmatic improvement.**

**b. Satisfaction of students and graduates**

The doctoral students interviewed by the panel seemed satisfied with their financial support despite information provided by the College of Science when they surveyed all doctoral students. There is a clear request that the students be more involved in the decision-making processes related to financial support.

Students also noted that advising is an important consideration during the first year of doctoral work and would like to have improvements made in their advising. Students interviewed by the panel stated that perhaps the advisors are over-extended. Conversations with faculty suggested that two professors are primarily responsible for advising students before students identify major professors to supervise their examinations and dissertation work. Even with relatively light teaching loads, the burden of advising was recognized as contributing significantly to the workload of the two professors. In particular, some doctoral students lamented the lack of a daily presence with their advising professor. However they were very aware of the quality of the advisors and their positions in the “forefront” of the field. **It is recommended that the process of first year doctoral advising be studied, with the inclusion of student input,**
and improvements be made to the advising process based on the findings of the study.

The doctoral students interviewed seemed to agree that some of their courses were not as engaging as they would like. The observation was that the instructors often talked about “best practices” but sometimes did not utilize these practices in their own instruction. A positive note that the students also agreed upon was the appreciation of the hands-on and research portions of their coursework. Also noted was a desire to see the coursework in the doctoral program more aligned with the actual research work the students were doing, so that these were mutually supportive.

Master’s students enrolled in the 6-12 licensure option are usually with the program only a year. The review panel interviewed several of the students enrolled in this degree option, which is a partnership with the OSU College of Education. The students reported that their classes are adequate. Many teaching candidates enjoyed the school-based experience of their program and were pleased with efforts made to secure placements for them close to their homes. It was clear that the program’s cohort structure was a popular strength of the 6-12 licensure option for the students. The students highly valued their relationships with one another and the professors. They were happy with the quality of their supervising teachers and the schools and classrooms in which they were placed. They unanimously reported feeling very well prepared for a teaching career.

c. Rankings/ratings

The OSU science education faculty was ranked 9 out of 375 for scholarly productivity, according to information provided in the Self-Study Report. This is evident in the amount and quality of research experience their students enjoy. However, the ranking is of all universities offering PhD programs, and it is not clear how many Science and Mathematics Education graduate programs are included in the ranking.

Recent NCATE and TSPC accreditation processes were successfully completed. There were recommendations around data collection and diversity in these reviews, which are being addressed. **It is recommended that data collection and analysis should extend beyond teacher candidates enrolled in the grade 6-12 licensure option and include all program graduates.** This would be especially useful for evaluating the relatively new and unique Free-Choice Learning degree options.

**Conclusion**

The overall recommendation of the panel is, given the pending repositioning of the Science and Mathematics Education Department within the College of Education, that the graduate program be restructured. Restructuring efforts should highlight the pivotal role of the Science and Mathematics Education Graduate Program to the formation of a research-focused College of Education and the significant value of establishing a university-wide Center for Research on Lifelong STEM Learning. Steps to improve the
Program are presented in the Summary of Findings as well as the Detailed Report above and include the following:

- Work with OSU Departments to develop online variants of desirable courses for inclusion as options in the online MS degree programs.

- Encourage the development of a course for mathematics education students that is equivalent to the history of science or philosophy of science courses available to science education students.

- Provide opportunities for all licensure students to learn about and work with 6-12 students from diverse cultural backgrounds and with special physical, emotional, and learning needs into courses and school-based experiences.

- In support of the Program’s doctoral degree options,
  (a) consider adding learning experiences in science and mathematics teacher education, grant writing, program evaluation, and international education to enhance the marketability of graduates;
  (b) encourage faculty members to evaluate their personal pedagogical predilections and the impact that they might have on student learning in doctoral courses;
  (c) distinguish between the mathematics education doctoral programs offered in the Department of Mathematics and the Department of Science and Mathematics Education; and
  (d) Establish a consistent policy for doctoral student advising based on input from students and faculty.

- Pursue the establishment of a university-wide Center for Research on Lifelong STEM Learning, but be mindful of the impact of Center affiliation on both opportunity for and productivity of faculty and students.

- Track faculty workload by program.

- Develop a plan and secure support from the Deans of the Colleges of Science and Education to regularly update computers and other forms of technology used for instruction and research.

- Collect, analyze, and report on an ongoing basis data on completion rates, time to completion and placements of all graduate students. Also, provide annual student reviews and summary evidence of faculty performance.
Table A1. Number of Matriculated Graduate Students by Degree Level, Concentration and Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Concentrations in PhD</th>
<th>PhD</th>
<th>Concentrations in Licensure</th>
<th>MS Licen.</th>
<th>Concentrations in Online MS Program</th>
<th>MS Online</th>
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Table A2. Number of Graduates by Degree Level, Concentration and Year

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<th>Year</th>
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<th>MS Licen.</th>
<th>Concentrations in Online MS Program</th>
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* Within the math and science concentrations, students elect specific course work in either K12 teaching, collegiate teaching, or free-choice learning.

**Faculty Performance**

Current external funding by SMED faculty averages about $150,000 per FTE and has been increasing each of the last five years. Faculty receives the majority of funding from NSF, NOAA, Department of Education, and the Noyce Foundation. A cursory examination of vitae suggests that each year tenure-track faculty (5.5 FTE) publish about 25 first-author peer-reviewed papers or chapters. Many more papers are published where faculty are not the first author. Each year, tenure-track faculty successfully competes for peer-reviewed presentation slots at major international conferences, in their respective fields.

**Faculty Honors and Awards**

Faculty members are recognized locally and nationally for their work. It is hard to summarize the general nature to these awards. Faculty are recognized for both scholarship and leadership within their profession. Below is a sample of awards over recent years.

Dr. Shawn Rowe received the 2011 Emerging Scholar Award from the OSU chapter of Phi Kappa Phi.
The American Association of Colleges recognized Dr. Rebekah Elliott and her collaborative team with the 2010 award for Outstanding Paper in the *Journal of Teacher Education*.

Dr. John Falk and Dr. Lynn Dierking were presented with the *John Cotton Dana Award for Leadership* at the American Association of Museums meeting in L.A. 2010.

Dr. John Falk appointed to the Governor’s Task Force on No Oregon Child Left Inside as Oregon University System representative, 2009.

Dr. Larry Flick received the Fred Fox Distinguished Service to Science Education Award from the Oregon Science Teachers Association, 2007.