

Proposal Information

Type:

Program Change Request

Title:

Program Change Request: Integrated Science Secondary Education BS

Log Number

9050-2015

College:

College of Liberal Arts and Sciences

Department:

Integrated Science Program

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Program Change Request

Summary of Changes

Program Title

Integrated Science Secondary Education Major

Type of Request:

- Change in Program Requirements

All Bachelor of Science degree programs must include at least three courses that focus on mathematics, statistics, quantitative reasoning, or scientific analysis. At least two courses must be outside of the General Education Foundations category. At least one course must build upon the expertise developed in the General Education Mathematical Sciences category by requiring a General Education Mathematical Science course as a prerequisite.

All Bachelor of Arts degree programs must include at least three courses that focus on culture, arts, philosophy, or language. At least two courses must be outside of the General Education Foundations category. All Bachelor of Arts programs must require third-semester proficiency in a classical or modern language.

1. Describe each change and give a rationale for each one.

This Program Change proposes to replace the current Integrated Science (ISCI) Secondary DI Endorsement with a Comprehensive ISCI Secondary Education Major. Pre-service teachers at GVSU currently become certified to teach two science disciplines in grades 6-12 after completing a teachable major and a teachable minor in Biology, Chemistry, Earth Science or Physics, plus a major in Secondary Education from the College of Education, and then passing the Michigan Department of Education (MTTC) subject area tests in the two chosen content areas. The ISCI Secondary DI Endorsement was originally created as an "add-on" to this initial secondary certification. The additional endorsement requires the completion of a breadth of science coursework across all four science disciplines and a passing score on the Integrated Science Secondary MTTC test, and better qualifies teachers at the middle school level, where there is a more integrated approach to teaching science in courses like General Science, Integrated Science, Environmental Science, etc. However, the ISCI Secondary DI Endorsement also certifies teachers to teach Biology, Chemistry, Earth Science and Physics at the high school level, from introductory through AP curriculum. For this reason, the ISCI Secondary DI Endorsement has become a high-demand requirement for securing a 6-12 grade science teaching job in the state of Michigan, as teachers that hold the endorsement can fill a vast variety of positions in a school district. GVSU has awarded 12 ISCI Secondary Endorsements in the last 2 years, and 20 additional students are currently working on completing the endorsement coursework. Most universities and colleges in Michigan now offer this endorsement as a secondary education major, taken either in conjunction with another science major or minor, or as a standalone comprehensive major, as we are proposing here.

It is a key objective for the GVSU ISCI Program to offer the highest quality curriculum to support the success of our students as future teachers. The Comprehensive ISCI Secondary Education Major proposed here (see "Comp ISCI Secondary Education Major Snapshot" document) provides students with as much content depth as possible in each of four science disciplines, while also covering the breadth of content necessary to teach from general science in middle school through AP science in any of the four disciplines at the high school level. This Comprehensive ISCI Secondary Education major will make these GVSU pre-service teachers among the most prepared (see the Peer Institution Comparison document) and the most marketable for the 6-12 teaching workforce in Michigan.

The proposed ISCI Secondary Education major introduces a few changes in the curriculum from those required by the "add-on" ISCI Secondary DI Endorsement currently in place (see "Comparison of Current ISCI DI and Comp ISCI Major" document).

- 1. Because of the Michigan Department of Education certification parameters, students with the Comprehensive ISCI**

Secondary Education major that pass the ISCI Secondary MTTC Test will be certified to teach grades 6-12. Students taking this major will therefore not be required to take a primary science major or minor in conjunction with the Comprehensive ISCI Secondary Education major. The ISCI Program cannot offer an ISCI major in addition to discipline specific science major, as students would therefore have to "triple major" in order to also complete the Secondary Education major required by the College of Education for their Secondary certification requirements. The proposed Comprehensive ISCI Secondary Education major therefore proposes as much content depth and rigor in each of the four science categories as possible.

2. Two additional content courses are required in Earth Science, one additional content course is required for both Chemistry and Physics disciplines, and one less course is required in the Biology area as compared to the current endorsement course list. This was done to create a balance of content between the four science disciplines, while addressing all key science concepts in each area at a depth necessary for high school content teaching. This major offers a more equal distribution of content as compared to the current list of ISCI DI Endorsement courses. MTTC pass rate data show that ISCI Secondary Endorsement students currently struggle more in the Earth and Physical Science areas than in the Life Science areas. This equally balanced curriculum should better support these areas of weakness.

3. The content requirements and rigor of coursework in this Comprehensive ISCI Secondary Education major have been carefully evaluated to ensure complete coverage of content taught in grades 6-12, including AP course content. The realities of the Michigan Secondary Education job market are that this endorsement is necessary to get a job teaching science at the secondary level. In addition, teachers with this certification are placed in a variety of classrooms and must be prepared to teach general science courses at the middle school level through AP science courses in any of the four disciplines at the high school level. The proposed list of courses best prepares teachers certified with this major to teach successfully in any of these classrooms (see attached ISCI Second new MTTC grid and NSTA Science Content Analysis Form New Program).

4. The gpa requirement for certification in the Comprehensive ISCI Secondary Education major has been raised from 2.7 to 3.0.

Students that struggle to meet the current 2.7 gpa requirement for Admission to the College of Education are those that show the lowest pass rates on the MTTC tests in the subject areas, as they are less proficient in content knowledge. Raising the gpa standard for secondary education certification in this major increases the expectation of high content proficiency and promotes excellent teachers in secondary science classrooms. Once the ISCI Secondary major curriculum is complete, students apply for admission to the College of Education, where they take coursework in Secondary Education major and fulfill their Teacher Assisting and Student Teaching semesters. During the application process, student transcripts are checked by the ISCI major advisor and the College of Education advisor for meeting the gpa requirements.

5. Three credits have been added to accommodate two new SCI courses in science education pedagogy (see grouped New Course Proposals for SCI 440 and SCI 450). SCI 450 will replace GEO319, a pedagogical content course that is a requirement in the current ISCI Secondary Endorsement. SCI 440 is the new course representing pedagogical content knowledge in physics and chemistry disciplines. This course provides the additional 3 credits in the major. These courses in science education pedagogy align with those found in Integrated Science Secondary majors at peer institutions. In addition, the Michigan Department of Education content guidelines for the Integrated Science DI Endorsement include objectives related to scientific inquiry skills and teaching pedagogy that will be covered in these courses. Furthermore, the Integrated Science MTTC test for secondary certification assesses knowledge in these areas as well.

The two new Integrated Science courses, SCI 440 and SCI 450, will provide students taking the ISCI Secondary Major with science process skills and pedagogical instruction in teaching each science discipline using an integrated approach. SCI 440 models effective teaching pedagogy for physical sciences (chemistry and physics), while SCI 450 integrates biology and earth science disciplines. Courses that instruct students in how to effectively teach science disciplines have been highly successful in the Chemistry Secondary Education Major (CHM 419) and the Earth Science Secondary Education Major (GEO 319), augmenting the content-specific coursework in these programs. SCI 440 and SCI 450 have modified these effective courses to integrate pedagogical methods in secondary

education for all four science disciplines in the ISCI Secondary Education Major. We anticipate these SCI courses will eventually replace CHM 419 and GEO 319, and therefore will not require additional faculty to teach them. SCI 450 will also serve as the capstone experience for the ISCI Secondary Education Major, integrating science content from major coursework and providing culminating experiences in how to teach science and develop integrated science curriculum. In addition, SCI 450 will have an SWS designation for the General Education curriculum requirement.

6. In most cases time to graduation and ISCI Secondary certification will be faster with the Comprehensive ISCI Secondary Education major, than with the current route of taking a science major, a science minor, and the remaining ISCI Secondary DI Endorsement courses, in addition to the College of Education major (see "Comp ISCI Secondary Catalog Copy" for 4 year coursework plan). In addition, understanding the coursework plan for the Comprehensive ISCI Secondary Education major will be easier for students, and it will be a more visible option for freshmen entering GVSU. A single list of coursework for the ISCI Secondary Education major puts less demand on advising than a program that requires a science major, a science minor and the non-overlapping "add-on" ISCI DI Endorsement courses.

Currently, administration of the ISCI Secondary DI Endorsement is handled by the CLAS Advising Center, which assesses each prospective student's coursework to date and puts together a curricular planned program for completing the endorsement coursework at GVSU. These students are typically either currently in progress with their primary science education major and minor, or are teachers in the field returning to add the endorsement. After seeing the planned program generated by the CLAS Advising Center, a student then decides whether to complete the outstanding courses toward the endorsement at GVSU. Creating these plans for each student takes a considerable amount of workload for the CLAS Advising Center (roughly a dozen plans per year and growing), and this work happens prior to students making the choice to commit to the program. The proposed Comprehensive ISCI Secondary Education Major will remove much of this prerequisite work from the CLAS Advising Center. Students would enter GVSU able to declare the ISCI Secondary Education Major that would then be tracked directly in Banner. There are no overlapping

courses from primary majors and minors to be evaluated. Transfer students, and those few that wish to enter the College of Education GTC Graduate program will still require the services of the CLAS Advising center, but we anticipate the majority of those who wish to receive the ISCI Secondary DI Endorsement in the future will do so as an undergraduate major. In addition, because the current ISCI DI Secondary Endorsement is not offered as an undergraduate major, we have had several science secondary education graduates not aware of just how valuable this endorsement is until they attempt a job search for a secondary teaching position. At that point they must return to GVSU for additional coursework to complete the ISCI DI Endorsement. The proposed Comprehensive ISCI Secondary Education major simplifies the route for obtaining the necessary endorsement and makes it a more visible option for undergraduate students pursuing a secondary education degree.

Regarding a timeline for transition from the current ISCI Secondary Endorsement to the new program, we propose that students that have a Planned Program in place from the CLAS Advising center will be allowed to complete coursework for the Endorsement under the old curriculum. Upon approval, the new ISCI Secondary major will begin with incoming freshman in the following fall semester. Students transferring into GVSU at that time, or coming back to pick up the Endorsement post-baccalaureate will need to comply with the new ISCI Secondary requirements in order to receive the endorsement. In this case, any overlapping curriculum will be waived.

2. Explain how these changes will strengthen and improve the curriculum and/or how these changes align with unit goals.

The current state of science education in Michigan is driving the high demand for secondary teachers to have the ISCI Secondary DI Endorsement. Teachers that have the endorsement are in high demand as school districts seek to hire teachers that can be placed in a wide variety of classrooms, from middle school through high school AP. The proposed Comprehensive ISCI Secondary Education Major will create an avenue for students to enter directly into this curriculum as an undergraduate, following a clear curriculum pathway to successful completion, and bypassing the need for a science major and minor before adding on the endorsement. Therefore, this major will address one Integrated Science Program goal of paving a clear path for students through college to successful job placement. This is a high-demand major that will put pre-service teachers in an excellent position for job placement in Michigan schools. We believe the greater visibility of this major in the GVSU academic catalogue will also increase the number of students pursuing the ISCI Secondary DI Endorsement at GVSU

and increasing enrollment in ISCI Program majors (another goal of this unit).

The ISCI program is also intent on making sure pre-service teachers are best prepared to effectively teach science content at a level equivalent with professional field expectations. Teachers who are unprepared to teach in specific science content areas have especially high attrition rates. The proposed Comprehensive ISCI Secondary Education Major provides the appropriate rigor and content depth for students to enter any grade 6-12 classroom and teach from middle school through high school Advanced Placement curriculum with a secure discipline content foundation in all four science areas. Peer institution comparison clearly shows this proposed curriculum with among the highest rigor in the State of Michigan. We want to continue to increase our ISCI Program visibility and reputation, and that of GVSU as well.

Important data supporting content depth and rigor in the Comprehensive ISCI Secondary Education major are the MTTC scores for secondary education certification. Students perform well on the MTTC subject area tests (Biology 84%; Chemistry 87%; Earth Science 73%; Physics 100%) when they have completed a major in the discipline (see table below). Minor pass rates fall below those for majors in all science disciplines (Biology 56%; Chemistry 67%; Earth Science 50%; Physics 88%). These data are concerning, especially in the context of assessment and accreditation for the College of Education. The data suggest that a high degree of rigor and depth in coursework is required for content proficiency in these science disciplines. Presumably, this content proficiency translates into increased preparedness for classroom instruction. The ISCI Program is committed to preparing preservice teachers with as much content depth in all four science disciplines as possible with the Comprehensive ISCI Secondary Education major.

MTTC Pass Rates Fall 2010 - Winter 2014

Biology

Majors	84%	n=51
Minors	56%	n=62

Chemistry

Majors	87%	n=15
Minors	67%	n=45

Earth Science

Majors	73%	n=11
Minors	50%	n=38

Physics

Majors	100%	n=6
Minors	88%	n=17

Integrated Science

DI Endorsement	71%	n=21
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Students taking the Comprehensive ISCI Secondary Education major are required to pass the MTTC Integrated Science Secondary test instead of the specific subject area tests. MTTC data above show that students have a 71% pass rate on the Integrated Science test over the last four years, following completion of the current ISCI Secondary DI Endorsement add-on curriculum. Breaking out the data by subject area reveals that students currently score lowest on the Earth Science and Physical Science areas of this test. The Integrated Science Program takes an evidence-based approach to curriculum revision. The more balanced coursework in the Comprehensive Secondary Education major increases the coursework and rigor specifically in these areas, which we anticipate will translate into higher pass rates on this test. The level of depth and rigor in this proposed major has also been supported by each of the four science unit heads (see Letters of Support), and aligns with both state and national science standards for ISCI accreditation (see ISCI Second new MTTC grid and NSTA Second Content Analysis Form New Program).

It is an important consideration that students deciding to change their major have viable and easy options available. The Comprehensive ISCI Secondary Education major is a pathway for certification in secondary education. Students deciding to become certified in just two of the four science disciplines can easily transition into a science major and minor in any of the four science content areas to complete the traditional path to secondary education certification. ISCI Secondary Education majors that decide they are no longer interested in secondary education certification can also easily transition to complete a science major in Biology, Chemistry, Earth Science or Physics with little difficulty. Many of the courses in one science discipline are cognate courses or prerequisites for courses in other science disciplines. Due to this overlap in curriculum, students may change their major even into their third year with little affect on their graduation schedule.

It is a key objective for the ISCI Program to offer the highest quality curriculum to support the success of our students as future teachers. With the implementation of this new Comprehensive ISCI Secondary Education major we expect to see MTTC ISCI pass rates increase. It is our intent to track placement and assess attrition rates of our secondary education graduates in the field. We expect our students to be highly successful in job placement and have low attrition rates due to their preparation in both content and science pedagogy. The current state of education in Michigan demands that we send our most prepared teachers into the classroom, and the ISCI Program at GVSU is working to lead that charge with this new major offering.

3. If relevant and appropriate, compare the proposed program with other appropriate programs found locally, regionally, and nationally.

The ISCI Secondary Education Major is found almost exclusively in Michigan. Programs in other states do exist for teaching general science in middle school, but none are equivalent to the curriculum objectives articulated by the Michigan Department of Education allowing certification to teach specific science disciplines through

grade 12.

The following peer institutions provide degrees that support the ISCI Secondary DI Endorsement, and qualify teachers to teach general science in middle school through AP curriculum in high school. These schools have ISCI Secondary majors in place that are similar to that proposed by the ISCI Program at GVSU.

GVSU Comprehensive ISCI Secondary Education Major:

- 83 science and math credits
- 6 credits in science teaching pedagogy

University of Michigan Comprehensive ISCI Major:

- 82-83 science and math credits (includes 12 credits of Calculus and 3 credits of Differential Equations)
- 3 credits in science teaching pedagogy

University of Michigan ISCI Major:

- Requires science minor in Biology, Chemistry, Earth Science or Physics
- Overlapping coursework waived from ISCI Secondary Education Major
- 66 science and math credits (includes 12 credits of Calculus and 3 credits of Differential Equations)
- 3 credits in science teaching pedagogy
- Need at least 45 non-overlapping credits with the minor

Western Michigan University:

- Requires first major in Biology, Chemistry, Earth Science or Physics
- Overlapping coursework waived from ISCI Secondary Education Major
- 63 science and math credits
- 7 credits in science teaching pedagogy courses

Michigan State University:

- Requires first major in Biology, Chemistry, Earth Science or Physics
- Overlapping coursework waived from ISCI Secondary Education Major
- 48 science and math credits
- 7 credits in science teaching pedagogy

Calvin:

- Requires science minor in Biology, Chemistry, Earth Science or Physics
- Overlapping coursework waived from ISCI Secondary Education Major
- 51 science and math credits
- 9 credits in science teaching pedagogy

We have attached a complete comparison analysis of coursework in all Michigan Institutions that offer an Integrated Science Secondary degree (see Peer Institution Comparison in supporting documents). The major we propose here has among the highest rigor in the state and aligns with other institution coursework in all four disciplines, as well as math cognates and pedagogical content courses.

Desired target date for implementation:

Fall 2016

If this proposal is part of a larger package of changes (e.g., program change request, new courses, or course changes)? You **must** group all related proposals together in the online system to facilitate review.

If some courses in the proposed program are housed in units outside that of the parent program, contact those units with a request for comments. Units may enter their comments directly into the online system's Comments box for this proposal. Alternatively, copies of interdepartmental communication can be attached to this proposal by the proposer as a Supporting Document.

Curriculum Resource Statement

Faculty/Staff Resources

Describe how faculty workload will be affected by this proposal.

The proposed ISCI Secondary major courses are all currently taught by faculty in their respective disciplines. The new SCI440 course will replace CHM 419 and SCI 450 will replace GEO 319, so there is not a net increase of courses in the catalog. SCI 440 and 450 each require 2 additional load credits, which will be filled by the ISCI Affiliate faculty (for SCI440) and shared between Earth Science and Biology ISCI program faculty. Since these courses are only taught once per year, this is a minor increase in workload for any one faculty member in any given year. In addition, since the number of ISCI Secondary majors will be relatively small, it will not significantly increase enrollment levels in the major courses and so workload will not be affected at all in those areas.

Library Resources

If this proposal requires additional library resources, provide an evaluation of those additional library resources.

N/A

Computer Resources

If this proposal requires additional computer resources, discuss any expansion of existing resources or need for additional resources (lab space, software license, etc.).

N/A

Classroom Resources

If this proposal requires additional classroom resources beyond the standard room with a lecture computer, projector, and whiteboard, describe any additional classroom resources required for this proposal.

N/A

Equipment Resources (non-computer)

If this proposal requires additional equipment resources (non-computer), provide an evaluation of those additional needed resources with estimated costs.

N/A