THE UNIVERSITY OF UTAH®

February 14, 2025

Mid-Cycle Self-Evaluation Report

for the Northwest Commission on Colleges and Universities

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1 - Mission Fulfillment

The University of Utah is one of 16 public colleges and universities in the Utah System of Higher Education (USHE) and one of two research universities. It is the only university with an academic health sciences center among that group of 16 and has a special responsibility for the state and its residents. The university adheres to policies and is guided by priorities set by the USHE Board in compliance with Utah legislation, and it has been regionally accredited by NWCCU since 1933.

The university's stated mission is:

Mission

> *The University of Utah fosters student success by preparing students from a diversity of backgrounds for lives of impact as leaders and citizens. We generate and share new knowledge, discoveries, and innovations, and we engage local and global communities to promote education, health, and quality of life. These contributions, in addition to responsible stewardship of our intellectual, physical, and financial resources, ensure the long-term success and viability of the institution.*

University of Utah President Taylor Randall has further articulated a vision and guiding statement as part of Impact 2030, an emerging strategy for the coming decade:

Vision

> *To improve the lives of all Utahns and to advance a new national higher education model for delivering societal impact.*

Guiding Statement

> *The University of Utah drives unsurpassed societal impact by preparing students from diverse backgrounds to be leaders and global citizens who strengthen our society and democracy; generating and sharing new knowledge, discoveries, and innovations that supercharge our economy and improve lives locally, nationally, and globally; and engaging local, national, and global communities to promote education, health, and quality of life.*

The Mission, Vision, and Guiding Statement are consistent with and support USHE priorities, including workforce development, operational excellence, shared services, and access to affordable education. The Mission statement provides guidance for strategic planning, allocation of resources, and new initiatives that are delivered in alignment with the Vision and Guiding Statement.

Strategic Planning Process

In accordance with NWCCU Standard 1.B, the university uses an inclusive planning process to set and articulate meaningful goals, objectives, and indicators of its goals to define mission fulfillment and improve its effectiveness. The past five years of institutional advancement have been guided by a strategic roadmap that was developed in spring 2019 with input from thousands of faculty, staff, students, alumni, and community members. Strategy 2025 was the result of this planning process. This vision for the last five years was guided by four core goals:

1. Promote student success
2. Develop and transfer knowledge
3. Engage communities to improve health and quality of life
4. Ensure the long-term vitality of the institution

All strategic and resource allocation decisions at the university were evaluated according to their support of the advancement of these goals. The performance indicators and the university's progress in achieving the goals, as of December 2024, are available on the Strategy 2025 website and are shown in the graphic below. Further, in support of advancing the university's mission and strategic priorities, all colleges, schools, and academic support units submit an annual "enterprise plan" as part of budget planning. All units conducted internal SWOT (strengths, weaknesses, opportunities, and threats) analyses and refreshed or developed new strategic plans in AY24, which align resource allocations with student success initiatives and priorities. The enterprise planning process for AY25 is currently underway.

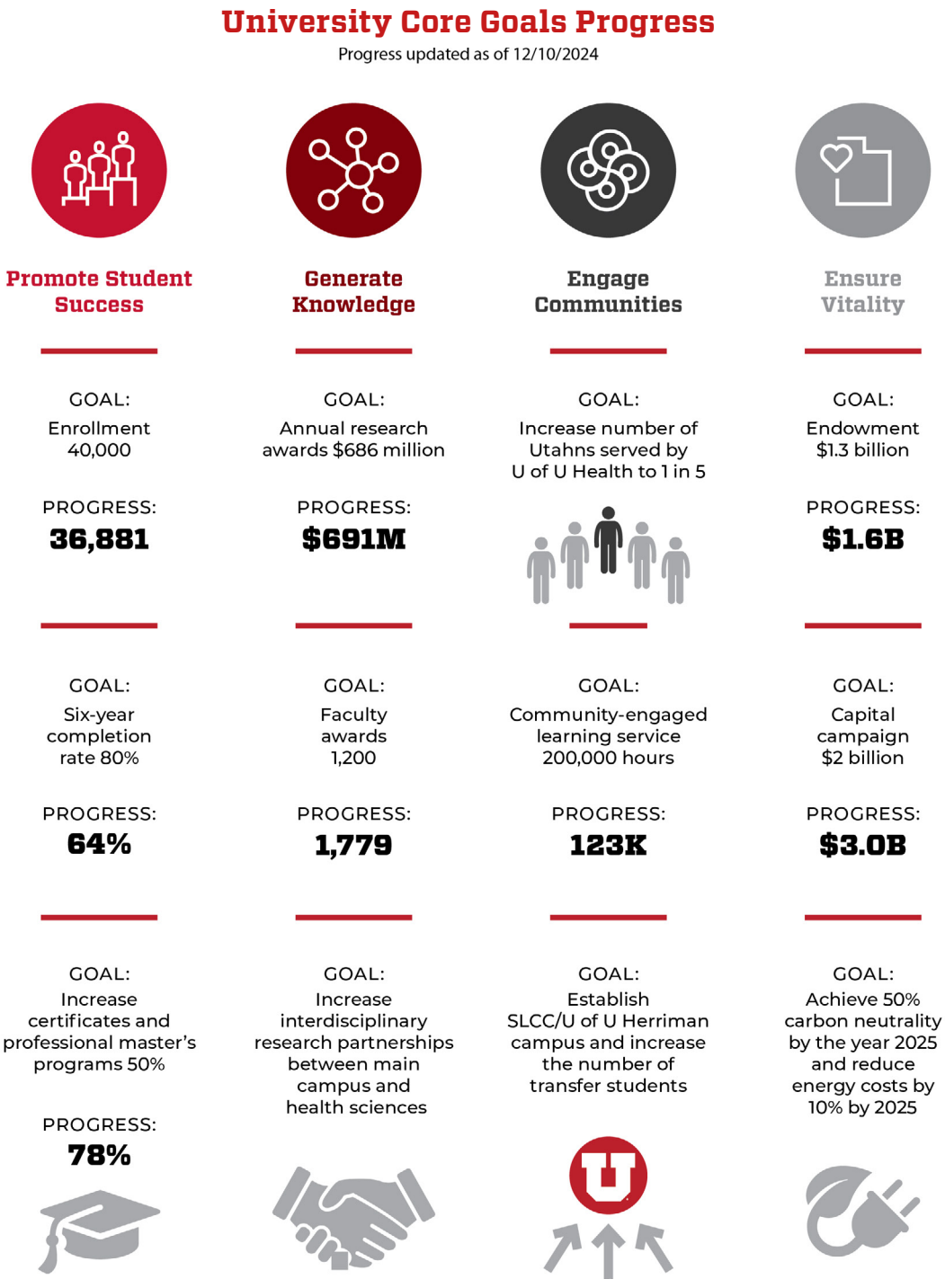

Figure 1: University of Utah Core Goals

Ongoing Evaluation and Planning

To build on the momentum and refine the framework of Strategy 2025, President Randall launched the planning process for Impact 2030 in January 2024. The vision for this new strategy is to improve the lives of all Utahns and to advance a new higher education model, becoming a top 10 public institution for delivering societal impact. Structurally, the planning process included three phases.

Phase 1: In March and April of 2024, the President's Leadership Council (PLC) held listening sessions with faculty, staff, students, alumni, and campus leadership. The participants gave feedback regarding the following areas of interest:

- Societal Impact
- Advancing Research
- Undergraduate Student Enrollment and Success
- Graduate Student Enrollment and Success
- Faculty Retention, Recruitment, and Well-Being
- Staff Retention, Recruitment, and Well-Being
- Community Outreach and Engagement
- Communications and Marketing

Phase 2: In summer 2024, feedback from the listening sessions was analyzed, and the PLC identified themes. Many respondents voiced a shared vision of the university adapting to emerging trends in education and health care, ensuring long-term relevance and impact. The council examined ways these themes could influence the university's success in comparison to regional and national peers, and they began to identify how to address strategic imperatives through research, community engagement, and other planning activities.

Phase 3: In fall 2024, the PLC developed an implementation plan that identified resources critical to success and defined mechanisms and metrics to gauge progress toward achieving the university's vision over time.

The university's efforts to implement Impact 2030 will be described in the **Moving Forward** section of this report.

2 - Student Achievement

Overview of Student Achievement Measures

University Analytics and Institutional Reporting (UAIR) serves as the official source of information for the University of Utah, providing a wide array of student achievement metrics, both public- and institutional-facing. These reports are regularly presented in interactive dashboards, allowing the user to define a variety of parameters such as major, demographic, or year. In general, these dashboards provide empirical evidence of student achievement at a few different levels.

Benchmarking and Peer Comparisons

As a member of the AAU with a strong focus on health care, the University of Utah benchmarks its student achievement efforts against peer institutions with similar characteristics; specifically, public AAU institutions with hospitals. The university occasionally benchmarks against other institutional members of the University Innovation Alliance, of which the University of Utah is also a member.

UAIR maintains a public dashboard called the Peer Comparison Tool. This dashboard offers users the ability to compare the University of Utah to a variety of peers, including other research universities and the member AAU institutions. In accordance with NWCCU Standard 1.D.3, the institution uses information gained from peer comparisons for continuous improvement to inform planning, decision making, and allocation of resources.

The dashboard allows for comparison of indicators such as retention and graduation rates, tuition rates, and enrollment. Where possible, the data are disaggregated by gender, race/ethnicity, and Pell status. The peer comparison dashboard also includes five years of longitudinal data so rates can be tracked and compared to peers over time. These comparative data show that the University of Utah's six-year graduation rates have been declining and are low when compared to public AAU institutions with hospitals. Improving this rate continues to be a strategic priority and motivates commitment to Navigate U's Activate projects. *(See p. 6 for more information about Navigate U.)*

Table 1. Comparative Six-year Graduation Rates, through 2022-23

	2018-19	2019-20	2020-21	2021-22	2022-23
University of Virginia-Main Campus	95	94	94	95	95
University of Michigan-Ann Arbor	93	93	94	93	93
University of California-Los Angeles	92	91	92	92	93
University of Florida	88	89	91	90	91
University of Wisconsin-Madison	88	88	89	89	89
University of California-San Diego	87	87	9	88	88
The University of Texas at Austin	86	88	88	88	88
The Ohio State University-Main Campus	86	87	88	88	88
University of California-Irvine	84	85	84	87	86
The Pennsylvania State University-Main Campus	72			83	86
University of California-Davis	87	86	87	86	85
Rutgers University-New Brunswick	84	84	84	84	85
University of Washington-Seattle Campus	84	82	84	84	84
Stony Brook University	76	76	78	78	78
University of California-Riverside	76	77	76	76	77
University of Missouri-Columbia	71	73	73	75	76
University of Iowa	72	72	74	74	73
University of Buffalo	75	75	74	74	73
University of Arizona	65	65	64	68	66
University of Utah	70	67	67	65	64

While the university pays close attention to external comparisons on key metrics, a new focus internally is on other metrics that indicate student success. A diagnostic report from the National Institute for Student Success (NISS) in June 2024 highlighted the need for improved access to, and use of, data to proactively support students. In response to this need, analysts from multiple academic affairs units were centralized to the UAIR office. This is one of several changes that have supported the wider dissemination of actionable data across campus. The move promoted efficiency while bringing together more analysts who work from the common data sets to coordinate, collaborate, and prioritize.

UAIR has analysts dedicated to student success analytics, and the office distributes reports that are both longitudinal and inclusive of leading and lagging indicators of student success. The office is also developing and expanding real-time reporting on indicators of student journey progress. UAIR members participate in regular meetings across campus that focus on indicators related to student success, and data are being shared more widely than ever before. UAIR analysts frequently attend meetings to teach where and how to access data and demonstrate how the data can be used. UAIR's direct participation in meetings involving the users of data creates an immediate feedback loop that drives continuous improvement of data resources and fosters a culture that is data informed.

General Education Reimagined

Through the General Education Reimagined effort, the university has implemented a new General Education and Baccalaureate Degree (GE/BD) requirement structure, approved in spring 2023 and launched in fall 2024. The structure is precisely aligned with state policies, facilitates GE program assessment (See 5—Update on Recommendation from 2022 EIE Review), and supports students by reducing the total number of required credits, saving students up to a full semester of tuition and fees. The approval and implementation of this streamlined structure demonstrates the university's commitment to persistence and timely degree completion for every student through the GE and BD curriculum, regardless of degree pathway.

All incoming students beginning with the fall 2024 semester follow the new requirements. Students admitted and enrolled before fall 2024 can migrate to the new requirements. As of January 15, 2025, 41% of students admitted before fall 2024 have transitioned to the new requirement structure. This number will continue to increase, highlighting the significant impact of the GE Reimagined effort and providing evidence of institutional efforts to enhance graduation rates.

In addition, the new requirement structure aligns directly with Utah Code R470, ensuring consistency with state standards and facilitating seamless transfer pathways to the University of Utah. This alignment supports access to Utah's flagship institution, enabling transfer students to integrate smoothly into academic programs and reducing barriers to degree completion. The new structure underscores the university's role in advancing educational opportunities for students across Utah.

Navigate U

The University of Utah is committed to fostering student success and equity through a systematic approach to self-reflection and continuous improvement. This is encapsulated within the Exceptional Educational Experience (E^3) Framework. The student success effort is operationalized through Navigate U—a student success strategy and series of projects designed to enhance persistence, completion, and postgraduation success.

The university leverages data-informed decision-making and targeted interventions to support student achievement. Navigate U's Activate projects are instrumental in addressing equity gaps and improving student outcomes, particularly through efforts such as the Tackling High-DEWI Course Rates project, which focuses on reducing failure and withdrawal rates in critical courses to enhance retention and completion rates. Additionally, the use of Navigate throughout the university allows students to engage the support they need when they need it or receive an immediate, direct referral across departments and programs.

Figure 2: Navigate Hubs

The University of Utah is designing a new approach to delivering support services to students, called Navigate Hubs, which are shared resource centers to enhance student support and streamline access to key services. For example, the Navigate Hub for Exploring Students provides tailored guidance for those still deciding on their academic path. The Navigate Hub for Liberal Arts and Sciences Students focuses on holistic advising and cross-disciplinary resources. Future hubs will expand shared services within and across traditional college and school structures, fostering collaboration and equal access to student success resources.

The university has made significant progress in advancing student outcomes, particularly in coordinated academic advising. From Sept. 9-20, 2024, the campus hosted 10 academic advising training sessions, achieving a 99.22% completion rate among academic advisors and a 93.45% completion rate for all advising staff and supervisors.

The implementation of a duplicate transfer course query has successfully reduced instances of students enrolling in courses for which they have already earned credit, with the number of such cases decreasing from 70 students in fall 2023 to just one in spring 2025. Additionally, the implementation of EAB Navigate has standardized academic advising practices across campus, with over 75,000 appointments and nearly 950 referrals issued in 2024 alone, underscoring the platform's role in strengthening coordinated support for undergraduate students.

In addition to proactive academic advising, the University of Utah has made strides in managing and monitoring course fill rates to ensure efficient scheduling and resource allocation. A structured approach was implemented in 2024, including daily monitoring of enrollment data through the CourseLeaf Section Scheduler (CLSS) platform and active use of waitlists. This initiative, fully implemented via a collaboration with the Office of the Registrar, Office of Undergraduate Studies, and schools/colleges for spring 2025, involved analyzing historical enrollment patterns, engaging department heads in regular planning meetings, and utilizing advanced analytics to predict enrollment trends and identify course demand. Key interventions, such as flexible scheduling practices and the opening of additional course sections, have optimized course availability and enhanced the student experience, positioning the university as a leader in responsive, student-centered scheduling practices.

Additional Activate Projects in support of Navigate U include:

- Academic Advising for Students-in-Transition: Supporting students in transition between majors to maintain momentum toward degree completion.
- Developing and Maintaining Functional 4-Year Degree Plans: Providing a roadmap for students' academic journey to improve timely completion.
- Academic First Experiences: Building foundational skills and connections for first-year students to support retention and success.
- Syllabus Transparency: Improving the posting of syllabi to advance student success efforts.

More about these projects and outcomes can be found on the Navigate U website.

Equity Gaps and Disaggregated Data

Through campus-wide use of EAB Navigate, the university monitors student achievement through disaggregated data across categories including race, ethnicity, age, gender, socioeconomic status, first-generation status, and Pell Grant eligibility. These data inform strategies to close equity gaps and support underserved populations, reflecting the university's commitment to dismantling barriers to academic success. Key initiatives to address equity gaps include:

- High-DEWI Project: Reducing failure rates in high-enrollment, high-impact courses.
- Center for First-Generation Success: Targeted programs for first-generation and low-income students to promote belonging, retention, and completion.
- Peer Education Programs: Leveraging student peers to support the academic and social engagement of undergraduate students through instructional support, academic and themed learning communities (Quest), and embedded peer mentoring programs.

In addition to the aforementioned tactics, the University of Utah has partnered with Inside Track, a member of the Strada Education Foundation, to implement their evidence-based coaching model to directly impact the success of all students and increase equity–with impressive outcomes. In the first year of the coaching program, 2022-23, the overall retention of students who were coached versus non-coached was 84% compared to 80%. The largest impact was seen with Pell-eligible students, as well as first-generation and students of color. Coached versus non-coached retention for those student groups are as follows:

- Pell-eligible—93% vs. 75%
- Students of color—86% vs. 79%
- First-generation students—84% vs. 77%

Similarly, for the 2023-24 academic year, all students who were coached—including students of color, Pell-eligible, and first generation—had significantly higher retention rates when compared to their non-coached peers.

The University of Utah also developed a learning community program for exploring first-year students, the Quest academic learning community. Quest offers four academic seminar courses that meet multiple general education and baccalaureate requirements and provide students with opportunities to consider the ethical dimensions of problem solving and action, a key learning objective at the university. Within Quest courses, students are introduced to integrated university support as they make early decisions around majors and career pathways. Each class section is assigned a specific academic librarian, student success coach, early career coach, and academic advisor to directly assist students with support services from their first days at the university. Students learn the importance of engaging with these individuals and units to reach their academic and future goals.

Quest further helps build students' immediate sense of belonging at the university with participation in Quest social, community service, and academic peer events. Quest includes a rich network of peer mentors and tutors who provide both social and academic support within these student-centered events and in direct consultation in open study groups offered every weekday evening on campus.

Growth and Strategic Goals

Aligned with the university's goal to grow to 40,000 students by 2030, outlined in the emerging Impact 2030 strategic plan, the Navigate U effort ensures that this growth is inclusive and supportive of all students. This growth strategy prioritizes maintaining academic quality, expanding access, and scaling equity-focused initiatives to support a diverse and growing student body.

The university remains committed to closing equity gaps in student success and achievement. In 2024, the institution significantly changed how it approaches some of its services designed to support those from historically marginalized backgrounds.

In January 2024, the Utah Legislature passed House Bill 261: Equal Opportunity Initiatives, which required state universities to disband centralized offices dedicated to "equity, diversity, and inclusion"—replacing them with an institution-wide focus on all students', staff, and faculty members' success, regardless of "personal identity characteristics." Subsequent guidance from the Utah System of Higher Education specified that centers related to specific identifies "must be focused on cultural education, celebration, engagement, and awareness to provide opportunities for all students to learn with and from one another." Further, "centers must not provide student success and support resources, such as academic advising, financial aid counseling, and tutoring." Instead, such resources should be accessed through the institution's "offices of student success and support, or previously established student services offices."

To comply with this law and guidance, the University of Utah's student support and cultural engagement organizational structure changed significantly. First, the Division of Equity, Diversity, and Inclusion was eliminated, and its student support functions were transferred to the Division of Student Affairs. On July 1, 2024, Student Affairs implemented foundational changes to how it approached student support work to comply with the law.

Two new centers were created:

- The Center for Student Access and Resources was established to centralize student resources like scholarship cohort coordination and support services. This center assists students with navigating challenges and connects them to resources, fulfills responsibilities associated with scholarship cohort programs, and creates additional cohort experiences open to all students.
- Among the many scholarship cohort programs run through the new center, the Miller Enrichment Scholarship supports first-generation students by covering tuition and fees, on-campus room and board, and a textbook allowance. The cohort program promotes campus involvement, community services, and leadership development. These scholarship recipients have an 84% graduation rate, compared to the national average of 26% for first-generation students.
- The Center for Community and Cultural Engagement was created to focus on multicultural education, celebration, engagement, and awareness about all cultural and social identities. Many of the celebrations managed by previously existing departments are maintained through this new center, including, but not limited to, Martin Luther King Jr. Week, Pride Week, Women's Week, and heritage and history months. During its first semester of operation, the center documented more than 1,000 student interactions, created five programs, hosted six events, maintained more than 20 community partnerships, created five committees to plan key events, and had more than 100 staff and faculty members apply for the center's advisory board.

In this new model, the Women's Resource Center, LGBT Resource Center, the Center for Equity and Student Belonging, and the Black Cultural Center student support services that are not allowed under the law were incorporated into the Center for Student Access and Resources. The cultural and community engagement functions of the four centers were incorporated into the Center for Community and Cultural Engagement.

The University of Utah's commitment to student success is reflected in its robust frameworks, strategic initiatives, and data-informed practices. By addressing equity gaps, leveraging comparative benchmarks, and aligning with state and institutional goals, the university ensures that all students can thrive and achieve their educational and professional aspirations.

Graduate Student Access and Success

The president's goal to grow the university to 40,000 students by 2030 includes growing the number of graduate students to 10,000, maintaining an approximately 3:1 undergraduate-to-graduate student ratio. That ratio is comparable to peer institutions, including many aspirational peers.

Prior to the pandemic, graduate enrollment had grown by approximately 1,000 students over the course of a decade, peaking in fall 2021 at 8,598. Enrollment fell slightly in 2022 and 2023 to below or approximately 8,400 but recovered in fall 2024 to 8,817 students, which is a record for graduate student enrollment. The self-reported gender balance has been steady at approximately 50/50 female/male. In Academic Year 2024, 3,187 graduate students were awarded 2,370 master's, 366 doctoral, and 461 professional degrees. Graduate student demographics are reflective of the state's demographics, though slightly more diverse overall when compared to 2020 Census data. Demographics have shifted slightly since 2020, with the most significant change being an approximately 40% increase in international graduate student enrollment (from 1,069 to 1,543).

Assuring that graduate school is affordable and accessible is a priority for the University of Utah. The university has sustained a relatively low tuition cost and offers programs that provide financial access, including WICHE discount programs, residency opportunities, and numerous financial support opportunities. Graduate student housing can be challenging due to rising housing costs in the Salt Lake Valley. Access to affordable housing continues to be a strategic initiative for the university, *as highlighted on p. 18*.

As the university anticipates continued growth, it is committed to ensuring a continuously improving experience for graduate students and postdoctoral scholars. The Graduate School Office of Graduate Education and Postdoctoral Affairs exists to foster excellence across the university by providing programs, administrative structure, and leadership to ensure quality and integrity in graduate and postdoctoral education and experiences. In 2023, as part of these efforts to continuously improve, President Randall charged a group of faculty, staff, and student leaders to assess the state of the graduate student experience and make recommendations for improvements. That Presidential Task Force on Graduate Student Support shared a summary of the findings with the university community in a June 2023 final report. The observations and recommendations cited in the report, the changing landscape of graduate education, and the ambitious goals of the university to grow in both size and reputation informed the strategic priorities of the Graduate School and the university.

University leadership has recognized the importance of having a Graduate School that is more accessible and outward facing. Leaders also want an office on campus that is an increasingly integral and accessible partner across all academic and research units in promoting, communicating, and facilitating excellence in graduate student and post-graduate development and resources. Consequently, the Graduate School was moved to two new locations in the summer of 2023, one of which is an outward-facing space located near the center of campus. The other, located in the university's main administrative building, is shared with the Office for Global Engagement and is adjacent to financial and student services. This investment has resulted in a significant increase in in-person interactions, particularly with graduate students who frequent the Graduate School office for meetings and resources.

To further efforts to improve communications and build trust with graduate students, as recommended in the task force report, the Graduate School worked with a group of student leaders to establish a new Graduate and Professional Student Council (GPSC). The GPSC holds events and monthly meetings with the Graduate School to discuss student needs and strengthen graduate student interactions. Likewise, the Graduate School works closely with the University Postdoc Association (UPDA) to provide professional development opportunities and build a more connected academic community.

Since the last accreditation cycle, the Graduate School implemented several changes to support graduate student access and experience. Graduate students constitute a group that has been particularly hard hit by residual effects of the pandemic, including inflation and rising health care and housing costs. Approximately one-third of graduate students are the beneficiaries of waived tuition and either a fellowship or stipend, making graduate education more accessible for qualified individuals. The tuition benefit program (TBP) provided approximately $50 million in AY24 in tuition relief to students, primarily as partial compensation for their service as either teaching (TA) or research assistants (RA), as shown below. Total payroll compensation was approximately $65 million in Academic Year 2024.

To be eligible for TBP, academic units are required to pay graduate students a minimum stipend though state funds, returned overhead, or tuition on grants or contracts. Most academic programs compensate students at a level well above the established minimum. During 2023-24, the Graduate School revised its TBP policy, increased the minimum stipend requirement by 15%, and established an annual schedule for further increases though Academic Year 2030. In addition, the university increased its support of subsidized health insurance for RAs and TAs (GSHIP) from 80% to 100% of the policy cost and negotiated an improved health insurance policy that became effective in fall 2024.

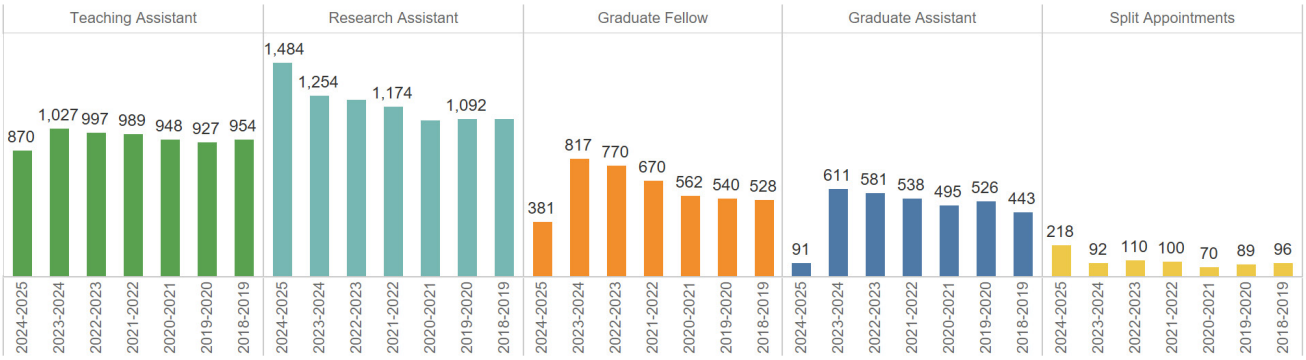

Figure 3: Graduate Students by Appointment (unique head count as of December 31, 2024)

Educational Cost and Career Success Outcomes

The University of Utah collects and assesses a variety of metrics related to student debt and employment outcomes. Borrowing activity from all sources known to the institution is analyzed for each graduating class. These data are available to university administration, including deans at the program level.

The university has lower in-state undergraduate tuition and fees compared to AAU peer publics, as shown in the chart on the following page.

Table 2: University of Utah In-state Tuition and Fee Rates

2024-25 in-state tuition and fees rates

University of Utah	**$9,620**
The Ohio State University	**$13,244**
University of Colorado-Boulder	**$15,666**
The Pennsylvania State University	**$20,644**
University of Pittsburgh	**$21,926**

Moreover, among AAU public universities in the West, the University of Utah's in-state and out-of-state tuition are both the lowest.

Additionally, in 2022-23, 67% of full-time, degree-seeking, first-time students received institutional scholarships, and 73% of full-time, degree-seeking, first-time students received scholarships or grants from all sources. For the entire 2023-24 undergraduate cohort, 75% received some form of financial support, including scholarships, grants, and loans, and 82% of graduate students received some form of financial support, including scholarships, grants, and loans. On the whole, University of Utah students are graduating with lower debt when compared to national averages, per data available. The average indebtedness at graduation for bachelor's degree students was $23,399. This compares to the average debt at graduation among all public university graduates of $27,100[1].

A variety of data sources are incorporated to capture employment information for University of Utah graduates. As students apply for graduation, they receive an invitation to complete the U Career Success First Destination Survey (FDS), launched with the support of the UAIR office, which gathers outcome data regarding students' post-graduation plans. The FDS survey captures key outcomes, including whether students have joined the full- or part-time workforce, started entrepreneurial ventures, enrolled to continue their educations, signed up for military service, or made other post-graduation plans. In addition, graduates' job locations, position types and titles, base salaries, and variable compensation are recorded.

The survey complements the ongoing work of U Career Success' full-time career coaches, who proactively reach out and offer an extensive variety of resources, activities, and events to students throughout their educational journey and as they seek employment. Vigorous outreach to students to complete the survey continues throughout their final semester and for up to six months beyond it, including coach messaging and phone calls, and marketing campaigns with email, social media, and other messages across campus. The survey response data are available daily and are continually reviewed, monitored, and discussed with the objective of supporting all graduates. In the past year, the knowledge rate of post-graduation plans has improved significantly, as have the reported salaries of graduates.

The FDS survey is one source of information about graduates. Data from several other sources are also analyzed and presented. This includes data from the Utah Department of Workforce Services (DWS) on the earnings of graduates who remain in the state for their employment. The state of Utah also participates in the U.S. Census Bureau Post-Secondary Employment Outcomes (PSEO) initiative. Through this partnership, data on the earnings of graduates by four-digit CIP discipline are publicly available via an interactive dashboard. Data from over 30 states are now available for comparison in this dashboard, and all public institutions in Utah are represented.

1 U.S. Department of Education, National Center for Education Statistics, 2015-16 National Postsecondary Student Aid Study.

3 - Programmatic Assessment

Graduate and Undergraduate Council Seven-Year Academic Program Review

In accordance with NWCCU Standard 1.C.5, the University of Utah systematically assesses the quality of learning in its programs. Assessment of academic programs is formally accomplished at the institutional level in several ways. The most comprehensive of these is the Seven-Year Academic Program Review conducted by either the Graduate Council or the Undergraduate Council. The Graduate School administers academic program review on behalf of the Graduate Council and institution for all units that offer graduate degrees; that review is inclusive of undergraduate degree programs in those units, as well. The purpose of academic program review is comprehensive assessment of programs' educational quality to the end of assuring and improving that quality. Last academic year, the Graduate Council reviewed and approved revisions to the review process to ensure greater efficiency, effectiveness, and active Graduate and Undergraduate Council engagement.

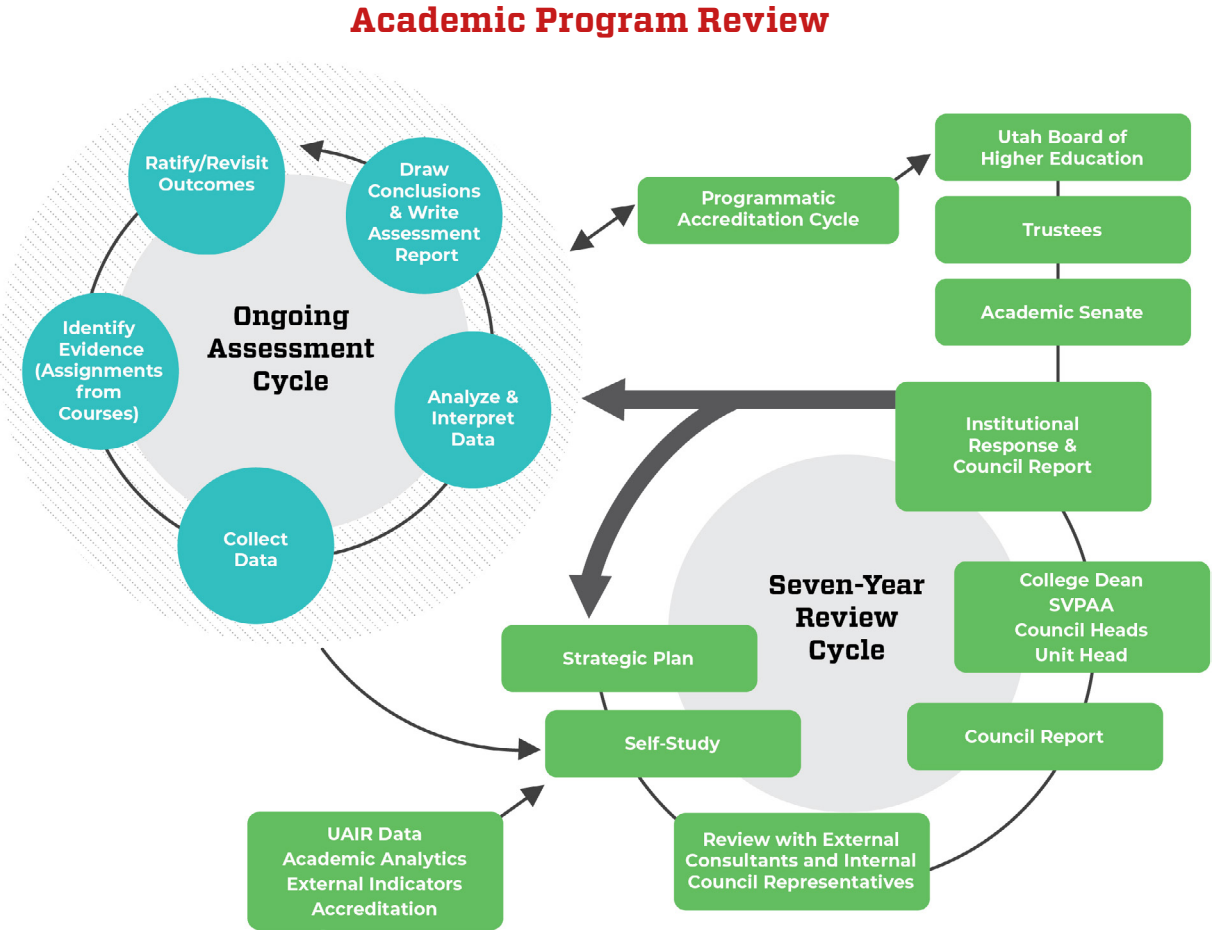

Figure 4: University of Utah Academic Program Review

This process is a broad and deep evaluation of program quality that entails investment on the part of numerous institutional agents and entities. At the unit level, those undergoing review must prepare a thorough self-study that describes and reflects upon six key facets of the unit, both in general and especially since the time of the last program review: program overview; faculty; students (and postdoctoral fellows, as applicable); curriculum; learning outcomes/program assessment; and facilities and resources. This self-study also includes departmental data and dashboard indicators (e.g., IPEDS data, faculty demographics, student

enrollment trends, student credit hours taught, research funding profiles, etc.) provided via UAIR. Additional data used in the self-study include external databases, such as Academic Analytics and Alumni Insight, which provides tracking of graduate student and postdoctoral placement.

The self-study is furnished to a program review team composed of:

- External members, who are typically disciplinary peers with expertise in the unit's subject matter. Industry experts may also serve to complement the disciplinary perspective.
- Internal members, who are Graduate Council and, if relevant, Undergraduate Council members.

Informed by the self-study, the review team convenes at the University of Utah for an on-site visit to evaluate the academic unit. This visit entails in-person interviews with faculty, students, staff, and relevant unit administrators as well as a tour of the unit's facilities. To encourage an unfettered disciplinary assessment of the unit and foster aspirational aims of the review, external reviewers prepare an independent review report organized around the above-mentioned six facets. Internal (council) members prepare a report into which key findings of the external program review report are integrated, concluding with commendations and a set of practical, actionable, and prioritized recommendations. Upon review and approval of this report by the relevant council, it becomes the formal academic program review report. The report and the unit's response to recommendations are reviewed and discussed by the unit chair/director and dean, administrators from the Undergraduate or Graduate Council, and the cognizant senior vice president. The outcome of this meeting is a formal institutional response, inclusive of feasible plans of action and resources to address the recommendations, which is subsequently forwarded as an information item to the Academic Senate, the university Board of Trustees, and the Utah State Board of Higher Education. All Graduate Council seven-year program review reports are available as public documents on the meeting agenda websites for the Academic Senate, Board of Trustees, and Board of Higher Education. Unit chairs/directors use review recommendations and institutional responses as direct guides for shaping strategic plans in collaboration with their faculty members and college administrators.

University academic programs that offer only undergraduate degrees are reviewed by the Undergraduate Council. The seven-year program review process by the Undergraduate Council follows the same process as the seven-year Graduate Council review described above. In fact, the Academic Program Review Procedures Manual was "universalized" in 2024 to be applicable for both Graduate and Undergraduate Council program reviews, to ensure consistency across both endeavors. The associate dean of the Graduate School (who oversees the seven-year Graduate Council review) is a member (ex officio) of the Undergraduate Council. Correspondingly, the associate dean for academic affairs in the Office of Undergraduate Studies is an ex officio member of the Graduate Council, which further assures alignment and consistency across reviews by the respective councils.

Curriculum Management Plans and Learning Outcomes Assessments

In addition to being required materials for Seven-Year Academic Program Review self-studies, curriculum management plans and learning outcomes assessments are required of units, per University Rule 6-001CMP, at three- and five-year interims during the seven-year program-review cycle. This policy has significantly improved the overall quality and frequency of program-level assessment in academic units. These reports (and the Seven-Year Academic Program Review report) must be furnished to the Office of Learning Analytics and Outcomes Assessment (LAOA). LAOA is charged with assisting programs as they write student learning outcomes and assessment plans. These assessment plans and reports are then included in the curriculum management plan of each academic program across campus.

As previously noted, the University of Utah has established the Exceptional Educational Experience E³ Framework as a set of institution-level outcomes it expects all undergraduate students to achieve. Depart-

ments and programs are referred to the framework when developing or revisiting their learning outcomes and asked to engage the university-level outcomes identified in the framework.

To aid in this endeavor, LAOA—in conjunction with the university's Teaching and Learning Technologies (TLT), curriculum management system (Coursedog), and learning management system (Canvas from Instructure)—has developed a host of tools and systems, collectively the "learning outcomes ecosystem." These tools leverage the course management and curriculum management systems to identify student assignments (using the "associator" tool) and the assessment of those assignments by faculty (using the "reviewer" tool) to measure the university's student outcomes.

LAOA has been the primary office through which this policy has been implemented for undergraduate programs. LAOA is in regular communication with units each year if they are in the third or fifth year of their program review cycle or one year away from their seven-year program review. LAOA reaches out to units to make sure they are on track to complete interim assessments of their learning outcomes and offer consultation or access to assessment tools (see below) if it would help them implement their assessment plans.

LAOA keeps track of the submission of assessment plans and third- and fifth-year learning outcomes assessment reports for undergraduate programs. LAOA maintains a reporting table and website to keep track of submissions so compliance with the policy can be tracked and examples can be provided to other departments that are looking for help with their own assessment work.

Two examples of program assessment plans that are broadly representative of institutional efforts are provided in Appendix A. These are for the Department of Geology and Geophysics and the Department of Philosophy.

4 - Moving Forward

Strategic Planning

The university is undergoing significant change driven by a new strategic plan, new leadership, a focus on operational excellence, new state legislation, and evolving Utah System of Higher Education policies. It is notable that USHE is also in the process of developing a new strategic plan. It is expected that the USHE plan will reinforce, not disrupt, university strategies, as USHE is likely to continue its focus on access, completion, and value, for both the student and the state.

The university's focus on Operational Excellence is a pathway to developing opportunities that will enhance its mission and fiscal resilience. Launched as a critical facilitator of the vision and goals of Impact 2030, this effort is an avenue for faculty and staff to identify, develop, and implement ideas that will improve outcomes and experiences at the university. Currently, approximately 80 projects are led by Operational Excellence teams and consultants.

Impact 2030 is an emerging strategic plan. To shape the path for Impact 2030, university leaders sought perspectives from the campus and local communities, receiving nearly 11,000 responses from a campus-wide survey sent to faculty and staff. The university also hosted numerous in-person and online listening sessions. Participants in these sessions included more than 700 faculty and staff, 30 graduate and undergraduate students, 45 alumni, 120 campus leaders, and 65 local community members. Additionally, a new public feedback website was launched to gather continuous input.

Participants highlighted the University of Utah's strengths: a culture of collaboration, entrepreneurialism, and growth; a focus on community and students; and a beautiful natural setting with expansive opportunities. They voiced confidence in the university's ability to advance knowledge, deliver patient care, create new technologies, and nurture a vibrant academic community and extensive health care system.

Key feedback underscores a strong desire for enhanced community engagement, broader support for research and innovation, and initiatives that foster a welcoming and supportive environment. Participants emphasized the importance of the university's role in addressing community needs, strengthening partnerships across Utah, and enhancing its impact in society. Many respondents voiced a shared vision of the university adapting to emerging trends in education and health care, ensuring long-term relevance and impact. The Impact 2030 plan has not been finalized, but it likely will consist of three pillars representing the broad work to be done.

Figure 5: University of Utah Impact 2030 Pillars

A Focus on Student Success

The student success area of Impact 2030 will focus on student access, experience, individual growth, and learning mindset. As the university anticipates undergoing significant change prior to the next accreditation visit, student success will continue to be a central concern. The university is reimagining its support services in order to be both more efficient and more responsive to student needs. These changes are expected to include a shared service model for fiscal management, IT support, research administration, student scholarship administration, marketing and communications, and student services such as advising. Student success initiatives at the university will continue to focus on retention, completion, placement, and thriving. The University of Utah will develop its leadership capacity in student success by participating in and investing in a variety of services and academic communities, including Navigate U, EAB, NISS, Strada, UIA, and Gray DI, to name a few.

The goal of the university's student success initiatives is to provide students with an exceptional educational experience by helping them foster a strong sense of community; equipping them with the knowledge and skills necessary to secure meaningful employment with competitive salaries; and guiding their transformation by helping them build confidence, embrace challenges, and discover their purpose. To support this vision, the university will provide proactive and personalized pathways that help students achieve their goals. It will enhance and streamline access to health and wellness resources. It will revitalize engagement and belonging experiences for students to help them discover their passion, people, and purpose. And it will provide faculty with targeted development opportunities in their integral roles of creating impactful learning environments. Key metrics will include, but not be limited to:

- Number of enrolled students (access)
- Percentage of students completing their degree within six years of enrolling in postsecondary education (graduation rate)
- Percentage of students who find employment in a related field within six months of graduation (placement rate)
- Percentage of graduates for whom the university has verifiable information about post-graduation activities (knowledge rate)
- Average starting salary for graduates (value)

Navigate U is a campus-wide initiative that brings together previously disparate and competing efforts to improve the undergraduate experience at the University of Utah. At the heart of Navigate U are eight strategic pillars, which ensure that every aspect of the student journey—from pre-enrollment through career placement—is supported. These pillars focus on enhancing awareness of and engagement with the university through pre-enrollment activities, optimizing student transitions, providing proactive academic advising, streamlining academic planning and curriculum systems, building transparent financial structures, providing experiential learning opportunities, investing in student pathways and career success, and providing academic and well-being resources.

Student Success Coaching will be a key component of the University of Utah's efforts to support all students while addressing equity gaps. Additional investments in the coaching program were made due to its early success. These investments resulted in doubling the coaching team to 12, including a director. To expand the impact of coaching, all incoming first-year students are assigned a student success coach in Navigate U, creating a visible and accessible "success team." Additionally, student success coaches will lead dedicated presentations during new student orientation to ensure students and parents are aware of the program. As enrollment continues to grow, so will the coaching program. The university is striving to continue to increase the number of coaches, so every student has an opportunity to benefit from the coaching experience.

Workforce Development

The U Career Success Center will ensure positive career outcomes for University of Utah graduates by providing comprehensive support at every stage of the student's professional journey and by cultivating strong partnerships with industry and community leaders. Career coaches manage student portfolios, enabling them to conduct proactive outreach, build meaningful relationships, and deliver personalized services. Corporate and community engagement managers collaborate closely with industry and community leaders to identify workforce needs, coordinating with career coaches to match students with employers. These services are accessible at no cost to all students, regardless of program or major. A broad range of career-building events are conducted throughout the academic calendar, including 100+ employer career fairs; targeted career expos that focus on a particular sector or major; workshops, panels, and student club meetings featuring employer guests; information sessions; and multiple collaborations with departments and colleges. U Career Success is also at the forefront of creating access to experiential learning opportunities, including internships, projects, and competitions. In addition, the center works with departments to include career-boosting curricula for students of any major.

Job Market Alignment

The University of Utah has been working on expanding data availability to support institutional understanding of the market viability of its offered programs. This includes understanding and evaluating the university's current portfolio of programs, as well as assessing new programs. To facilitate this understanding, the Office of Academic Affairs entered a partnership with Gray Decision Intelligence in spring 2024. The partnership provides several key data tools for the university's academic strategy, planning, and evaluation efforts.

Data available through Gray DI includes synthesized information from sources including IPEDS, the National Student Clearinghouse, NC-SARA, the Bureau of Labor Statistics, Google keyword search data, job postings, and the U.S. Census Bureau. These data will support informed decision-making about current and future program offerings. Those proposing new programs will have robust information to evaluate program viability across different markets and delivery modalities. The tool is available to the university community and provides access to information on:

- Student demand
- Program competition
- Wages, skills, and jobs associated with academic programs
- Data analysis on careers by academic programs, aligning with job placement

It is important for students to understand the career opportunities associated with the programs they may be considering. To promote the availability of this information to all students, both current and prospective, the University of Utah purchased a product from Lightcast that aggregates labor market data allowing access to a full range of local, state, and national career data. Sources include Bureau of Labor Statistics data, current job posting data, and location data. Access to this information helps career coaches and leadership, college personnel, and students make informed decisions regarding programs, courses, and offerings to maximize career outcomes.

Growth and Strategic Goals

Student development theories help consider how students grow, develop, and form their identities. According to these frameworks, students need opportunities to develop skills essential for success beyond academic learning to evolve into well-rounded individuals. Several efforts are underway to support this holistic approach to student success, specifically focused on health, well-being, and sense of belonging.

Engagement and belonging

Since implementing "pillar" events and other programming to engage students, the university has made progress. According to the U's Sense of Belonging survey, administered in spring 2024, students felt a

stronger sense of belonging socially, culturally, academically, and professionally due to their engagement with support offices.

Also, as research shows that students who live on campus become more engaged, have higher GPAs, and are more likely to graduate (and students are facing a significant rise in off-campus housing costs in recent years), the U has made a concerted effort to increase the quantity of on-campus housing for both undergraduate and graduate students. Plans are in motion to increase capacity to 12,000 beds and create still more campus communities where students can thrive.

Additionally, a technology platform called Campus Connect is helping students get involved. The technology creates a single place for Registered Student Organizations to manage their clubs and organizations, propose budgets, host and advertise events, communicate with organization members, and more. At the end of the Fall 2024 semester, more than 425 student clubs and organizations were registered in the system, and nearly 6,500 students attended the semester's opening "Get Involved Fair," where students connect with and explore opportunities to engage.

The platform is also being piloted for use with university-sponsored events and activities to not only promote and advertise offerings, but also to collect RSVPs, track attendance, and automate distribution of post-event surveys. Students attending simply tap their university identification card at the entrance of the event. This procedure simplifies the process for students and allows university staff to better track attendance and understand the impacts of these experiences on students' perceptions and outcomes.

Health and wellness

According to data from the Healthy Minds survey administered at the University of Utah in fall 2023, 85% of respondents indicated that their mental health had an impact on their academics lasting from one to six or more days, with 25% selecting "six or more." Because of this, the university remains committed to offering a variety of resources to support student mental health and well-being.

By considering service delivery methods, improving health literacy, increasing education and outreach, and investing in infrastructure and programs, the university aims to ensure students not only have access to health and wellness information and resources, but also that they can navigate these services with ease and confidence.

On average, students' overall mental/emotional distress levels improved by 22% over their course of treatment at the University Counseling Center during the 2023-24 academic year. The use of victim-survivor advocates in the Center for Campus Wellness increased by 21% during Fiscal Year 2024, compared to the previous year. To support this increased caseload, the center hosted two Master's of Social Work practicum students, who contributed 900 hours to these services, while also obtaining important experience required for their academic programs. Also, during the 2023-24 academic year, the Center for Disability and Access saw an increase of students seeking disability services and accommodations of nearly 10%, meaning the center serves nearly 9% of the university's student population. Some of the ways the center supports students with disabilities include providing classroom and exam accommodations; offering assistive technology, American Sign Language interpreting and captioning services; scholarships; and peer mentoring programs.

Additionally, a centralized health and wellness hub was established to co-locate multiple offices—streamlining operational processes and standardizing systems for seamless referrals. A Well-being Navigation Program launched in fall 2024 to provide personalized guidance, coping strategies, health education, and referrals to both on- and off-campus resources at no cost. The program enhances health literacy by directing students to relevant health and wellness resources, encouraging them to take an active role in managing their well-being journey. A streamlined referral process to better support students and ensure that protected health information is stored in a single, compliant system is also underway. This process is designed to ensure consistent communication and prevent students from having to repeat their information multiple times.

5 - Update on Recommendation from 2022 EIE Review

Recommendation: "The evaluation team recommends that the institution should accelerate the development of the General Education learning outcomes (GELO) assessment (1.C.6)."

To address the recommendation to accelerate the development of the General Education Learning Outcomes (GELO) assessment, the university has made significant progress in the structural and operational areas necessary for sustainable and impactful GE program assessment. Since the last accreditation visit, the university has implemented a new General Education (GE) requirement structure, approved in spring 2023 and launched in fall 2024, designed to align with state policies, support students, and facilitate GE program assessment. The university's focus has been to establish new systems and better integrate those already in place to facilitate regular, reliable, and valid assessment of the GE program.

Concurrent with these efforts, an updated curriculum management system, Coursedog, was adopted in summer 2024, incrementally loaded through the fall of 2024, and made ready to house the GE curriculum and learning outcomes during the Spring 2025 semester. The university is also updating its in-house assessment products to work seamlessly with Coursedog, enabling faculty to align assignments in their courses with the GELOs. This integration allows administrators to use these assignments as direct evidence in the assessment of GELOs, creating a robust and reliable foundation for outcome-based evaluation.

The university has fully aligned all GE courses with the GELOs as of December 2024, a semester ahead of schedule. (See GELO alignment document in Appendix B.) The GELOs are embedded within the university's E³ Framework, which describes institution-level learning outcomes, creating an intentionally scaffolded structure that serves as an exemplar for other programs across the institution. This alignment follows the recent update to Utah Code R470 in November 2024, which introduced revised Essential Learning Outcomes for each GE-requirement area. Together, these updates ensure that the curriculum and assessment standards are responsive to state requirements while supporting the university's program-level GELOs.

As of spring 2024, the GE Curriculum Committee (GECC) is developing the assessment processes and procedures to support outcome-based evaluation in preparation for fall 2025. The university is also strategically utilizing the NWCCU Fellowship project to advance course-level reviews in GE, which will further enhance the rigor and coherence of its assessment strategy. The NWCCU fellows are surveying comparable schools to better understand best practices in the field, largely among programs that are of a similar size and mission to the University of Utah. Their written report will be used to further refine the university's assessment plan.

With the new GE requirement structure in place, complete GELO alignment, Coursedog implementation, and integration with assessment tools, the institution is fully prepared to commence GE program-level assessment beginning in fall 2025. These actions are also responsive to the legislature and updates to policy, reflecting the recent focus on General Education at the state level. This readiness reflects a holistic commitment to advancing GE program evaluation and continuous improvement, ensuring compliance with institutional and state accreditation standards.

The University of Utah's efforts to reimagine General Education have resulted in significant progress toward creating clear and efficient curricular pathways for students. Changes to the GE requirements have reduced the total number of credits needed by at least nine, saving students up to an entire semester of coursework and reducing tuition costs by between $3,543 and $5,143 for Utah residents. (Figures were accurate based on tuition rates at the time of Board of Trustees review and approval.) These updates also support transfer student transitions, foster discipline-specific inquiry skills, and guarantee experiential learning opportunities for all students. The redesign aligns with Utah Code R470 and facilitates holistic assessment, ensuring quality improvement and accreditation compliance while enhancing student success.

Conclusion

The University of Utah remains steadfast in its commitment to student success, continuously developing programs and initiatives that foster growth, innovation, and excellence.

A key example of this commitment is the university's engagement with students, faculty, staff, and the broader community in shaping the Impact 2030 strategic plan, ensuring alignment with its mission and vision for the future. Data-informed decision-making, supported by UAIR and advanced analytical tools, will enhance the effectiveness of these efforts.

Through the Exceptional Educational Experience (E^3) Framework, operationalized by Navigate U and its Activate projects, the university is actively addressing equity gaps and improving student outcomes. Frequent, comprehensive program assessments will uphold the quality of academic offerings, while expanded resources for student well-being will provide holistic support within and beyond the classroom.

As a leading public research institution, the University of Utah takes pride in delivering a high-quality, affordable education that empowers students to graduate prepared for meaningful careers, engaged citizenship, and lifelong contributions to their communities and society.

The following individuals contributed to the writing of this report:

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Appendices

to the
Mid-Cycle Self-Evaluation Report for the
Northwest Commission on
Colleges and Universities

Appendix A
Programmatic Assessment Examples

Each example includes the seven-year Academic Program Review of the department, the department's assessment plan, and a sample assessment report.

The Graduate School - The University of Utah

GRADUATE COUNCIL REPORT TO THE SENIOR VICE PRESIDENT FOR ACADEMIC AFFAIRS AND THE ACADEMIC SENATE

April 30, 2018

The Graduate Council has completed its review of the **Department of Philosophy.** The external review committee included:

Judith Lichtenberg, PhD
Professor, Department of Philosophy
Georgetown University

Geoffrey Sayre-McCord, PhD
Morehead-Cain Distinguished Professor
Department of Philosophy
University of North Carolina at Chapel Hill

Michael Strevens, PhD
Professor, Department of Philosophy
New York University

The internal review committee of the University of Utah included:

Jeffrey R. Botkin, MD
Professor
Department of Pediatrics

Rebecca L. Utz, PhD
Associate Professor
Department of Sociology

Suresh Venkatasubramanian, PhD
Professor
School of Computing

This report of the Graduate Council is based on the self-study submitted by the Department of Philosophy, the reports of the external and internal review committees, and the responses to the external and internal reports from the Chair of the Philosophy Department and the co-Interim Deans of the College of Humanities.

DEPARTMENT PROFILE

Program Overview

The Department of Philosophy has a long history since 1897, and the mission of the Department is to pursue "an empirically-informed, engaged approach to philosophy in the analytic tradition." The core strengths of the Department are philosophy of science (especially biology), applied ethics, and practical reasoning. The Department identified and re-identified strategic plans in 2000 and 2015. The Department has continued working on these identified strategic goals: (1) Present a new model of philosophy in the 21st century which reflects the role and contributions of the discipline to the goals of a top-tier university, (2) Build from their core strengths outward, (3) Elevate the graduate program, (4) Provide innovative, engaged, and effective teaching, (5) Become a destination program, and (6) Introduce a new major: Philosophy of Science.

The Department offers both undergraduate and graduate degrees: BA and BS in Philosophy, and MA, MS, PhD degrees in Philosophy. The Department also offers three minors: Applied Ethics, Cognitive Science, and Philosophy. The Department has 17 tenure-line and 4 career-line faculty. Among 17 tenure-line faculty, 4 are jointly appointed with other departments or programs.[1] Faculty's teaching excellence was well-regarded by both external and internal reviewers.

The Department has approximately 20 graduate students and 51 undergraduate students, and granted 1 PhD, 17 BA/BS degrees, and 11 minors in 2016. The Department also serves large numbers of non-majors, providing courses with General Education designations, and required or elective courses for interdisciplinary majors such as Health, Society and Policy, Criminology and Criminal Justice, and Business. The Department has effectively pursued a "boutique" strategy in research and graduate teaching, emphasizing the philosophy of science, applied ethics, and practical reasoning. The Department has achieved significant international visibility, making it an attractive program for many talented students who seek a graduate degree in philosophy. In general, the Department's climate is reported to be positive and collegial.

Faculty

The Department has 17 tenure-line and 4 career-line faculty. The external and internal reviews had different counts on faculty numbers. The Dean's response letter clarified that it has 13 tenure-line and 4 additional joint appointments in other disciplines, and one mid-year departure. The following summary of faculty demography is based on the snapshot provided in the departmental self-study. Within the total of 22 tenure- and career-line faculty, 19 are white, 1 Hispanic, and 2 unknown. Nine out of 22 are women. While one racially diverse faculty member was successfully recruited recently, racial/ethnic diversity has remained the same since the last review and is still noted by the Department to be a challenge. The faculty consists of

[1] There was conflicting information in the reports and the count is based on the Chair and Dean's response letters.

6 Professors, 8 Associate Professors, and 3 Assistant Professors. Faculty gender equality is praised by both external and internal reviews. The external review pinpoints that the Department has the highest proportion of female faculty in philosophy departments with graduate programs in the United States. External reviewers noted that "the department is internationally recognized for the quality of its faculty" but caution that retention is likely to be an ongoing issue.

Faculty teaching loads are two courses per semester, and the departmental executive committee, including the Chair, the Director of Graduate Studies, the Director of Undergraduate Studies, and the Associate Chair, receive course load reduction. Career-line faculty have a 3:3 teaching load with 3-year contracts. The external reviewers emphasized the value of career-line faculty, who offer a significant portion of undergraduate teaching and contribute significantly to departmental undergraduate education. The external review pointed out the problems with the timing of contract renewals, lack of engagement in departmental governance, and uncertainty of the promotion process for career-line faculty.

Faculty in the Department receive positive teaching evaluations, suggesting that they are actively engaged in teaching and very committed to their students. Many faculty have received University or College teaching awards. According to the departmental self-study, "Faculty routinely publish in competitive and highly regarded peer-ranked journals and publishing houses." The Department has a well-structured mentoring system, and junior faculty are well-guided through the RPT process.

Students

The Department has approximately 20 graduate students and 51 undergraduate majors[2]. In the 2015-2016 academic year, this resulted in 1 PhD, 17 BA/BS degrees, and 11 minors granted. The Department has a healthy faculty-to-student ratio. As a result, students feel a strong sense of community and intimacy with faculty. With regard to undergraduate students, the internal review noted: "The number of majors is down slightly when viewing the trend data, though it should be noted that the number of degrees awarded was never more than 30 in recent years. The number of minors appears to be relatively constant in recent years. Many of the undergrad students are double (or triple) majors, finding philosophy to be a complement to their primary major."

The number of PhD degrees awarded in 2015-2016 is down from earlier years, likely due to the Department's effort to deliberately shrink the size of the graduate program and to provide more competitive funding for graduate students. As a result, the current number of graduate students has fallen below critical mass. However, in the 2017-18 *Philosophical Gourmet Report*, a widely respected ranking of graduate program quality based on research strength, the Department has maintained notable rankings, appearing in Group 4 in Applied Ethics; Group 3 in Philosophy of Science; Group 2 in Philosophy of Biology and Feminist Biology; and Group 1 (top 3) in Chinese Philosophy. Given this strong standing, as well as issues with curriculum noted below, this may be a juncture to consider increasing the graduate program enrollment somewhat if resources permit. One option raised by reviewers was a BA/MA program.

[2] The number of undergraduate majors reported by OBIA is roughly one-third of the number of actual enrolled Philosophy majors, as only first majors are counted.

The departmental self-study does not indicate a clear improvement in gender equality and racial/ethnic diversity in the student composition. However, the Department recently formed a diversity committee to work on this area, putting efforts in recruiting, outreach, and targeted funding opportunities for underrepresented groups of students.

Curriculum

The Department provides BA/BS degrees in philosophy, plus three different minors: Applied Ethics, Cognitive Science, and Philosophy. Applied Ethics and Cognitive Science minors are interdisciplinary, requiring students to take a series of courses from philosophy and other departments. The minor in Philosophy is a traditional academic minor that gives students more flexibility in comparison to the major requirements. The Department also offers a significant number of courses in General Education curriculum and in various majors in the College and across the University. Both external and internal reviews noted that the Department plays an important role in undergraduate education at the University of Utah.

With the deliberate shrinkage of the graduate program, the overall caliber of the graduate students has improved. There is also less variation in their quality, making it possible for faculty to offer more challenging courses that further enhance students' skills. The Department also prepares and mentors graduate students in teaching by requiring the Proseminar and assigning teaching assistantships under faculty supervision in the first two years of graduate studies. However, the size reduction resulted in one curriculum problem. Because the number of graduate students has fallen below the critical mass, the Department has difficulty offering graduate-only courses, and courses are usually cross-listed with upper-level undergraduate courses. The internal review noted that graduate students requested additional graduate-only seminars.

Program Effectiveness and Outcomes Assessment

In terms of learning outcomes and outcomes assessment, the Department has, in their words, "created a thoughtful curriculum and grades students within each course." Students at both the graduate and undergraduate level had high praise about the classroom experiences and individualized mentoring they have received from the Department. According to the internal review, faculty are beginning to work with Undergraduate Studies to articulate program-level learning outcomes and to formalize outcomes assessment strategies for the undergraduate majors. Graduate-level outcomes assessment included the desire to implement a more formal process to track placement of graduate students over time, but external reviewers noted the success graduate students have had in securing academic positions. The internal review suggests the Department should provide more data and metrics to document program effectiveness and to assess learning outcomes. The internal review also acknowledges that "the Department appears to be on the path to developing and implementing more standard outcome assessment strategies and protocols."

Facilities and Resources

Faculty, staff, and graduate students are all housed on the 4th floor of the Carolyn Tanner Irish Humanities Building. The building provides nice administrative space, as well as excellent faculty offices, classrooms, lounges, and meeting spaces. According to the internal reviewers, "the space is ample for departmental activities, with some office space available for faculty growth and/or visiting scholars. Additional space for graduate students (i.e., a dedicated desk for each graduate student) and access to classrooms that can accommodate class sizes would be ideal."

The department has two staff members. Both external and internal reviews noted concerns with inadequate staffing. The Chair indicated that a temporary, half-time staff member had been hired and the impact of this hire was being studied relative to budget and workload. The Dean responded that effective management of staff duties and administrative tasks, such as sharing academic advisors with other departments in the College, may be a resolution to this problem.

COMMENDATIONS

1. The Department is a leader in the fields of Philosophy of Science, Applied Ethics, and Value Theory in the 21st century.

2. The Department plays a significant and essential role in providing its disciplinary knowledge for undergraduate education, including many general education courses, as well as philosophy courses required or elective in other disciplines.

3. Faculty provide high quality courses and education, initiate cross-disciplinary research projects, and engage in professional communities.

4. The Department's gender balance among faculty members is well-reputed in the field of Philosophy.

5. The Department's climate is positive and collegial. Faculty support of students and junior faculty through informal and formal mentoring activities are apparent.

RECOMMENDATIONS

1. Maintain a robust cadre of undergraduate majors by participating in College initiatives (such as Medical Humanities), building connections with related disciplines in Sciences, and encouraging interdisciplinary research and curriculum efforts. In addition, increase number of graduate students to optimal levels while maintaining adequate funding support. It is also recommended that the Department analyze the trend of Philosophy majors by comparing the numbers and recruitment strategies of Philosophy departments in PAC-12 universities.

2. Work with College administration to develop a strategy for faculty hiring and for salary compression concerns that may contribute to retention issues. While the Department's recent effort in hiring a diverse faculty member was successful, it is also recommended to escalate racial and ethnic diversity in the Department.

3. Create new strategies to restructure the graduate program and to develop/communicate clear pathways of study for undergraduates, including in Philosophy of Science. At the same time, maintain outreach, retention, and recruitment efforts.

4. Ensure job security and inclusion for full-time career-line faculty by improving contracting procedures, engaging them in departmental governance, and clarifying career-line promotion processes.

5. Work with the College to effectively manage administrative duties and staff workload, such as sharing full-time advisors with other departments in the College.

6. It is strongly encouraged that the Department employ surveys and data-driven analyses to assess its disciplinary contributions to undergraduate education and learning outcomes, especially for the educational impact outside the major's curriculum. Relatedly, learning outcomes and assessment plans must be fully developed.

Submitted by the Ad Hoc Committee of the Graduate Council:

Lien Fan Shen (Chair)
Associate Professor, Department of Film and Media Arts

Elisabeth E. Pankl
Head, Undergraduate and Graduate Services, Marriott Library

Julie L. Wambaugh
Professor, Department of Communication Sciences and Disorders

Mary S. Wells (Undergraduate Council Representative)
Associate Professor, Department of Health, Kinesiology and Recreation

Assessment Guide:
PHIL Department Level Learning Objectives

Goal: Provide department level assessment of skill acquisition of PHIL majors.

Procedure: Instructors of designated classes will assess skills using Department Level Outcome Assessment Forms (available in the shared Department Box folder). Completed forms are to be submitted to both the Chair of the Department and the Director of Undergraduate Studies.

Skills Assessed:

Philosophical Writing and Analysis (see rubric for details)

Designated Class: PHIL 4010 "Senior Seminar." Instructors are encouraged (though not required) to use the associated rubric in their assessment.

Rationale & Notes: PHIL 4010 is typically offered every semester, and is unique among our offerings in being limited to philosophy majors that have completed a substantial number of our courses. This provides the opportunity to assess the acquisition of skills of PHIL majors near the completion of their major.

Outcomes Assessed:

- *Outcome A: Philosophical Arguments (Writing)*
  - Articulation of Thesis/Introduction
  - Idea Development
  - Readability
- *Outcome B: Philosophical Arguments (Analysis)*
  - Comprehension of Issues
  - Quality Argumentation

Quantitative Reasoning (assessment outcomes in development)

Designated Class: PHIL 3200 "Deductive Logic"

Rationale & Notes: PHIL 3200 provides a clear avenue for assessing the acquisition of the kinds of quantitative reasoning we expect PHIL majors to develop. It also has the dual advantage of being offered every semester and being a popular option for our majors to satisfy their formal methods requirement (where we expect them to develop these skills in a particular way).

Outcomes Assessed (tentative):

- Outcome C: Quantitative Reasoning (Abstract/Formal Instruments)
- Outcome D: Quantitative Reasoning (Applying Formal Instruments to Reasoning)

Discussion/Presentation of Philosophical Content (assessment outcomes in development)

Designated Class: TBD

Rationale & Notes: TBD

Outcomes Assessed (tentative):

- Outcome E: Varieties of Presentation
- Outcome F: Delivery & Content

Writing and Analysis in Philosophy Courses

(These guidelines do not necessarily apply to writing and analysis in your non-philosophy courses)

Grade	WRITING	ANALYSIS
A Excellent! AIM HERE	1. **Intro / thesis** : Your essay includes a clearly stated thesis, thereby announcing (at the outset) the broader point you wish to make in your essay. Your introductory remarks include sufficient background information needed for readers to understand the thesis and its importance (and hopefully, to generate interest). This thesis statement reflects what actually happens in your essay. 2. **Idea development**: • **Clarity**: The ideas discussed are fully developed. This means that examples are used; jargon is explained; quotations are properly set-up; ambiguous language is avoided; and in argumentative passages, it is clear how you intend the arguments to go (whether or not they are good arguments). Unlike with creative writing, in argumentative philosophy essays your readers are not encouraged to find their own subjective meaning; rather, your writing clarifies a single meaning. • **Structure**: The ideas are presented in orderly fashion – both within paragraphs, and between them. This means your discussion does not bounce back and forth between topics, nor between lines of reasoning. 3. **Readability**: Your sentences are free of spelling, grammatical, and punctuation errors. The sentences read easily. Verbal cues allow for smooth transitions of thought, both within and between paragraphs. **** For in-class Essay Exams, emphasize 2 – idea development ****	1. **Success in supporting your thesis**: Your essay has a broader point (its thesis). The primary measure of success in an argumentative philosophy essay is the extent to which it supports that broader point. Even with in-class essay exams (which may not require a formal intro or thesis), you'll be *arguing* in the sense of trying to convince your reader (the grader) of your comprehension. Support your thesis and other claims – make the case! 2. **Comprehension of issues**: • **Show and tell**: Your aim is not merely to *have* high level comprehension, but to write everything needed to *exhibit* it. Grades are the result of sentence reading, not mind reading. • **Depth of analysis**: To write simply that "Plato is a rationalist", or that "Mill holds the greatest happiness principle," is to write something true but unilluminating – these don't exhibit much comprehension. Break these claims down and address the component concepts. Explain what the general happiness principle says; explain what Mill means by *happiness*; offer examples of actions that promote the general happiness, and actions that demote it. Analyze claims into their components and explain them. • **Breadth of analysis**: The range of issues actually addressed (and the quotations included, where relevant) encompass the range of issues that *should* be discussed, given the nature of the topics under consideration, and the nature of the assignment. This means that your essay neither strays into off-topic areas, nor ignores on-topic issues of importance.
B Good	Overall, your writing is a good performance relative to the above, "A" level goals. (It might be A level in some respects, while below B level in others.)	Overall, your analysis is a good performance relative to the above, "A" level goals. (It might be A level in some respects, while below B level in others.)
C Standard	Overall, your writing is a standard performance relative to the above, "A" level goals. (It might be above C level in some respects, and below it in others.)	Overall, your analysis is a standard performance relative to the above, "A" level goals. (It might be above C level in some respects, and below it in others.)
D Substandard	Overall, your writing is a substandard performance relative to the above, "A" level goals. (It might be above D level in some respects, and below it in others.)	Overall, your analysis is a substandard performance relative to the above, "A" level goals. (It might be above D level in some respects, and below it in others.)
E Unsatisfactory	Overall, this essay is unsatisfactory writing.	Overall, this essay provides unsatisfactory analysis.

Department of Philosophy, University of Utah
Program Learning Outcomes Assessment, May 2022

CONTENTS

Introduction

This report details the Department of Philosophy's inaugural assessment of program learning outcomes covering the past three years. Section 1 provides background information on our major and section 2 explains the design of our PLOA. Sections 3 and 4 detail the results of our PLOA, while section 5 offers an evaluative summary.

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1. Background on the Philosophy Major

The requirements of the Philosophy Major reflect our broad priorities for student outcomes, at the program level. Our PLOA strategy thus builds on those requirements. Majors complete a minimum of 12 courses (36 credit hours). 10 of these are upper division courses that fall under our Area Requirement – at least three of which must be completed at the 5000 level. One further course is the senior capstone course. And where needed, students complete an elective chosen from any course we offer (including introductory courses aimed at non-majors).

Area Requirement. This includes the bulk of each student's required courses. It centers around four major "Areas" of philosophic coursework: Area I includes topics related to *ethics and value theory*; Area II, *metaphysics and epistemology*; Area III, *history of philosophy*; and Area IV, *logic and formal methods*. This fourfold scheme covers the extraordinarily broad range of topics encompassed by the field of Philosophy. The range of subtopics falling under each Area is itself quite broad – indeed, too broad to be exhaustively covered in an undergraduate education. This raises the question of which subtopics make for a well-planned philosophical education. There is no disciplinary consensus on an answer (Area IV is an exception) – i.e., no accepted "canon" of specific must-take courses. Our approach is to offer courses on a wide range of subtopics, in Areas I, II, and III: we require students to complete at least three courses in each of these three Areas, while allowing them to choose the particular courses based on their particular interests.

(We manage to *nudge* students towards particularly important courses in each Area by offering those courses more often.) This flexibility in selecting courses works well for the large number of philosophy students who are double-majors, or on a track toward graduate school, as they can take courses complementing their other interests. As for Area IV, students are required to complete at least one course. (And for those with special interest in methodology, we offer a Certificate in Formal Methods; the certificate complements our departmental strength in philosophy of science.)

Advanced Course Requirement. This requirement specifies that of the 10 courses students take in completing the Area Requirement, at least three courses must be taken at the 5000 level. Not only are these courses taught at a more advanced level, they typically "meet with" an associated graduate level course (6000 level), providing advanced undergraduate students the opportunity to interact with graduate students.

Senior Seminar Requirement. This is the *capstone* course for the Major. Class size is small – helping facilitate a writing- and discussion-intensive environment. Enrollment is restricted to advanced philosophy majors, and the seminar does not meet with any associated graduate course.

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2. Design of our Program Learning Outcome Assessment (PLOA)

Three main overlapping program objectives. The requirements for our Philosophy Major emphasize three overlapping program objectives.

- *Clarity of academic writing and argumentation*. With the exception of some Area IV courses (which focus on formal methods), every course in the curriculum supports this objective. Course typically emphasize writing assignments.
- *Logical rigor of argumentation*. While every philosophy course supports this objective, our Area IV courses focus on the art of logical reasoning. These courses introduce formal logical languages and proof techniques.
- *Understanding of philosophical themes apropos of the four Areas*. Every course in the curriculum contributes to this objective.

These three overlapping objectives converge on two primary learning outcomes. For purposes of PLOA, we focus on the following two *official* learning outcomes:

- Learning Outcome A: Analytical Writing
- Learning Outcome B: Quantitative Reasoning

At first glance, this appears to prioritize the first two of the three overlapping objectives. In one sense this is correct, in another it's merely apparent. Of the three objectives, only the first two align with clear disciplinary standards. As for the third objective, recall, there is no "canon" of

philosophical topics related to Area coursework – i.e., no *particular* philosophical topics an understanding of which exemplify a program learning outcome: every course in the curriculum does nonetheless contribute to that third objective; and students are required to take a broad range of Area courses. Moreover, what we mean by *analytical writing* always involves analysis of philosophical topics or texts – thereby incorporating these apropos of the four Areas. Consequently, learning outcomes A and B jointly encompass the three main overlapping program objectives.

Coursework exemplifying student achievement in regards to these Learning Outcomes. Our PLOA focuses on student achievement in the following two kinds of courses:

- Learning Outcome A: Senior Seminar (Phil 4010)
- Learning Outcome B: Our 3000 level logic courses (Phil 3200 / 3210)

The Senior Seminar is an advanced, writing intensive CW-designated GenEd course that every Philosophy Major is required to take. As the capstone course for the major, essay work in this course typically represents the pinnacle student achievement in regards to all three of the above program objectives. The Senior Seminar is offered every Fall and Spring semester and is taught by a rotating lineup of regular tenure track faculty whose research interests determine the particular "Area" *theme* of the seminar.

Our 3000 level logic courses include Phil 3200 (Deductive Logic) and Phil 3210 (Inductive Logic). These are quantitative intensive QBQI-designated GenEd courses, at least one of which every Philosophy Major is required to take. Both courses emphasize the formal logical methods which are the basis of the argumentative rigor that unifies the study of philosophy across the entire curriculum. Both courses are typically offered every Fall and Spring semester and are taught by any of several faculty with specific competence in formal methods.

Summary of our PLOA strategy.

- Instructors complete a PLOA Form each time they teach the course.
- Three elements of a PLOA Form:

  1. Brief description of an example assignment related to the core learning outcomes of the course (a list of core outcomes is provided at the top of the form).

  2. Description of criteria used to measure student work at the "B" level (or higher) on the example assignment. This level of performance ("B" level) has been chosen largely because – to quote the University General Catalogue – it signifies "good performance and substantial achievement". This characterizes aptly what we regard as a *successful* outcome.

  3. Summary of the class performance in meeting this threshold of success – again, "good performance and substantial achievement".

- Optionally, instructors may submit a copy of the designated example assignment (in order to provide the review committee with any further needed context).
- Along with submitting a PLOA Form, instructors include a course Syllabus. This allows the review committee to review overall course design, ensuring that the course is appropriate to the learning outcomes of the course (and thereby our overall program learning objectives).
- The various paperwork we collect is archived in a u-Box folder available to all faculty.

The PLOA review committee. For this first assessment, the review committee consists of the Department Chair, the outgoing Undergraduate Director, and the incoming Undergraduate Director. In part, the committee membership for this initial review is a function of the fact that this same group was engaged significantly in the formulation and refinement of the PLOA strategy. (We should add that the previous Department Chair, and the department as a whole, played significant roles in the early development of the overall PLOA strategy.) Moving forward, we expect to have the Undergraduate Director, together with the Undergraduate Committee, and the Department Chair, involved in collecting and reviewing PLOA Forms submitted by course instructors.

Our review process encompasses data regarding individual student achievement in our program, along with individual faculty effectiveness. However, this summary assessment is not principally an assessment of individual student achievement, nor of individual faculty effectiveness; instead, the assessment is closer to a meta-analysis of such outcomes with the aim of providing an overview of departmental effectiveness in achieving our overall program learning objectives – specifically targeting student outcomes of "good performance and substantial achievement".

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3. Inaugural Assessment: Learning Outcome A, Analytical Writing

Data was gathered from seven iterations (five different instructors) of our PHIL 4010–Senior Seminar course between 2018 and 2022. For each iteration of the course, the instructor was asked to choose an example assignment and show how it emphasizes at least one of the following learning outcomes: Analysis, Explanation, or Writing. The assignments chosen to evaluate analytical writing ranged from term papers to short response papers to essay exams. The materials used in these classes were, by and large, a series of articles/book excerpts hand-chosen by each instructor around a specific theme.

A review of the syllabi associated with each iteration of the seminar reveals consistency with the learning objectives they identify. Generally, each seminar requires students to develop an understanding of a body of philosophical questions and views surrounding the theme of that seminar (which varies from historical to contemporary topics); each iteration also requires

students to do various assignments (including a major writing assignment) in which they aim to develop creative and critical analysis of those questions and views.

Assignment Goals. In the category of "Analysis," all the assignments chosen emphasized the goal of identifying either an objection to a philosophical theory under discussion in the course or a point of support for that theory, and further developing that objection or point of support (e.g. by considering how someone might respond). Many instructors also emphasized the goal of developing the objection or point of support in a creative or original way. In the category of "Explanation," all the assignments chosen emphasized the goal of clearly and accurately articulating the various philosophical questions and theories under discussion in the course. Additionally, some instructors emphasized the goal of comparing and contrasting the questions and theories under discussion. In the category of "Writing," many instructors emphasized the goal of identifying a clear thesis and defending that thesis via arguments in a logically organized and well-supported way.

Threshold for Success. The criteria for achieving at least a B level grade centered, for most instructors, around writing that achieved the above goals with a good level of clarity, accuracy, and detail (as opposed to the excellent or insightful/original clarity, accuracy, and detail which would be required for an A level grade).

Results. Across all seven of these courses, an average of 84 percent of students met the threshold of a "B" grade for the assignment chosen (range 80 to 93.7 percent, median 81 percent). This result shows that by the time students take PHIL 4010, most have developed the core skills evaluated in our learning outcome A. At the same time, it reflects the fact that 4010 remains a challenging course requiring significant student effort and skill.

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4. Inaugural Assessment: Learning Outcome B, Quantitative Reasoning

Data was gathered from seven iterations (four different instructors) of PHIL 3200–Deductive Logic) or PHIL 3210–Inductive Logic, courses which fit into Area IV of our major, "Logic and Formal Methods." For each iteration of the course, the instructor was asked to choose an example assignment and show how it emphasizes at least one of the following learning outcomes: Formalization & Translation, Construction of Formal Proofs, Axiomatic Foundations and Theorem Proving, Bayesian and Classical Statistical Methods, or Inference of Complex Probabilities and Notions Informing Statistics. The assignments chosen ranged from quizzes to exams. By and large, the key materials used in these classes were logic textbooks facilitating development of the formal skills needed.

A review of the syllabi associated with each iteration of PHIL 3200 or 3210 reveals consistency with the learning objectives they identify. Generally, each of these courses requires students to develop proficiency in understanding and employing formal methods of reasoning in logic (e.g. a formal language or theory, such as propositional logic, predicate logic, probability theory, etc.). Such proficiency is evaluated through quizzes, exams, and/or homework problem sets.

Assignment Goals. Although the specifics differ, all the assignments on offer for Quantitative Reasoning focus on understanding the structure and components of different types of logic, as well as achieving a certain degree of facility in using that logic. Two of the assignments addressed "Formalization & Translation," two addressed "Construction of Formal Proofs," one addressed "Axiomatic Foundations and Theorem Proving," and one addressed "Bayesian and Classical Statistical Methods." Those focused on "Formalization & Translation" involved exam questions that asked students to translate natural language sentences into the formal language of first order logic (the logic of complex sentences involving variables and quantifiers, i.e. all/some). Those focusing on "Construction of Formal Proofs" involved exam or quiz questions testing students on their understanding of and facility with deriving theorems in propositional logic (the logic behind simple, declarative sentences without variables or quantifiers). Derivations require students to understand how formal sentences relate to each other and how we can use them to infer other formal sentences. The assignment focused on "Axiomatic Foundations and Theorem Proving" was an exam requiring students to explain axioms (basic assumptions) of probability theory and prove theorems on the basis of these axioms. Finally, the assignment focused on "Bayesian and Classical Statistical Methods" was an exam requiring students to understand the structure and validity of statistical arguments, as well as to employ probability rules in specific scenarios.

Threshold for Success. The criteria for achieving at least a B level grade centered, for most instructors, around having a good understanding of the central terms and structure of the logic being explored and making significant progress in using it correctly (as opposed to having high-level understanding and achieving full success in using the logic correctly, as required for an A level grade).

Results. Across all seven of these courses, an average of 63 percent of students met the threshold of a "B" grade for the assignment chosen (range 44 to 90 percent). Although this percentage is significantly lower than the percentage of students achieving a "B" grade in the assignments for learning outcome A in the Senior Seminar course, this result is to be expected for two main reasons. First, all of our area IV courses, including PHIL 3200 and 3210, satisfy the University's Quantitative Intensive GenEd requirement. Lower performance in such courses is a general trend at the University, rather than an issue specific to our major. Second, whereas PHIL 4010 is taken after students have developed a facility with philosophical writing and argumentation in previous philosophy courses, PHIL 3200 or PHIL 3210 is in many cases the only logic course a student takes. The lower rate of students meeting the threshold for a "B" grade is thus not reflective of a problem with the evaluation standards in these classes, but rather of the quantitative material combined with the fact that for many students this is their initial and only encounter with such material, or at least one of comparatively fewer encounters than their encounters with analytical writing material.

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5. Summary and General Evaluation

To sum up, the learning outcomes for the Philosophy major are general enough to apply to the broad range of subject matter covered in our curriculum, yet specific enough to zero in on the

methodology distinctive of the discipline. The logic and formal methods (area IV) courses focus on the formal structure of reasoning, in abstraction from a specific topic. Courses in our other three area requirements deploy critical thinking methods (including those explored in the quantitative methods courses) to explore philosophical questions on specific topics in ethics and value theory, metaphysics and epistemology, or the history of philosophy. By evaluating assignments from PHIL 3200 or 3210, we measure student success in understanding and employing the logical structure behind philosophical arguments and theories. By evaluating assignments from PHIL 4010, we measure student success in applying these and other critical thinking methods to specific debates in Philosophy.

As previously noted, our Senior Seminar, PHIL 4010, alternates between faculty who focus on area I, area II, and area III courses. Indeed, data from the past three years of our PHIL 4010 Senior Seminar course includes cases where the topic explored lies at the intersection of two of our main area emphases. For example, one course lies at the intersection of areas I and II (covering current events such as misinformation and climate change), and three courses lie at the intersection of areas II and III (two focusing on feminism currently and in recent U.S. history; one focusing on the nature of science in Aristotle and in recent philosophy). Another focuses on area I, another on area II, and another on area III. Therefore, our evaluations of PHIL 4010 in conjunction with our evaluations of the two area IV courses measure student success across Philosophy's entire curriculum.

With this background in mind, the data we have collected shows that 1) Philosophy students are succeeding in the main objectives that define our major, while 2) Philosophy instructors are succeeding in setting up challenges that require a significantly high level of skill and effort. Achieving the proper balance between these two goals is important; if, for example, 100% of students achieved a grade of B or higher, then the difficulty and challenge of the assignments offered by instructors may be called into question. By contrast, if very few students achieved the threshold for a grade of B, instructors' standards of evaluation may be too high.

As previously discussed, there is a discrepancy between the number of students achieving a B grade or higher in the Logical and Formal Methods courses vs. the Senior Seminar courses. However, given the quantitative nature of our formal methods courses (along with the fact that students often take them earlier in the major, and without previous exposure to other such courses), the fact that 63% of students achieved a grade of B or higher on the key assignment being evaluated shows that the two goals of success and challenge are well-balanced. By contrast, students in PHIL 4010 have already developed the skills measured in this seminar in previous classes; indeed, PHIL 4010 represents their capstone experience for the major. Thus, the fact that 84% achieved a grade of B or higher on the key assignment being evaluated likewise shows a proper balance between success and challenge.

Overall, we consider the PLOA to reveal that our program is succeeding in meeting the goals in effectiveness of undergraduate education that the department has set for itself, and that no significant changes in approach or trajectory are required at this juncture.

Department of Philosophy, University of Utah

5th Year Program Learning Outcomes Assessment, June 2023

CONTENTS

Introduction

This report details the Department of Philosophy's assessment of program learning outcomes from spring 2022 to spring 2023 (since our previous assessment covering spring 2018 to fall 2021). Section 1 provides background information on our major and section 2 explains the design of our PLOA. Sections 3 and 4 detail the results of our PLOA, while section 5 offers an evaluative summary.

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1. Background on the Philosophy Major

The requirements of the Philosophy Major reflect our broad priorities for student outcomes, at the program level. Our PLOA strategy thus builds on those requirements. Majors complete a minimum of 12 courses (36 credit hours). 10 of these are upper division courses that fall under our Area Requirement – at least three of which must be completed at the 5000 level. One further course is the senior capstone course. And where needed, students complete an elective chosen from any course we offer (including introductory courses aimed at non-majors).

Area Requirement. This includes the bulk of each student's required courses. It centers around four major "Areas" of philosophic coursework: Area I includes topics related to *ethics and value theory*; Area II, *metaphysics and epistemology*; Area III, *history of philosophy*; and Area IV, *logic and formal methods*. This fourfold scheme covers the extraordinarily broad range of topics encompassed by the field of Philosophy. The range of subtopics falling under each Area is itself quite broad – indeed, too broad to be exhaustively covered in an undergraduate education. This raises the question of which subtopics make for a well-planned philosophical education. There is no disciplinary consensus on an answer (Area IV is an exception) – i.e., no accepted "canon" of specific must-take courses. Our approach is to offer courses on a wide range of subtopics, in Areas I, II, and III: we require students to complete at least three courses in each of these three

Areas, while allowing them to choose the particular courses based on their particular interests. (We manage to *nudge* students towards particularly important courses in each Area by offering those courses more often.) This flexibility in selecting courses works well for the large number of philosophy students who are double-majors, or on a track toward graduate school, as they can take courses complementing their other interests. As for Area IV, students are required to complete at least one course. (And for those with special interest in methodology, we offer a Certificate in Formal Methods; the certificate complements our departmental strength in philosophy of science.)

Advanced Course Requirement. This requirement specifies that of the 10 courses students take in completing the Area Requirement, at least three courses must be taken at the 5000 level. Not only are these courses taught at a more advanced level, they typically "meet with" an associated graduate level course (6000 level), providing advanced undergraduate students the opportunity to interact with graduate students.

Senior Seminar Requirement. This is the *capstone* course for the Major. Class size is small – helping facilitate a writing- and discussion-intensive environment. Enrollment is restricted to advanced philosophy majors, and the seminar does not meet with any associated graduate course.

---

2. Design of our Program Learning Outcome Assessment (PLOA)

Three main overlapping program objectives. The requirements for our Philosophy Major emphasize three overlapping program objectives.

- *Clarity of academic writing and argumentation*. With the exception of some Area IV courses (which focus on formal methods), every course in the curriculum supports this objective. Course typically emphasize writing assignments.
- *Logical rigor of argumentation*. While every philosophy course supports this objective, our Area IV courses focus on the art of logical reasoning. These courses introduce formal logical languages and proof techniques.
- *Understanding of philosophical themes apropos of the four Areas*. Every course in the curriculum contributes to this objective.

These three overlapping objectives converge on two primary learning outcomes. For purposes of PLOA, we focus on the following two *official* learning outcomes:

- Learning Outcome A: Analytical Writing
- Learning Outcome B: Quantitative Reasoning

At first glance, this appears to prioritize the first two of the three overlapping objectives. In one

sense this is correct, in another it's merely apparent. Of the three objectives, only the first two align with clear disciplinary standards. As for the third objective, recall, there is no "canon" of philosophical topics related to Area coursework – i.e., no *particular* philosophical topics an understanding of which exemplify a program learning outcome: every course in the curriculum does nonetheless contribute to that third objective; and students are required to take a broad range of Area courses. Moreover, what we mean by *analytical writing* always involves analysis of philosophical topics or texts – thereby incorporating these apropos of the four Areas. Consequently, learning outcomes A and B jointly encompass the three main overlapping program objectives.

Coursework exemplifying student achievement in regards to these Learning Outcomes. Our PLOA focuses on student achievement in the following two kinds of courses:

- Learning Outcome A: Senior Seminar (Phil 4010)
- Learning Outcome B: Our 3000 level logic courses (Phil 3200 / 3210)

The Senior Seminar is an advanced, writing intensive CW-designated GenEd course that every Philosophy Major is required to take. As the capstone course for the major, essay work in this course typically represents the pinnacle student achievement in regards to all three of the above program objectives. The Senior Seminar is offered every Fall and Spring semester and is taught by a rotating lineup of regular tenure track faculty whose research interests determine the particular "Area" *theme* of the seminar.

Our 3000 level logic courses include Phil 3200 (Deductive Logic) and Phil 3210 (Inductive Logic). These are quantitative intensive QBQI-designated GenEd courses, at least one of which every Philosophy Major is required to take. Both courses emphasize the formal logical methods which are the basis of the argumentative rigor that unifies the study of philosophy across the entire curriculum. Both courses are typically offered every Fall and Spring semester and are taught by any of several faculty with specific competence in formal methods.

Summary of our PLOA strategy.

- Instructors complete a PLOA Form each time they teach the course.
- Three elements of a PLOA Form:

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  3. Summary of the class performance in meeting this threshold of success – again, "good performance and substantial achievement".

- Optionally, instructors may submit a copy of the designated example assignment (in order to provide the review committee with any further needed context).
- Along with submitting a PLOA Form, instructors include a course Syllabus. This allows the review committee to review overall course design, ensuring that the course is appropriate to the learning outcomes of the course (and thereby our overall program learning objectives).
- The various paperwork we collect is archived in a u-Box folder available to all faculty.

The PLOA review committee. The review committee consists of the Department Chair and the current Undergraduate Director (in consultation with the Undergraduate Committee as needed).

Our review process encompasses data regarding individual student achievement in our program, along with individual faculty effectiveness. However, this summary assessment is not principally an assessment of individual student achievement, nor of individual faculty effectiveness; instead, the assessment is closer to a meta-analysis of such outcomes with the aim of providing an overview of departmental effectiveness in achieving our overall program learning objectives – specifically targeting student outcomes of "good performance and substantial achievement".

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3. 5th Year Assessment: Learning Outcome A, Analytical Writing

Data was gathered from three iterations (three different instructors) of our PHIL 4010–Senior Seminar course between spring 2022 and spring 2023. For each iteration of the course, the instructor was asked to choose an example assignment (or set of assignments, in cases where students had choice in which assignments to complete) and show how it emphasizes at least one of the following learning outcomes: Analysis, Explanation, or Writing. The assignments chosen to evaluate analytical writing ranged from reading response papers to short essays analyzing class material. The materials used in these classes were, by and large, a series of articles/book excerpts hand-chosen by each instructor around a specific theme.

A review of the syllabi associated with each iteration of the seminar reveals consistency with the learning objectives they identify. Generally, each seminar requires students to develop an understanding of a body of philosophical questions and views surrounding the theme of that seminar (which varies from historical to contemporary topics); each iteration also requires students to do various assignments (including a major writing assignment or a series of smaller writing assignments) in which they aim to develop creative and critical analysis of those questions and views.

Assignment Goals. In the category of "Analysis," all the assignments chosen emphasized the goal of developing either an objection to a philosophical view under discussion in the course or a

point of support for that view, often further developing that objection or point of support (e.g. by considering how someone else might respond or articulating an innovative response of one's own). Others emphasized the goal of applying a theoretical framework to a specific example. In the category of "Explanation," all the assignments chosen emphasized the goal of clearly and accurately articulating the various philosophical questions and views under discussion in the course. Additionally, some instructors emphasized the goal of comparing and contrasting the questions and views under discussion. In the category of "Writing," many instructors emphasized the goal of identifying a clear thesis and defending that thesis via arguments in a logically organized and innovative way.

Threshold for Success. The criteria for achieving at least a B level grade centered, for most instructors, around writing that achieved the above goals with a good level of clarity, accuracy, and detail (as opposed to the excellent or insightful/original clarity, accuracy, and detail which would be required for an A level grade).

Results. Across all three of these courses, an average of 83.3 percent of students met the threshold of a "B" grade for the assignment chosen (range 80 to 90 percent, median 81 percent). This result shows that by the time students take PHIL 4010, most have developed the core skills evaluated in our learning outcome A. At the same time, it reflects the fact that 4010 remains a challenging course requiring significant student effort and skill.

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4. 5th Year Assessment: Learning Outcome B, Quantitative Reasoning

Data was gathered from five iterations (three different instructors) of PHIL 3200–Deductive Logic) or PHIL 3210–Inductive Logic, courses which fit into Area IV of our major, "Logic and Formal Methods." For each iteration of the course, the instructor was asked to choose an example assignment and show how it emphasizes at least one of the following learning outcomes: Formalization & Translation, Construction of Formal Proofs, Axiomatic Foundations and Theorem Proving, Bayesian and Classical Statistical Methods, or Inference of Complex Probabilities and Notions Informing Statistics. The assignments chosen ranged from quizzes to exams. By and large, the key materials used in these classes were logic textbooks facilitating development of the formal skills needed.

A review of the syllabi associated with each iteration of PHIL 3200 or 3210 reveals consistency with the learning objectives they identify. Generally, each of these courses requires students to develop proficiency in understanding and employing formal methods of reasoning in logic (e.g. a formal language or theory, such as propositional logic, predicate logic, probability theory, etc.). Such proficiency is evaluated through quizzes, exams, and/or homework problem sets.

Assignment Goals. Although the specifics differ, all the assignments on offer for Quantitative Reasoning focus on understanding the structure and components of different types of logic, as well as achieving a certain degree of facility in using that logic. Three of the assignments

addressed "Bayesian and Classical Statistical Methods," and two addressed "Construction of Formal Proofs." Those focusing on "Bayesian and Classical Statistical Methods" asked students to calculate complex probabilities or to understand logical relationships between claims in probability theory, or in some cases to apply probability rules to specific scenarios. Those focusing on "Construction of Formal Proofs" involved exam or quiz questions testing students on their understanding of and facility with deriving theorems in propositional logic (the logic behind simple, declarative sentences without variables or quantifiers). Derivations require students to understand how formal sentences relate to each other and how we can use them to infer other formal sentences.

Threshold for Success. The criteria for achieving at least a B level grade centered, for most instructors, around having a good understanding of the central terms and structure of the logic being explored and making significant progress in using it correctly (i.e. identifying a promising strategy to complete a proof), even if they did not ultimately deploy their strategy in a way that led to the correct answer (as opposed to having high- level understanding and achieving full success in using the logic correctly, as required for an A level grade).

Results. Across all five of these courses, an average of 62 percent of students met the threshold of a "B" grade for the assignment chosen (range 46 to 83.5 percent, median 53 percent). Although this percentage is significantly lower than the percentage of students achieving a "B" grade in the assignments for learning outcome A in the Senior Seminar course, this result is to be expected for two main reasons. First, all of our area IV courses, including PHIL 3200 and 3210, satisfy the University's Quantitative Intensive GenEd requirement. Lower performance in such courses is a general trend at the University, rather than an issue specific to our major. Second, whereas PHIL 4010 is taken after students have developed a facility with philosophical writing and argumentation in previous philosophy courses, PHIL 3200 or PHIL 3210 is in many cases the only logic course a student takes. The lower rate of students meeting the threshold for a "B" grade is thus not reflective of a problem with the evaluation standards in these classes, but rather of the quantitative material combined with the fact that for many students this is their initial and only encounter with such material, or at least one of comparatively fewer encounters than their encounters with analytical writing material.

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5. Summary and General Evaluation

To sum up, the learning outcomes for the Philosophy major are general enough to apply to the broad range of subject matter covered in our curriculum, yet specific enough to zero in on the methodology distinctive of the discipline. The logic and formal methods (area IV) courses focus on the formal structure of reasoning, in abstraction from a specific topic. Courses in our other three area requirements deploy critical thinking methods (including those explored in the quantitative methods courses) to explore philosophical questions on specific topics in ethics and value theory, metaphysics and epistemology, or the history of philosophy. By evaluating assignments from PHIL 3200 or 3210, we measure student success in understanding and

employing the logical structure behind philosophical arguments and theories. By evaluating assignments from PHIL 4010, we measure student success in applying these and other critical thinking methods to specific debates in Philosophy.

As previously noted, our Senior Seminar, PHIL 4010, alternates between faculty who focus on area I, area II, and area III courses. Indeed, data from the past three years of our PHIL 4010 Senior Seminar course includes cases where the topic explored lies at the intersection of two of our main area emphases. For example, one course lies at the intersection of areas I and II (covering current events such as misinformation and climate change), and three courses lie at the intersection of areas II and III (two focusing on feminism currently and in recent U.S. history; one focusing on the nature of science in Aristotle and in recent philosophy). Another focuses on area I, another on area II, and another on area III. Therefore, our evaluations of PHIL 4010 in conjunction with our evaluations of the two area IV courses measure student success across Philosophy's entire curriculum.

With this background in mind, the data we have collected shows that 1) Philosophy students are succeeding in the main objectives that define our major, while 2) Philosophy instructors are succeeding in setting up challenges that require a significantly high level of skill and effort. Achieving the proper balance between these two goals is important; if, for example, 100% of students achieved a grade of B or higher, then the difficulty and challenge of the assignments offered by instructors may be called into question. By contrast, if very few students achieved the threshold for a grade of B, instructors' standards of evaluation may be too high.

As previously discussed, there is a discrepancy between the number of students achieving a B grade or higher in the Logical and Formal Methods courses vs. the Senior Seminar courses.

However, given the quantitative nature of our formal methods courses (along with the fact that students often take them earlier in the major, and without previous exposure to other such courses), the fact that 62% of students achieved a grade of B or higher on the key assignment being evaluated shows that the two goals of success and challenge are well-balanced. Were we to lower the standards to evaluation to raise the average score, we would not be addressing the needs specific to Philosophy majors who take these courses in preparation for logic-related work at even higher levels. We therefore deem average scores in this ballpark to achieve the correct balance between the goal of adequately developing material at the level needed to pave the way for advanced work in Philosophy and the goal of keeping the material accessible to a broad range a students. Additionally, further exams as well as other grading components beyond the exams allow students ample opportunity to raise their overall course grade in these courses.

By contrast, students in PHIL 4010 have already developed the skills measured in this seminar in previous classes; indeed, PHIL 4010 represents their capstone experience for the major. Thus, the fact that 83.3% achieved a grade of B or higher on the key assignment being evaluated likewise shows a proper balance between success and challenge.

Overall, we consider the PLOA to reveal that our program is succeeding in meeting the goals in effectiveness of undergraduate education that the department has set for itself, and that no significant changes in approach or trajectory are required at this juncture.

The Graduate School - The University of Utah

GRADUATE COUNCIL REPORT TO THE SENIOR VICE PRESIDENT FOR ACADEMIC AFFAIRS AND THE ACADEMIC SENATE

March 26, 2018

The Graduate Council has completed its review of the **Department of Geology and Geophysics.** The external review committee included:

Robert S. Anderson, PhD
Department of Geological Sciences
University of Colorado, Boulder

Joel D. Blum, PhD
JD MacArthur Chair and AF Thurnau Chair
GJ Keeler Distinguished University Professor
Department of Earth and Environmental Sciences
University of Michigan

Lisa Tauxe, PhD
Distinguished Professor of Geophysics
Professor, Geosciences Research Division
Scripps Institution of Oceanography
University of California, San Diego

The internal review committee of the University of Utah included:

Benjamin C. Bromley, PhD
Professor and Chair
Department of Physics and Astronomy

Jan L. Christian, PhD
Professor
Department of Neurobiology and Anatomy

Eric R. Pardyjak, PhD
Professor
Department of Mechanical Engineering

This report of the Graduate Council is based on the self-study submitted by the Department of Geology and Geophysics, the reports of the external and internal review committees, and a joint response to the external and internal reports from the Chair of the Geology and Geophysics Department and Dean of the College of Mines and Earth Sciences.

DEPARTMENT PROFILE

Program Overview

The Department of Geology and Geophysics (hereinafter the "Department"), as of the time of the site visits, consists of 24 tenure-line faculty (21 full-time equivalent) and 12 career-line faculty (3 teaching faculty and 9 research faculty). Teaching and scholarly activities are organized under four topical areas: Solid-Earth Processes and Dynamics, Earth Resources and Exploration, Surface Processes and Environment, and Geologic Time and Evolution. The Department offers BS degrees in Geosciences (with emphases in Geology, Geophysics or Environmental Geoscience), Geological Engineering, and Earth Science Teaching. The Department offers master's and doctoral programs in Geology, Geophysics (including an MS in Science Teaching in Earth Science), and Geological Engineering. Research activity in the Department is high, with a significant proportion of faculty securing grants regularly. The Department culture is collegial and the Department has benefited from excellent leadership from former and current chairs.

The Department has responded to many of the recommendations from the previous program review in 2011, including: investing in strategic hires, creating an endowed chair to help with salary compression, hiring a new academic advisor, increasing peer mentoring opportunities for students, and making recruitment of female undergraduates a priority. Funding for staffing and maintenance of core facilities continues to be a challenge for the department.

Faculty

As stated previously, the Department has 24 tenure-line faculty (21 full-time equivalent) and 12 career-line faculty (3 teaching faculty and 9 research faculty). The internal review reports that, "This represents significant growth and turnover in the department since the last review, including 12 new hires in the last seven years. Two of the new tenure-line hires are females, and women now account for 25% of faculty. This is on par with the national average in Geoscience departments. Three of the tenure-line faculty are of Asian ancestry and three research faculty are of Asian, Hispanic or Arabic ancestry. Current faculty diversity reflects that of the faculty applicant pool for positions filled since the last review and also reflects that of Geoscience departments in general."

The external review committee assessed the faculty as strong, with diverse expertise. They noted the bimodal age profile of faculty, but also stressed that "the older cadre of faculty, among whom several are more than 60 years old, remains strong with still-active to thriving research programs." And they further commented that "the newly hired faculty, many of whom have been at UU for less than 10 years, are vibrant and excited about both research and teaching." Yet, clearly the bimodal age distribution may present a challenge in terms of departmental leadership in the upcoming years and the external reviewers

advised that steps be taken now to ensure strong leadership in the coming years. The external review committee also suggested that the department make a better effort to include non-tenure-line faculty in the life and governance of the Department.

The faculty also received praise for funding and publications in the external reports. The internal review committee notes, "Geology and Geophysics faculty are above the national median in awards, citations and published articles but are slightly below the national median in grant dollars and number of grants per faculty. This may reflect the relatively recent and rapid addition of new junior faculty. The majority of faculty, however, are publishing regularly in peer-reviewed journals, and have external funding." The internal review committee also notes the high service activity of the faculty and that teaching loads are not equitable.

A need for more formal mentoring processes emerged from interviews with junior faculty. Given the importance of cultivating leadership in the department, extending mentorship opportunities to mid-level faculty is likely also important.

Students

The Department seeks undergraduate students through multiple avenues. The Department's diversity with respect to female and underrepresented minority enrollments has averaged 35% and 10%, respectively. The internal review committee claims, "There is an appropriate gender balance among students. The number of underrepresented minority (URM) students is low, but the department has had some success in recruiting URMs recently and numbers are comparable with nationwide averages for Geoscience programs." Recruitment efforts (including efforts to increase diversity) include offering scholarship opportunities and an NSF-funded collaboration with Salt Lake Community College and Weber State University to create a mentored pipeline for transfer students. The Chair's response letter reports that the college-wide Advising Center has a focus on outreach and that they are also working with the Admissions Office to increase diversity.

Reviewers found the graduate students to be high quality, dynamic and engaging, and remarked that they progress through the program in good time. However, the Department is faced with turning away highly qualified graduate students due to a lack of funding for Teaching Assistantships. These rejected students are both national and international applicants.

Although the external review committee notes that the graduate program is overall strong and thriving, there is a problem with advising. To correct this problem the external review committee offered five concrete suggestions: yearly committee meetings with sign-off by student, advisor, and committee; increased effort to back-fill information from other disciplines in order to perform high-end, cross-disciplinary research; exposure to non-academic and non-industry career options; an introductory activity for first-year graduate students each year; and more activities in general to weave graduate students and the Department together. The Department has many activities now planned (or underway) that should promote interactions among students and provide broad opportunities to bring together students, faculty, and staff.

Postdoctoral fellows are recruited and mentored by individual faculty. Ensuring consistent access to additional mentoring resources is a point where improvements could be made; capitalizing on resources that exist, whether at the departmental, college or university level, seems like a first important priority.

Curriculum

The Department's curriculum is vast, including the offering of three BS degrees, four MS degrees, and three PhD degrees. The Department offers a wide variety of courses for students to pursue these degrees, with 170 courses on the books. The external review committee noted that the undergraduate curriculum is too "rock based" but that they see the Department making strides towards including more of the diversity of the field. The external committee expressed some concerns over planned changes to the curriculum that suggest this revamping process should be approached carefully. The Chair's response indicates a commitment to evaluating the effectiveness of any changes and being willing to revise if needed. Certainly, striving to eliminate redundancy and optimize class sizes are very reasonable and timely goals.

The external review committee took issue with the graduate curriculum, stating: "There doesn't seem to be a coherent graduate curriculum at all. There also seems to be a lack of graduate course offerings and inconsistency as to when they are offered. Teaching assistants are also not receiving adequate instruction in teaching pedagogy or in classroom management." The internal review committee did not note this problem with the graduate curriculum but did state that they received feedback from graduate students that technical courses such as programming, statistics, and instrumentation were not adequately provided. While graduate certificate programs seem to knit together prescribed curricular choices and professional development, it is important to ensure students throughout the Department have a strong program of study.

Program Effectiveness and Outcomes Assessment

The Department has a successful track record of graduating most undergraduate students within a five-year period and moving those students on to careers in the field and/or graduate school. It is noted by the internal review committee that the diversity of degrees offered by the Department makes it a little difficult to produce uniform assessments; however, they note the success of the four-step assessment model utilized by the Department. The external review committee notes that the Department has clearly made improvements in their efforts toward programmatic evaluation. However, the committee also would like to see more concrete metrics to evaluate the teaching of the graduate programs, and both teams noted the general need to have a more robust feedback loop to improve program effectiveness.

Facilities and Resources

Both the internal and external review committees note the state-of-the-art quality of the labs and facilities of the Department. The external review committee mentioned the successful "collaboration between two heavy-weight researchers, Thure Cerling whose primary appointment is in GG, and Jim Ehleringer whose primary appointment is in Biology. Together they are largely credited with establishing the field of stable isotope ecology and paleoecology, and both are now in the National Academy of Sciences. Their joint lab facility, called SIRFER, has been a key to the success of much research on campus." This facility, along with other resources, has helped drive a widespread reputation for the Department as a site of cutting-edge analytical facilities, yet the internal review committee points to a major problem with funding for technical positions, claiming: "There are significant departmental operating budget issues that include insufficient funds for staff… and non-personnel operations. The department has been quite successful securing endowment funding, competitive external funding, and running recharge facilities to close budget

gaps, but there is insufficient staff help to manage these accounts. Furthermore, the department operates millions of dollars of facilities without secure technical staff positions. Many of these facilities operate as recharge centers that rely on transient support and would benefit greatly from stable long-term support." It is recommended that the College Dean and upper administration revisit the returned overhead agreement, given the current expectation that the Department contribute substantially to start-up packages for new faculty. The external report concurs with this assessment and further underscores the need to hire tenure-track faculty who will be future leaders of specific analytical laboratories.

COMMENDATIONS

1. The Department building (Frederick A. Sutton Building) is well-designed and used intelligently.

2. The Department has a highly collegial environment that includes positive interactions between students, faculty, and staff.

3. Faculty at all levels are commended: the chair for his vision and for being an exemplary role model of excellence in research and collaboration, the junior faculty for their energetic contributions to the department mission, and the full faculty for their excellence in research quality and productivity. Teamwork among the faculty to address key issues was noted to be high.

4. The Department makes robust contributions to cross-disciplinary research and education via state-of-the-art shared resources and through close connections to the Global Change and Sustainability Center.

5. The Department has made strides in gaining more gender balance with the hiring of two women for new tenure-line positions.

RECOMMENDATIONS

1. The Department should establish a mentoring program for untenured faculty.

2. The Department should ensure that all graduate students are guided along a robust program of study with ample advising, mentoring, and community building.

3. The Department should reinvigorate strategic planning that capitalizes on their strength in cross-disciplinary research and the talents of new hires. Within this context, plans for future faculty hiring should be articulated, as well as pathways to increase diversity. An external advisory board would be very useful to strategic planning and other departmental efforts.

4. The Department should work to increase effectiveness of undergraduate student recruitment, including attracting more underrepresented racial and ethnic minorities.

5. The Department should investigate ways to increase administrative and technical staff support. For example, the College Dean and upper administration should revisit the returned overhead agreement, given the current expectation that the Department contribute substantially to start-up packages for new faculty. This presents a challenge to recruiting efforts and constrains other initiatives central to running the Department.

6. The Department should develop processes that seek to make faculty workload in teaching equitable, being protective of junior faculty.

Submitted by the Ad Hoc Committee of the Graduate Council:

Elisabeth E. Pankl (Chair)
Head, Undergraduate and Graduate Services, Marriott Library

Christopher A. Reilly
Associate Professor, Department of Pharmacology and Toxicology

Lien Shen
Associate Professor, Department of Film and Media Arts

Jane D. Hatter (Undergraduate Council Representative)
Assistant Professor, School of Music

Learning Outcome Assessment Plan
for the Department of Geology & Geophysics
AY 2020-2021

Program Purpose

The Department of Geology and Geophysics offers Bachelors of Science (B.S.) degree programs that are designed for students who wish to pursue professional careers in the Earth sciences or in other areas of science, engineering, teaching and learning, public service, or business. In addition to providing a broad, rigorous education in the Earth sciences, the curriculum also includes comprehensive preparation in all the physical sciences, so graduates from the program will be competitive when applying for admission to graduate schools and/or quality jobs in the professional arena.

The Geology and Geophysics Department offers three different B.S. degrees in Geoscience (with formal concentration in Geology, Geophysics, or Environmental Geoscience Emphasis), Earth Science Composite Teaching, and Geological Engineering with a curriculum that is accredited by the Engineering Accreditation Commission of ABET (www.abet.org). A minor in Earth Science also is offered. In addition, the department participates in three cross-disciplinary programs with other science departments – Geology-Biology, Geology-Chemistry and Geology-Physics, and in a Philosophy of Science program with the Department of Philosophy.

This 2020 assessment presents newly updated learning outcomes that align with the undergraduate core curriculum that was revised in 2018 with input from all faculty within the department. This new curriculum was introduced at the start of the Fall 2018 term. Our new curriculum includes four new sequential introductory courses that provide a broader and more process-based overview of the Geosciences. It connects undergraduate students with more, and more diverse, faculty early in the students' program of study. This new curriculum provides a geoscience foundation from which students extend their focus into one of five degree pathways (Geoscience – Geology emphasis; Geoscience – Environmental Geology emphasis; Geoscience – Geophysics emphasis; Geological Engineering; and Earth Science Teaching). The program lays out coherent plans of study that help students to select logically connected courses among our many electives and are designed in a manner that aims to meet our program's learning outcomes.

The new core includes the following sequence: 1) GEO 1100 Evolving Earth, 2) GEO 2100 Reactive Earth, 3) GEO 2500 Wasatch in the Field, 4) GEO 3100 Dynamic Earth, and 5) GEO 4500 Field Methods cohort. Each of these courses is team-taught by multiple faculty.

2020 Learning Outcomes

Bachelor of Science

(Geoscience) emphasis areas Geology, Environmental Geoscience, Geophysics, and Earth Science Composite Teaching

[Geological Engineering]

1. An ability to identify, formulate, and solve complex (geoscience) [engineering] problems by applying principles of [engineering], science, and mathematics.
    a. Simplify open-ended problems using a systems approach to produce sustainable outcomes.
        a. Quantitative approaches
        b. Qualitative approaches
2. An ability to apply (geoscience knowledge) [engineering design] to produce (understanding) [solutions] that meet(s) specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences
    a. Written and spoken communication
    b. Effective visualization and presentation of information
4. Ability to recognize ethical, professional responsibilities in (geoscience consulting) [engineering situations] and make informed judgements, which must consider the impact of (geoscience) [engineering] solutions in global, economic, environmental, and/or societal context.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop hypotheses and conduct appropriate experimentation, analyze and interpret data, reference peer reviewed literature, and use (geoscience) [engineering] judgement to draw conclusions in a timely manner.
    a. Think in four dimensions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Masters of Engineering Geological Engineering

8. Demonstrated level of complexity and independence with respect to 1-7 as appropriate for a non-thesis M.E. recipient.

Masters of Science Geoscience and Geological Engineering

9. Demonstrated level of complexity and independence with respect to 1-7 as appropriate for an M.S. recipient.

Doctor of Philosophy Geoscience and Geological Engineering

10. Demonstrated full complexity and independence with respect to 1-7 as appropriate for a Ph.D. recipient.

Program Assessment

Each of the five degree pathways within the Department of Geology & Geophysics will be rigorously reviewed as a part of an ongoing program-level learning outcomes assessment plan that aims to identify the standard of quality of our undergraduate and graduate programs. Data collection is modeled after the approach that has been taken with the Geological Engineering program with ABET Outcomes Assessment.

The evidence needed to assess each of the listed learning outcomes within each program will be collected from faculty using a template for each of the listed outcomes that prompts them to identify:

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, *etc*. used to assess this outcome.
2. Statement of how the problem addresses the outcome.
3. Student grades on the problem/assignment. Include statistics.
4. What they understand.
5. What they don't understand.
6. Conclusion (supported by data).
7. Recommendations to improve achievement of this outcome.

These data will be formally collected from each of the faculty who have taught in the new core curriculum in Fall 2020 and Spring 2021. As each of these courses has been team taught, faculty groups who have contributed to these courses will be engaged through a series of small group meetings to determine the potential for retroactive assessment and consensus on best steps for the future. In addition, a matrix identifying each of the departmental electives and how they contribute to the specific learning outcomes will be created. This matrix will use a scale to indicate whether this is a minor or significant outcome for each of the courses taught in the department. We will utilize tools made available in Canvas to help faculty to collect representative examples of student work to inform the assessment. The Curriculum Committee, in partnership with the Undergraduate Affairs Committee, Graduate Affairs Committee, and the Associate Chair for the department will then review all the collected data and suggest changes and modifications to address quality shortfalls in the program. A similar but more expansive assessment plan will also be implemented in subsequent academic years.

APPENDIX: Prior learning outcomes

Geoscience (Bachelor of Science)

Emphasis areas: Geology, Environmental Geoscience, Geophysics

- Program graduates will have demonstrated a mastery of the geosciences that allow them to succeed as graduate students in geology, environmental earth science, geophysics, or in related fields, as students in professional schools, or as entry-level employees in industry or government.
- Program graduates will have an understanding of the nature and origin of the materials that make up the Earth.
- Program graduates will understand the dynamic processes that operate within the Earth from its deep interior to the surface.
- Program graduates will have an understanding of geologic time and how it is measured.
- Program graduates will have an understanding of the geologic evolution of the Earth and the development and evolution of life on Earth.
- Program graduates will have the ability to apply basic principles of mathematics, chemistry, biology and physics to geologic issues.
- Program graduates will demonstrate skills in reading comprehension of the scientific literature, and in oral and written communication of scientific results.
- Program graduates will demonstrate proficiency in geologic field skills and in solving integrative, field-based problems in Earth science.
- Students nearing graduation will be able to make informed choices as to post-graduate opportunities for education or employment.
- Program graduates will be prepared and qualified to pass the professional geologist licensure examination.
- Students will understand the place of the Earth sciences in the larger picture of the intellectual landscape of inquiry, including connections between science and, history, philosophy, ethics and the formulation of public policy.
- Ability to engage in lifelong learning and understanding of the need to do so.

Geological Engineering (Bachelor of Science)

- Ability to apply knowledge of mathematics, science, and engineering.
- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Ability to design a system, component, or process to meet desired needs.
- Ability to function on multi-disciplinary teams.
- Ability to identify, formulate, and solve engineering problems.
- Understanding of professional and ethical responsibility.
- Ability to communicate effectively.
- Understanding of the impact of engineering solutions in a global and societal context.
- Recognition of the need for and ability to engage in life-long learning.

- Knowledge of contemporary issues.
- Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Ability to engage in lifelong learning and understanding of the need to do so.
- Ability to pass the Fundamentals of Engineering examination, thereby allowing them to immediately begin training for Professional Engineering licensure upon graduation.

Earth Science Composite Teaching (Bachelor of Science)

- Demonstrate mastery of the geosciences, chemistry, physics, astronomy, biology, ecology, math and atmospheric sciences that allow them to meet State requirements for Secondary Science Endorsements in Earth Science and Integrated Science and Secondary Licensure Program requirements within the College of Education.
- Understand the nature and origin of the materials that make up the Earth.
- Understand the dynamic processes that operate within the Earth from its deep interior to the surface.
- Understand geologic time and how it is measured.
- Understand the geologic evolution of the Earth and the development and evolution of life on Earth.
- Demonstrate proficiency in basic geologic field skills.
- Demonstrate comprehension of the scientific literature, and skill in oral and written communication of scientific results.
- Ability to organize content for student learning and select appropriate evaluation methods to measure student mastery of the content.
- Ability to provide differentiated instructions and curriculum, adaptations, and modifications necessary to promote student learning.
- Ability to adapt instruction to cultural and language differences and to provide effective large group, small group and one to one instruction.
- Ability to assess student learning, including development and administration of assessment instruments and using the results to modify student placement and instruction.
- Demonstrate skills for student learning/classroom management.
- Understand teaching professionalism and ethical responsibility.
- Ability to engage in lifelong learning and understanding of the need to do so.
- Ability to pass the Level I Praxis Exam.

THE UNIVERSITY OF UTAH

Department of Geology & Geophysics – College of Mines and Earth Sciences

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http://www.earth.utah.edu/

Learning Outcome Assessment
Year 5 Interim Report
Fall 2018-Spring 2023

06/30/2023

Prepared by Lowell Miyagi,
Chair, Curriculum Committee,
Department of Geology and Geophysics

1. Program Purpose

The Department of Geology and Geophysics offers Bachelors of Science (B.S.) degree programs that are designed for students who wish to pursue professional careers in the Earth sciences or in other areas of science, engineering, teaching and learning, public service, or business. In addition to providing a broad, rigorous education in the Earth sciences, the curriculum also includes comprehensive preparation in all the physical sciences, so graduates from the program will be competitive when applying for admission to graduate schools and/or quality jobs in the professional arena.

The Geology and Geophysics Department offers three different B.S. degrees in Geoscience (with formal concentration in Geology, Geophysics, or Environmental Geoscience Emphasis), Earth Science Composite Teaching, and Geological Engineering with a curriculum that is accredited by the Engineering Accreditation Commission of ABET (www.abet.org). A minor in Earth Science also is offered. In addition, the department participates in three cross-disciplinary programs with other science departments – Geology-Biology, Geology-Chemistry and Geology-Physics, and in a Philosophy of Science program with the Department of Philosophy.

In academic year 2020 we developed updated learning outcomes that align with the undergraduate core curriculum that was revised in 2018 with input from all faculty within the department (for a list of the previous outcomes see Appendix 1). This new curriculum was introduced at the start of the fall 2018 term. Our new curriculum includes four new sequential introductory courses that provide a broader and more process-based overview of the Geosciences. It connects undergraduate students with more, and more diverse, faculty early in the students' program of study. This new curriculum provides a geoscience foundation from which students extend their focus into one of five degree pathways (Geoscience – Geology emphasis; Geoscience – Environmental Geology emphasis; Geoscience – Geophysics emphasis; Geological Engineering; and Earth Science Teaching). The program lays out coherent plans of study that help students to select logically connected courses among our many electives and are designed in a manner that aims to meet our program's learning outcomes.

The new core includes the following sequence: 1) GEO 1100 Evolving Earth, 2) GEO 2100 Reactive Earth, 3) GEO 2500 Wasatch in the Field, 4) GEO 3100 Dynamic Earth, and 5) GEO 4500 Field Methods cohort. Each of these courses is team-taught by multiple faculty.

2. Learning Outcomes Established in 2020

Bachelor of Science

(Geoscience) emphasis areas (tracks): Geology, Environmental Geoscience, Geophysics, and Earth Science Composite Teaching
[Geological Engineering]

1. An ability to identify, formulate, and solve complex (geoscience) [engineering] problems by applying principles of [engineering], science, and mathematics.
    a. Simplify open-ended problems using a systems approach to produce sustainable outcomes.
        a. Quantitative approaches
        b. Qualitative approaches
2. An ability to apply (geoscience knowledge) [engineering design] to produce (understanding) [solutions] that meet(s) specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences
    a. Written and spoken communication
    b. Effective visualization and presentation of information
4. Ability to recognize ethical, professional responsibilities in (geoscience consulting) [engineering situations] and make informed judgements, which must consider the impact of (geoscience) [engineering] solutions in global, economic, environmental, and/or societal context.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop hypotheses and conduct appropriate experimentation, analyze and interpret data, reference peer reviewed literature, and use (geoscience) [engineering] judgement to draw conclusions in a timely manner.
    a. Think in four dimensions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Masters of Engineering Geological Engineering
8. Demonstrated level of complexity and independence with respect to 1-7 as appropriate for a non-thesis M.E. recipient.

Masters of Science Geoscience and Geological Engineering
9. Demonstrated level of complexity and independence with respect to 1-7 as appropriate for an M.S. recipient.

Doctor of Philosophy Geoscience and Geological Engineering
10. Demonstrated full complexity and independence with respect to 1-7 as appropriate for a Ph.D. recipient.

3. Program Assessment

Each of the five degree pathways (tracks) within the Department of Geology & Geophysics will be rigorously reviewed as a part of an ongoing program-level learning outcomes assessment plan that aims to identify the standard of quality of our undergraduate and graduate programs. Data

collection is modeled after the approach that has been taken with the Geological Engineering program with Accreditation Board for Engineering and Technology (ABET) Outcomes Assessment.

The evidence needed to assess each of the listed learning outcomes within each program will be collected from faculty using a template for each of the listed outcomes that prompts them to identify:

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, *etc*. used to assess this outcome.
2. Statement of how the problem addresses the outcome.
3. Student grades on the problem/assignment. Include statistics.
4. What they understand.
5. What they don't understand.
6. Conclusion (supported by data).
7. Recommendations to improve achievement of this outcome.

These data will be formally collected from each of the faculty who have taught in the new core curriculum in fall 2020 and/or spring 2021 and again in fall 2022 and/or spring 2023. As each of these courses has been team taught, faculty groups who have contributed to these courses will be engaged through a series of small group meetings to determine the potential for retroactive assessment and consensus on best steps for the future. We will utilize tools made available in Canvas to help faculty to collect representative examples of student work to inform the assessment. The Curriculum Committee, in partnership with the Undergraduate Affairs Committee, Graduate Affairs Committee, and the Associate Chair for the department will then review all the collected data and suggest changes and modifications to address quality shortfalls in the program.

4. Year 3 Assessment Summary: Fall 2020 and Spring 2021

Below is a summary of our 3rd year outcomes assessments for the three-course core sequence plus Wasatch in the Field that was conducted during the 2020 academic year. Appendix 2 contains the specific outcomes assessed and the instructor reflective memos from the year 3 assessment.

4.1. Background:

During the 2020 academic year, outcomes assessment was started for the Department of Geology and Geophysics curriculum. This assessment is particularly important as we instituted a new core curriculum in academic year 2018. The new courses in the core are an introductory field course, Wasatch in the Field (GEO 2500) and a three-course sequence of Evolving Earth (GEO 1100), Reactive Earth (GEO 2100), and Dynamic Earth (GEO 3100). As these are newly implemented core courses, this assessment focuses on the effectiveness of the progression of these courses and their success at achieving desired outcomes. Outcomes assessment consisted of identification of outcomes and the assignments that are designed to teach and test the desired outcomes and a

reflective memo from instructors assessing success of the course in meeting these outcomes, as well as recommended changes to the courses. It is worth noting that this outcomes assessment took place during the COVID pandemic and at a time when courses had been shifted online. Many of the noted issues and recommendations for these courses focused on how to better transition to online learning and facilitate the student experience with CANVAS. This is likely to be a less acute problem as we transition back to in person classes. In the following summary, Wasatch in the Field will be presented first as it can be taken out of sequence from the other courses.

4.2. Wasatch in the Field:

This course is intended to be an introduction to field based Geoscience and is co-taught by four instructors. It typically contains modules from the following topics, geology, hydrogeology/environmental geoscience, geophysics and engineering geology. On some level this course is intended to be a "hook" to draw students into the major. As this course is to be a first look at field-based geoscience there are no prerequisites and no prior geoscience background required. The main outcome associated with this course is to develop "an ability to acquire and apply new knowledge as needed, using appropriate learning strategies". The main challenge associated with this course is coherence between the 4 modules and teaching styles of the four instructors. There has also been some confusion about the level of background and rigor of the course (i.e. this is an introductory course rather than a more advance field course). This is somewhat exacerbated by the fact that some students take this course in their third year and so some students have considerable geoscience background. This issue appears to have been addressed and students do appear to be meeting expectations and enjoying the course. One challenge going forward will be addressing increasing enrollment and the potential need to offer this in spring semester as well. This will require careful consideration as access to field sites is considerably different in the spring than in the fall. Thus, care needs to be taken that outcomes are being met in an equivalent manner.

4.3. Three Course Core Sequence:

Evolving Earth (GEO 1100) is the first course in this sequence and focuses on the various systems that drive our planet's evolution from formation to the present day. This course serves to provide context for subsequent courses in the Geosciences. A key skill that is developed in this course is for students to "…learn to observe, interpret and critically reason from primary earth science data." This is a critical outcome for this course as it is vital for students to develop this ability since it is foundational to future geoscience courses. For most of the students this is the first time they have had to use and develop this type of critical think skill set, but the assignments designed to develop these skills appear to be successful and students are appropriately prepared for subsequent courses. The main adjustments recommended by the instructor are to further emphasize critical reasoning, data interpretation, and synthesis skills.

Reactive Earth (GEO 2100) is the second course in this sequence and focuses on the intersection of chemistry and geoscience. This course covers high- and low-temperature geochemistry processes, introducing students to rock forming minerals and petrogenesis as well as aqueous geochemistry and weathering phenomena. Several outcomes are associated with this course and include identification, formulation and solving of complex geoscience problems; functioning

effectively as a collaborative team; and developing the ability to design, conduct, and interpret experiments. As with Evolving Earth it was noted that this course was difficult transitioning to an online environment given the hands-on nature of the topic. The instructors were satisfied with students meeting the desired outcomes particularly given difficulties of transitioning to an online course. It was noted that some students lacked basic quantitative skills. It should be noted however that during the period of the assessment, prerequisites were not enforced for Geology and Geophysics courses and it will be useful to revisit this moving forward.

Dynamic Earth (GEO 3100) is the third core course in the sequence and focuses on dynamic processes both in the Earth's interior as well as surface processes that shape the planet. The main outcomes associated with this course are to identify and solve complex geoscience problems by applying principles of science and mathematics, to design and conduct experiments, and draw conclusions from these experiments, particularly by thinking in four dimensions. These outcomes are assessed through a series of workshops requiring increasing complexity in the student's problem-solving capabilities. Students appear to be able to merge analytical expressions with real world data indicating that they are meeting the desired outcomes. However, some struggle with more abstract concepts such as vector and tensor rotation. This course was noted to be difficult to teach as students appear to have a large discrepancy in quantitative ability and numerical capabilities. For example, many are proficient with excel but some have no experience. Give the short time for workshops (the course has three lecture periods and no labs), it can be difficult to bring students to a level playing field. As noted above, as prerequisites are now enforced this will be an issue to revisit going forward. A suggested adjustment is to spend more time and rework sections on abstract concepts like vector and tensor rotation and to move a significant portion of this material to subsequent courses such as Structural Geology (GEO 4060) where more time can be devoted to these topics.

4.4. Year 3 Assessment Conclusions:

In general, the new core sequence is achieving the desired outcomes and the sequence is effective. Many issues identified in reflective memos were related to transitioning courses which were developed for in-person instruction and hands on activities to online remote learning. With respect to student preparedness, inconsistency in student quantitative background appears to be the biggest challenge. A significant part of this may be due to unenforced prerequisites, and it is advisable to monitor this going forward. The main recommendation moving forward will be to assess the impact of the new core curriculum on upper division courses specific to the various geoscience tracks within the major, as well as assess the impact on student preparedness for elective courses. An efficient way to achieve this objective would be to hold a faculty retreat in order to determine the impacts of the new core on courses that follow the three-course sequence.

5. Year 5 Assessment Summary: Fall 2022 and Spring 2023

Below is a summary of outcomes assessments for the three-course core sequence plus Wasatch in the Field that was conducted during the 2022 academic year. As before outcomes from Wasatch in the Field (GEO 2500) will be presented first followed by the three-course sequence of Evolving Earth (GEO 1100), Reactive Earth (GEO 2100), and Dynamic Earth (GEO 3100).

Appendix 3 contains the detailed outcomes that were assessed for each course and the instructor's/instructors' reflective memo. Also included below is a summary of the faculty retreat that was held based on the recommendation from the year 3 assessment. It should be noted that although our department's understanding was that prerequisite enforcement would start in fall 2022, this did not happen. While our prerequisites were entered in the Kuali system on the departmental side, these did not get transferred internally to the PeopleSoft system which is used by the registrar for prerequisite enforcement. During academic year 2022-2023 we coordinated with the registrar's office to correct this issue and we believe these will be enforced properly moving forward.

5.1. Wasatch in the Field:

Instructional support has been improved through the addition of undergraduate Learning Assistants. This is a direct follow up from the 3rd year assessment and was highly successful. However, logistical and instructional support still remains a challenge for this course. This course is particularly demanding in this area as it brings 30 plus students in to the field weekly for off-campus exercises involving activities ranging from geologic mapping, GPS measurements, stream flow measurement, and geologic hazard analysis. Obviously, student safety is of paramount concern and this is a major logistical consideration. Also as noted student have diverse backgrounds, and some students are computationally unprepared. Specifically, some of them did not know how to calculate an average of a set of numbers. In addition, although this course does not have any geology prerequisites and no prior knowledge is needed, some students had taken some geology courses and thus had an advantage over other students. The recommendation moving forward is to group students such that individuals with better computational skills and more extensive background are grouped with students that have less preparation in these areas to build in peer mentoring. Additionally for fall 2023, undergraduate Learning Assistant are again being utilized for this course and we now have staff support to assist with logistical and technical aspect of this course. Previous issues with expectations related to the level of rigor and student background has been corrected. Also, though some challenges still remain related to continuity between instructors. The faculty involved in this course are more organized in communication and calibration of expectations and learning goals. Some issues with student engagement in lecture exist and inclusion of more, short, hands-on activities during the lecture portion is recommended moving forward.

5.2. Three Course Core Sequence:

Evolving Earth (GEO 1100) continues to be highly successful and is facing growing enrollments. It consistently meets or slightly exceeds the enrollment cap every semester it is offered. Moving forward we look to facilitate continued growth through utilization of larger classrooms and increased instructional support in the form of Teaching Assistants and undergraduate Learning Assistants. This is a good sign for departmental growth, though we face problems with a bottleneck in Wasatch in the Field (see section 5.3.2. for steps we are taking to address this problem). This course has high approval from the students and is preparing them well for next set of core courses. The instructor feels that outcomes are appropriate and appear to be at the proper difficulty. Students initially struggle with data interpretation and critical reasoning early in the course but have increase comfort by the second half of the semester. This indicates that

the course is meeting desired outcomes. Some suggested improvements are to add "level up challenges" for students who are interested in more challenging exercises and to increase the number of interactive activities in the second half of the course. One area of instructional support that needs to be improved is more and better rock and mineral samples for hands-on activities.

Reactive Earth (GEO 2100) appears to be running smoothly, but instructors still note that there are some students lacking quantitative skills. However, as noted, due to problems with prerequisite enforcement at the registrar's office. many students were still able to register for classes without meeting the prerequisites. This year was the first year that the instructor for Mineralogy (GEO 3020) was involved in the course and we expect that this should improve continuity between this course and the subsequent mineralogy course. See section 5.3.2. for student concerns related to preparation for Mineralogy. In general, the instructors are satisfied that students are meeting the required outcomes. Note that for the first time in spring 2023 Petrology for Engineers (GEO 3070) now meets with the first half of GEO 2100. GEO 3070 is a required course for Mining Engineering students that is taught in our department. This has the potential to add as many as 15 students to the first half of this course and so is an area where we should monitor the impact on instructional needs for this course. However, because Reactive Earth is offered every semester, while previously GEO 3070 was only offered fall semester, this should increase flexibility for Mining Engineering students and minimize the impact on Reactive Earth.

Dynamic Earth (GEO 3100) has undergone significant modification this year with the inclusion of PYTHON scripts for basic scientific computing during the weekly workshop period. It was evident from our student survey results that more exposure to coding experience would be beneficial (See section 5.3.2.). This is also something that has been discussed among faculty who teach GEO 3100 as an area that needed strengthening in our core sequence. It is important for the tracks that continue on to take Computational and Numerical Methods (GEO 3400). This course continues to be a challenging course to teach as student have disparate physics and quantitative reasoning backgrounds. A new addition this year was to conduct a student survey at the beginning of the course. This revealed that approximately half the students did not have the physics prerequisites due to issues with prerequisite enforcement (see above). The addition of python was challenging for students but overall successful. Some recommended changes that were identified by the instructors are better onboarding for PYTHON (quick-start guides), the addition of an undergraduate Learning Assistant, as well as note taking guides to help students develop successful study habits. The instructors found that the outcomes are appropriate for this course and that these are being achieved. Additionally, students are well prepared for subsequent courses based on discussion with instructors of those courses.

5.3. Impact on Upper Division Courses:

As a part of the Year 5 Assessment the Department of Geology and Geophysics held a faculty retreat January 6th 2023 to improve continuity in the core sequence and to investigate student preparedness for upper division courses. As a part of this retreat a survey was sent to current department undergraduate majors to solicit feedback on Wasatch in the Field and the three-course core sequence.

In general student feedback on the new core sequences was overall positive (> 80%). Based on this feedback several positives/opportunities and challenges/areas for improvement were identified during the retreat along with steps to incorporate this feedback into the courses. These are summarized below.

5.3.1. Positives and Opportunities:

Wasatch in The Field was widely viewed by the students as the best exposure to various geoscience tracks. This exposure allows the students to make informed decisions with respect to specialization and selection of a geoscience track to pursue. However, in the other cores courses (Evolving, Reactive, and Dynamic Earth) faculty could do more to emphasize the various geoscience tracks, highlight each tracks specialties, and emphasize the relationship between the material covered and the different tracks. In addition, students felt it would be helpful to emphasize the links between the individual courses in the three-course core sequence. In other words, highlighting the links between these courses during class and including material that links the courses. Much of this already exists in the current course structure and faculty are committed to explicitly emphasize these links between the courses and the material and the various tracks.

Team teaching was broadly viewed favorably and students appreciated interreacting with more faculty at an earlier stage in the curriculum. They also enjoyed the exposure to individual faculty member's areas of specialization. There were however some caveats to team teaching which are detailed below under challenges and areas for improvement.

5.3.2. Challenges and Areas for Improvement:

One of the major challenges that was identified with the team-teaching model is continuity between instructors. Transitions could be jarring for the students. Some of this is due to changes in format of lab materials, use of lab time, and lecture style. This is easily remedied through closer collaboration between faculty to standardize format of material. However, some differences will remain due to differences in teaching style between instructors and to some degree this is intrinsic to this teaching model. Continuity in expectations and difficulty level are a challenge for this model. Here several options have been proposed and/or are already being implemented. This includes clearer articulation of expectations at the beginning of each module in the course, as well as regular short quizzes to give student the opportunity to develop an understanding of instructor expectations. One challenge in the three-course core sequence is that each instructor has often only given one exam at the end of their half of the course and student do not have the opportunity to adapt to the style of questions each instructor asks. Having short quizzes gives students this opportunity and keeping the point values low on individual quizzes makes each one less consequential.

Another concern that was expressed by students is that content varies from instructor to instructor. However, this is something that was built into this curriculum model. One of the goals of this curriculum was to allow faculty to teach to their strengths while at the same time ensuring that learning outcomes and the underlying concepts are the same. For example, a faculty member specializing in structural geology will teach a different application of stress and strain in rocks than a geologic engineer or seismologist, however, the underlying concepts and

skills are similar. In this curriculum the geologic concepts and underlying mathematics, physics, chemistry etc. that we teach are standardized, rather than the specific applications.

Several challenges were identified that relate to preparedness of students for upper division courses. In particular students felt that while overall the three-course core and Wasatch in the Field provided proper preparation for subsequent courses, Reactive Earth (GEO 2100) did not seem to fully prepare students for Mineralogy (GEO 3020). This is currently being addressed by having the GEO 3020 instructor involved in teaching GEO 2100 and modifying content of this course to address this gap. Another area of concern is that some of the tracks do not take courses such as Sedimentology and Stratigraphy (GEO 3040) and Structural Geology and Tectonics (GEO 4060). Students who do not take these courses are at a distinct disadvantage when/if they take Field Geology (GEO 4510 and 4520), which is currently the default capstone for our students. While we do not have an immediate solution to this problem it should be noted that there is a broader ongoing discussion of and proposals for alternate and potentially more appropriate capstones for the various tracks. Finally, it was noted that coding experience is becoming more important for students and it would be good to have more exposure to this in the core. This is already being addressed in Dynamic Earth through a series of weekly hand on class using python to model or analyze various problems related to the dynamic earth.

Finally, flexibility in when courses are offered is problematic for student to meet course requirements for graduation particularly when also trying to meet allied science requirements. This has been addressed for the three-course core sequence. We now offer all three of these courses every fall and spring semester. Wasatch in the Field is still only offered in the fall due to logistical issues with field work during spring semester. In addition, this course is limited in size due to safety considerations associated with field work. Thus, Wasatch in the Field is current bottleneck for our majors. One solution that we are currently implementing is to add an additional field section to this course to give student scheduling flexibility and to allow us to double student numbers in this course while maintaining a safe field environment.

5.3.3. Assessment of Student Performance in Subsequent Courses:

To assess the impact of the new core on student performance student grades in several subsequent courses were compiled and compared pre and post adoption of the new curriculum. Note that this is not a perfect comparison as some of these courses have changed slightly during the curriculum revision. For example, the current course Mineralogy (GEO 3020) is equivalent to the Earth Materials I (GEO 3080) from the old curriculum. While these are not direct replacements for each other the course material is substantially similar. The courses chosen for this analysis were Geophysics (GEO 3010), Mineralogy (GEO 3020)/Earth Materials I (GEO 3080), Stratigraphy and Sedimentology (GEO 3040; formerly GEO 5760), Petrogenesis of Igneous and Metamorphic Rocks (GEO 3050)/Earth Materials II (GEO 3090), Structural Geology (GEO 4060; formerly GEO 3060), Introduction to Geologic Engineering (GEO 3075), Paleobiology (GEO 3180), Computational and Numerical Methods (GEO 3400), The Oceans (GEO 3800), and Field Methods (GEO 4500). For the purpose of the following discussion this body of courses listed above will be referred to as “subsequent courses”. These particular courses were selected as they are typically the first courses taken by students in the various tracks

following completion of the initial core sequence (GEO 1100, GEO 2100, GEO 2500, and GEO 3100).

Data for this analysis was collected from data compiled by the University of Utah's Office of Budget and Institutional Analysis. This data only records whole letter grades so for example a B entry contains B+, B and B- as a single number. At the time of this analysis data was only available to fall semester 2022. Data was compiled from spring 2017 through fall 2018 to represent the "old curriculum" data and spring 2021 through fall 2022 was collected to represent the "new curriculum" data. Data from spring 2020 to spring 2021 was generally excluded as during this period courses were moved online due to the COVID-19 pandemic. However, some courses in spring 2021 were offered in person or partially in person and these were included in the "new curriculum analysis". We excluded most of spring 2020 to spring 2021 to try to avoid a bias in the data due to a hasty transition to online instruction during this time period. None of the core curriculum or the subsequent courses were designed to be online, and all of these courses rely on a significant hands-on components and field components that could not be fully transitioned to an online environment. Still the exclusion of this data does not fully remove this bias as many students taking these subsequent courses have taken some or all of the core online and it also introduces several issues namely that post COVID statistics are limited to Spring 2022 and Fall 2022. As some of these courses can be small this will introduce sampling bias. For example, in spring 2021 GEO 3075 only had 3 students. This was a course that was offered in person during the COVID pandemic so it is not surprising that enrollment was low. In spite of these limitations, this analysis can provide first-order insight into the effectiveness of the core in preparing students for subsequent courses.

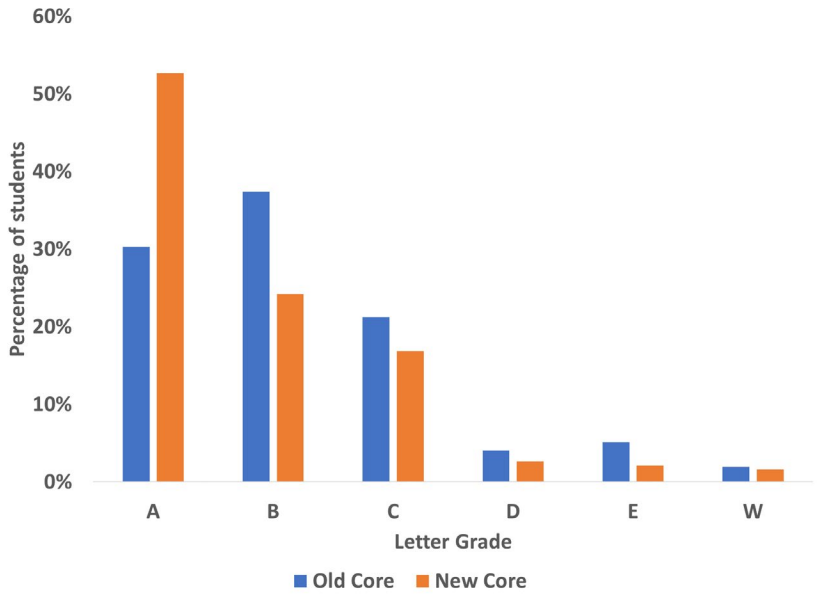

Figure 1: Letter grade distribution for subsequent courses taken under the old core curriculum model (before, fall 2018) and with the new core curriculum (spring 2021-fall 2022). The x-axis shows the letter grade or withdrawn (W). The y-axis is the percentage of students with that letter grade, or who withdrew from a course.

The most obvious trend in this data is that overall, the percentage of A students in these courses has increased significantly from 30% to greater that 50% (Figure 1). Prior to institution of the new core the letter grade grouping with the largest number of students was the B student group. Currently the largest letter grade group under the new core curriculum is the A group. In addition, the number of students receiving a failing grade (E) has decreased under the new core

as compared to the old core, while the number of students withdrawing from a course has remained the same. Clearly this analysis is imperfect and this trend could be partially or entirely due to grade inflation. Additionally, this is a coarse analysis of the data and it is recommended to follow up on this in more detail to see if specific courses are affected disproportionally and to include subsequent years to observe trends over multiple years. That being said this first look at the impact of the new core on subsequent courses is promising.

6. Concluding Remarks:

In general, our new core curriculum seems to be serving our students well and is meeting the assessed outcomes. Instructor outcomes assessments and reflective memos are positive and a student survey seems to indicate that students are overall satisfied with the core. Team teaching is widely view as a positive, but has room for improvement. A first and very limited analysis of the impacts of these courses on subsequent courses in the curriculum appears to be positive with an overall increase in student performance and more importantly a reduction in the number of students failing, something that is important for maintaining and improving our graduation rate. Several areas for improvement that were identified by instructors in the third-year assessments appear to have been addressed in the 5th year assessment. In particular, instructional support and a recalibration of rigor and instructor expectations in Wasatch in the Field (GEO 2500). However, disparities in student's quantitative background remains a challenge for instructors. Student surveys at the beginning of the semester in GEO 3100 appears to be helpful in preparing the instructors to address this effectively.

There are several areas that should be monitored moving forward. This includes 1) impacts to instructional needs and downstream effects of continued growth of Evolving Earth (a big positive for the department), 2) disparities in student's quantitative preparation and how well this is addressed by prerequisite enforcement, 3) student preparation for Mineralogy (GEO 3020), 4) the impact of the addition of GEO 3070 students to the first half of Reactive Earth, 5) continuity between instructors in team taught courses, 6) onboarding of new computing modules in Dynamic Earth, and 7) the effectiveness of our strategies to reducing bottlenecks in Wasatch in the Field and beyond. Finally, it is recommended in future assessments that the department should take a more detailed look at the effectiveness of the four courses studied here in preparing students for subsequent courses in the curriculum and to assess outcomes and the role of these subsequent courses in our curriculum.

APPENDIX 1: Prior learning outcomes

Geoscience (Bachelor of Science)

Emphasis areas: Geology, Environmental Geoscience, Geophysics

- Program graduates will have demonstrated a mastery of the geosciences that allow them to succeed as graduate students in geology, environmental earth science, geophysics, or in related fields, as students in professional schools, or as entry-level employees in industry or government.
- Program graduates will have an understanding of the nature and origin of the materials that make up the Earth.
- Program graduates will understand the dynamic processes that operate within the Earth from its deep interior to the surface.
- Program graduates will have an understanding of geologic time and how it is measured.
- Program graduates will have an understanding of the geologic evolution of the Earth and the development and evolution of life on Earth.
- Program graduates will have the ability to apply basic principles of mathematics, chemistry, biology and physics to geologic issues.
- Program graduates will demonstrate skills in reading comprehension of the scientific literature, and in oral and written communication of scientific results.
- Program graduates will demonstrate proficiency in geologic field skills and in solving integrative, field-based problems in Earth science.
- Students nearing graduation will be able to make informed choices as to post-graduate opportunities for education or employment.
- Program graduates will be prepared and qualified to pass the professional geologist licensure examination.
- Students will understand the place of the Earth sciences in the larger picture of the intellectual landscape of inquiry, including connections between science and, history, philosophy, ethics and the formulation of public policy.
- Ability to engage in lifelong learning and understanding of the need to do so.

Geological Engineering (Bachelor of Science)

- Ability to apply knowledge of mathematics, science, and engineering.
- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Ability to design a system, component, or process to meet desired needs.
- Ability to function on multi-disciplinary teams.
- Ability to identify, formulate, and solve engineering problems.
- Understanding of professional and ethical responsibility.
- Ability to communicate effectively.
- Understanding of the impact of engineering solutions in a global and societal context.
- Recognition of the need for and ability to engage in life-long learning.

- Knowledge of contemporary issues.
- Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Ability to engage in lifelong learning and understanding of the need to do so.
- Ability to pass the Fundamentals of Engineering examination, thereby allowing them to immediately begin training for Professional Engineering licensure upon graduation.

Earth Science Composite Teaching (Bachelor of Science)

- Demonstrate mastery of the geosciences, chemistry, physics, astronomy, biology, ecology, math and atmospheric sciences that allow them to meet State requirements for Secondary Science Endorsements in Earth Science and Integrated Science and Secondary Licensure Program requirements within the College of Education.
- Understand the nature and origin of the materials that make up the Earth.
- Understand the dynamic processes that operate within the Earth from its deep interior to the surface.
- Understand geologic time and how it is measured.
- Understand the geologic evolution of the Earth and the development and evolution of life on Earth.
- Demonstrate proficiency in basic geologic field skills.
- Demonstrate comprehension of the scientific literature, and skill in oral and written communication of scientific results.
- Ability to organize content for student learning and select appropriate evaluation methods to measure student mastery of the content.
- Ability to provide differentiated instructions and curriculum, adaptations, and modifications necessary to promote student learning.
- Ability to adapt instruction to cultural and language differences and to provide effective large group, small group and one to one instruction.
- Ability to assess student learning, including development and administration of assessment instruments and using the results to modify student placement and instruction.
- Demonstrate skills for student learning/classroom management.
- Understand teaching professionalism and ethical responsibility.
- Ability to engage in lifelong learning and understanding of the need to do so.
- Ability to pass the Level I Praxis Exam.

APPENDIX 2: Year 3 Instructor Assessments and Reflective Memos

Wasatch in the Field: GEO 2500

G&G Outcomes Geoscience Assessment

OUTCOME 7

An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Course: GEO 2500, Wasatch in the Field

Instructor: Paul Jewell **Semester/Yr: F-2019**

1. **Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.**

Students were given a simple topographic map containing a scale bar. A straight line was drawn across the contours on a portion of the map. Students were asked to calculate the gradient of the topographic surface beneath the line.

2. **Statement of how the problem addresses the outcome.**

This introductory course is intended to make students comfortable with map representations of a variety of features including elevation. This evaluation was meant to evaluate student's ability to make 3-dimensional interpretations from 2-dimensional data.

3. **Student grades on the problem/assignment. Include statistics.**

The exercise was given to 23 students. 13 completed the calculation correctly, 7 were completely wrong, and the remaining 3 were ambiguous. My target have 75% of the students complete the exercise correctly. Splitting the ambiguous exercises between the correct and completely wrong categories yields a 63% success rate.

4. **What they understand.**

All students seem to under that the scale bar can be used to calculate horizontal distance.

5. **What they don't understand**.

Apparently the concept of a gradient "rise" (elevation represented by contours) divided by "run" (horizontal distance) is not sufficiently comfortable for nearly 40% of the students.

6. **Conclusion (supported by data).**

I need to do better working with actual maps earlier in the course.

7. **Recommendations to improve achievement of this outcome.**

More systematic use of topographic maps and cross sections needs to be integrated into the course at an early stage.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #6* **Semester and Year**: Fall, 2019 and 2020

Course Number and Title: GEO 2500, "Wasatch in the Field"

Pre-Requisites: none

Co-Requisites: GEO 1100 (Evolving Earth)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. **What changes will you make to your course this year in response to feedback?**
   a) Increase instructional support (a second TA, or hire undergraduate class assistants, or more faculty on field excursions) to provide students with more access to instructors during field exercises.
   b) Work with other instructors to better scaffold learning outcomes throughout the five modules of the course.
   c) Provide clearer expectations for tasks to be completed for student assessment (consistent use of grading rubrics).
2. **Based on your experience with this class this semester, how appropriate are the course goals?**
   a) The course goals are reasonable for an in-person course when students attend every lecture and field excursion. Same applies to the online offering of this course. The biggest challenge is ensuring that the 4 faculty members who teach the various course modules are clearly aware of and embrace the course goals from the outset of their instruction. For example, the course is explicitly intended to require no prior knowledge of geoscience, but this is not uniformly embraced by all faculty responsible for teaching the course. Moreover, students who are in their 3rd year or higher of geoscience education who enroll in the course tend to add to this confusion/misalignment of expectations. This mis-alignment can cause significant student and instructor frustration.
3. **What method do you use to assess whether or not students met the above-listed goals?**
   a) Lab reports, observations from field and lab work.
4. **Are you satisfied with how well the students were able to obtain these goals?**

a) Generally yes, students did well given the challenging mix of changing instructors and structure of modules, and in 2020, online instruction.

5. **What will you do differently next time?**
   a) I will work better with all instructors both before the course starts and throughout the course to help communicate and steam line the transitions between the course modules and better align learning outcomes and expectations all semester long.
   b) I will strategize how to embed more instructional support and student mentoring during the field and lab exercises.

Pre-Requisites

6. **Do students have the required prerequisite knowledge? If not, what is lacking?**
   a) Generally yes; ideally, the course it taught such that students without any background in the geosciences can succeed.
7. **Comment on the students' ability to do what you expected them to do in the course?**
   a) In general, they met expectations and conveyed high satisfaction with the course.

Post-Requisites

8. **What do the instructors of those courses expect the students to know?**
   a) Basic field safety strategies; basic field observation and data collection techniques; an appreciation and understanding for Geology, Environmental Geoscience, Geophysics, and Geological Engineering.
9. **Do the instructors of those courses indicate that the students entered with the appropriate knowledge?**
   a) The only negative feedback received thus far is due to a subsequent instructor misunderstanding the intended learning outcomes and level of this course (*i.e.*, misunderstanding this course for a more advanced field methods course, which it is not)
10. **How can you change this course to better fit these outcomes?**
    a) TBD. We plan to schedule meetings that constitute the entire instructional team for this course in the December or January immediately subsequent to a course offering to review outcomes and challenges that semester. We also anticipate the need to offer this course during the Spring term to accommodate growing demand, and a Spring version of this course will have to be carefully planned and executed to ensure similar learning outcomes are achieved each semester.

Student Engagement

11. How would you change the course to increase student engagement?

a) Increase the amount of time dedicated to sample collection, observation, analyses, and interpretation. The students respond very favorably to seeing how basic field observations and measurements are used to understand not only a sense of place, but also resource and risk management.

b) Integrate existing modules better, and provide more opportunities for practicing science communication and advocacy, not just traditional report writing.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

a) Students provided minimal comments. In 2019, there were 8 of 32 possible respondents; in 2020, there were 10 of 39 possible respondents. A major goal going forward is to garner feedback from more students so that these university evaluations more accurately represent the course. We currently use the last class session for a 50 minute class discussion about the successes and challenges of the course. A separate course evaluation could be provided as an assignment to increase participation; this strategy has worked well in my other courses.

b) In 2019, the Overall Effectiveness of the course was 5.23/6.0 (Dept. average 5.23/6.0), the Overall Effectiveness of the instructor was 5.68/6.0 (Dept. average 5.32/6.0). In 2020, the Overall Effectiveness of the course was 5.04/6.0 (Dept. average 5.23/6.0), the Overall Effectiveness of the instructor was 5.59/6.0 (Dept. average 5.32/6.0).

Below are comments from the students from 2019:

Question: Comments on course effectiveness
The field outings were an excellent setting for learning about earth sciences. Loved them! The variety of the course material was interesting but would be helpful if the structure carried over into each module. A lot of variance from module to module that made it hard to say if all objectives were made or not. I loved this class. It really got me a taste of field work and the different fields I can go into as a geosciencist. It took what I had been learning and put into reality. The lectures did sometimes feel not useful, because most of it was presented during the labs. A recap at the end of each lab would be very useful in solidifying the information I was learning. Actually doing things in the field helped me to grasp an idea of what each field in geoscience does. What was discussed in class could have aligned better with the labs, though. Nicely broken down into sections, cool to learn different things that we can do all within geology.
Question: Instructor Comments

One of the more organized sections and like how much the local geology was explained. More clear definitions of when assignment are due initially. He was very enthusiastic about any subject he discussed. He was also clear on what he wanted on the assignments. Brought excellent teaching energy and encouraged student critical and independent thinking Started out the class strong with creating a relaxed and studious environment. Was very prepared and pushed students to use their critical thinking skills and pushed students to view Geology in an almost 3-D manner.

Below are comments from the students from 2020:

Question: Comments on course effectiveness
I liked that we covered 4 different topics. For not being in the field we made the most of the class. I found the course difficult because it was online. The separation of modules into subdivisions of geoscience was helpful for getting familiar with the field. Labs frequently stayed on one concept or lesion for awhile. This helped me string together the concepts we worked on throughout the class and I feel like I got a nicely rounded geoscience experience. The content was organized and easily accessible. I understand that it is difficult to do a field class during a pandemic. The online learning aspect of this class made it much less engaging than it would have been had we been able to go into the field.
Question: Instructor Comments
He was really helpful when it came to providing feedback to questions but not so much for providing graded assignments Very knowledgable. Could give more guidance on the labs. Offered group talks and was very organized. I don't remember much from this section since it was the beginning of the semester, but I remember his lectures being relatively engaging and informative and his labs were fine, although sometimes the instructions were confusing.

Evolving Earth: GEO 1100

G&G Outcomes Assessment

OUTCOME 1

1.An ability to identify, formulate, and solve complex (geoscience) [engineering] problems by applying principles of [engineering], science, and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes.

Course: GEO 1100

Instructor: Cari Johnson, Randy Irmis **Semester/Yr: Fall 2020**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students complete an earth systems learning module called Discovering Plate Boundaries. This exercise has a jigsaw design: students first are assigned specialty groups that focus on different datasets related to plate boundaries (geochronology, seismology, volcanology, topography/landforms); these groups are then mixed and students work together to create a combined classification scheme for plate boundary types. The graded assignment is an annotated map where plate boundaries are assigned and described in the context of the datasets as well as tectonic processes. All 3 exams in this class include some questions about plate tectonics as a dynamic earth system, building on new knowledge that is attained as the course progresses (surface processes, earth history, etc.).

2. Statement of how the problem addresses the outcome.

Students are required to classify all global plate boundaries into only 3 main types. This requires simplification of very complex systems. In order to do so, they must identify what aspects of their real-world datasets are most relevant to the problem at hand. In order to link observed data to earth processes, they formulate and test working hypotheses with the help of the datasets and instructors.

3. Student grades on the problem/assignment. Include statistics.

The plate boundaries assignment is graded out of 40 points, and the average was 36. This assignment is basically a study guide for the exam, so students are encouraged to use notes and all resources to make it as complete as possible. The first midterm exam has the heaviest focus on plate tectonics, with 5 questions worth 23 points (a mix of short answer and auto-graded responses). The average for this exam was 78%, although it was noted that some students did not allot enough time to complete the exam before the window closed.

4. What they understand.

There are three main plate boundary types, which represent differential plate motion. There are multiple subtypes as well. Plate boundary processes are demonstrated by distinctive geologic and geophysical datasets. Archetype examples are generally well understood (e.g., mid-Atlantic spreading ridge, Pacific Ring of Fire).

5. What they don't understand.

The seismology dataset is generally the hardest to grasp, because there is little background given on earthquakes before starting the exercise. Details of subtypes can be challenging (i.e., fast versus slow spreading ridges). Strike-slip margins are so variable that they are the most difficult of the 3 main types to teach effectively. Terminology causes confusion for some, particularly linking convergent margins as "destructive" and divergent margins as "constructive". Understanding what controls the distribution of mafic versus felsic magmatism is also a challenge for some students.

6. Conclusion (supported by data).

Most students enjoy the in-class portion of this assignment, which is very interactive and exploratory, rather than lecture-based. High-level learning outcomes are reasonably well achieved. A persistent challenge is always time limitation: this exercise could easily be run over the course of 2 weeks, but has to be taught in highly distilled form in this class. This exercise is also much easier to run in-person, but can work using breakout rooms and google jamboards. Both in person and remote, it is absolutely critical that one instructor or TA is assigned to each of the datasets, and that they have a plan to keep students on-course during the breakouts.

7. Recommendations to improve achievement of this outcome.

It would help to review earthquake basics in advance. Given limited time in the schedule, providing prerecorded background/introductory lectures as well as recording the wrap-up sessions would improve the effectiveness of this exercise.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #7* Semester and Year: Fall 2020

Course Number and Title: GEO 1100 – *Evolving Earth*

Pre-Requisites: MATH 1210 and CHEM 1210

Co-Requisites: GEO 2500 – *Wasatch in the Field* (recommended, not required)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

   This course is normally taught synchronous in-person, but because of the COVID-19 pandemic, the Fall 2020 iteration was taught online synchronous, using Zoom, Canvas, and other available virtual platforms. Only 13% of students provided course evaluations, so written comments were few and its difficult to evaluate whether ratings are representative; nonetheless a strong majority of respondents 'agreed' or 'strongly agreed' with the statements regarding the effectiveness of the course and instructors, that objectives were achieved, etc. With respect to written feedback:

   a) We will investigate and utilize the 'module' function of Canvas for the next iteration of the course.

   b) Where possible, we will make recorded lectures easier to find on Canvas (though this may be a moot point post-pandemic as instruction returns to in-person).

   c) We will continue to develop additional interactive team-based activities to reduce and break-up traditional in-class lectures.

   D_ Though 3D models of rocks and minerals were much better than nothing, they were difficult for the students to understand because of the lack of tactile input, so we will shift back to using physical specimens as soon as health/safety protocols allow.

2. Based on your experience with this class this semester, how appropriate are the course goals?

   a) This is the first course in a sequence of four courses required for all Geoscience majors. As such, the goal is to impart a basic understanding of Earth systems, and how those systems have changed over Earth history in relationship to life, climate, etc. A key part of this course is that students

learn to observe, interpret and critically reason from primary earth science data. For many students, this is the first university course where they have been asked to develop and apply these skills. The success of these learning outcomes is critical for all future courses the students take as a geoscience major, and as such, are definitely appropriate course goals for the first course in the core curriculum.

3. What method do you use to assess whether or not students met the above-listed goals?
   a) Assignments (based on in-class group projects), weekly quizzes, and exams.
4. Are you satisfied with how well the students were able to obtain these goals?
   a) Yes, students performed well despite online instruction. As has occurred in other semesters, they often struggle with data interpretation and critical reasoning early in the semester, but become much more confident in their skills in the second half of the semester.
5. What will you do differently next time?
   a) We will shift back to in-person instruction with physical specimens and in-class group projects as soon as health/safety protocols allow.
   b) We will continue to expand our use of in-class project-based assignments that help us evaluate whether students are achieving course goals, particularly with respect to observation, interpretation and critical reasoning about earth science data.
   c) We will refine our use of online resources (e.g., on Canvas).

Pre-Requisites

6. Do students have the required prerequisite knowledge? If not, what is lacking?
   a) Yes – the course requires a basic understanding of physical sciences and algebra-level math, and it is clear through the semester that they have enough background to understand the introduced concepts.
7. Comment on the students' ability to do what you expected them to do in the course?
   a) They met our expectations, and in some cases exceeded them given the challenges of the online format.

Post-Requisites

8. What do the instructors of those courses expect the students to know?
   a) GEO 2100 and 2500 are the next courses in the core curriculum –students are expected to already have a solid understanding of major Earth systems, and the ability to interpret and critically think about earth science data.
9. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?
   a) Yes.
10. How can you change this course to better fit these outcomes?
    a) Continue to stress critical reasoning and data interpretation/synthesis skills.

Student Engagement

11. How would you change the course to increase student engagement?

    a) Return to in-person synchronous instruction.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

    a) Most written comments indicated the instruction of the course was effective despite the online Zoom environment

    b) The students appreciated the passion and knowledge of the instructors, which made the course fun and engaging

    c) Some students commented on additional ways Canvas could be more user-friendly (e.g., modules)

    d) Though the Overall Effectiveness of the course was 4.67/6.0 (Dept. average 5.20/6.0), this is an artifact of low sample size (6/45 students responded). Five of six respondents 'agreed' or 'strongly agreed' with all statements related to course effectiveness, goals, instruction, etc.

Below are comments from the students:

Question: Comments on course effectiveness
- The professors did a good job with the zoom environment. I liked that their slides frequently had the original data from research. - A Module page might have pushed the organization of this course to the next level. Other than that, I loved how we could access any File we wanted from the same place. - The zoom sessions were always as interesting as they could have been - readings complimented the sessions very well - Difficult to find and rewatch previous lectures [on Canvas]
Question: Instructor Comments
- The pace of the lectures was nice and the questions were answered quickly and efficiently. - Very passionate about subject - made each class period interesting. - I could tell that [the instructors] loved the subject matter. Their enthusiasm was contagious.

Reactive Earth: GEO 2100

Outcomes Assessment

OUTCOME 1

An ability to identify, formulate, and solve complex geoscience problems by applying principles of science and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes

Course: GEO 2100

Instructor: Brooks, Bowen **Semester/Yr: Fall 2020**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students are assigned the task of assessing the radiative effects of different gas mixtures representative of a planetary atmosphere. The students consider current and past atmospheric composition of the earth along with likely geochemical and biogeochemical modifications to the original earth's atmosphere. Gas mixtures are placed into experimental systems and illuminated with both artificial and natural (sun) light. Observations of temperature over time are used to calculate internal energy states and fluxes.

2. Statement of how the problem addresses the outcome.

Students need to consider possible gas composition of planetary atmosphere based on their knowledge earth geochemical evolution. The resulting atmospheric compositions result in widely varying thermal energy storage. These results suggest possible effects of GHG emissions on climate and feedbacks between temperature e and water cycling through phase change

3. Student grades on the problem/assignment. Include statistics.

4. What they understand.

All matter above absolute 0K both emit and absorb energy. The amount of energy absorbance is a function of EM spectrum/ wavelength and chemical composition of matter. The ability to quantify these fluxes and predict the effects of changes in chemical composition of radiative properties of earth materials.

5. What they don't understand.

The interactions between radiative energy, the thermal energy, and latent energy in real world systems. How an object or system can gain energy from radiation but experience a decrease in temperature/ thermal energy storage

6. Conclusion (supported by data).

Students grasp the importance of radiant energy interactions with matter well, but some struggle when radiant energy fluxes are partitioned between sensible heat and latent energy.

7. Recommendations to improve achievement of this outcome.

Spend more time in previous lab on latent energy

Outcomes Assessment

OUTCOME 5

An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Course: GEO 2100

Instructor: Brooks **Semester/Yr: F 2020**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students are tasked with collecting water samples from precipitation, surface water, and groundwaters throughout the region. These samples are then analyzed for major ion chemistry and water isotopes. Data from all samples are combined in to a common dataset that students use to answer questions about how precipitation moves through the earth system from atmosphere to soils and deeper subsurface.

2. Statement of how the problem addresses the outcome.

Students must work together to collect samples, identify them accurately, and share data with their peers to develop the dataset that is needed by all to complete assignment.

3. Student grades on the problem/assignment. Include statistics.

4. What they understand.

Water chemistry reflects where water has been and water isotopes reflects the seasonality of precipitation (T as surrogate for energy availability during phase change)

5. What they don't understand.

How changes in water isotopic composition and chemistry can be used to infer evaporation

6. Conclusion (supported by data).

Students enjoy this lab and recognize that the data they collect is needed both for their own work and for their classmates.

7. Recommendations to improve achievement of this outcome.

Continue to build a comprehensive dataset from courses over the years to develop a greater appreciation of how location and seasonality influence results.

Outcomes Assessment

OUTCOME 6

An ability to develop and and conduct appropriate experimentation, analyze and interpret data, and use geoscience judgement to draw conclusions, including an ability to think in four dimensions

Course: GEO 2100

Instructor: Brooks **Semester/Yr: F 2020**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

This lab builds in a previous workshop where students calculated the specific heat of different minerals, metals, and earth materials. In this lab they build on their knowledge of specific heat combining with latent energy. Various sizes and shapes of ice cubes are melted in a liquid water bath. The students need to solve for latent energy of melting ice along with changes in internal/ thermal energy of the water bath and the ice cube before melting.

2. Statement of how the problem addresses the outcome.

To close the energy balance for their experimental systems students must solve for multiple energy fluxes simultaneously. The total energy flux is related to mass/ volume (X,Y,Z) while the flux rate is related to changes in energy storage over time (t) and surface area (X,Y)

3. Student grades on the problem/assignment. Include statistics.

4. What they understand.

That specific heat and thermal energy fluxes typically are small relative to latent energy exchanges.

5. What they don't understand.

Latent energy is associated with any phase change and is equal in magnitude and opposite in direction depending on the phase change (e.g. energy is released during freezing or condensation)

6. Conclusion (supported by data).

7. Recommendations to improve achievement of this outcome.

Expand to include latent energy of vaporization

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #8* Semester and Year: Fall, 2020

Course Number and Title: GEO 2100, "Reactive Earth"

Pre-Requisites: CHEM 1210

Co-Requisites: MATH 1220

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?
   a) Clarify grading policy multiple times throughout the term rather than only during initial lecture and in syllabus
   b) Balance online and in person activities
2. Based on your experience with this class this semester, how appropriate are the course goals?
   a) Very reasonable for in person classes; holding lab activities is much more challenging with online only students who have limited access to equipment
3. What method do you use to assess whether or not students met the above-listed goals?
   a) Homework assignments, workshop/ lab reports, two midterm exams, optional final exam.
4. Are you satisfied with how well the students were able to obtain these goals?

a) Yes, students did quite well given the challenging mix of in person, online, and hybrid attendance

5. What will you do differently next time?
   a) I will clarify grading policies following each graded assignment
   b) Seek funding to increase lab supplies for remote students

Pre-Requisites

6. Do students have the required prerequisite knowledge? If not, what is lacking?
   a) Generally yes, although some student lack basic quantitative skills
7. Comment on the students' ability to do what you expected them to do in the course?
   a) They met expectations.

Post-Requisites

8. What do the instructors of those courses expect the students to know?
   a) Basic earth system chemical concepts; conservation of energy and mass; observational and analytical skills
9. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?
   a) No negative feedback has been received yet
10. How can you change this course to better fit these outcomes?
    a) TBD.

Student Engagement

11. How would you change the course to increase student engagement?
    a) Increase the amount of time dedicated to sample collection, observation, analyses, and interpretation. The student respond very favorably to seeing how basic chemical and thermodynamic concepts are expressed in the world outside the laboratory.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

    a) Students provided minimal comments. Two additional comments I received not included on official response were 1) that the lab activities for remote learning students were too long/ large and that 2) grading was either too strict and not clear.
    b) The Overall Effectiveness of the course was 5.58/6.0 (Dept. average 5.23/6.0), the Overall Effectiveness of the instructor was 5.69/6.0 (Dept. average 5.32/6.0). These values are reasonable and generally consistent, albeit slightly lower I believe, with my previous courses.

Below are comments from the students:

Question: Comments on course effectiveness
Lectures were great

All online classes I have taken except for one has been a complete let down if there were any other option I wouldnt be engaging in them. Online classes are magnitudes harder to learn in.
Question: Instructor Comments
fun activities, passionate about the subject and explained everything very well Great interesting lectures

Dynamic Earth: GEO 3100

G&G Outcomes Geoscience Assessment

OUTCOME 1

An ability to identify, formulate, and solve complex geoscience problems by applying principals of science and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes.

Course: GEO3100

Instructor: Lin/Lippert Semester/Yr: Fall/2020

1. **Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.**

One of the workshops in this course tasks the students to practice what they learned about Fracture & Faulting and gain insight on the stresses and material properties that influence slip. Examples of Fracture & Faulting are given on three very different scales while the math and physics concept needed to solve the problems are the same. In the first part, giving a picture of a fractured stratum, students are asked to identify fracture surfaces, determine the principal stress directions, and estimate the rock friction. In the second part, a hydraulic press experiment setting is described, where the students are asked to calculate normal and shear stresses on a particular surface as well as drawing the Mohr circle. In the third part, the M5.7 Magna earthquake is used as an example for students to estimate the stress condition associated with the Wasatch fault.

Students are encouraged to work in groups to think through the problems. However, students are responsible for their own work.

2. **Statement of how the problem addresses the outcome.**

The problems to be solved in the workshop are designed in such a way that the student must identify the input, the output, and the methodological approach to achieve the solution. The problems increase in complexity from the beginning to the end of the workshop. They start with identifying/classifying the faults in a real fractured stratum image, and then they are asked to label the principal stresses based on the math and physical concept they learned about in the class. The students acquire confidence and are expected to ultimately apply their increasing knowledge to solve the more difficult problems toward the end of the assignment. The final problems in this workshop are more open ended and require the students to apply a deeper understanding of the material. In this particular workshop the students finish by analyzing the stresses along the Wasatch fault involved in the 2020 Magna earthquake.

3. **Student grades on the problem/assignment. Include statistics.**

In Fall 2020, there were 17 students enrolled in the course. Of those, 15 students completed and handed in this workshop exercise. The average score of those who handed in the exercise was 36.9 out of 50 points (74%) with a standard deviation of 7 points. The grade distribution is quite even; the majority of the students performed satisfactorily but there were a few students who after attending office hours still had a hard time with the workshop.

4. What they understand

Most students were able to estimate the orientation of principal stresses and rock friction based on given fracture surfaces, indicating they understand the fundamental relationship between stress, fracture, and friction. Most of the students also correctly calculated the vertical principal stress associated with the Magna earthquake suggesting they understand how gravity loading affects regional stresses in the crust.

5. What they don't understand.

The students seem to struggle with vector/tensor rotation, which is used to determine stresses in different coordinates, and the concept of Mohr's Circle. These are difficult concepts to grasp and are not intuitive.

6. Conclusion (supported by data).

This is probably the hardest workshop for the entire class. The grades indicate that the workshop support the lecture and students are able to grasp the learning outcome. Nevertheless, there is a recognized problem as some of the math and physical concept are not only new but also not intuitive to the students.

7. Recommendations to improve achievement of this outcome.

We need to improve the workshop on "Stresses and Brittle Failure in the Earth". It is probably better to leave the concept of Mohr's circles to a more advance class such as structure geology.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #9* Semester and Year: Fall, 2020

Course Number and Title: GEO3100
Pre-Requisites: Reactive Earth (GEO 2100); Physics for Scientists & Engineers I (PHYS 2210); Wasatch in the Field (GEO 2500, co-req permitted)

Co-Requisites: Calculus II (MATH 1220), Physics for Scientists & Engineers II (PHYS 2220)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

This is a difficult course to teach. It is a required course demanding some background in physics. But students come into the class with different levels of physics understanding. To make sure that all students acquire the learning outcomes, it will be important to spend more time reviewing the physical concepts before applying them to the geophysical concepts.

We will also try to develop a different approach to teaching Mohr's circles. We need to decide if this is the approach to teach stress, strain, and faulting to the students or if we should approach these concepts differently.

2. **Based on your experience with this class this semester, how appropriate are the course goals?**

After careful consideration, we feel that the course goals are suitable and do not need to be adjusted.

3. **What method do you use to assess whether or not students met the above-listed goals?**

Weekly assignments, weekly quizzes, and an exam are used to assess the student's understanding.

4. **Are you satisfied with how well the students were able to obtain these goals?**

Yes, this was a typical performance despite the shift to on-line instruction halfway through this semester.

5. **What will you do differently next time?**

See the response to question 1.

Pre-Requisites

6. **Do students have the required prerequisite knowledge? If not, what is lacking?**

Most of the students have the required background. But some of the students do not. The system allows students to register to the class even if they do not have the prerequisites.

7. **Comment on the students' ability to do what you expected them to do in the course?**

They met our expectations.

G&G Outcomes Assessment

OUTCOME 6

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use geoscience judgement to draw conclusions, including an ability to think in four dimensions.

Course: GEO 3100

Instructor: Van Dam / Moore **Semester/Yr: Spring/2021**

1. **Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcom**e.

One of the workshops in this course explores the analytic formulation for steady state diffusive hilltop profiles and ultimately tasks students with comparing analytic predictions against real world topographic data. The objective is to test and explore the analytic expression developed by combining principles of mass conservation and slope dependent transport, understand what variables contribute to controlling the steady state hilltop profile and explore how profiles vary by changing these parameters. Students complete the exercises by testing how well the analytic expression fits real data from hilltop topographic profile measured in Utah, and interpret differences in their profiles between predicted and measured elevation values.

2. Statement of how the problem addresses the outcome.

In the first part of the assignment students explore aspects of the analytical expressions through simple tests. In the second part of the assignment students are then given actual topographic data to analyze, attempting to fit the hilltop profile to the analytical solution. Exact fit will never be obtained and students must use their own judgement accounting for geological uncertainty to draw conclusions on the suitability of their profile fit. Attaining a satisfactory fit to topographic data provides students with an estimate of bedrock weathering rate, thus linking hillslope material, local climate, and form, and demonstrating that climatic variables can be assessed from topographic data. Students are in turn challenged to think over the dimension of time, as the theoretical expression used is only valid for steady state forms and any transient disturbances (e.g. landslides) must be ignored when attempting to obtain a best fit to real-world topographic data.

3. Student grades on the problem/assignment. Include statistics.

In Spring 2021 there were 15 students enrolled in the course. Of those 13 students completed and handed in this workshop exercise (two students were mostly absent yet remained enrolled). The average score of those who handed in the exercise was 49 out of 50 points (97%) with a standard deviation of 3 points. These high marks indicate that the students understood the exercise and performed to the instructor's expectations.

4. What they understand.

Almost all students were able to obtain satisfactory match between the theoretical prediction and actual hillslope topographic data. This demonstrates that they were able to grasp the meaning of the variables in the expression and manipulate those that could be manipulated to obtain satisfactory match. They also understood that matching every part of the profile was not possible, and that only the central hill top / crest could be adequately reproduced while the segments further downslope ultimately deviated – for valid reasons – from the expected analytical form.

5. What they don't understand.

It is clear that while most students did well and understood the concepts of this exercise, a few were unable to fully grasp how to manipulate the variables in the analytical expression to obtain good match with field topographic data. Most commonly, those that struggled seemed not to grasp that the needed to adjust the zo value in the expression to be the actual measured elevation of the hillcrest and thus were producing profiles that while shaped correctly were at an offset elevation.

6. Conclusion (supported by data).

Workshop grades indicate that students understood the exercise and were able to successfully merge analytical expressions and real world topographic data in a combined analysis, fitting theoretical forms to real topography and in doing so back out a rock weathering parameter from analysis of topographic form.

7. Recommendations to improve achievement of this outcome.

More attention should be given to explaining all variables in the analytical expressions and how they relate to real-world metrics.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #1* Semester and Year: Spring, 2021

Course Number and Title: GEO3100
Pre-Requisites: Reactive Earth (GEO 2100); Physics for Scientists & Engineers I (PHYS 2210); Wasatch in the Field (GEO 2500, co-req permitted)

Co-Requisites: Calculus II (MATH 1220), Physics for Scientists & Engineers II (PHYS 2220)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

This is a difficult course to teach. It is a required course demanding some background in physics. But students come into the class with different levels of physics understanding. To make sure that all students acquire the learning outcomes, it will be important to spend more time reviewing the physical concepts before applying them to the geophysical concepts.

Similarly, students have varying background with basic computing skills, e.g. Excel, and experience shows that many need instruction on how to use Excel. This in turn frustrates (or bores) students that are already proficient in basic computing. It remains a challenge for the course, but experience shows we need to spend time bringing up those with no or poor experience, which is done during lab instruction.

We will also try to develop a different approach to teaching Mohr's circles. We need to decide if this is the approach to teach stress, strain, and faulting to the students or if we should approach these concepts differently.

2. **Based on your experience with this class this semester, how appropriate are the course goals?**

Based on our experience in the course, we feel that the course goals are suitable and do not need to be adjusted.

3. **What method do you use to assess whether or not students met the above-listed goals?**

Weekly assignments, quizzes, and an exam are used to assess the student's understanding. Informal and formal student feedback, in addition to conversations with the TA (who interfaces often with the students) are also invaluable.

4. **Are you satisfied with how well the students were able to obtain these goals?**

Yes. Final course grades show the majority of students performed well in the course and met or exceeded our expectations. This shows us that the course goals were most likely satisfactorily achieved.

5. **What will you do differently next time?**

See response to question 1. The course continues to improve each iteration as we learn what students need, what modules work and don't work (i.e. which are too detailed, which are appropriate), and how best to structure exams to assess student learning.

Pre-Requisites

6. Do students have the required prerequisite knowledge? If not, what is lacking?

Most of the students have the required background, but some do not. This is a major struggle for the course, but something that is appropriate to address in a core course. Physics, math and computing skills are all over the board.

7. Comment on the students' ability to do what you expected them to do in the course?

They met our expectations.

Post-Requisites

8. What do the instructors of those courses expect the students to know?

Applications of physics principles to solve Earth dynamics problems, things like advection and diffusion across different areas. Application of mathematics to quantify Earth system problems. Parameterization of Earth system problems using mathematics and computing.

9. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?

Some yes, some no. See above responses, this is a major area we struggle with in this course. Mostly it's physics, math and computing that they may not all have sufficient background and skills coming in to this course.

10. How can you change this course to better fit these outcomes?

The course is fitting the outcomes.

Student Engagement

11. How would you change the course to increase student engagement?

Returning to in-class workshops will help a lot with student engagement. These were designed to get students working together, and have them engage with their peers, TA and instructors.

APPENDIX 3: Year 5 Instructor Assessments and Reflective Memos

Wasatch in the Field: GEO 2500

G&G Outcomes Assessment

OUTCOME 7

An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Course: GEO 2500, Wasatch in the Field

Instructor: Jeff Moore **Semester/Yr: F-2022**

1. **Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.**

Students were taken to the site of a large ancient landslide of a type that no student in the course had previously known. Through two field days they had to assemble a wide ranging dataset of field observations based on different approaches and strategies, in order to describe hazard-relevant metrics of the landslide (e.g. size and age).

2. **Statement of how the problem addresses the outcome.**

Field observation strategies are a new skill set for almost every student in the course. For example mapping the boundary of the landslide, students had to create a way they will define the boundary, then use field evidence to map that boundary on paper. To determine landslide depth they must use topographic clues from their surroundings to estimate a reasonable value. They are generating a variety of knew knowledge using specific strategies in each case.

3. **Student grades on the problem/assignment. Include statistics.**

The exercise was given to 31 students and all completed the exercise. The average score was a 98%, with a standard deviation of 6% and a low score of 68%. Omitting the single low score, the standard deviation dropped to 2%. All students thus did very well, satisfactorily completing the assignment.

4. **What they understand.**

Students learned how to generate quantitate data from geological field observations, and use those data to compute metrics relevant for landslide hazard assessment.

5. **What they don't understand**.

Some students had surprisingly little experience with basic math concepts and needed additional instructions, it is important to get a feel for the class and keep in close contact with students to learn who needs this extra attention.

6. **Conclusion (supported by data).**

Students achieved the learning goal.

7. Recommendations to improve achievement of this outcome.
Continue to keep close eye on all students in both the field and lab.

Faculty Self-Assessment - Reflective Memo

Instructor Name: *Instructor #2* **Semester and Year**: Fall 2022

Course Number and Title: GEO 2500 "Wasatch in the Field"

Pre-Requisites: none

Co-Requisites: GEO 1100 (Evolving Earth)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. **What changes will you make to your course this year in response to feedback?**
   a) Continue increased instructional support (hire undergraduate learning assistants, plus more senior faculty or professional staff on field excursions) to provide students with more access to instructors during field exercises.
   b) Work with other instructors to better scaffold learning outcomes throughout the modules of the course.
   c) Formalize the inclusion of undergraduate assistants and their education as instructors.
   d) Identify junior and senior level geology undergrads with ample geo experience and work them in as team members with less experienced students or non-geo majors.
2. **Based on your experience with this class this semester, how appropriate are the course goals?**
   a) The course goals are reasonable for an in-person course when students attend every lecture and field excursion. The course is intended to require no prior knowledge of geoscience, and many of the students are not geo majors, which is now becoming better appreciated by the instructors. Students who are in their 3rd year or higher of geoscience education who enroll in the course tend to add confusion/misalignment of expectations. Such students should be identified and used as additional assistants in an ad-hoc manner, helping less experienced students.
3. **What method do you use to assess whether or not students met the above-listed goals?**
   a) Workshop and lab exercises, observations from field and lab work.
4. **Are you satisfied with how well the students were able to obtain these goals?**
   a) Yes, students did well given the challenging mix of changing instructors and of modules.

5. **What will you do differently next time?**
    a) Try to better formalize the use and training of undergraduate teaching assistants.
    b) Make sure all instructors are on the same page with respect to learning goals and level of instruction.
    c) Consider alternative modes of transportation to field sites.
    d) Continue to reflect with instructors about learning goals and teaching of specific necessary introductory topics.

Pre-Requisites

6. **Do students have the required prerequisite knowledge? If not, what is lacking?**
    a) Yes; the course should be taught such that students without any background in geoscience can succeed.
7. **Comment on the students' ability to do what you expected them to do in the course?**
    a) Students generally met expectations and conveyed high satisfaction with the course.

Post-Requisites

8. **What do the instructors of those courses expect the students to know?**
    a) Basic field safety strategies; basic field observation and data collection techniques; an appreciation and understanding for Geology, Environmental Geoscience, Geophysics, and Geological Engineering.
9. **Do the instructors of those courses indicate that the students entered with the appropriate knowledge?**
    a) Yes.
10. **How can you change this course to better fit these outcomes?**
    a) Continued refinement of course content, identification of missing or under-emphasized key topics.

Student Engagement

11. **How would you change the course to increase student engagement?**
    a) Students are very engaged in the field instruction. They do not seem to do any of the readings, these could be further emphasized.
    b) Engagement in the lectures is modest. In-class mini-exercises could be added to break up long lecture periods.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

Students did not really respond to the request for evaluation. Of 31 students, only 6 responded (19%). This is a poor sample population to draw any important inferences. Students who did respond noted they enjoyed field and community based learning. One noted a recommendation to provide readings (these are provided by most instructors so it's clear that was not communicated clearly).

Instructor Reflections:

Moore

Students were eager learners in the field, and seemed to enjoy the Albion Basin field activity. They worked well in groups and for the most part everyone was engaged in the activity. The addition of two undergraduate assistants was crucial for safe and effective field work with a group of this size… can't state enough how awesome the undergrad assistants were (they drove, helped in the field, and helped in the analysis lab as well). *Note that this improvement was made as a follow-up from the past course self-assessment.* Having a member of the UGS hazards staff join us was also a real value to the students.

Challenges: mobilizing all students and vehicles in a timely manner was stressful. The drive up is fairly long so field time is a bit compressed. The vehicles sustained some damage, so clearly more care is needed on my end to prep the team so we don't have to leave in a stressful rush. Without the added undergrad assistants keeping track of everyone in the field would have been very stressful. Because of different backgrounds, some students are computationally unprepared (e.g. I had to explain how to compute an average) – usually they could work through this in their groups however, or with the team of assistants in class.

Brooks

Students were enthusiastic and engaged in field data collection and to slightly lesser extent analysis and interpretation. The process of developing hypotheses, collecting data directly, collecting samples (isotope and chemistry) for analyses later, and drawing inferences/ evaluating hypotheses worked well. Working in teams definitely helped as some students were challenged by not having background or experience in asking questions/ generating hypotheses, and analyzing data to answering/evaluating them. Student comments were very positive.

Challenges: The ability to effectively execute the environmental geoscience module requires bringing in multiple graduate students or experienced undergraduates for assistance. The diversity of experience and preparation among students was a challenge in developing effective lessons. A number of students struggled when working with excel, although exercises in class helped bring students up to speed. A portion of students did not understand the scientific method and/or did not have a strong grasp of the differences between observations and inferences/ interpretation although again class exercises helped with this. A more fundamental challenge was some students who did not grasp first principles/ conservation or energy and mass.

Lin

The theme of earthquake hazards in Salt Lake resonated well with the students. Both gravity and seismic field exercises went quite well, particularly with the help of UGS personnel, a TA, and two undergraduate assistants. The computer lab/data analysis section was a little bit too long considering most students do

not have experience working in the CHPC/Linux environment. A more thorough instruction given ahead of the field experiments and the lab section could have helped students to further understand the steps they need to perform.

Anderson

In the geology module of Wasatch in the Field I ran a classic geology field trip up Big Cottonwood canyon. The goal of the field trip was to give the students a classic geology experience giving the students the full story of the Wasatch Range, from the oldest rocks to the youngest, including the uplift of the range, and the expansion of Lake Bonneville. We had a professional geologist from the United States Geological Survey join and co-lead the field trip. On the field trip students were taught how to take field notes and then graded on how well they followed the guidelines provided.

The second field trip took students to the Bells Canyon glacial moraines. We had a professional mapper from the Utah Geologic Survey present his experience with geologic mapping. Students were asked in the field to outline glacial moraines on a topographic map. In the field we also compared the precision and accuracy of cell phone GPS, hand-held GPS, and Real-time kinematic (RTK) GPS measurements. We also measured the offset of the fault through the glacial moraines using the highly accurate RTK GPS.

The final activity allowed students to be a bit more artistic and design a billboard that would be posted on a highway to inform the populace about seismic hazards along the Wasatch Fault. Information on the billboard was measured in the field by the students. Students were also asked to evaluate the uncertainty of their GPS measurements.

What went well: The inclusion of a full story of the Wasatch for the students tied well with the name of the course and provided a broad overview of the local geology. The end of the geology module was designed to ease the transition to the next module of the course. The inclusion of the RTK GPS added a state-of-the-art technological component to the course. There was plenty of graduate student and undergraduate student support in the field and classroom.

Improvements: 1) Better integration of the in-class lectures/activities with the field trips; 2) Better instructions for the use of the RTK GPS in the field; 3) More in-class activities during the lecture portion of the class; 4) Including more strategies to create belonging for students from all backgrounds; 5) Better communication at Bells Canyon to ensure that all students are able to find the instructor taking the RTK GPS measurements.

Evolving Earth: GEO 1100

G&G Outcomes Assessment

OUTCOME 1

1.An ability to identify, formulate, and solve complex (geoscience) [engineering] problems by applying principles of [engineering], science, and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes.

Course: GEO 1100

Instructor: Lauren Birgenheier **Semester/Yr: Spring 2023**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students complete an earth systems learning module called Discovering Plate Boundaries. This exercise has a jigsaw design: students first are assigned specialty groups that focus on different datasets related to plate boundaries (geochronology, seismology, volcanology, topography/landforms); these groups are then mixed and students work together to create a combined classification scheme for plate boundary types. The graded assignment is an annotated map where plate boundaries are assigned and described in the context of the datasets as well as tectonic processes. Both the mid term and final exam in this class include some questions about plate tectonics as a dynamic earth system, building on new knowledge that is attained as the course progresses (surface processes, earth history, etc.).

2. Statement of how the problem addresses the outcome.

Students are required to classify all global plate boundaries into only 3 main types. This requires simplification of very complex systems. In order to do so, they must identify what aspects of their real-world datasets are most relevant to the problem at hand. In order to link observed data to earth processes, they formulate and test working hypotheses with the help of the datasets and instructors.

3. Student grades on the problem/assignment. Include statistics.

The plate boundaries assignment is graded out of 60 points, and the average was 56. This assignment is basically a study guide for the exam, so students are encouraged to use notes and all resources to make it as complete as possible. The midterm exam has the heaviest focus on plate tectonics, with 6 questions worth 23 points (a mix of short answer and auto-graded responses). The average for this exam was 82%.

4. What they understand.

There are three main plate boundary types, which represent differential plate motion. There are multiple subtypes as well. Plate boundary processes are demonstrated by distinctive geologic and geophysical datasets. Archetype examples are generally well understood (e.g., mid-Atlantic spreading ridge, Pacific Ring of Fire).

5. What they don't understand.

The seismology dataset is generally the hardest to grasp, because there is little background given on earthquakes before starting the exercise. Details of subtypes can be challenging (i.e., fast versus slow spreading ridges). Strike-slip margins are so variable that they are the most difficult of the 3 main types to teach effectively. Terminology causes confusion for some, particularly linking convergent margins as "destructive" and divergent margins as "constructive". Understanding what controls the distribution of mafic versus felsic magmatism is also a challenge for some students.

6. Conclusion (supported by data).

Most students enjoy the in-class portion of this assignment, which is very interactive and exploratory, rather than lecture-based. High-level learning outcomes are reasonably well achieved. A persistent challenge is always time limitation: this exercise could easily be run over the course of 2 weeks, but has to be taught in highly distilled form in this class. This exercise is also much easier to run in-person, but can work using breakout rooms and google jamboards. Both in person and remote, it is absolutely critical that one instructor or TA is assigned to each of the datasets, and that they have a plan to keep students on-course during the breakouts.

7. Recommendations to improve achievement of this outcome.

A subset of students complained that the assignment felt like "busy work." This might be improved by making sure groups stay smaller in number so students are more likely to engage with the conversation.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #3* Semester and Year: Spring 2023

Course Number and Title: GEO 1100 – *Evolving Earth*

Pre-Requisites: MATH 1210 and CHEM 1210

Co-Requisites: GEO 2500 – *Wasatch in the Field* (recommended, not required)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

   The feedback on the course was overwhelmingly positive with 86.7% of students stating they would recommend the course and 93.3% indicating they would recommend the instructor. There was one comment that suggested the in class activities seemed trivial or like busy work. However, the student

acknowledged that they may have been more beneficial to those with different learning styles. I do think that the class activities could be more challenging for the students, and at times, a bit more interactive with the instructor, not just among their peer group. In the future, the course would be improved including an optional "level up challenge" with each activity, for those who may be eager to take on a more challenging assignment. In the future, I will aim to break students into smaller groups and develop more interactive experiences for the second half of the course that focuses on Earth history. This portion of the course really only has one main interactive class activity.

2. Based on your experience with this class this semester, how appropriate are the course goals?
   This is the first course in a sequence of four courses required for all Geoscience majors. As such, the goal is to impart a basic understanding of Earth systems, and how those systems have changed over Earth history in relationship to life, climate, etc. A key part of this course is that students learn to observe, interpret and critically reason from primary earth science data. For many students, this is the first university course where they have been asked to develop and apply these skills. The success of these learning outcomes is critical for all future courses the students take as a geoscience major, and as such, are definitely appropriate course goals for the first course in the core curriculum.
3. What method do you use to assess whether or not students met the above-listed goals?
   a) Assignments (based on in-class group projects), weekly quizzes, and exams.
4. Are you satisfied with how well the students were able to obtain these goals?
   a) Yes, students performed well. As has occurred in other semesters, they often struggle with data interpretation and critical reasoning early in the semester, but become much more confident in their skills in the second half of the semester.
5. What will you do differently next time?
   a) I will develop a second interactive in class activity for the second half of the course, the Earth history portion.
   b) We will revisit the quality of our hand specimens for the rocks, minerals and sedimentary rocks in class, hands on assignment in the first half of the course. We need both more and higher quality samples in some cases.

Pre-Requisites

6. Do students have the required prerequisite knowledge? If not, what is lacking?
   a) Yes – the course requires a basic understanding of physical sciences and algebra-level math, and it is clear through the semester that they have enough background to understand the introduced concepts.
7. Comment on the students' ability to do what you expected them to do in the course?
   a) They met our expectations, and in some cases exceeded them.

Post-Requisites

8. What do the instructors of those courses expect the students to know?
    a) GEO 2100 and 2500 are the next courses in the core curriculum –students are expected to already have a solid understanding of major Earth systems, and the ability to interpret and critically think about earth science data.
9. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?
    a) Yes.
10. How can you change this course to better fit these outcomes?
    a) Continue to stress critical reasoning and data interpretation/synthesis skills.

Student Engagement

11. How would you change the course to increase student engagement?
    a) Participation and attendance in class was not as high as I would have liked, especially with the return of fully in person learning (with appropriate hybrid and remote flexibility for students). In the future, I think getting to know the students by name very early in the class and engaging them in different ways each class period will help promote a culture of accountability and attendance.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

    The feedback on the course was overwhelmingly positive.
    a) 86.7% of students stated they would recommend the course.
    b) 93.3% indicating they would recommend the instructor.
    c) 92.9% felt comfortable asking questions and openly expressing and discussing their views in my course. The vote of confidence regarding their comfort and safety provides the optimal learning environment we hope to achieve.
    d) 93.3% indicated it was clear what students were expected to learning in the course. This provides needed documentation that the course outcomes were clear. Students generally performed well in the course, further evidence they achieved the learning outcomes.

One student comment suggested the in class activities felt trivial. In the future, I will allow for students to work at different levels and speeds, and include some optional advanced content on the in class activities.

Below are comments from the students:

Comments
Thank you this class was very fun and has inspired me to take more geo classes
Great class
Thanks for everything!
Thanks for a great semester!
Loved the class
Thank you, both, for the time and effort you put into teaching us this semester. I look forward to continuing my path in this field and hope to learn from you in future classes. I also want you to know that I will not hesitate to seek you (& Dr. Morris) out should I have any questions. You both cultivated an open and informative space, where students felt comfortable and confident to ask questions when necessary.

Reactive Earth: GEO 2100

Outcomes Assessment

OUTCOME 1

An ability to identify, formulate, and solve complex geoscience problems by applying principles of science and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes.

Course: GEO 2100

Instructor: Lambart, Bowen **Semester/Yr: Spr 2023**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students collect water samples and use isotope geochemistry and mathematical mixing relationships to determine source relationships between samples.

2. Statement of how the problem addresses the outcome.

Tracing the flow of matter through Earth systems is a common and often complex task in the development of biogeochemical models. Chemical tracers such as isotopes and mathematical constructs such as mixing models can facilitate this work, and are the focus of this assignment.

3. Student grades on the problem/assignment. Include statistics.

The average grade on the lab was 81%, but this number includes the grade for three students who had disengaged from the class prior to the assignment and did not attend or complete it. Not including these students, the class average was 90%.

4. What they understand.

They understand the practical application of chemistry and simple mathematical models to problems of the type conducted here.

5. What they don't understand.

The lab write-ups suggest that the students have a mixed level of understanding of the assumptions inherent in conducting the mixing calculations, and their potential influence on the results obtained.

6. Conclusion (supported by data).

The students are gaining basic ability to apply the simplifying construct of an idealized, 2-endmember mixing model to a complex geoscience problem.

7. Recommendations to improve achievement of this outcome.

Continue to focus on and encourage students to address and incorporate uncertainty in their application of the mixing concept in this work.

Outcomes Assessment

OUTCOME 5

An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Course: GEO 2100

Instructor: Lambart, Bowen **Semester/Yr: Spr 2023**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students work in teams to develop and conduct a series of experiments investigating the solubility of a salt under different conditions. They collect data on the system conditions and measure salt dissolution in two different ways (mass dissolved, salinity of the solution). They analyze the data to determine limits and controls on the solubility and dissolution rates in each system.

2. Statement of how the problem addresses the outcome.

Students have to collaborate within their teams to allocate responsibility for experimental tasks, coordinate multiple physical and observational activities in a prescribed sequence, and collect the comprehensive suite of data needed to complete their data analysis.

3. Student grades on the problem/assignment. Include statistics.

The average grade on the lab was 79%, but this number includes the grade for three students who had disengaged from the class prior to the assignment and did not attend or complete it. Not including these students, the class average was 89%.

4. What they understand.

Coordination within their lab group is needed to successfully complete the experiment, no individual can complete the work alone.

5. What they don't understand.

Several groups had to repeat one of the experiments because they rushed ahead with their work without fully reading instructions or coordinating tasks within the team.

6. Conclusion (supported by data).

Observations within the laboratory show that all of the student groups, whether on the first or second try, were able to coordinate within their team to successfully complete all three experiments. In addition, we observed evidence of sharing and cross-teaching between groups as they rotated through the 3 experiments.

7. Recommendations to improve achievement of this outcome.

Clarify and emphasize the need to fully read instructions and plan for each task before acting.

Outcomes Assessment

OUTCOME 6

An ability to develop and and conduct appropriate experimentation, analyze and interpret data, and use geoscience judgement to draw conclusions, including an ability to think in four dimensions.

Course: GEO 2100

Instructor: Lambart, Bowen **Semester/Yr: Spr 2023**

1. Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.

Students work in teams to observe, measure, and interpret the property of soils on the University of Utah campus. Each team selected a site, excavated the soil, executed an extensive set of observational and experimental activities, and integrated data across the activities to produce an interpretive report describing the properties and history of the soil.

2. Statement of how the problem addresses the outcome.

To complete the work successfully the students had to conduct a suite of experiments, including infiltration tests, bulk density measurements, textural analysis, and compaction measurements. They had to integrate these data and use their understanding of chemical and physical weathering, plus relationships between these processes and climate and time, to interpret the origin and history of the study soil.

3. Student grades on the problem/assignment. Include statistics.

The average grade on the lab was 83%, but this number includes the grade for three students who had disengaged from the class prior to the assignment and did not attend or complete it. Not including these students, the class average was 93%.

4. What they understand.

They understand how processes such as chemical weathering and infiltration of water, acting vertically through the soil profile and over time, produce structure in the soil profile. They are able to observe the structure that is produced and draw basic interpretations about the weathering and infiltration history that produced it.

5. What they don't understand.

In some cases, students struggled to clearly organize and express their understanding in the form of a written report. Not all data analyses were conducted correctly.

6. Conclusion (supported by data).

The students are beginning to develop ability to interpret Earth science observations and experimental results in the context of processes which happen over space and time.

7. Recommendations to improve achievement of this outcome.

It would be useful to allow time for iteration during the preparation of the final soils report, so that instructors can provide feedback on the results and interpretations and the students can further develop these during revision.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #4* Semester and Year: Spring, 2023

Course Number and Title: GEO 2100, "Reactive Earth"

Pre-Requisites: CHEM 1210

Co-Requisites: MATH 1220

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

   a) Overall feedback was quite positive. The only constructive suggestion was the strengthen the ties between lecture and laboratory materials, by providing more context for how the labs connected to the lecture material. This will be a focus for me in the future.

2. Based on your experience with this class this semester, how appropriate are the course goals?

a) I believe the goals are appropriate.

3. What method do you use to assess whether or not students met the above-listed goals?
   a) I use a combination of assignment types, including examinations, problem sets, and hands-on laboratory activities (with accompanying write-ups).
4. Are you satisfied with how well the students were able to obtain these goals?
   a) I am. I believe additional refinements can be made, as indicated in the response to the specific objectives, but overall the students are realizing most of the goals of the course.
5. What will you do differently next time?
   a) I will incorporate minor changes to improve the articulation between lectures and labs and to improve the alignment of specific assignments with learning objectives.

Pre-Requisites

6. Do students have the required prerequisite knowledge? If not, what is lacking?
   a) Generally yes, although some student lack basic quantitative skills.
7. Comment on the students' ability to do what you expected them to do in the course?
   a) They met expectations.

Post-Requisites

8. What do the instructors of those courses expect the students to know?
   a) Basic earth system chemical concepts; conservation of energy and mass; observational and analytical skills.
9. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?
   a) No negative feedback has been received yet.
10. How can you change this course to better fit these outcomes?
    a) TBD.

Student Engagement

11. How would you change the course to increase student engagement?
    a) Students who attended were well engaged in the lecture and laboratory sections. Some students were habitually absent, particularly from lectures, which had a negative impact on their engagement with other students. Lecture materials were shared via Canvas, however. It would be useful to measure individual attendance and assess whether student attendance is correlated with achievement.

Course Evaluations

12. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

    a) Students enjoyed the course and found the material clear and well organized. As noted above, improving articulation between labs and lectures will be a goal for the future.

Dynamic Earth: GEO 3100

G&G Outcomes Geoscience Assessment

OUTCOME 1

An ability to identify, formulate, and solve complex geoscience problems by applying principals of science and mathematics. Simplify open-ended problems using a systems approach to produce sustainable outcomes.

Course: GEO3100

Instructor: Lippert/van Dam Semester/Yr: Spring/2023

1. **Brief statement describing the specifics of the assignment, quiz, exam, problem, etc. used to assess this outcome.**

One of the workshops in this course tasks the students to practice what they learned about Stress, Strain, and Rheology and gain insight on the stresses and material properties that influence slip. Before the workshop, students have had an in-person lecture and have taken a short low-risk quiz to assess their understanding of the lecture. This semester we did all the assignments in Jupyter Notebooks (JN). The learning outcomes for both the geologic and the PYTHON learning objectives for this workshop were clearly defined in the JN. As a first step, the students were taught the PYTHON commands to plot data and fit a line. The students were then asked to read in normal and shear stressed from a hydraulic press experiment for three mineral/rock types. Students were asked to plot the normal stresses as a function of the shear stresses. They were asked to fit a line to the data from each sample and to answer a number of questions. In second part of the workshop, students were asked to explore the faulting processes by generating Mohr's circles of the data. From the Mohr's circles, they were asked to answer four questions with the last question asking them to translate their findings from the workshop into an explanation of the geological faulting process at wavelengths of faults.

Students were encouraged to work in groups to think through the problems. However, students were responsible for their own work.

2. **Statement of how the problem addresses the outcome.**

The questions to be answered in the workshop are designed in such a way that the student must identify the input, the output, and the methodological approach to achieve the solution. The questions increased in complexity from the beginning to the end of the workshop. They start with

identifying/classifying the different parts of the stress curves. The students acquire confidence and are expected to ultimately apply their increasing knowledge to solve the more difficult problems toward the end of the assignment. The final problems in this workshop are more open ended and require the students to apply a deeper understanding of the material.

3. Student grades on the problem/assignment. Include statistics.

In Spring 2023, there were 8 students enrolled in the course. Of those, 7 students completed and handed in this workshop exercise. The average score of those who handed in the exercise was 44.2 out of 50 points (84%) with a standard deviation of 6 points. The grade distribution is quite even; the majority of the students performed well but there was who after attending office hours still had a hard time with the workshop—he understood the physics but he could not master the PYTHON.

4. What they understand

In general, students demonstrated an excellent ability to plot scattered data in 2D x-y plots, label axes, and understand the implications of data trends. The majority of students had few problems with the python-aspects of this module, and those that did had structural barriers accessing python environments throughout the course.

Aside from a few outliers, most students demonstrated excellent outside research skills. One aspect of the assignment was to identify slip angles from the literature consistent with a problem setup. The results, while heterogeneous, demonstrated that students were effectively identifying appropriate research journals, identifying relevant articles, and extracting pertinent coefficients.

The students were also asked to explain how to use Mohr's circles to determine stresses acting on a fault during the Midterm exam. All students answered this question successfully.

5. What they don't understand.

There were no robust trends in particular failures of understanding, leading me to conclude the assignment in essence achieved the learning goals. In a few instances possible mental health effects on student performance were evident, including snowballed late assignments and inattentive-like symptoms. A persistent issue was student inability to self-assess when outside help was required to stay on track. Specific difficulties students had with the assignment were:

6. Conclusion (supported by data).

This is probably the hardest workshop for the entire class. The workshop grades indicate that the workshop supports the lecture and students can grasp the learning outcomes. Nevertheless, there is a recognized problem as some of the math and physical concept are not only new but also not intuitive to the students.

7. Recommendations to improve achievement of this outcome.

Persistent issues were noted with small mathematic and scientific barriers, such as unit analysis, order-of-magnitude estimates, and understanding outliers. While these did not affect student performance, they are concerning as it speaks to a failure of past coursework to prepare students for rigorous scientific problem solving.

Faculty Self Assessment - Reflective Memo

Instructor Name: *Instructor #5* Semester and Year: Spring 2023

Course Number and Title: GEO3100 – The Dynamic Earth
Pre-Requisites: Reactive Earth (GEO 2100); Physics for Scientists & Engineers I (PHYS 2210);
Recommended Co/Pre-Requisites Wasatch in the Field (GEO 2500); Calculus II (MATH1220); Physics for Scientists & Engineers II (PHYS2220)
Co-Requisites: Calculus II (MATH 1220), Physics for Scientists & Engineers II (PHYS 2220)

Please reflect on the course you have just finished teaching and determine how to improve the course in the future. The questions are provided to guide your thoughts, but you do not need to answer all questions.

1. What changes will you make to your course this year in response to feedback?

This is a difficult course to teach. It is a required course that demands some background in physics and quantitative reasoning, but students come into the class with different levels of physics understanding. We conducted a comprehensive student survey at the start of the Spring 2023 term to a) become acquainted with the students as people, and b) understand their quantitative background. The survey revealed that one-half of the enrolled students had not completed the pre-reqs (PHYS 2210), which further revealed that the enrollment system was not enforcing pre-reqs. We encouraged students without PHYS2210 to drop the course and then as a department reviewed all the pre-reqs to avoid this in the future. Even for the students with PHYS2210 completed, it is important going forward to spend more time reviewing the physical concepts before applying them to the geophysical concepts; more time should be spent explaining the form of equations and functions and discussion of how the variables describe physical attributes of a process and how the results change while varying a single variable. ***We will continue with this first-week student survey/assessment*** *because it was key to aligning expectations and goals for the course among the instructors, TA, and students. It also provided a benchmark for students to see their progress from the beginning to the end of the semester.* ***We will design and implement a better end-of-the-semester assessment*** *as a workshop module, rather than rely solely on the exams as a final assessment of skills gained.*

The Spring 2023 course was unique because we changed the workshop model. We have now embedded introductory scientific computing via Jupyter notebooks; students are not learning how to code, per se, rather they are introduced to how scientific computing is used to organize,

plot, and analyze data. Thus, the primary frustration for students during the workshop has switched from the physical experiment not proceeding as anticipated or 'extra messy data' to ensuring that the python programming environment and the notebooks run correctly on department and personal computers. *Changes will include more onboarding to the PYTHON and Jupyter notebook environment in weeks 1 and 2 of the course. This will also include developing a '**quick-start reference guide**' for students. We have also added an undergraduate **Learning Assistant** to provide another instructional contact point for the students.*

We experimented with adding quizzes, student office hour visits, and a department seminar review to the matrix of student assessments this semester. These were all received well by students because they provided more opportunities to test their understanding, prepare for exams, and increase belonging within the department. We will continue to use these additional assessments. Because this course occurs early in a GEO student's curriculum, it's valuable to provide opportunities to practice successful student habits that they can take with them (e.g., regularly review material; meet with faculty during office hours, attend department events). *Following this goal, **we will add note-taking guides for each module** starting in Fall 2023: student polling in other courses that use these guides demonstrate overwhelming support for these guides, and GEO3100 is an ideal candidate for this learning aid.*

3. Based on your experience with this class this semester, how appropriate are the course goals?

After careful consideration, we feel that the course goals are suitable and do not need to be adjusted. The overall goals remain suitable and strong, and we have just adjusted them in Spring 2023 to introduce scientific computing. Thus, it is important to refine this change to the course without drastically changing other aspects of the course right away. One discussion that will need to happen within the next 1-2 years is should we have fewer modules (application topics) so that we can spend 3-4 lectures on a subject, rather than 2.

4. What method do you use to assess whether or not students met the above-listed goals?

Weekly assignments, weekly quizzes, and an exam are used to assess the student's understanding.

5. Are you satisfied with how well the students were able to obtain these goals?

Generally, yes. The students did better than typical in this course, which we did not anticipate with the dramatic change from physical experiments to scientific computing in the workshops.

6. What will you do differently next time?

See the response to the questions above, but in summary (and all based on discussions with students who have completed GEO3100):

- Python/Jupyter notebook quick-start guide (responding directly to student input)
- Note-taking guides for the lectures
- In-class review of quizzes and workshops

- Better end-of-course workshop assessment (e.g., a lab practical)
- Continue what was introduced in Spring 2023: weekly quizzes, required minimum office hour attendance, department seminar review, beginning of semester student biographies & quantitative assessment

Pre-Requisites

7. Do students have the required prerequisite knowledge? If not, what is lacking?

Most of the students have the required background. But some of the students do not. Prior to Spring 2023, the enrollment system allowed students to register to the class even if they do not have the prerequisites; this has been changed both in the Enrollment Software System and very clearly communicated to the department academic advisor. Pre-reqs. are now explicitly discussed on the first day of class.

8. Comment on the students' ability to do what you expected them to do in the course?

They met our expectations**.**

Post-Requisites

9. What do the instructors of those courses expect the students to know?
Courses that require GEO3100 prior to enrollment include: Structural Geology & Tectonics (GEO4060); Field Methods (GEO4500); Geomorphology (GEO5270). Particularly for Structural Geology & Tectonics and Geomorphology, students are better prepared for these courses than they were prior to GEO3100 as a pre-req. because students are already familiar with stress, strain, crustal strength, rheology, fracture mechanics, diffusion, advection, and general body and surface forces applied to the geosciences.

10. Do the instructors of those courses indicate that the students entered with the appropriate knowledge?
Yes; see response to Question 8.

11. How can you change this course to better fit these outcomes?
Instructors of GEO3100 can emphasize more to students how the skills and content from GEO3100 is necessary and applied in downstream courses. Students in general do not understand well the concept of scaffolding in curriculum, particularly across courses. Thus, greater outcomes in GEO3100 and in downstream courses can be achieved in part by discussing how GEO3100 is relevant to their future coursework and careers. Students respond well to this discussion.

Student Engagement

12. How would you change the course to increase student engagement?
Ideally with more in-class activities, but the 50-minute lecture period makes this challenging. See response to Question 10 above. Also, in Spring 2023, we required that students attend at least 1 office hour session for each of the two instructors of the course. This provided an out-

of-class connection with each student, which translated to more class discussion and office hour engagement throughout the semester. This is a quantitative course, in which lectures explore the form and application of functions to understand Earth processes. It's a challenge to present this in an engaging way, so each lecture we continue to experiment with increasing student participation. An approachable and knowledgeable TA is a fundamental asset to this course; we're adding an undergraduate Learning Assistant to the instruction team in Fall 2023 in hopes of increasing student engagement and success. Stay tuned.

Course Evaluations

13. Please summarize your student evaluations for this course and comment on any changes you might make in response to those evaluations.

3 of 8 students (37.5%) completed the end-of-semester course evaluation; when we conducted student surveys via canvas, we typically had 100% response rates. The review below refers to the 3 official evaluations, thus numbers are low.

1. I chose to apply myself to the course (participated in discussions, completed assignments, etc.): 1 said always, two said usually; this is consistent with the instructors' assessment of student engagement.
2. I understood how my grades were determined: 3 students said always.
3. I would recommend this course: 1 said yes, 2 were neutral.
4. I would recommend this instructor: 3 said yes.
5. I felt comfortable asking questions and openly expressing and discussion my views in this course: 3 said always.
6. The 3 students noted that a positive classroom environment, course material, instructors, other students, and teaching assistant contributed to their positive review of the course.
7. Was it clear what you were expected to learn in this class: 3 said yes, and that they knew this from Canvas, the syllabus, the instructors, and the TA.

Below are comments from the students:

"*Pete [and Tonie] goes out of his way to make sure students understand what is expected of them. He is very approachable and almost always had an open door to his office. I could stop by and chat with him about class topics or anything.*"

"*I always felt comfortable asking questions related and non related to specific course material.*"

"*I would happily take another course from them.*"

"*I enjoyed the material of this class but I feel it could have benefitted from a longer lab time. My biggest struggle was the python portion of the course and workshops. I think I understood most of the geologic concepts but I had trouble doing the workshops because of the python and the limited time we worked on them in class.*"

APPENDIX 4: Student Survey

Below is a Survey that was sent out to current Majors During Winter break of 2022/2023. 10 responses were received and are contained below.

Core Curriculum Survey

The following questions relate to the core course sequence which includes Wasatch in the Field, Evolving Earth, Reactive Earth, and Dynamic Earth. Your responses will help the department to understand how the current core is being implemented and how we can improve this sequence and experience to better meet student needs toward degree completion.

If you have not taken the entire core sequence, then please answer only the questions or portions of questions that are relevant to you. If possible, please explain why or why not for your answers.

We really appreciate your time in filling out this survey. We will put this information into practice for future G&G students.

Q1) **Does the core sequence expose you to a broad enough set of topics to help you make an informed decision as to which of the various geoscience tracks (Geology, Geophysics, Environmental, Geologic Engineering, and Earth Science Composite Teaching) are right for you?**

1) Yes, they're all pretty basic since they're the first building blocks of classes but Wasatch in the Field is the most important one for getting a good look at the different tracks.
2) Yes
3) I already knew what I wanted, so I'm not sure on this.
4) Yes, I think it does. I wasn't aware, though, that this is the goal of the core sequence of classes.
5) Yes, I think it provides a good framework to see all the different tracks. The classes are organized well for this purpose, but the tracks aren't usually explicitly mentioned.
6) Yes
7) Yes
8) Yes
9) Yes
10) Not really. It all felt the same track to me, there wasn't a lot that was clear and distinct. It did show me what things I enjoyed within the Geology track.

Q2) **Do you feel that meeting more faculty from across the entire department early in your degree program is helpful?**

1) Yes, showing the faculty and how different career paths look in geology is very helpful.
2) Yes
3) It was nice and useful for considering doing research in the future.
4) Yes, meeting different faculty is really helpful.
5) Yes, it is very helpful for research, different perspectives, etc.
6) Yes, especially as a double major who started their geoscience degree rather late
7) Yes
8) Yes
9) Yes
10) No. Networking is nice and all but eventually we're going to get all the professors anyway. It's a pretty small department.

Q3) **How do you feel about the team-teaching model, as currently implemented?**

1) I feel like it works well as long as the professors grade similarly/have similar challenge when it comes to assignments or course content.
2) It is fine as implemented. However, there should be more communication and standardization of expected outcomes and assignment structure between the teachers.
3) It struggles, especially when professors don't communicate consistent standards across the course.
4) I think it makes sense to have different teachers cover different areas, since they all have specialized knowledge. I just think more could be done to make sure the transitions between teachers are smooth, more specifically in workload and the format of homework/quizzes.
5) This is probably my favorite aspect of CMES classes. It is great to get two different perspectives and teaching styles. It also makes it clear what content should be focused on for for each exam.
6) I enjoy it, since different professors have different interests that they bring to the class.
7) I think it’s adequate
8) I liked it a lot
9) It's pretty solid
10) While it can be very effective there have been some classes where isn't effective. The classes specifically where the professors don't have a unified grading or curriculum.

Q4) **Do you feel that the prerequisites are appropriate for each course?**

1) Yeah, they work.
2) Yes
3) I took them out of order, so it doesn't really seem to be necessary.

4) For me they were appropriate, but I've met non-geoscience majors who have had trouble in some of the classes, such as dynamic earth, because they don't have the same math/physics background.
5) Yes. However, taking similar geology classes from other colleges should absolutely be considered equivalent to taking the necessary pre-reqs. A friend of mine, one of the most knowledgeable geology peers of mine, has been set back a full year or two since he completed the beginning of his degree at another college. He should be able to demonstrate competency to get credit for some of the core classes.
6) NA (I've only taken 1100)
7) Yes
8) Yes
9) Yes
10) For the next classes yes, for what I want to do with my career not all of them.

Q5) **Do you feel that the core courses are effective in demonstrating how to apply allied science concepts (e.g., Chemistry, Physics, etc.) to geoscience problems?**

1) For sure, though the geology courses never go as in depth as the other classes do. Like Reactive Earth never got as into chemisty as chemistry 1 did but I don't mind that. Still showed that chemistry is important to geological sciences.
2) Yes
3) Generally yes.
4) Yes
5) Absolutely. Sometimes I do think we could use a bit more quantitative assessments, but I doubt that is a popular opinion among other students.
6) Yes
7) Yes
8) Yes
9) Yes
10) I feel like it's too much science, there's regular Chemistry, Physics and then departmentally there's also a Geochem, and Geophysics. Feels unnecessary and redundant.

Q6) **Do you feel that the sequence of Evolving Earth, Reactive Earth, and Dynamic Earth is appropriate in terms of content and difficulty of the content covered?**

1) Yeah, there is a little bit of a disconnect since those three cover quite different topics and for me personally it would have been nice to have gotten a little more of Reactive Earth in Evolving Each and the same with Dynamic Earth but I took Evolving Earth like 3/4 years ago so maybe it's improved on that already.
2) Yes
3) Yes
4) Yes, if people have the prerequisites.

5) It is very appropriate.
6) I've only taken 1100 so far, so no comment
7) Yes
8) Yes
9) Probably, haven't finished the set
10) It is pretty hard, but that might just be me.

Q7) **Do you feel that the core adequately prepared you for upper division geoscience course (e.g., Geophysics, Hydrogeology, Mineralogy, Geomorphology, Structural Geology & Tectonics, Sedimentology and Stratigraphy, etc.)?**

1) Kinda, some of the classes I took so long ago that I don't really remember them that well but the core concepts stuck and those helped a lot. The only class that they didn't help with was the Field Methods capstone as I felt as an Environmental Geoscience major I had been shot in the foot since I'm not required to take Structural or Sed Strat and that was highly important for one half of the capstone.
2) NA
3) It was good for structure and sedimentology, but I was not adequately prepared for mineralogy.
4) I think it prepared me pretty well. It was helpful to have been exposed to topics in the core classes. This meant when I got to upper division classes the topics were just being expanded and I didn't have to learn them from scratch.
5) I do think they prepared me sufficiently for the ones I've taken. Just having taken general chem, physics, calc, etc. is very helpful.
6) NA
7) Yes
8) I haven't taken upper division courses yet
9) Haven't taken those classes yet
10) I think the upper division classes were easier actually.

Q8) **What content or experiences do you feel are missing from the introductory core courses?**

1) I wish it was easier to take these classes when needed. Aka, that they were offered all year which... I think most of them are but I could be mistaken.
2) There should be more field experience and hands on activities.
3) I think a better explanation of mineralogy would be useful. Additionally, the content is not standardized. I took reactive earth two years before my friend and the course content was completely different.
4) I think an into to coding class would be a good addition to the core courses. I was able to succeed in classes that involved coding, including computational methods, because I took a summer coding workshop. If I hadn't done that I don't think I would have been prepared to code for classes.
5) MORE FIELD TRIPS

6) NA
7) None
8) A field trip of some sort
9) I can't think of anything missing, but I'm only starting, so I may not know what the introductory courses need
10) Fossils, but once again might just be a me thing.

Appendix B
General Education Learning Outcomes Alignment

General Education Program Level Learning Outcome Alignment

Course Code	Course #	Course Title	College	Cross listed	Desig Code	GELO
ARCH	1615	Introduction to Architecture	Architecture + Planning		FF	Collaborate Effectively
ARCH	2630	Design Foundations Workshop	Architecture + Planning		FF	Persist in Addressing Complex Problems
CMP	2010	Design Ecologies	Architecture + Planning		BF	Respond Creatively
DES	2615	Introduction to Design Thinking	Architecture + Planning		FF	Respond Creatively
DES	2630	Design Contexts	Architecture + Planning		FF	Reason & Act Ethically
ED PS	1000	Introduction to Educational Psychology	Education		BF	Actualize and Contribute
ED PS	2030	Research and Inquiry in Education	Education		BF	Respond Creatively
ED PS	2950	The Undergraduate Research Experience	Education		BF	Actualize and Contribute
ED PS	3720	Child Development and Learning: Understanding Children Birth to Grade 6	Education		BF	Collaborate Effectively
ED PS	3721	Child Development and Learning: Understanding Adolescents Grades 7 - 12	Education		BF	Collaborate Effectively
COMP	2050	Making Noise: Sound Art and Digital Media	Engineering		PS	Respond Creatively
CVEEN	1060	Life Sciences In Engineering	Engineering		LS	Respond Creatively
ECE	1030	Your Smartphone: How it Works and How it is Changing the World	Engineering	MSE 1030	IRPS	Reason & Act Ethically
ENGIN	1022	Survey of Engineering	Engineering		LSPS	Persist in Addressing Complex Problems
MSE	1030	Your Smartphone: How it Works and How it is Changing the World	Engineering	ECE 1030	IRPS	Reason & Act Ethically
ART	1010	Introduction to the Visual Arts	Fine Arts		FF	Respond Creatively
ART	1015	Creative Response to Materials	Fine Arts		FF	Respond Creatively
ART	1020	Non-major Basic Drawing	Fine Arts		FF	Respond Creatively
ART	1030	Non-major Basic Painting	Fine Arts		FF	Respond Creatively
ART	1050	Non-major Darkroom Photography	Fine Arts		FF	Respond Creatively
ART	1070	Non-major Handbuilding Ceramics	Fine Arts		FF	Respond Creatively
ART	1080	Non-major Wheelthrown Pottery	Fine Arts		FF	Respond Creatively
ART	2060	Non-major Digital Photography	Fine Arts		FF	Respond Creatively
ARTH	1010	Masterpieces of World Art	Fine Arts		FF	Respond Creatively
ARTH	2500	Introduction to the History of Art and Visual Culture	Fine Arts		FFHF	Respond Creatively
BALLE	1140	Ballet I for Non-Majors	Fine Arts		FF	Respond Creatively

BALLE	2290	Technique I	Fine Arts	FF	Persist in Addressing Complex Problems
DANC	1010	Dance in Culture	Fine Arts	DVFF	Respond Creatively
DANC	1013	History of Hip-Hop	Fine Arts	DVFF	Respond Creatively
DANC	1015	Dance Appreciation - Demystifying Dance	Fine Arts	FF	Respond Creatively
DANC	1023	Dance Composition for Nonmajors	Fine Arts	FF	Respond Creatively
DANC	1310	Contemporary Dance Techniques 1	Fine Arts	FF	Persist in Addressing Complex Problems
FILM	1110	Introduction to Film & Media Arts	Fine Arts	FFHF	Respond Creatively
FILM	1600	Animation: Then, Now, & Next	Fine Arts	FF	Respond Creatively
FILM	2110	History of Film & Media Arts: Origins to 1952	Fine Arts	FF	Respond Creatively
FILM	2115	History of Film & Media Arts: 1952 to the Present	Fine Arts	FF	Respond Creatively
MUSC	1010	Introduction to Music	Fine Arts	FF	Respond Creatively
MUSC	1015	Introduction to Musical Elements through Basic Guitar and Songwriting	Fine Arts	FF	Respond Creatively
MUSC	1120	Music Theory II	Fine Arts	FF	Persist in Addressing Complex Problems
MUSC	1236	Survey of Jazz	Fine Arts	DVFF	Reason & Act Ethically
MUSC	1250	World Music	Fine Arts	IRFF	Reason & Act Ethically
MUSC	1460	Introduction to Music Theory	Fine Arts	FF	Respond Creatively
MUSC	2100	History of Rock and Roll	Fine Arts	FF	Respond Creatively
THEA	1013	Exploring Theatre	Fine Arts	FF	Actualize and Contribute
THEA	1033	Acting I for Non Majors	Fine Arts	FF	Actualize and Contribute
THEA	1040	Dramatic Arts in Television	Fine Arts	FF	Actualize and Contribute
THEA	1551	Scenography Lecture	Fine Arts	FF	Actualize and Contribute
THEA	1713	Script Analysis	Fine Arts	FF	Actualize and Contribute
THEA	1770	The American Experience Through Black Theatre	Fine Arts	DVFF	Actualize and Contribute
THEA	4010	Shakespeare in Performance	Fine Arts	FFHF	Actualize and Contribute
CSD	1010	Introduction to Communication Sciences and Disorders	Health	BF	Respond Creatively
KINES	2600	Perspectives on Sport and American Society	Health	BF	Reason & Act Ethically
NUIP	1020	Scientific Foundations of Human Nutrition and Health	Health	LS	Persist in Addressing Complex Problems
PRT	1110	Well-being, Happiness, and the Good Life	Health	BF	Respond Creatively
PRT	2100	Wilderness in America	Health	BF	Respond Creatively
CL CV	1550	Classical Mythology	Humanities	HF	Respond Creatively

CL CV	1560	The Greeks	Humanities		HF	Collaborate Effectively
CL CV	1570	The Romans	Humanities		HF	Collaborate Effectively
COMM	1020	Principles of Public Speaking	Humanities		HF	Respond Creatively
COMM	1270	Analysis of Argument	Humanities		HF	Persist in Addressing Complex Problems
COMM	1500	Media and Society	Humanities		HF	Actualize and Contribute
COMM	2020	Communication Theory and Everyday Life	Humanities		HF	Reason & Act Ethically
COMM	2040	Media Theory and Popular Culture	Humanities		HF	Persist in Addressing Complex Problems
COMM	2110	Introduction to Interpersonal Communication	Humanities		BF	Collaborate Effectively
ENGL	2010	Intermediate Writing: Academic Writing and Research	Humanities	WRTG 2010	WR2	Persist in Addressing Complex Problems
ENGL	2085	Digital Culture	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2090	Video Game Storytelling	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2095	Literature by the Numbers	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2211	Writing in Honors	Humanities		WR2	Persist in Addressing Complex Problems
ENGL	2225	Science Fiction	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2235	Fantasy	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2250	Introduction to Creative Writing	Humanities		FF	Respond Creatively
ENGL	2300	Introduction to Shakespeare	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2330	Intro to Children's Lit	Humanities		HF	Persist in Addressing Complex Problems
ENGL	2510	Introduction to Creative Writing with Book Arts Workshop	Humanities		FF	Respond Creatively
ENGL	3030	The Bible as Literature	Humanities		HF	Persist in Addressing Complex Problems
HIST	1100	European History to 1300	Humanities		HF	Respond Creatively
HIST	1110	European History Since 1300	Humanities		HF	Persist in Addressing Complex Problems
HIST	1210	Asian History to 1500	Humanities		HF	Respond Creatively
HIST	1500	World History to 1500	Humanities		HF	Respond Creatively
HIST	1510	World History Since 1500	Humanities		HF	Respond Creatively
HIST	1700	American History	Humanities		AI	Respond Creatively
HIST	2100	Nazi Germany and the Holocaust	Humanities		HF	Respond Creatively
HIST	2210	Age of Total War	Humanities		IRHF	Respond Creatively
HUM	1500	Great Books In The Humanities	Humanities		HF	Respond Creatively
HUM	1550	Great Science Books	Humanities		HF	Respond Creatively
HUM	1600	Programming for Humanities	Humanities		HF	Persist in Addressing Complex Problems
HUM	2250	Introduction to Medical Humanities	Humanities		HF	Reason & Act Ethically
LING	1069	@#$!: Bad Words & Taboo Terms	Humanities		HF	Persist in Addressing Complex Problems
LING	2200	Introduction to the Study of Language	Humanities		BF	Persist in Addressing Complex Problems

LING	2470	Language and Culture	Humanities		IRHF	Reason & Act Ethically
LING	2475	Language Myths	Humanities		BF	Actualize and Contribute
LING	2600	Cross-Cultural Communication	Humanities		DVHF	Collaborate Effectively
PHIL	1000	Intro: Survey of Philosophy	Humanities		HF	Persist in Addressing Complex Problems
PHIL	1001	Intro: Philosophy and ethical dilemmas in the contemporary world	Humanities		HF	Reason & Act Ethically
PHIL	1002	Intro: Philosophy and issues related to God, faith, and reason	Humanities		HF	Persist in Addressing Complex Problems
PHIL	1003	Intro: Philosophy and Human Nature	Humanities		HF	Persist in Addressing Complex Problems
PHIL	1005	Introduction to Philosophy en Espanol	Humanities		HF	Respond Creatively
PHIL	2640	World Religions	Humanities	RELS 2640	IRHF	Collaborate Effectively
RELS	2640	World Religions	Humanities	PHIL 2640	IRHF	Collaborate Effectively
WLC	2010	Introduction to the Study of Literature and Culture	Humanities		HF	Collaborate Effectively
WRTG	1009	Multilingual Writing I	Humanities		WR1	Persist in Addressing Complex Problems
WRTG	1010	Introduction to Academic Writing	Humanities		WR1	Persist in Addressing Complex Problems
WRTG	2009	Multilingual Writing II	Humanities		WR2	Persist in Addressing Complex Problems
WRTG	2010	Intermediate Writing: Academic Writing and Research	Humanities	ENGL 2010	WR2	Persist in Addressing Complex Problems
WRTG	2040	Intro to Writing Studies	Humanities		HF	Respond Creatively
WRTG	2050	Writing as Superpower	Humanities		HF	Actualize and Contribute
WRTG	2080	Writing about Music	Humanities		HF	Respond Creatively
WRTG	2705	Rhetoric, Science & Technology Studies	Humanities		BFHF	Actualize and Contribute
WRTG	3018	Writing Popular Culture	Humanities		HF	Respond Creatively
GERON	3001	Experiences of Aging: Challenges and Promise	Nursing		BF	Actualize and Contribute
NURS	2100	Human Development: A Lifespan Approach to Health	Nursing		BF	Reason & Act Ethically
ASTR	1050	The Solar System	Science	GEO 1080 PHYS 1050	PS	Persist in Addressing Complex Problems
ASTR	1060	The Universe	Science	PHYS 1060	PS	Persist in Addressing Complex Problems
ATMOS	1000	Secrets of the Greatest Snow on Earth	Science		PS	Persist in Addressing Complex Problems
ATMOS	1010	Severe and Unusual Weather	Science		PS	Persist in Addressing Complex Problems
ATMOS	1020	Climate Change	Science		PS	Persist in Addressing Complex Problems
ATMOS	1120	Introduction to Earth System Science	Science	BIOL 1120, GEO 1120	LS	Persist in Addressing Complex Problems

ATMOS	2750	Energy, Water, Air, and Metals: Sustainable Use and Development	Science		PS	Persist in Addressing Complex Problems
BIOL	1010	Biology in the 21st Century	Science		DVLS	Persist in Addressing Complex Problems
BIOL	1030	Human Biology	Science		LS	Actualize and Contribute
BIOL	1120	Introduction to Earth System Science	Science		LS	Persist in Addressing Complex Problems
BIOL	1610	Fundamental Principles of Biology I: Cells, Genetics, and Biochemistry	Science		LS	Collaborate Effectively
BIOL	1620	Fundamental Principles of Biology II: Evolution, Ecology and Physiology	Science		LS	Collaborate Effectively
BIOL	2420	Human Physiology	Science		LS	Persist in Addressing Complex Problems
CHEM	1210	General Chemistry I	Science		PS	Persist in Addressing Complex Problems
CHEM	1211	Honors General Chemistry I	Science		PS	Persist in Addressing Complex Problems
CHEM	1220	General Chemistry II	Science		PS	Persist in Addressing Complex Problems
CHEM	1221	Honors General Chemistry II	Science		PS	Persist in Addressing Complex Problems
GEO	1000	Earth Science in the Cinema	Science		PS	Persist in Addressing Complex Problems
GEO	1030	Living with Earthquakes and Volcanoes	Science		IRPS	Persist in Addressing Complex Problems
GEO	1040	The World of Dinosaurs	Science		LS	Persist in Addressing Complex Problems
GEO	1050	National Parks: Geology Behind the Scenery	Science		PS	Persist in Addressing Complex Problems
GEO	1100	Evolving Earth	Science		LS	Persist in Addressing Complex Problems
GEO	1120	Introduction to Earth System Science	Science	BIOL 1120, ATMOS 1120	LS	Persist in Addressing Complex Problems
GEO	1150	The Solar System	Science	PHYS 1050, ASTR 1050	PS	Persist in Addressing Complex Problems
GEO	2080	The Oceans	Science		PS	Persist in Addressing Complex Problems
GEO	2500	Wasatch in the Field	Science		PS	Persist in Addressing Complex Problems
MATH	1030	Introduction to Quantitative Reasoning	Science		QL	Persist in Addressing Complex Problems
MATH	1035	Life Applications of Mathematics, Statistics, and Probability	Science		QL	Persist in Addressing Complex Problems
MATH	1040	Introduction to Statistics and Probability	Science		QL	Persist in Addressing Complex Problems
MATH	1050	College Algebra	Science		QL	Persist in Addressing Complex Problems
MATH	1060	Trigonometry	Science		QL	Persist in Addressing Complex Problems
MATH	1070	Introduction to Statistical Inference	Science		QL	Persist in Addressing Complex Problems
MATH	1080	Precalculus	Science		QL	Persist in Addressing Complex Problems
MATH	1090	Business Algebra	Science		QL	Persist in Addressing Complex Problems
MATH	1100	Business Calculus	Science		QL	Persist in Addressing Complex Problems
MATH	1170	Calculus for Biologists I	Science		QL	Persist in Addressing Complex Problems

MATH	1210	Calculus I	Science		QL	Persist in Addressing Complex Problems
MATH	1215	Calculus I and Trigonometry	Science		QL	Persist in Addressing Complex Problems
MATH	1310	Engineering Calculus I	Science		QL	Persist in Addressing Complex Problems
MATH	2000	Algebraic Reasoning	Science		QL	Persist in Addressing Complex Problems
PHYS	1010	Elementary Physics: The Way Things Work	Science		PS	Persist in Addressing Complex Problems
PHYS	1050	The Solar System	Science		PS	Persist in Addressing Complex Problems
PHYS	1060	The Universe	Science		PS	Persist in Addressing Complex Problems
PHYS	1110	Physics of the Human Body	Science		LS	Persist in Addressing Complex Problems
PHYS	1330	Physics of Audio and Video (Analog to Digital)	Science		PS	Persist in Addressing Complex Problems
PHYS	2010	General Physics I	Science		PS	Persist in Addressing Complex Problems
PHYS	2020	General Physics II	Science		PS	Persist in Addressing Complex Problems
PHYS	2210	Physics for Scientists and Engineers I	Science		PS	Persist in Addressing Complex Problems
PHYS	2220	Physics for Scientists and Engineers II	Science		PS	Persist in Addressing Complex Problems
ANTH	1010	Culture and the Human Experience	Soc and Behavioral Science		BF	Respond Creatively
ANTH	1020	Human Origins: Evolution and Diversity	Soc and Behavioral Science		LS	Persist in Addressing Complex Problems
ANTH	1030	Prehistoric Archaeology	Soc and Behavioral Science		BF	Persist in Addressing Complex Problems
ANTH	1050	The Evolution of Human Nature	Soc and Behavioral Science		LS	Actualize and Contribute
ANTH	2220	Intro to Forensic Anthropology and the Science "of CSI"	Soc and Behavioral Science		LS	Persist in Addressing Complex Problems
ANTH	2400	Climate Change and Lost Cities	Soc and Behavioral Science	GEOG 2400	BFPS	Collaborate Effectively
CRIM	1010	Introduction to Criminal Justice	Soc and Behavioral Science	SOC 1111	BF	Reason & Act Ethically
ECON	1740	US Economic History	Soc and Behavioral Science		AI	Respond Creatively
ECON	2010	Principles of Microeconomics	Soc and Behavioral Science		BF	Persist in Addressing Complex Problems
ECON	2020	Principles of Macroeconomics	Soc and Behavioral Science		BF	Actualize and Contribute
ECON	2030	Economics in the Context of Science and Society	Soc and Behavioral Science		BF	Collaborate Effectively
ECON	2500	The United States of Inequality: Political and Economic Remedies and Challenges	Soc and Behavioral Science	POLS 2500	BF	Reason & Act Ethically
ENV	2100	Environment and Society	Soc and Behavioral Science		BF	Persist in Addressing Complex Problems
ENVST	2050	Introduction to Environmental Science	Soc and Behavioral Science		LSPS	Actualize and Contribute
FCS	1500	Lifespan Human Development	Soc and Behavioral Science		BF	Actualize and Contribute
FCS	2100	Transition to Adulthood	Soc and Behavioral Science	SOC 2100	BF	Actualize and Contribute
FCS	2400	Modern Family: A Life Course Perspective	Soc and Behavioral Science		BF	Persist in Addressing Complex Problems
GEOG	1000	Earth Environments and Global Change	Soc and Behavioral Science		PS	Actualize and Contribute

GEOG	1300	World Regional Geography	Soc and Behavioral Science		BF	Respond Creatively
GEOG	1400	Human Geography	Soc and Behavioral Science		BF	Respond Creatively
GEOG	1750	Greatest Snow on Earth: Geography of Skiing	Soc and Behavioral Science		PS	Respond Creatively
GEOG	2400	Climate Change and Lost Cities	Soc and Behavioral Science	ANTH 2400	BFPS	Collaborate Effectively
HSP	1010	Introduction to Health, Society & Policy Major	Soc and Behavioral Science		BF	Persist in Addressing Complex Problems
POLS	1100	U.S. National Government	Soc and Behavioral Science		AI	Respond Creatively
POLS	2100	Introduction to International Relations	Soc and Behavioral Science		BF	Respond Creatively
POLS	2200	Introduction to Comparative Politics	Soc and Behavioral Science		BF	Respond Creatively
POLS	2300	Introduction to Political Theory	Soc and Behavioral Science		HF	Reason & Act Ethically
POLS	2500	The United States of Inequality: Political and Economic Remedies and Challenges	Soc and Behavioral Science	ECON 2500	BF	Reason & Act Ethically
POLS	2700	Introduction to Public Administration	Soc and Behavioral Science		BF	Reason & Act Ethically
PSY	1010	General Psychology	Soc and Behavioral Science		BF	Respond Creatively
PSY	1011	Honors General Psychology	Soc and Behavioral Science		BF	Respond Creatively
PSY	1080	Love and Relationships	Soc and Behavioral Science	SBS 1080 GNDR 1080	BF	Respond Creatively
PSY	2710	Brain and Behavior	Soc and Behavioral Science		LS	Respond Creatively
SBS	1080	Love and Relationships	Soc and Behavioral Science	PSY 1080, GNDR 1080	BF	Respond Creatively
SOC	1010	Introduction to Sociology	Soc and Behavioral Science		BF	Respond Creatively
SOC	1020	Current Social Problems in America	Soc and Behavioral Science		BF	Respond Creatively
SOC	1111	Introduction to Criminal Justice	Soc and Behavioral Science	CRIM 1010	BF	Reason & Act Ethically
SOC	2100	Transition to Adulthood	Soc and Behavioral Science	FCS 2100	BF	Actualize and Contribute
ENTP	1010	Entrepreneurship and Society	School of Business		BF	Respond Creatively
MGT	1050	Foundations of Business Thought	School of Business		BF	Respond Creatively
MGT	1051	Honors Foundations of Business Thought	School of Business		BFHF	Respond Creatively
QAMO	2010	Introduction to Business Economics	School of Business		BF	Actualize and Contribute
QAMO	2011	Honors Introduction to Quantitative Business Economics	School of Business		BF	Actualize and Contribute
STRAT	1050	Social Impact Through Business	School of Business		BF	Reason & Act Ethically
HONOR	2010	Special Topics	Honors College		FF	Respond Creatively
HONOR	2101	Honors Core in Intellectual Traditions: Antiquity	Honors College		HF	Respond Creatively

HONOR	2102	Honors Core in Intellectual Traditions: The Middle Ages	Honors College		HF	Respond Creatively
HONOR	2103	Honors Core in Intellectual Tradition: Modernity	Honors College		HF	Respond Creatively
HONOR	2104	Intellectual Traditions Cross-Cultural Dialogues	Honors College		HF	Reason & Act Ethically
HONOR	2106	Reacting to the Past: the Middle Ages	Honors College		HF	Persist in Addressing Complex Problems
HONOR	2108	Visual and Media Literacy in The Modern Era	Honors College		HF	Respond Creatively
HONOR	2109	Honors Core in Intellectual Traditions: through an Ecological Lens I	Honors College		HF	Respond Creatively
HONOR	2110	Honors Core in Intellectual Traditions: through an Ecological Lens II	Honors College		HF	Respond Creatively
HONOR	2113	Integrated IT in Humanities & Science: Science, Technology & Human Rights	Honors College		HF	Respond Creatively
HONOR	2114	Honors Core in Intellectual Traditions: Health	Honors College		HF	Respond Creatively
HONOR	2115	Intellectual Traditions: Community and Identity	Honors College		HF	Respond Creatively
HONOR	2211	Writing in Honors	Honors College		WR2	Collaborate Effectively
HONOR	2212	American Institutions	Honors College		AI	Respond Creatively
HONOR	2285	Energy and Society	Honors College		PS	Persist in Addressing Complex Problems
HONOR	2400	Politics of Abstraction	Honors College		FF	Respond Creatively
HONOR	2700	Comparative Ecology and Species Interactions	Honors College		LS	Respond Creatively
HONOR	2750	Energy, Water, Air, and Metals: Sustainable Use and Development	Honors College	ATMOS 2750	PS	Persist in Addressing Complex Problems
HONOR	2810	Honors Core Thematic Intellectual Traditions	Honors College		HF	Respond Creatively
HONOR	2850	Composing a Community	Honors College		FF	Collaborate Effectively
HONOR	2870	The Artfully Extended Mind	Honors College		FF	Respond Creatively
HONOR	2890	Creative Writing: Ecology and the Other	Honors College		FF	Actualize and Contribute
HONOR	2980	Creative Problem Solving	Honors College		BF	Respond Creatively
HONOR	3180	Queer Art History	Honors College		DVFF	Respond Creatively
HONOR	3214	Foundations in Social Sciences	Honors College		DVBF	Persist in Addressing Complex Problems
HONOR	3245	Global Environmental Change	Honors College		PS	Persist in Addressing Complex Problems
HONOR	3280	Ecology and Evolution of Human Disease	Honors College		LS	Persist in Addressing Complex Problems
HONOR	3374	Special Topics	Honors College		BF	Actualize and Contribute

HONOR	3418	Radical Quiet	Honors College		FF	Respond Creatively
HONOR	3700	Honors Praxis Lab	Honors College		BF	Persist in Addressing Complex Problems
HONOR	3818	City as Text	Honors College		FFHF	Respond Creatively
HONOR	3820	Critical Landscapes: Land Use in Contemporary Art	Honors College		FF	Reason & Act Ethically
HONOR	4471	Seminar/Workshop in Physical and Life Science	Honors College		LS	Actualize and Contribute
HONOR	4472	Seminar/Workshop in Humanities	Honors College		HF	Actualize and Contribute
HONOR	4474	Seminar/Workshop in Social Sciences	Honors College		BF	Actualize and Contribute
ETHNC	2500	Introduction to Ethnic Studies	Cultural & Soc Transformation		DVBF	Respond Creatively
ETHNC	2510	Diversity Scholars: Land and Labor	Cultural & Soc Transformation		DVBF	Respond Creatively
ETHNC	2520	Diversity Scholars: What is Justice?	Cultural & Soc Transformation		HF	Collaborate Effectively
ETHNC	2550	African American Experiences	Cultural & Soc Transformation		DVHF	Collaborate Effectively
ETHNC	2570	American Indian Experiences	Cultural & Soc Transformation		DVHF	Collaborate Effectively
ETHNC	2580	Asian American Experiences	Cultural & Soc Transformation		DVBF	Collaborate Effectively
ETHNC	2590	Pacific Islander American Experiences	Cultural & Soc Transformation		DVHF	Collaborate Effectively
GNDR	1080	Love and Relationships	Cultural & Soc Transformation	SBS 1080 PSY 1080	BF	Respond Creatively
GNDR	1100	Gender and Social Change	Cultural & Soc Transformation		DVBF	Respond Creatively
GNDR	3690	Gender and Contemporary Issues	Cultural & Soc Transformation		DVHF	Collaborate Effectively