

Courses Designed to Support Students' Professional Development and Progress through a Multi-Year Co-Curricular Program, the Grand Challenges Scholars Program

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Abstract

This paper describes three courses designed and implemented at Arizona State University (ASU) to support students' progress and persistence through a multi-year co-curricular program, the Grand Challenges Scholars Program (GCSP). The first course primarily focuses on the interdisciplinary exploration of global challenges within four theme areas (Sustainability, Security, Health, Joy of Living) to help students identify which area to focus their GCSP experiences on for their remaining years in the program. This course also introduces students to opportunities to achieve the program outcomes and requires them to develop a customized four-year plan for the program. The two one-credit asynchronous online middle year courses were designed to each include a set of required assignments and options for self-select assignments to support their progress in the GCSP and their professional development. The second year course provides students with opportunities to continue to explore the theme area they chose for GCSP, develop and enhance professional skills, communicate and showcase their accomplishments and progress in the GCSP, and identify future opportunities to achieve the program outcomes. It also offers opportunities for students to connect with students and faculty within the GCSP community and receive mentorship from the GCSP faculty directors. The third year course has similar objectives but additionally emphasizes student reflection on their GCSP experiences, communication of GCSP accomplishments to future employers, and preparation for their graduation as a Grand Challenges Scholar. Details of the design and implementation of these courses will be described in this paper, with a focus on the second and third year courses. To assess the achievement of the course objectives and the value of the required and self-select assignments in these two courses, a survey instrument was developed and administered at the end of the course. Survey responses collected over three semesters, starting from the initial offering of the courses in Fall 2022, indicate that students' perception of the course is largely positive. Students in both courses found the courses very valuable in multiple ways. In the paper, detailed survey results will be presented and discussed. Areas for future work will also be shared.

Introduction and Motivation

At Arizona State University (ASU), the Grand Challenges Scholars Program (GCSP) is a multi-year co-curricular program that typically spans the entirety of a student's undergraduate collegiate career. The majority of GCSP students start their journey in the program as incoming first year students or during their first year and continue in the program until they graduate from their undergraduate degree program. Throughout their time in the GCSP, students engage in curricular, co-curricular, and extracurricular experiences (courses and experiences) to achieve the

program outcomes, known as the GCSP Competencies: Talent; Multidisciplinary; Viable Business/Entrepreneurship; Multicultural; and Social Consciousness [1]. To achieve each competency, students must complete two courses and/or experiences, except for the Viable Business/Entrepreneurship competency which only requires one course or experience, and Social Consciousness which requires 80 hours of service-learning experience. Each student tailors their experiences in alignment with their personal interests and focuses their experiences on an overarching theme (sustainability, health, security, or joy of living), hereafter referred to as their GCSP theme. Throughout a student's journey in the program, each time they choose and complete a course or experience to fulfill a competency requirement, they submit it to be evaluated for achievement of the competency outcomes and submit evidence of completion, and they describe and reflect on their (course) experience in a digital portfolio. During their final semester, they submit their comprehensive digital portfolio of their GCSP experiences for final approval and graduate as a Grand Challenges Scholar, recognized both by ASU and nationally by the National Academy of Engineering and GCSP Network.

Each student can choose when to complete each competency requirement and can complete the competency requirements in any order, i.e., they can completely customize their path in the program. The personalized journeys and extended duration of the program often poses a challenge for student support and retention. To address these challenges, a series of courses were developed for students' first three years in the program, respectively, to better connect them to the faculty directors of the program, their peers, and the GCSP community, and to support their progress in the program. The courses also aim to provide additional value to the students, such as earning credit for making progress in the program, receiving automatic credits towards requirements of the Honors College (if applicable) and engaging in professional development. Except for the first year course, which meets one of the requirements of the Multidisciplinary competency, the middle year courses do not contribute to any GCSP competencies but they are specifically designed to support students as they complete other courses and experiences to achieve the competencies. Due to the nature and purpose of these two middle year courses, they were designed to be one credit each and asynchronous online to prevent them from being an extra burden for students and to allow for maximum flexibility for students' schedules.

The design of these courses, particularly the middle year courses, was also inspired in part by best practices for student support and retention found in the literature. Several studies have investigated methods for providing support for students, particularly those from underrepresented populations [2-6]. Lee and Matusovich (2016) presented a comprehensive model of outside of class (co-curricular) support for undergraduate engineering students, which illustrates the many different types of support that engineering support centers need to provide for students including support for their academic experience, peer interactions, faculty/staff interactions, professional development, and extracurricular involvement [2]. Cohort models which involve scaffolded opportunities for interaction and engagement with activities, peers,

faculty, etc., are often used to provide support for students throughout the curriculum [4, 5]. These studies investigating how support throughout the academic career can improve student retention in an engineering program have inspired this current effort to provide structured support to students engaging in a multi-year co-curricular program that spans their entire academic career.

Course Description

Course Overviews and Outcomes

The first year course, FSE150 Perspectives on Grand Challenges for Engineering, aims to introduce new GCSP students to global challenges facing society in the 21st century and ongoing research efforts in addressing these challenges from an interdisciplinary systems perspective. In this course, students actively explore global challenges in each of the four themes (sustainability, security, health, and joy of living) and evaluate the relationships between various aspects of society and engineering solutions/technologies related to each theme. They are provided with opportunities to further explore theme(s) that they are interested in through individualized research-based assignments and a team project. In this course, students also learn about program requirements and opportunities to achieve the program competencies, and develop a customized four-year plan for the program, i.e., they identify opportunities they would like to pursue to meet each competency requirement and plan out when to pursue each opportunity during their four year journey. Due to the active learning and group based nature of this course, the first year students also closely connect with their peers and the first year community in the GCSP. More details about this course can be found in [7, 8]. Since this first year course has been described in detail in other publications, this paper will focus mostly on the two middle year courses.

The second year course, FSE250 Grand Challenges Scholars Program Gold, offers opportunities for second year GCSP students to explore ways in which they can connect their academic and career goals, interests and experiences through the GCSP. It also provides opportunities for students to continue to explore their chosen GCSP theme, develop and enhance professional skills, communicate and showcase their accomplishments and progress in GCSP, and identify future opportunities to achieve the GCSP competencies. In this course, students also have opportunities to connect with students and faculty within the GCSP community and receive mentorship from the faculty directors. The specific learning outcomes of this course are included below:

In this course, students will

- gain a better understanding of the value of GCSP;
- further explore and take next steps toward opportunities to achieve GCSP competencies related to their interests in their GCSP theme;

- become more aware of opportunities to engage in the ASU GCSP and international GCSP Network communities;
- develop and/or enhance professional skills;
- connect with the GCSP community;
- learn how to effectively communicate GCSP progress and accomplishments to GCSP faculty, peers, and future employers;
- develop revised GCSP plan for current and following academic years and receive faculty feedback on their plans; and
- contribute to and make progress toward their GCSP portfolio.

The third year course, FSE350 Grand Challenges Scholars Program Maroon, has similar objectives, but also focuses on helping students to connect their GCSP experiences to their career goals and next steps in their professional life beyond college. In the course, students also reflect on their GCSP experiences, communicate GCSP accomplishments to future employers, and prepare to graduate as a Grand Challenges Scholar. The specific learning outcomes of this course are included below:

In this course, students will

- gain a better understanding of how GCSP connects to their future career goals;
- practice telling their personal story about their GCSP experiences and leveraging GCSP accomplishments in job searches/graduate school applications;
- connect with the GCSP community;
- communicate GCSP progress to GCSP faculty and revise plan for remaining semesters;
- become more aware of GCSP graduation requirements and processes;
- make progress toward GCSP graduation requirements;
- become more aware of opportunities to engage in the ASU GCSP and international GCSP Network communities as an alumnus; and
- learn about opportunities to continue their work in their GCSP theme after graduation.

Each of these two courses was designed to be assignment-based and does not include lecture videos or materials. More specifically, each course has six required assignments due at different times throughout a 15-week semester and 11 options of self-select assignments, of which each student chooses any four to complete before the end of the semester.

Required Assignments

In each of these two courses, three of the required assignments aim to help students to stay on track in their journeys and receive faculty mentorship. One of these three assignments, *GCSP progress check*, requires each student to revise their customized four-year plan, created in the first year course, and then meet with a faculty director to discuss their progress and their revised

plan. The second one, *GCSP competency submission*, requires each student to submit one course/experience that they have completed or plan to complete for a competency requirement to be evaluated to verify fulfillment of the competency outcomes and/or for completion. The third one, *GCSP portfolio update*, requires students to update their digital portfolio to describe and reflect on one course or experience that they have completed (other than the first year course FSE150) that meets a competency requirement and submit it for feedback. Since some second year students may have not completed a course or experience yet besides the required first year course (FSE150), students have the option to provide constructive feedback to their peers who were able to update their portfolios instead.

The fourth required assignment in each course seeks to help students better highlight their GCSP experiences for future career opportunities and receive professional feedback. In the second year course, students create or update their resume and submit it to be reviewed by professional staff from the engineering career center for feedback (*update (or create) your resume* assignment). In the third year course, students develop an elevator pitch to showcase their accomplishments through the GCSP and beyond in the *elevator pitch: why you?* assignment and these elevator pitches are shared with industry professionals for review and feedback. Both assignments were developed in collaboration with the engineering career center whose professional staff shared career preparation advice and resources, including guidance to help students to highlight their GCSP experiences on their resumes.

Another required assignment completed near the start of both courses is *value of the Grand Challenges Scholars Program: year 2 or 3 perspective*. Students share their perspectives on the value of participation in the GCSP to them and learn about how the program participation has been valuable to their peers in the form of a digital whiteboard.

The remaining required assignment in each course (FSE250 and FSE350) is different, but both focus on helping students to think about connections between their interests, experiences, career goals, and vision for the future. In the second year course, in the *visualize your future as a Grand Challenges Scholar* assignment, students create a vision board to represent what they would like their future in the program and beyond to look like and comment on each other's vision boards. The third year assignment is *skills inventory & gap analysis*, in which students evaluate their past and current experiences to identify skills, competencies, and mindsets that they have gained, pinpoint desired skills their next step (a job or graduate school) desires, analyze the gaps in between what they have gained and what are desired, and determine actions they can take to close those gaps.

Self-Select Assignments

Both courses have the same set of 11 options of self-select assignments, with slight variations in two of them to accommodate students' academic level and needs. These assignments are each listed and briefly described below.

Attend a research seminar: Students attend a research seminar that focuses on a topic(s) related to their GCSP theme to learn about ongoing research efforts and connect with faculty/researchers working in their theme area.

Attend a professional development workshop: Students attend and participate in a career workshop (or other professional development workshop/event) to develop and practice professional skills that will help them in obtaining internships/jobs and reaching their career goals.

Attend a career fair: Students attend a career fair to network with potential employers, explore possible career opportunities, practice their interview skills, practice sharing their GCSP experiences with potential employers, and apply for internship opportunities (if applicable).

Attend an employer information session: Students attend an information session offered by an employer that they are interested in working with (or a graduate school that they are interested in applying to in the future), to learn more about the employer, network with professionals who work at the employer, and learn about internship and job opportunities that the employer offers (or learn more about a graduate school program they are interested in).

Attend an ASU GCSP event: Students attend one GCSP event during the current semester to socialize with and connect with other GCSP students, the GCSP Student Leaders, GCSP Faculty Directors, staff, and beyond (e.g., faculty, industry, GCSP alumni, etc., depending on the event). Each semester, multiple GCSP events are held at ASU such as a welcome social event and a faculty dinner event in the fall semester, an alumni panel event and a graduate showcase event in the spring semester, and monthly professional development or social events throughout the academic year.

Apply for a program that meets a GCSP competency requirement(s): Students apply for a program/opportunity during the current semester that could meet any of the GCSP Competency requirement(s), such as a research program, a study abroad program, etc.

Identify/talk to a GCSP alumnus/alumna whose career path interests you: Students use LinkedIn to find an ASU GCSP Alumnus/alumna who has a career path and/or academic experience that

they are interested in and learn more about their academic journey and career path via LinkedIn and/or their GCSP Portfolio or connect with and talk to the alumni.

Share a recent experience/accomplishment with the GCSP community: Students fill out a form to share an accomplishment or cool experience they recently participated in to be more broadly shared with the GCSP community via social media, newsletter, etc.

Interview a GCSP upperclassman/Meet with a GCSP younger peer: Second year students interview a GCSP upperclassman to learn more about their experiences while third year students meet with a younger GCSP peer to share their experiences.

Share your GCSP digital badge(s) on LinkedIn: Each time a student completes a competency, they are awarded a GCSP digital badge for recognition of their achievements. Students share the digital GCSP badge(s) they have earned on their LinkedIn profile in this assignment.

Form a team with GCSP students to participate in an event: Students form a team with at least 2 other GCSP students to participate in a hackathon, design challenge, or other team-based competition or activity.

Student Feedback

To gather student feedback on the achievement of the course outcomes of the two middle year courses and the value of the required and self-select assignments, a survey instrument was designed and administered to students enrolled in the course in the Fall 2022, Spring 2023, and Fall 2023 semesters. The survey included questions that collected student demographic information, Likert scale questions, and open-ended questions. Sixty-eight survey responses were collected from the second year course and 61 from the third year course, across the three semesters. The results from the survey are presented and discussed below.

Demographics of the Survey Participants

The second year course survey participants were 32.8% females and 68.2% males while the distribution was 39.3% females and 59.0% males (and 1.6% preferred not to answer) in the third year course. The second year survey participants represented 10 majors, largest being Computer Science (28.4%), followed by Biomedical Engineering (20.9%), while the third year participants were more dominated by Computer Science majors (32.8%) with the other 67.2% distributed across 12 other majors. These participants' GCSP theme distributions in the two courses, respectively, were as follows, Sustainability, 36.8% and 33.3%, Health, 27.9% and 18.3%, Security, 13.2% and 15.0%, and Joy of Living, 22.1% and 33.3%.

Meeting Course Outcomes

To understand how well the students thought the course achieved its desired objectives, the survey asked each participant to rate the level of their agreement with a series of statements about the course on a Likert scale of 1-5, with 1 being strongly disagree and 5 being strongly agree. The results are shown in Fig. 1 and Fig. 2 for both courses, respectively. The majority of the survey participants agreed or strongly agreed with the statements about the courses, indicating that both courses have been very successful at meeting their desired objectives. The statements that focus on supporting GCSP progress and exploration of opportunities were scored the highest by second year students, indicating that they appreciated and perhaps needed this structured support during their second year, as opposed to just being “set loose” to pursue their own customized journey in the program. For the third year course, it is worth noting that students felt that the course helped them better understand how GCSP can contribute to their career goals and how they can better leverage their GCSP experiences as they seek opportunities for their next steps beyond college, which is a great value this course has provided students with, in addition to just supporting their progress in the program. One interesting finding is the positive scores received for “the course made me feel more connected with the GCSP community” in both courses; these scores were higher than expected since it is an asynchronous online course, and the assignments focused on connecting with peers and/or attending events were all self-select assignment options (i.e., not all students were required to do them).

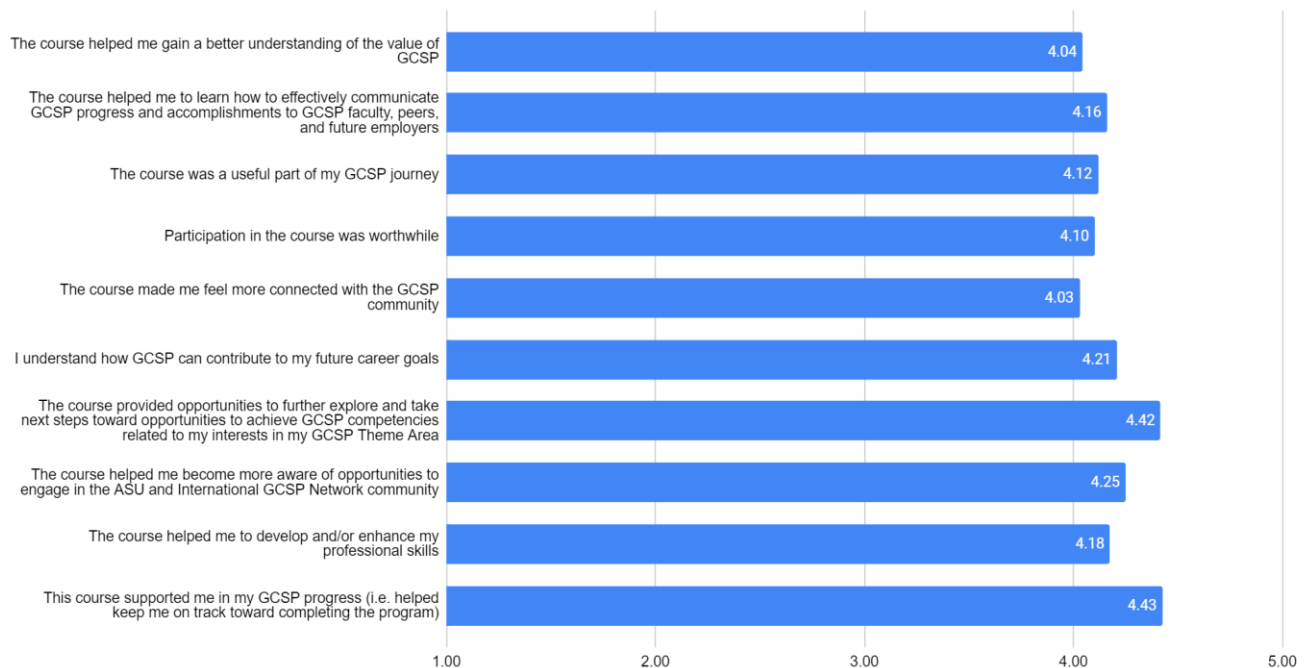


Fig. 1 Second year course meeting course objectives (n=68)

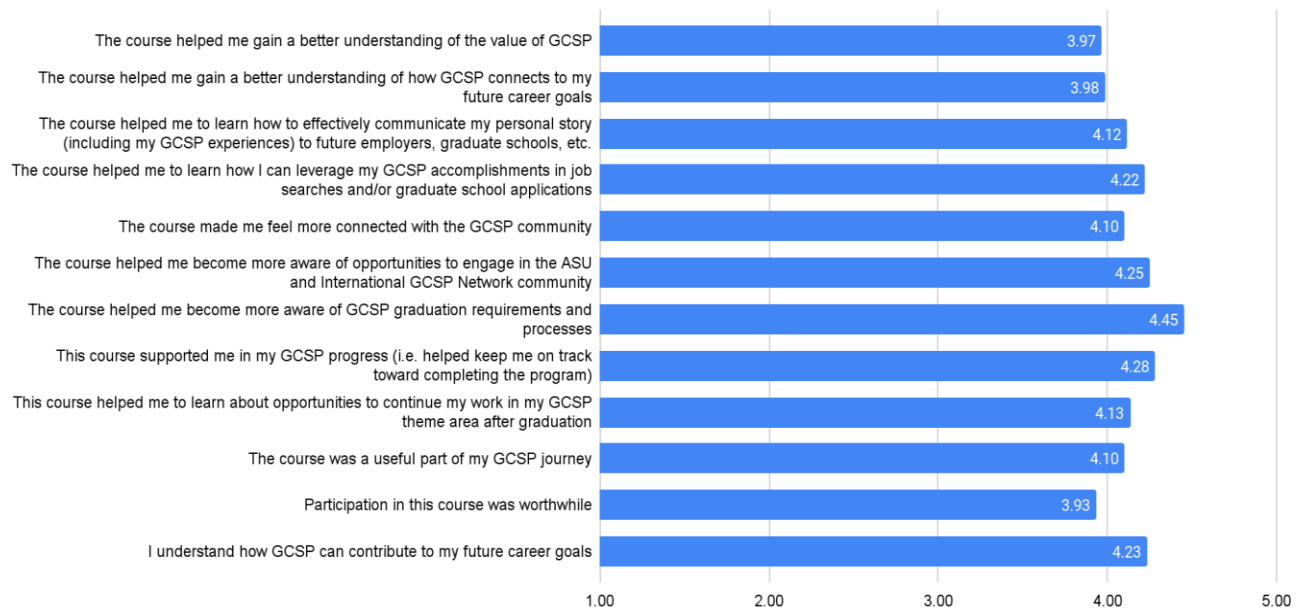


Fig. 2 Third year course meeting course objectives (n=61)

Value of the Assignments

To understand students' perceptions of the value of the required and self-select assignments in each course, the survey asked participants to rate each assignment based on how important and/or useful the assignment was to them on a Likert scale of 1-5 (1=not useful at all; 5=extremely useful). The results for the required assignments are shown in Fig. 3 and Fig. 4 for the two courses, respectively. Based on the results, both second year and third year students found the one-on-one mentorship meeting with the program faculty director to discuss their progress in the program and their revised plan to be the most useful. In these one-on-one meetings, students usually can get help in identifying possible opportunities to fulfill competency requirements, confirm their choice of courses/experiences to be confident that they align with the competency outcomes, confirm their revised plan to be confident in their ability to complete all program requirements, get clarifications on and help with the competency approval processes, and get their questions answered. Second year students also found great value in the resume assignment, perhaps because they were "forced" to have a better resume because of this assignment that may help increase their chance to secure internship opportunities and other opportunities. Similarly, third year students also found the elevator pitch assignment very useful, probably due to similar reasons. Students in both courses also found the competency submission assignment and the portfolio update assignment very useful. This is probably because both assignments help them to complete these necessary steps early on so that their final semester will become less stressful when all competency submissions need to be made and the entire portfolio needs to be completed.

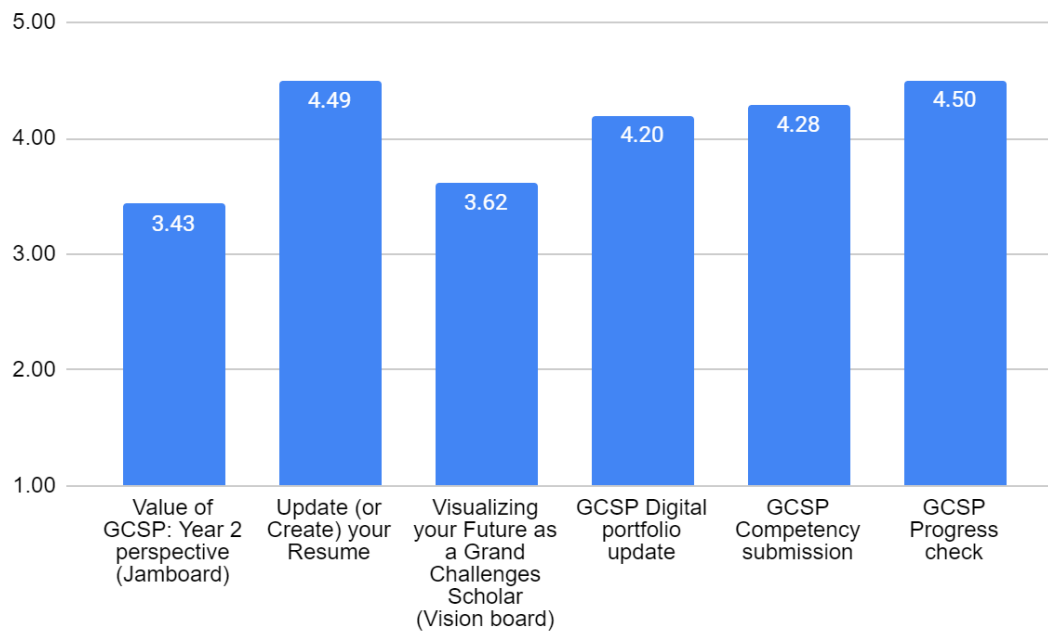


Fig. 3 Usefulness of the required assignments in the second year course (n=68)

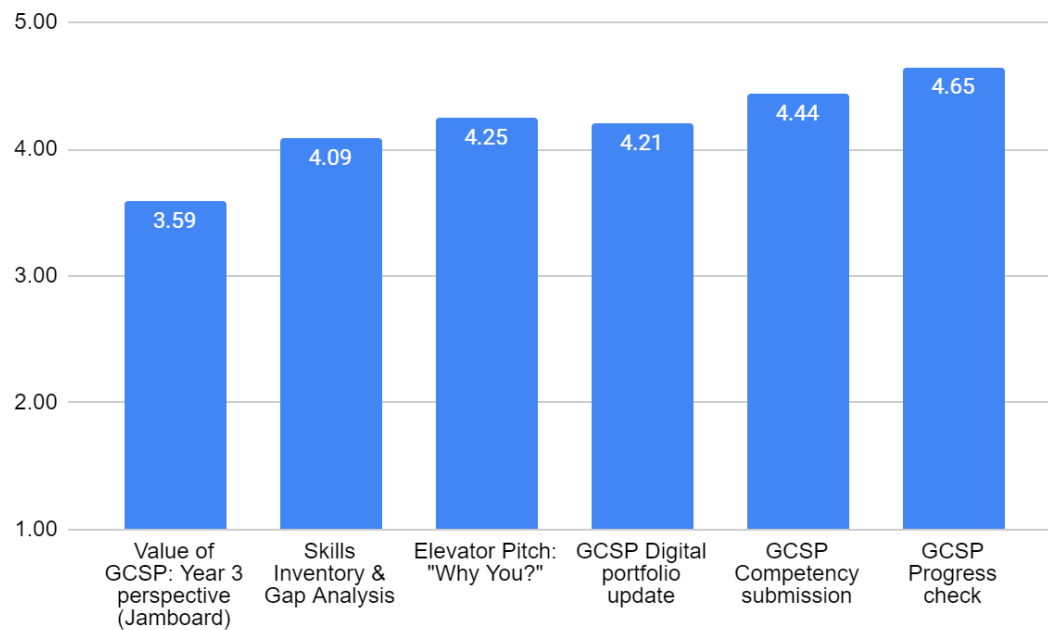


Fig. 4 Usefulness of the required assignments in the third year course (n=61)

Table 1 and Table 2 show the results of usefulness of the self-select assignments for the two courses, respectively. Since each student only chooses four of the 11 self-select assignments to complete, only those who completed a particular self-select assignment responded to the survey question about that assignment, so the number of responses collected for each of the self-select

assignments varies as indicated in the tables. In each table, the self-select assignments are listed in order based on their mean scores, from highest to lowest. Based on the results, students from both courses found the self-select assignments that they completed largely valuable. Second year students valued the opportunity to talk to a GCSP upperclassman one-on-one to learn about their experiences and receive advice the most. Third year students found the opportunity to apply for a program that contributes to their GCSP requirements and professional development in general the most useful. It is worth noting that third year students valued assignments that focus on career path or employers more compared to second year students. Students in both courses valued the opportunity to share a recent accomplishment or experience with the GCSP community less compared to other self-select assignment options. This may be because they do not directly benefit from sharing their accomplishments or experiences with the community, though other members of the GCSP community may benefit from learning about these accomplishments and experiences. Third year students also rated research seminars as less useful than second year students did, perhaps because they have already confirmed their research interests/career goals so particular research seminars may be of less interest to them. Forming a team with GCSP students to participate in an event from the third year course received the lowest overall rating but only two students provided ratings for this assignment.

Table 1. Usefulness of the self-select assignments in the second year course

Self-select assignment	Mean score	Number of responses
Interview a GCSP upperclassman	4.75	16
Attend a professional development workshop	4.58	26
Apply for a program that meets GCSP competency requirement(s)	4.52	21
Attend a research seminar	4.50	14
Form a team with GCSP students to participate in an event	4.50	6
Attend a Fulton schools career fair	4.46	26
Identify a GCSP alumna/alumnus whose career path interests you	4.36	28
Attend a GCSP event	4.33	33
Attend an employer info session	4.30	23
Share your GCSP Digital Badge(s) on LinkedIn	3.88	8

Share a recent experience/accomplishment with the GCSP community	3.80	25
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Table 2. Usefulness of the self-select assignments in the third year course

Self-select assignment	Mean score	Number of responses
Apply for a program that meets GCSP competency requirement(s)	4.81	16
Attend a Fulton schools career fair	4.62	26
Attend an employer info session	4.59	27
Attend a professional development workshop	4.50	24
Talk to a GCSP alumna/alumnus whose career path interests you	4.45	11
Meet with a younger GCSP peer	4.29	21
Attend a GCSP event	4.21	33
Share your GCSP Digital Badge(s) on LinkedIn	4.03	29
Share a recent experience/accomplishment with the GCSP community	3.85	27
Attend a research seminar	3.73	11
Form a team with GCSP students to participate in an event	3.00	2

Students' Course Experience and Suggestions for Improvement

The survey also included three open-ended questions to learn more about students' experience from the course and to collect suggestions for improvement. Insights gained from these questions are described below.

Fifty-nine second year and fifty-four third year survey participants responded to the first question *“What was most useful or impactful about your course experience?”*. Common responses from both years included the progress check meeting/talking to the faculty director about their progress, holding them accountable for submitting their competencies/updating their portfolio, staying in touch with the GCSP community, as well as creating a better resume/elevator pitch, attending the career fair, and in general pushing them to pursue professional development opportunities. Below are a few example responses:

“I liked that I got pushed to organize my remaining time at ASU so I can finish the GCSP program. It's the sort of thing I would normally procrastinate on.”

“It is easier to track my GCSP career by taking this course and it has also given me valuable insight on how I can be successful in my career.”

“The most useful aspect was having to submit certain college-career-advancing experiences for assignment grades, because it made me evaluate and put my GCSP plans into perspective.”

The same numbers of responses were collected for the second open-ended question, “*What did you like most about your course experience?*”. Similar responses were found for this question, but students also mentioned that they liked the self-paced, flexible nature of the course, such as being asynchronous online, offering options for self-select assignments, and being easy. For example, some students said:

“I liked the low coursework and approach to help keep students on track without overburdening them with assignments, and how some of the assignments were self-select so that a student would do things that would help them.”

“It was a holistic approach and helped with multiple aspects including a deeper insight into the program.”

“Easy course that kept me on track!”

Responses to the third question, “*How could we improve the course experience?*” mentioned opportunities to interact with peers in the class (such as having discussions, in-person meetings/events), making career fair event participation a required assignment due to its value, and adding more reminders about self-select assignments (since they are all due at the end of the semester), and adding more options for self-select assignments. But in general, most responses mentioned how the course was overall great. One student mentioned,

“The course is updated at its level best. I would say [it is] one of the best course[s] till now in my academic journey.”

Conclusion and Future Work

Three courses were developed and implemented at Arizona State University to support students' personalized journey and progress through a multi-year co-curricular program, the Grand Challenges Scholars Program. The two one-credit asynchronous online middle year courses were each created to include required assignments and options for self-select assignments that help

students explore their interests and opportunities to meet program requirements, connect their program-related experiences to academic and career goals, engage in professional development, receive faculty mentorship, complete necessary processes in preparation for graduation from the program, and showcase their accomplishments and experiences to potential employers. Data collected from a survey across three semesters to gauge students' perception of the value of these two courses show that both courses have been very successful at meeting their desired outcomes. Students found these self-paced asynchronous online courses easy and flexible yet valuable. They found that the courses effectively held them accountable for achieving the goals they set for themselves to be successful in the program and better prepared them for career opportunities. Possible areas for future work include creating opportunities for students to connect with their peers in the courses, adding more options for self-select assignments, and performing longitudinal studies to evaluate the role these courses play in supporting student retention in the program.

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