

GEORGIA TECH:

VERTICALLY INTEGRATED PROJECTS (VIP) PROGRAM

QUICK FACTS

Year founded: **2001**Project source: **Faculty**Duration: **Minimum 4 years**Students per year: **3,900**Interdisciplinary: **Yes**Vertical integration: **Yes**

By: Edward J. Coyle, J.B. Peatman Distinguished Professor of Electrical and Computer Engineering, Director of VIP@GT and Board Chair of the VIP Consortium, LLC.; Julia Sonnenberg-Klein, Executive Director of VIP@GT

PROGRAM SUMMARY

A VIP team in the [VIP Program at Georgia Tech](#) is a large-scale, long-term, vertically integrated multidisciplinary team of undergraduates who are embedded in the scholarly and creative projects of the team's faculty adviser(s) and graduate students. The size, continuity, disciplinary depth and multidisciplinary breadth of VIP teams enable them to make significant contributions to the adviser's project.



Student Teams. Faculty Projects. Innovating Together.

All VIP students enroll in VIP courses that exist at the sophomore through graduate levels. Each semester, sophomores earn one credit; juniors and seniors earn one or two credits; and, in many departments, participation in VIP can satisfy capstone requirements. Master's students in some departments can earn one, two or three VIP credits per semester. All registered students are graded (A through F) each semester, with grades based on:

- 1. Documentation:** This includes a student's personal log and to-do list of their activities on the team, their contributions to the team's wiki, their contributions to GitHub for software projects and other documentation required by the team's adviser(s).
- 2. Peer evaluations:** A team's adviser(s) have access to students' evaluations of each other in areas that include leadership, teamwork, progress on tasks, initiative, reliability, etc.
- 3. Contributions:** A team's adviser(s) and graduate students evaluate each student's contributions to the team's effort, as appropriate for the student's level, time on team, discipline and number of credits.

Undergraduates who have accumulated all credits that could count toward their degrees are sometimes paid by the team's adviser(s) on an hourly basis to continue on the project.

To share best practices and spread this model, Georgia Tech launched the [VIP Consortium](#) — a nonprofit that supports universities that have VIP Programs. A key element of that support is an annual meeting at which member institutions share best practices and research results for VIP. Members of the Consortium vote on the essential elements of VIP to ensure the quality of all VIP Programs, while enabling adaptation to local conditions. The meeting also includes workshops for prospective VIP sites and mentoring for new VIP sites.



Figure 1: Map showing the locations of the 40+ VIP sites in 2022 ([see the full site list](#))

RESOURCES AND ADMINISTRATIVE MODEL

AT GEORGIA TECH: The VIP Program was the first program at Georgia Tech to have courses with a university-wide subject code: “VIP.” The full set of undergraduate and graduate level VIP courses, each with the subject code of VIP, is shown in Table 1. These courses are officially housed in the university registrar’s office instead of a college or department. Each department determines how the VIP credits that their students earn count towards their degrees, which leads to many [different credit-use policies across campus](#). In general, departments first allow VIP credits to count for free-elective or research credits. Their policies then evolve to a [threshold type of policy](#) in which some fraction of, or all, VIP credits count as in-discipline electives once a minimum number of credits has been completed. In some departments, VIP credits taken after a specified minimum number can be used for capstone credit, such as senior-design in the College of Engineering or junior-design in the College of Computing.

The [VIP Program staff](#) consists of a director, executive director, assistant director for outreach and communication, assistant director for departmental and university policies, academic program manager, academic program coordinator and web application developer. The funding for the program comes through the Colleges of Engineering and Computing from the provost’s office. Staff salaries are the primary costs at ~\$450,000 per year, or ~\$115 per VIP student.

	Sophomore		Junior			Senior				Graduate			
Course #	2601	2600	3601	3602	2600	4601	4602	Cap-stone	4600	6601	6602	6603	6600
Credits	1	Pay	1	2	Pay	1	2	Varies	Pay	1	2	3	Pay
Section, team 1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1	VP1
Section, team 2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2	VP2

Table 1: Courses that make up the VIP Program at Georgia Tech. Each course number is preceded by the VIP subject code: e.g., VIP-4602. Each VIP team consists of students in the same section of each VIP course: e.g., the [Smart Stadium VIP team](#) is section VP3 of each course. The campus course management system, Canvas, allows these sections to be combined into one Canvas site, making it easy for advisers to manage their VIP teams.

Faculty in some departments at Georgia Tech receive teaching credit for their work with their VIP team if they are the primary adviser (instructor of record) for the team. They typically receive credit for one course for the year, i.e., half of a course per semester. If some students on a VIP team are completing senior design requirements within their VIP project, additional teaching credit may sometimes be given.

The average number of undergraduates on a VIP team at Georgia Tech is ~25. Research staff at Georgia Tech and at the Georgia Tech Research Institute (GTRI) can also advise VIP teams — 13 of the 99 current VIP teams are advised by research staff members of GTRI, a contract-research organization of 2,400+ people associated with Georgia Tech. Clearly, VIP has the potential to scale to the point where every faculty member who wants to have a VIP team can start one and every undergraduate who wants to be on a VIP team can find one.

.....

VIP has the potential to scale to the point where every faculty member who wants to have a VIP team can start one.

.....

BEST PRACTICES AND LESSONS LEARNED

ONGOING PROGRAM EVALUATION: A high priority of the VIP Program at Georgia Tech is the long-term evaluation of its impact on students, faculty and institutions. [Research articles](#) from Georgia Tech about the VIP program are publicly available; as are those from, and with, [other institutions](#) in the VIP Consortium. The effort at Georgia Tech, which is led by Executive Director Julie Sonnenberg-Klein, provides compelling evidence of the effectiveness of the program. The two graphs in Figure 2 show students’ development of skills in expertise-based and organizational leadership during their time on their VIP teams. It is not their academic rank when they join their team that matters; it is how many semesters they stay on their team.

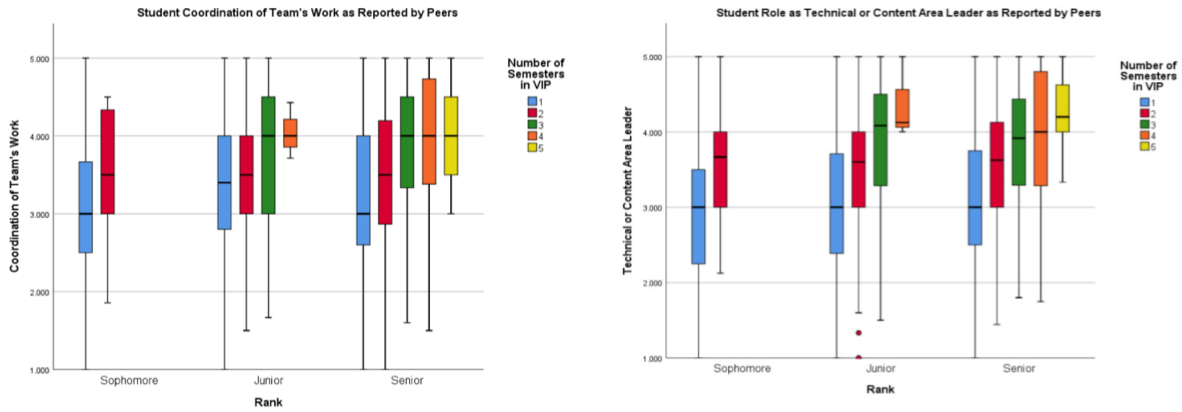


Figure 2: Students' development of expertise-based and organizational leadership skills as reported by peers. It's not the year (sophomore, junior, senior) that matters, but how many semesters they spend on their team. These results were published in the proceedings of the [2022 Frontiers in Education Conference](#) and in the [IEEE Transactions on Education](#) in 2024.

IMPORTANCE OF POLICIES ON HOW CREDITS COUNT: Whether students participate in VIP and for how many semesters they choose to participate are closely tied to whether VIP credits can be counted in meaningful ways toward their degree programs (Figure 3). The benefits of multiple semesters of participation, both in leadership development and in job placement, justify consideration of policies that incentivize multiple semesters of participation.

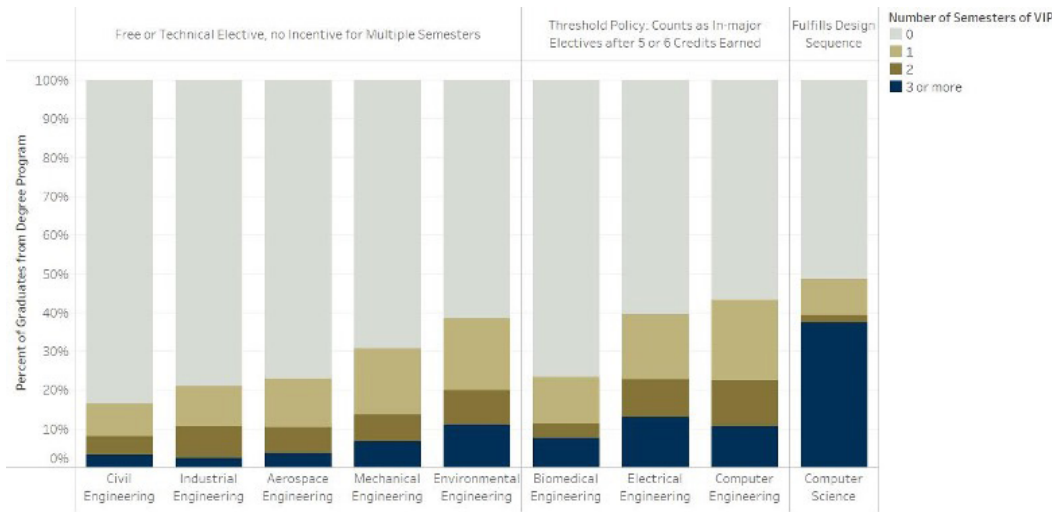


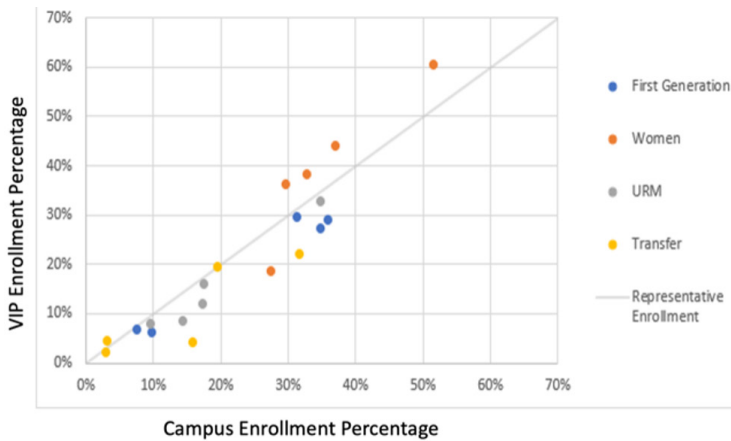
Figure 3: Student participation in VIP by major and curricular models for how VIP credits count

ENSURING EQUITABLE PARTICIPATION: VIP is a high-impact practice that increases graduation rates and achieves equitable results in employment upon graduation. Ensuring VIP is available to all students has thus been a goal of the program from its inception. This has been achieved primarily by lowering the barriers to participation:

- Teams are advertised on the VIP website so students do not have to seek out faculty to ask them if they have any projects available and if they can join.
- A student logs on to the [VIP Application System](#) after deciding which team is of most interest to them. The information students must provide is the name of the team they want to join,

their year and major, the number of credits they want to take and an explanation of why they want to join that team.

- The applications for teams are in a database that VIP staff and the adviser for each team review on a rolling first-come-first-serve basis. Permits to register for the VIP courses are issued for students that are accepted onto a team. Students returning to a team must apply again but are, almost without exception, accepted back to their team.
- Applicants for teams are **not** screened by GPAs, resumes, prerequisites or interviews, but program leaders do take account of applicants' year and major to balance the composition of the team. Prior work has shown a students' enthusiasm for the team to be the best predictor of their success.



These admissions procedures, combined with advertising and outreach to student groups and during campus orientations, have resulted in equitable participation. In recent work shown in Figure 4, enrollment data from Boise State, Georgia Tech, NYU, Purdue and Virginia Commonwealth demonstrate representational participation in VIP.

Figure 4: VIP participation rates for several groups of students at five different U.S. VIP sites demonstrate that equitable participation — normalized by enrollment percentages by discipline — can be achieved. Detailed explanations of these results have been published in the [2023 IEEE Frontiers in Education Conference](#).

ASSOCIATED WITH HIGHER JOB PLACEMENT: In an analysis of undergraduates' job placement prior to graduation, participation in three semesters of VIP was associated with approximately triple the odds of having found a job (Figure 5). These adjusted odds ratios were comparable to gains associated with having done an internship.

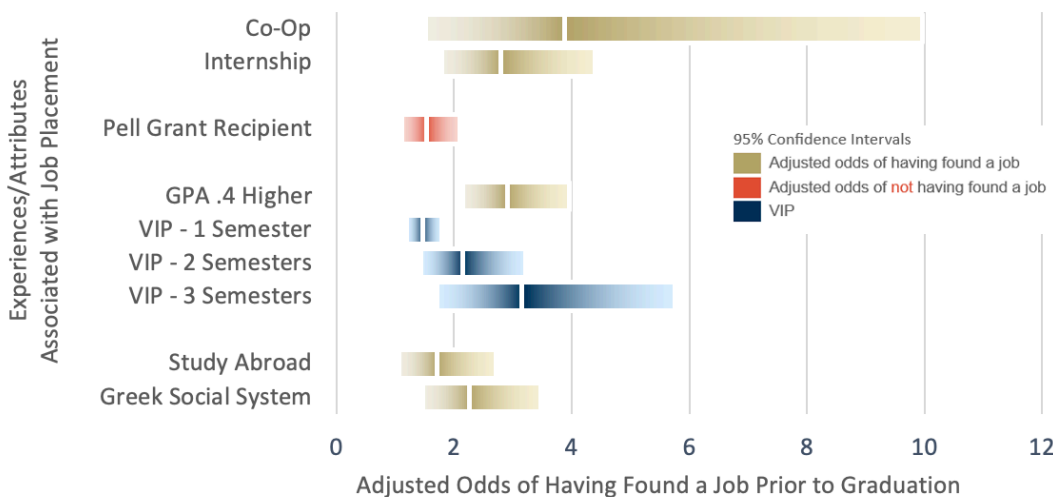


Figure 5: Programs associated with higher (or lower) job placement prior to graduation among students seeking employment. Figure based on data in <https://doi.org/10.57709/36962302>.

Supporting the findings of equity discussed above, the study also found that marginalized students participated at VIP at higher rates than in other programs associated with higher job placement (Figure 6).

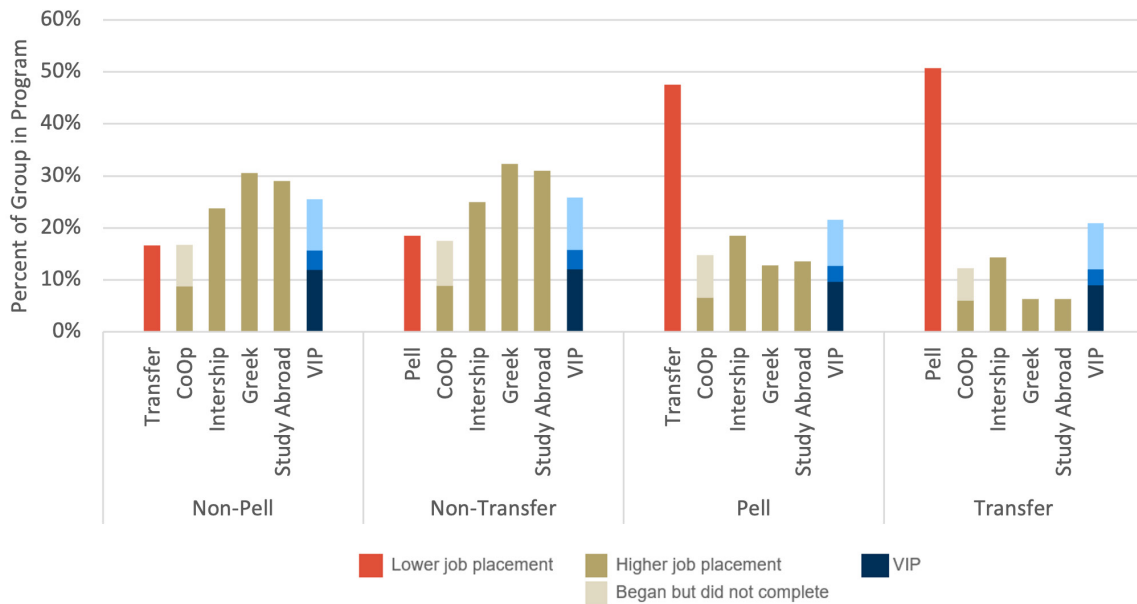


Figure 6: Student participation in programs associated with job placement by indicators of socioeconomic class. Figure based on data in <https://doi.org/10.57709/36962302>.

MULTIDISCIPLINARITY: Every VIP team at Georgia Tech is multidisciplinary and there are faculty from every college on campus that have teams. This has led us to measure the level of multidisciplinary of teams and to see if/how that is a function of team size. The Rao-Sterling Diversity Index was used, with a measure of the similarity between disciplines based on the number of cross-listed courses between each pair of disciplines. These results are discussed in a paper that has been submitted to the journal *Studies in Higher Education*.

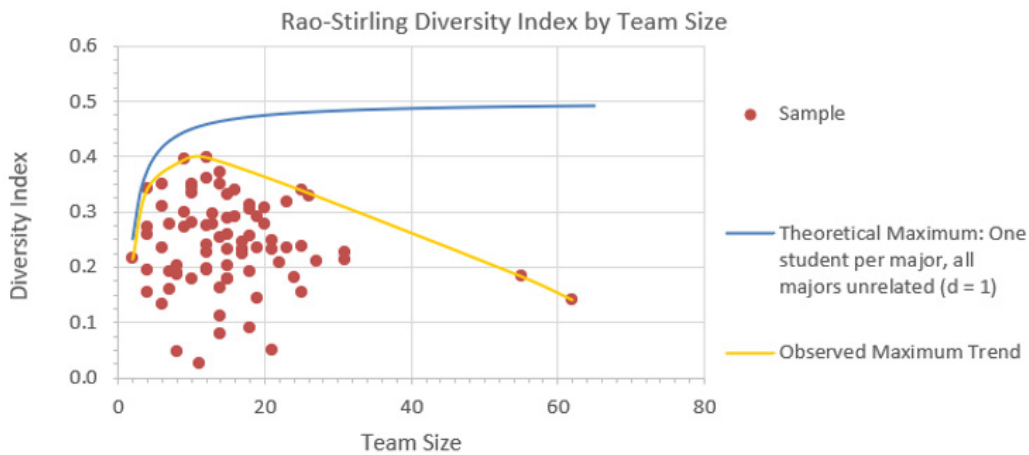


Figure 7: An entropy-like measure — the Rao-Sterling Diversity Index — of multidisciplinary of teams, as a function of teams' sizes in the VIP Program at GT in 2020

THE BENEFITS OF THE VIP CONSORTIUM: The VIP Consortium was launched with a grant from Helmsley Trust in 2014-2015. It enabled the set of VIP sites to grow from five to 18 over three years. This grant enabled Georgia Tech to launch the [Annual VIP Consortium Meeting](#), which is typically attended by the director and one or more faculty and/or students from each VIP site — there were 100 attendees this year. These meetings enable VIP sites to learn from each other, identify problems and opportunities affecting all VIP sites, plan research efforts focused on VIP, foster the development of VIP teams that span multiple VIP sites, identify funding opportunities, etc. They also provide workshops for institutions interested in VIP or in the process of launching VIP.

The collaborations fostered by these meetings resulted very quickly in the expansion of VIP beyond its traditional home in engineering disciplines to all other disciplines on campus. The examples of projects in new disciplines at one site helped ease the way for the launch of teams in those disciplines at other sites — primarily by easing the concerns of department chairs and college deans about whether the new VIP teams would be successful. There are now new VIP sites that have started up in the sciences and liberal arts as well as in engineering and computing.

To continue the benefits of the collaborations between VIP sites beyond the end of the Helmsley grant, the nonprofit [VIP Consortium](#) was launched on March 25, 2019. It supports all member VIP sites by providing documents/templates and other resources for new VIP sites, matching new VIP institutions with mentors at nearby VIP sites and continuing the annual Consortium meeting. Recently, the Consortium has seen the formation of regional hubs of VIP sites and the creation of special interest groups across VIP sites. The latter include VIP sites that have teams that share an interest, such as the UN Sustainable Development Goals, VIP in the Arts, Service-Learning, etc.

THE ROLE OF FACULTY: The fundamental reason for the success and scalability of the VIP Program at each institution is that faculty members benefit from their teams' activities. They thus have incentives to both request teams that will work with them and support those teams for the long term with good mentoring and financial support. For the latter, faculty include their VIP teams in research proposals to demonstrate the education and workforce development aspects of their proposed efforts and to secure funding for the activities of their teams.

The VIP Program at Georgia Tech does not provide any financial support to any VIP team. It has launched the VIP Industrial Affiliates program that enables industry, national labs and other organizations to support the student activities of VIP teams at the level of \$20 million a year. These funds come in without overhead and are free of deliverables and intellectual property issues. This enables organizations to work with teams over a number of years, often resulting in standard research contracts that support the graduate students that are members of the teams.

In summary, VIP is successful because both faculty and students *want* to work together on interesting projects. The VIP Program enables them to do that.

CHALLENGES AND PRIORITIES FOR THE FUTURE

The goal of each VIP Program is to scale to serve everyone on campus that would like to have, or join, a VIP team. Most VIP Programs start at the faculty, departmental or college level and take time to spread across campus. We would like to shorten this time as much as possible by providing models for campus-wide VIP programs that exist at the university level.

At the departmental level, credit use policies evolve to the point where VIP credits count as disciplinary credits. This can come with a desire by curriculum managers to vet the activities of teams, sub-teams or even students. Effective management of this effort is still being developed. Solutions might include counting some VIP credits as university core classes if a student is contributing to a project but not in a way associated with their major.

The long-term vision is VIP counting as a mix of free, core and disciplinary electives. Figure 8 depicts the overall vision for the future curriculum.

The standard curriculum is shown as a space-filling curve on the left, with first-year students entering at the bottom left and completing standard course requirement and then exiting at the top left. On the right is the long-term VIP enrollment as a thread that runs through a student's time on campus. The VIP thread provides students with the chance to learn and master skills

such as teamwork, leadership, innovation, etc. that are difficult to learn in standard course settings. It also enables them to participate in challenging projects in which they apply what they are learning in courses. Each VIP team is a community of individuals from all levels at the institution that share a common goal. The team is thus an excellent setting for effective advising and support of students.

The final challenge is to ensure the long-term success of the VIP Consortium, its annual Consortium meeting and its recruiting and support of new VIP sites around the world. The overall goal is worldwide systemic reform of higher education.

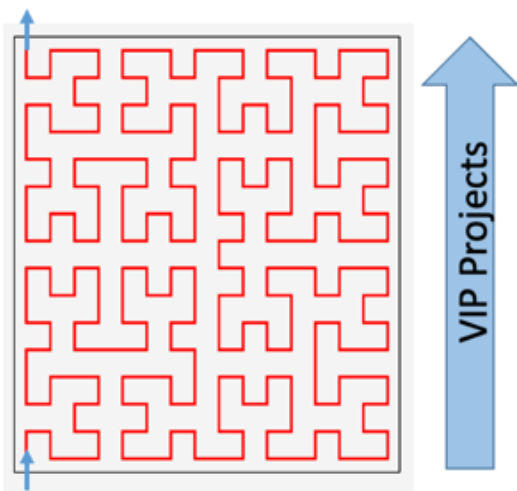


Figure 8: A depiction of the future curriculum

Georgia Tech is an AAU/R1 public university located in Atlanta, Georgia. It has an enrollment of 45,000 students (18,000 undergraduates, 27,000 graduates) and is ranked in the nation's top 10 public universities by US News and World Report.