

	Reading	Writing	Protocols	Administering	Data	Tools	Group	Lab/Research Participation
Learning/ Grades	2	1	2	1	2	0	1	0
Perception of intervention	8	6	5	4	9	6	14	7
Perception of self/field	5	4	4	3	6	6	13	6
Perception by faculty/staff	2	1	2	0	2	1	4	3
Workload	2	2	1	0	1	0	3	2
Grad School Intentions	0	0	0	0	0	0	0	1
Outcomes	2	2	2	0	4	3	5	1
Deep Feedback	7	5	5	4	7	5	11	4

Population vs Evaluation

	Learning/ Grades	Perception of intervention	Perception of self/field	Perception by faculty/staff	Workload	Grad School Intentions	Outcomes	Deep Feedback
K-12	0	1	0	0	0	0	1	0
Undergraduate	2	18	17	4	3	1	6	15
Graduate	0	5	3	1	0	0	3	2
Non CS Students	0	4	5	3	1	0	2	4
Educators	1	2	2	1	0	0	1	3
Race/Gender	1	7	8	1	1	1	1	6

Population vs Intervention

	Reading	Writing	Protocols	Administering	Data	Tools	Group	Lab/Research Participation
K-12	0	0	0	0	0	1	1	1
Undergraduate	7	4	5	4	9	6	17	8
Graduate	2	3	2	0	3	2	4	1
Non CS Students	1	1	2	0	1	4	6	3
Educators	1	2	2	1	1	0	1	1
Race/Gender	3	1	2	2	4	2	6	3

Evaluation vs Intervention								
	Reading	Writing	Protocols	Administering	Data	Tools	Group	Lab/Research Participation
Learning/ Grades	[9] [18]	[9]	[9] [18]	[9]	[9] [18]		[18]	
Perception of intervention	[10] [15] [9] [4] [12] [21] [1] [16]	[15] [9] [4] [12] [14] [16]	[10] [9] [4] [12] [16]	[10] [9] [19] [21]	[10] [11] [9] [4] [12] [19] [21] [1] [16]	[8] [25] [11] [6] [21] [16]	[10] [25] [7] [15] [11] [6] [4] [20] [12] [2] [21] [1] [22] [16]	[25] [7] [24] [4] [23] [2] [22]
Perception of self/field	[15] [9] [4] [21] [16]	[15] [9] [4] [16]	[5] [9] [4] [16]	[9] [19] [21]	[11] [9] [4] [19] [21] [16]	[8] [11] [6] [17] [21] [16]	[7] [15] [5] [11] [6] [4] [20] [17] [3] [21] [13] [22] [16]	[7] [5] [24] [4] [23] [22]
Perception by faculty/staff	[1] [16]	[16]	[5] [16]		[1] [16]	[16]	[5] [1] [22] [16]	[5] [24] [22]
Workload	[15] [4]	[15] [4]	[4]		[4]		[15] [4] [22]	[4] [22]
Grad School Intentions								[24]
Outcomes	[16] [18]	[14] [16]	[16] [18]		[11] [26] [16] [18]	[25] [11] [16]	[25] [11] [3] [16] [18]	[25]
Deep Feedback	[10] [15] [9] [4] [21] [1] [16]	[15] [9] [4] [14] [16]	[10] [5] [9] [4] [16]	[10] [9] [19] [21]	[10] [9] [4] [19] [21] [1] [16]	[8] [6] [17] [21] [16]	[10] [15] [5] [6] [4] [17] [2] [21] [1] [13] [16]	[5] [24] [4] [2]

Population vs Evaluation								
	Learning/ Grades	Perception of intervention	Perception of self/field	Perception by faculty/staff	Workload	Grad School Intentions	Outcomes	Deep Feedback
K-12		[25]					[25]	
Undergraduate	[9] [18]	[8] [10] [25] [7] [15] [11] [9] [6] [24] [4] [23] [20] [14] [2] [19] [21] [1] [22]	[8] [7] [15] [5] [11] [9] [6] [24] [4] [23] [20] [17] [3] [19] [21] [13] [22]	[5] [24] [1] [22]	[15] [4] [22]	[24]	[25] [11] [26] [14] [3] [18]	[8] [10] [15] [5] [9] [6] [24] [4] [17] [14] [2] [19] [21] [1] [13]
Graduate		[7] [11] [12] [14] [16]	[7] [11] [16]	[16]			[11] [14] [16]	[14] [16]
Non CS Students		[25] [6] [22] [16]	[5] [6] [17] [22] [16]	[5] [22] [16]	[22]		[25] [16]	[5] [6] [17] [16]
Educators	[9]	[9] [14]	[5] [9]	[5]			[14]	[5] [9] [14]
Race/Gender	[18]	[6] [24] [4] [23] [20] [19] [21]	[6] [24] [4] [23] [20] [19] [21] [13]	[24]	[4]	[24]	[18]	[6] [24] [4] [19] [21] [13]

Population vs Intervention								
	Reading	Writing	Protocols	Administering	Data	Tools	Group	Lab/Research Participation
K-12						[25]	[25]	[25]
Undergraduate	[10] [15] [9] [4] [21] [1] [18]	[15] [9] [4] [14]	[10] [5] [9] [4] [18]	[10] [9] [19] [21]	[10] [11] [9] [26] [4] [19] [21] [1] [18]	[8] [25] [11] [6] [17] [21]	[10] [25] [7] [15] [5] [11] [6] [4] [20] [17] [3] [2] [21] [1] [13] [22] [18]	[25] [7] [5] [24] [4] [23] [2] [22]
Graduate	[12] [16]	[12] [14] [16]	[12] [16]		[11] [12] [16]	[11] [16]	[7] [11] [12] [16]	[7]
Non CS Students	[16]	[16]	[5] [16]		[16]	[25] [6] [17] [16]	[25] [5] [6] [17] [22] [16]	[25] [5] [22]
Educators	[9]	[9] [14]	[5] [9]	[9]	[9]		[5]	[5]
Race/Gender	[4] [21] [18]	[4]	[4] [18]	[19] [21]	[4] [19] [21] [18]	[6] [21]	[6] [4] [20] [21] [13] [18]	[24] [4] [23]

- [1] Cecilia O. Alm, Reynold Bailey, and Hannah Miller. 2022. Remote Early Research Experiences for Undergraduate Students in Computing. In *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education - Volume 1 (SIGCSE 2022)*. Association for Computing Machinery, New York, NY, USA, 4349. <https://doi.org/10.1145/3478431.3499283>
- [2] Christine Alvarado, Alistair Gray, Diba Mirza, and Madeline Tjoa. 2021. The Role of Mentoring in a Dual-Mentored Scalable CS Research Program. In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21)*. Association for Computing Machinery, New York, NY, USA, 945951. <https://doi.org/10.1145/3408877.3432364>
- [3] Christine Alvarado, Sergio Villazon, and Burcin Tamer. 2019. Evaluating a Scalable Program for Undergraduate CS Research. In *Proceedings of the 2019 ACM Conference on International Computing Education Research (ICER '19)*. Association for Computing Machinery, New York, NY, USA, 269277. <https://doi.org/10.1145/3291279.3339406>
- [4] Michael Barrow, Shelby Thomas, and Christine Alvarado. 2016. ERSP: A Structured CS Research Program for Early-College Students. In *Proceedings of the 2016 ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE '16)*. Association for Computing Machinery, New York, NY, USA, 148153. <https://doi.org/10.1145/2899415.2899436>
- [5] Bethany Bowling, Heather Bullen, Maureen Doyle, and John Filaseta. 2013. Retention of STEM majors using early undergraduate research experiences. In *Proceeding of the 44th ACM Technical Symposium on Computer Science Education (SIGCSE '13)*. Association for Computing Machinery, New York, NY, USA, 171176. <https://doi.org/10.1145/2445196.2445249>
- [6] Jennifer Burg, V. Paúl Pauca, William Turkett, Errin Fulp, Samuel S. Cho, Peter Santago, Daniel Cañas, and H. Donald Gage. 2015. Engaging Non-Traditional Students in Computer Science through Socially-Inspired Learning and Sustained Mentoring. In *Proceedings of the 46th ACM Technical Symposium on Computer Science Education (SIGCSE '15)*. Association for Computing Machinery, New York, NY, USA, 639644. <https://doi.org/10.1145/2676723.2677266>
- [7] Yonina Cooper, M. Bernardine Dias, Ermine A. Teves, Sarah Belousov, and M. Freddie Freddie Dias. 2011. Enhancing participation and education in CS through guided research projects in underserved communities. In *Proceedings of the 42nd ACM Technical Symposium on Computer Science Education (SIGCSE '11)*. Association for Computing Machinery, New York, NY, USA, 577582. <https://doi.org/10.1145/1953163.1953324>
- [8] Teresa Dahlberg, Tiffany Barnes, Audrey Rorrer, Eve Powell, and Lauren Cairco. 2008. Improving retention and graduate recruitment through immersive research experiences for undergraduates. In *Proceedings of the 39th SIGCSE Technical Symposium on Computer Science Education (SIGCSE '08)*. Association for Computing Machinery, New York, NY, USA, 466470. <https://doi.org/10.1145/1352135.1352293>
- [9] Sonal Dekhane and Richard Price. 2014. Course-embedded research in software development courses. In *Proceedings of the 45th ACM Technical Symposium on Computer Science Education (SIGCSE '14)*. Association for Computing Machinery, New York, NY, USA, 4548. <https://doi.org/10.1145/2538862.2538927>
- [10] Ali Erkan, Sam Newmark, and Nicolas Ommen. 2009. Exposure to research through replication of research: a case in complex networks. In *Proceedings of the 14th Annual ACM SIGCSE Conference on Innovation and Technology in Computer Science Education (ITiCSE '09)*. Association for Computing Machinery, New York, NY, USA, 114118. <https://doi.org/10.1145/1562877.1562916>
- [11] Maria Gorlatova, John Sarik, Peter Kinget, Ioannis Kymissis, and Gil Zussman. 2013. Project-based learning within a large-scale interdisciplinary research effort. In *Proceedings of the 18th ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE '13)*. Association for Computing Machinery, New York, NY, USA, 207212. <https://doi.org/10.1145/2462476.2465588>
- [12] Thanos Hatzia Apostolou, Dimitris Dranidis, Anna Sotiriadou, Petros Kefalas, and Ioannis Nikolakopoulos. 2018. An authentic student research experience: fostering research skills and boosting the employability profile of students. In *Proceedings of the 23rd Annual ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE 2018)*. Association for Computing Machinery, New York, NY, USA, 254259. <https://doi.org/10.1145/3197091.3197131>
- [13] Katherine Izhikevich, Kyeling Ong, and Christine Alvarado. 2022. Exploring Group Dynamics in a Group-Structured Computing Undergraduate Research Experience. In *Proceedings of the 2022 ACM Conference on International Computing Education Research - Volume 1 (ICER '22)*. Association for Computing Machinery, New York, NY, USA, 135148. <https://doi.org/10.1145/3501385.3543959>
- [14] Ben Jelen, Julia Dunbar, Susan Monsey, Olivia K. Richards, and Katie A. Siek. 2019. Utilizing the Affinity Research Group Model in a Summer Research Experience for Undergraduates Program. In *Proceedings of the 50th ACM Technical Symposium on Computer Science Education (SIGCSE '19)*. Association for Computing Machinery, New York, NY, USA, 990996. <https://doi.org/10.1145/3287324.3287501>
- [15] Herman Koppelman, Betsy van Dijk, and Gerrit van der Hoeven. 2011. Undergraduate research: a case study. In *Proceedings of the 16th Annual Joint Conference on Innovation and Technology in Computer Science Education (ITiCSE '11)*. Association for Computing Machinery, New York, NY, USA, 288292. <https://doi.org/10.1145/1999747.1999828>
- [16] Stephanie J. Lunn, Máira Marques Samary, and Alan Peterfreund. 2023. Research Experiences for Graduate Students (REGS): The Evolution of Computing Education Projects and Creation of a Virtual Community. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 1 (SIGCSE 2023)*. Association for Computing Machinery, New York, NY, USA, 701707. <https://doi.org/10.1145/3545945.3569858>
- [17] Mark Meysenburg, Tessa Durham Brooks, Raychelle Burks, Erin Doyle, and Timothy Frey. 2018. DIVAS: Outreach to the Natural Sciences through Image Processing. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18)*. Association for Computing Machinery, New York, NY, USA, 777782. <https://doi.org/10.1145/3159450.3159537>
- [18] Kamen Redfield, Sukham Sidhu, Zackary Glazewski, Cynthia Lee, Diba Mirza, and Christine Alvarado. 2024. A Longitudinal Study of the Relationship Between Early Undergraduate Research and Academic Outcomes in Computer Science. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1 (SIGCSE 2024)*. Association for Computing Machinery, New York, NY, USA, 11191125. <https://doi.org/10.1145/3626252.3630765>
- [19] Audrey Rorrer, Breana Spencer, Sloan Davis, Sepi Hejazi Moghadam, Deborah Holmes, and Cori Grainger. 2021. Understanding Immersive Research Experiences that Build Community, Equity, and Inclusion. In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21)*. Association for Computing Machinery, New York, NY, USA, 149155. <https://doi.org/10.1145/3408877.3432523>
- [20] Audrey Smith Rorrer, Joseph Allen, and Huifang Zuo. 2018. A National Study of Undergraduate Research Experiences in Computing: Implications for Culturally Relevant Pedagogy. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18)*. Association for Computing Machinery, New York, NY, USA, 604609. <https://doi.org/10.1145/3159450.3159510>
- [21] Monique Ross, Elizabeth Litzler, and Jake Lopez. 2021. Meeting Students Where they Are: A Virtual Computer Science Education Research (CSER) Experience for Undergraduates (REU). In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21)*. Association for Computing Machinery, New York, NY, USA, 309314. <https://doi.org/10.1145/3408877.3432547>
- [22] Rhea Sharma, Atira Nair, Ana Guo, Dustin Palea, and David T. Lee. 2022. Its usually not worth the effort unless you get really lucky: Barriers to Undergraduate Research Experiences from the Perspective of Computing Faculty. In *Proceedings of the 2022 ACM Conference on International Computing Education Research - Volume 1 (ICER '22)*. Association for Computing Machinery, New York, NY, USA, 149163. <https://doi.org/10.1145/3501385.3543976>

- [23] Jane G. Stout, N. Burçin Tamer, and Christine J. Alvarado. 2018. Formal Research Experiences for First Year Students: A Key to Greater Diversity in Computing?. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18)*. Association for Computing Machinery, New York, NY, USA, 693698. <https://doi.org/10.1145/3159450.3159472>
- [24] Burçin Tamer and Jane G. Stout. 2016. Understanding How Research Experiences for Undergraduate Students May Foster Diversity in the Professorate. In *Proceedings of the 47th ACM Technical Symposium on Computing Science Education (SIGCSE '16)*. Association for Computing Machinery, New York, NY, USA, 114119. <https://doi.org/10.1145/2839509.2844573>
- [25] Rahman Tashakkori, Barry L. Kurtz, Dolores A. Parks, James B. Fenwick, and Alice A. McRae. 2011. Early participation of CS students in research. In *Proceedings of the 42nd ACM Technical Symposium on Computer Science Education (SIGCSE '11)*. Association for Computing Machinery, New York, NY, USA, 6368. <https://doi.org/10.1145/1953163.1953185>
- [26] Jerod Weinman, David Jensen, and David Lopatto. 2015. Teaching Computing as Science in a Research Experience. In *Proceedings of the 46th ACM Technical Symposium on Computer Science Education (SIGCSE '15)*. Association for Computing Machinery, New York, NY, USA, 2429. <https://doi.org/10.1145/2676723.2677231>