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# Geoffrey L. Herman

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## Qualifications

### Faculty Positions

- Severns Teaching Associate Professor in the Department of Computer Science Aug. 2021 – present
- Teaching Associate Professor in the Department of Computer Science Aug. 2019 – present
- Teaching Assistant Professor in the Department of Computer Science Aug. 2016 – Aug. 2019
- Research Assistant Professor in the Department of Curriculum and Instruction Oct. 2014 – present
- Visiting Assistant Professor with the Illinois Foundry for Innovation in Engineering Education, University of Illinois at Urbana-Champaign. Aug. 2012 – Aug. 2016

### Research

- Postdoctoral Researcher in the School of Engineering Education, Purdue University. Aug. 2011 – July 2012
- Postdoctoral Researcher with the Illinois Foundry for Innovation in Engineering Education, University of Illinois at Urbana-Champaign. May 2011 – July 2012

### Consulting

- Engineering Education Consultant with Quality Evaluation Designs. Oct. 2011 – Dec. 2012

### Other Teaching Experience and Teacher Training

- Course Instructor, Department of Electrical and Computer Engineering University of Illinois at Urbana-Champaign SU 2008, SU 2010 Aug. 2012 – Dec. 2014
- Affiliate with the Center for Teaching Excellence Dec. 2009 – May 2011

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## Education

### University of Illinois at Urbana-Champaign

- PhD in Electrical and Computer Engineering May 2011  
Dissertation title: The Development of a Digital Logic Concept Inventory  
Dissertation advisers: Michael C. Loui and Craig Zilles
- MS in Electrical and Computer Engineering Dec. 2007
- BS in Electrical Engineering May 2005

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## Research Interests

Closing the research-to-practice gap in education, sustainable education innovation at scale, sparking and sustaining education innovation, conceptual change and misconceptions, and assessing student learning.

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## Research Fellowships and Awards

- ACM ICER 2021 Honorable Mention Award 2021
- ACM SIGCSE best paper in the first 50 years of SIGCSE 2019
- ASEE IL/IN best poster award 2018
- IEEE Transactions in Education, Finalist for Best Paper of the Year 2012
- ASEE Educational Research & Methods Division Apprentice Faculty Grant 2011
- IEEE Signal Processing Education Workshop 2011 Best Student Paper Award 2011
- Mavis Future Faculty program fellow: co-founded program, mentored first year fellows. 2010-2011
- E.A. Reid Fellowship for students pursuing an academic career in engineering. 2009
- Mavis Memorial Fund Scholarship for students planning to become engineering teachers. 2008

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## Students Advised

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### Prior Postdoctoral Research Associates

- Kelly Cross
  - Current Position – Assistant Professor, University of New Mexico
- Julia Thompson
  - Current Position – Assistant Professor, University of San Francisco

### Current Doctoral Students

- Suleman Mahmood, Department of Computer Science
- Morgan Fong, Department of Computer Science
- Seth Poulsen, Department of Computer Science
- Liia Butler, Department of Computer Science
- Hongxuan Chen, Department of Computer Science

### Prior Doctoral Students

- K. F. Trenshaw, PhD 2014, Department of Chemical and Biological Engineering,
  - Dissertation: Improving motivation and engagement in core engineering courses with student teams.
  - Current Position: Educational Development Specialist at the University of Rochester's Center for Excellence in Teaching and Learning
- Brian Faulkner, PhD 2018, Department of Electrical and Computer Engineering
  - Dissertation: Studying the implementation of an integrated engineering mathematics curriculum.
  - Current Position: Assistant Professor, Milwaukee School of Engineering
- Nicole Johnson-Glauch, PhD 2018, Department of Materials Science and Engineering,
  - Dissertation: Studying students conceptual understanding of the mechanical properties of materials in the context of computation.
  - Current Position: Lecturer, California Polytechnic State University San Luis Obispo

### Prior Masters Students

- Suneer Angra, M. S. 2021, Department of Computer Science
- Christiaan Hazlett, M.S. 2020, Department of Computer Science
- Spencer Offenberger, M.S. 2019, Department of Electrical and Computer Engineering
- Brian Faulkner, M.S. 2016, Department of Electrical and Computer Engineering

### Current Undergraduate Students

- Yucheng Jiang, Department of Computer Science
- Yueqi Jiang, Department of Computer Science
- Sophia Yang, Department of Computer Science
- Cale Wolf, Department of Computer Science
- Renzo Ledesma, Department of Computer Science
- Matthew Tang, Department of Computer Science

### Prior Undergraduate Students

- Hongxuan Chen, Department of Computer Science
- Omar Khan, Department of Computer Science
- Jason Xia, Department of Computer Science
- Mingjie Zhao, Department of Computer Science
- Danielle Plecki, Department of Computer Science
- Ish Shah, Department of Computer Science
- Kavya Varghese, Department of Computer Science
- Daniel Paez, Department of Computer Science
- David Levering, Department of Computer Science
- Joseph Handzik, Department of Electrical and Computer Engineering
- Pallav Pathak, Department of Electrical and Computer Engineering

- Ajay Jain, Department of Computer Science
- Tamara Nelson-Fromm, Department of Computer Science

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## Teaching Interests

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First- and second-year computer science and engineering courses, digital logic design, computer organization, introductory programming, analog signal processing, digital signal processing, music/speech signal processing, cognition and science/engineering learning, educational research methodologies, assessment.

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## Teaching Experience

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| Learning and Computer Science   | Spring 2019  |
| <ul style="list-style-type: none"> <li>• Developed a graduate-level project-based course engaging students in theories about how people learn and the implications those theories have on how we teach computer science.</li> </ul>   |  |
| Learning and Computer Science   | Spring 2018  |
| <ul style="list-style-type: none"> <li>• Developed a project-based course engaging students in theories about how people learn and the implications those theories have on how we teach computer science.</li> </ul>  |  |
| Online Learning Systems   | Fall 2017  |
| <ul style="list-style-type: none"> <li>• Developed a project-based course to teach students about how to use online assessments to improve student learning and to develop online learning platforms.</li> </ul>  |  |
| Computer Architecture   | Fall 2016, Spring 2017,<br>Fall 2017, Spring 2018,<br>Fall 2018, Spring 2019,<br>Fall 2019, Spring 2020,<br>Fall 2020, Spring 2021 |
| <ul style="list-style-type: none"> <li>• Organized content around the core concepts of state, data, control, and indirection</li> <li>• Created a suite of video microlectures to support flipping the classroom</li> <li>• Flipped the classroom to use more collaborative learning and peer instruction</li> <li>• Developed honor's section for students to explore programming in ARM assembly on a Raspberry Pi</li> </ul>   |  |
| Survey of Engineering Education Research  | Spring 2015  |
| <ul style="list-style-type: none"> <li>• Developed a graduate-level course to provide an overview of engineering education research to both engineering and education students.</li> </ul>  |  |
| Introduction to Computer Engineering  | Summer 2008, Fall 2012,<br>Spring 2013, Fall 2013,<br>Spring 2014  |
| <ul style="list-style-type: none"> <li>• Developed video lectures and flipped lectures with the use of classroom response systems.</li> <li>• Designed a new Freshman-level computer engineering course that integrates instruction of hardware and software in computing contexts.</li> <li>• Designed laboratory assignments and collaborative, context-rich discussion section exercises.</li> <li>• Designed assessment procedures for the effectiveness of the new course.</li> <li>• Trained teaching assistants and undergraduate peer mentors.</li> </ul> |  |
| Digital Signal Processing   | Summer 2010  |
| <ul style="list-style-type: none"> <li>• Piloted a new blended learning environment using online lectures for the course.</li> <li>• Designed Matlab programming exercises</li> </ul>   |  |

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## Teaching Awards

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| • IEEE Education Society Mac Van Valkenburg Early Career Teaching Award | Fall 2020   |
| • List of Teachers Ranked as Excellent, CS 233                          | Spring 2021 |
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- List of Teachers Ranked as Excellent, CS 233 Spring 2020
  - List of Teachers Ranked as Excellent, CS 233 Fall 2019
  - List of Teachers Ranked as Excellent, CS 598GH Fall 2019
  - List of Teachers Ranked as Excellent, CS 233 Spring 2019
  - List of Teachers Ranked as Excellent CS 498GH Spring 2018
  - List of Teachers Ranked as Excellent, ECE 290 Spring 2007
  - List of Teachers Ranked as Excellent, ECE 385 Spring 2006
  - List of Teachers Ranked as Excellent, ECE 110 Fall 2005
  - Olesen Award for Excellence in Undergraduate Teaching for the Department of Electrical and Computer Engineering 2007

## Educational Innovations

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- Co-designer and implementer of the Strategic Instructional Innovations Program, which has provided faculty development in teaching to over 200 STEM faculty from over 20 departments, reforming over 60 courses and impacting over 17,000 students each year.
- Redesigned the introductory Computer Engineering curriculum, helping to propose and implement two new courses: ECE 120 (Introduction to Computing) and ECE 220 (Computer Systems & Programming). These teach students how to program by first teaching them how computers are built. Created a suite of microlecture videos to supplement in-class instruction.
- Redesigned ECE 110 (Introduction to Electronics), helped the instructional staff redesign the course to have a tighter focus and give students more choices to explore select topics more deeply. Redesigned the course's online resources and designed collaborative learning discussion sections that help promote the retention of women and underrepresented minorities in the major.
- Proposed and developed a project-based learning course (CS 498OL) to teach students about how to design and implement online assessment tools.
- Proposed and developed an undergraduate research and projects course (CS 498GH) to teach students about the principles of how students learn computing and programming
- Created a suite of microlecture videos and flipped Computer Architecture (CS 233) to create more time for student interactions during class. Flipping the course closed the gender gap in student performance.
- Guided a team of undergraduate researchers in the creation of an online cache visualization tool that lets students submit any C code they wish to write and see how that code executes on a cache that they define.
- Created a framework for administering multiple-part exam questions about complex engineering systems that still allows for machine grading that fairly awards partial credit.
- Created methods for procedurally generating assembly code that teaches students how different types of code perform on pipelined architectures.
- Consulted on the redesign of a 5-course design sequence in Mechanical Engineering, the redesign of the Bioengineering curriculum, the design of virtual reality simulations to teach students about electro-magnetic fields, the design of sketching software to teach students about water pathways, the redesign of introductory biology courses to use more active learning, and the redesign of chemistry courses to use more active learning.

## Publications

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### Book chapters

Streveler, R., Brown, S., Herman, G. L., & Montfort, D. (2014). Chapter 5: Conceptual change and misconceptions in engineering education: Curriculum, measurement, and theory-focused approaches, *Cambridge Handbook of Engineering Education Research*. Eds. A. Johri and B. Olds. Cambridge University Press, 83-102. ISBN: 9781107014107

Rosu, L., Barrett, B., Wilcox, B., Herman, G., Price, R. & Destefano, L. (2014). Engineering Professors who are Re-engineering Their Courses: the iFoundry perspective. In Burton, A. & Winkelmes, M.A. (Eds) Talking about Teaching on the Prairie. University of Illinois Press, Champaign, IL, USA. ISBN-13: 978-0252080234

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### Peer-reviewed journal articles

- Poulsen, S., Herman, G. L., Peterson, P. A. H., Golaszewski, E., Gorti, Akshita, Oliva, L., Scheponik, T., Sherman, A. T. (2021). Psychometric evaluation of the cybersecurity concept inventory, *ACM Transactions on Computing Education*.
- Cross, K. J., Mamaril, N., Johnson-Glauch, N., & Herman, G. (2021). Building Cultures of Collaboration That Promote Instructional Change. *Studies in Engineering Education*, 2(2), pp. 1–18.
- Katz, J. H., Herman, G., Johnson, M. A., Loewenstein, J. (2021). Cultivating not gatekeeping: A key leadership role in the creative process. *BMJ Leader*, 5(1), pp. 9-13.
- Johnson-Glauch, N. & Herman, G. L. (2020). How engineering students use domain knowledge when problem solving using different visual representations. *Journal of Engineering Education*, 109(3), 443-469. <https://doi.org/10.1002/jee.20348>
- Faulkner, B., Johnson-Glauch, N., Choi, D., & Herman, G. L. (2020). Where does the calculus go in engineering coursework? *Journal of Engineering Education*, 109(3), 402-423. <https://doi.org/10.1002/jee.20344>
- Morphew, J., Silva, M., Herman, G. L., West, M. (2019). Frequent mastery testing with second-chance exams leads to enhanced student learning in undergraduate STEM. *Applied Cognitive Psychology*. <https://doi.org/10.1002/acp.3605>.
- Sherman, A. T., Oliva, L., Golaszewski, E., Phatak, D., Scheponik, T., Herman, G. L., Choi, D. S., Offenberger, S. E., Peterson, P., Dykstra, J., Bard, G. V., Chattopadhyay, Sharevski, F., Verma, R., Vrecenar, R. (2019). The CATS hackathon: Creating and refining test items for cybersecurity concept inventories, *IEEE Security & Privacy*, 17(6), 77 - 83. <https://doi.org/10.1109/MSEC.2019.2929812>.
- Johnson-Glauch, N. & Herman, G. L. (2019). Engineering representations guide student problem solving in Statics, *Journal of Engineering Education*, 108(2), 220-247. <https://doi.org/10.1002/jee.20258>
- Faulkner, B., Earl, K., & Herman G. L. (2019). Mathematical maturity for engineering students, *International Journal of Research in Undergraduate Mathematics Education*, 5(1), 97-128. <https://doi.org/10.1007/s40753-019-00083-8>
- Tomkin, J. H., Beilstein, S. O., Morphew, J. W., Herman, G. L. (2019). Evidence that Communities of Practice are associated with active learning in large STEM lectures, *International Journal of STEM Education*, 6(1), 1-15. <https://doi.org/10.1186/s40594-018-0154-z>
- Mestre, J.P., Herman, G.L., Tomkin, J.H., & West, M. (2019). Keep your friends close and your colleagues nearby: The hidden ties that improve STEM education. *Change: The Magazine of Higher Learning*, 51 (#1), 42-49. <https://doi.org/10.1080/00091383.2019.1547081>
- Ma, S., Herman, G. L., West, M., Tomkin, J., & Mestre, J. (2019). Studying STEM faculty communities of practice through social network analysis, *Journal of Higher Education*, 90(5), 773-799. DOI: <https://doi.org/10.1080/00221546.2018.1557100>
- Ma, S., Herman, G. L., West, M., Tomkin, J., & Mestre, J. (2018). Spreading teaching innovations in a social network: The bridging role of mentors, *Journal of STEM Education Research*, 1(1-2), 60-84. DOI: <https://doi.org/10.1007/s41979-018-0002-6>
- Tomkin, J., West, M., Herman. & G. L. (2018). An improved grade point average, with applications to CS undergraduate education analytics, *ACM Transactions on Computing Education*, 18(4), Article 17, 16 pages. DOI: <https://doi.org/10.1145/3157086>

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Herman, G. L., Green, J. C., Hahn, L., Mestre, J., Tomkin, J., & West, M. (2018). Implementing evidence-based instructional practices across STEM departments at a large research university, *Journal of College Science Teaching*, 47(6), 32-38.

Thompson, J., Herman, G. L., Scheponik, T., Golaszewski, E., Sherman, A. T., DeLatte, D., Phatak, D., Patsourakos, K., & Oliva, L. (2018). Student misconceptions about cybersecurity concepts: Analysis of think-aloud interviews, *Journal of Cybersecurity Education, Research, and Practice*, 2018(1), Article 5. <https://digitalcommons.kennesaw.edu/jcerp/vol2018/iss1/5>

Mestre, J. P., Cheville, A., & Herman, G. L. (2018). Promoting DBER-Cognitive Psychology Collaborations in STEM Education. *Journal of Engineering Education*, 107(1), 1-6. DOI: [10.1002/jee.20188](https://doi.org/10.1002/jee.20188)

Parekh, G., DeLatte, D., Herman, G. L., Oliva, L., Scheponik, T., & Sherman, A. T. (2018). Identifying core concepts of cybersecurity: Results of two Delphi processes. *IEEE Transactions on Education*, 61(1), 11-20. DOI: [10.1109/TE.2017.2715174](https://doi.org/10.1109/TE.2017.2715174)

Choi, D. S., Earl, K., Cross, K., & Herman, G. L. (2018). The challenge of fidelity of outcomes: Insights from an effectiveness study of a low-cost, Intrinsic Motivation Course Conversion. *International Journal of Engineering Education*, 34(1), 141-154.

Sherman, A. T., DeLatte, D., Herman, G. L., Neary, M., Oliva, L., Dhananjay, P., Scheponik, T., & Thompson, J. (2018). Cybersecurity: Exploring Core Concepts through Six Scenarios, *Cryptologia*, 42(4), 337-377. DOI: [10.1080/01611194.2017.1362063](https://doi.org/10.1080/01611194.2017.1362063)

Herman, G. L., Goldberg, D. E., Trenshaw, K. F., Somerville, M., & Stolk, J. (2017). The intrinsic-motivation course design method. *International Journal of Engineering Education*, 33(2A), 558-574.

Herman, G. L. & Loewenstein, J. (2017). Evidence-based change practices, *Journal of Engineering Education*, 106(1), 1-10. DOI: [10.1002/jee.20152](https://doi.org/10.1002/jee.20152)

Mansbach, R., Ferguson, A., Killian, K., Krogstadt, J., Leal, C., Schleife, A., Trinkle, D., West, M., & Herman, G. L. (2016). Reforming an undergraduate materials science curriculum with computational modules. *Journal of Materials Education*, 38(3-4), 161-174.

Trenshaw, K. F., Revelo, R. A., Earl, K. A., & Herman, G. L. (2016). Using Self Determination Theory principles to promote engineering students' intrinsic motivation to learn. *International Journal of Engineering Education*, 32(3A), 1194-1207.

Montfort, D. B., Herman, G. L., Brown S. A., Matusovich, H. M., & Streveler, R. A., Adesope, O. (2015). Patterns of student conceptual understanding across engineering content areas. *International Journal of Engineering Education*, 31(6A), 1587-1604.

Herman, G. L., Zilles, C., & Loui, M. C. (2014). A psychometric evaluation of the Digital Logic Concept Inventory. *Computer Science Education*, 24(4), 277-303. DOI: [10.1080/08993408.2014.970781](https://doi.org/10.1080/08993408.2014.970781)

Ogunfunmi, T., Herman, G. L., & Rahman, M. (2014). On the use of concept inventories for circuits and systems courses. *IEEE Circuits and Systems Magazine*, 14(3), 12-26. DOI: [10.1109/MCAS.2014.2333614](https://doi.org/10.1109/MCAS.2014.2333614)

Trenshaw, K. F., Green, K. A., Goldberg, D. E., & Herman, G. L. (2014). Fostering motivation as a class objective in a large engineering class for second-year students: A narrative approach. *International Journal of Engineering Education*, 30(4), 837-847.

Herman, G. L. (2012). Designing contributing student pedagogies to promote students' intrinsic motivation to learn, *Computer Science Education*, 22(4), 369-388. DOI: [10.1080/08993408.2012.727711](https://doi.org/10.1080/08993408.2012.727711).



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Herman, G. L., Loui, M. C., Kaczmarczyk, L., & Zilles, C. (2012). Describing the what and why of students' difficulties in Boolean logic. *ACM Transactions on Computing Education*, 12(1), 3:1-28. DOI: [10.1145/2133797.2133800](https://doi.org/10.1145/2133797.2133800)

Herman, G. L., Zilles, C., & Loui, M. C. (2012). Flip-flops in students' conceptions of state. *IEEE Transactions on Education*, 55 (1), 88–98. DOI: [10.1109/TE.2011.2140372](https://doi.org/10.1109/TE.2011.2140372)

Herman, G. L., Loui, M. C., & Zilles, C. (2011). Students' misconceptions about medium-scale integrated circuits. *IEEE Transactions on Education*, 54 (4), 637-645. DOI: [10.1109/TE.2011.2104361](https://doi.org/10.1109/TE.2011.2104361)

Herman, G. L., Zilles, C., & Loui, M. C. (2011). How do students misunderstand number representations? *Computer Science Education*, 23 (3), 289-312. DOI: [10.1080/08993408.2011.611712](https://doi.org/10.1080/08993408.2011.611712)

Goldman, K., Gross, P., Heeren, C., Herman, G. L., Kaczmarczyk, L., Loui, M. C., & Zilles, C. (2010). Setting the scope of concept inventories for introductory computing subject. *ACM Transactions on Computing Education*, 10 (2), 5:1–29. DOI: [10.1145/1789934.1789935](https://doi.org/10.1145/1789934.1789935)

### Peer-reviewed conference papers

Poulsen, S., Viswanathan, M., Herman, G. L., West, M. (2021). Evaluating proof blocks problems as exam questions, In *Proceedings of the 14<sup>th</sup> ACM Conference on International Computing Education Research (ICER 2021)*, Aug. 16-19, 2021, Virtual Event, 12 pages. <https://doi.org/10.1145/3446871.3469741>. (Honorable Mention Award)

Fong, M. M., Poulsen, S., & Herman, G. L. (2021). What's in a linked list? A phenomenographic study of data structures diagrams, In *Proceedings of the 2021 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #32913), July 26-29.

Herman, G. L., Meyers, S., Deshaies, S.-E. (2021). A comparison of novice coders' approaches to reading code, an eye-tracking study, In *Proceedings of the 2021 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #33409), July 26-29.

Yang, S., Wei, Z., Herman, G., & Alawini, A. (2021). Analyzing patterns in student SQL solutions via Levenshtein edit distance. In *L@S '21: Proceedings of the Eighth ACM Conference on Learning @ Scale*, June 23-25. pp. 323-326. <https://doi.org/10.1145/3430895.3460979>

Mahmood, S. & Herman, G. L. (2021). A modular assessment for cache memories. In *Proceedings of the 52<sup>nd</sup> Technical Symposium on Computer Science Education (SIGCSE '21)*, Mar. 2021. pp. 1089-1095. <https://doi.org/10.1145/3408877.3432410>

Mahmood, S., Zhao, M., Khan, O., Herman, G. L. (2020). Caches as an example of machine-gradable exam questions for complex engineering systems. In *Proceedings of the 49th ASEE/IEEE Frontiers in Education Conference*, Uppsala, Sweden, Oct. 21-24. <https://doi.org/10.1109/FIE44824.2020.9273822>

Herman, G. L., Cai, Z., Bretl, T., Zilles, C., West, M. (2020). Comparison of grade replacement and weighted averages for second-chance exams. In *Proceedings of the 2020 ACM Conference on International Computing Education Research*, August, pp. 56-66. <https://doi.org/10.1145/3372782.3406260>

Poulsen, S., Butler, L., Alawini, A., & Herman, G. L. (2020). Insights into student behavior while solving SQL homework problems. *25th annual ACM conference on Innovation and Technology in Computer Science Education (ITiCSE)*. June pp. 404-410. <https://doi.org/10.1145/3341525.3387391>

Herman, G. L. & Azad, S. (2020). A comparison of peer instruction with collaborative problem solving in computer architecture course, In *Proceedings of the ACM Special Interests Group on Computer Science Education (SIGCSE '20)*, pp. 461-467. <https://doi.org/10.1145/3328778.3366819>

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Offenberger, S., Herman, G. L., Sherman, A. T., Oliva, L., Peterson, P., Scheponik, T., & Golaszewski, E. M. (2019). Initial validation of the Cybersecurity Concept Inventory: Pilot testing and expert review, In *Proceedings of the 49th ASEE/IEEE Frontiers in Education Conference*, Cincinnati, OH, Oct. 16-19.

Herman, G. L., Varghese, K., & Zilles, C. (2019). Second-chance testing course policies and student behavior, In *Proceedings of the 49th ASEE/IEEE Frontiers in Education Conference*, Cincinnati, OH, Oct. 16-19.

Scheponik, T., Golaszewski, E., Herman, G., Offenberger, S., Oliva, L., Peterson, P. A. H., & Sherman, A. T. (2019). Investigating crowdsourcing to generate distractors for multiple-choice assessments, In *Proceedings of the National Cyber Summit*. June. pp. 185–201. [https://doi.org/10.1007/978-3-030-31239-8\\_15](https://doi.org/10.1007/978-3-030-31239-8_15)

Johnson-Glauch, N. & Herman, G. L. (2019), Visual representations guide students' use of conceptual knowledge and problem-solving, In *Proceedings of the 2019 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #32426). Tampa, Florida, June. <https://peer.asee.org/32426>

Faulkner, B. E., Herman, G. L., Choi, D. S., & Johnson-Glauch, N. (2019, June), Mathematical maturity for engineering students, In *Proceedings of the 2019 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #32368). Tampa, Florida, June. <https://peer.asee.org/32368>

Amos, J. R., Herman, G. L., Pool, M., Cross, K. J., Insana, M. F., & Burks, G. R. (2019), Leveraging undergraduate curriculum reform to impact graduate education: A case study paper, In *Proceedings of the 2019 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #32341). Tampa, Florida, June. <https://peer.asee.org/32341>

Lee, C.-W., Schleife, A., Trinkle, D. R., Krogstad, J. A., Maass, R., Bellon, P., Shang, J. K., Leal, C., West, M., Bretl, T., Herman, G. L., & Tang, S. (2019). Impact of computational curricular reform on non-participating undergraduate courses: Student and faculty perspective. In *Proceedings of the 2019 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #32926). Tampa, FL. June. <https://peer.asee.org/32926>

Zhang, X., Schleife, A., Ferguson, A., Bellon, P., Bretl, T., Herman, G. L., Krogstad, J. A., Maass, R., Leal, C., Trinkle, D. R., Shang, J. K., & West, M. (2018), Computational Curriculum for MatSE Undergraduates and the Influence on Senior In *Proceedings of the 2018 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #30213). Salt Lake City, Utah. June. <https://peer.asee.org/30213>

Faulkner, B. E., & Herman, G. L. (2018). How is calculus applied in engineering statics? In *Proceedings of the 2018 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #30030). Salt Lake City, Utah. June. <https://peer.asee.org/30030>

Johnson-Glauch, N., Choi, D. S., & Herman, G. L. (2018). WIP: How do visual representations affect how engineering students learn and solve problems within and across disciplines? In *Proceedings of the 2018 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #31252). Salt Lake City, Utah. June. <https://peer.asee.org/31252>

Johnson-Glauch, N.E. & Herman, G. L. (2018, April). Student conceptions of stress and mechanical failure probed through different visual representations of material stress. Poster presented at the *2018 Illinois Indiana ASEE Section Conference*, West Lafayette, IN. (Best Poster Award)

Nip, T., Gunter, E., Herman, G. L., Morphew, J., West, M. (2018). Using a computer-based testing facility to improve student learning in a programming languages and compilers course, In *Proceedings of the ACM Special Interests Group on Computer Science Education (SIGCSE '18)*. (35% Acceptance Rate)

Herman, G., L. & Choi, D. S. (2017). The affordances and constraints of diagrams on students' reasoning about state machines, In *Proceedings of the 2017 ACM Conference on International Computing Education Research (ICER 2017)*, (pp. 173-181) Seattle, WA, August 18-20. DOI: [10.1145/3105726.3106172](https://doi.org/10.1145/3105726.3106172) (16% Acceptance Rate)



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Kononov, A., Bellon, P., Bretl, T., Ferguson, A. L., Herman, G. L., Killian, K. A., Krogstad, J. A., Leal, C., Maass, R., Schleife, A., Shang, J. K., Trinkle, D. R., & West, M. (2017). Computational curriculum for MatSE undergraduates. In *Proceedings of the 2017 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #19440). Columbus, OH, June 25-28. <https://peer.asee.org/28060>

Johnson, N. & Herman, G. L. (2017). Students' conception and application of mechanical equilibrium through their sketches. In *Proceedings of the 2017 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #17998). Columbus, OH, June 25-28. <https://peer.asee.org/28869>

Amos, J. R., Bashir, R., Cross, K. J., Herman, G. L., Loewenstein, J., Pool, M. & Silverman, D. (2017). Defining the frontiers of Bioengineering Education at Illinois and beyond. In *Proceedings of the 2017 American Society for Engineering Education Annual Conference and Exposition*, (Paper ID #19347). Columbus, OH, June 25-28. <https://peer.asee.org/27871>

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Handzik, J., & Herman, G. L. (2011). Work in progress: Developing a cognitively based digital logic calculator. *Proceedings of the Forty-first ASEE/IEEE Frontiers in Education Conference*, (pp. T2E-1 to T2E-3). Rapid City, SD. Oct. 27-30. DOI: [10.1109/FIE.2011.6142934](https://doi.org/10.1109/FIE.2011.6142934)

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Herman, G. L., Loui, M. C., & Zilles, C. (2010). Work in Progress: How do engineering students misunderstand number representations? *Proceedings of the Fortieth ASEE/IEEE Frontiers in Education Conference*, (pp. T3G-1 to T3G-2), Arlington, VA, October 27-30. DOI: [10.1109/FIE.2010.5673585](https://doi.org/10.1109/FIE.2010.5673585)

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Herman, G. L., Kaczmarczyk, L., Loui, M. C., & Zilles, C. (2008). Proof by incomplete enumeration and other logical misconceptions, *Proceedings of the 2008 ACM Conference on International Computing Education Research (ICER 2008)*, (pp. 59–70) Sydney, Australia, September 6-7. DOI: [10.1145/1404520.1404527](https://doi.org/10.1145/1404520.1404527) (35% Acceptance Rate)

Goldman, K., Gross, P., Heeren, C., Herman, G. L., Kaczmarczyk, L., Loui, M. C., & Zilles, C. (2008). Identifying important and difficult concepts in fundamental computing courses using a Delphi process. *Proceedings of the Thirty-Ninth ACM Technical Symposium on Computer Science Education*, (pp. 256–260), Portland, OR, March 12–15. DOI: [10.1145/1352135.1352226](https://doi.org/10.1145/1352135.1352226) (31% Acceptance Rate)

## Other publications

Morphew, J.W., Silva-Sohn, M., Herman, G., & West, M. (2019). Improving mathematical problem-solving in an introductory engineering course with the testing effect. Paper presentation at the Annual Meeting of the American Education Research Association. Toronto, Canada. April 5-9.

Herman, G. L., Cheville, A., Yang, D., Streveler, R. A., Brown, S. A., Menekse, M., Self, B. P., Svilha, V., Koretsky, M., Brophy, S. P., Goodridge, W. H., Husman, J., Sohoni, S. A. (2017). Creating capacity and funding for studying how students learn engineering. In *Proceedings of the 2017 American Society for Engineering Education Annual Conference and Exposition*, (Special Session). Columbus, OH, June 25-28.



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Herman, G. L. (2011). *The Development of a Digital Logic Concept Inventory*, Unpublished Doctoral Dissertation, University of Illinois at Urbana-Champaign, May.

Herman, G. L., (2007). *Fundamental Frequency Tracking in Music with Multiple Voices*, M.S. Thesis, University of Illinois at Urbana-Champaign, December.

## Invited Presentations

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Rethinking assessment to improve learning of computer architecture, 2021 Workshop on Computer Architecture Education, Keynote Address, June 2021.

Sparking sustained innovation in engineering education through faculty communities, Department of Computer Science, University of Iowa, October 2020.

Sparking sustained innovation in engineering education through faculty communities, School of Universal Computing, Construction, and Engineering Education, Florida International University, October 2020.

Engineering college-wide instructional change through faculty teaching and innovation communities, Northwestern Center for Engineering Education Research, November 2017.

Exploring what it means to learn computing concepts, Indiana University, Cognitive Science Brownbag, March 2017.

## Invited Workshops

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Computing Research Association, Teaching Faculty Development Workshop, Feb. 27, 2019. Minneapolis, MN

Dagstuhl Seminar: Notional Machines and Programming Language Semantics in Education, July 2019, Wadern, Germany.

Engineering Education Research & Innovation Impact Summit, NSF-sponsored workshop, Sept. 2018, West Lafayette, IN

Connecting Discipline-Based Education Researchers and Cognitive Scientists, NSF-sponsored workshop, Sept. 2016, Washington D.C.

Research Integration of Early Findings from Institution Transformation Projects, NSF-sponsored workshop, April 2016, Washington D.C.

Connecting Concepts across the Curriculum: From digital logic to distributed computing, NSF-sponsored workshop, Feb. 2016, Baton Rouge, LA.

Dagstuhl Seminar: Assessing Learning in Introductory Computer Science, Feb. 2016, Wadern, Germany.

Designing Low-Cost Intrinsic-Motivation Course Conversions, NSF C2GEN (Chautauqua Second Generation) Synchronous Online Professional Development Program, Oct-Nov. 2014.

## Externally-Funded Grants

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Herman, G. L. (PI) *Collaborative Research: EAGER SaTC-EDU: Artificial Intelligence and Cybersecurity: From Research to the Classroom*. National Science Foundation, SaTC, \$80,000, 2021-2023. DGE 2115040.

Herman, G. L. (PI), Alawini, A. *Foundational research and data-driven tool development to enhance learning of database programming*. National Science Foundation, IUSE, \$300,000, 2020-2023. DUE 2021499.



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Zilles, C. (PI), Herman, G., Bretl, T., West, M. *Exploring Second-Chance Testing as a Practical Form of Mastery Learning*. National Science Foundation, IUSE, \$600,000, 2019-2022. DUE 1915257.

Herman, G. L. (PI), SFS-Capacity: Collaborative: Validation of Concept Assessment Tools for Cybersecurity. (In Collaboration with A. T. Sherman, L. Oliva, & D. Phatak of University of Maryland, Baltimore County). National Science Foundation, \$190,033: 2018-2021. DGE 1820531.

Herman, G. L. (PI), *Creating a Cybersecurity Curriculum Assessment Tool*. (In collaboration with A. T. Sherman, L. Oliva, & D. Phatak of University of Maryland, Baltimore County). Department of Defense, \$128,495.77: 2017-2018. CNAP-CAE Grant# H98230-17-1-0347.

Bashir, R. (PI), Loewenstein, J., Amos, J., Herman, G. L., Boppart, S. *Defining the Frontiers of Bioengineering Education at Illinois and Beyond*. National Science Foundation, IUSE/PFE:RED, \$1,998,057, 2016-2021. EEC 1623141.

Herman, G. L. (PI) & Pembridge, J. *Conference Title: Research Integration of Early Findings from Institution Transformation Projects*. National Science Foundation, IUSE, \$45,808: 2016-2017. DUE 1622893.

Herman, G. L. (PI), Litchfield, B., Amos, J., & Rapti, Z. *MATH:EAGER Understanding faculty barriers in adopting evidence-based integrated mathematics curricula*. National Science Foundation, IUSE, \$299,207: 2015-2017. DUE 1544388.

Herman, G. L. (PI) *Creating concept and curriculum assessment tools for Cybersecurity* (In collaboration with A. T. Sherman, L. Oliva, & D. Phatak of University of Maryland, Baltimore County). Department of Defense, \$147,099: 2015-2016. BAA-00-15, NSA H98230-15-1-0273.

Mercier, E. (PI), Herman, G. L., & Peschel, J. *Fostering collaborative drawing and problem solving through digital sketch and touch*. National Science Foundation, Cyberlearning, \$549,995: 2014-2017. IIS 1441149.

Herman, G. L. (PI). & Peschel, J. *Exploring expert & novice graphical communication through digital sketching*. National Science Foundation, Research in Engineering Education, \$248,239: 2014-2017. EEC 1429348.

Mestre, J. (PI), Greene, J., Herman, G. L., Tomkin, J., & West, M. *Scaling cultures of collaboration: Evidence-based reform in portal STEM courses*. National Science Foundation, Widening Implementation & Demonstration of Evidence-Based Reforms, \$2,000,000: 2014-2017. DUE 1347722

Loui, M. C. (PI), Herman, G. L., & Goldberg, D. E. *Enhancing Intrinsic Motivation in Core Engineering Courses*. National Science Foundation, Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics, \$200,000: 2012-2014. DUE 1140554

## **Instructional Grants**

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Bretl, T., Herman, G., L., Zilles, C., Silva, M., Mussulman, D., West, M. *Remote Testing with PrairieLearn*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, Grainger College of Engineering, 2020-2022.

Sliva, M., Alawini, A., Beckman, M., Mussulman, D., Amos, J. Herman, G. L., Jensen, K., Shaffer, E., Schleife, A. *Facilitating Adoption of Collaborative Activities using Computer-Based Tools*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, Grainger College of Engineering: 2020-2022.

Bretl, T., Amos, J., Herman, G. L., Silva, M., Zilles, C., Stelzer, T., Trinkle, D., Mussulman, D., West, M. *Growing the PrairieLearn Community*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, Grainger College of Engineering: 2016-2019.

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Fu, W.-T. Herman, G. L., Xiao, Z., Dey, S. Leake, J. Woodard, B., Wolters, A., Philpott, M. *Developing Intelligent Online Tools to Improve Visuospatial Skills of Engineering Students*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, Grainger College of Engineering: 2016-2019.

Herman, G. L. *Designing visualizations to enhance trace-based coding*. Provost's Initiative on Teaching Advancement (PITA), University of Illinois at Urbana-Champaign, \$13,500: 2017-2018.

Herman, G. L., Schmitz, C., Varodayan, D., Minin, S., Goddard, L., Loui, M. C., Kudeki, E., Franke, P. *Improving students' learning and experience in ECE 110*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, College of Engineering, \$49,500: 2014-2015.

Herman, G. L., Faulkner, B., Varodayan, D. *Exploring the creation of effective instructional text*. Grants for the Advancement of Teaching in Engineering (GATE) Program, College of Engineering, University of Illinois at Urbana-Champaign, \$18,900: 2014-2015.

Bhat, P. B., Do, M., & Herman G. L. *Harnessing Multiple Modes of Visual Communication to Enhance the Student Experience in Distance Learning*. Grants for the Advancement of Teaching in Engineering (GATE) Program, College of Engineering, University of Illinois at Urbana-Champaign, \$15,000: 2013-2014.

Jones, D. L., Lumetta, S. S., Brunet, M. C., Chen, D., Haken, L., Herman, G. L., Hu, Y.C., Kalbarczyk, Z., Kindratenko, V., Kudeki, E., Kumar, R., Mitra, S., Patel, S., & Vasudevan, S., Loui, M. C., Vaidya, N. *Creating the World's Best Computer Engineering Core*. Strategic Instructional Initiatives Program, University of Illinois at Urbana-Champaign, College of Engineering, \$300,000: 2012-2014.

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## Professional Memberships

- Association for Computing Machinery (ACM) Special Interest Group on Computer Science Education
- Institute of Electrical and Electronics Engineers (IEEE)
  - Signal Processing Society
  - Education Society
- American Society for Engineering Education (ASEE)
  - Educational Research and Methods Division
  - Student Division
  - New Engineering Educators Division
  - Electrical and Computer Engineering Division

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## Consulting

**Engineering Education Consultant with Quality Evaluation Designs** **Oct. 2011 – Dec. 2012**

- External evaluator of the Philosophy of Engineering Education Community of Practice's use of NSF funding

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## Service

### Service Awards

- Journal of Engineering Education Star Reviewer 2018 – Top 2% rated reviewer based on quality and quantity of reviews

### Professional Service

- ASEE/IEEE Frontiers in Education 2021 – Technical Program Chair
- Computing Research Association, Teaching Faculty Development Workshop Organizing Committee, 2021. (Virtual Conference)
- ACM 2020 International Computing Education Research Conference, Program Committee
- Computing Research Association, Teaching Faculty Development Workshop Organizing Committee, Mar. 11, 2020. Portland, OR
- Computing Research Association – Education Committee
- ACM 2020 Special Interest Group, Computer Science Education Annual Conference, Program Committee

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- ACM 2019 International Computing Education Research Conference, Program Committee
  - ACM 2018 International Computing Education Research Conference, Program Committee
  - ACM 2018 Special Interest Group, Computer Science Education Annual Conference, Program Committee
  - National Science Foundation (NSF) grant proposals reviewer, Since 2012.
  - ASEE Educational Research and Methods Division, Publications Chair, 2016-2019
  - Faculty advisor for the ASEE graduate doctoral consortium, Since 2016
  - Shedd Science Department Curriculum Reviewer for University Laboratory High School, 2015.
  - Conference Organizer for the PEER Collaborative National Workshop, 2014.
    - Created professional development activities for tenure-track engineering education faculty
    - Created ongoing peer-mentoring networks
  - Peer reviewer
    - Journal of STEM Education Research, Since 2018
    - Journal of Cybersecurity Education and Practice, Since 2018
    - Journal of Parallel and Distributed Computing, Since 2017
    - ACM Transactions on Computing Education, Since 2016.
    - National Science Foundation grant proposals reviewer, Since 2012.
    - Journal of Computer Science Education, since 2014.
    - Journal of Higher Education, Since 2013.
    - Teaching and Learning Inquiry, Since 2013.
    - IEEE Transactions on Education, Since 2012.
    - Advances in Engineering Education, Since 2012.
    - Journal of Engineering Education, Since 2011.
    - ASEE/IEEE Frontiers in Education Conference, Since 2009.
    - ASEE Annual Conference and Exposition, Since 2008.
  - ASEE Educational Research and Methods Division Webmaster, 2014-2015.
  - Graduate Engineering Education Consortium for Students, Immediate Past Chair, 2010–2012.
    - Advised the group.
    - Sponsored professional development webinars.
  - ASEE Student Division Information Chair, 2010-2012.
    - Restructured the Student Division leadership
    - Wrote bi-monthly newsletter.
  - Signal Processing Education Network Student Liaison, 2011–2012.

#### **Campus Service and Involvement**

- Computer Science Research Area Chair, 2020-2021.
- Computer Science Teaching Professor Search Committee, 2019-2020
- Computer Science Teaching Evaluation and Innovation Committee Co-Chair, 2019-2020.
- College Engineering Education Research Committee, 2019
- Departmental liaison with the Institutional Review Board, since 2018
- Computer Science Graduate Fellowships, Admissions, and Awards Committee, 2016-2019
  - Area coordinator for review of prospective graduate student applications
  - Coordinated prospective student visits
  - Coordinated recruitment efforts
- Department of Computer Science undergraduate advising, since 2016
- Search committee for departmental office support specialist, 2018
- Academy for Excellence in Engineering Education, 2012-2018
  - Support faculty teams participating in the Strategic Instructional Innovations Program
  - Led workshop on writing educational research grants for the National Science Foundation for teaching-track faculty
  - Led workshop on writing, submitting, and reviewing educational research journal articles for teaching-track faculty
  - Coordinated distinguished lectures
  - Developed instructional workshops for new faculty
  - Developed co-teaching program to train new faculty in instructional best practices
  - Co-developed Strategic Instructional Innovations Program

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- Faculty advisor: American Society for Engineering Education: Univ. of Illinois student chapter, 2012-2015.
  - College Teaching Effectiveness Network Steering Committee, 2009-2011.
    - Maintained organization records and finances.
    - Organized seminars for various teaching topics including grading methods, academic job searches, and incorporating technology in the classroom.
  - Instructor for campus-wide teaching assistant training program, 2008-2014.