

# Georgia Van de Zande

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## EDUCATION

**Massachusetts Institute of Technology**, Cambridge, Massachusetts

**PhD, Mechanical Engineering**, September 2023.

Major: Product Design    Minor: Education

Dissertation: "Bringing the Water-Efficiency Benefits of Precision Irrigation to Resource-Constrained Farms Through an Automatic Scheduling-Manual Operation Irrigation Tool"

Committee: Profs. Amos G. Winter V, Maria Yang, and Glen Urban

**Massachusetts Institute of Technology**, Cambridge, Massachusetts

**SM, Mechanical Engineering**, January 2018.

Thesis: "Online Communication in Student Product Design Teams"

**Massachusetts Institute of Technology**, Cambridge, Massachusetts

**BS, Mechanical Engineering**, June 2015.

Pi Tau Sigma, Honor Society for Mechanical Engineers

Thesis: "Removal Rates of Electrolytes Commonly Found in Brackish Groundwater by Means of Electrodialysis Reversal Desalination"

## ACADEMIC POSITIONS

**Olin College of Engineering**, Needham, Massachusetts

Assistant Visiting Professor of Mechanical Engineering

August 2023–present

**Massachusetts Institute of Technology**, Cambridge, Massachusetts

Lecturer in Mechanical Engineering

January–December 2018

## RESEARCH & TEACHING INTERESTS

Sustainable design & engineering

Prototyping & fabrication

User-centered product design

Engineering & design education

Design processes

Design for manufacturing

AI in design

Global engineering

## RESEARCH EXPERIENCE

**MIT Global Engineering and Research (GEAR) Lab** | Prof. Amos G Winter

**Cambridge, Mass.**

Research Affiliate

2023–present

Graduate Researcher

2019–2023

Undergraduate Researcher

2012–2015

*Project 1: Design of a water-efficient, semi-manual precision irrigation tool for resource-constrained farmers*

- Validating the water saving and user adoptability of this tool on a farm in Kenya
- Designed and prototyped a semi-manual/semi-automatic tool architecture that allows farmers to adopt the efficiency benefits of precision irrigation at low costs
- Measured how farmers use this tool to save water; participants accurately reported 97% of irrigation events

- Designed interview protocols to collect data from farmers, field technicians, and other key stakeholders
- Modeled the capital and operating costs of irrigation systems using various energy sources and irrigation methods; used this technoeconomic model to identify the most promising system architectures for four market segments of East African farmers

**Project 2: Village-scale, PV-powered water desalination systems for India**

- Designed and built a batch production prototype for an electrodialysis unit and ran desalination tests to estimate energy needs of a full system
- Conducted user research interviews in multiple regions of India to understand how consumers interact with current desalination systems

**University of Toronto Ready Lab** | Prof. Alison Olechowski  
Collaborator

**Toronto, Canada**  
2019–present

**Project: Communication and networks in student product design teams**

- Collecting Slack communication and demographic data from engineering design teams; current database consists of 425,000 messages sent by 59 teams over 8 years
- Framing research questions providing guidance on research directions

**MIT CADLab** | Prof. David Wallace  
Graduate Researcher

**Cambridge, Mass.**  
2015–2018

**Project: Online communication in student product design teams**

- Analyzed 138,000 Slack messages of eight student teams to discover the relationship between virtual communication and design process effectiveness
- Identified metrics that educators could use to more effectively mentor teams, including equality of communication among members and consistency of daily team communication

## JOURNAL PUBLICATIONS

6. Sheline, C., Grant, F., Gelmini, S., **Van de Zande, G.D.**, Pratt, S., Winter V, A.G. "*Field Validation of Predictive Optimal Water and Energy Irrigation (POWEIr) Controller Theory.*" [In preparation, 2024]
5. **Van de Zande, G.**, Sheline, C., Pratt, S., and Winter V, A.G. "*Water Savings and User-Centered Validation of an Automatic Scheduling-Manual Operation (AS-MO) Irrigation Tool: A Case Study on a Jordanian Farm*" [in preparation for the *Journal of Mechanical Design*, 2024]
4. Grant, F., Amrose, S., **Van de Zande, G.D.**, Winter V, A.G. "*Market and energetics analysis of PV-powered drip irrigation for the Middle East and North Africa.*" [In preparation, 2024]
3. **Van de Zande, G.**, Grant, F., Sheline, C., Amrose, S., Costello, J., Ghodgaonkar, A., and Winter V, A.G. "*Design and Evaluation of an Automatic Scheduling-Manual Operation Tool to Bring Precision Irrigation to Resource-Constrained Farmers*" [under revise and resubmission to the *Journal of Mechanical Design*, 2024]
2. **Van de Zande, G.**, Amrose, S., Donlon, E., Shamsbery, P., and Winter V, A.G. "*Identifying opportunities for irrigation systems to meet the specific needs of farmers in East Africa.*" *Water*, December 2023.
1. Ferguson, S., Cheng, K., Adolphe, L., **Van de Zande, G.D.**, Wallace, D.R., and Olechowski, A. "*Communication patterns in engineering enterprise social networks: an exploratory analysis using short text topic modelling.*" *Design Science*. June 2022.

## PEER-REVIEWED CONFERENCE ARTICLES

10. **Van de Zande, G.D.**, Zastavker Y., Chachra, D., Edmonds, T., Linder, B. "Scaffolding a Spirit of Sustainable Design in a First-Year, Project-Based Engineering Design Course." [in preparation for *Frontiers in Education* 2024]

9. Ferguson, S., **Van de Zande, G.D.**, Wallace, D.R., and Olechowski, A. *"How virtual communication constructs shared understanding: A comparison across startup, enterprise, and academic teams."* [In Preparation for CHI Late Breaking Work 2025, 2024]
8. Ferguson, S., **Van de Zande, G.D.**, Wallace, D.R., and Olechowski, A. *"Take a risk: How teams build psychological safety in online environments."* [In Preparation for CHI Late Breaking Work 2024]
7. Ferguson, S., Flus, M., Bussmann, J., **Van de Zande, G.D.**, Wallace, D.R., and Olechowski, A. *"Conflict influencers and brokers: How centrality in team conflict networks influences innovative outcomes."* [in Preparation for CSCW 2024]
6. **Van de Zande, G.**, Sheline, C., Pratt, S., and Winter V, A.G. *"User-Centered Validation of an Automatic Scheduling-Manual Operation (AS-MO) Irrigation Tool: A Case Study in Jordan"* [in preparation for ASME IDETC/CIE 2024]
5. **Van de Zande, G.D.**, Sheline, C., Amrose, S., Costello, J., Ghodgaonkar, A., Grant, F., and Winter V, A.G. *"Design and Evaluation of an Automatic Scheduling-Manual Operation Tool to Bring Precision Irrigation to Resource-Constrained Farmers."* *Proceedings of the ASME IDETC/CIE*. Boston, USA. August 20–23, 2023.
4. **Van de Zande, G.D.**, Amrose, S., and Winter V, A.G. *"Evaluating the Potential for a Novel Irrigation System Controller to Be Adopted by Medium-Scale Contract Farmers in East Africa."* *Proceedings of the ASME IDETC/CIE*. St. Louis, USA. August 14–18, 2022.
3. Adolphe, L., **Van de Zande, G.D.**, Wallace, D.R., and Olechowski, A. *"Analysis of virtual communication within engineering design teams and its impact on team effectiveness."* *Proceedings of the ASME IDETC/CIE*. Virtual. August 17–19, 2020.
2. **Van de Zande, G.**, Amrose, S., and Winter V, A.G. *"Evaluating the potential for low energy emitters to facilitate solar-powered drip irrigation in Sub-Saharan Africa."* *Proceedings of the DESIGN Conference*. Virtual. October 26–29, 2020.
1. Wright, N.C., **Van de Zande, G.D.**, and Winter V, A.G. *"Justification, Design, and Analysis of a Village-Scale Photovoltaic-Powered Electrodialysis Reversal System for Rural India."* *Proceedings of the ASME IDETC/CIE*. Boston, USA. August 2–5, 2015.

## PATENTS

Sheline, C., Grant, F., **Van de Zande, G.D.**, Pratt, S., Gelmini, S., Winter V, A.G. *"Systems, devices, and methods for management of schedules used with renewable-energy powered irrigation systems."* August 2023. Pending.

## HONORS & AWARDS

- 2023 MIT Water, Food & Agriculture Prize, Audience choice team & top 7 out of 150 teams
- 2022 Selected participant for Rising Stars in MechE at Stanford University
- 2021 Goodwin Medal Award, for above ordinary excellence in teaching of an MIT graduate student
- 2020 Reviewer's Favorite paper at the DESIGN conference, awarded to top 10% of papers
- 2020 First place winner in MIT J-WAFS World Food Day Video Competition
- 2020 Honorable Mention for MIT J-WAFS Graduate Student Fellowship for Water Solutions
- 2015 MIT School of Engineering George Cohen Fellowship (valued at \$74,000)
- 2015 First place team in USAID and the Bureau of Reclamation's Desal Prize (valued at \$140,000)
- 2014 BP Women in Research Innovation Award

## FUNDED PROPOSALS *for which I was a contributing writer*

- 2020 **\$23,000**, MIT Undergraduate Research Opportunities Program, funding for eight undergraduate researchers
- 2019 **\$450,000**, Two-year research program with Xylem, Inc. to hire one research assistant and one staff engineer, plus materials and travel

## TEACHING & MENTORING EXPERIENCE

### Olin College of Engineering

- Lead Instructor** | Mechanics of Solids & Structures, sophomore-level course Spring 2024
- Lead Instructor** | Introduction to Mechanical Prototyping, primarily first-year students Spring 2024
- Lead Instructor** | Design for Manufacturing, junior- and senior-level course Fall 2023
- Studio Instructor** | Design Nature, first year introductory design course Fall 2023

### MIT Department of Mechanical Engineering

- Communication Fellow** | Providing communication coaching to all students 2020–2023
- Lab Instructor** | 2.009: Product Engineering Processes, senior product design course 2019–2021 (3 terms)
- Lab Instructor** | 2.00b: Toy Product Design, first year introductory design course 2016–2022 (5 terms)
- Teaching Assistant** | 2.007: Design & Manufacturing I, sophomore-level robot design course Spring 2021
- Teaching Assistant** | 2.000: Explorations in Mechanical Engineering, first year seminar Spring 2021
- Curriculum Developer** | 2.007: Design & Manufacturing I, sophomore-level robot design course Fall 2020
- Lecturer** | 2.00b: Toy Product Design, first year introductory design course Spring 2018
- Team Mentor** | 2.76: Global Engineering, graduate-level product design course Fall 2018
- Lab Instructor** | 2.00: Introduction to Design, sophomore-level design course Fall 2018
- Teaching Assistant** | 2.009: Product Engineering Processes, senior product design 2015–2018 (4 terms)

### MIT Teaching + Learning Lab

- Graduate Teaching Certificate** | Certificate covers completing courses in Inclusive Teaching, Subject Design, and Teaching Practice Spring 2023

### MIT Division of Student Life

- Graduate Resident Advisor** | Live-in advisor for a community of 35 undergraduates 2020–2023

### MIT Museum

- Curriculum Developer** | Developed and delivered a lecture on design to middle schoolers Spring 2018

### MIT Women's Technology Program

- Lead Graduate Instructor** | Created curriculum for high school girls learning engineering Summer 2018
- Tutor** | Led creativity and design lectures; assisted students with homework Summer 2015

### MIT Undergraduate Research Opportunities Program

- Graduate Mentor** | Mentored eight undergraduate researchers 2020–2021

## INVITED TALKS & PRESENTATIONS

Van de Zande, G., Amrose, S., and Winter V, A.G. "Articulating the user needs and values of a solar-powered drip irrigation systems designed for medium-scale contract farmers in East Africa," Poster presentation at the ASME IDETC/CIE. Virtual. August 2021.

Van de Zande, G.D. and Wallace, D.R. "A Creative, Hands-on Approach to the Engineering Development Process," Poster presentation at the Jean Piaget Society Conference. June 2018.

Panelist at the 2016 Learning International Networks Consortium Conference at MIT on *The Future of Pedagogy*.

## INDUSTRY EXPERIENCE

### Apple, Inc

#### iPad Product Design Intern

Cupertino, Calif.  
Spring & Summer 2017

- Designed key module components for functionality, manufacturability, and assembly, working with fellow engineers to ensure system compatibility
- Designed flexible and rigid PCBs for product development, collaborating with electrical engineers, layout specialists, and vendors
- Developed test methods, designed test fixtures, and wrote MATLAB scripts to process images and analyze data to evaluate risks in future products

### MMID Integrated Product Design Functionality Design Intern

Delft, The Netherlands  
Summer 2016

- Designed a handling system for experienced SCUBA divers who dive with physically disabled individuals to make their dives safer
- Developed ways to improve the current structure of a client's large injection molded part the current with minimal additional parts, using FEA

### Goddard Technologies, Inc. Mechanical Engineering Intern

Beverly, Mass.  
Summer 2014

- Developed and tested concepts for consumer products in the kitchen and travel markets

## SERVICE

- 2023–present **Faculty liaison** between Olin college and Singapore University of Technology and Design (SUTD)
- 2023–present **Research Committee member** at Olin College, promoting undergraduate research opportunities
- 2023–present **Reviewer**, *ASME's Journal of Mechanical Design*
- 2015–present **Educational Counselor**, interviewing high school students applying to MIT
- 2023 **Selection Committee member**, MIT Goodwin Medal for excellence in graduate teaching
- 2021–2022 **Organizer**, Mechanical Engineering Graduate Student Gala
- 2020–2022 **Mentor**, Product Design qualifying exam study group
- 2017–2018 **Planning committee member**, MIT Class of 2015 3.14 Year "Pi" Reunion

## MEDIA & POPULAR PRESS

- 2023 "Smart irrigation technology covers 'more crop per drop'," by A. Wilson, *MIT News*
- 2023 "No Drop to Spare: MIT creates affordable, user-driven smart irrigation technology," video by J. Freidah, *MIT MechE YouTube*
- 2022 "Why I'm voting 'no' to the graduate student union," by **G. Van de Zande**, *The Tech*
- 2021 "Reimagining 2.007, an iconic design class, during the Covid-19 pandemic," by M.B. Gallagher, *MIT News*
- 2021 "MIT's first-ever virtual robot competition," video by A. Lehn and J. Freidah, *MIT MechE YouTube*
- 2019 "Collaborating for Irrigation Access Solutions: Where Policy & Engineering Meet," by L. Miller, *MIT News*
- 2018 "Toy-making offers seriously fun introduction to engineering," by M.B. O'Leary *MIT News*
- 2016 "Mens et ... mens?: Rethinking the freshman year science core," by **G. Van de Zande**, *The Tech*

# **COURSE INSTRUCTOR EVALUATIONS** *for all semesters when ratings were collected*

## **Olin College of Engineering**

### **Design for Manufacturing**

Lead Instructor (Fall 2021): 4.6/5.0

### **Design Nature**

Studio Instructor (Fall 2021): 4.5/5.0

## **MIT Department of Mechanical Engineering**

### **2.009: Product Engineering Processes**

Instructor (Fall 2021): 7.0/7.0

Instructor (Fall 2020): 6.9/7.0

Instructor (Fall 2019): 6.7/7.0

Teaching Assistant (Fall 2018): 6.7/7.0

Teaching Assistant (Fall 2017): 6.9/7.0

Teaching Assistant (Fall 2016): 6.9/7.0

Teaching Assistant (Fall 2015): 6.9/7.0

### **2.00b: Toy Product Design**

Instructor (Spring 2021): 7.0/7.0

Lecturer (Spring 2017): 6.8/7.0

Instructor (Spring 2016): 7.0/7.0

### **2.007: Design & Manufacturing I**

Teaching Assistant (Spring 2021): 6.9/7.0

### **2.00: Introduction to Design**

Instructor (Spring 2021): 6.5/7.0

### **2.000: Explorations in Mechanical Engineering**

Teaching Assistant (Spring 2021): 7.0/7.0