Minkyung Lee

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SUMMARY

Recent Ph.D. graduate in Learning Design and Technology with expertise in collaborative learning, instructional design, and advanced data analysis methods, including Social Network Analysis (SNA) and Machine Learning (ML). Dedicated to leveraging evidence-based approaches and innovative technologies to enhance learner engagement and promote equity in online and hybrid learning environments. Experienced in leading research projects, designing technology-enhanced courses, and applying learning analytics to improve instructional strategies.

EDUCATION

Penn State University
Ph.D., Learning Design and Technology (Defended: Dec 2024, Degree Conferred: May 2025)
Department of Learning and Performance Systems
Dissertation: "*The Impact of Scripted Roles on Learner Engagement and Knowledge Construction Assignment in Asynchronous Discussion: A Comparative Study of Structured vs. Unstructured Collaborative Learning*"
Advisor: Priya Sharma, Roy Clariana

Lesley University
M.Ed., Curriculum and Instruction (2014)
Department of Education
Thesis: "*Consideration in the improvement of Korean students' English proficiency and their perceptions to public English education*"

Hanyang University
B.A., French Language and Culture (2009)
Minor: English Language and Culture
Department of Liberal Arts

PROFESSIONAL EXPERIENCES

Director   Feb 2025- Current
Institutional Data Analytics, Office of Institutional Effectiveness
University of Houston, Downtown
- Developed machine learning models to predict student dropout and enrollment trends, using six years of data (645,228 data points across 50,000 students and 127 variables)
- Identified the most relevant factors influencing dropout and conducted temporal analyses to uncover long-term trends in student enrollment and retention, helping to anticipate shifts in academic engagement
- Utilize EAB Navigate to efficiently gather and organize learner data, streamlining access to relevant

information for further analysis and institutional reporting
- Prepare grant proposals focused on data-informed interventions to enhance student success

Graduate Research Assistant   June 2022 – Dec 2024
Leonhard Center for Engineering Education
College of Engineering, Penn State University
- Conducted quantitative data analysis to evaluate the effectiveness of VR applications in educational settings, ensuring data quality and reliability
- Analyzed student preferences and learning outcomes for the NSF-Boeing PEER Grant project on online learning in advanced manufacturing and data science
- Collaborated with faculty to interpret data analysis results and provided insights to guide enhancements in course design and instructional strategies

Graduate Research Fellow   Aug 2018 – May 2022
World Campus Learning Design
World Campus, Penn State University
- Collaborated with faculty and learning designers to design and develop online course content.
- Conducted needs assessments to identify instructional goals and develop effective course materials tailored to diverse learning environments
- Applied social network analysis to study collaborative learning dynamics, using findings to inform course design and improve group interactions in online discussions
- Utilized natural language processing techniques to perform lexical network analysis on synchronous discussions, enhancing understanding of student discourse patterns
- Designed and refined asynchronous discussion activities and rubrics to improve student engagement and learning outcomes

Researcher   Dec 2017 – July 2018
Global Education Center for Engineering, Seoul National University
- Designed and implemented STEM education programs for middle school students, integrating technology to enhance learning outcomes
- Managed flipped classroom projects using video conferencing tools, enabling interactive and student-centered learning
- Produced evaluation reports with actionable recommendations for program improvement, contributing to the center's strategic goals

Researcher
Smart Center for Teaching and Learning, Hanyang University   Feb 2015– March 2016
- Organized and facilitated monthly workshops on innovative teaching strategies for technology-enhanced education, receiving high satisfaction ratings from participants
- Assisted in adapting and localizing a Futurelearn MOOC for a Korean audience, improving accessibility and relevance for local learners
- Co-authored a flipped learning guidebook in collaboration with Tokyo University, sharing best practices in international contexts

English Instructor
Daejin Woman's High School | Grade 11   2014–2015
- Developed and implemented curricula to prepare students for college entrance exams, emphasizing

critical reading, writing, and comprehension
- Conducted mock exams and provided tailored feedback, improving students' readiness for high-stakes assessments
- Led collaborations with other instructors to align lesson plans and introduced student-centered learning strategies

English Instructor
Garak Middle School | Grades 7–8   2009–2011
- Taught grammar, vocabulary, and conversational fluency using interactive teaching strategies and multimedia resources

RESEARCH SKILLS

- Programming & Analysis:
  Python:
  > Data Manipulation & Analysis: pandas, scikit-learn (for predictive modeling)
  > Network Analysis: networkx
  > Qualitative & Text Analysis: NLTK, spaCy, gensim (for NLP and topic modeling)
  > Visualization: matplotlib, seaborn (for plotting), pyLDAvis (for visualizing topic models)
  R:
  > Predictive Modeling: caret
  > Network Analysis: igraph
  > Visualization: ggplot2 (for custom plotting)
  > Text Mining: tm
- Statistical Tools: SPSS (for traditional statistical tests), Mplus (for structural equation modeling)
- Qualitative & Text Analysis Tools: NVivo (for coding and thematic analysis)
- Visualization & Network Analysis Tools: Gephi (for network visualization), PowerBI (for interactive dashboards)

FELLOWSHIPS & GRANTS

Penn State World Campus Graduate Research Fellowship	Fall 2018 - Spring 2022
Penn State World Campus Learning Design, Summer Research Fellowship	2019 - 2021
Penn State UPAC Graduate Student Travel Grant	2021, 2023

HONORS & AWARDS

AERA SIG Instructional Technology Graduate Student Paper Award	2024
Penn State College of Education Graduate Student Travel Award	2019, 2020, 2021, 2023, 2024
Summer Tuition Assistance Funding, Penn State University	2019, 2020, 2021, 2023, 2024

RESEARCH EXPERIENCE IN FUNDED PROJECTS

Research and evaluation with quantitative and qualitative data analysis
Leonhard Center-funded Educational Innovation, 2024
- Project Title: VR Application for Mechanical Engineering Courses
- Principal Investigator: Daniel Cortes, Andrea Gregg, Laura Pauley
- Tasks: Quantitative and Qualitative Data Analysis, Publications
- Relevant published works:

Cortes, D., Gregg, A., **Lee, M.K.**, Pauley, L., Osunbunmi, I (2024, October). By students, for students: Development of custom Virtual Reality applications for teaching and learning in engineering courses, FIE (Frontier of Education), Washington DC 2024

Gregg, A., Cortes, D., Pauley, L., **Lee, M.K.,** Osunbunmi, I (2024, June). Designing and evaluating virtual reality applications for a machine design course, accepted as a presentation, ASEE, Portland

Research and evaluation with qualitative analysis
NSF-REU Project 2022, 2023, 2024
- Project Title: Integration of Biology and Materials in Chemical Engineering
- Principal Investigators: Stephanie Velegol, Esther Gomez
- Tasks: Data collection (interviews), qualitative data analysis to evaluate the program.
- Relevant published works : Xia, Y., Cutler, S., Osunbunmi, I., Zappe, S. E., Gomez, E., Velegol, S., & **Lee, M.K.** (in press). The impact of applied improvisation on undergraduate engineering students' professional development. *Advances in Engineering Education*.

Evaluation with qualitative analysis
Leonhard Center-funded Educational Innovation, 2023
- Project Title: A New Sustainable Lab Ambassador Program within the College of Engineering
- Principal Investigators: Rachel Brennan, Kristen Dreyer, Lydia Vandenburgh, David Jones
- Tasks: Qualitative report to evaluate the program by Interviews for Sustainable Lab Ambassadors and focus groups for the lap PI to understand their sustainable lab experiences.

Evaluation with quantitative data Analysis
NSF-Boeing PEER Grant, 2023, 2024
- Project Title: Engineering Online Learning in Advanced Manufacturing and Data Science
- Principal Investigator: Samuel Spiegel
- Tasks: large-scaled quantitative survey data analysis and publication.
- Relevant published work: **Lee, M.K.**, Cutler, S., Osunbunmi, I., Zappe, S. E., Samuel, S (2024, June). Student preferences and performance in active learning online environments, accepted as a presentation, ASEE, Portland 2024.

CERTIFICATES

TESOL Certificate, University of California at San Diego.	2009
Massachusetts ESL Initial license (expired).	2014

TEACHIING & COURSE DESIGN EXPERIENCE

Teaching Assistant

'Seminar for Engineering Teaching Assistants'   Fall 2023, Spring 2024, Fall 2024
College of Engineering, Penn State University
- Graded and provided the feedback for any asynchronous discussion and collaborative projects
- Assisted in F2F classroom instruction and grading
- Developed asynchronous collaborative discussion generated by Louvain algorithm

Research-based Course Designer

'Introduction to Business Information Systems'   Fall 2021, Spring 2022

World Campus, Penn State University
- Designed two modules for enhancing asynchronous discussions in the *'Introduction to Business Information Systems'* course, which were formally accepted into the curriculum

Teaching Assistant
'Global Engineering Technology Exchange'   Fall 2017, Spring 2018
College of Engineering, Seoul National University
- Managed IP-based video conferencing for "flipped classroom" models and assisted collaboratively designed engineering MOOC classrooms with Tokyo university

Course Design Assistant
'*Korea in a Global Context'*   Fall 2016
Smart Center for Teaching and Learning, Hanyang University
- Assisted in refining MOOC (Futurelearn) course materials to align with pedagogical objectives, ensuring both quality and relevance

PUBLICATIONS

Lee, M.. (in preparation). Tracking student persistence: a multimodal and temporal approach to dropout risk prediction.

Lee, M., Sharma, P., Clariana, R (under review). Which roles bridge, centralize, or synthesize collaboration in online courses? - Linking network metrics with knowledge construction in asynchronous discussions. Internet and Higher education

Lee, M. Sharma, P., Clariana, R (under review) When does structure matter? social and cognitive outcomes in role-assigned vs. organic online groups, Internet and Higher education

Lee, M. (under review). Predicting assigned roles and knowledge-construction processes in asynchronous discussion: a course-scale feasibility study, Journal of Computers in Education

Sharma, P, **Lee, M**. (under review). The quality of student cognitive engagement across different levels of social engagement in online discussions. Education and Information Technologies.

Lee, M., Clariana, R. (In revision). Implementing sociograms in online learning: examining their influence on community of inquiry elements, Learning Environment Research.

Lee, M., Sharma, P., Strauss, S (2025) Network structure and communication clarity as factors influencing engagement in asynchronous online discussions, Interactive Learning Environment. http://dx.doi.org/10.1080/10494820.2025.2550035

Lee, M., Sharma, P. (2024). Applying a community detection algorithm to examine group formation in online discussions: Exploring network characteristics and dynamics, International Journal of Educational Technology in Higher Education. https://doi.org/10.1186/s41239-024-00495-w

Xia, Y., Cutler, S., Osunbunmi, I., Zappe, S. E., Gomez, E., Velegol, S., & **Lee, M.** (2024). The impact of applied improvisation on undergraduate engineering students' professional development. *Advances in Engineering Education*.

Lee, M., Clariana, R. B. (2022). The influence of external concept structures on an individual's knowledge structures. Educational Technology Research and Development (ETR&D), 70(5), 1657-1674. http://dx.doi.org/10.1007/s11423-022-10144-6

Jeong, J. & **Lee, M**. (2017). Hanyang MOOC Flipped learning guidebook, Hanyang University, Seoul.

PEER REVIEWED PRESENTATIONS

Lee, M., Sharma, P (2025, April). Predicting roles and knowledge construction processes in asynchronous discussion using machine learning, AERA, 2025

Cortes, D., Gregg, A., **Lee, M.,** Pauley, L., Osunbunmi, I (2024, October). By students, for students: development of custom virtual reality applications for teaching and learning in engineering courses, accepted as a presentation, FIE (Frontier of Education), Washington DC, 2024

Gregg, A., & Cortes, D., & Osunbunmi, I. S., & Pauley, L. L., & **Lee, M.** (2024, June), Designing and evaluating virtual reality applications for a machine design course, accepted as a presentation, ASEE Annual Conference & Exposition, Portland, Oregon. 10.18260/1-2--47139

Lee,M., & Cutler, S., & Zappe, S. E., & Spiegel, S., & Osunbunmi, I. S. (2024, June), Student preferences and performance in active learning online environments. accepted as a presentation, ASEE Annual Conference & Exposition, Portland, Oregon. 10.18260/1-2—48018

Lee, M., Roy B. Clariana (2024, April). Implementing sociograms in online learning: examining their influences on community of inquiry elements, accepted as a poster, AERA, Philadelphia. 10.3102/2107692

Lee, M., Sharma, P. (2023, April). Applying community detection algorithms to examine group formation in online discussions, accepted as a presentation, AERA, Chicago https://www.aera.net/Publications/Online-Paper-Repository/AERA-Online-Paper-Repository-Viewer/ID/2107692

Lee, M., Sharma, P. (2022, October). Applying the Louvain algorithm to examine emergent groups in asynchronous online discussion, accepted as a presentation**,** College of Education Research Conference, State College

Clariana, R., **Lee, M**. (2022. October). An OER tool for writing-to-learn in undergraduate architectural engineering, accepted as a presentation, College of Education Research Conference, State College

Lee, M., Garbrick, A., Clariana, R. (2021, November). Knowledge convergence in collaborative concept mapping, accepted as a presentation, Association for Educational Communications & Technology (AECT), Chicago

Lee, M., Garbrick, A., Clariana, R. (2021, November). Lexical network analysis on synchronous discussion, accepted as a poster, Association for Educational Communications & Technology (AECT), Chicago

Lee, M., Clariana, R. (2021, November). Students' perceptions in online courses with the Community of Inquiry Framework, accepted as a presentation, Association for Educational Communications & Technology (AECT

Lee, M., Garbrick, A., Clariana, R. (2021). Knowledge convergence in collaborative concept mapping, Association for Educational Communications & Technology (AECT), accepted as a presentation, Chicago, Selected Research and Development Papers Vol1, 106-120

Lee,M., (2020, November). Social network analysis on online collaborative knowledge construction, accepted as a poster, Association for Educational Communications & Technology (AECT), Virtual

Lee, M., Clariana, R. (2019, November). Knowledge structure measurement of cross-classification table as a visual external representation, accepted as a poster, Association for Educational Communications & Technology (AECT), Las Vegas

Lee, M., & Jiyeon Lee. (2016, October). Examining affective variables within the EFL learner's interlanguage system, accepted as a presentation, KEFL (Korean Association of English as Foreign Language), Seoul

PROFESSIONAL AFFILIATIONS

American Educational Research Association (AERA)

American Society for Engineering Education (ASEE)
Association For Educational Communications & Technology (AECT)

discussion using machine learning, AERA, 2025

Cortes, D., Gregg, A., **Lee, M.,** Pauley, L., Osunbunmi, I (2024, October). By students, for students: development of custom virtual reality applications for teaching and learning in engineering courses, accepted as a presentation, FIE (Frontier of Education), Washington DC, 2024

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