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Education

Ph.D. Science Education, University of Iowa
M.A. Education, American University of Beirut
B.S. Science Education, Lebanese American University [*formerly* Beirut University College]

Professional Experience

Positions held

2006-Present Professor, School of Education, University of Delaware [UD].

2013-Present Faculty Fellow, Center for Science, Ethics, and Public Policy, UD.

2007-2008 Deputy Dean, College of Education, Qatar University. Doha, Qatar.

1996-2006 Associate Professor (with Tenure), School of Education, UD.

1989-1996 Assistant Professor, College of Education, UD.

1994-1995 National Academy of Education Spencer Postdoctoral Fellow
Associate, Science and Mathematics Education Center, American University of Beirut

1993 January Visiting Professor, Faculty of Education (II) Lebanese University, Rowdah, Lebanon

1992 Jul-Nov Visiting Scholar, Science and Mathematics Education Centre [SMEC]
Curtin University of Technology, Perth - Western Australia

1986-1989 Research Assistant, University of Iowa
NSF supported: STAR Project (Summer 88 to 89), STEPS Project (87-88), Honors Workshop (86-88); Clinical Interviewer (Fall-86)

1986 Summer Instructor/Resource, University of Iowa Secondary Student Training Program (SSTP)

1985-1986 Teaching Assistant, University of Iowa
Fundamentals of Science [General science course for non-majors]

1983-1984 Science Teacher [9-11 Grade Biology & Chemistry] Evangelical Armenian Schools, Beirut, Lebanon

1982-1983 Science Teacher [6-10 Grade General Science, Physics, Chemistry]
International School of Choueifat, Choueifat, Lebanon

1980-1982 Graduate Assistant, American University of Beirut, Science and Mathematics Education Center [SMEC]

Honors and Awards

2024 Lifetime Achievement Award, International History, Philosophy and Science Teaching Group.
2020-2021 Fellow, INSPIRE CS-AI Project, Massachusetts Institute of Technology.
2019 Elected Fellow, American Association for the Advancement of Science.
Spring 2019 Salzburg Global Fellow.
Spring 2018 Distinguished Faculty Award, School of Education, University of Delaware.
Spring 1999 Phi Delta Kappa Teaching Award-School of Education Chapter.
1994-1995 National Academy of Education Spencer Postdoctoral Fellowship.
1987-1988 Gustav Ohaus Program for Innovations in College Science Teaching Award.
1986-1987 PEO International Peace Scholarship Award.
1985-1986 McBride Scholarship.

Consulting

2020 Member, Teacher Education Undergraduate Academic Program Review Team, Drexel University, Philadelphia, USA
2019 Member, NSF Review Panel.
2019 Team Leader, Academic Program Review Team for the Department of Education, Lebanese American University, Beirut, Lebanon.
2017 Short Term Consultant, World Bank Group, Kuwait Project.
2017 Team Leader, Academic Quality Assurance Review Team for the School of Education, University of the West Indies at Cave Hill, Barbados.
2006 Member, Praxis Elementary Education National Advisory Committee. Educational Testing Service.

Publications (Google Scholar; ResearchGate)

Books:

Erduran, S. & Dagher, Z. (2014). *Reconceptualizing the nature of science for science education: Scientific knowledge, practices and other family categories.* Dordrecht, The Netherlands: Springer**.**

BouJaoude, S. & Dagher, Z. (Eds.). (2009). *The world of science education: Arab states*. Rotterdam, The Netherlands: Sense Publishers.

Peer-Reviewed Journal Articles:

Metzger, C., & Dagher, Z. (in review). From weaker to stronger: A spectrum of elementary preservice teachers' equity mindsets in science education.

Dagher, Z., & Metzger, C. (2024). Exploring preservice teachers' engagement in a digital clinical simulation for inclusive science education. *Contemporary Issues in Technology and Teacher Education, 24*(4). https://citejournal.org/volume-24/issue-4-24/science/exploring-preservice-teachers-engagement-in-a-digital-clinical-simulation-for-inclusive-science-education

Dagher, Z., & Erduran, S. (2023). To FRA or not to FRA: What is the question for science education? *Science & Education*, 32, 1247-1264 (Early Access, March 10). https://doi.org/10.1007/s11191-023-00425-8

Peters-Barton, E., Dagher, Z., & Erduran, S. (2023). Student, teacher, and scientist views of the scientific enterprise: An epistemic network re-analysis. *International Journal of Science and Mathematics Education, 21,* 347-375. (Early Access, February 10, 2022). https://doi.org/10.1007/s10763-022-10254-w

Bichara, D., Dagher, Z., & Fang, H. (2022). What do COVID-19 tweets reveal about public engagement with nature of science? *Science & Education 31*(2), 293–323. https://doi.org/10.1007/s11191-021-00233-y (Early Access, July 21, 2021).

Erduran, S., Dagher, Z. & McDonald, C. (2019). Contributions of the family resemblance approach to nature of science in science education: A review of emergent research and development. *Science & Education*, 28(3), 311-328. https://doi.org/10.1007/s11191-019-00052-2

Dagher, Z. & Erduran, S. (2016). Reconceptualizing the nature of science for science education: Why does it matter? *Science & Education, 25*(1), 147-164. https://doi.org/10.1007/s11191-015-9800-8.

Dagher, Z. (2015). The relevance of history of biology to teaching and learning in the life sciences: The case of Mendel's laws. *Interchange*, *45*, 205-216. https://doi.org/10.1007/s10780-015-9241-y

Erduran, S. & Dagher, Z. (2014). Regaining focus in Irish junior cycle science: Potential new directions for curriculum and assessment development on nature of science. *Irish Educational Studies*, *33*(4), 335-350. *https://doi.org/10.1080/03323315.2014.984386*

Dagher, Z. & BouJaoude, S. (2011). Science education in Arab states: Bright future or status quo? *Studies in Science Education*, *47*, 73-101. https://doi.org/10.1080/03057267.2011.549622

Dagher, Z., & BouJaoude, S. (2005). Students' perceptions of the nature of evolutionary theory. *Science Education, 89*(3), 378-391. https://doi.org/10.1002/sce.20054

Dagher, Z., & Ford, D. (2005). How are scientists portrayed in children's science biographies. *Science & Education, 14,* 377-393. https://doi.org/10.1007/s11191-004-7933-2

Dagher, Z., Brickhouse, N., Shipman, H., & Letts, W. (2004). How some college students represent their understanding of scientific theories. *International Journal of Science Education, 26,* 735-755. https://doi.org/10.1080/0950069032000138806

Brickhouse, N., Dagher, Z., Shipman, H., & Letts, W. (2002). Evidence and warrants for belief in a college astronomy course. *Science & Education*, *11*, 573-588. https://doi.org/10.1023/A:1019693819079

Shipman, H., Brickhouse, N., Dagher, Z., & Letts, W. (2002). Changes in student views of religion and science in a college astronomy course. *Science Education*, *86*, 526-547. https://doi.org/10.1002/sce.10029

Brickhouse, N., Dagher, Z., Letts, W., & Shipman, H. (2000). Diversity of students' views about evidence, theory, and the interface between science and religion in an astronomy course. *Journal of Research in Science Teaching, 37,* 340-362.

Eichinger, D., Abell, S., & Dagher, Z. (1997). Developing a graduate level science education course on the nature of science. *Science & Education, 6,* 417-429.

Dagher, Z. & BouJaoude, S. (1997). Scientific views and religious beliefs of college students: The case of biological evolution. *Journal of Research in Science Teaching, 34,* 429-445.

Treagust, D., Harrison, A., Venville, G., & Dagher, Z. (1996). Using an analogical teaching approach to engender conceptual change. *International Journal of Science Education*, *18*, 213-229.

Dagher, Z. (1995). Materials speak louder than words. *Science Scope, 19*(1), 48-50.

Dagher, Z. (1995). Review of studies on the effectiveness of instructional analogies in science education. *Science Education, 79,* 295-312.

Dagher, Z. (1995). Analysis of analogies used by science teachers. *Journal of Research in Science Teaching, 32,* 259-270.

Dagher, Z. (1994). Características únicas das analogias utilizadas pelos professores de ciências. *Revista de Educação, IV*, 57-67.Dagher, Z. (1994). Does the use of analogies contribute to conceptual change? *Science Education*, *78*, 601-614.

Dagher, Z. & Cossman, G. (1992). Verbal explanations given by science teachers: Their nature and implications. *Journal of Research in Science Teaching*, *29*, 361-374.

Book Chapters

Dagher, Z. R. (2020). Balancing the epistemic and social realms of science in promoting NOS for social justice. In H. Yacoubian & L. Hansson (Eds.), *Nature of science for social justice* (pp. 41-58). Dordrecht, The Netherlands: Springer. https://doi.org/10.1007/978-3-030-47260-3_3

Erduran, S., Kaya, E., & Dagher, Z. (2017). From lists in pieces to coherent wholes: Nature of science, scientific practices and science teacher education. In, J. Yeo, T. Teo, & K.S. Tang (Eds.), *Science education research and practice in Asia-Pacific and beyond* (pp. 3-24). Singapore: Springer. https://doi.org/10.1007/978-981-10-5149-4_1

BouJaoude, S., Dagher, Z. & Refai, S. (2017). The portrayal of nature of science in Lebanese 9th grade science textbooks. In C. McDonald & F. Abd-El-Khalick (Eds.), *Representations of nature of science in school science textbooks – A global perspective* (pp. 79-97). New York, NY: Routledge. https://doi.org/10.4324/9781315650524

Dagher, Z. & BouJaoude, S. (2015). NOS cultural perspectives. In R. Gunstone (Ed.), *Encyclopedia of Science Education Springer Reference* (708-712). New York, NY: Springer. Retrieved from https://link.springer.com/content/pdf/10.1007%2F978-94-007-2150-0_270.pdf

Dagher, Z. & Erduran, S. (2014). Laws and explanations in biology and chemistry: Philosophical perspectives and educational implications. In M. Matthews (Ed.), *International handbook of research in history and philosophy for science and mathematics education* (pp. 1203-1233). Dordrecht, The Netherlands: Springer.

Dagher, Z. (2013). The relevance of history of biology to teaching and learning in the life sciences: The case of Mendel's laws. In P. Heering, S. Klassen, & D. Metz (Eds.), *Enabling scientific understanding through historical instruments and experiments in formal and non-formal learning environments* (pp. 303-312). Flensburg Studies on the History and Philosophy of Science in Science Education (2nd volume). Flensburg, Germany: Flensburg University Press.

Ford, D., Allen, D., Dagher, Z., Donham, R. Fifield, S., Madsen, J., & Shipman, H. (2011). Reforming science for prospective K-8 Teachers: The University of Delaware Professional Continuum (Background Research Paper No. 22). Tuscaloosa, AL: National Science Education Undergraduate Study.

BouJaoude, S. & Dagher, Z. (2009). Introduction: Science education in Arab states. In S. BouJaoude & Z. Dagher (Eds.), The world of science education: Arab states (pp. 1-8). Rotterdam, The Netherlands: Sense Publishers.

Dagher, Z. (2009). Epistemology of science in curriculum standards of four Arab countries. In S. BouJaoude & Z. Dagher (Eds.), *The world of science education: Arab states* (pp. 41-60). Rotterdam, The Netherlands: Sense Publishers.

Dagher, Z. & BouJaoude, S. (2009). Challenges and opportunities for science education in the Arab region. In S. BouJaoude & Z. Dagher (Eds.), *The world of science education: Arab states* (pp. 265-277). Rotterdam, The Netherlands: Sense Publishers.

Erduran, S. & Dagher, Z. (2007). Exemplary teaching of argumentation in science. A case study of two middle school teachers. In R. Pintó and D. Couso (Eds.), *Contributions from science education research* (pp. 403-415). The Netherlands: Springer.

Brickhouse, N., Dagher, Z., Letts, W., & Shipman, H. (2000). Why things fall: Evidence and warrants for belief in a college astronomy course. In R. Millar, J. Leach, & J. Osborne (Eds.), *Improving science education* (pp. 11-26). London, UK: Open University.

Dagher, Z. (2000). O caso das analogias no ensino da ciencia para a compreensao. In J. J. Mintzes, J. H. Wandersee, & J. D. Novak (Eds.), *Ensinando ciencia para a compreensao: Uma visao construtivista* (pp. 180-193). Lisbon, Portugal: Platano Edicoes Tecnicas. *[Portuguese version of Dagher 1998]*

Dagher, Z. (1998). The case for analogies in teaching science for understanding. In J. Mintzes, J. Wandersee, & J. Novak (Eds.), *Teaching science for understanding: A human constructivist view* (pp. 195-211). San Diego, CA: Academic Press.

Dagher, Z., & D'Ambrosio, B. (1996). History, philosophy, and sociology of science and mathematics. In F. B. Murray (Ed.), *The teacher educator's handbook: Building a knowledge base for the preparation of teachers* (pp. 245-260). San Francisco, CA: Jossey-Bass.

Dagher, Z. (1991). Methodological issues in interpretive research: The case of teacher explanations. In J. Gallagher (Ed.), *Interpretive research in science education*. NARST Monograph # 4 (pp. 61-82). Manhattan, KS: National Association for Research in Science Teaching. (Translated to Chinese).

Professional Development Resource:

Erduran, S., Mogaluglu, E., Kaya, E., Saribas, D., Ceyhan, G., & Dagher, Z. (2016). *Learning to teach scientific practices*: *A professional development resource*. Limerick, Ireland: University of Limerick. doi 10.13140/RG.2.2.31352.44806

Invited Publications:

Dagher, Z. & Heering, P. (2015). *Science & Education* in educational perspectives: Recognizing the contributions of Michael R. Matthews. *Science & Education*, 24(7-8), 821-826. DOI 10.1007/s11191-015-9742-1.

Critical Commentaries:

Dagher, Z. & Erduran, S. (2017). Abandoning patchwork approaches to nature of science in science education. *Canadian Journal of Science, Mathematics and Technology Education, 17*(1), 46-52.

Dagher, Z. & BouJaoude, S. (1996). Tailoring science education graduate programs to the needs of All science educators. *Science Education, 80,* 89-9

Dagher, Z., Thiele, R., Treagust, D., & Duit, R. (1993). Comment on analogy, explanation, and education, *Journal of Research in Science Teaching*, *6*, 615-616.

Published Service Contributions

Dagher, Z. (1996). The science classroom as an explanatorium! Guest Editorial, *SMEC Newsletter, 2*, 1-2.

Dagher, Z. (1996). Science, society, and education: A personal outlook. *SciQuest,* 6*,* 6-8.

Dagher, Z. (1995). What makes an analogy successful? *SMEC Newsletter*, 1, 13-14.

Dagher, Z. (1995). Analogies and science teaching. *SMEC Newsletter*, 0, 9-10.

Conference Proceedings

Dagher, Z. & Erduran, S. (2011). A comparative study of the nature of laws and explanations in biology and chemistry. In F. Seroglou, V. Koulountzos, & A. Siatras (Eds.), *Science & Culture: Promise, Challenge and Demand* (pp. 170-176). Proceedings for the 11th International IHPST and 6th Greek History, Philosophy and Science Teaching Joint Conference. 1-5 July, Thessaloniki, Greece: Epikentro.

Dagher, Z. (1996). Current trends in science education and the challenges they pose to the Arab world. In M. Debs (Ed.), *Proceedings of the Second Scientific Conference on the Future of Science and Mathematics Teaching and the Needs of Arab Society* (pp. 294-303). December 19-22, Tunisia. Arab Development Office.

Eichinger, D., Abell, S. & Dagher, Z. (1995). Issues and ideas in developing and teaching a course on the nature of science for science educators. *Third International History, Philosophy, and Science Teaching Conference, Proceedings Volume I* (pp. 326-325) Minneapolis, MN: University of Minnesota.

Dagher, Z. & Cossman, G. (1989). The nature of verbal explanations given by science teachers. In D. Herget (Ed.), *The history and philosophy of science in science teaching*, Proceedings of the First International Conference (pp. 106-112). Tallahassee, FL: Florida State University.

Dagher Z. (1988). Comparison of student attitudes towards science of selected teachers before and after participating in an STS workshop. *Science Education Information Report 61st NARST Annual Conference*. Columbus, OH: ERIC SMEAC, The Ohio State University.

Theses

Dagher, Z. (1989). The nature of verbal teacher explanations in junior high science classrooms. Unpublished doctoral dissertation. University of Iowa, Iowa City, Iowa, USA.

Dagher, Z. (1983). Prevalence of some health misconceptions among fourth intermediate and first secondary students in Beirut. Unpublished master's thesis. American University of Beirut, Beirut, Lebanon.

Reports

Dagher, Z. (1988). Thinking Beyond. In R. E. Yager, *Assessing the impact of the Iowa Honors Workshop on science teachers and students: Appendices*. Iowa City, IA: Science Education Center, University of Iowa.

Dagher, Z. (1988). Perspectives on Science Teaching. In R. E. Yager, *Assessing the impact of the Iowa Honors Workshop on science teachers and student: Appendices*. Iowa City, IA: Science Education Center, University of Iowa.

Dagher, Z. (1988). Science and Society (Adapted from NAEP). In R. E. Yager, *Assessing the impact of the Iowa Honors Workshop on science teachers and students: Appendices*. Iowa City, IA: Science Education Center, University of Iowa.

Research Grants

Awarded:

2023-27 Van Buren, T. (PI), Gallo-Fox, J. (Co-PI), Dagher, Z. R. (Co-PI), *SHARK - Aquatic Soft Robotic STEM Education Kit*. ($650,003)

2015 Linking Science Educators Grant: *Infusing Scientific Practices in Science Education in Lebanon*. NARST: A worldwide organization for improving science teaching and learning through research. ($5000)

2014-19 Co-Investigator with Delaware Team. NSF Supplement to NSF SES: *Becoming the Online Resource Center for Ethics Education in Engineering and Science* (with the National Academy of Engineering, P.I. Rachelle Hollander). ($209,239)

2012 Center for Science, Ethics, & Public Policy, UD. Seed research grant for a project with Robin Andreasen: *Towards a Tighter Connection between Ethics Education and the New Integrated Approach to Science Education*. ($1500)

2011 Seed research grants and travel award from the Delaware Science Ethics and Public Policy Research Group through funds from the National Science Foundation, grant EPS-0814251, for two projects: *An alternative nature of science framework for science education,* and, *Deriving organizing principles for biology education from the philosophy of biology*. ($4000)

2007 International Research Award: *Analysis of Middle School Textbooks in the Middle East*. Center for International Studies. University of Delaware [Deferred to 2008]. ($10,000).

1994-5 National Academy of Education Spencer Postdoctoral Fellowship to study students' construction of explanations (Award $35,000).

1991-2 General University Research (GUR) grant from the University of Delaware to study the process of knowledge construction by children (Award $6000).

1990-1 Research Award from the College of Education, University of Delaware (Award $1000).

Instructional Awards & Grants:

2020-21 Fellow, INSPIRE CS-AI Project, Massachusetts Institute of Technology.

2020-21 Participant, Preparing Computationally Literate Pre-Service Teachers Project Through Professional Development for Teacher Educators. Google 2020 Grant awarded to Chrystalla Mouza (PI).

2015 Center for Teaching and Assessment of Learning (CTAL), University of Delaware (with Chrystalla Mouza and Lori Pollock) *Bringing Computational Thinking to GenEd* ($16,500).

2012 Information Technologies Innovation Grant, University of Delaware. *Using the iPad to teach and learn science* ($1200).

2005 Agilent Technologies (with Danielle Ford) Grant for upgrading the learning technologies for the undergraduate science curriculum courses (Award $25,000).

Travel Awards:

2025 Travel Award to attend the European Science Education Research Association's SIG 8 First International Conference. Bologna, Italy. Center for Science, Ethics, and Public Policy ($600).

2019 Travel Award to attend the Salzburg Seminar. Institute for Global Studies, School of Education, and College of Education and Human Development, University of Delaware.

2017 Globex Travel Award to attend the 14th IHPST Biennial Conference in Ankara, Turkey. Institute for Global Studies, University of Delaware ($1500).

2015 International Travel Award to the Society for Philosophy of Science in Practice conference, Aarhus, Denmark. Center for Teaching and Learning, University of Delaware ($1000).

2014 International Travel Award to present a paper at the 2nd IHPST Asian Regional Conference, Taipei, Taiwan. Center for International Studies, University of Delaware ($1000).

2011 International Travel Award to present at a symposium at the International History, Philosophy and Science Teaching conference, Thessaloniki, Greece. Center for International Studies. University of Delaware ($750).

2009 International Travel Award to present a paper at the European Science Education Research conference, Istanbul, Turkey. Center for International Studies. University of Delaware ($750)

2005 International Travel Award to present a paper at the IHPST conference at the University of Leeds, UK. Office of International Programs and Special Sessions. University of Delaware ($500).

2004 International Travel Award to attend the PBL conference at Cancun, Mexico. Office of International Programs and Special Sessions. University of Delaware ($500).

1992 International Mini-Grant. Office of International Programs and Special Sessions. University of Delaware ($1000).

1988-9 University of Iowa Collegiate Associations Council (UICAC) Student Research Grant to study the nature of teacher verbal explanations in junior-high science classrooms ($750).

Invited Talks/Webinars/Seminars/Panels

Dagher, Z. (2025). Real science, real teachers: Using citizen science to prepare tomorrow's middle school educators. Presentation at a panel focused on Citizen science, Tech Talk Tuesday, University of Delaware, Newark, DE, November 18.

Dagher, Z. (2025). Science without walls: Discovering the scientist in all of us. Guest speaker at the Environmental Issues course at the Osher Lifelong Learning Institute. Wilmington, DE, September 12.

Dagher, Z. (2025). Reflections on my professional journey. Inaugural session in the *Career Steps Webinar Series* organized by the NARST Graduate Student Committee. July 25.

Dagher, Z. (2025). 'Echos' of the Bologna meeting panel discussion (online). European Science Education Research Association's SIG 8 online meeting. May 26.

Dagher, Z., & Metzger, C. (2025). Exploring preservice teachers' engagement in a digital clinical simulation for inclusive science education. Association of Science Teacher Education Equity Committee virtual discussion. May 14.

Dagher, Z. (2021 & 2022). *Why should teachers care about nature of science, and how does it affect their teaching?* Guest speaker in MMSC 604 Methods in Bioscience Education, University of Delaware. December 1, 2021 & November 2, 2022

Dagher, Z. (2021). *Towards a research agenda in nature of science for social justice.* Panelist in webinar organized by Lena Hansson & Hagop Yacoubian, hosted by the International History, Philosophy and Science Teaching [IHPST] Group. April 13.

Dagher, Z. (2017). *Proposing a framework to navigate tensions between science and religion in science education*. Presentation Workshop on Science Education in the Muslim World, organized and hosted by the College of Islamic Studies, Hamad Bin Khalifa University, Doha, Qatar, December 9 & 10. https://hbku.edu.qa/en/news/hbku-cse-science-islam

Dagher, Z. (2017). *Reconceptualizing the nature of science in science education: Premises, challenges and future directions*. Plenary at the International History, Philosophy and Science Teaching Conference, Ankara, Turkey, July 4-7.

Dagher, Z. (2017). *Innovations in teacher education programs*. Guest Speaker at the Integrated Professional Development of Kuwait Conference, sponsored by the National Center for Education Development, Kuwait, March 7-8.

Dagher, Z. (2016). *The power and promise of the expanded family resemblance approach to nature of science*. Plenary at the Limerick Symposium on Nature of Science for Science Education. Limerick, Ireland. October 26-28.

Dagher, Z., Erduran, S., & Kaya, E. (2015). *From scientific inquiry to scientific practices: Redefining teaching and learning of science*. Science and Mathematics Education Center (SMEC), American University of Beirut, Beirut, Lebanon, October 29.

Dagher, Z. (2015). *Integrating technology and engineering design in science and mathematics education.* Keynote speech presented at the First Excellence Conference in Teaching and Learning of Science and Mathematics: STEM. King Saud University (KSU), Riyadh, Saudi Arabia, May 5-7.

Dagher, Z. (2015). *Applications of STEM in the science classroom*. Workshop presented at the First Excellence Conference in Teaching and Learning of Science and Mathematics: STEM. King Saud University (KSU), Riyadh, Saudi Arabia, May 5-7.

Dagher, Z. (2015). *Using images of science to enrich the integrated science curriculum*. Informal seminar with Preceptors at the Interdisciplinary Science and Engineering Laboratory. University of Delaware, January 12.

Dagher, Z. (2014). *Deconstructing the scientific method in science education: What's left?* Plenary session at a National Seminar entitled: Scientific Practices: What are they and how can they be promoted in school science? Bogazici University. Istanbul, Turkey, December 22.

Dagher, Z. (2014). *Opening Pandora's NOS box: The after*math. Invited talk at the Graduate Institute for Science Education, National Changhua University of Education. Changhua, Taiwan, December 2.

Dagher, Z. (2014). *Reconceptualizing the nature of science for science teaching: Theoretical basis and practical implications*. IND, University of Copenhagen, October 29.

Dagher, Z. (2014). *The distinctive nature of biological laws and explanations and its implications to teaching*. University of Flensburg, Flensburg, Germany, October 28.

Dagher, Z. (2014). *Reconceptualizing the nature of scientific practices in pre-service elementary teacher education*. Integrated Science & Engineering Lab Lecture Series: Interdisciplinary International Collaborations, University of Delaware, October 13.

Dagher, Z. (2013). *Beyond the scientific method: Alternatives for science teaching*. Plenary speech presented at the 15th Annual Science and Math Educators Conference, American University of Beirut, Beirut, Lebanon, March 16.

Dagher, Z. (2012). *The relevance of history of biology to teaching and learning in the life sciences: The case of Mendel's laws*. Paper presented at the 9th International Conference for the History of Science in Science Education (ICHSSE). Flensburg, Germany, July 30-August 3.

Dagher, Z. (2008). *The power and promise of action research*. Invited keynote speech at the First Action Research conference in Doha, Qatar, June 21.

Dagher, Z. (1998). *Scientific literacy: A mythical or an achievable goal?* Invited paper at the Science-Technology-Society conference at the American University of Beirut, November 28.

Dagher, Z. (1997). *The dialectic between life experience and the development of thought*. Lebanese University, Faculty of Education I & II. Tahweeta, Lebanon. January 22.

Dagher, Z. (1996). *Do biology majors accept the theory of evolution?* With S. BouJaoude, Science and Mathematics Education Center. American University of Beirut. January 10.

Dagher, Z. (1995). *Teachers' explanations and students' construction of meaning*. Department of Education. American University of Beirut. March 27.

Dagher, Z. (1995). *Analogies in selling*. American Life Insurance Company. Antelias, Lebanon. March 3.

Dagher, Z. (1994). *Analogies and interpretive research*. American University of Beirut. Beirut, Lebanon. January 6.

Dagher, Z. (1993). *Science-Technology-Society: A recent trend in science teaching*. Presented in a symposium organized by the Faculty of Education at the Lebanese University. Beirut, Lebanon. January 30.

Dagher, Z. (1993). *Teachers' verbal explanations of science teachers in middle school*. Colloquium at Faculty of Education (II), Lebanese University, Rowdah, Lebanon. January 13.

Dagher, Z. (1992). *Teachers' verbal explanations in middle school science classrooms*. National Changhua University of Education, Changhua, Taiwan. December 8.

Dagher, Z. (1992). *Qualitative research in science education: Issues & dilemmas*. National Kaohsiung Normal University, Kaohsiung, Taiwan. December 7.

Dagher, Z. (1992). *Current trends in science education*. Chulalongkorn University. Bangkok, Thailand. November 24.

Dagher, Z. (1992). *Classifying the types of explanations offered by science teachers to their students*. Science & Mathematics Education Centre, Curtin University of Technology. Perth, Western Australia. September 10.

Dagher, Z. (1992). *Connections between the nature of science and science teaching*. Faculty of Education (II), Lebanese University, Rowdah, Lebanon. January 29.

Dagher, Z. (1992). *Discussion of Thomas Kuhn's Structure of Scientific Revolutions*. Faculty of Education (II), Lebanese University, Rowdah, Lebanon. January 27.

Dagher, Z. (1991). *Analogies as a type of teacher explanations*. Pennsylvania State University, State College, Pennsylvania. April 26.

Conference Presentations

Dagher, Z. R., & Erduran, S. (2026). *Artificial intelligence and the nature of science: Rethinking school science for a new era.* Round Table Discussion to take place at the annual meeting of the National Association for Research in Science Teaching, Seattle, WA, April 19-22.

Dagher, Z. R., Mouli, M., Gallo-Fox, J., Vahdat Nia, F., & Van Buren, T. W. (2026). *Beyond building: Teacher discourse and the development of elementary students' epistemic engineering practices*. Paper to be presented at the annual meeting of the National Association for Research in Science Teaching, Seattle, WA, April 19-22.

Şahın Kalyon, D. & Dagher, Z. R. (2024). *A Family Resemblance Approach-based drama integration for teaching the nature of science: Insights from pre-service elementary teachers.* Poster to be presented at the virtual meeting of the National Association for Research in Science Teaching, April 9.

Dagher, Z. R., & Metzger, C. (2025). *How do elementary preservice teachers engage with an equity-oriented digital clinical simulation?* Paper presented at a Symposium titled, Preparing 21st-Century Teachers with Digital Clinical Simulations: Advancing Equity and Innovation in Teacher Education, at the annual meeting of the American Educational Research Association, Denver, CO, April 23-27.

Dagher, Z. R., & Metzger, C. (2025). *Exploring elementary preservice teachers' education equity mindsets captured in a digital simulation*. Paper presented at the annual meeting of the American Educational Research Association, Denver, CO, April 23-27.

Dagher, Z. R. (2025). *Affordances of citizen science for developing student understanding of the nature of science.* Paper presented at the annual meeting of NARST, National Harbor, MD, March 23-26.

Dagher, Z. R., Gallo-Fox, J., Mouli, M., Vahdat Nia, F., & Van Buren, T. W. (2025). *Designing research-based STEM frameworks for student-focused holistic aquatic robotics kits (SHARK) for children and adolescents*. Round Table Discussion at the annual meeting of NARST, National Harbor, MD, March 23-26.

Dagher, Z. R. & Erduran, S. (2025). *Artificial Intelligence and nature of science: Exploring the connections for school science*. Paper presented at the European Science Education Research Association's SIG 8 First International Conference. Bologna, Italy, February 27-March 1.

Dagher, Z. R. (2024). *Where is the nature of science in citizen science?* Paper presented at the biennial meeting of the International History, Philosophy and Science Teaching (IHPST) Group, Buenos Aires, Argentina. September 2-6.

Dagher, Z. R. (2024). *School science and the participatory sciences*. Paper presented at a discussion session at the Association for the Advancement of the Participatory Sciences. Virtual Conference. June 3-6.

Şahın Kalyon, D. & Dagher, Z. R. (2024). *Drama and nature of science: An educational design based on Reconceptualized Family Resemblance Approach*. Poster presented at the University of Delaware Visiting Scholar Poster Fair, Newark, DE, April 19.

Dagher Z. R., & Metzger, C. (2024). *Analysis of elementary pre-service teachers' proposed interventions to support student engagement in an equity-oriented simulation*. Paper presented at a Roundtable Session at the annual meeting of the American Educational Research Association, Philadelphia, Pennsylvania, April 11-14.

Dagher Z. R., & Metzger, C. (2024). *Elementary teacher candidates' reflection on their roles as educators after engaging in a digital simulation.* Paper presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Denver, Colorado, March 17-20.

Dagher, Z. R. (2024). *Citizen science as a means to support understanding of cultural heritage.* Paper presented at a Roundtable session at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Denver, Colorado, March 17-20.

Dagher, Z. R., & Turski, T. (2023). *The status of elementary science teaching in the United States: Issues and implications*. Poster presented to the annual meeting of the American Educational Research Association, Chicago, Illinois, April 13-16.

Dagher, Z. R., & Turski, T. (2023). *Elementary school science: Building a case for urgent action*. Paper presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Chicago, Illinois, April 18-21.

Dagher, Z. (2022). How citizen science is revolutionizing the sciences: Implications for school science. Paper presented at the biennial meeting of the International History, Philosophy and Science Teaching Group, Calgary, Canada, July 3-7.

Dagher, Z. (2022). Continuing the discussions on nature of science for social justice: Exploring possibilities for future research and collaborations. Participant in a Roundtable Discussion organized by Lena Hansson and Hagop A. Yacoubian at the biennial meeting of the International History, Philosophy and Science Teaching Group, Calgary, Canada, July 3-7.

Dagher, Z. (2022). Preservice elementary teachers' perceptions of challenges pertaining to integrating computational thinking in science teaching. Paper presented in a symposium titled*, Preparing Computationally Literate Teacher Educators: A Professional Development Approach* (live-virtual format) at the annual meeting of the American Educational Research Association, San Diego, CA, April 21-26.

Dagher, Z. (2022). Analysis of pre-service teachers' reflections on equity-oriented simulations in an elementary science methods course. Brief Paper presented (live-virtual format) at the annual meeting of the Society for Information Technology and Teacher Education, San Diego, CA, April 11-15.

Dagher, Z. (2021). Empowering informed action using an integrated nature of science and socio-scientific reasoning framework. Poster presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research (Virtual), April 7-10.

Dagher, Z. (2020). Negotiating perceived conflict between scientific and religious claims. Paper presented at the Epistemic Insights and Big Questions Conference (virtual), at the University of Oxford, June 22-23.

Dagher, Z. (2019). Using the FRA to NOS framework to support teaching science for social justice. Paper presented at a symposium titled, *Science Education in a Damaged World: Nature of Science and Social Justice,* at the biennial meeting of the International History, Philosophy & Science Teaching Conference [IHPST], Thessaloniki, Greece, July 15-19.

McDonald, C., Dagher, Z., Erduran, S., Kaya, E., Cullinane, A., Kelly, R., Cilekrenkli, A., Aksoz, B., Akgun, S. (2019). Emergent research using the Family Resemblance Approach to nature of science in science education. A symposium presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Baltimore, Maryland, March 31-April 3.

Dagher, Z. (2018). "Like somebody who has seen thousands of trees but has never seen a forest": The critical role of history and philosophy of science in science education. Panel Discussion-Joint session at the History of Science Society and the Philosophy of Science Association meetings in Seattle, Washington, November 1-4.

Dagher, Z. (2018). Preservice elementary science teachers' inclusion of computational thinking concepts in lesson plans. Paper presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Atlanta, Georgia, March 10-13.

Dagher, Z., Mouza, C., & Pollock, L. (2017). Promoting computational thinking in elementary preservice science teacher education. Paper presented at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, San Antonio, Texas, April 22-25.

Dagher, Z. (2016). History and philosophy of science and science education: A symbiotic relationship. Presented in a symposium titled, Taking History and Philosophy of Science to School, an IHPST Cognate Society session presented at the Philosophy of Science Association Biennial Meeting at Atlanta, Georgia, November 3-5.

Mouza, C., Pollock, L. & Dagher, Z. (2016). Infusing computational reasoning into the curriculum. University of Delaware Summer Faculty Institute. Newark, Delaware, June 2.

Dagher, Z, Erduran, S., Kaya, E. & BouJaoude, S. (2016). Infusing scientific practices in science education in Lebanon *a NARST LSEP 2015 project*. Invited paper presented in a symposium organized by the International Committee titled, *Promoting Cross- Culture Science Education Research*, at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Baltimore, Maryland, April 14-17.

BouJaoude, S., Dagher, Z., Refai, S. (2016). The portrayal of nature of science in Lebanese middle school science textbooks. Paper presented as part of a symposium titled, *Global Perspectives on Nature of Science in School Science Textbooks: Representations, Methodologies, Contexts, and Implications*, at the annual meeting of NARST: A worldwide organization for improving science teaching and learning through research, Baltimore, Maryland, April 14-17.

Erdruan, S. & Dagher, Z. (2016). Scientific practices and the nature of science. Paper presented as part of symposium titled: Current challenges about epistemic practices, selected by ESERA for presentation at NARST: A worldwide organization for improving science teaching and learning through research, Baltimore, Maryland, April 14-17.

Lavigne, N.C., Mouza, C., Dagher, Z., Mead, H., Buckley, J., Pollock, L., Cirillo, M., & Roberts, D. (2016). Learning to teach engineering design by being a designer. Poster presented at the annual meeting of the American Association for Educational Research, Washington, DC, April 8-12.

Erdruan, S. & Dagher, Z. (2015). Scientific practices and the nature of science. Paper presented as part of a symposium titled: Current challenges about epistemic practices at the Biennial Meeting of the European Science Education Research Association [ESERA], Helsinki, Finland, August 31-September 4.

Dagher, Z. & Erduran, S. (2015). Characterizing the nature of science: Family resemblance. Paper presented at the Biennial Meeting of the International History, Philosophy & Science Teaching Conference [IHPST], Rio de Janeiro, Brazil, July 22-25.

Erduran, S. & Dagher, Z. (2015). From fragments to wholes in scientific knowledge and its growth in school science. Paper presented at the Biennial Meeting of the International History, Philosophy & Science Teaching Conference [IHPST], Rio de Janeiro, Brazil, July 22-25.

Erduran, S. & Dagher, Z. (2015). Incorporating growth of knowledge frameworks in the science curriculum. Paper presented at the Biennial Meeting of the Society for Philosophy of Science in Practice [SPSP]. Aarhus, Denmark, June 24-26.

Dagher, Z. & Erduran, S. (2015). Reconceptualizing the nature of science for science education. Paper presented at the Biennial Meeting of the Society for Philosophy of Science in Practice [SPSP]. Aarhus, Denmark, June 24-26.

Erduran, S., Dagher, Z., Mugaloglu, E., Kaya, E., Saribas, D. & Ceyhan, G. (2015). Towards a holistic account of scientific practices in science teacher education. Round table discussion held at the Annual Meeting of the American Educational Research Association. Chicago, IL, April 16-20.

Erduran, S., Dagher, Z., Mugaloglu, E., Kaya, E., Saribas, D. & Ceyhan, G. (2015). Defining and understanding scientific practices pre-service science teacher education. Symposium presented at the Annual meeting of the National Association for Research in Science Teaching. Chicago, IL, April 11-14.

Dagher, Z. & Erduran, S. (2015). NGSS Implementation Resources: Averting Blind Spots. Paper presented at the Annual meeting of the National Association for Research in Science Teaching. Chicago, IL, April 11-14.

Dagher, Z. & Erduran, S. (2014). Aims and values of science: Implications for curriculum design and assessment of learning. Paper presented at the Annual meeting of the National Association for Research in Science Teaching. Pittsburgh, PA, March 30-April 3.

Dagher, Z. & Erduran, S. (2014). Reconceptualizing the nature of science for science education: Why does it matter? Paper presented at the 2nd IHPST Asian Regional Conference in Taipei, Taiwan, December 4-7.

Dagher, Z. & Erduran, S. (2014). Aims and values of science: Implications for curriculum design and assessment of learning. Paper presented at the Annual meeting of the National Association for Research in Science Teaching. Pittsburgh, PA, March 30-April 3.

Erduran, S. & Dagher, Z. (2013). The role of scientific aims and values in science education**.** Paper presented at the European Conference on Educational Research (ECER) conference in Istanbul, Turkey, September 10-13.

Erduran, S. & Dagher, Z. (2013). The nature of scientific activities: Theoretical perspectives with educational implications. Paper presented at the European Science Education Research Association (ESERA) Conference in Nicosia, Cyprus, September 2-7.

Dagher, Z. & Erduran, S. (2013). Methods in scientific practices and science education. Paper presented at the Biennial conference of the International History, Philosophy and Science Teaching Group. Pittsburgh, Pennsylvania, June 19-22.

Dagher, Z. & Erduran, S. (2013). Laws and explanations in biology and chemistry: Philosophical Perspectives and educational implications. Paper presented at the Biennial conference of the International History, Philosophy and Science Teaching Group. Pittsburgh, PA, June 19-22.

Dagher, Z. & Erduran, S. (2013). Towards a holistic model of scientific and engineering practices for science education. Poster presented at a national conference for Improving Middle School Science Instruction Using Cognitive Science. Washington, DC, May 21-22.

Dagher, Z. & Erduran S. (2013). Laws and explanations in biology and chemistry: Philosophical perspectives and educational implications. Paper presented at the Annual meeting of the National Association for Research in Science Teaching at a symposium titled: A critical review of HPS scholarship in science Education. Río Grande, Puerto Rico, April 6-9.

Dagher, Z. (2012). Re-imagining nature of science: Implications for policy and research. Paper presented at the Annual meeting of the National Association for Research in Science Teaching, Indianapolis, Indiana, March 25-28.

Dagher, Z. & Erduran, S. (2011). A comparative study of the nature of laws and explanations in biology and chemistry. Paper presented at a symposium I organized titled, New Perspectives on the Nature of Science: The Role of Laws, Explanations and Models in Science Education, at the

International History, Philosophy and Science Teaching conference, Thessaloniki, Greece. July 1-5.

Dagher, Z. & Erduran, S. (2011). The nature of scientific laws in biology and chemistry: Implications for Science Curriculum and Instruction. Poster presented at the Annual meeting of the National Association for Research in Science Teaching, Orlando, Florida. April 3-6.

Dagher, Z., BouJaoude, S. & Alameh, S. (2010). Analysis of nature of science coverage in Egyptian and Lebanese middle school science textbooks. Paper presented at the Annual meeting of the National Association for Research in Science Teaching, Philadelphia, Pennsylvania, March 21-24.

BouJaoude, S. & Dagher, S. (2009). Status of science education in Arab states. Paper presented at the International Science Education Conference, Singapore. November 24-26.

Dagher, Z. (2009). Identifying nature of science concepts in science textbooks: Trends and issues. Paper presented at the European Science Education Research Association. Istanbul, Turkey, August 31-September 4.

Dagher, Z. (2009). Nature of science features in curriculum documents of four Arab countries. Paper presented as part of a symposium I organized titled, Challenges and opportunities for science education in Arab states, at the Annual meeting of the National Association for Research in Science Teaching, Garden Grove, California, April 17-21.

Dagher, Z. (2008). A case for innovation in teacher education programs. Paper presented at the Higher Education Conference in the Arab World, coinciding with the 10th Meeting of the Society of the Deans of Colleges and Institutes of Education of Arab Universities, Doha, Qatar, March 29-30.

Madsen, J., Allen, D., Donham, R., Fifield, S., Ford, D., Shipman, H., & Dagher, Z. (2007). Integrating science content and pedagogy in the earth, life, and physical sciences: A K-8 preservice teacher preparation continuum at the University of Delaware. Fall Meeting, American Geophysical Union, San Francisco, CA, December 10-14.

Dagher, Z. (2007). How frameworks of scientific epistemology inform science education research. Contribution to: Cognitive Perspectives on Epistemology in Science Education. An Interactive Plenary Panel at the Biennial Meeting of the International History, Philosophy, and Science Teaching Group at the University of Calgary, Canada.

Dagher, Z. (2007). The nature of school science inquiry in science education research. Paper presented at the Biennial Meeting of the International History, Philosophy, and Science Teaching Group at the University of Calgary, Canada.

Dagher, Z. (2007). Towards a more inclusive account of authenticity in school science inquiry. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, New Orleans, Louisiana.

Donham, R., Allen, D., Dagher, Z., Fifield, S., Ford, D. Madsen, J., & Shipman, H. (2006). Science education by total immersion: Integrating content and pedagogy in an interdisciplinary Science Semester for Preservice K-8 teachers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, San Francisco, California.

Erdruan, S. & Dagher, Z. (2005). Exemplary teaching of argumentation in science: Case studies of two middle school teachers. Paper presented at the European Science Education Research Association Conference, Barcelona, Spain.

Cohen, E. & Dagher, Z. (2005). An exploratory study of the nature of science in middle school science textbooks. Paper presented at the Biennial Meeting of the International History, Philosophy and Science Teaching Group at the University of Leeds, UK.

Dagher, Z. (2004). Developing the "need to know" in a science curriculum course for prospective elementary teachers. Poster presented at the PBL 2004 International Conference: Pleasure of Learning, Cancun, Mexico.

Dagher, Z. (2004). Engineering science education. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Vancouver, Canada.

Dagher, Z. & Ford, D. (2003). How are scientists portrayed in children's science biographies? Paper presented at the Biennial Meeting of the International History, Philosophy, and Science Teaching Group. Winnipeg, Canada.

Dagher, Z. & Ford, D. (2003). Children's science biographies: How do they represent science and scientists? Paper presented at the Annual Meeting of the National Science Teachers Association, Philadelphia, Pennsylvania.

Dagher, Z. & Ford, D. (2002). Images of science and scientists in children's science biographies. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, New Orleans, Louisiana.

Madsen, J., Allen, D., Brickhouse, N., Dagher, Z., Fifield, S., Ford, D., & Shipman, H. (2001). Science semester at the University of Delaware: Integrated inquiry- and problem-based learning approach to improve the science understanding of future elementary education teachers. Paper presented at the annual meeting of the Geological Society of America.

Madsen, J., Allen, D., Brickhouse, N., Dagher, Z., Fifield, S., Ford, D., & Shipman, H. (2001). Integrating inquiry-based science and education methods courses in a Science Semester for future elementary teachers. Paper presented at the Annual Meeting of the American Geophysical Union, Boston.

Dagher, Z. (2000). A comparative analysis of controversies pertaining to the teaching of biological evolution. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, New Orleans, Louisiana.

Dagher, Z., Brickhouse, N., Letts, W. & Shipman, H. (1999). What is a theory? What is a law? Students' conceptions of the knowledge structure of science. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Boston, Massachusetts.

Brickhouse, N., Dagher, Z., Letts, W. & Shipman, H. (1999). Why things Fall: Evidence, explanation, and warrants for belief in a college astronomy course. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Boston, Massachusetts.

Shipman, H., Brickhouse, N., Dagher, Z. & Letts, W. (1999). Changes in student views of religion/ science. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Boston, Massachusetts.

Brickhouse, N., Dagher, Z., Shipman, S., & Letts, W. (1998). Student growth in understanding the nature of science in a college astronomy course. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, San Diego, California.

Brickhouse, N., Dagher, Z., Shipman, H. & Letts, W. (1997). Teaching and learning about the nature of science in an astronomy course. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Chicago, Illinois.

Dagher, Z. & BouJaoude, S. (1997). College students' generic and specific conceptions of theories. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Chicago, Illinois.

Dagher, Z. (1996). Current trends in science education and the challenges they pose to the Arab world. Second Conference for Science and Mathematics Teaching and the Needs of Arab Society. Tunis, Tunisia (December).

Dagher, Z. (1996). Explanatory Styles in seventh grade science. Spencer Forum. New York City.

Dagher, Z. (1996). A teacher's practices and students' understanding of science: The case of a seventh grade classroom. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, St. Louis-Missouri.

Dagher, Z. & BouJaoude, S. (1995). Scientific views and religious beliefs of college students: the case of biological evolution. Paper presented at the Third International Conference on the History and Philosophy of Science in Science Teaching. Minneapolis, Minnesota.

Dagher, Z. (1995). Issues and ideas in developing and teaching a course on the nature of science for science educators. Participant in a panel discussion at the Third International Conference on the History and Philosophy of Science in Science Teaching. Minneapolis, Minnesota.

Dagher, Z. (1995). Children's spontaneous use of analogies and metaphors. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, California.

Dagher, Z. (1993). On the unique features of teacher analogies in science classrooms. Paper presented at Simpósio Novas Perspectivas no Ensino das Ciências e da Matemática. Lisbon, Portugal.

Dagher, Z. (1993). Does the use of analogies contribute to conceptual change? Paper presented as part of a symposium titled: Using analogies to engender conceptual change, at the Annual Meeting of the American Educational Research Association, Atlanta, Georgia.

Dagher, Z. (1993). Analysis of analogies used by science teachers. Paper presented as part of a symposium titled: Teaching and learning science with analogies, at the Annual Meeting of the National Association of Research in Science Teaching, Atlanta, Georgia.

Bloom, J. & Dagher, Z. (1993). The meaning children attach to the notion of earth and life on earth: A cross cultural study between Canadian and Lebanese children. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Atlanta, Georgia.

Dagher, Z. (1992). Why analogize? Paper presented at the West Australian Science Education conference. Perth, Western Australia.

Dagher, Z. (1992). A comparative study of analogies used by science teachers and scientists. Paper presented at the Second International Conference on the History and Philosophy of science in Science Teaching, Kingston, Ontario.

Dagher, Z. (1992). Philosophical roots for methodological dilemmas in conceptual change research. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, California.

Dagher, Z. (1992). Analysis and synthesis of studies related to the effectiveness of analogies in science teaching. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Boston, Massachusetts.

Dagher, Z. (1991). Analogies in the science classroom: Do they promote learning? Paper presented at the Annual Meeting of the Association for Teacher Education in Europe (ATEE), Amsterdam, The Netherlands.

Dagher, Z. (1991). Analysis of analogies used by science teachers. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago-Illinois. Also presented at the Annual Meeting of the National Association of Research in Science Teaching, Lake Geneva, Wisconsin.

Dagher, Z. (1989). The nature of verbal explanations given by science teachers. Paper presented with George Cossman at the First International Conference on the History and Philosophy of science in Science Teaching, Tallahassee-Florida. Also presented at the 1990 Annual Meeting of the National Association for Research in Science Teaching, Atlanta, Georgia.

Dagher, Z. (1989). The nature of verbal explanations given by science teachers. Paper presented with George Cossman at the First International Conference on the History and Philosophy of science in Science Teaching, Tallahassee-Florida. Also presented at the 1990 Annual Meeting of the National Association for Research in Science Teaching, Atlanta, Georgia.

Dagher, Z. & Cossman, G. (1989). The nature of teacher verbal explanations in junior-high science classrooms. (preliminary findings). Poster presented at the Annual Meeting of the National Association of Research in Science Teaching, San Francisco, California.

Dagher, Z. (1988). Comparison of student attitudes of selected teachers before and after participating in an S/T/S workshop. Paper presented at the Annual Meeting of the National Association of Research in Science Teaching, Lake of Ozarks, Missouri.

Professional Memberships

American Association for the Advancement of Science (AAAS)
American Educational Research Association (AERA)
Association for Advancing Participatory Sciences (AAPS)
Delaware Teachers of Science (DTS)

European Science Education Research Association (ESERA)
International History, Philosophy and Science Teaching Group (IHPST)
National Association for Research in Science Teaching (NARST)
National Science Teachers Association (NSTA)
Phi Delta Kappa (PDK)

Professional Service:

National/International Organizations

2024-2026 Member, Nominating Committee (IHPST).
2024-2025 Member, External Policy and Relations, National Association for Research in Science Teaching [NARST].
2023-Present Member, Advisory Board for *Journal of Educational Sciences* (Qatar University).
2017-2019 Chair, Advisory Board for *Science & Education*.
2015-2017 President, International History, Philosophy and Science Teaching Group [IHPST].
2012-2015 Member, Distinguished Contributions to Research Award Committee, NARST.
2005-2007 Member, Advisory Committee, IHPST.
2002-2005 Member, Board of Directors, NARST.
2000-2001 Member, Election Committee, NARST.
1997-2001 Member, Distinguished Contributions to Research Award Committee, NARST
1994&95 Member, Journal of Research in Science Teaching Awards Committee, NARST.
1993 Invited participant, UNESCO International Forum on Scientific and Technological Literacy for All (Project 2000+). Paris, France (July).

Conference Program Committee

2019 Member , Program Committee for Congress for Logic, Methodology and Philosophy of Science [CLMPS]. Responsible for the newly founded section B.7: Educational aspects of philosophy of science.
2019 Member, Scientific Committee for the 15th Biennial IHPST Conference, Thessaloniki, Greece.
2018 Member, Scientific Committee for the 4th Regional IHPST-Latin America Conference, Santo André, Brazil.
2017 Member, Scientific Committee for the 14th Biennial IHPST Conference, Ankara, Turkey.
2016 Member, Scientific Committee for the 1st European Regional IHPST Conference, Flensburg, Germany.
2015 Member, Scientific Committee for the 13th Biennial IHPST Conference, Rio de Janeiro, Brazil.
2014 Member, Scientific Committee for the 2nd Asian Regional IHPST Conference, Taipei, Taiwan.
2014 Member, International Committee for the 3rd Latin American Regional IHPST Conference, Santiago de Chile, Chile.
1994 Member, Program Committee, NARST Annual Meeting.

Peer review: Manuscripts

2015-Present Editorial Board Member, *Science & Education*
2020 Reviewer, *Canadian Journal of Science, Mathematics, and Technology Education*
2018-2019 Reviewer, *International Journal of Science Education*
2019,20;23,24,25 Reviewer, *Science Education*.
1998-2012 Review Board Member, *International Journal of Science Education*.
2005-2015 Reviewer, *International Journal of Science and Mathematics Education (IJSME)*.
2004-2011 Reviewer, *Science Education*.

2006-2011 Editorial Committee, *Science & Education*.
2004-2006 Review Board Member, *Science Education*.
1994-1998 Editorial Board Member, *Journal of Research in Science Teaching*.
1993-2002 Review Board Member, *Science Education*.
Guest Reviewer, *Research in Science Education*.

Peer review: Grant Proposals

2025 Reviewer, National Science Foundation.
2019 Member, National Science Foundation Review Panel.
2013 Oak Ridge Associated Universities Powe Awards for Junior Faculty.
2012 Proposal reviewer, National Science Foundation.
2009 Proposal reviewer, National Science Foundation.
Proposal reviewer, Australian Research Council.

Peer review: Proposals for professional meetings

1993 Proposal reviewer for Subject Matter Knowledge and Conceptual Change SIG for the annual meeting of the American Educational Research Association.
1995 Proposal reviewer for Division C, Section 3: Science Learning and Instruction, for the annual meetings of the American Educational Research Association.
1998 Proposal reviewer for Strand 8: History and Philosophy of science for the annual meeting of the National Association for Research in Science Teaching.
1998 Proposal reviewer for Division C, Section 3: Science Learning and Instruction, for the annual meeting of the American Educational Research Association.
1999 Proposal reviewer for Division C, Section 3: Science Learning and Instruction, for the annual meeting of the American Educational Research Association.
2006 Proposal reviewer for the National Association for Research in Science Teaching 2007 conference; Strand 13: History and Philosophy of Science.
2010 Proposal reviewer for the National Association for Research in Science Teaching 2011 conference; Strand 13: History and Philosophy of Science.
2011 Proposal reviewer for the European Science Education Research Association 2011 conference.
2011 Proposal reviewer for the National Association for Research in Science Teaching 2012 conference; Strand 13: History and Philosophy of Science.
2013 Proposal reviewer for the National Association for Research in Science Teaching 2014 conference; Strand 13: History and Philosophy of Science.
2014 Proposal reviewer for the National Association for Research in Science Teaching 2015 conference; Strand 13: History and Philosophy of Science.
2015 Proposal reviewer for the National Association for Research in Science Teaching 2016 conference; Strand 13: History and Philosophy of Science.
2016 Proposal reviewer for the National Association for Research in Science Teaching 2017 conference; Strand 13: History and Philosophy of Science.
2017 Proposal reviewer for the National Association for Research in Science Teaching 2018 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.
2018 Proposal reviewer for the National Association for Research in Science Teaching 2019 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.
2020 Proposal reviewer for the National Association for Research in Science Teaching 2021 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.
2021 Proposal reviewer for the National Association for Research in Science Teaching 2022 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.
2022 Proposal reviewer for the National Association for Research in Science Teaching 2023 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.

2023 Proposal reviewer for the European Science Education Research Association 2023 conference; Strand 5: Nature of science, History, Philosophy, Sociology of Science.
2023 Proposal reviewer for the National Association for Research in Science Teaching 2024 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.
2024 Proposal reviewer for the National Association for Research in Science Teaching 2025 conference; Strand 10: Curriculum and Assessment.
2025 Proposal reviewer for the National Association for Research in Science Teaching 2026 conference; Strand 13: History, Philosophy, Sociology and Nature of Science.

External Examiner

2020 Spring Heather McPherson, "Educational curriculum reform: Exploring the liminal experience of experience of in-service science teachers." Doctoral dissertation – McGill University, Quebec, Canada.
2018 Summer Nouf Mohammed S. Albadi, "Science literacy in Saudi Arabia through language analysis of a secondary school physics textbook". Doctoral thesis - The University of Newcastle, Australia.
2014 Fall Mads Paludan Goddiksen. "Philosophical perspectives on interdisciplinary science Education: Characterizing important expertises through a practice oriented analysis of integration and explanation". Doctoral dissertation - Aarhus University, Denmark.
2012 Fall Hagop Yacoubian, "Towards a philosophically and a pedagogically reasonable *nature of science* curriculum." Doctoral dissertation - University of Alberta, Alberta, Canada.
1992 Fall Master's thesis - Curtin University of Technology, Australia.

Other Service

2019-2020 Research-based Professional Learning Community (PLC) Mentor & PD content leader for science teachers, Building Leadership for Change through Immersion Experience (Khbrat, Cohort III). Program sponsored by Ministry of Education, Kingdom of Saudi Arabia.
2018-2019 Research-based Professional Learning Community (PLC) Advisor for science and interdisciplinary teachers, Building Leadership for Change through Immersion Experience (Khbrat, Cohort II). Program sponsored by Ministry of Education, Kingdom of Saudi Arabia.
2004-2019 Member, Environmental Education Committee, Delaware Nature Society.
2013-2015 Member, Delaware NGSS Lead Planning Team
2011-2014 Partner, Delaware Science Coalition, State of Delaware.
2010-2011 Judge, Science Fair, The College School, University of Delaware.
2005-2006 Judge, Science Fair, Bancroft Middle School.
2004-2005 Member, Parent Involvement Advisory Committee, Iron Hill Museum.
1997-1999 Member, Higher Education Committee. State of Delaware.
1993-1994 Advisory board member, Coordinated Thematic Science II Staff Development Program for the Texas Education Agency.
1993 Discussant: Phi Delta Kappa Research Retreat; Lewes, Delaware. April 30.

University Service

1989-1990 Member, Department Program Committee.
Member, Social Studies Search Committee.

1990-1991 Chair, Department Undergraduate Program Committee.
Member, College Committee on Graduate Studies.
Member, Ph.D. Dissertation Committee.

1991-1992 Chair, College Committee on Undergraduate Studies in Education.
Member, University Committee on Undergraduate Studies.
Member, College Committee on Graduate Studies.

Member, Department Undergraduate Program Committee.

1992-1993 Member, University Committee on Undergraduate Studies.
Member, University Science Education Committee.
Member, Department Graduate Committee.
Member, Selection Committee: SMEC, Curtin University of Technology, Perth, Western Australia.

1993-1994 Chair, Science Education Search Committee.
Member, University Library Committee.
Member, Department Promotion and Tenure Committee.

1995-1996 Coordinator, Middle school science NSTA/NMSA curriculum folio for NCATE review.

1996-1997 Member, College of Education Promotion and Tenure Committee.
Coordinator, Science curriculum in the partnership initiative with the Professional Development School (PDS) in Milford, Delaware.
Coordinator, Middle school science NSTA/NMSA curriculum folio for NCATE review.

1997-1998 Member, Biology Education Search Committee, College of Arts and Sciences.
Member, Science Education Search Committee.
Coordinator, science curriculum in the partnership initiative with the Professional Development School in Milford, Delaware.

1998-1999 Chair, Science Education Search Committee, School of Education.
Member, School of Education Promotion and Tenure Committee.
Member, Science Advisory Council, Mathematics and Science Education Resource Center.
Coordinator, Science curriculum in the partnership initiative with the Professional Development School (PDS) in Milford, Delaware.

2000-2001 Member, Committee for Undergraduate Education, School of Education.
Member, Search Committee for Student Teaching Coordinator for the Milford PDS.
Member, Ad hoc Committee for ETE honors major, School of Education.

2001-2002 Member, Ph.D. Working Group.
Coordinator, M.Ed. in Curriculum and Instruction, Science Education specialization.

2002-2003 Member, College of Human Resources, Education, and Public Policy [CHEP] Council.
Member, Ad hoc Committee for Revising the Masters Program, School of Education.
Member, Nomination Committee, School of Education.
Coordinator, M.Ed. in Curriculum and Instruction, Science Education specialization.

2003-2004 Vice Chair, CHEP Council (Fall).
Chair, CHEP Council (Spring).
Chair, Science Education Search Committee.
Coordinator, M.Ed. in Curriculum and Instruction, Science Education specialization.
Moderator, First Annual UD National McNair Scholar conference.

2004-2005 Chair, Science Education Search Committee.
Member, Distinguished Service Committee, School of Education.

Coordinator, M.Ed. Curriculum and Instruction, Science Education specialization.
Advisor, M.I. Program, Science Education Concentration.
Member, Committee to develop and implement a graduate course of study for middle school science teachers, Mathematics and Science Education Resource Center.
Member, Secondary Science Specialist Position Search, Mathematics & Science Education Resource Center.
Faculty Advisor, Coptic Orthodox Youth Association.

2005-2006 Member, Distinguished Service Committee, School of Education.
Coordinator, M.Ed. Curriculum and Instruction, Science Education specialization.
Advisor, M.I. Program, Science Education Concentration.
Member, ITA Selection Committee (Fall Cycle), Center for International Studies.
Presenter, Faculty Forum for Student Teaching (Fall 2005).
Member, PDS Search Committee for a Clinical Professional (science), College of Arts and Sciences.
Faculty Advisor, Coptic Orthodox Youth Association [UD].

2006-2007 [Sabbatical Leave]
Faculty Advisor, Coptic Orthodox Youth Association [UD].

2008-2009 Member, Strategic Action Planning Committee, CHEP.
Member, Faculty Affairs Committee, School of Education.
Member, Human Subjects Committee, School of Education.
Program Coordinator, Ed.D. Science Education Concentration
Acting Coordinator (Spring), MI Program, Science Education Concentration.
Faculty Advisor, Coptic Orthodox Youth Association [UD].

2009-2010 Member, School of Education Institutional Review Board [IRB] for Human Subjects Committee—also Alternate Member to UD HSRB Committee.
Member, School of Education Individualized Promotion and Tenure Committee.
Acting Coordinator (Fall): MI program, Science Education Concentration.
Program Coordinator, Middle School Science Concentration.
Program Coordinator, Ed.D. Science Education Concentration.

2010-2011 Chair, School of Education Individualized Promotion and Tenure Committee.
Member, School of Education Institutional Review Board [IRB] for Human Subjects Committee/Alternate Member to UD HSRB Committee.
Program Coordinator, Middle School Science Concentration.
Program Coordinator, Ed.D. Science Education Concentration.

2011-2012 Member, School of Education Institutional Review Board [IRB] for Human Subjects Committee/Alternate Member to UD HSRB Committee.
Member, Search Committee for Director of Office of International Students & Scholars.
Program Coordinator, Middle School Science Concentration.
Program Coordinator, Ed.D. Science Education.

2012-2013 Member, Faculty Council, College of Education and Human Development.
Member, Search Committee for Director of Office of International Students & Scholars.
Member, ad hoc ETE Committee for revising the student teaching experience.
Program Coordinator, Middle School Science Concentration.

Program Coordinator, Ed.D. Science Education Concentration.

2013-2014 Member, Faculty Council, College of Education and Human Development.
Member, Search Committee for Associate Director for DCTE.
Member, Ed.D. Admissions Committee.
Program Coordinator, Middle School Science Concentration.

2014-2015 [Fall 2014-Sabbatical leave]
Co-organizer, School of Education Colloquium Series.
Member, Ed.D. Admissions Committee.
Member, Search Committee for Distinguished Named Professorship in Energy and the Environment. Office of the Provost
Program Coordinator, Middle School Science Concentration.
Faculty Advisor, Coptic Orthodox Youth Association.

2015-2016 Member, CEHD Graduate Curriculum Committee.
Member, Search Committee for Distinguished Named Professorship in Energy and the Environment. Office of the Provost.
Program Coordinator: Middle School Science Concentration.
Member, School of Education Individualized Promotion and Tenure Committee.

2016-2017 Co-Chair, CEHD Faculty Council.
Program Coordinator, Middle School Science.
Member, School of Education Individualized Promotion and Tenure Committee.

2017-2018 Member, CEHD Faculty Council.
Member, School of Education Faculty Affairs Committee.
Program Coordinator, Middle School Science Concentration.

2018-2019 Member, CEHD Faculty Council.
Member, Educational Leadership Search Committee.
Program Coordinator, Middle School Science Concentration.
Coordinator, Learning Sciences 2nd Year Qualifying Project
Member, Peace Studies Initiative *ad hoc* Committee.

2019-2020 Member, CEHD Promotion and Tenure Committee.
Member, Mathematics Education Search Committee (Continuing Track).
Coordinator, Learning Sciences 2nd Year Qualifying Project.
Program Coordinator, Middle School Science Concentration.

2020-2021 Member, CEHD Faculty Council.
Coordinator, Learning Sciences 2nd Year Qualifying Project.
Program Coordinator, Middle School Science Concentration.

2021-2022 Member, CEHD Faculty Council (Fall).
Program Coordinator, Middle School Science Concentration.

2022-2023 Member, Admissions Committee, Educational Leadership Program.
Program Coordinator, Middle School Science Concentration.

2023-2024 Member, School of Education Individualized Promotion and Tenure Committee.
Member, School of Education Committee on Spousal Hire.
Member, University of Delaware, Institutional Review Board.
Program Coordinator, Middle School Science Concentration.

2024-2025 Member, Advancing Readied Teachers (ART): An Inclusive and Impactful Educator Preparation Partnership at the University of Delaware.
Member, University of Delaware, Institutional Review Board.
Program Coordinator, Middle School Science Concentration.

2025-2026 Chair, Individualized Promotion Committee, School of Education.
Member, Promotion & Tenure Committee, School of Education.
Member, Post Tenure Review Committee, Department of Biological Sciences.
Member, University of Delaware, Institutional Review Board.
Faculty Advisor, Coptic Orthodox Youth Association [UD].
Member, Advancing Readied Teachers (ART): An Inclusive and Impactful Educator Preparation Partnership at the University of Delaware.
Program Coordinator, Middle School Science Concentration.

Courses Taught

EDUC 341 Elementary curriculum: Science
EDUC 441 Teaching science in middle school
EDUC 696 Methods of teaching secondary science
EDUC 751 Advanced methods of teaching secondary science
EDUC 641 Science curriculum and instruction
EDUC 642 Topics in science education: Nature of science in science teaching
EDUC 642 Topics in science education: Science and society
EDUC 642 Topics in science education: Assessment and inquiry
EDUC 667 Participatory science for teachers
EDUC 819 Disciplinary knowledge in the learning sciences
EDUC 843 Proseminar in science education: Research on learning
EDUC 843 Proseminar in science education: Research on teaching
EDUC 843 Proseminar in science education: Research on curriculum
EDUC 897 Curriculum planning and design
SCEN 650 Scientific inquiry for teachers (*Focus on Citizen Science*)

Supervision of Doctoral Research *(in chronological order)*

Bergeron, V. (2003). *The use of computers to teach human anatomy and physiology to allied health and nursing students*. Executive Position Paper.

Scali, J. (2011). *Restructuring the sequence of chemical concepts in the curriculum: The effect on secondary students' understanding of and attitudes toward chemistry*. Executive Position Paper.

Olson, P. (2014). *An investigation into student engagement with an online collaboration platform (Edmodo) in a high school environmental science course*. Executive Position Paper.

LaFazia, D. (2016). *Reframing conceptual physics: Improving relevance to elementary education and sonography majors*. Executive Position Paper.

Makarious, N. (2017). *Designing an educative curriculum unit for teaching molecular geometry in high school chemistry*. Executive Position Paper.

Ndiforamang, N. (2017). *Reconstructing high school chemical reaction lessons to motivate and support conceptual learning*. Education Leadership Portfolio.

Maramante, L. S. (2018). *Scientific knowledge building: A curriculum module to scaffold student learning about the nature of science*. Executive Position Paper.

Rohe, B. (2018). *Review of the University of Delaware's department of biological sciences curriculum goals against national expectations*. Education Leadership Portfolio.

Dao, H. (2019). *Revising a freshman chemistry gas laws unit to enhance conceptual learning and problem solving*. Executive Position Paper.

Tigan, A. (2020). *Streamlining internationalization strategies for the department of education at a mid-Atlantic state university: Context and recommendations***.** Education Leadership Portfolio.

Kansichi, T. (2024). *Music production essentials: Professional development designed for aspiring independent musicians.* Education Leadership Portfolio.

Valenti, M. (2024). *Design and implementation of a ninth-grade biology curriculum unit using socio-scientific issues.* Education Leadership Portfolio.

Supervision of Masters' Research

Bates, L. (2005). *Preservice elementary teachers' judgments about good science teaching in a reform-based university science education curriculum*. Master's Thesis.

Scali, J. (2005). *The impact of an inquiry approach on students' performance in a high school honors chemistry course*. Master's Thesis.

Supervision of Undergraduate Student Research

Cohen, E. (2004). An exploratory study of the nature of science in middle school textbooks. College of Human Services, Education and Public Policy Undergraduate Scholar.

Mintzer, K. (2012). Scientific and engineering practices and crosscutting concepts in a current biology textbook. Independent Study.

Expert Advisor, High School Advanced Placement Research

Almeida, A. (2023-2024). Relationships between eighth-grade students' meta-cognitive awareness and their perceptions of the epistemic practices of engineering. Advanced Placement (AP) Research Project. Newark Charter High School.

Media Mentions

Horleman, C. (2025, December 28). The College School at UD supports STEAM learning with aquatics Project: A University of Delaware research team is helping kids bring robotic sea creatures to life. *Delaware Today*, p. 16.

Henderson, J. (2025, June 30). Swimming with SHARKs. *UDaily*.

Henderson, J. (2025, March 31). Life achievements in science education. *UDaily*.

Howell, J. (2020, February 28). Building trust in science. *UDaily*.

Kukich, D. (2014, October 15). Interdisciplinary team to address global issues in STEM research**.** *UDaily*.