מדע אזרחי : גשר בין בית הספר, הקהילה והמדע

Citizen Science: A Bridge Between School, Community and Science

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A key idea within the learning sciences is that learning is part of everyday life, and not limited to the classroom. This notion has resulted in conceptualizations and designs that bridge where, when, how, why and with whom people learn. At the Taking Citizen Science to School (TCSS) research center, we view school participation in citizen science (partnerships between scientists and non-expert volunteers to advance knowledge, decision making and action regarding real world problems in various domains) as an especially fertile ground for developing such bridging processes. We describe these processes using four main principles that serve as both analytical and design frameworks for school participation in citizen science: Bridge learning among students, teachers and scientists; Bridge in-school and out-of-school learning (with the aid of technology); Bridge school and community learning; Bridge science and data literacies.

This seminar illustrates the realization of three of these principles in the TCSSs research, which are part of the special issue *School Participation in Citizen Science: Bridging schools with Network Society Learning*, forthcoming in *Instructional Science* (Kali, Sagy, Magnussen, & Matuk, forthcoming). The seminar will be presented through short presentations followed by a discussion with the audience (presenters represent larger research teams led by TCSS graduate students):

- **Citizen science: A bridge between school, community and science** (Yael Kali and Ornit Sagy)
  An introduction laying out the theoretical constructs of school participation in citizen science, and presenting TCSS' pedagogical and implementation approach.
- **Integration between informal statistical reasoning, scientific reasoning and nature of science understanding through Citizen Science** (Dani Ben-Zvi and Dina Tsybulsky)

  Citizen science provides a unique pedagogical opportunity for learning scientific contents by engaging students in authentic scientific practices including data analysis. It can afford meaningful learning experiences with statistical reasoning, scientific reasoning and reasoning about the nature of science. Our findings elucidate where the three types of reasoning converge and how they can be integrated and nurtured in the unique context of school-participation in citizen science.
- **Practitioner growth in mutualistic ecologies of citizen science: Three case studies** (Yotam Hod)
  A design-based implementation research (DBIR) in three schools was carried out to develop and examine a unique implementation model to introduce citizen science partnerships into science education. Findings highlighted the unique opportunities for school practitioners not only as means for personal and professional growth, but also for developing renewed expansive conceptualization of their own work as meaningful to audiences above and beyond the school arena.
- **Building mutualistic ecologies in school-based citizen science projects** (Ayelet Baram Tsabari)
  Nine cases of citizen science partnerships in different schools were examined following the first year of implementation. A think aloud Likert-type questionnaire revealed the various motivations, costs, benefits, roles and interactions between scientists and teachers. Findings call for further consideration of the role of citizen science projects in formal education, for a more nuanced definition of the partnerships built around these projects, and for a deeper look at the interactional dynamics within these partnerships.
- **Co-created citizen science: Moving from established to diverse communities** (Tali Tal)

  Ninth grade students were engaged in a co-created, local CS project on fertilization of Irises. We examined the process by which the teacher and her partners, scientists and community members, developed the project and investigated students' learning outcomes. Findings show the battery of scientific practices used by the students, understanding the scientific idea of biodiversity but moreover, their growing interest in science and the environment and the development of pro-environmental behavior and stewardship.

Presenters' Bios

- Yael Kali is a Professor of technology-enhanced-learning at the University of Haifa and director of the Learning In a NetworKed Society (LINKS) Israeli Center of Research Excellence and the Taking Citizen Science to School (TCSS) Center. She explores technology-enhanced learning and teaching at various levels, from junior high school to higher education. Her work focuses on the role of design principles for supporting Computer Supported Collaborative Learning (CSCL). She has served as an Associate Editor for the journal Instructional Science from 2012 to 2020, and has been selected in 2021as a fellow of the International Society of the Learning Science.
- Ayelet Baram-Tsabari is an Associate Professor at the Faculty of Education in Science and Technology at the Technion – Israel Institute of Technology and head the "Applied Science Communication" research group. Founder of the Israeli Science Communication Conference series, and served as an elected member of the scientific committee of the Public Communication of Science and Technology Network (PCST), which aims to improve science communication worldwide. A member of the Advisory Board for the US National Academy of Sciences' LabX public engagement program, and was elected member of the Israel Young Academy (2016-2020). A member of the Israeli Centers of Research Excellence (I-CORE) on "Learning in a Networked Society" and "Taking Citizen Science to School," among other professional activities.
- Dani Ben-Zvi is a professor in statistics education and educational technologies in the Faculty of Education at the University of Haifa, Israel. He is the head of the Department of Learning, Instruction & Teacher Education. His research interests draw upon two central aspects of human life: Statistical thinking and technology. Focusing on these two aspects in his research, he studies (a) students' statistical learning and the development of their statistical reasoning as it occurs in the social context of the classroom; and (b) the role of innovative technological tools in offering new forms of understanding, learning and communicating. He has been pursuing these themes in classroom studies that emphasize inquiry, reasoning, creativity, communication and collaboration, and the use of notations and technological tools.
- Yotam Hod is an Assistant Professor at the University of Haifa Faculty of Education. He is Head of the Educational Technologies Graduate Program, Director of the LINKS Future Learning Spaces, Marie Curie Fellow (2018-2020) studying students' identities as knowledge builders, and co-PI on two grants supported by the Israeli Science Foundation (Learning in a Networked Society; Taking Citizen Science to Schools). In 2019 he was honored by the Mordechai Nisan Early Career Research Award from the Hebrew University in Jerusalem.
- Ornit Sagy is the research coordinator of the TCSS Center. Her expertise is in designing and exploring technology-enhanced learning environments to promote an internal-value-based learning culture. Ornit holds a Ph.D. from the Department of Education in Technology and Science, an MBA in Industrial Engineering, and a B.Sc. in Computer Science from the Technion - Israel Institute of Technology. In addition to her thirteen years of experience as a software engineer in the Israeli and American high-tech industry, she has taught computer science in high-schools, and graduate courses in technology-enhanced learning at the University of Haifa and the Weizmann Institute.
- Prof. Tali Tal is the Dean of the Faculty of Education in Science and Technology at the Technion, and the head of the informal science and environmental education research group. Her research focuses on learning science in informal settings, inquiry-based learning, environmental education and learning with socioscientific issues. She served as an associate editor and as editorial board member of numerous journals. Prof. Tal was the President of NARST. She is one of the PIs of TCSS – Taking Citizen Science to School research center funded by the Israel Science Foundation and the Ministry of Education.
- Dina Tsybulsky is an Assistant Professor and head of the Biology Education research group at the Faculty of Education in Science and Technology at the Technion. Her research interests include inquiry-based biology learning; nature of science and scientific practices; identity, worldviews, beliefs, and attitudes of pre- and in-service teachers. Dr. Tsybulsky has served as the co-chair of the History, Philosophy, Sociology and the Nature of Science research strand and as a member of the Outstanding Doctoral Research Award Committee at the NARST Association. In Israel, Dr. Tsybulsky serves as a member of several committees and as a co-chair of the Israeli Biology Education Research Forum. Currently, she has been a member of the TCSS – Taking Citizen Science to School research center and a PI of several research projects funded by the Israeli Science Foundation and the Israeli Ministry of Education.