Binghamton University professor develops framework for teaching networks

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A framework co-developed by a Binghamton University researcher could help future scientists improve their understanding of all types of networks, from social media channels to beehives.

Hiroki Sayama, director of the Center for Collective Dynamics of Complex Systems and associate professor of systems science and industrial engineering at Binghamton University, co-led a team of over 30 network science researchers, educators, teachers and students to set up a framework that any school can adapt to teach students the concept of a network from the ground up.

"The concept of networks is truly interdisciplinary and knowing about general properties of networks allows students to see common patterns across disciplines, and thereby transcend disciplinary boundaries," Sayama said. "It would be wonderful to see students studying various subjects—languages, history, social phenomena, biological organisms, engineered products, the Internet—all from a common lens of networks."

Sayama, along with co-authors Catherine Cramer, Mason A. Porter, Lori Sheetz and Stephen Uzzo, created seven concepts that characterize any network, ranging from Facebook to food webs. The research was driven by one key question: What should every person living in the 21st century know about networks by the time they finish secondary education? The sooner future scientists know these core ideas, the sooner they can make networks around us—ranging from financial markets to transportation

networks—more efficient, cost-effective and safe, for example.

"Networks can be learned by people of all ages with different learning or instruction methods," said Sayama. "Middle- and high-school-aged students will be best to start learning about networks in a generalized, abstract manner."

The team also created a booklet titled "Network Literacy: Essential Concepts and Core Ideas," with breakdowns teachers can use in the classroom or for planning.

"While they are nearly equally important, we arranged the concepts in the order of how easy and straightforward the concept is," Sayama said. "The earlier concepts are easier to understand for everyone, while the latter ones—especially six and seven—may need more thinking and learning to fully grasp what they mean."

The project was done in collaboration with the New York Hall of Science, the U.S. Military Academy at West Point and the University of Oxford in England. The booklet has been translated into eight different languages so far, including Persian, Japanese and German. The booklet is freely available online at http://tinyurl.com/networkliteracy.

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