Researchers create model of collaborative problem solving

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If you want to get things done in the 21st century, collaboration is key.

To better understand this important skill, two Florida State University researchers joined a team developing a model for collaborative problem solving—coordination between two or more people sharing their skills and knowledge to create a solution to a problem.

Having a model helps describe exactly what researchers are measuring when they observe collaborative problem solving in action and serves as a tool for good decision-making about how to support a person or team. The work will be published in the January print edition of the journal *Computers & Education*.

"For instance, suppose I see that within a team you are really good at pointing out other members' errors but don't contribute anything toward how to go about solving the problem at hand," said Valerie Shute, the Mack and Effie Campbell Tyner Endowed Professor of Education. "Those indicators provide diagnostic evidence toward your personal model of collaborative problem solving and can provide the basis for targeted support."

The researchers proposed a model that combined the cognitive aspects and the social aspects of collaborative problem solving, something they saw as dependent on each other but that other frameworks treated as independent.

Their model includes three main features: constructing shared knowledge, negotiating and coordinating action and maintaining team function. They identified specific behaviors that indicated if someone was practicing skills that contributed to those main features. For example, if a test subject provided a reason to support or refute a potential solution or if they talked about the results the team was working toward, that was evidence they were negotiating and coordinating.

The researchers' goal was to develop a model that applies across various populations and contexts, so it was important to find behaviors that were common to a variety of tasks. To make sure their model was working in different scenarios, they sought two contexts for testing. In one scenario, they tested the model with middle school students who interacted face-to-

face while playing a game for three hours. In the second context, they tested it with college students who communicated through videoconferencing while completing a 20-minute visual programming task.

Their results showed that the model accurately described the behaviors—such as sharing knowledge, establishing a shared understanding and respectful negotiating—that led to successful collaborative problem solving. Further work should refine the model they proposed and test it with a greater variety of tasks, environments and teams, researchers said. It should also address how to monitor progress over time, both within a single testing session and across multiple sessions.

They hope to be able to automate the process, so a computer could provide real-time feedback to people working together.

"For example, if you and I are collaborating together and I do not say anything constructive, a computer could pop up a message saying "Please provide more constructive information to your teammate,'" said Chen Sun, a doctoral student in the College of Education.

In work, school and life in general, collaborative problem solving helps people achieve their goals by working with others. Understanding and assessing how people do this is important for developing collaborative abilities and for future study into this crucial skill.

"Fifty years ago, and up until very recently, people tended to work in hierarchies, with maybe a CEO or a dean on top and individuals working underneath," Shute said. "But two heads are better than one, and with the advent of the internet, connectivity that had previously been limited to physical proximity has no bounds."