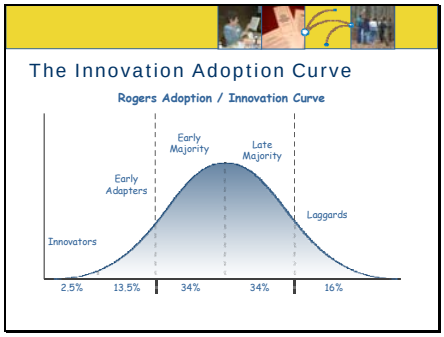
Slide 1

Hello, my name is Bill Penuel. I am Director of Evaluation Research at the Center for Technology in Learning at SRI International. This presentation will review research on how to promote technology integration schoolwide. In this presentation you will learn about research on the diffusion of innovations and how it relates to the topic of teaching with technology in schools. You will also learn about some research findings you can apply to foster the kinds of collaborations among teachers that are likely to facilitate the diffusion of technology use across classrooms in your school.

Slide 2



The study of the diffusion of innovations is a good place to start the discussion about how to promote technology use in schools, because the origins of Everett Rogers' classic theory are in the study of technology adoption in the workplace. Rogers' theory describes a bell curve of adoption, and he came up with a way to describe different people's responses to the introduction of new technology systems. Some people were **innovators,** in that they could almost always be counted on not just to adopt new technologies but to be the first to try them out and find ways to use them that might not even have been anticipated by the designers. This group is always a small group, and is followed by a slightly larger group of **early adopters.** These are also

technology enthusiasts, people always on the lookout for new tools. But they are also opinion leaders, respected in their organizations, which makes them a key to the diffusion of innovations. Most people, however, fall into other categories. **Early majority** people are more thoughtful and cautious than early adopters. They wait to see how a new technology gets implemented in a few places before making the decision to adopt it themselves. **Late majority** people are even more cautious and will only adopt a new technology when they see that the majority of their colleagues is using it. Finally, **Laggards** are traditionalists. They are reluctant to adopt anything new until the new thing itself has taken on the form of "tradition."

Source: Rogers, E. (1995). *Diffusion of innovations*. New York: The Free Press.

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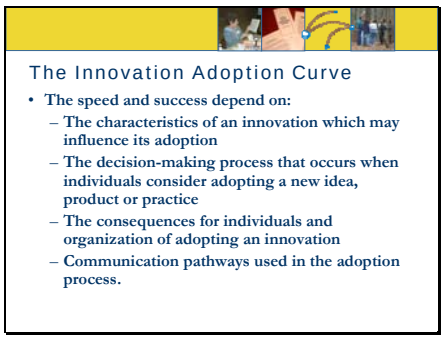

Rogers' adoption curve is familiar to many educators, and it is tempting to use Rogers' labels as an excuse for why it is so hard to get all teachers to use technology. But Rogers' research pointed out that there are other factors that are important in shaping the speed and success of an innovation. These are:
Characteristics of an innovation, such as its ease of use and perceived value
The context of adoption,

particularly whether people have a choice in adopting a new idea or practice
The broader consequences, especially in terms of what individuals and organizations might have to give up to adopt an innovation
The pathways or channels of communication through which expertise is shared about how to implement the innovation

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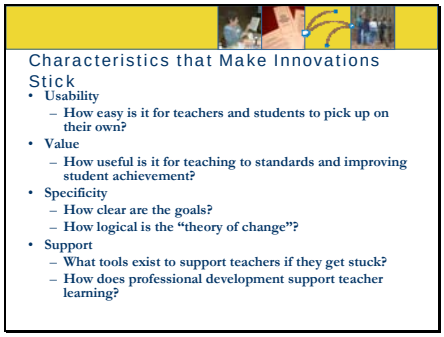

Two groups of researchers at the University of Michigan have examined what makes innovations "stick" in schools. One group, the Center for Highly Interactive Computing in Education, has focused on technology-supported innovations such as handheld computers and Web-based digital libraries. They have concluded that what matters most for these types of innovations are their **usability** and their perceived **value** for meeting educational goals. All too often, technology innovations require teachers to learn an entirely new way of teaching. While these new ways of teaching may be more effective than the ones teachers are using now, having to learn how to use a new technology and a new method of teaching at the same time often proves so difficult that teachers wind up not adopting the innovation. The perceived **value** of an innovation varies somewhat from teacher to teacher, but standards and achievement goals are always

concerns that teachers have today.

Source: Blumenfeld, P., Fishman, B. J., Krajcik, J., Marx, R. W., & Soloway, E. (2000). Creating usable innovations in systemic reform: Scaling up technology-embedded project-based science in urban schools. *Educational Psychologist, 35*(3), 149-164.

A second group has been more focused on schoolwide reforms in general. In their research, they have argued that what makes innovations more or less easy to adopt depends on a clear and logical specification of goals, or the reform's **specificity,** and on the availability of supports for teachers to meet those goals. They point out that more specific innovations are able to give teachers, staff developers, and leaders a better sense of what an innovation should look like in practice and how to prepare teachers to implement it. Support is necessary because inevitably, teachers will encounter difficulties as they try out new tools. Having follow up professional development for teachers is a way for teachers to pose questions and get help after they have begun to try out a new program, curriculum, or technology tool.

Source: Cohen, D. K., & Ball, D. L. (1999). *Instruction, capacity, and improvement*. Philadelphia, PA: Consortium for Policy

Research in Education,
University of Pennsylvania.

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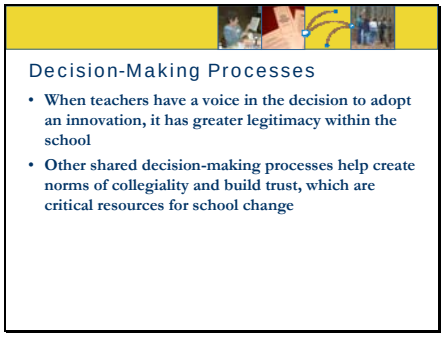

The nature of decision making in a school also plays a role in the diffusion of innovations. School reform advocates know this: for example, to implement the popular Success for All literacy program, 80% of faculty members must vote in favor of its adoption before implementation begins. More broadly, when teachers have a say in curriculum decisions at a school, we know that shared decision-making helps build collegiality and a sense of trust. These in turn not only can be a resource for improved instruction; research shows they also improve student achievement.

Sources:

Bryk, A. S., & Schneider, B. (2002). *Trust in schools: A core resource for improvement*. New York: Russell Sage Foundation.

Desimone, L. (2002). How can comprehensive school reform models be successfully implemented? *Review of Educational Research, 72*(1), 433-479.

Datnow, A., & Stringfield, S. (2000). Working together for reliable school reform. *Journal of Education for Students Placed at Risk (JESPAR), 5*(1, 2), 183-204.
Lee, V. E., Bryk, A. S., & Smith, J. B. (1993). The organization of effective secondary schools. *Review of Research in Education, 19*, 171-267.
McLaughlin, M. W., & Talbert, J. E. (2001). *Professional communities and the work of high school teaching*. Chicago, IL: University of Chicago Press.

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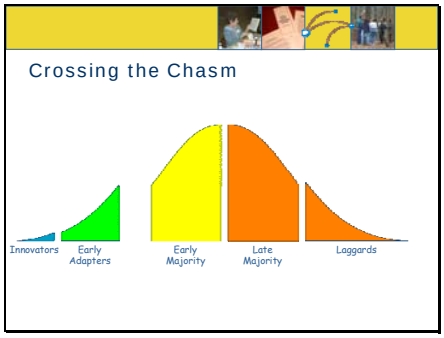

To begin to analyze how communication affects the diffusion process, we need to consider how Geoffrey Moore has altered Rogers' initial innovation adoption diagram. Moore places a "chasm" between early adopters and early majority users, noting that some innovations "get stuck" before they ever get widely implemented within an organization. In many ways, this "chasm" is evident within educational technology, as we know that within our schools, there are some who have taken the challenge of integrating technology into their instruction to heart, and have gone full speed ahead. Others, however, have not changed their practices and are reluctant to adopt new technologies to support their teaching.
One thing that distinguishes innovators and early adopters from others on the innovation

curve is their relative **connectedness** to others in their profession. Innovators are well networked; in Malcolm Gladwell's terms they might be said to be "connectors" who bridge different social worlds and know lots more people than the average person. By contrast, laggards tend to be social isolates, cut off from regular communication and news about their field.

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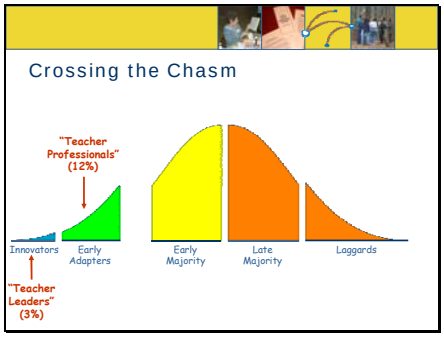

A study five years ago by Margaret Riel and Hank Becker confirms that for educational technology, Moore's model fits the data well. Riel and Becker defined teachers as "teacher leaders" and "teacher professionals" or as "interactive" or "isolated" teachers on the basis of the frequency with which they communicated with others inside and outside their schools about their teaching practice. They found that the distribution of teacher leaders and teacher professionals was similar to Rogers' distribution. There is a very small minority of teachers who are "teacher leaders" and a somewhat larger group of "teacher professionals." The rest of the bell curve, they found, is made up equally of what they called "interactive teachers" – that is teachers with a modest degree of interaction with colleagues around professional matters, and more "isolated teachers."

Source: Riel, M., & Becker, H. J. (2000, April). *The beliefs,*

practices, and computer use of teacher leaders. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans. www.crito.uci.edu/tlc/findings/aera/aera.htm

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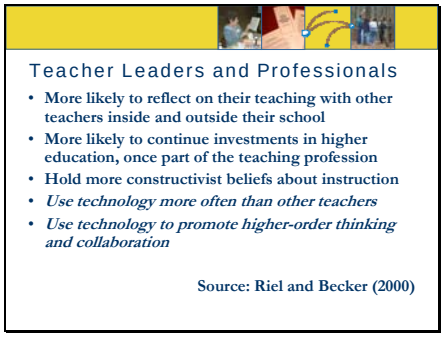

In addition to differing on the dimension of how often they communicate with others, Riel and Becker found that teacher leaders and teacher professionals differed in their teaching practice and in how often they used technology. In short, the differences between these teachers and less interactive teachers are much greater than just in how likely they are to adopt a particular innovation. They bring different teaching philosophies and a different level of commitment to their own learning. In short, as Moore predicts, there's a "chasm" between this group of teachers and others. The question school leaders must ask is, "How can I bridge this chasm?"

Source:
Riel, M., & Becker, H. J. (2000, April). *The beliefs, practices, and computer use of teacher leaders.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

www.crito.uci.edu/tlc/findings/aera/aera.htm

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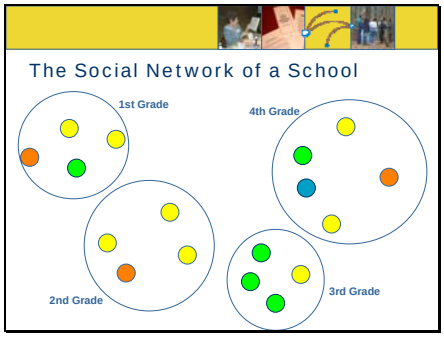
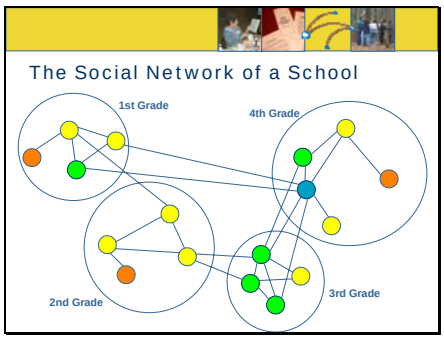


One possible way of bridging this chasm within schools trying to integrate technology is by connecting the early adopters to early and late majority teachers. Consider this way of looking at a school. What you see here are individual teachers as colored dots, grouped by grade level. The color of the dots indicates the type of teacher the teacher is – either a teacher leader (darkest blue), teacher professional (green), interactive teacher (yellow), or isolated teacher (orange). Note that in this hypothetical school, there are some teachers of each category in nearly every grade group. Also note that the relative position of the grade level groupings, as well as the distance between individual teachers, can be viewed as distance in **social space,** not just physical space or space on the page. What you see here is called a **sociogram**, and it is a picture of the social network or the informal social structure of a school.

Slide 10



Let's now overlay patterns of communication on top of the network, so we can see how information and expertise can flow within the school. As you can see, the teacher leaders and professionals tend to be better connected than are the isolated teachers, as represented by the lines that go out from them indicating ties or communication with other teachers.

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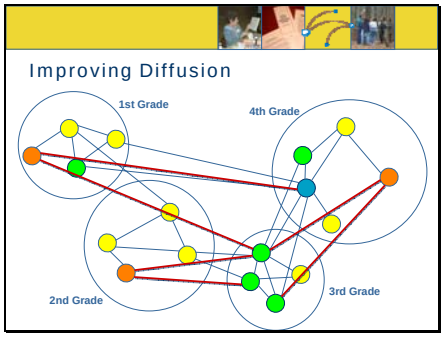
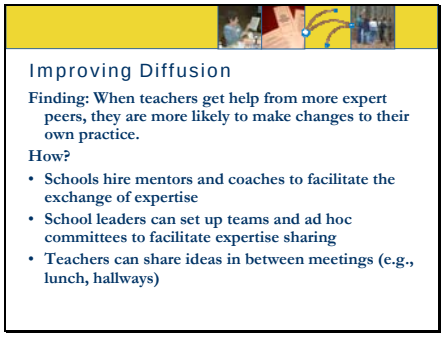


To improve diffusion in this school, one strategy would be to link early adopters to late majority and laggard teachers, as represented by the red lines in this slide. To accomplish this, you might free up time of early adopters to plan joint lessons with the other teachers. In this way teachers less likely to adopt an innovation have the opportunity to benefit from the expertise of early adopters.

Slide 12



So what is the evidence that diffusion of innovation can be improved in this way? At SRI International, we recently completed a study of 21 California schools that were engaged in schoolwide reform efforts. As part of that study, we asked teachers to identify people who had helped them in the past year with specific ideas about how to implement changes to their practice associated with their school's reform. And what we found was that when teachers reported getting help from colleagues who were

already aligning their practice to reform goals, they were more likely to be able to make changes to their own practice. Our research found that the places where teachers got help from colleagues were varied. In addition to help receive in formal meetings, teachers sought and received help from mentors, coaches and colleagues, in hallways, in the lunch room, and in their own classrooms.

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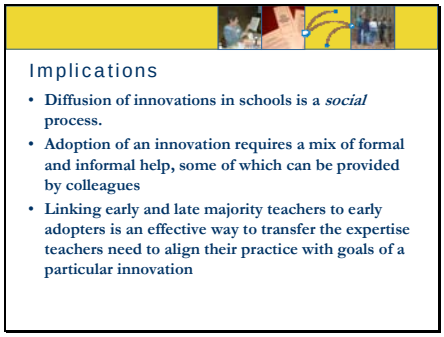

The research presented in this presentation has clear implications for leadership practice. First, the diffusion of innovation in schools is a *social* process requiring lots of interactions among faculty. It's not just a matter of having the "right people on the bus." Nor is formal professional development sufficient. School leaders need to create opportunities for teachers to share expertise, and leaders need to create a culture in which teachers are encouraged to give and seek help. The goal is not to have everyone help everyone; instead, it is to facilitate exchanges between early adopters and other teachers in the school.

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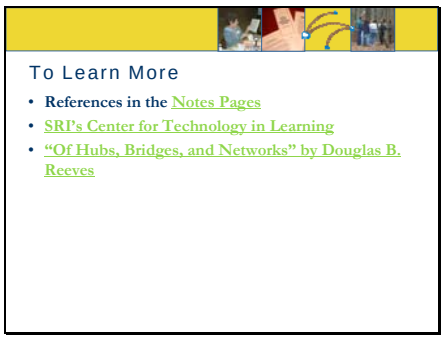

Here are some suggestions if you would like to learn more about this topic. If you print the Notes Pages for this presentation, you will find references to the research that is the basis for this presentation. At the website of SRI's Center for Technology in Learning you can access research papers about the relationship between collaboration and diffusions of innovations. Finally, you may like to read Doug Reeve's article in *Educational Leadership* , "Of Hubs, Bridges, and Networks," in which he explores the diffusion of innovation from a social network perspective. Thank you for taking the time to view this presentation. I hope you will find these ideas useful in your own work.