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# 10. WHY THE TAIL WAGS THE DOG: THE PERNICIOUS INFLUENCE OF PRODUCT-ORIENTED DISCOURSE ON THE PROVISION OF EDUCATIONAL TECHNOLOGY SUPPORT

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Instructors and instructional technologists who promote the adoption of educational technology commonly participate in a discourse pattern focused on technology products, software, and services. Considered in terms of Rogers's (2003) diffusion of innovations model, the technologist works as a change agent, and the innovations in question are the adoption of technology products. When pressed, most instructors and technologists acknowledge that the innovations of interest more properly revolve around changes in our instructional designs, yet the vocabulary of common discourse remains product-oriented. This article describes the pernicious influences of this product-oriented pattern of discourse on the organization and provision of educational technology support services, as well as some of the driving forces that make it hard to talk about educational technology in terms of innovations in teaching.

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## Instructional Technologists Engage in Product-Oriented Discourse

> Scenario: An instructor attends a session at a conference called *Podcasts, Blogs, and Wikis,* where the presenter describes an instructional activity where students collaborate to publish a wiki-book on the public Internet. After the instructor returns home, she inquires with her local technical support providers about wiki solutions, and she starts working with her students to publish a wiki-book in conjunction with a course she is teaching.

The conversations in the preceding scenario are examples of product-oriented discourse. The conference presentation is conceptually organized into three technology product categories, and the resulting technology request for a wiki is expressed in terms of one of those technology product categories. Such a product orientation is the norm in educational technology deliberations. We talk about course management systems, learning management systems, or specific product names such as Moodle. We talk about the participatory Web, Web 2.0, social networking sites, blogs, wikis, blogger.com, MySpace, or Facebook. We talk about videoconferencing, VOIP (voice over Internet protocol). We talk about the software to be installed in our computer labs, and debate whether our institutions should adopt a student laptop program. In our conferences, in our committee meetings, in our strategic planning sessions, in our provision of educational technology services, and in our evaluation efforts, the bread and butter of our educational technology discourse are products and product categories.

**Innovation in Teaching and as Product Adoption**

Rogers (2003) described a well-known model for the diffusion of innovations. This model describes how an innovation is adopted by communities of people, describes the process of adoption, and describes general factors that govern the rate of adoption. Rogers defined an innovation as a new idea, practice, or technology that a potential adopter becomes aware of, has an opinion about, or is thinking of adopting. Innovations spread through communities of potential adopters. Typically, the adoption rate is relatively slow at first, picks up speed as the number of users reaches a critical mass, then finally tapers off after most of the potential user community has adopted the innovation. Rogers labeled those people or organizations who adopt early in the diffusion process innovators or early adopters. Those who are slowest to adopt are called laggards. Some innovations catch fire and diffuse rather quickly, while other innovations spread more slowly. Rogers identified several factors that impact the adoption rate of innovations, which I've characterized in these questions:

- To what extent does the innovation represent an improvement over what I have?
- To what extent is the innovation in line with my needs and values?
- To what extent is the innovation easy to use?
- To what extent is it possible to try the innovation on a limited basis?
- To what extent are other people able to see the results when I adopt the innovation?

Innovations that represent improvements, that are in line with one's needs and values, that are easy to use, that one can try out first, and that other potential adopters can easily see are the innovations that are adopted most quickly.

Our fictitious instructor discovers an innovation at the conference, decides to adopt the innovation, and finally works with her local technology support providers and eventually with her students to implement the innovation.

But what precisely is the innovation being adopted? On the one hand, the innovation lies in the use of wiki technology, and one might say that the instructor has adopted the use of wiki software. On the other hand, it is likely that the instructor has also adopted an innovation in her teaching methodology, assuming the activity that the wiki facilitates is new to her practice. In defining technological innovations, Rogers (2003) wrote:

> we . . . often use the words “innovation” and “technology” as synonyms. A technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome. (p. 13)

In our wiki example, the wiki software is one of the necessary pieces of the puzzle that simplifies the collaborative organization and publication of an online book.

There is a tendency to conflate the technological innovation (the wiki software) with the teaching innovation (publishing an online collaborative book as an educational activity). This is completely natural and understandable. Our wiki instructor has to name the innovation in order to talk about it, and to work with local technical support providers to get the necessary software in place. The technology innovation and the teaching innovation become bundled ideas. Most instructors and instructional technologists, when pressed, recognize that “it’s not about the technology.” The innovations of interest are concerned with the intended instructional outcomes of deploying and using technologies. The intent is to save time, or money, improve student achievement, or make instruction available to a broader audience. Technology facilitates aspects of our teaching environment and practice that make these improvements possible.

Clearly, as instructors and technologists make their technology choices, they must be guided by their instructional values and the instructional challenges they face. If a particular educational technology is a solution, it really pays to have well-articulated problems in mind that the technology is meant to address. As Covey (2006) advised, “Begin with the end in mind.”

**The Pernicious Influence of Product-Oriented Discourse**

In common discourse about educational technology, there is a tendency to conflate the technological innovation with the teaching innovation, or perhaps a tendency to use the name of the technology as shorthand for the technology–teaching innovation bundle. In cases where a technology product is designed to facilitate a relatively specific teaching innovation, it’s natural and useful that the technology product and the teaching innovation would be synonymous. However, in cases where the technology is rather flexible, amenable to facilitating a wide variety of teaching innovations, it becomes less likely that a listener and a speaker will share a common notion of the purposes of the technology product, and it becomes increasingly unclear what the intended outcomes of the technology deployment are.

An example where the name of the technology and the teaching innovation it facilitates are tightly bundled is the software program Calibrated Peer Review (CPR), http://cpr.molsci.ucla.edu/. This Web-based software structures and facilitates a writing activity where students evaluate writing for other students, based on a rubric and sample “calibration” essays, then finally evaluate their own writing. Instructors may either develop their own writing activities, or may use activities contributed from various sources to the CPR library.

CPR is relatively easy to talk to instructors about, and it's relatively easy to understand the application of CPR to teaching and learning situations. The software innovation and the teaching innovation are linked together in a close relationship. You can use the software to do a peer review writing activity for nearly any discipline, but the basic structure of the activity, including the peer review component, will be similar. In a sense, the CPR software encapsulates expertise in conducting a specific kind of learning activity.

Wiki software, on the other hand, is a kind of software that is quite flexible in its application, and can be used to facilitate a very wide variety of activities. Wiki software is what Ehrmann (1995) called "worldware," general purpose software that is not specifically designed to facilitate learning activities. Blogs, word-processing software, statistics software, and PowerPoint are all examples of worldware. Wiki software is probably most familiar to most Internet users through the Wikipedia (http://www.wikipedia.org) Web site, a community-authored encyclopedia powered by wiki software. Entire conferences, such as Wikimania (2007) are devoted to exploring the various applications of wiki software and exploring possible modifications to the software code.

General purpose worldware like wiki software predominates in higher-education teaching situations. The flexibility of general purpose software may lead to widespread adoption of the software, but because the software is flexible enough to facilitate a wide variety of learning activities, figuring out how to apply the software sometimes takes considerable effort, and it's more complicated to identify what teaching innovations are being facilitated, or whether use of the software is much of an innovation at all.

Our example wiki instructor goes to a conference and discovers a teaching activity (writing an online collaborative book) facilitated by wiki software, so both the teaching innovation and the software innovation were explicitly presented and adopted. The presentation of general purpose software doesn't always include details on how the software can be applied in teaching and learning situations. One common way of talking about general purpose software in an educational context is what we might call the *variable application* approach, where the software is taken as organizing theme, and the application of the software is treated as a variable. The variable application approach to the presentation of general purpose software is especially common among information technology (IT) professionals whose job requires familiarity with a wide variety of software.

In cases where the technology is extremely flexible, and the applications of the technology are quite varied, a focus on educational products and technologies runs the risk of leaving out what people who wish to innovate think or hope the results of using the product might be. After all, even a long discussion of possible applications will still be incomplete, and whole books can be written on the application and significance of a few common technologies (see Richardson, 2006). Omitting the intended purposes of technology deployment causes difficulties in three major areas:

- Resource allocation
- Evaluation of our educational technology efforts
- Effecting change in teaching and learning practices

Difficulties in Resource Allocation

Here's a list of various technologies or initiatives that an educational institution might consider. Assuming that funds and staff are limited, which ones are worth pursuing? If you're the administrator who has to ultimately make the funding decisions, which initiatives should be funded?

- Wireless Internet for all classrooms
- Projectors for all classrooms
- Clicker systems
- Providing PowerPoint consulting to students
- Redesigning classroom space to provide work space for student laptops
- A laptop program where all incoming students must purchase a laptop
- A better/different course management system
- A campuswide wiki/blog service
- A video production studio
- A blended learning course redesign initiative
- Video cameras for student checkout
- iPods for every student
- Podcasting facilities for instructors & students
- Audio- and videoconferencing software or facilities
- Laptops for all instructors

When the intended purpose of technology deployment is underspecified, educational technology spending starts to look like a black hole—with so many initiatives we could be pursuing, no amount of money or staff is sufficient. Funding decisions become driven by other concerns, like what other institutions are doing, or who is requesting the funds, or how much the initiative will cost. If budget decision makers are skeptical types, then perhaps maintaining the current educational technology infrastructure will suffice. It's hard to say because the true utility and impact of the technology deployment is not explicit.

Sometimes it is not obvious that an educational technology proposal doesn't really have an intended educational outcome. For example, consider a proposal to install projectors, screens, and resident computers in all classrooms on campus. The "rationale" section of the project proposal explains that this project will make it convenient for instructors to show PowerPoint presentations, Web pages, or digital images in their classrooms. Currently, instructors have to bring a laptop and projector to class, or schedule class sessions in rooms equipped with presentation equipment. Good idea? Maybe, but because the proposal is written in terms of technologies (projectors, computers, PowerPoint) and doesn't spell out what the intended impact on teaching and learning will be, it's not obvious that good things will happen as a result of this project. How can the costs and benefits of the project be weighed?

## Difficulties in Evaluating the Impact of Technology Deployments

When we think about educational technology in terms of products, and as we attempt to weigh the costs of these products against their benefits, decision makers may ask straightforward questions like "What data do we have on the impact on student learning of our laptop program, of our course management system?" Implicit in questions like this is the notion that technology products cause changes in learning, or maybe cause changes in teaching that result in changes in learning. When evaluators focus on technology products, they often run into the "no significant difference" phenomenon, where it appears that the deployment of technology had no impact on student achievement. Clark (1983) famously compared the influence of media on student achievement to the influence of a grocery delivery truck on nutrition. According to Clark, media do not directly affect learning outcomes. Clark (1994, p. 26) suggested that media do not cause learning, but "learning is caused by the instructional methods embedded in the media presentation." Ehrmann (1995, p. 24) summed up Clark this way: "Communications media and other technologies are so flexible that they do not dictate methods of teaching and learning." It is difficult to evaluate a product by itself without looking at how instructors and students are using the technology. And there is often a surprising variety in the ways technology is used. The focus of evaluation should be on the effectiveness of the teaching or learning innovation we intended to facilitate, rather than on the technology itself.

Although Clark made a compelling argument that educational technology doesn't cause student achievement, I see plenty of evidence from my own experience that technology products will make some kinds of activity more likely. PowerPoint facilities will lead to more widespread use of PowerPoint. A course management system with convenient online quizzing facilities will lead to more quizzes done online. There is, of course, a gap between enabling or promoting the use of particular technologies and improvements in teaching and learning. Too often, instructors find expertise or instructional methods embedded in technology products that are not really present. PowerPoint is a good example. PowerPoint is a very flexible tool. You can use it to present a variety of media, images, animations, and movies. From a pedagogical standpoint, PowerPoint is very useful for presenting explanatory visuals of various kinds, charts, graphs, diagrams, pictures of relevant objects or people, graphic organizers, and so forth (see, e.g., jwitte.uiuc-atlas.net/beyond). However, in my experience, this is not the usual PowerPoint lecture. More typical is for an instructor to use PowerPoint to outline her lecture, displaying the text of her outline in bullet points as she speaks. We've all been to that PowerPoint presentation many times, and it's sometimes hard to sit though. Maybe it's how the software is designed, or maybe it's the assumptions that instructors bring to the software, but whatever the cause, the results are not usually compelling. If we were to evaluate the impact of projection equipment in terms of the number of PowerPoint presentations given, we'd almost certainly find success. If the purpose of PowerPoint and projection equipment were part of an effort to present visual explanations to learners, we'd want to look at what instructors were doing with the software. Success would depend on our success in persuading and helping instructors to develop visual explanations.

The remarkable flexibility of most educational software discourages assessment of the impact in teaching and learning. From an institutional level, it's fairly straightforward to discover who is using a given piece of software, but because the application of the technology varies so much, and faculty practice is mostly a solitary endeavor, getting a sense of the overall impact of the software requires the gathering of data from a relatively large number of sources.

## How Product-Oriented Discourse Compartmentalizes Educational Technology Support

When you have a problem with your computer, you call tech support. If you're fortunate, you may have several sources of tech support you can turn to, perhaps the manufacturer of your computer, or the store where you purchased it. Most schools have specialists who manage the network and keep our computers and servers running smoothly, as well as consultants on call who provide workshops and consult with individual instructors on software problems.

Every tech support organization, and every consultant, is faced with determining service levels for the work they do. IT consultants work to provide an appropriate technology environment to enable their clients to accomplish something. Typically, when IT consultants define service levels, it's done in terms of technology products and services. They will fix your hardware, install software, or provide a workshop on using the campus course management system. The realities of IT support demand this. There are too many products, too many technologies for any one person or group of people to be expert in all of them, so specialization among IT support providers is absolutely required. This specialization also encourages clients to pose their support requests in terms of products or technologies, because their request will have to be routed to the appropriate specialist. Typically, it's the IT client or user who specializes in the application domain. IT will help ensure that your word processor is working, but IT will not write your lesson plan for you. The point where IT service ends, where responsibility is handed off to the client, is commonly at the point where the product or technology is applied to solving real problems. Defining service levels in this way is the norm, and it's what both clients and IT service providers have come to expect.

Supporting educational technologies is different. In my experience, when it comes to educational technologies, the customary service hand-off point just described compartmentalizes educational technology support in a counterproductive way. Educational technologies are quite flexible, and when the instructor starts with the product and looks for possible applications, the questions about how to apply the product and for what purposes are not simple ones, and these questions seem to go well beyond the customary technical support hand-off point. The problems of application—designing an activity, conducting meaningful online discussions, and determining the role of online testing in a course design—become too easy to neglect. When the discourse of educational technology support revolves around products and technologies, support requests become technology requests. Instructors rarely make IT requests for help to redesign a course to be more learner-centered, for example.

Putting the customary hand-off point at the point of applying products to instructional matters also makes it more difficult for IT service providers to make resource allocation decisions and develop IT services to meet the needs of instructors. When the hand-off is at the point of application, the IT support specialists may remain unaware of the purpose or impact of the technologies they provide. A common question at IT resource allocation meetings is: "What do instructors want? What are instructors asking for? " When the IT providers are unaccustomed or unable to discern the impact or purpose of the products they support, they have trouble making sense of the various and sometimes conflicting information they have.

Instructors, for their part, remain unaware of the variety of educational technology solutions available and their associated costs. Providing educational technologies can entail substantial investments of time and money, and are typically offered as a shared resources for many or all instructors at an institution. It's hard for IT to propose the right solutions and work with instructors to correctly weigh the costs and benefits when IT is largely unaware of the intended outcomes of technology deployment.

When devising an administrative structure for people who do educational technology support, there are two broad options. If educational technology is thought of as a specific kind of technical support, specializing in particular products or technologies, the logical home for the educational technology group is with other technical support providers. If educational technology support is though of as a specific kind of teaching and learning support, then the natural home for the educational technology group is with the campus teaching and learning center.

## Neglecting the Nontechnical Aspects of Instructional Innovation

When educational technology is looked at as product adoption, if your technology deployment is a solution looking for a largely unspecified instructional problem to solve, it becomes more likely that the nontechnical pieces of the puzzle will be neglected, or that unintended consequences may result. Ehrmann (1994) described "complementary nontechnical efforts" that need to accompany technical initiatives to get to better learning environments.

As an example, consider a hypothetical initiative where several institutions propose to cooperatively provide distance learning courses in "less commonly taught languages." These courses tend to have relatively low enrollment, but are crucial to researchers and students who need to communicate with the target language population or read documents in the target language. Because enrollment is low, the cost of providing these courses is relatively high. By offering these courses using distance learning technologies, each institution hopes to maximize the enrollment in the languages it offers and provide for its own students access to language instruction it does not offer on campus. When viewed as primarily a technical problem, a natural progression in this initiative would be to identify courses, work on the administrative issues of getting courses staffed, scheduled, and approved on multiple campuses, and then identify the technology products that will be needed to deliver these courses at a distance. Videoconferencing rooms, desktop videoconferencing, and course management systems or Web sites are all obvious technologies to consider. Viewed as primarily a technical problem, we identify and implement the technologies needed. Let the instruction begin!

Viewed primarily as an innovation in teaching, different questions arise. If we're talking about four-skills language learning courses (reading, writing, speaking, listening), how will we conduct activities online to foster these skills? Will we want (or need) to adapt our desired learning outcomes to this new teaching environment? If our instructors are accustomed to doing information-gap or other active learning activities in their face-to-face class as a way of developing communicative competence in learners, how can we achieve these outcomes online? Solutions can be developed for these teaching challenges, and technology will be part of the solution, but clearly considerable effort will be involved in redesigning the course, reexamining the course objectives, and developing activities to leverage the strengths and mitigate the weaknesses of the medium. Support for course redesign becomes a vital part of the solution and a significant portion of the overall project budget.

## What Drives Product-Oriented Discourse in Instructional Technology? A World of Products

The technology world is a world of competing products and technologies. We choose among competing products, we develop support facilities for specific products, and vendors sell products. Clearly, product-oriented discourse is necessary when choosing and deploying technology products.

Contrast technology-oriented talk with discourse about teaching and learning. It's often difficult to describe innovations in teaching and learning without resorting to descriptions of what the instructor and students will do, or what software they will use. Even specialists in education struggle to define instructional objectives and how these objectives will be assessed.

Thus, it becomes natural that people use technology product names to describe the technology–teaching innovation bundle. If you want to talk about something, it has to have a name, and it's common to name computer-facilitated activities for the software that enables the activity. Instructors talk about "doing PowerPoint" as something different from lecturing. *Moodle* (http://www.moodle.org), an open-source course management system, becomes the way of talking about doing online course management. *Clickers* becomes the word that people use to describe doing active learning activities in face-to-face instruction using student response systems.

## Avoiding Uncomfortable Aspects of Specifying Intended Outcomes

It is sometimes politically useful to leave the intended impact of a technology product underspecified. By articulating or associating intended teaching and learning outcomes with a technology product, the instructional technologist has entered the debate concerning what instructors should be teaching and how they should be teaching. Culture varies from institution to institution, but many instructors in higher education, especially professors, enjoy a great deal of autonomy in their teaching and may be put off by the talk about what the technology is supposed to accomplish or facilitate. Faculty may see the intended outcomes of technology deployment as an unspoken mandate to standardize practice. Talking about technology adoption rather than the intended outcome of technology deployment offers a way to sidestep this issue.

## Process-Driven Educational Tech Support: A Brief Outline

Armed with an awareness of how discourse about technologies and technology products often drive the process of using technology in instruction, I offer the following suggestion for organizing educational technology support to mitigate the influence of technology talk.

### Intentionally Address Technical, Learning Science, and Disciplinary Aspects of Educational Technology Applications

Work in educational technology involves work in three major dimensions, technical work (work with software, servers, programming/HTML), work in applying learning science, and work in research and teaching in an academic discipline. Indeed, a university is likely to have specialists corresponding to all three dimensions, in the form of server administrators, software training specialists, instructional designers or consultants, and, of course, faculty discipline experts.

An effective educational technology support program aims to improve instruction by purposefully bringing all three dimensions to bear on projects and initiatives. By intentionally considering the nontechnical aspects of improving teaching and learning, educational technologists are better able keep the focus of their thinking and activity where it belongs, namely on the improvements in teaching and learning, rather than on the technologies themselves. The art of educational technology support is to appropriately create that intersection of technology, learning science, and discipline expertise in efforts to improve teaching and learning.

As an example, imagine a meeting where the team responsible for the campus course management system is discussing possible improvements to the course management system (CMS) service. Defined in a narrow sense, along mostly technical lines, the discussion could easily be about modifications or expansions to the features that the CMS provides. Maybe they should work on getting weighted grade categories in the grade book, or work on developing a new activity type that will allow students to submit video responses to questions or prompts. Of course, these sorts of conversations are necessary but, by themselves, not sufficient to lead to improvements in teaching and learning.

When learning science and disciplinary dimensions are added to the question, additional ideas for improvement emerge. Because success is measured in terms of the impact on teaching and learning, rather than "merely" supplying software with specific features, initiatives that investigate how the CMS is actually used by instructors and students become vital. Efforts to integrate all three of the aforementioned dimensions also suggest that training for the CMS should not be narrowly focused on software operation, but should also include examples of authentic disciplinary content, and a discussion of best pedagogical practices in the use of the various functionalities provided. For example, a training session or workshop on how to create quizzes in the CMS would include information about formative and summative assessment, difficulties in monitoring in an online testing environment, appropriateness and usefulness of using test question banks, and instructional design consulting on campus that might be available for help in constructing tests and test questions. The goal is to develop a training session that leads to effective electronic quizzing, not just the use of a software tool. In general, the CMS training becomes training in electronic course management, rather than software training.

As another example of bringing the three dimensions of technology, learning science, and discipline expertise to bear, consider a project where a very large enrollment lecture course is redesigned to use a blended learning format, with the goal of improving student engagement without requiring long-term additional staffing requirements.

Narrowly construed in terms of technology products, educational technology consultations may well proceed on the assumption that responsibility for success in the project lies with the instructors. The technologist demonstrates the typically wide variety of various technologies available at hand, and the instructor picks one or more technologies that appear relevant. The educational technologist then provides the necessary software training and support as the instructor proceeds through "implementation."

When the educational technologist strives to create that useful intersection of technology, learning science, and discipline expertise, the work changes significantly. Ideally, the technologist aims to become part of the course redesign team, and has some awareness of what the total project entails, rather than sticking to a narrow technical piece of the puzzle.

Early stages of the project will involve some investigation into the various possible course design models, and how those models relate to the intended outcomes of the course redesign and the resource constraints of the institution. Because so many course design projects involve technology, the educational technologist can help the team discover other models, both on campus and in the wider teaching community. Early work on the project will also involve assessing the current level of student engagement in the course and assessing the eventual impact of the redesign. Again, the technologist can help the team get any needed consulting and arrange to have appropriate technologies in place to facilitate the assessment.

Development of electronic course materials for the project changes in the team approach as well. Instructors are not always in a position to efficiently acquire and maintain the necessary skills to organize and develop electronic materials, or to develop visual explanations, or multimedia presentations, or electronic simulations. An approach that intentionally facilitates the intersection of technology, learning science, and discipline expertise would seek to address this resource shortage. One possible solution would be to establish a formal group of discipline-specific content developers. These individuals could be faculty, teaching assistants, or staff. They could be full-time content developers, or they could work part-time alongside other teaching or research duties. The goal is to populate that useful intersection, that middle ground between technology, learning science, and discipline expertise.

## Conclusion

This article argues that attention to the intended impact of technology on teaching and learning is useful when choosing and evaluating technologies, and is useful in identifying the entire package of factors, both technological and nontechnological, that are needed to effect change in teaching and learning. However, the natural tendency is to attend to the technological aspect of innovation rather than the teaching and learning aspects because a focus on technology makes discourse simpler, and because the impacts on teaching and learning can be quite varied and difficult to describe, or even unforeseeable.

Making the connection from technology products to the impacts on teaching and learning can be helpful for everyone. For an instructor, distinguishing between the technological and instructional innovation can help the instructor figure out if new technology is really needed. Perhaps the instructional innovation can be effected using technologies already at hand. For budget decision makers, distinguishing between the two kinds of innovation helps keep budget decisions strategic. It becomes easier to choose the appropriate technologies, and to assess their impact on our teaching and learning environments. Finally, for instructional technologists, intentionally bringing in the nontechnical aspects of improving teaching and learning helps keep the focus off the technology and on the intended improvements, which is where it belongs.

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These articles represent important milestones in instructional technology research. Clark argued that media such as computers/software and teaching methods can be distinguished, and that changes in learning outcomes trace back exclusively to teaching methods, rather than the medium used. Clark's work encouraged instructional technology researchers to look beyond the presence or use of technology as an interesting variable.

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