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The future of our field

Introduction

The following two invited articles from Charles M. Reigeluth and Elizabeth Boling and Colin M. Gray of Indiana University are in response to an AECT conference panel sponsored by the Graduate Student Assembly. The panel, called "What is the future of our field? What should we be talking about that we are not?" focused on contributions graduate students should consider making to the field.

In his article, What should we be talking about that we are not?, Reigeluth argues that we, as educational technologists, often talk about technological advances, but allocate little time to how advanced technologies can bring about a system of education that helps every learner reach her or his potential. Such a system can only be realized when we begin to maximize different kinds of learning, move to being "learner-centered rather than teacher-centered, personalized rather than standardized", and look at progress based on student mastery.

In "Design: The topic that should not be closed", Boling & Gray address missing components from design conversations in our field. The authors argue that our discussions on design should not only be limited to validating models or refining instructional design theories. Such limitations in our discourse restrict our growth as a field and permit those "who are active in pursuing such questions to appropriate our position in domains where we have much to offer–namely every place where design, education and technology overlap."

What is the Future of Educational Technology?

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What Is the Future of the Field?

Technological Advances

One does not need a crystal ball to predict that the future of our field will be strongly influenced by advances in technology. Some of the likely advances and their implications are:

The increasing fidelity of virtual worlds or simulations, allowing the design of more immersive and authentic learning environments. This means that experiential methods of instruction, such as problem-based, project-based, and inquiry-based, will become more powerful and prevalent.

The increasing power of tools for communication and collaboration (e.g., social media, wikis, computer-supported collaborative learning), allowing the design of more effective collaboration and sharing for learning anywhere and anytime. This means that collaborative methods of instruction, such as team-based projects, peer tutoring, and peer critique, will become more powerful and prevalent.

The increasing effectiveness of artificial intelligence and intelligent tutoring systems, allowing the design of personalized, just-in-time tutoring and authentic assessment during collaborative projects. This means that competency-based learning, such as practicing a skill until a mastery criterion is met and then immediately using that skill in a project, will become more manageable, more efficient, less expensive, and more prevalent.

Each of these technological advances has important implications for instructional practice, theory, and research. The most important implication is that these advances allow the transformation of education and training systems from the teacher-centered, standardized paradigm, in which learner progress is based on time, to the learner-centered, customized paradigm, in which learner progress is based on learning. This paradigm change promises a quantum improvement in the ability to help every student reach her or his potential (Reigeluth & Karnopp, 2013).

Paradigm Change

Most of our current education and training systems are teacher-centered. All learners move on to the next topic based on time, whether or not they have truly learned the material. This slows down the fast learners, resulting in a huge waste of potential for those most likely to contribute the most to our communities and country. And it forces the slow learners to move on before mastery, resulting in gaps in their learning that make it much harder for them to learn related material in the future and virtually condemning them to flunk out and develop low self-esteem and self-efficacy, leading to increases in crime. This is a hugely wasteful and even inhumane paradigm that was developed for the industrial age – a time when most jobs were manual labor, we didn't need to educate many people to high levels, so we needed schools to sort out the managers and professional people from the laborers. This time-based, sorting-focused system made some sense then.

But now that a) knowledge work has become predominant and b) there is a much greater diversity of kinds of jobs and c) life has become far more complex, requiring all to reach higher levels of learning for a decent quality of life. We need systems of education and training that help every learner to reach her or his potential. This requires a system that is learner-centered rather than teacher-centered, personalized rather than standardized, where student progress is based on learning rather than on time. Technological advances make such a new paradigm more manageable and cost-effective. So the future of our field must, first and foremost, be to help make this paradigm change happen. If not us, then who? We have the knowledge of technology and learner-centered pedagogy that form the foundation of this new paradigm.

But there are other things we need to know to be successful in this endeavor. First, we need to understand basic principles of a systemic change process, including such things as the importance of mindset change, consensus-building, stakeholder ownership, invention, ideal design and shared vision, leadership and political support, readiness and culture, systemic leverage, change process expertise, time and money, and technology (Reigeluth & Karnopp, 2013). Paradigm change is a lot more difficult than piecemeal reforms, so it is important for educational technologists to develop some expertise in this area.

Second, we need to understand the essential building blocks of the learner-centered paradigm of education and training. Most educational technologists already have a good understanding of technology and learner-centered pedagogy (instructional theory). Cornerstones of this pedagogy are an immersive project-based learning environment and just-in-time instructional support within that environment (Reigeluth, 2011, 2012a, 2012b), which were both addressed earlier. But these cornerstones require changes in roles and structures.

Changes in Roles

The learner-centered paradigm requires changes in the roles of learners, teachers, and technology (Reigeluth & Karnopp, 2013).

Roles for learners. First and foremost, learners are active and self-directed. They must be helped to learn to manage their own learning, which includes learning how they learn best. To be self-directed, they must be given a good measure of control over what to learn as well as how to learn it. For example, they could be given choice among several projects that all encompass the same skills and understandings, or they could even be allowed to create their own projects, with approval of the teacher. Second, learners are teachers. One of the best ways to learn something well is to teach it. Peer tutoring and peer critique are two ways of serving this role. Third, learners are collaborators in learning, whereby they help each other to learn.

Roles for teachers. First, teachers are designers of student work options, mostly projects. To the extent that projects become available on the Internet, this role changes more to being selectors of student work options. Second, teachers support student learning during the projects. This may entail designing web-based tutorials, selecting such tutorials, or tutoring students directly. Third, teachers are learners, always learning with the students, from the students, about the students, and for the students. Fourth, the teacher is a mentor for perhaps 20-30 students of, say, three different age levels for several years, to get to know each student well. As mentor, the teacher is concerned about the full well-rounded development of each student.

Roles for technology. In the teacher-centered paradigm, technology's role is primarily to serve the teacher, from PowerPoint presentations to electronic grade books. In the learner-centered paradigm, technology's primary role is to serve the student. We have identified four major roles for technology to support student learning (Reigeluth et al., 2008): 1) recordkeeping, to keep track of what every student has learned as well as the learning styles of each; 2) planning, to develop a personal learning plan for each student that includes setting long-term and short-term goals, selecting projects, assembling teams, assigning roles on the teams, and developing contracts with timelines and resources; 3) instruction, to introduce students to projects, provide a dynamic project environment, provide just-in-time instructional support for learning what the project requires, and help students manage their projects effectively; and 4) assessment, seamlessly integrated with the instructional support, to determine when each student has reached the criterion for mastery of each skill and understanding required in the project (perhaps the last 10 performances of a skill correct in a tutorial, as in the Khan Academy). Of course, these functions must be served within a single system that automatically feeds information from one role to another, which we have called a Personalized Integrated Educational System (PIES) (Reigeluth, Watson, & Watson, 2011; Watson, Watson, & Reigeluth, 2012; 2013). For example, assessment data are automatically fed into the recordkeeping tool, which in turn makes them available for the planning tool, which takes into consideration the options available in the instructional tool, which fully integrates the assessment tool with its instructional support). This single system ideally has an open architecture that allows many individuals and companies to contribute parts to it, much like apps on the iPhone, only the apps are designed to share information with other apps through the system architecture.

Changes in System Structures

Grade levels. The learner-centered paradigm requires that learners be allowed to move on as soon as they have mastered the current material and that they not be required to move on until they have mastered the current material. Such continuous progress is incompatible with the grade-level structure that characterizes the vast majority of educational systems today. Grade levels must be replaced by levels and/or varieties of "personal attainments" (a term used broadly to refer to all kinds of learning and human development) in each subject area and in non-academic areas. These attainments are tracked with the record-keeping system described earlier.

Grades and tests. The learner-centered paradigm is founded on competency-based education wherein a student keeps working on an attainment until it is mastered. Grades are irrelevant because all students keep working until they master what they are learning – the same level of performance for all. Grades are tools of norm-referenced assessment, which is designed to compare students with each other, whereas competency-based education is built on criterion-referenced assessment, which is designed to compare each student with a standard. Therefore, grades must be replaced by "inventories" of attainments – records of individual attainments that each student has learned. These records are kept with the record-keeping system described earlier. Similarly, tests must be replaced by performance-based assessments in which students "practice until perfect," with the practice serving as the test. This is done by the assessment system described earlier. Periodic reuse of what has been learned promotes long-term retention. This is done by the planning system by periodically and systematically identifying projects that require some attainments previously mastered.

Courses, class periods, and classrooms. The learner-centered paradigm organizes instruction around projects (usually interdisciplinary) and individual attainments. There is no added value to having courses. The downside to courses is that the teacher (or the larger system) selects the course content – a large amount of content; there is little flexibility for a learner to make decisions about specific attainments to pursue. Courses must be replaced by projects that are chosen based on their utilization of the particular mix of attainments that the student has selected, with input from teacher and parents. These projects are selected with the planning system described earlier and are implemented with the instructional system described earlier. Similarly, class periods must be replaced by flexible use of time, so learning is not interrupted when learners are experiencing "flow" (Csíkszentmihályi, 1990) and so that learners have the opportunity to manage their own learning. Also, classrooms must be replaced by flexible workspaces where teams of students can work together in immersive virtual learning environments or travel to real-world environments for service learning and community-based education. These are done by the instructional system described earlier.

In sum, the learner-centered paradigm requires such changes in system structures as doing away with grade levels, grades, tests, courses, class periods, and classrooms (Reigeluth & Karnopp, 2013). While educational technologists cannot bring about these changes alone, we must be aware of the need for education and training systems to move in this direction, and we must formulate powerful arguments to help other stakeholders understand the need for this systemic transformation.

What Should We Be Talking about that We Are Not?

We educational technologists talk a lot about advances in technologies, especially wikis, blogs, MOOCs, other social media, virtual worlds, simulations, course management systems, learning management systems, mobile learning, tablets, electronic white boards, and much more. We tend not to talk so much about how these advances allow us to change from the teacher-centered paradigm to the learner-centered paradigm. We tend not to talk enough about ways to create powerful project-based learning environments or the different instructional methods that are needed to maximize each of the different kinds of learning through just-in-time support within the project environment. We tend not to talk enough about how each of those instructional methods can be better implemented with some of those technologies than with others. And we tend not to talk enough about the changes in roles and system structures that are necessary to optimize learner-centered instruction.

Continued preoccupation with advances in technologies and teacher-centered instruction put us at risk of paddling in the backwaters of education and training, failing to meet the needs of our learners, their organizations, and their communities. The health of our field will depend greatly on the extent to which our graduate students, professors, and researchers dedicate themselves to developing more knowledge about:

Instructional theory for the learner-centered paradigm, including a) methods for designing powerful, immersive, project-based learning environments, b) methods for designing powerful, just-in-time instructional supports for different kinds of learning, and c) ways to best interface the two (Reigeluth, 2012b; Reigeluth & Karnopp, 2013).

Design specifications for each of the four major roles for technology in the learner-centered paradigm, plus specifications for information sharing among the four (Aslan, 2012; Aslan, Huh, Lee, & Reigeluth, 2011; Reigeluth et al., 2008; Yildirim, Reigeluth, Kwon, Kageto, & Shao, 2013).

Your decisions can help lead our field into a meaningful future.

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Design: The topic that should not be closed

By Elizabeth Boling and Colin M. Gray, Indiana University

We address design at a comparatively low level in this field compared to other fields in which design takes place (Buchanan et al., 2013). By this we mean that our focus on instructional design models suggests that we consider design mainly at the task level—even if the models are conceptual, they are organized around tasks (e.g., analyzing, evaluating, identifying part-whole tasks, sequencing content from simple to complex, breaking whole learning tasks down into parts and so on). As such, models are only one step removed from daily design activity and they are intended to guide that activity (Boling & Smith, 2014). We can see this in the repeated calls for designers themselves to adapt those models to fit the contexts of their practice (e.g., Reigeluth & Carr-Chellman, 2009). Our ISD models are sometimes discussed as design theories, but while they might reflect design theories, they are not equivalent to design theories.

As we have discussed design models traditionally, the implied—and pervasive—design theory in our field could well be stated as, "any person who follows the steps of a model correctly has a reasonable chance of producing a product (instruction, intervention) that works for its stated goal." This theory can be examined, discussed, tested; and it should be. This theory makes the assumption, for example, that the steps of the ID model adequately address what is meant by design, that there is an embedded concept of adaptation-in-use, and that models by their nature are an attempt toward technical rationalization of design (Dunne, 1997; Gibbons, Boling, & Smith, 2014). Constant reexamination and discussion of theory makes more sense than "validating models" by asking competent designers to use them (and occasionally adapt them), calling this research on design theory.

What we call instructional design theories can be seen, and we do see them, as tools aimed at preventing error on the part of designers—again, also not far removed from the individual activities of designers. Stated as prescriptive theories, they are also hedged as probabilistic. This suggests both that, once validated, they are changed only with difficulty, and that, even when validated, they cannot be relied upon to guarantee success. Viewed as tools instead of as theories, however, these theories could become open to examination and discussion (Stolterman et al., 2008). And once that discussion begins, we propose to question instructional design theories from two perspectives. First, use of theory in practice seems over-reliant on the designer's judgment, in that the designer must perceive when a theory needs adjustment to meet circumstances and decide exactly how to adjust it when little or no guidance is provided for how to do so (Smith & Boling, 2009). At the same time, instructional design theories seem disrespectful of designers' judgment because the existence of such theories implies that the designer is viewed as unable, unless aided by the theory, to assemble basic strategies into patterns that will promote learning.

These tools could further be seen as embedded in a design philosophy so hegemonic that there are pointers to it as a philosophy, and few debates about it. The prevailing and pervasive philosophy in our field holds that the important question for the design of instruction is the degree to which designed interventions are effective and efficient (e.g., Merrill, 2013). Effectiveness and efficiency comprise, arguably, part of the definition of design in any domain (which begs the question why we hold them up as uniquely characterizing our own efforts). Both are, however, contingent in their particulars on multiple situational factors; they are not absolutes and not confined either to learning gain as a measure of effectiveness or to the shortest time possible elapsed between start of instruction and measureable learning gain. Critical examination of what may be the important questions in instructional design apart from these most basic and evident ones is not only largely missing in the field, we have heard it denigrated as an unnecessary waste of time.

What are we missing by limiting our discussions of design to a low level–by assuming there is not much more to be done except to validate models and refine instructional design theories? We argue that this limitation in our discourse also limits our growth as a field and allows those who are active in pursuing such questions to appropriate our position in domains where we have much to offer–namely every place where design, education and technology overlap.

Why are the tools we develop through scholarship used so little outside academic circles, and why does practice barely impact scholarship?

From Rowland (1992) to Boling, et al. (2011) the news from the field