

Over the last 25 years, there has been an extraordinary set of breakthroughs in research on cognitive development and learning. This research falls into three broad categories:

- Robust Learning – long-term memory of facts, concepts and skills; transfer of knowledge into new contexts; and acceleration of future learning.
- Integrative Learning – the integration of curricular and co-curricular educational components and the integration of content across disciplinary boundaries to promote effective application and adaptation of knowledge and its transfer into new contexts.
- Self-regulated learning – understanding and implementing the behaviors needed to ensure effective study, mastery, application, and integration of new material.

During roughly the same period, a companion set of research findings has emerged on the effects of a broad range of human differences on the ability to make successful transitions into university environments. These analyses include research on a wide variety of topics, including:

- How developmental and maturation processes affect traditional-aged college-going populations.
- The challenges confronting adult learners, including veterans.
- The experiences of students from historically under-served populations.
- The challenges and opportunities created by an increasingly internationalized campus community.
- The implications of an increasingly digital student culture for our understanding of the nature of community.

Taken together, these streams of research findings constitute a new and broad-ranging “science of learning” that augments the important insights traditionally associated with the scholarship of teaching and learning (SoTL). To these multiple streams of research we should add an ever-expanding number of tools – such as

high impact practices, adaptive courseware, and learning analytics – that promote engaged learning. The result: a once-in-a-generation opportunity to significantly, rather than merely incrementally, deepen our students’ educational experiences in ways that launch successful learners toward a lifetime of curiosity, creativity, and discovery.

The purpose of the undergraduate student success initiatives at Colorado State – and of the inter-university networks CSU participates in through the Reinvention Collaborative and the Unizin Consortium – is to realize this opportunity by fully leveraging the distinctive capacity of research universities to meet the educational needs of today’s students. That distinctive capacity includes opportunities for research-based educational experiences for undergraduate students *and* the ability to conduct and apply research on learning and persistence to graduation. It is within the reach of research universities to deliver on a promise that their programs of study and curricular and co-curricular educational experiences are based, implemented, and evaluated on research about learning and successful persistence to degree completion.

What is at stake for our students is clear: Neither the U.S. economy nor U.S. educational credentials remain in the uniquely advantaged global positions they occupied for a half century after World War II. Consequently, our students’ post-graduation success will increasingly depend less on having a credential from a U.S. institution and more on what they have actually learned – and the global bar for success is going up. The more competitive the international economic environment, the more daunting our global challenges, the higher the demand for creative behavior driven by curiosity and a self-directed commitment to discovery. It is a situation that will place a high premium on undergraduate experiences that launch students who know how to learn deeply, retain what they learn, and can apply what they retain to new problems in varied and novel situations.

The stakes for research universities and the scholar-educators who work there are no less real. Unless we move successfully to achieve these educational goals, we will find ourselves in a position of extraordinary rhetorical and political disadvantage as a national debate rages over the future of higher education. Given the quality of political discourse today, it is not a good time to be the focus of a contentious, highly politicized national debate. But the situation is actually worse than that. The really scary problem is that we are on the cusp of a national debate about a core aspect of our profession – how much and how well students learn –

without having done our homework on learning research and the tools that are available to support innovation.

The good news, the opportunity, is that learning research suggests both big and small ways in which residential experiences and the distinctive opportunities available at research universities can be used to deepen students' learning, to improve their ability to retain and apply what they have learned, and to increase the percentage of students who complete their degree.

**In almost every case, we are better off educationally if we organize the educational experience for long-term retention and transfer (application), provide rich opportunities for active and experiential learning, and organize those opportunities so that students can find an entry point within their proximate range of understanding. Moreover, there is a growing reason to believe that activities that promote robust, integrative, and self-regulated learning can accelerate intellectual and personal maturation, helping emerging adults emerge faster.**

The ways in which one actually applies these principles will vary with the “facts on the ground.” Several sets of facts seem particularly relevant.

*The mix of student characteristics is changing.* Seven changes stand out.

- First, the percentage of students who are first-generation, low-income, did not speak English at home, and come from a historically underserved ethnic population is going up. These changes in the mosaic of students is being further enriched by increasing numbers of international students. Positive changes all, but it makes it harder for many faculty – especially in courses with large numbers of entering students – to identify where students are and to choose educational strategies that reach as many of them as possible.
- Second, the percentage of college-going students with learning disabilities is rising rapidly (at Colorado State University it is over 10% and climbing).
- Third, faculty are increasingly confronting a more complicated middle cluster of student attributes. Many different dimensions contribute to learning and what works in a course, but certainly students' preparation,

motivation, study skills, and expectations about the legitimate level of intellectual challenge are central. Today, faculty often find a coherent cluster of exceptionally well-prepared, highly motivated over-achievers begging to be challenged at one end of the spectrum and then an educational cliff that separates this group from the rest, who are typically missing one or more key pieces in the mix of preparation, motivation, and study skills.

→ Makes it harder to find the “range of proximate understanding” for each student and harder to create shared expectations about legitimate levels of challenge

- Fourth, the focus on credentialing exacerbates all of the above: Students preoccupied with gaining the credential are much less likely to see high expectations as legitimate
- Fifth, even among the best prepared, there is a body of research documenting a phenomenon called *extended adolescence* (more recently augmented by an *emerging adulthood* discussion) in which neither students nor their families expect students to be responsible for themselves and their choices well into their middle 20s.
- Sixth, in public institutions neither faculty nor students have yet adjusted to the implications of the shift in the cost of education from the state to the student on the culture of expectations in faculty-student relationships.
- Seventh, the growth in the number of students transferring and “swirling” is making it harder to identify what one can safely assume about preparation and course expectations.

***The pressing need to clarify the purpose of face-to-face class time.*** Going back further than most of us can remember, faculty typically used a great deal of class time to transmit information. On-line course materials can release a lot of that time for more active learning, but at present, faculty face an exercise in brinkmanship: If they proceed on the assumption that students have read the on-line materials when large numbers have not, they alienate and lose the unprepared. If they blink when

their bluff is called, they alienate and bore the prepared. We need to work together across campus to change expectations about what happens in-class and what happens outside of class. Here again, we find that there are new tools available. Various educational technology platforms offer help, from the Engage eReader, which provides analytics data on students' page views in assigned texts, to adaptive platforms, which often integrate reading assignments with relevant problem sets or other activities that ask students to apply knowledge gained from linked readings.

***The tension between short- and long-term educational objectives.*** Employers, students, and parents increasingly want students to be turn-key-ready for their first job. But we also know that people change careers multiple times and, even when they don't, over the long haul it is still about educating for life-long learning, as professions themselves now change substantially over the course of one's career. The challenge is to find a way to do both.

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As I mentioned earlier, the multiple streams of learning research and the growth in vetted pedagogical tools – such as high impact practices, adaptive courseware, and learning analytics – are creating an opportunity to take on these teaching challenges in ways that promote students' academic success and degree completion. I would offer several suggestions as you consider the most effective ways to take advantage of that opportunity.

First, your range of “proximate understanding” is as important as your students'. Pay attention to your pedagogical skill sets and what you have the capacity to implement. Books such as *Small Teaching* highlight very modest changes that are grounded in the science of learning that can have big educational effects.

Second, when considering different high impact practices, think very systematically about what you are trying to achieve. For instance, the extensive literature on high impact practices frequently proceeds as if we all know the answer to a key question: “high impact on what?” Is the impact on a form of learning (robust, integrative, or self-regulated)? Is it on a student's sense of belonging or inclusion? Is it on the development of a professional identity and sense of purpose after graduation?

Similarly, when considering learning analytics or adaptive courseware, what exactly are you trying to achieve? For instance, adaptive courseware can be used effectively to get all the students to a spot where the topic in the F2F class is within everyone's range of proximate understanding. It can also be used to promote self-regulated learning behavior by those who have not yet developed university-level study skills. Or is the goal simply to generate more time on task and more engaged learning?

Third, share your goals and the rationale for the pedagogical techniques you have chosen with your students. Make them partners in achieving the course's learning objectives, not the targets of innovation.