MAGNA ONLINE SEMINARS

Transcript

Evidence-Based Teaching in Higher Education: Strategies to Improve Student Learning

A Magna Online Seminar was presented on December 1, 2015 by Dr. Victor Benassi and Dr. Maryellen Weimer

Evidence-Based Teaching in Higher Education: Strategies to Improve Student Learning teaches participants:

- The learning needs of today's college students—and the strategies to address them
- Approaches you can use to help your students get the most out of studying
- Practical strategies for evidence-based teaching
- Various teaching practices and learning strategies that promote a deeper understanding of the information provided
- What "desirable difficulties" are, and why they're so important in the teaching environment
- How to use desirable difficulties when you teach
- Techniques that help students learn more when they read
- Why multitasking doesn't work—and how to explain that to your students
- How to help students create ideal study conditions for improved learning

Editor's note:

This is a written transcript of an audio recording. Our policy is to edit only the occasional unintelligible phrase. Everything else appears exactly as it was spoken.

Welcome to Evidence-Based Teaching in Higher Education: Strategies to Improve Student Learning, cosponsored by Magna Publications and The Teaching Professor. I'm Nancy Kern and I'll be the moderator today. And now I'm pleased to introduce Dr. Victor Benassi and Dr. Maryellen Weimer. Victor Benassi is professor of psychology and faculty director of the Center for Excellence in Teaching and Learning at the University of New Hampshire.

Maryellen Weimer edits the Teaching Professor newsletter and writes the Teaching Professor blog. She is professor emerita of Teaching and Learning at Penn State Berks. Welcome, Victor Benassi and Maryellen Weimer.

Thank you, Nancy. Victor and I are really happy to be here. Evidence-based teaching is a real popular idea right now. And I think a lot of our thinking about it is kind of generic. So I think, Victor, a good way for us to start would be for you to you talk to us just a little bit about what you mean by "the science of learning".

Thanks very much, Maryellen. Great to have this conversation. What we're interested in is: what is the science of learning? And a very simple, straightforward definition is: it's the scientific study of how people learn. In other words, what are the conditions that promote or interfere with student learning?

So the work is being done by what academic disciplines are we really talking about here?

Well, a large percentage of the research that's being published on science of learning is being done by psychologists, and in particular, psychologists who have an emphasis in cognition. But one of the things that the participants will learn if they start delving into this is that people from many other fields and disciplines are beginning to become involved in doing scholarly work about how students learn in their discipline.

Well, my understanding about cognitive psychology research, though, is that most of it is done the labs. And I can kind of hear some participants worrying that research that's done in the labs isn't really very much like what happens in the dynamic milieu of the classroom.

That's a great question. And the fact of the matter is that psychologists have been studying about how people learn since really the late 1800s. And throughout the 20th century, there's been thousands and thousands of studies done about human learning. What had happened, though, over the last, I like to say about 10, 15 years, and really in the last five years; tremendous upsurge. People are beginning to do research on how students learn in real academic courses using real academic materials and authentic assessments of student learning, and to the extent we can, with good research design.

I do want to add kind of a crass question about it, though. Is the science of learning going to make teaching evidence-based? Is this good science? Is this something that teachers can really implement in their practice, with the understanding that these techniques and practices are likely to promote learning to make teaching evidence-based?

The fact of that matter is that we know a lot more about conditions that foster learning in some circumstances in real courses than in others. And that's because this research that you said has been done mainly in research labs needs to be translated to the real conditions of learning and teaching in real academic courses. And that work needs to happen systematically, methodically over time.

We need replication, so that when we start talking about so-called best practices, or as my friend David Daniel calls them, best principles, that these are based on actual demonstrations of the impact of the methods in real courses. And I think that what we're seeing is that systematically, the number of examples of real effects in real classrooms is going up over and over every year.

I know that you recommended an article that I take a look, Victor, one by Dunlosky, which is, I think, an excellent kind of review of research. This is a really good article that is easy for people to read that does a very comprehensive review of some of the practices that we're even going to be talking about on the program today.

Absolutely. Both the article by Dunlosky and colleagues and Henry Roediger and Pyc, both of those are there-- they're detailed. There's a lot of substance in them. But they're readable by people who are not psychologists and clearly not specialists in human cognition. We'll be citing some examples going on further of the book that I edited with Overson and Hakala on Applying the Science of Learning in Education, which is a free online book published by the Society for Teaching of Psychology. In that book, there are lots of chapters written by people that are doing this work that are even more accessible and readable than in those two articles. But they're excellent.

Yes. I wanted to sort of make an endorsement of that book as well. In fact, in the supplementary materials, I included the review of the book that I wrote for the Teaching Professor newsletter. And I'm hoping that the participants picked up on what you said. This is a 300 page, free download available from the link in the supplementary materials.

What that book shows is that the science of learning is a very comprehensive area. And we obviously don't have time to cover everything. So you and I have made some selections, Victor. And we're going to talk about some very specific things about which there are chapters in this book. But they are examples of the kind of work that's been done. And we thought it would be useful to talk specifically, rather than to provide an overview.

And so we decided to start by talking about desirable difficulties as one of the science of learning concepts that we're going to talk about in the program. And then we'll talk about learning from texts and cognitive loads. Now, desirable difficulties is a little bit of educational jargon, but it's actually jargon that kind of makes sense. Because it's really talking about the challenge that's associated with learning. Can you talk to us a little bit about what is “desirable difficulties” with respect to learning?

Absolutely. So Robert Bjork, who's a psychologist at UCLA, is the person that coined this phrase, “desirable difficulties”. And participants can see on the screen there a nice little

summary. What a desirable difficulty is describes a situation in which makes something harder learn initially, but makes it easier to recall and apply later. In other words, a desirable difficulty is set of conditions that, during learning creates errors on the part of students, that slows down their learning, that makes material less accessible initially.

In other words, all the things that students and even a lot of teachers would think, like, we really don't want to do that. We want to make the material accessible. We want to minimize the errors that students make, and so on. And what Bjork has shown in other research is that by creating conditions of difficulty during learning, that what could happen if it's done desirably-- that is to say, you don't go too far, that what happens is that the students in the long term learn the material better. They remember the material longer. And most importantly, they're able to transfer what they've learned to new situations.

So one thing I heard you say, Victor, which I think is a concern to a lot of faculty, is that desired difficulties are related to errors and mistakes. And I think teachers, we try really hard to avoid making mistakes. And one of the things that's a big worry for us is that when students are working with each other, say, in a group, maybe they make a mistake and explain something wrong. So how does that sort of feed into this idea of desirable difficulty?

Right. In fact, if you go back to the mid-20th century, in experimental psychology there was a lot of research that was being done on so-called “errorless learning”. That is, trying to minimize the errors that students make. In fact, so-called “teaching machines” that started way back when were predicated on this idea of having really tiny, little incremental steps that made it almost impossible for students to make mistakes.

It turns out that that kind of learning is actually not desirable. What we see in real classrooms is that students make a lot of mistakes. What we see is that when students do group work together, one student might have a more dominant or authoritative personality, may be able to persuade other students, sometimes persuade them about a wrong answer to a question or a way to think about something.

And so these errors are created. So what we often do as teachers, at least in my experience with teachers I work with and myself earlier on, is that what we try to do is to minimize those kind of errors. Well, what Bob Bjork's research and thinking about this is, is that that's really not a desirable thing to do. So it's not that the errors per se are the problem. The problem comes in as how they're addressed.

And if you read the chapter, very accessible chapter by Mary Clark and Bob Bjork in the book, what they show is that it's critically important to correct those errors. And it's not just correcting the errors, which is critically important, but it's correcting the errors with an explanation about why the wrong answer is wrong and why the right answer is correct or is a better way to think about the topic.

Yeah. So it is a little bit the old adage that there is a lot to be learned from mistakes, and that mistakes are really a desirable difficulty, in terms of learning. Now, in the chapter in the book by

Courtney Clark and Bjork that you just mentioned, there are three examples of desirable difficulties. And I think we'd like to talk about each one of those, because they are very concrete examples and have lots of implications for teachers. In other words, there's lots of things teachers can do to promote students using these techniques, which is going to help them to learn.

So the first one is: spacing study, in the literature often called "deliberate practice". And this is something that most of us teachers are pretty comfortable with, because it's really the antithesis of cramming, which we're always telling students not to do anyway. So talk to us a little bit about how deliberate practice or spacing the study works.

All right, excellent question. Spacing out practice versus cramming or massing practice, I mean, this is something that we've known about for a long time. We as teachers, of course, see this in our students, where they pull the venerable all-nighter to cram. My view about students is that they're always right. That is to say, they do things for a reason. The reasons why students cram is because it works.

But the problem is what it does is it works for the high stakes exam that immediately follows the cramming. The downside to cramming as opposed to spacing is that in the long run, is that it fades away. As Lee Shulman says, it falls away after the high stakes exams, like dry ice. It just evaporates. And it's gone.

And so what we know is that if students are able to space out their practice over trials, it could be days, it could be over hours, ideally over a week, is that they will find that more difficult. They think they've learned the material. Why are you making me space when I can cram, because I learn it better when I cram.

Cramming gives a high sense of knowing. Spacing gives a lower sense of knowing. But on the long term assessments, we can show lots of research results that show that spacing has desirable effects. Shana Carpenter, in the book, has a chapter on spacing and interleaving-- starts on page 131. And she does a beautiful job of reviewing the research studies and showing how teachers can use spacing in the room.

There's a couple of things about spacing that you said which I think are really noteworthy. I mean, one of them is a little bit in teachers' face, I think, because students cram-- what you said, students are right. They do what's effective. The reason that cramming works on exams is that they're being asked a lot of questions where a memorized answer will suffice. And that may not be an answer that is clearly understood. I think that's a really important issue.

And I think this is a great example of a place where teachers can do some things to promote this with students, something simple as saying to students; "well, we talked about that last Thursday. Let's see what you've got in your notes about it. Read to me what you've got in our notes. What does that mean to you"-- so that this is happening across the course.

As I mentioned to you earlier today, we're just completing a study now in an entry-level biology course at the university in which we're having students over the four days prior to an exam, each

day do a small amount of practice, studying the material, and then repeating that over four consecutive days. And what we're finding is that there are significant and large differences on the mid-term exam compared to cramming the material.

Now let's move on and talk about interleaving, because there's a piece of educational jargon that when I read that, doesn't mean a lot to me. So what are we talking about here?

Yeah. Interleaving is the idea of going back to material that was previously covered or addressed. And so the example that I like to use, I've told you again today earlier about teaching a statistics course. Now, when you teach a course in statistics or math, or basically any kind of topic like that, you cover material. You get assessed on it. Then you move to the next topic. You get assessed on it, and so on and so forth.

If there are no final exams in the course, students will do whatever they do. Some will do better. Some will not do as well. But if you give a comprehensive test, everything tends to fall down. What interleaving involves is, so if you are covering a statistical test one on week one, and on week two, statistical test two; on week two, you give them a quiz that covers week two's test and week one.

Right.

When you go to week three; week one, week two, week three. So you keep going back and interleaving the study. Again, the research, as Shana Carpenter's chapter will show, is that you can see really quite profound differences in student performance when the material's interleaved.

I think you had a graph that sort of showed this as well.

Yeah. And we won't have time to go into the details of the research study. But basically, what this is involving in a statistics course, where we compared students that were quizzed each week on a statistical test. And then they got a comprehensive final at the end, versus they got weekly quizzes; the interleaving condition, in which they were each week tested on a test for that week, as well as previous ones. And what you can see there is a huge difference in performance on the comprehensive final. And we've seen this now in four or five statistics classes.

Yeah. OK, well, let's talk about the layout of desirable difficulty, and that is testing as in retrieval practice. Testing is not something that's very popular with students, so--

Yeah. And we're, of course, not talking about testing here as assessment. But we're talking here about testing really as a way to learn the material. Probably not using the word “testing” might be a good practice. We like to use the words “retrieval practice”. But basically, the idea is to give students the opportunity to practice retrieving material that had been previously studied. And that can be done by test questions. But it can be done by other kinds of questions, like “what I want you to do now is think about the material you just read in this part of the chapter and try to produce as many ideas as you can recall from that material”, and so on.

We have data on well over 3,000 students from all over the United States, and actually in a number of other countries, that show that if students are given a choice between re-reading material versus engaging in retrieval practice the night before the exam-- you have one choice. You can either re-read and study the material that way, or engage in retrieval practice. Between 70% and 80% of the students pick re-reading.

That is not a desirable difficulty. Students think it's a good thing to do. The more they re-read it, the more they think they know. And retrieval practice is hard, because you also learn what you don't know. We see huge differences in performance down the line with retrieval practice. You know, Pyc and Roediger have a chapter in the book on p.78. It's a beautiful summary, teacher-ready summary, of how retrieval practice can be used in academic courses.

Excellent. So I think the thing about the desirable difficulties that I think is helpful is that when we talk about spacing, interleaving, and testing, we are talking about very concrete evidence-based practices. And these are things which I think teachers can really share with students, and by the way they design instruction in class, incorporate these, and that those will have some positive effects on student learning.

So we should probably move to our second example after desirable difficulties. What we want to talk about are some potent techniques for learning from text material. And the reason that we decided to talk about this particular strategy is the fact that so many of us are dealing with students who really do not have very good reading skills. You're already sort of alluding to that, and that when students are reading the text, it's like their eyes are touching the words on the pages, but nothing else is happening.

And again in the book, the chapter by McDaniel and Nguyen, which is highlighted on the screen, it catches your attention right away. Because they sort of point out that the two favorite strategies that student use, re-read and highlighting, are really not very effective. So talk a little bit about why re-reading doesn't work and what an alternative might be, Victor.

What re-reading does is it creates a high sense of knowing. McDaniel published a paper a few years ago that showed in like maybe 15 experiments comparing re-reading the material versus reading it once, on exams that followed that and a whole variety of experimental manipulations. And basically, what he found in all these is; in one of them, re-reading led to better performance. In one of them, reading it once led to better performance. And in all the rest, there was no difference.

So what happens with re-reading is; the more you re-read, you get a high sense of knowing. I mean, the people in the audience know that, of course, if you keep re-reading stuff, you can even begin to anticipate the next thing that's going to come, the next sentence. So it creates a high sense of knowing. So what students believe is that when they don't do well on a test and they go in, they go, oh, I don't understand. Because I've re-read the material 20 times and I studied, is they get a sense of knowing. But it, in fact, doesn't lead to better performance.

Comparing that to retrieval practice, I mean, it's hands-down a benefit. Highlighting and underlining is problematic on many levels. I mean, surely if key concepts are highlighted, they can surely send a signal to students about what to focus on. But the problem is that when students do it themselves, first of all, do what they highlight, does that match what it is that you as a teacher think the critical concept is?

So we've done studies that show that what students identify as the key concepts are often not what the teachers are going to assess. So students are not very good judges of that. And so what they tend to do is they tend to highlight. And then what do they do? They go in and memorize and re-read what they highlighted, which is like a double whammy.

And they highlight so much. I mean, sometimes it'll be an entire page that ends up being highlighted. So we have another question here about-- we talked a little bit about the highlighting. We haven't talked about note taking from reading text. Is that a strategy you can recommend to students? Is there some evidence behind that?

Yeah, there actually is a-- I wouldn't say a substantial, but there's clearly a growing applied research literature, a lot of research done over the years on note taking, but real research studies and real courses as a more recent phenomenon. This is a complex question. And there's no simple, straightforward answer. Is it good or not good to do?

What we know is that if low skill students or low background knowledge students take notes on their own, then take test, or they're given a structured outline, a so-called empty outline to take notes, and then take a test, what we know is that they will do substantially better when they're given an empty outline as a structure than when they do it on their own.

By the way, with high skill students, high knowledge, background knowledge students, is that you often get what the experts call an “expertise reversal effect”, is that teachers giving structured outlines to high skill often actually leads to poorer performance. The reason for that is high skill students also like to follow directions. They follow the instructor's directions for the outline, but it's not what their preferred but really successful method is. So there is an example of where note taking can be beneficial differentially for high skill or low skill.

But what I didn't hear you saying was that what a lot of students are asking, and that is for a set of the teacher's notes or the PowerPoints from the presentation.

Yeah, yeah, not a good idea on so many levels.

It seems like the sort of common sense answer is that the notes make sense to the teacher. That doesn't necessarily mean they're going to make sense to the students. And so if something in a teacher's set of notes doesn't make sense to the students, it seems to me the default that it's just memorization without understanding.

Right. And if the notes are a detailed encyclopedic presentation, then what it is, is it's a text. And you're giving them a text.

Right.

And what they're going to do with that text is the same thing they do with other texts, which is to re-read it, and to underline it and highlight it, and so on. I mean, this is a topic we could spend another whole hour on.

Well, what we basically have said is that re-reading, highlighting, aren't very successful. But we're dealing with students that don't have good college level reading skills. So what would you recommend that might help those students develop reading skills as they are doing the reading for the course?

And there's some research that's actually being done and has been done in science areas that shows actually some beneficial effects of a certain kind of pedagogy for reading skills. That, again, is a topic that we could go off on in quite detail. But what we know is that the methods that teachers use to instruct students are not very beneficial to help them, either with their reading skills or to accommodate for them.

And so the approach that's used by McDaniel, the so-called read, recite, and review method-- which what it is, it's sort of a version on the old SQR3 approach, which has been found to be very effective. What McDaniel shows is that the trouble is that students don't do it. So he's got sort of a more brief way to try to do this. And you can go look at the chapter in the book for details about how to implement such a method in your class.

My advice would be, of course, is that don't just tell students to do it, because what will happen is some will and some won't. And usually it's the students that need it the least that will do it. But then structure it so that there's some low stakes involved, like I had said before about the spacing, by having low stakes for spacing out study.

Now, what we've focused on in our work is not trying to improve students' reading, but rather to try to come up with interventions that can actually help the performance of poor students. So what you see here on this slide is that this is in a course which was an upper division course in consciousness. We've done this same study in an introduction to chemistry course and found exactly the same results, is that if you take low skill readers-- here, we're using the SAT critical reading. We've also used the Gaits-MacGinitie reading test.

You take low skill students that are below the midpoint on the reading skills, and you give them a test compared to high skill, you'll see about a 15%, 20% difference on our studies, controlling for other background characteristics. In other words, it's not just ability. What we do in this study is that we give students with their reading material-- in this case, research articles-- guiding questions to answer.

On the weeks where they answer those guiding questions versus they don't-- the guiding questions, no guiding questions-- on the mid-term exam, what you see the low skill SAT people, when they got the guiding questions, they performed over 12% better on mid-term-- not the same questions, but conceptually-related questions-- than when they didn't. Go to the next one, what

you see, which we see over and over again, is that the high skill students, it makes no never mind. They've got it figured out. Whatever it is, they've got it figured out. We've seen this over and over. And when there is a difference, it's usually the instructor intervention leads to a drop off in performance.

So we can summarize that part then, I think, when we're talking about sort of techniques to deal with the students' reading that we don't want to just be recommending re-reading and highlighting, but thinking about some of these other strategies to get students interacting. I mean, basically we've got to move students past the sort of passive engagement to much more active engagement with the texts. And we wanted to talk about the third example of something from the science of learning, and that's something that is called cognitive load. And again, we probably better start with a couple of definitions.

"Cognitive load" is a wonderful concept, a bit of jargon. Richard Mayer, a psychologist, has done a lot of wonderful work on this topic. But basically, what we're talking about here is what's called "working memory". And working memory with everybody, unless you're out there in the audience sleeping right now, it's what's going on right up in your noggin right now. It's what your active processing is.

What we know is that the demand for working memory resources of a learner differs by different kinds of specific tasks or activities. In other words, I think the example I'd like to give is we all have a glass. And our glass can be filled up with working memory. And everybody's glass isn't the same size. But everybody's glass can be full. It can be empty. Or it can be partially full. And what we do is we fill that working memory up with input.

And so there are sort of three kinds of general inputs that go in and affect our working memory. One has to do with essential input. And essential input is what it sounds like. It's the information, the words, the sounds, the music, whatever it might be, related to the task at hand, essential. And we try to process that essential material. That's what our cognitive task is as learners.

But-- and we teachers probably are to blame for this more than we like to admit-- is that what we also like to do is to put into that little cup or glass of ours a lot of extraneous material, what we like to call the bells and the whistles, the seductive details, those sorts of things that what they do is they capture students' attention. But what they do is they divert our attention from the extraneous processing. And then finally, what we need to do whenever we're acting as learners, is try to make sense of material, to generate, to make inferences, to make conclusions, and so on.

All of that stuff going on, where this glass gets filled up really quickly, if we as practitioners, as teachers, think about all the things that we do in our courses to capture our students' attention that actually, in fact, degrades from their learning. Go look at Richard Mayer's book, which I'm sure we have cited, called Multimedia Learning. It's in its second edition now. And it's filled with research examples of where these so-called seductive details, extraneous details, lead to a decrease in performance in students. And there's a nice chapter by Rich Mayer in the book starting on page 59.

Yeah. So and I think what you're saying has a lot to do, or is particularly relevant, to those who are teaching; most of us teaching these courses that are just jam packed with content. And one of the things that I think is particularly challenging to teachers is the idea of when you're trying to figure out cognitive load, a lot of times we're teaching material which is very easy to us. We know it so well. How do we figure out how much cognitive load is being required of the students, and help us back away from content of this, so that we're delivering it in reasonable increments?

This is not a question that I give a quantitative answer to, but I give a qualitative answer. Is there a relationship between cognitive load and the content? Absolutely. And there have been a number of actual studies in classrooms that have tried to quantify this. Almost assuredly with most of us teachers, the answer is that the amount of content, particularly during presentations, is more than what students can process, not only at that one time, but over occasion.

That is, because you want students to continue to think about the material, not just for the 50 minutes they're in the class, for example, but as they're studying and learning. They have to make connections with prior learning, which, of course, is what is a critically important factor, is that it's simply our cognitive architecture is not capable of handling that on its own. Mayer's book and his chapter, and other people's work, show techniques that you can use to try to manage that cognitive load, like chunking, spacing, spreading out materials.

Exactly.

And getting rid of seductive details, and so on.

Yeah. Exactly. I think that we have to reach a point where we start challenging the assumption that more is always better with respect to content and the course, and start thinking think about these issues in terms of how difficult they are for students to learn, and techniques and strategies like spacing and some of the things that you're mentioning that we can talk about. So one last question, and kind of a tough one really; what do you think's needed to get faculty implementing more of the cognitive psychology, science of learning work? Because you have so much evidence that these things really do have strong, significant impacts on students' learning? So how do we get ourselves doing more of this?

I think a large opportunity, and as a director of a teaching and learning center myself, a responsibility, is that looking at people as they're signing in, a lot of these folks are from teaching and learning centers. And they have people there with them, is that teaching and learning centers, in terms of their faculty development opportunities, have a great window here to help their faculty learn more about the science of learning. Most of the people in the audience, of course, are not experimental psychologists. They're not educational psychologists. They're not going to go out and read, don't have the time, interest, or energy to do it, the technical literature.

But there are many opportunities for teaching and learning centers to work with faculty. Our desired approach would be to do it in small, little groups or learning communities to help faculty develop projects where these things become integrated into their work. I think for stand-alone

faculty who don't have such a resource at their institutions that aren't able to go to conferences all the time to learn about these things, is the book that we did, I do think is a really good example where we went out and got faculty that are experts in this area who have been willing to share what they know, in particular with teachers who are not researchers in cognition.

Yeah. I think that's been one of the really encouraging things to me, is that this is implementable. The findings are pragmatic. They're implementable. They're things that you can do about it. You might have to be a little bit creative in thinking about them. But this is a way that we can make teaching more evidence-based, and in the process, really promote better learning for students. It's been a great conversation, Victor. Thank you so much.

Thanks to everybody for being out there. Thank you very much.

Absolutely.

You can read about more of our upcoming seminars on www.magnapubs.com. Thanks again for joining us, and have a great day.

Link to feedback survey: https://www.surveymonkey.com/r/MOS120115.

Adobe Connect Chat Transcript

David Rice, Magna Publications: Our program begins at the top of the hour. You will hear music until the program begins. For optimal quality, please make sure there are no other programs running on your computer. Also, if you are hearing an echo, please check that you do not have two connections open to the program on your computer. If you need technical assistance, please call the number at the top left of the screen.
Broward College: Hello to everyone from Broward College
Broward College: Will there be a sound check? I do not hear anything from my speakers
EVMS: Hello from EVMS
EVMS: Good clean audio and video here at EVMS.
Laramie County Community College: Greetings from Laramie County Community College!
David Rice, Magna Publications: Broward: You should be hearing music right now. If you are not, please check that your computer audio is turned on and turned up.
Lawrence Tech University: Clean audio (music) here at LTU
Laramie County Community College: Sound is good on our end.
UAMS: Greetings from UAMS College of Nursing!
Canisius College: Hello from Canisius College
University of the Sciences: Hello from the University of the Sciences- The Philadelphia College of Pharmacy!
Bow Valley College: Greetings from Calgary. Canada

Marygrove College: Hello from Marygrove College!
Broward College: Sounds it all good! Thanks
Linda Stine: Hi from Lincoln University PA. Audio works here--looking forward to the webinar
Joliet Junior College 2: Hello from Joliet Junior College, the nation's first public community college!
Lynchburg College: Greetings from Lynchburg College!
Valencia College: Greetings from Valencia College, Orlando Florida!
Purdue: Greetings from the Purdue College of Veterinary Medicine - sound coming through fine!
Florida ulf Coast University: s
Mid-Plains Community College (Cathy): Hello from North Platte Community College a division of Mid Plains Community College in SW Nebraska!
Pierce College: Greetings from the Pacific NW! Pierce College is ready to go! Looking forward to this.
Tarrant County College 2: Hello to everyone from Tarrant County College South Campus.
George Brown College: Greetings, from George Brown College in Toronto, Ontario, Canada
Arizona State University Clinical Faculty: Hello!
U of MN College of Pharmacy: Greetings from the University of Minnesota College of Pharmacy - Duluth campus!
Chippewa Valley Technical College: Chippewa Valley Technical College in Eau Claire, WI is checking in!
University of MN Crookston: greetings from the University of Minnesota in Crookston
University of Arizona: Hello from the University of Arizona in Tucson, AZ
Molloy College: Hello from Molloy College located in Rockville Centre, NY (long Island)
Mid-Plains Community College (Tyler Esch): We were hearing music, but that has stopped?
The University of Alabama, Capstone College of Nursing: Hello from The University of Alabama Roll Tide Roll !!
Florida Gulf Coast University: Hello from Fort Myers, FL!
NSCC: Hello from Nova Scotia Community College in Nova Scotia, Canada!
Roberta Harris: Hello from Monroe College in New Rochelle, New York
Worcester State University: Good afternoon from Worcester State University, MA
SK Poly: Hi SK Polytech in Saskatchewan, Canada
Renton Technical College: Hi from Renton Technical College!
Carol: Cabarrus College of Health Sciences, good afternoon from Concord, North Carolina
Guest: Hello from Tulsa Community College, Tulsa, OK
Community b College of Vermont: Community College of Vermont
Broward College: We have 10+ scheduled to attend here at Broward College
Paula Colby-Clements: Hello from Massachusetts School of Law
Susan: We're here from University of Dayton.
Beth: We're here from Texas Woman's University, Denton
Lawrence Tech University: 10+ here at LTU!
Mid-Plains Community College (Cathy): We can no longer hear you
Tufts University 2: We're her from Tufts University School of
University of Denver: University of Denver here
Scott: Hardin-Simmons Univ.: Can we tweet out a link to the eBook? I downloaded it, appreciate the resource.
Nancy Kern, Magna Publications: Sure. I think that's a great idea.
SK Poly: Who was the woman regarding spacing?
Mila Kostic: University of Pennsylvania, Office of CME here as well

Nancy Kern, Magna Publications: @ SK Poly: You'll receive a transcript in a few weeks. So you'll have the name then. I missed the name. Maybe someone else got it and could respond to you.
University of Denver: page 131 of the e-text referenced... (spacing study mentioned)
SK Poly: What about the whole idea of the student having to take in the material and then put something on their paper? It is going into their mind - hearing, comprehending and writing
George Brown College: Hey Nancy, just to let you know...our audio is cutting in and out -help!
David Rice, Magna Publications: George Brown: usually that indicates an issue with not enough bandwidth... please make sure you have no other programs running... if that doesn't help, you can try calling in using the phone & access code shown in the box in the lower left.
Nancy Kern, Magna Publications: Remember to ask your questions in the next eight minutes!
Arifa Garman- Gulf Coast State College: thanks to both of you
University of Denver: What are the 3 main ideas you'd suggest for those designing new courses, based on your presentation today?
Lisa Contino: What are your thoughts about the usefulness of the book by Ambrose et al on the science of teaching and learning?
Mary Mauldin: What is the science of learning in regards to students reviewing test results?
SK Poly: still want to know if people should be encouraged to take notes if they are in a lecture?
Renton Technical College: Great presentation - thank you from Renton Tech!
Broward College: Thank you :0

Additional Q&A

Below are the left over questions the presenter did not have time to answer during the seminar.

SK Poly: What about the whole idea of the student having to take in the material and then put something on their paper? It is going into their mind - hearing, comprehending and writing

Having students write responses to material they hear or read has been shown to have positive benefits on initial learning and on transfer of that learning. Whether such benefits accrue depend on the type of writing prompts and way they are presented.

Some readable references:

Stiegler-Balfour, J. J., Benassi, V. A., Tatsak, H., & Taatjes, A. (2014). The influence of guiding questions on skilled- and less-skilled readers' understanding of written discourse. In V. A. Benassi, C. E Overson, & C. M. Hakala (Eds.), Applying the science of learning in education: Infusing psychological science into the curriculum (pp. 293-298). Retrieved from the Society for the Teaching of Psychology website: http://teachpsych.org/ebooks/asle2014/index.php. ISBN: 978-1-941804-29-2.

Khuyen Nguyen, K., & McDaniel, M. A. (2014). Potent Techniques to Improve Learning from Text. In V. A. Benassi, C. E Overson, & C. M. Hakala (Eds.), Applying the science of learning in education: Infusing psychological science into the curriculum (pp. 293-298). Retrieved from the Society for the Teaching of Psychology website: http://teachpsych.org/ebooks/asle2014/index.php. ISBN: 978-1-941804-29-2.

The explanations can be oral and have positive benefits--not just written (although writing may have other benefits, such as improving writing skill).

Chiu, J. L., & Chi, M. T. H. (2014). Supporting Self-Explanation in the Classroom. In V. A. Benassi, C. E Overson, & C. M. Hakala (Eds.), Applying the science of learning in education: Infusing psychological science into the curriculum (pp. 293-298). Retrieved from the Society for the Teaching of Psychology website: http://teachpsych.org/ebooks/asle2014/index.php. ISBN: 978-1-941804-29-2.

University of Denver: What are the 3 main ideas you'd suggest for those designing new courses, based on your presentation today?

1. Consult any of the excellent free resources available through the internet on course design. Some examples are:
   University of Washington: http://www.washington.edu/teaching/teaching-resources/preparing-to-teach/designing-your-course-and-syllabus/#Course

   L. Dee Fink and associates: http://ideaedu.org/wp-content/uploads/2014/11/Idea_Paper_42.pdf

2. Connect learning goals and outcomes, course content and pedagogy, and assessment. Connect learning goals and outcomes of the course with other courses in the curriculum (transfer of learning across courses).
3. Design and use pedagogy that is supported by evidence and that is has been shown to have positive benefits on the learning outcomes desired. For example, if long-term retention and transfer are important goals, use instructional methods (in and out of class time) that include spaced or distributed practice opportunities for students.

   Carpenter, S. K. (2014). Spacing and Interleaving of Study and Practice. In V. A. Benassi, C. E Overson, & C. M. Hakala (Eds.), Applying the science of learning in education: Infusing psychological science into the curriculum (pp. 293-298). Retrieved from the Society for the Teaching of Psychology website: http://teachpsych.org/ebooks/asle2014/index.php. ISBN: 978-1-941804-29-2.

Lisa Contino: What are your thoughts about the usefulness of the book by Ambrose et al on the science of teaching and learning?

This book was written by several leading faculty development experts (all at Carnegie Mellon University's teaching and learning center at the time of publication). The book provides an overview of many issues related to teaching and learning in higher educations (under the theme of 7 research-based principles). I think the book will provide teachers with a lot to think about in their teaching, and the sections on "What strategies does the research suggest" offer teachers with a lot of potentially useful ideas for designing and offering their courses. The book differs from our *Applying the Science of Learning in Education* book, in that we had leading experts in science of learning areas describe specific

instructional methods (principles) and provide detailed suggestions on how to implement those in their courses.

Mary Mauldin: What is the science of learning in regards to students reviewing test results?
This question relates to the role of feedback in learning. Having students review test results can provide them with a powerful opportunity for further learning, but as is usually the case, it will depend on the nature and timing of the feedback. I recommend the following reference for further information on this important topic:
Hattie, J. A. C., & Yates, G. C. R. (2014). Using feedback to promote Learning. In V. A. Benassi, C. E. Overson, & C. M. Hakala (Eds.). *Applying science of learning in education: Infusing psychological science into the curriculum.* Retrieved from the Society for the Teaching of Psychology web site: http://teachpsych.org/ebooks/asle2014/index.php

SK Poly: I still want to know if people should be encouraged to take notes if they are in a lecture?
Note-taking, when students are reading text, has consistently shown positive results on learning. Refer to the Dunlosky et al article in the webinar materials. Note-taking during a lecture can also be effective (in terms of learning), but there are a number of issues to consider. If students are writing while the teacher is talking, we have a classic case of divided attention, which we know hinders processing of information. Also recall from the webinar that less-skilled, lower background knowledge students may benefit more if the teacher provides a structured outline (sometimes called an 'empty outline'). Perhaps such outlines can be provided early in the course and faded out across the semester. My main view on this question is that there is no simple yes or no answer. Whether and how students will benefit from taking notes during lecture will depend on a variety of factors—who the students are, what is the content you are presenting and what do you want students to do with it, what is the purpose of the note taking (do you want students to simply get what you say onto their paper/computer, to process the information while you are presenting it, etc,). There are other considerations as well. I think that deciding whether and how to use note-taking during a lecture is something that may be best discussed with a faculty development expert (or with other colleagues, if no faculty development expert is available at your institution).

One last point on note-taking during lecture. There appear to be differences in learning depending on whether students take notes by hand or with the use of a computer. Take a look here: http://www.psychologicalscience.org/index.php/news/releases/take-notes-by-hand-for-better-long-term-comprehension.html.