Bonni: [00:00:00] I've been fascinated with how people learn for as long as I can remember. That makes it all that much more special to get to talk with the UCLA Distinguished Professor of Psychology Today Dr. Robert Bjork about using cognitive psychology to enhance learning.

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Bonni: [00:00:26] Welcome to this episode of Teaching in Higher Ed. This is the space where we explore the art and science of being more effective at facilitating learning. We also share ways to increase our personal productivity approaches so we can have more peace in our lives and be even more present for our students.

Bonni: [00:00:54] I am absolutely thrilled as I mentioned up top to be welcoming Dr. Robert Bjork to the show. He is the Distinguished Research Professor in the Department of Psychology at the University of California Los Angeles and Bob's research focuses on human learning and memory and on the implications of the science of learning for instruction and training. Welcome to Teaching in Higher Ed, Bob.

Robert: [00:01:21] I'm happy to be here.

Bonni: [00:01:22] Thank you so much for responding to the invitation. I thought perhaps we could start out by you sharing a little bit about the Bjork learning and Forgetting Lab how did that get started and what kinds of things are you researching in the lab today.

Robert: [00:01:36] Well our laboratory here which is supervised by Professor Elizabeth Bjork my wife and colleague as focus for a long time on what we think of as kind of the basic architecture of how people learn and remember sort of how the system works. In recent years we became increasingly conscious that some of that very basic research has very strong implications for education and

for self regulated learning that is how we manage our own money. And the notion of the Bjork learning and Forgetting Lab just reflects that forgetting is not entirely a negative process.

Robert: [00:02:27] There are a number of senses in which we're gaining in the sense of losing access to information can be almost a partner to learning. But in any case the very active lab in which there are a mixture of postdocs and graduate students and actually a lot of undergraduates involved because it's sort of motivating recently they're in the process they are very involved in their own learning and they tend to have a feeling they can do it better. They play a key role in our research too.

Bonni: [00:03:07] Oh that must be a wonderful opportunity for them to get it to get to see it in practice.

Robert: [00:03:12] What's particularly wonderful to them is that most of them were close early with the graduate student of someone project and that is the kind of synergy that's very effective and a lot of ways we get more out of working closely with a grad student who's you know just a few years older than them than they would with Elizabeth or me. So he can a wonderful to observe and a lot of different ways.

Bonni: [00:03:39] What are some of the common misperceptions about how we think that we learn versus how we actually learn.

Robert: [00:03:46] There's a whole series of them but I think a kind of overriding theme for us that the misconceptions is a kind of belief that we work something like a manmade recording device of some kind I'm like maybe a CD disk or something that that information kind of writes it on ourselves and and then when are asked to recall we kind of play it off of there and in almost every critical way we differ from any such device. Both how information is stored what happens in the retrieval and so on.

Robert: [00:04:26] So this has been a kind of a continuing fascination for me personally which is that how can it be that we didn't have all these years of learning things and formal education and then end up really not understanding the process. You might just think by sheer trial and error during all of our educational experiences we'd kind of come to understand ourselves better than we definitely do.

Bonni: [00:04:59] I've often joked with people saying I wish I could fix this hard drive in my brain because I can still remember the lyrics to all these camp songs from when I used to be a counselor but I can't remember where my keys are and I know that that's a perfect example of that misconception.

Bonni: [00:05:15] What has been the biggest surprise for you in all your study of memory and learning that revealed one of your own misperceptions. Now you said this was early in your career.

Robert: [00:05:24] Yeah early all the way back when I was a grad student at Stanford. I won't go into details of the research were carried out. It was clear that being in a condition that was forgetting what you just think of losing the information from memory that same condition led to better learning measured at a delay. Eventually over years even decades of research we found all these different situations where the very same thing that produces forgetting and enhances learning from materials restudy to get them called this the forgetting is a frame of learning.

Robert: [00:06:06] So if we delay restarting some information we will forget more before we restudy but then that will enhance greatly the effectiveness of the relearning. And it's sometimes called the spacing effect the very robust learning as you study something twice either right in a row or you study what's going on and do other things and come back and study it. It's in that second case that you've got much better long term memory.

Robert: [00:06:39] We also showed years ago that if you change the environmental context from the first time you study something to the second time you study it if you're tested there you will tend to remember less sleep and you're in some new place than were then you're back where you studied it. But if you study it again and you're better off to study it in a different place.

Robert: [00:07:04] And of course that has implications for teaching in colleges because often how the study guides advise students to find someone placed the study and do all are studying that place but research says if you want to remember something optimally factually better to study in more than one place.

Bonni: [00:07:25] What are some of the other components that make up successful remembering?

Robert: [00:07:31] Well. Absolutely and it's been very active in research recently. Is this the critical importance of what we tend to refer to as retrieval practice. So when you recall something from memory when you produce it does far more than to reveal that you did indeed have it in your memory what she retrieved becomes much more recallable in the future than it would have been otherwise.

Robert: [00:08:01] And interestingly things that are in competition with it become less recallable in the future. So actually using our memories shapes our memories you know rather than something like memory combat guest or something where you play information on it you leave things the way they were as we used our memory the things we recall that become more callable themes in competition let it become less recallable.

Robert: [00:08:31] And this is just important both theoretically in terms of how memory works. But in a practical sense for students for all of us we should do as I sometimes advise students we should input less and uplift more students who just decides to go over the material again.

Robert: [00:08:52] And I decided on a different color say that's nowhere near as effective as producing that information as maybe a couple of students getting together and asking each other questions facing the as critical thing to know.

Robert: [00:09:08] Going the test yourself that is often testing is kind of seems to be a dirty word among people these days. But that's why sometimes we talk about retrieval practice. But those are no stakes testing is actually keyed optimizing learning. And so there's there's a whole bunch of things to get in your you've become sophisticated learner.

Robert: [00:09:38] There there's a set of things to learn just how to manage your own learning activities.

Bonni: [00:09:45] What would be an example of something that would be in competition with something that I was learning. Is it around the same topic that we're trying to teach. We're trying to learn or is it-

Robert: [00:09:56] Would often be, or let's say or it can be it can be in the domain of skills and procedures to you need to learn how to operate some new software you use it effectively. And then as you retrieve it use it there may be some competition from the old out-of-date version of that or something similar.

Robert: [00:10:18] You know often in our lives. Let's say you make some. You're a student or whatever and you you go across the country or a school somewhere else and all of a sudden there's all these new means to learn names of streets and phone numbers other numbers names and buildings and homes.

Robert: [00:10:38] And as you use those new things that gradually become accessible and the things that are now kind of out of date numbers and addresses and all of that become inaccessible it's a critical thing that when I say it become inaccessible they are absolutely not gone.

Robert: [00:11:01] So another key way we differ from anything like a memory computers. In that case where we update some information it's like riding over it or something.

Robert: [00:11:13] In the case of. Human memory what happens is the out-of-date information remains in memory big but becomes inaccessible then doesn't interfere with recalling current information. But if it's necessary to relearn it it's really learned at a very accelerated rate.

Bonni: [00:11:35] It's reminding me a little bit. I used to back in the days when I was in the business world I used to coach executives on presentation skills and also trainers on presentation skills and if they had issues with filler words like um, ah, etc we could use a service Bell a hotel service Bell.

Bonni: [00:11:53] And if you'd ring that bell while they were saying the um it was conditioning and eventually it actually only took about 15 minutes for the ums to practically go away entirely. And then if you reinforced it at some point in the future. It was then it was gone and it stuck.

Robert: [00:12:09] That's a good example because in fact he talked about reinforcing the future that is often necessary because things will come back but there again sort of suppressed that that becomes somewhat more permanent.

Bonni: [00:12:28] I had to warn them though that you're going to find all your skills in presenting if you're if you've got great inflection or you're really good with hand gestures or whatever your strengths are those are going to go away for a little while because your brain is going to be so overwhelmed by this new horrible punishment of the bell. But it will come back. But we have to just give some room.

Robert: [00:12:48] Yeah that was a very good point. Absolutely right. I mean for a while they're just monitoring that could lead to a kind of paralysis.

Bonni: [00:12:59] What is interleaving and how is it important to the learning process.

Robert: [00:13:04] Interleaving is something we're we're probably doing more work on our laboratory right now than any other one topic and what it refers to is that in all those real world situations where there is several related tasks to be learned or several components of some task to be learned.

Robert: [00:13:25] The tendency is to provide instruction or have people practice in what we referred to a blocked fashion. I mean it seems to make sense to people that sort of work on one thing at a time.

Robert: [00:13:40] We're now fighting for a constant amount of practice in or leaving the separate things to be learned leads to much better long term attention. It slows the game in performance during the training process but then leads to much better long term performance.

Robert: [00:14:01] And this was first show actually in a number of experiments on on skills that would be studies like you were learning to play tennis and would you go somewhere now to learn to play tennis.

Robert: [00:14:19] What you will tend to get is "blocked instruction" - that is the instructor will work - often with a machine or whatever - will work on your forehand and then they will have your practice a backhand and then have your practice the serve and they will "block" the practice which again only seems to make sense.

Robert: [00:14:38] But it turns out that the same number of practice if you kind of jump around almost randomly between the cracks in that forehead and the back and sort of you will appear to be making slower progress but then your long term performance and the attention will be better and it's been shown with many different skills. And then more recently we've been shown that it's true for kind of verbal conceptual tasks as well.

Robert: [00:15:09] In one just to give you a brief illustration a study that got a lot of attention. We had people learn the styles of different painters from examples of their paint. They studied paintings by 12 different artists. Six paintings by each

artist and the test later was when they saw nude painting had to say which of those artists painted this new painting.

Bonni: [00:15:35] And this is a painting they've never seen before this new one.

Robert: [00:15:37] Never seen. And that's that's crucial because this is something called inductive or conceptual learning and you're trying to transfer what you learned to a new thing. Who painted this new painting. Anything like they are like that in the actual real world of education and expertise that medical people.

Robert: [00:15:56] What I have to say I've never seen this particular equation before. And to classify it.

Bonni: [00:16:03] Yeah.

Robert: [00:16:04] But in any case, what was so important about that was not just the interleaving the paintings by different artists is better than showing one painters six paintings right in a row.

Robert: [00:16:19] But the reason it got so much attention is at the end of the experiment, we asked people what helped you learn better? To have the paintings interleaved or blocked? And the very same people who would just perform better substantially with interleaving were almost uniformly said that blocking helps them learn better.

Robert: [00:16:41] And then that's been not just done with paintings but since then those have been done people learning families of birds, butterflies, women's voices, whole variety of things and again interleaving tends to enhance the standard of learning about people's subjective experience is quite the opposite.

Bonni: [00:17:05] I have this sense that this is about to tie into our next topic but you'll have to correct me if I'm wrong does this tie in to us not liking to have difficulty in our learning but actually it's helping us. I am I am I on the right track here.

Robert: [00:17:19] You are exactly on the right track so almost 21 years ago this term desirable difficulties and it refers to a set of conditions of learning were something like spacing interleaving testing rather than presenting looks like it's creating difficulties and impairing learning creating challenges.

Robert: [00:17:46] You're measuring different things. It looks like it's slowing down learning but then it produces better long term retention and transfer there are difficulties in the sense that they pose challenges. Increase frequency of errors and so on but they are desirable in the sense that they foster the very goals of instruction which is a long term retention and transfer of knowledge to new situations.

Robert: [00:18:16] And so yes indeed and interleaving versus blocking the example varying the conditions of learning that the examples you provide rather than keeping them constant and predictable. Spacing repeated study sessions rather than massing... I mention that spacing enhanced long term memory, but actually if you look at a very short retention interval, then massing looks better.

Robert: [00:18:42] So of course this corresponds to the cramming that kids do prior to an exam but I can actually produce pretty good exam performance. This is just the measures of memory and understanding of the last very quickly.

Bonni: [00:18:57] And don't ask them to tell you anything about it six weeks later six days later probably.

Robert: [00:19:02] That's exactly right.

Bonni: [00:19:04] I love the title of a recent publication of yours or I think it said it's in press, "making things hard on yourself but in a good way creating desirable difficulties to enhance learning." So we talked a little bit about desirable difficulties. Do you also then look at the undesirable difficulties that we should try to get out of the way for our learners.

Robert: [00:19:27] You know we often have to emphasize that the word desirable is a key. There's a lot of ways to make things difficult for people that are just bad period. And so. And in fact even even difficulties that are desirable under most circumstances can be undesirable if the learners completely unequipped correspond to them.

Robert: [00:20:00] So I'll just give you one example. One of the keys to being effective actually managing our own learning or teaching other people is to take advantage of what's called the generation effect.

Robert: [00:20:14] And what that refers to is at any time and let's say you are the teacher and take advantage of what your students already know and give them certain cues so that they produce an answer rather than you giving them the answer you will enhance greatly their long term gains. That's what's called the generation effect. Anything you come up with and generate you remember much longer than if you are just presented that information.

Robert: [00:20:45] And so generation incorporating generation is a desirable difficulty. But people have to succeed at the generation. If they fail it's no longer a desirable effect. So people need to have that. Students need to have the past prior knowledge that puts them in a position to be able to generate to make this very effective.

Bonni: [00:21:10] In the generation effect if they struggle along the way perhaps getting that wrong at first but then eventually making it. Is that still a desirable difficulty?

Robert: [00:21:20] It really is. And you just hit on something that's another important current theme in our lab. It turns out you know people talk about trying to avoid students making errors.

Robert: [00:21:36] Maybe they'll learn their errors this and that but if it turns out now lots of evidence that. Errors are kind of a key complement to effective one and one thing that making errors does is when you've tried to answer it and they haven't succeeded. The subsequent studying you do is more effective.

Robert: [00:22:03] But even even we now look at some cases giving students pretesting on which they make almost 100 percent errors that they haven't studied interior yet and so they get very few things correct.

Robert: [00:22:20] But that precast them then enhances sort of potentiated their subsequent studies and makes studying more efficient. We tend to think well we should ask questions after somebody study something but imagine what it looks like. A lot of circumstances. The question should come before it.

Bonni: [00:22:42] So you talked earlier about successful forgetting. I'd love to circle back and talk a little bit more about it now. Can you can you share a bit more about successful forgetting and why it's important that the learning process?

Robert: [00:22:56] Well is gets to be a kind of complicated story except that when we forget let let's take one of the cases where we're getting enhanced learning that's where you've studied something in one situation in the presence of certain cues and and so on.

Robert: [00:23:17] Now as I mentioned earlier you will tend to remember better if you tested in that situation rather than if it's you're tested in some new situation where everything is different.

Robert: [00:23:35] But what. But now if I presented again and so when I study something twice in two different contexts two different settings that appears to engage a number of processes that didn't support long term memory.

Robert: [00:23:50] One is you interpret are to use our jargon, encode the information somewhat differently. When its studied a second time in a different place and that introduces what we can call encoding variability which helps long term performance particularly performance in some altogether new setting.

Robert: [00:24:13] So many of the things that cause forgetting, create the opportunities for the information to be interpreted somewhat differently to make it be recalling it from the past 30 episodes just a little bit more difficult.

Robert: [00:24:33] And I should probably emphasize there. We've mentioned earlier that retrieval is a powerful learning event in the sense that you what you retrieve remembered better later.

Robert: [00:24:46] But it's critical that you sort of succeed and the retrieval and research says that the more involved or difficult the active retrieval provided you do succeed the more powerful it is as the learning about if you something is trivially easily. You just met this person and now you're going to retrieve that name a few seconds later.

Robert: [00:25:08] That's a good thing to do but it will have relatively small effects whereas an hour later looking at cross the room and seeing that person are retrieving their name will have very long term powerful effects.

Bonni: [00:25:23] And in that instance was I successfully forgetting in the beginning when I couldn't recall it immediately and therefore it sticks that much more when I remember it later am I getting that part of it correct.

Robert: [00:25:34] Yes that that is essentially correct. Now it turns out many things are involved in remembering people's names and why we are just so bad at it you know.

Robert: [00:25:46] So I mean the names are arbitrary they don't just map onto what we already know. We get presented people's names and there's sort of alternately extreme time sharing kind of circumstances we're giving our own name or introducing a friend. So it's it's it's a poor circumstance for encoding.

Robert: [00:26:09] Basically we tend not to practice that retrieval very much. People are good at names too that they're clear about how our name is pronounced and our name is spelled.

Robert: [00:26:21] It's its own skill and that means people think well well people are good at remembering names that just sort of sticks in their brain and they don't stick and I presume that that couldn't be further from the truth of the activities that you carry out.

Robert: [00:26:37] And I will say that this is another broad conclusion from the research that we've done over decades which is there's such a tendency for people to think that the differences between individuals and how well they do on a later test are how well they remember names or whatever it is that that reflects just innate differences in their brain.

Robert: [00:27:00] Really the overwhelming evidence is what it reflects is the processes and activities carried out and the key is for us all to learn how to learn more effectively. It's not just that in some domain if we just find the right area that learning will be effortless and easy not that way.

Bonni: [00:27:21] That brings me to my last question of this of this segment would you describe self regulated learning and how it's important to the learning process.

Robert: [00:27:31] Well that's been another key thing in terms of recent research which is that. As a consequence of our complex and rapidly changing world and also changes in technology and educational environments more and more learning is happening outside of any formal classroom setting.

Robert: [00:27:59] It's in our own hands so to speak and not just during the years of formal education but also more and more across the lifespan and people in their jobs need to learn new procedures need to be retrained maybe even in

our hobbies in education across our lifetime and turn to learning about birdwatching or whatever it is.

Robert: [00:28:25] And this learning is in our own hands and in that sense is self-regulating. You can make an argument that it's always been important to know how to learn but probably never more important than right now to know how effectively.

Robert: [00:28:41] The other thing that makes it important is people's intuitions are often just wrong. So there's a lot to learn about how to learn.

Bonni: [00:28:51] Now we're going to shift over then to the recommendations segment and if people are like me and would love to learn more from you there's a wonderful set of videos on Youtube from go cognitive and I'll put a link to that in the show notes.

Bonni: [00:29:06] These are just little bite size five to six minute videos of Bob sharing about a lot of the topics that he and I have talked about today about interleaving about memory and learning about the positive aspects of forgetting the cramming.

Bonni: [00:29:22] Looking better I just Lots I think there are probably a collection of maybe 15 of them up there and it looked like some other good videos from experts in the field too. So I would just encourage people to check out that link and want to learn more.

Bonni: [00:29:34] I was enjoying going on that rabbit trail. I should have been grading and just going. And what do you know.

Robert: [00:29:43] There's a fair number of things. I think we put some on our Web site that are interviews.

Bonni: [00:29:48] What would you like to recommend to people that are listening today on Teaching in Higher Ed.

Robert: [00:29:53] One thing is you mentioned that little article we wrote on making things hard on yourself that is the one article that Elizabeth and I addressed to students. You know most of the articles that we're writing are in professional journals and not easy to understand often and so on so that particular article is a little different from other things you've written.

Robert: [00:30:18] I will say to that right now for the first time there are several really good books written for a more general audience on the research online and on the cognitive science its relevance to self regulated learning and education.

Robert: [00:30:40] One of those is but three of our colleagues who are at Washington University in St. Louis it's called Make it stick: The Science of successful learning. That is a very good book because it takes the kind of research we've been talking about and gives examples of it in terms of people's real lives.

Robert: [00:31:00] And another one we kind of collaborated with or it helped a New York Times reporter Benedict Carey get very interested in this domain and that book is also out to it's called How We Learn: and then I forget what's after that colon and that is too a really good book where he tries to relate these things to his own life.

Robert: [00:31:24] And then one even the newer ones are written by a teacher who's been a teacher and administrator in the United Kingdom David Didau and it's titled "What if everything we knew about education was wrong?" And I wrote a preface for the book. This is kind of a unique time in that respect three very accessible very readable books that talk about the science of learning.

Bonni: [00:31:58] Oh that those sound like wonderful resources and I'll be able to link to each one of those in the show notes people can follow up and take even more of this and put it into practice.

Bonni: [00:32:08] I just want to thank you once again for being on the episode. It was really an honor to have you respond to the invitation. I'm so excited for people to get to listen and get to learn from you.

Robert: [00:32:20] It was fun it was fun to talk to you.

Bonni: [00:32:23] Thanks to all of you for listening to this episode of Teaching in Higher Ed, as always if you have suggestions for the show I encourage you to go and visit Teachinginhighered.com/feedback and I also you know this is coming.

Bonni: [00:32:40] To encourage you to listen to subscribe to the Teaching in Higher Ed weekly update. And by doing that once a week you'll get an email that has two things in it. One is all of the show notes. And all the links that we

talked about on the show and an article included on either teaching or productivity.

Bonni: [00:32:59] And when you subscribe the first time you will get a free e-guide. Of the 19 educational technology tools to help you facilitate learning in the classroom and online; so go ahead and check that out if you haven't already. That's at teachinginhighered.com/subscribe.

Bonni: [00:33:17] Thanks for listening. I welcome reviews or ratings on iTunes or whatever service it is you use to listen to the show. That just helps other people discover the show and build our listener community. As we continue to learn from each other. Thanks again for listening. I'll see you next time.