Transferring Information from Faculty Development to Classroom Practice: A Mixed-Method Study

By Matthew P. Winslow, Camille Skubik-Peplaski, & Barry Burkett

Professional learning communities (PLCs) are an effective way for faculty to learn about pedagogical topics and tactics. However, less is known about how effective they are at changing the teaching practices of the faculty participants and ultimately student learning. This article describes a mixed-method study of such a transfer of knowledge. In this case, the pedagogical topic was metacognition, effortful learning in particular. We describe the PLC, how effortful learning was incorporated into one class, and the results of that change in practice. We found that effortful learning (using a jigsaw classroom activity) improved student learning and student perceptions of instruction.

MOST FACULTY WANT TO IMPROVE their instruction, and this desire can be satisfied by a variety of professional development strategies. One strategy is the professional learning community (PLC) (AllThingsPLC) or faculty learning community (FLC) (Cox, 2004), defined as a group of faculty who agree to ongoing meetings for facilitated discussion, collaboration, and inquiry about a topic that leads to improved student learning. As resources in higher education decrease, the need to create effective pedagogical models remains a priority with collaborative communities oriented toward achieving better student learning results (Cox, 2004; Stark & Smith, 2016). This article describes the transfer of information from a PLC to classroom practice within a cross-disciplinary group of faculty learners. We start by describing our variation of the PLC and then examine how two participants implemented strategies from that PLC in a course, including results that suggest enhancements in student learning. The authors conclude by discussing ways in which this experience enhances faculty development efforts at the authors' institution.

The Professional Learning Community on Metacognition

The first step in planning the PLC was to select sources of information about metacognition. With many books to choose from, the facilitator selected two books, one scholarly and one popular-press. *Using Reflection and Metacognition to Improve Student Learning*, a scholarly edited volume by Kaplan, Silver, Lavaque-Manty, and Meizlish (2013), contains accessible, research-based ideas for incorporating metacognition into the classroom on a practical, implementable level. Some chapters even include templates and sample instructions. The chapters also cover a range of disciplines from biology to engineering to writing, a range that is essential for a PLC with faculty members from departments across the university. In the other book, *Make it Stick: The Science of Successful Learning* by Brown, Roediger, and McDaniel (2014), the authors (two cognitive scientists and a journalist) considered students and teachers their primary audience members. They employ case studies from a variety of contexts, including students in law school and medical school, undergraduates, and athletes. While based solidly on research in cognitive science, the book also provides practical advice in an engaging way. Of course, many online resources about metacognition can be found, notably the *Improve with Metacognition* blog (http://www.improvewithmetacognition.com/) and *Applying the Science of Learning in Education: Infusing Psychological Science in the Curriculum* (available at http://teachpsych.org/ebooks/asle2014/index.php).

PLCs at Eastern Kentucky University conform to a flexible template: 12-15 members, regular in-person meetings, and a facilitation model instead of an instruction model, meaning that a facilitator creates the structure of the PLC and then members deliver content as much as the facilitator. The

semester-long PLC began with two meetings where participants discussed metacognition broadly. Many members of the PLC were just familiar enough with metacognition to know they wanted to learn more. To prepare for these discussions, members read chapter two in the Kaplan et al. book and chapter eight in *Make it Stick*, each containing summaries and overviews of metacognition.

The majority of the PLC sessions were consumed by team presentations. Participants were randomly divided into six teams based on six topics gleaned from the two books: retrieval practice (self-quizzes), spaced practice and interleaving, growth mindset, wrappers, metacognition and writing, and effortful (difficult) learning. Teams presented their material to the group in the remaining weeks. Each presentation consisted of a live, in-person presentation as well as a brief (5-15 minute) recorded presentation. PLC participants focused on creating electronic resources that would last beyond the PLC and could be added to a repository the university is developing of such products that all faculty across campus could access on their own time (Burkett & Skubik-Peplaski, n.d.). Teams were encouraged to create resources, such as templates, lesson plans, and rubrics. PLC participants also decided to create a poster based on the team presentations for our university's celebration of scholarship, Scholarship Week. While this event focuses on student scholarship and faculty-student collaboration, this poster highlighted the scholarship of teaching and learning at the university, especially our emphasis on student learning as the central focus of professional development on campus.

Effortful Learning

Brown, Roediger, and McDaniel (2014) share that when more effort is given in variable learning situations, learning is "stronger, more precise, and more enduring" (p. 68). The authors further espouse that when learning is slowed down and made more difficult—including steps that must be mastered—confidence is gained, and learning has a stronger representation in the brain. Shors (2014) states that when adults learn with effort, they increase the survival of newly generated cells in the hippocampus, and as long as the learning experience is new, effortful, and successful, then these cells differentiate into neurons to form synapses and action potentials to create a circuitry in the brain. Therefore, effortful learning has initial and long-term benefits for the learner.

Effortful learning requires encoding, consolidation, and retrieval cues. Encoding occurs when the brain converts perceptions into chemical and electrical changes that form a mental representation of the patterns, known as short-term memory. Short term memory drives most everyday activities, but when these memory skills are not practiced, they tend to be forgotten. Consolidation, which occurs when the brain reorganizes and commits the information to an area of the brain and forms a memory path, is used to strengthen these short-term mental representations into long-term memory. Furthermore, consolidation requires prior knowledge to make sense of new learning. Hence, initial learning can start out feeling disorganized, but with consolidation comes organization and clarity (Brown, Roediger, & McDaniel, 2014). Retrieval of a memory from long-term storage can strengthen the memory and connect it to more recent learning, making it easier to access with a stronger pathway. This process is called reconsolidation, and retrieving information with retrieval cues is a critical component of learning. Effortful learning can be incorporated into classroom activities to increase student engagement, learning, and retention.

According to Brown, Roediger, and McDaniel (2014), the more effort that is required to encode and consolidate during learning, the more the individual reloads or reconstructs the components of the skill, making it pliable again. Learning then becomes clearer, reinforces meaning, and strengthens connections in the brain, while decreasing weaker competing routes. Massed practice, another technique, gives the illusion of mastery, but it uses short-term memory without having to reconstruct the learning from long-term memory. The effortful process of reconstructing the knowledge triggers reconsolidation and deeper learning (McGaugh, 2000).

The Study

Background

Knowing a presentation on effortful learning was coming, Skubik-Peplaski and Burkett met to talk about how to conduct research, share reporting, and ultimately present. It was decided in this initial meeting that instead of just researching, Skubik-Peplaski would like to give students the benefits of

effortful learning. The overarching question came down to, "Can we add effortful learning to the classroom in a way that is authentic to students?"

Skubik-Peplaski's follow-up question in the first meeting was, "Am I employing effortful learning already?" She chose an upcoming lecture covering different styles of research to employ effortful learning. Vella (2000) argues for the incorporation of artifacts and questioning that requires the use of artifacts to answer the questions. Therefore, Skubik-Peplaski looked for artifacts that would prepare her class for the lecture.

As part of the PLC, effortful learning concepts were infused in a graduate occupational therapy research class while learning content on qualitative design methods. The institution is a regional comprehensive undergraduate and graduate university of approximately 16,000 students. In previous semesters, a lecture format with some learning activities was used for teaching quantitative research methods. The students struggled to understand these various research methods and did not approach this topic with a growth mindset. Then, when effortful learning techniques were introduced, some students questioned their value while others embraced the change. As we learned about effortful learning in our PLC, the authors incorporated several techniques to manage knowledge, including appraising, analyzing, interpreting, locating, and reporting. These concepts are also part of the learning goals (evaluate, analyze and apply) in the revised Bloom's Taxonomy (Anderson, Krathwohl, & Bloom, 2001). Using these learning techniques in class requires the learner to interact differently with the material, slows them down, and forces them to process at a deeper level. The focus is to retain knowledge.

Participants

Participants were 72 graduate students in two sections of a graduate occupational therapy research course. The jigsaw course had 36 students with 2 males and 2 students of color, and the control course had 36 students with 3 males and 1 student of color. Ages in both courses ranged from 22 – 35.

Procedure

Before every class, the students were to read about research topics and then respond to a readiness check or quiz conducted at the start of each class. The same format was followed when Skubik-Peplaski and Burkett began to implement effortful learning techniques. After students had read about qualitative design methods before class and completed a readiness check, we reviewed the answers together. Is asking students to do homework relative to the coming lecture effortful? To us, the answer was yes, but we wanted students to use the information in a more systematic and comprehensive way that continually asks them to grapple with the information. Skubik-Peplaski wanted students to be interacting with peers, sharing information, and discussing findings. At this point, we talked about Skubik-Peplaski's role as lecturer versus her desire to let students steer the conversation. She wanted students to be invested in their education, to lead in the classroom, but needed to verify that students were meeting their learning objectives.

After discussing several pedagogical delivery models, Skubik-Peplaski decided to use the jigsaw method (Aronson, Blaney, Stephin, Sikes, & Snapp, 1978; Aronson & Patnoe, 2011; Jigsaw Classroom) with the class in order to increase the effort required to learn the material. The jigsaw classroom or method is a way to assemble students into groups—students are the pieces that come together to build the encompassing picture. Jigsaw activities are examples of collaborative assignments, one of Kuh's (2008) types of high-impact practices. A jigsaw satisfies both of the goals of collaborative assignments: learning to solve problems with others, and paying attention to the insights of others. We thus believe that jigsaw activities provide the many benefits of high-impact practices that Kuh describes.

A jigsaw occurs in multiple steps: in this class, we started with alphabetical named groups and then transitioned to numerical named groups. The 36 students were assigned into 6 groups so that each group to start had 6 people with each group having a different focus (see Table 1).

The groups were given set questions about studies to which they could answer or research. If students knew the answer, they answered the question. If the answer was unknown, students were encouraged to research the answer using book, notes, class resources, and the internet. Students were encouraged to ask the instructor questions relative to their group work and/or search for information. Students were expected to share among

their group so that each individual had answers to the set questions. Then, the students were asked to reflect on what they learned to establish encoding, creating short-term memory, and practice retrieving key ideas for use later in class.

At the end of an allotted amount of time, groups were stopped, a small break occurred, and when students returned, groups were reorganized. The new structure of the groups took one person from each initial group and put students together into a new group; therefore, a new group would have a participant from each of the previous groups A - F. In this second group students were expected to share what they had learned in the initial group and lead their peers in learning the content. Students were told that they would be given a readiness check at the end of the class.

During the second phase, the typically quiet classroom got loud. Students were feeding one another information they had just learned, and peers would ask questions. Commotion built with students asking their peers or the instructor follow-up questions for clarity. A shift had occurred whereby students were the experts on what they just learned and were sharing and defending their new found knowledge with peers. Burkett and Skubik-Peplaski saw the students transferring knowledge as increasing the effort required to learn.

Another instructor led a control group. The class was led like many other classes in the department. The class was taught with the same pre-work from the students. The same readiness check was given to both classes. The control group was taught using a traditional lecturer, this lecturer would ask questions to the group during lecture to check for understanding. No jigsaw or other form of effortful learning—beyond the prework and readiness check—was performed with the control group.

Table 1. Structure and topic of initial groups in the jigsaw

Group	Topic
A	Historical: a method that collects data related to past experiences
B	Ethnography: a method that describes the culture and the shared experiences of a group of people
C	Phenomenology: a method that uses a philosophical approach study people's experiences
D	Grounded theory: a method to collect and analyze data leading to an inductive theoretical foundation
E	Observational: a method used when observing social situations
F	Case Study: a method used when conducting an intensive study of an individual or context

Results

To assess the effectiveness of the jigsaw, we

Table 2. The Kirkpatrick Model

Level	Description	Implementation in study
Reaction	The degree to which participants find the training favorable, engaging and relevant to their jobs	What we wanted to know: did the students like the way information was delivered? How measured: Students were given questionnaire after class.
Learning	The degree to which participants acquire the intended knowledge, skills, attitude, confidence, and commitment, all based on their participation in the training	What we wanted to know: did students gain knowledge as defined by learning objectives? How measured: Students given same five question readiness check before and after class. The purpose of the "readiness check" is to see what students know before the class starts. By using the same five questions at the end of class, a comparison of acquired knowledge in the class is able to be made: using the same questions in pre/post checks is not common practice, and was employed for this class only.
Behavior	The degree to which participants apply what they learned during training when they are back on the job	What we wanted to know: did students apply learning method to their benefit outside of class? How measured: unintentionally acquired via interview.
Results	The degree to which targeted outcomes occur as a result of the training and the support and accountability package	What we wanted to know: did the students retain the information? How measured: Same 5 questions from readiness check given 1+ week(s) later.

incorporated a pretest posttest method to measure change using The Kirkpatrick Model (n.d.) into our study. The Kirkpatrick Model evaluates effectiveness of training and behavior change over four levels (see Table 2). Responses to the Kirkpatrick Level 1 Questionnaire were similar between both the Jigsaw and Control classes:

- 45% of students reported liking the class on descriptive design
- 65% felt they understood the content taught
- 68% reported being engaged in the class
- 65% reported the quality of the class to be better than average.

At the end of the questionnaire, students were encouraged to give an open response. Both classes reported preferring 'hands on' activities. A student in the Jigsaw reported, "I really enjoyed being engaged and not having a purely lecture environment." A student in the control class "want[ed] activity and not all lecture."

Responses for the Kirkpatrick Level 2 questionnaire were in line with expectation—students did better at the end of the class than the initial readiness check at the beginning in the class with the jigsaw. Unfortunately, results were not able to be compared against the control group due to circumstances beyond the instructor's control. From this effortful learning experience of using the jigsaw method, it is clear that students did learn over the instruction period. We cannot deduce if this result is from prompting associated with the readiness check questions, or transfer of knowledge as a result of the jigsaw.

At the onset of the project, we decided we could not measure Kirkpatrick Level 3 as it was felt it would be too limited a time to measure a behavior change in the student due to the use of the jigsaw method in the class. At the end of the class students were informally interviewed. Students were asked, "What is a change you have seen in yourself as a student?" One student responded, "I think I'm more able to put things into my own words so I can explain them to someone else. As [Skubik-Peplaski] is saying it to me I am trying to relate it back to my experience so I can relay that to someone else." This response suggests a behavior shift occurred, but this finding is not measured across students.

Based on this limited study, Skubik-Peplaski recognized a shift in her students' participation and her instruction. Before the project students would sit passively, expecting her to give the information. After the jigsaw class students were more apt to question resources and view her as a knowledgeable peer. Additionally, when the jigsaw Method was used in future classes, students were more at ease with the structure, their role in the structure, and reported, "I learned more this time, a lot more."

To measure Kirkpatrick Level 4, we wanted to know what the students retained from the jigsaw experience. We planned on using the same readiness check questions again one week later. The jigsaw group had over 90% retention of questions for the treatment class. However, the day the readiness check was to be delivered in the control class the university cancelled all classes due to threats made against the student body. Thus we cannot compare the jigsaw class to the control class on this measure.

Limitations

We acknowledge several limitations to this study. The make-up, size, and selection of the sample all limit the generalizability of the results. We used students already enrolled in a graduate course in a single discipline who were mostly female, and there were only a small number of them. The loss of the follow-up data for the control group is also unfortunate because it limits our ability to demonstrate the effectiveness of the jigsaw and effortful learning. Clearly, more data needs to be collected to more firmly establish the benefits of the jigsaw and effortful learning as well as to broaden the range of students to which these effects apply. The jigsaw technique is easy to adapt to any type of class, as our study demonstrates. We encourage researchers to contribute to the literature on the jigsaw and effortful learning.

Conclusion

Effortful learning can be applied to any course across the curriculum. Effortful learning points out the role of effort in learning, and this insight is valuable for both students and instructors. A class does not have to use the jigsaw method to be effortful, but the approach succeeds. The jigsaw classroom requires that instructors transition from leader to facilitator and students transition from passive

recipients of information to active participants in learning. A partnership was formed instead of a learning hierarchy, and students took more responsibility for their learning. Overall, students became owners of the content and their learning. Everyone benefitted from the partnership that was transformed through the use of effortful learning, and it was a win/win experience.

PLCs provide a space for faculty to learn about topics of common interest. The true payoff, however, occurs when that learning transfers to changes in instruction, and ultimately in student learning. This article shared one instance of such a transfer. As the faculty developer, Winslow created a collaborative learning community within the PLC, and Burkett and Skubik-Peplaski were challenged and able to take risks with their new learning and apply them in the classroom. Winslow provided a supportive platform in which faculty could create effective pedagogical models to achieve better student learning outcomes (Stark & Smith, 2016).

References

AllThingsPLC. (n.d.) Retrieved from http://www.allthingsplc.info/about

Anderson, L., Krathwohl, D. R, & Bloom, B. S. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives* (Complete ed.). New York, NY: Longman.

Aronson, E., Blaney, N., Stephin, C., Sikes, J., & Snapp, M. (1978). *The jigsaw classroom*. Beverly Hills, CA: Sage Publishing Company.

Aronson, E., & Patnoe, S. (2011). *Cooperation in the classroom*: *The jigsaw method* (3rd ed.). London: Pinter & Martin, Ltd.

Brown, P. C., Roediger, H. L., & McDaniel, M. A. (2014). *Make it stick: The science of successful learning*. Cambridge, MA: Belknap Press of Harvard University Press.

Burkett, B., & Skubik-Peplaski, C. (n.d.). Effortful learning. Retrieved from https://www.youtube.com/watch?v=XxjHyYjE9PE

Cox, M. D. (2004). Introduction to faculty learning communities. In M. Cox & L. Richlin (Eds.), *New Directions for Teaching and Learning (pp. 8-20) Vol 97*. San Francisco, CA: Jossey-Bass.

Jigsaw Classroom. Retrieved from https://www.jigsaw.org/

Kaplan, M., Sliver, N., LaVaque-Manty, D., & Meizlish, D. (2013). *Using reflection and metacognition to improve student learning: Across the disciplines, across the academy* (First edition.). (New pedagogies and practices for teaching in higher education series; New pedagogies and practices for teaching in higher education series). Sterling, VA: Stylus.

Kirkpatrick Model. (n.d.). Retrieved from http://www.kirkpatrickpartners.com/

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter.* Washington, DC: AAC&U.

McGaugh, J. L. (2000). Memory—a century of consolidation, *Science, 287*, 248-251.

Shors, T. J. (2014). The adult brain makes new neurons, and effortful learning keeps them alive. *Current Directions in Psychological Science, 23*(5) 311-318. doi: 10.1177/0963721414540167

Stark, A. M & Smith, G. A. (2016). Communities of practice as agents of future faculty development. *Journal of Faculty Development, 30*(2), 59-67.

Vella, J. (2000). Taking learning to task: Creative strategies for teaching adults. In *The Jossey-Bass Higher and Adult Education Series.* San Francisco, CA: Jossey-Bass.

Matthew P. Winslow, Ph.D., is a Professor in the Department of Psychology at Eastern Kentucky University. He also holds the titles of Teaching Enhancement Coordinator at the Department level and Faculty Innovator at the University level. His research touches on empathy, prejudice, and social psychology.

Camille Skubik-Peplaski, Ph.D., OTR/L, BCP, FAOTA, is an Associate Professor in the Occupational Science and Occupational Therapy Department at Eastern Kentucky University. Her research interests include occupation-based practice and evidence-based practice.

Barry Burkett, is an Instructional Designer in the Office of ECampus Learning, Instructional Design Center. His role is to work with professors to translate information to students in a way that meets the professor's goals. His research interests include the relationship between augmented reality and 3D printing; immersive video; and andragogy.