In Practice…

Making Thinking Visible:
Three Essential Elements No Class Can Be Without!

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This article will discuss effective methodology for preparing preservice teachers to be better equipped K-12 educators, whereby improving the learning of each child in the 21st century classroom. Its focus will be on three essential elements that professors can implement in a higher education classroom: organizing, reflecting, and representing thinking. A number of different active learning strategies will be discussed to provide concrete examples of how to infuse each element in both the presentation and processing of new material. When strategically incorporated into the design of a course, these three elements can facilitate the process of engaging students and making thinking visible to the learner.

Although the teacher training college is well established as an integral component of higher education, our dialogue around what constitutes effective methodology for preparing preservice teachers is continuously evolving. Calls abound for structural changes in teacher education to better equip K-12 teachers to improve the learning of each child in the 21st century classroom (van Laarhoven, Munk, Lynch, Bosma, & Rouse, 2007). Part of the call for reform has centered around the criticism that traditional teacher education programs have not adequately prepared teachers to make the theory to practice leap (Darling-Hammond & Baratz-Snowden, 2008). Researchers such as Spalding, Klecka, Lin, Wang & Odell have discussed some of the obstacles that must be addressed to help preservice teachers make these connections, such as "the complexity of learning to teach, the need to demystify the knowledge we do have about how people learn to teach, and the necessity of conceptualizing learning to teach as an ongoing, enduring process" (2011, p. 3). All of these obstacles require institutions of higher education to find ways to model and unpack the types of teaching that we expect of preservice teachers once they enter the profession. This is not possible if institutions continue to rely on extended periods of lecture as the primary mode of promoting student learning.

The authors have found that one

way to address these issues *within* the higher education classroom is by incorporating active learning strategies during the presentation and processing of new material. The promotion of learning in which students are actively involved with the course material through a pedagogy of interaction can help preservice teachers concretely experience the scholarship of teaching and learning. We have found that incorporating active learning strategies, which make the learner's thinking visible not only improves students' content knowledge, but also impacts their understanding of effective pedagogy.

Importance of Active Learning Strategies

Comprehension of new information can be improved through the use of active learning strategies. A learning strategy is a person's approach to learning, synthesizing, and using information. Active learning strategies are used by students to help them understand information and solve problems; however, students who do not know or use good learning strategies often learn passively and can ultimately fail in school (The University of Kansas Center for Research on Learning, 2009). It is our job to help students become aware of the learning strategies they currently employ and then adapt and add new strategies to their repertoire, both for use as a student and in their future teaching. Ritchhart, Church, & Morrison have argued that, "…we first must be clear in our own minds what thinking is. This allows us to make thinking visible by naming and noticing it as it occurs." (2011, p. 30). Largely due to the fact that thinking is such an internal process, the use of active learning strategies can only enhance our ability to make learning more visible for our students.

It is essential for teachers of higher education to use, name, and model active learning strategies, hence better preparing future K-12 teachers. This article will discuss three essential elements that professors can implement in a higher education classroom to actively engage students in learning the theory of teaching while seeing it modeled in practice by the professor. This process focuses on the metacognitive practices of organizing, reflecting, and representing thinking. We will discuss how each of these elements can help make students' thinking visible during both the presentation and processing of new material. We will also provide authentic examples, from our higher education classrooms, explaining how we have used active learning strategies to incorporate these elements in ways that have had a positive effect on the learning of preservice teachers.

The Three Essential Elements

In the last few decades much research has been done in the area of cognitive development, more specifically in the study of how information is stored and processed in memory (Ferry, Hedberg & Harper, 1998; Huitt, 2003) and then how one represents and applies the new content (Park, 1995). Cognitive researchers view learners as processors of information who use a variety of organizational strategies to store and retrieve knowledge (Huitt, 2003; Weinstein & McDonald, 1986). Such mental activities help students to acquire, organize, and remember incoming knowledge more efficiently so they can apply the new knowledge to a variety of experiences. One important goal when working with preservice teachers is to help them generalize the new content they are learning so they can apply it to their own classrooms.

The subsequent sections will define, provide research evidence, and give specific examples of three essential elements that professors can implement in a higher education classroom to actively engage students' thinking about new content and better prepare them to be effective teachers of the future.

Organizing Thinking

First and foremost, it is essential for learners to have strategies to facilitate the cognitive organization of new content in order to later retrieve, apply, and generalize these skills to new situations in a variety of environments. In current literature, one popular organizational strategy is referred to as a graphic organizer. Graphic organizers have been defined as visual and graphic displays that depict the relationships between facts, terms, and or ideas within a learning task (Hall & Strangman, 2002). Graphic organizers are also sometimes referred to as knowledge maps, mental maps, concept maps, story maps, cognitive organizers, advance organizers, or concept diagrams. For the purpose of this article we will refer to these tools for organizing thinking as graphic organizers.

Effective strategies designed to promote efficient and meaningful learning rely upon connecting prior knowledge to new concepts (Okebukola & Jegede, 1988) and research indicates that graphic organizers are examples of such a strategy (Novak & Gowin, 1984; White & Gunstone, 1992). The notion of activating, or switching on, appropriate background knowledge is important because new knowledge, if it is to be thoroughly learned and understood, must be integrated into existing knowledge (McKenna & Robinson, 2009). For graphic organizers to be effective, prior knowledge must be activated to allow the learners to record their thinking in an organized way and assist them in making connections between existing knowledge and new

information.

When preservice teachers construct mental maps they are identifying and defining important concepts or ideas and then graphically representing interrelationships among concepts (Holley & Dansereau, 1984; White & Gunstone, 1992) sometimes resulting in two-dimensional or three-dimensional maps that represent a spatial organizational system of their knowledge about curriculum content and pedagogy. As the connections in this structure are identified, labeled, and the concepts fully described, the map becomes more authentic to the learner. While this part of the process is crucial, it is not an easy task and White and Gunstone (1992) report that learners find this part to be the "most irksome... and would skip it if they could" (p. 18).

Graphic organizers may be implemented as advance organizers, before the learning of specific content takes place, or after encountering the learning material. Whether they are being used prior to, during, or after taught content, they need to be taught explicitly with the incorporation of teacher modeling and independent practice of the strategy with provided feedback to the learner (Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; as cited in Strangman, Hall, & Meyer, 2003).

In our higher education classes, we have utilized many strategies for students to organize their thinking. We have used these organizers for out-of-class assignments as well as in-class activities. Some of the most well received tools that we have used are organizers that are specifically designed for a new concept. For example, when introducing a complex topic or assigning a dense reading we often design a graphic organizer to help students focus on the important aspects of the content. When introducing Universal Design for Learning (UDL) and how this approach fits into effective literacy instruction, we created an organizer for students to identify important elements from a reading and then had them continue to add details after discussing in class. Students can then use these tools for review when connecting to new learning or studying for an exam.

Another type of organizer that we have used with success is an evolving concept map. In many ways this is the opposite approach to the previously discussed technique. Instead of the professor giving the student a structured organizer, the teacher's role is to design learning events to help students understand aspects of the new content. Students then create the organizer as new information is shared. In this way, each student's organizer looks different and evolves in a slightly different way depending on their background knowledge and the connections they are making to the new content. See Figure 1 for an example of

an evolving map about the writing process.

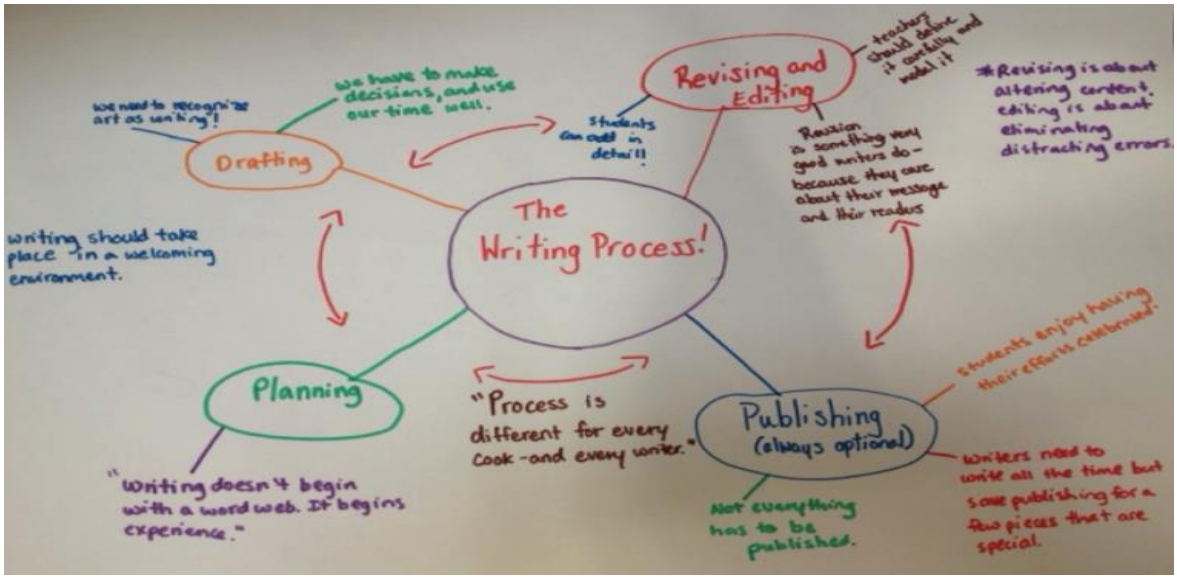

Figure 1. Evolving concept map. This figure illustrates a graphic organizer created by a student utilized in the classroom to represent the writing process.

A third type of organizer that we have used is a foldable. This approach combines the structured organizer with the evolving map. Oftentimes, we will design the format of the foldable in advance and then have students record information as they are learning. For example, we use a foldable design when discussing comprehension strategies (see Figure 2). After the students label the key ideas for the foldable they are free to record the information in ways that will facilitate their understanding. We often give suggestions about how to organize this information, but this decision is ultimately up to the learners as they are recording the new content. In each of these designs, we explicitly discuss how the selected tool can help organize the students' thinking. In addition, we also discuss and challenge our preservice teachers to think about ways they could adapt these same tools to use in their own classrooms.

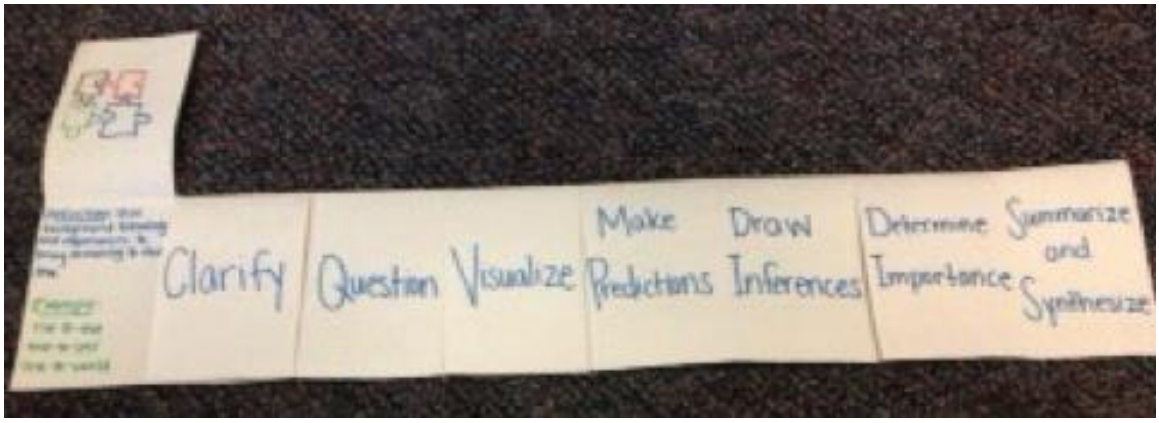

Figure 2. A comprehension foldable. This figure illustrates a graphic organizer designed to help students organize their thinking about how proficient readers use comprehension strategies.

Reflecting on Thinking

Subsequent to content being cognitively organized, it is essential for preservice teachers to reflect upon the new content being learned. Reflection on thinking encompasses several educational terms: reflective practice, reflective journaling, and learning logs. For the purpose of this article, the focus will be on reflective journaling as it was utilized throughout the semester as a strategy to enhance content learning.

We must actively teach and model reflective skills in a variety of ways if we are to demystify reflection for our students (Spalding & Wilson, 2002). Additionally, there is evidence that the art of reflection can help boost students' critical thinking skills, encourage students to think about their own thinking, and help students prepare for assignments and assessments (Homik & Melis, 2006; RMIT, 2006). Reflective writing is evidence of the learner looking back at previously taught content. It involves the action of analysis and forces the individual to look at the content from several lenses, such as exploring the importance or relevance of the content, considering how one's understanding of the content is evolving, and explaining how one's learning will influence the way that individual thinks and uses the content in the future. Thus, it pushes the learner to explore situations from a personal perspective, but within the context of the learning experiences designed by the professor.

Reflective journaling places emphasis on displaying reflections where the learners can record and reflect upon their experiences, observations, feelings and/or responses that can later be used to elicit class discussion, develop beliefs, and synthesize previous learning. Preservice teachers can benefit from spending

class time defining, discussing, and viewing models of active reflection. In our higher education classes, we have used reflective journaling in a number of ways to further students' learning. One way is to incorporate journal prompts at the start of every class. In methods courses where students are applying what they are learning in practicum experiences, we have found this type of structured reflection to be especially helpful. At the beginning of the course we purchase a variety of inexpensive journals and the students choose one to use for their own reflection throughout the semester. Students are required to bring this journal to class each week. The professor designs the reflection prompts to strategically incorporate topics the students are reading and learning about, as well as topics the students are observing in practicum settings. An example of a prompt we have used after students have begun to learn about word study instruction is, "If you were hired at a school to start teaching next week and the principal explained that you would need to implement developmental word study with your students, what questions would you have about this type of instruction? In your journal write down your questions and what you would need to learn to be confident with this type of teaching." After giving students a few minutes to reflect on the prompt in writing, we typically allow students to share their responses with a peer or small group of peers and then briefly discuss the most common questions as a whole class. This activity serves many purposes, but most importantly requires students to take an active role in their learning and to begin each class by synthesizing what they already know and identifying what they still need to learn. This type of cyclical reflection leaves a record of how students' ideas and understandings are changing over time and sends an important message to preservice teachers about the importance of reflective thinking.

Other ways that we have incorporated reflective journaling include assignments, both during class and outside of class, that require students to make connections between their experiences and their new learning. Most often these opportunities are designed to help students process the connections between class lecture, assigned readings, and what they are learning about effective teaching practices. These assignments are often couched in experiences that are also designed to organize their thinking. We use various forms of graphic organizers, as described in the preceding section, which require students to highlight the key information in a text and then reflect on that information in some way. For example, in all of our classes, we use the Double-Entry Journal (AdLit.org, 2014) and the Golden Lines (Rozzelle & Scearce, 2008) organizers to assist

students in determining important information and engaging in reflective thinking. We have found that some students automatically do the types of reflective thinking typical of successful college students and future teachers, but many require this type of thinking to be modeled and need structured assignments that facilitate the level of engagement critical to learning new content. Assigning this type of work and then providing class time to discuss and expand on students' reflections has been a key aspect in the design of our courses. Students consistently report that these types of reflective practices have a positive impact on their learning and teach them skills they use in other courses and learning situations.

Representing Thinking

Once preservice teachers have organized content in a logical manner through the use of graphic organizers and have had time to reflect upon the new content through journaling, professors must allow preservice teachers a variety of ways to represent learned knowledge. Creating a visual product to integrate learning and demonstrate higher levels of understanding is one way of representing new knowledge. Visual representations allow teachers to see not only what students are learning, as a form of assessment, but also how they are thinking and how the thinking process evolves over time (Hattie, 2012).

Visual representations, in nonlinguistic form, exist in two basic forms: internal representations, which are personal mental images, and external representations, which are open to examination by others. The literature refers to both of these forms as visualization (Gilbert, 2008). As both are necessary and interdependent, the focus of this article will be on strategies used to elicit external representations that demonstrate preservice teachers' content knowledge.

When students use the visual thinking strategies, they demonstrate their understanding of course content, as well as represent in a visual way the thinking that led them to this understanding. Students can represent their internal thinking process to others through external representations. Making this process explicit can help to model problem solving skills that can be applied to other situations (Zhang & Norman, 1994). This process of problem solving that is learned through the exercise of visual representations can strengthen students' higher-order thinking skills.

One of the ways we have incorporated visual representations into our course designs is to dedicate class time for students to work with peers to compare and consolidate their thinking after learning about a new idea or concept. We have found that this time is very valuable for students to strengthen

their basic knowledge about the concept, but also to practice thinking about the concept at a deeper level. For instance, after learning about the six components of language, we have students work in groups of four or five to come up with a way to represent how the components relate to one another (see Figure 3). The first time we ask students to create visual representations, we often have to give examples of what this could look like so students begin to think more abstractly. By the second time we engage with representing ideas in this way, students are often more prepared and excited to develop creative ideas that show connections between complex topics. By the end of our Foundations of Literacy course, we often have students create a visual representation of the relationship between all of the literacy concepts discussed throughout the course. This visual representation serves as a form of self-assessment and validation of content learned. Students often realize how much they now know about literacy after just a few short months.

Figure 3. A visual representation of the six components of language. This figure illustrates how one group of students represented the relationship between the six components of language and their schema.

We have also focused on having students represent their thinking in independent assignments. For instance, effective teaching. In addition to writing a philosophy of education, students are also required to create a visual product that demonstrates their learning. Some students design dioramas of what their future classrooms might look like, including identified features discussed during the course. Other students create collages (both paper and electronic) which demonstrate their ideas in picture format. Both of these out-of-class and in-class examples push students to demonstrate their knowledge in new ways in which they can recall in greater detail and with more clarity than when only represented in writing.

after completing an Introduction to Education course, we require students to show what they learned about

Conclusion

As teacher preparation programs look for ways to continue improving the educational experiences of preservice teachers, it is important to evaluate how course design can maximize this preparation process. We have found that intentionally incorporating the three elements of organizing, reflecting, and representing thinking into our teacher preparation courses through the use of active learning strategies has had a significant impact on student learning. Additionally, students are more actively engaged in learning during class, make more connections with their learning outside of class, and can more effectively put what they have learned into practice in future practicum experiences.

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