Transforming Technical Content Skills into Teaching Skills

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Introduction/need for innovation or idea

Teacher preparation programs are challenged with providing preservice teachers learning opportunities that promote pedagogical content knowledge (PCK) development. PCK allows the teacher to combine subject matter with pedagogy, and to practice their teaching skills (Shulman, 1986). According to Bransford, Brown, and Cocking (2000),

> Expert teachers know the structure of their disciplines, and this knowledge provides them with cognitive roadmaps that guide the assignments they give students, the assessments they use to gauge students' progress, and the questions they ask in the give and take of classroom life. (p. 155)

Rice and Kitchel (2015) recommend teacher educators "work with content faculty on developing explanations or assignments which help preservice teachers learn the content in a meaningful way, where the end-goal would be for them to ultimately teach the content" (p.98). In order to combine subject matter with pedagogy, a teacher educator at [university] worked with content faculty to develop learning opportunities that promote content knowledge development and the ability to teach the content in way that recognizes how individuals learn (Darling-Hammond & Bransford, 2005).

How it works/methodology/program phases/steps

Preservice agricultural teachers at the [university] enrolled in a technical welding course at a local community college. The course was facilitated by a professional welding instructor. A faculty member from the [department] at [university] collaborated with the welding instructor to develop a capstone experience for the technical welding course. The capstone experience was designed to transfer the preservice agricultural teachers technical welding skills into teaching skills that can be used in their future classrooms and laboratories.

The capstone experience provided a unique opportunity for the preservice agricultural teachers to use their technical welding skills to prepare and deliver welding demonstrations for high school welding students. Since it was the first time that this capstone experience was used, preservice agricultural teachers were asked to volunteer to prepare a welding demonstration. Five volunteers from the technical welding course were selected to design and deliver welding demonstrations for high school students. The preservice agricultural teachers prepared and submitted a lesson plan and a handout for the demonstration two weeks prior to the capstone experience. The preservice agricultural teachers had access to the high school agricultural mechanics lab in order to prepare material, setup machines, and practice their demonstrations. The sequence of demonstrations allowed the preservice agricultural teachers to work as a team to coordinate lesson planning, material preparations, and to identify any gaps that may exist in their lesson plans. The demonstrations were implemented within a welding pathway at a career academy for high school students. The preservice teachers worked with the [university] faculty member to design the demonstration and worked with the welding instructor to ensure the accuracy of the technical content. Each demonstration lasted approximately 10 minutes. Upon completion of each demonstration, 10 minutes were allocated for oral feedback regarding the effectiveness of the demonstration. Feedback was provided by the high school students, the

professional welding instructor, the university faculty member, and the preservice agricultural teachers.

In addition to the preservice agricultural teachers enrolled in the technical welding course, preservice agricultural teachers enrolled in a laboratory and instruction management course at [university] attended the capstone experience for the technical welding course. The preservice teachers enrolled in the laboratory instruction course had been learning how to design and implement demonstrations in the area of agricultural mechanics. The integration of the two courses added a unique dynamic to the capstone experience for the preservice teachers enrolled in the welding course and it allowed the preservice agricultural teachers in the laboratory and instruction management course the opportunity to critique their peers and to observe welding demonstrations in the high school setting.

The capstone experience included demonstrations over Gas Metal Arc Welding:

1. Machine set up and basic lab safety
2. Machine polarity and striking an arc
3. Striking as arc and running a bead
4. Striking an arc and running multiple passes
5. Basic tack welding and T welding joint

Results to date/implications

Preservice agricultural teachers enrolled in the technical welding course reported that the capstone experience was beneficial to their growth as a preservice agricultural teacher because it allowed for them to use their newly developed welding skills to teach high school students. Based on the feedback after each demonstration, it seemed the preservice agricultural teachers quickly realized there is more to effective teaching than simply knowing the content or possessing a skill.

Future plans/advice to others

In order to help preservice agricultural teachers experience growth and development in the area of PDK, faculty at [university] plan to continue the capstone experience and to create a similar capstone experience in a small engines course. If interested in implementing a similar capstone experience, it is recommended that university faculty build positive relationships with the instructors of the technical contents courses. This will help make it possible to collaborate with the instructors and to design a capstone experience that will allow students to practice teaching technical content. Additionally, locate a local high school agricultural mechanics program that is willing to allow the preservice agricultural teachers to come in and teach their high school students.

Costs/resources needed

In order to provide an authentic environment for preservice agricultural teachers to practice teaching high school students, a local high school agricultural mechanics class is needed. An agricultural mechanics laboratory/shop will provide the appropriate environment for the preservice agricultural teachers to practice educating high school students. The actual cost of the capstone experience will depend on the consumable supplies that are used during the demonstrations. The metal needed may be recycled from past projects, leaving the main expense to be the cost of the welding rods which is approximately $20.00/5lb container.

References

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