USE OF CREATIVE ASSESSMENTS IN SPACE SCIENCE COURSES DESIGNED FOR TEACHERS. M. L. Urquhart1, The University of Texas at Dallas, Department of Science and Mathematics Education (800 West Campbell Road, FN 33, Richardson, TX 75080, urquhart@utdallas.edu.

Introduction: As instructors from elementary to graduate school are aware, assessments of student learning can take a variety of forms. In a Master of Arts in Teaching Program (MAT) designed for in-service science teachers [1,2], the three space science courses (astronomy, planetary science, and astrobiology) use creative assessments to make course content more accessible and applicable to the diverse group of students. Many of these assessments take forms can be used by the students in their own future teaching, and some are at least similar to a Project-Based Learning (PBL) approach [3].

Addressing the Needs of Academically Diverse Learners: Students enrolled in these space science courses are generally a mix of in-service and pre-service science teachers. These students may teach (or be preparing to teach) any level, from elementary school to early college. No specific prerequisites are required. As such, students with a strong background in physics or geosciences may be enrolled in the same course as content novices. A diverse classroom presents a necessary challenge in differentiated instruction for an instructor. The course must be relevant and accessible for all learners. For these MAT courses, another requirement is that course content and tasks will address the needs of participants who are also current or future teaching professionals.

Designing Tasks, Making Connections: Tasks in the courses include a wide variety of opportunities for individual and group exploration, synthesis, and applications of the course content. Weekly journaling, quiz/thought questions, and small projects provide formative assessment opportunities, as do class discussions. An example of a collaborative task is the Earth Systems Concept Map activity in the planetary science course.

Working together to create a concept map of Earth’s interconnected systems assists participants in making connections within Earth science and to the other science disciplines they may teach. Small groups are assigned the task of making a large concept map of one or more Earth systems “spheres” such as the atmosphere, hydrosphere, geosphere, or biosphere. The smaller groups then combine to produce one or more larger concept maps that give a more complete picture of the complex and interconnected systems and processes active on planet Earth.

Sparking Creativity with a Menu of Final Projects: The MAT astrobiology course is taught with a PBL framework with a pre-defined semester-long project involving the Drake Equation, which is closer to a standard PBL task. The MAT astronomy and planetary science courses have a creative, open-ended final project. Students are required to complete and present a project that accurately synthesizes content from one or more course topics. A menu of forms the project might take is provided. Requirements include a specified target audience, and students are encouraged to produce a product useful in their future teaching or other professional work. An informal educator, for example, created displays comparing and contrasting the Galilean satellites for use in a nearby public informal institution. A high school chemistry teacher created a curriculum document showing connections between the space science content and resources used in the MAT courses with the chemistry topics she taught throughout the year. Other students have chosen to create games, videos, mission proposals, science fiction stories, or even children’s books of publishable quality based on course content, as described below.

Shown above: A children’s book created by 8th grade teacher Barbara W. McCoy, and illustrated by middle school students Denise Cribbet, Larry Choy, and Hannah Wisdom.

“Have You Seen the Moon?” [4] (© 2016 and used with permission) is a children’s book developed as a final project for the MAT astronomy course by Barbara McCoy, an 8th grade science teacher in a local high-needs middle school. In her presentation to her peers, Ms. McCoy recounted how her own students
struggle to learn the lunar phases and the reason behind them.

Her book, with illustrations formerly by students and in its current form by her friends and family, is written to inspire students to do their own lunar observations.

A simple template for a lunar log, a 5-week activity from the MAT astronomy course, is also provided to guide young readers in recording their observations.

The book uses a fanciful children’s story and illustrations to tell the tale of Pluto’s reclassification from Pluto’s point of view. Sample pages are shown below.


"A Perfect Place for Pluto" [5] (© 2018 and used with permission) is a children’s book created as a final project for the MAT planetary science course by preservice teacher Preston Dozier with illustrations by her sister, Christina Dozier. In her class presentation to her peers, Ms. Dozier recounted how her inspiration for her final project was her own frustration as a child with the reclassification of Pluto.