Chesapeake Section of the American Association of Physics Teachers Fall 2021 Virtual Meeting

Contribution ID: **15** Type: **Talk**

STEM – Teaching Particle Physics in Space Weather Studies

Saturday, October 23, 2021 1:15 PM (15 minutes)

Whereas the Standard Model has typically been developed through experimentation within an artificially-produced electromagnetic environment, similar particles have been detected within space weather regions with solar probing imagers and detectors onboard satellites. To better understand coronal mass ejections, solar winds, galactic cosmic rays as they constitute space weather and penetrate the Earth's atmosphere to infrequently impact terrestrial as well as space telecommunications, the natural space environment has been observed to contain the same subatomic particles as those observed and analyzed from detectors housed in particle accelerators and colliders of US Department of Energy national labs and CERN.
The purpose of this paper is to contextualize the study of particle physics, hence make the study relevant for learning, reframed within the environment of space weather. Subatomic and/or ionized particle absorption in Earth atmosphere infrequently impacts global commerce. The relevance of astrophysics has implications not only for disruptions to radio and other telecommunications, power of electrical grids, GPS localizations and navigations but to the less frequently mentioned global warming.
How relevant STEM students value these potential impacts on their lives correlate to the degree of personal engagement they see themselves in a career that addresses environmental challenges. In other words, STEM students envision their roles in the outcome expectations/contributions of their chosen vocations. And, their visions signify self-identification with their choices. By illustrating the progression timeline in developing astrophysics according to real-world events and knowledge-building milestones, student self-reflection becomes the instructional process for further STEM-based education and vocational planning.

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Session Classification: Afternoon Session 1