

## Space, Scale, and Scope (S<sub>3</sub>): Enhancing Understanding and Decreasing Misconceptions in STEM Education

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This project aims to identify scientific misconceptions surrounding space, scale, and scope, and the introduction of interventions to potentially address those misconceptions. Our objective is to create research-based activities in order to address common misconceptions found in physics, astronomy, and geology within a population of preservice elementary science teachers. This quasi-experimental study includes surveys, research-based classroom interventions, and data analysis. The survey consists of a research-based instrument to measure the range of misconceptions within this population. Following this pretest, there were three research-based interventions administered. Each lesson focused on a different concept within the standards of space, scale, and scope, followed by a posttest that was administered at the end of the semester. This project aligns with NASA's Strategic Objective 3.3: *Inspire and Engage the Public in Aeronautics, Space, and Science*, as well as Objective 4.4: *Manage Human Capital*. By facilitating research and discussion surrounding misconceptions in STEM, students and communities can more comfortably engage with once-unknown or previously misconstrued scientific material. This can inspire and engage the public to seek and disseminate accurate, interesting, and instructive scientific information. This project seeks to enhance and further develop the STEM workforce by increasing diversity and involvement for future generations and ensuring the growth of human capital. By identifying common misconceptions that exist within this population, we can actively address these problems by instituting productive research-based activities or shifting focus within lesson plans. Our preliminary data demonstrate that this population of preservice teachers had several misconceptions regarding elementary science concepts. These misconceptions ranged from misunderstanding the lunar cycle as well as the size and distance of the moon. Additionally, many students struggled with understanding the structure of our solar system and how quickly light travels. Our preliminary analysis suggest that the students have responded well to these interventions.