

# The Arizona Crisis in Physics Education

by Michael Vargas, AEF Ambassador for Excellence, & Jane Jackson, ASU Modeling Instruction

**FACTS:** In Greater Phoenix, only 20% of high school students take physics. Nationwide, 40% do. The U.S.A. has a severe shortage of science, technology, engineering, & math (STEM) techs & professionals. STEM jobs are growing twice as fast as other fields. High school physics is essential for STEM careers.

## WHY SHOULD WE CARE?

- \* The STEM economy is here: 60% of new jobs in the 21st century will require skills that only 20% of the current workforce have. No one has realized that these 20 percenters are the ones with physics skills. Businessmen and politicians have failed to realize that physics is STEM!
- \* High school physics is needed for almost all STEM college majors and careers.
- \* Only 10% of Hispanics and Blacks in Greater Phoenix take physics. We need STEM opportunities for *all* of our kids!

## HEED THE RESEARCH:

- \* ACT research shows that high school students who take physics are *twice as likely* to be ready for any college science – and more likely to be ready for workforce training programs. Thus ACT recommends a **minimum core curriculum in high school that includes biology, chemistry, and physics**.
- \* A college student who took high school physics is *twice as likely* to earn a STEM degree, than a student whose highest high school course was chemistry. [Tyson et al., U of So. FL, 2007]

## CURRENT CRISIS CONDITION OF ARIZONA PHYSICS TEACHERS:

- \* Only 160 people in Arizona have a Physics Certificate and taught high school physics in 2016-2017, according to the Arizona Department of Education. That's 1 teacher for every 2000 high school students!
- \* Most large public high schools have only 1 physics teacher, who teaches chiefly other subjects.
- \* Of the 100 comprehensive public high schools in Greater Phoenix, 8 have NO physics teacher in 2019. Of the 70 sizable rural Arizona public high schools, 20 no longer have a physics teacher.
- \* Physics classes are eliminated, to maintain student access in other AP classes. Students are being displaced to biology and other non-math-based sciences, where there is an abundance of qualified staff.

## WE ARE NOT REPLACING PHYSICS TEACHERS FAST ENOUGH.

- \* Arizona's 3 universities produce about 6 physics teachers yearly, altogether.
- \* Teachers leave: There were 25 open positions for physics teachers in Greater Phoenix in spring 2016.
- \* Schools are dropping physics and replacing it with science courses that are less rigorous.

## WE MUST INCREASE THE NUMBER OF PHYSICS TEACHERS IN ARIZONA:

- \* SB1051 provides \$2000 scholarships to re-train existing teachers (e.g., biology, middle school) to teach STEM. Goal: Fund 200 teachers in 5 years to take 12 graduate credits in physics or chemistry @ \$700/cr.
- \* The ASU Modeling Instruction Program is world-renowned physics and chemistry teacher professional development, with proven success. Teachers learn deep content and effective hands-on, minds-on pedagogy so that *in science class, students DO science*.
- \* Arizona leaders must convince school principals that physics is essential, even for average students.
- \* By increasing the number of physics and chemistry teachers in Arizona, we can double the number of students who have access to higher level STEM. Quality high school physics instruction is critical for Arizona prosperity! It will yield long-term sustainable and tangible benefits. Arizona needs a capable and mathematically adept workforce. Arizona desperately needs to invest in high school physics before it is too late. We need help from our Arizona leadership, to do this.

For information: Michael Vargas <goose2000@hotmail.com>; <http://modeling.asu.edu>