iSTEM & Diversity

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Committee on Integrated STEM Education
National Academy of Engineering

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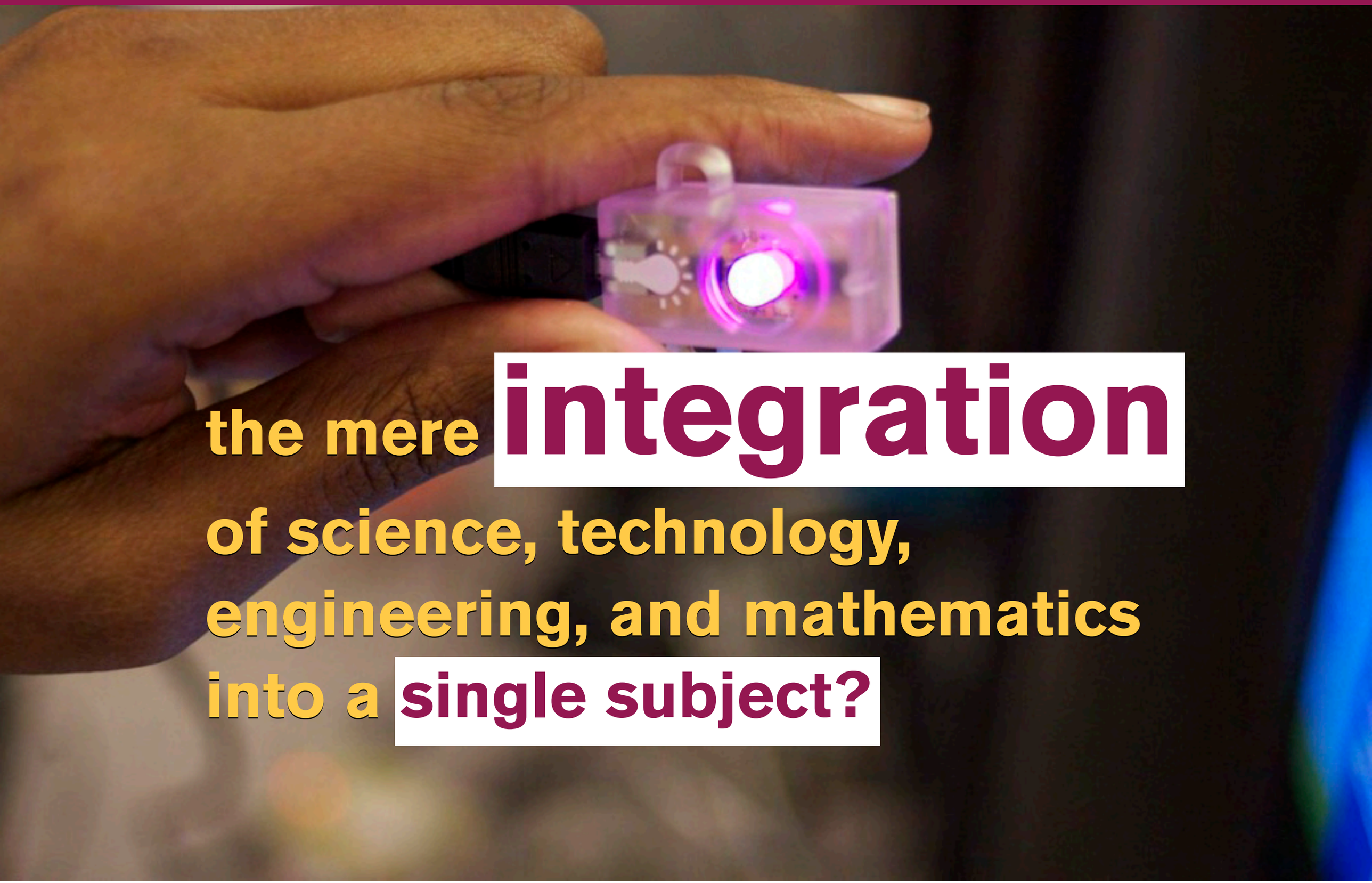
is integrated STEM education. . .



the mere **integration** of science, technology, engineering, and mathematics into a **single subject?**

k-12 students are. . .

disenchanted with school science and mathematics

k-12 schools are. . .

eager and desperate

to redesign/rename their buildings as

“STEM schools”

will integrated STEM education. . .

transform learning opportunities for

demotivated learners?

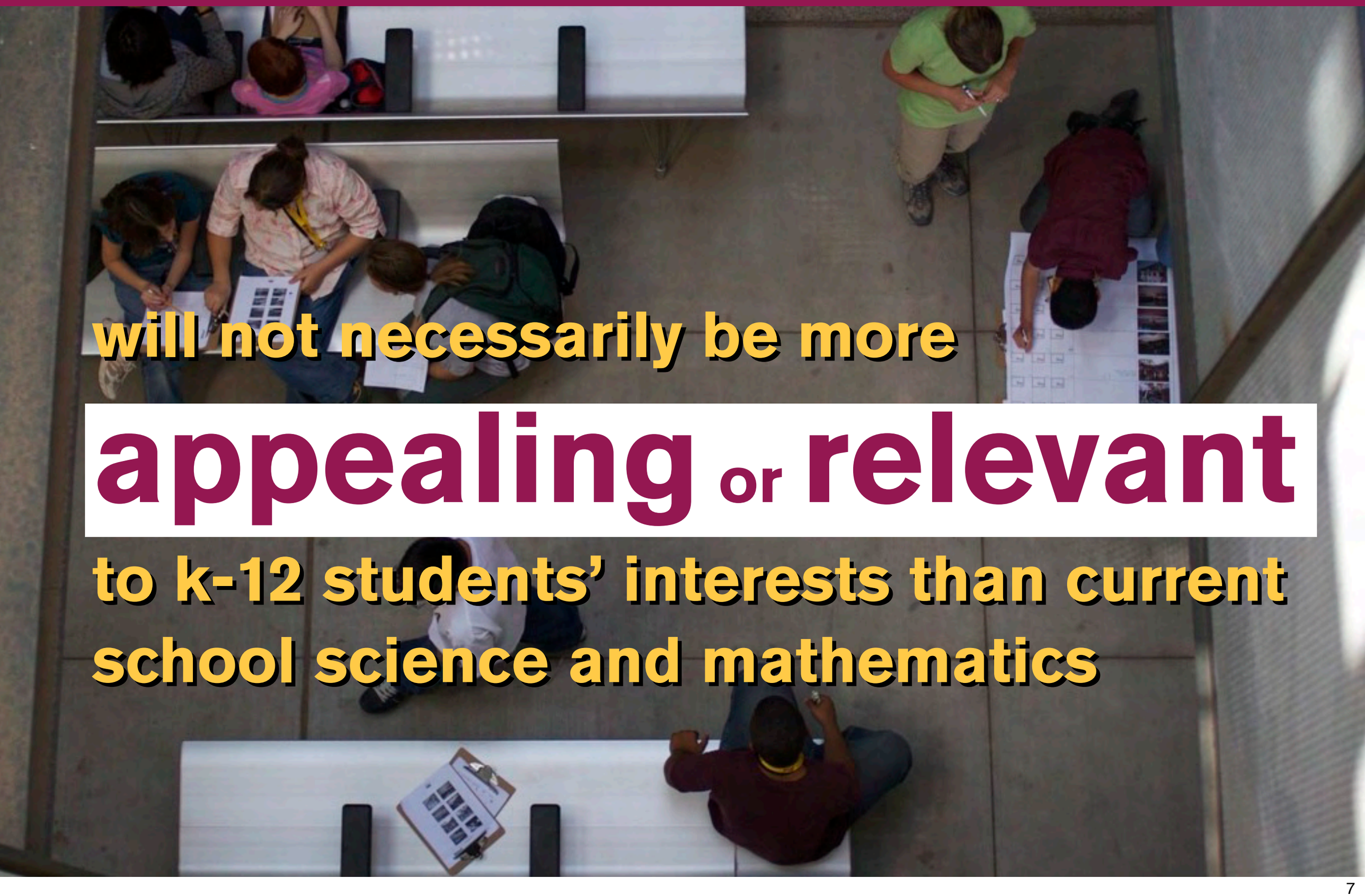
will integrated STEM education. . .

enhance **participation?**

increase **diversity?**

lead to **innovation?**

integrated STEM education. . .



will not necessarily be more

appealing or relevant

to k-12 students' interests than current school science and mathematics

unless integrated STEM education

also integrates

personal and social relevance

unless integrated STEM education

also integrates

identity

development

relevance. . .

mastery (experience success)

high value

science education research. . .

identity development is. . .

impacted by

stereotypes related to

jobs, subjects, and activities

— these are culture dependent and

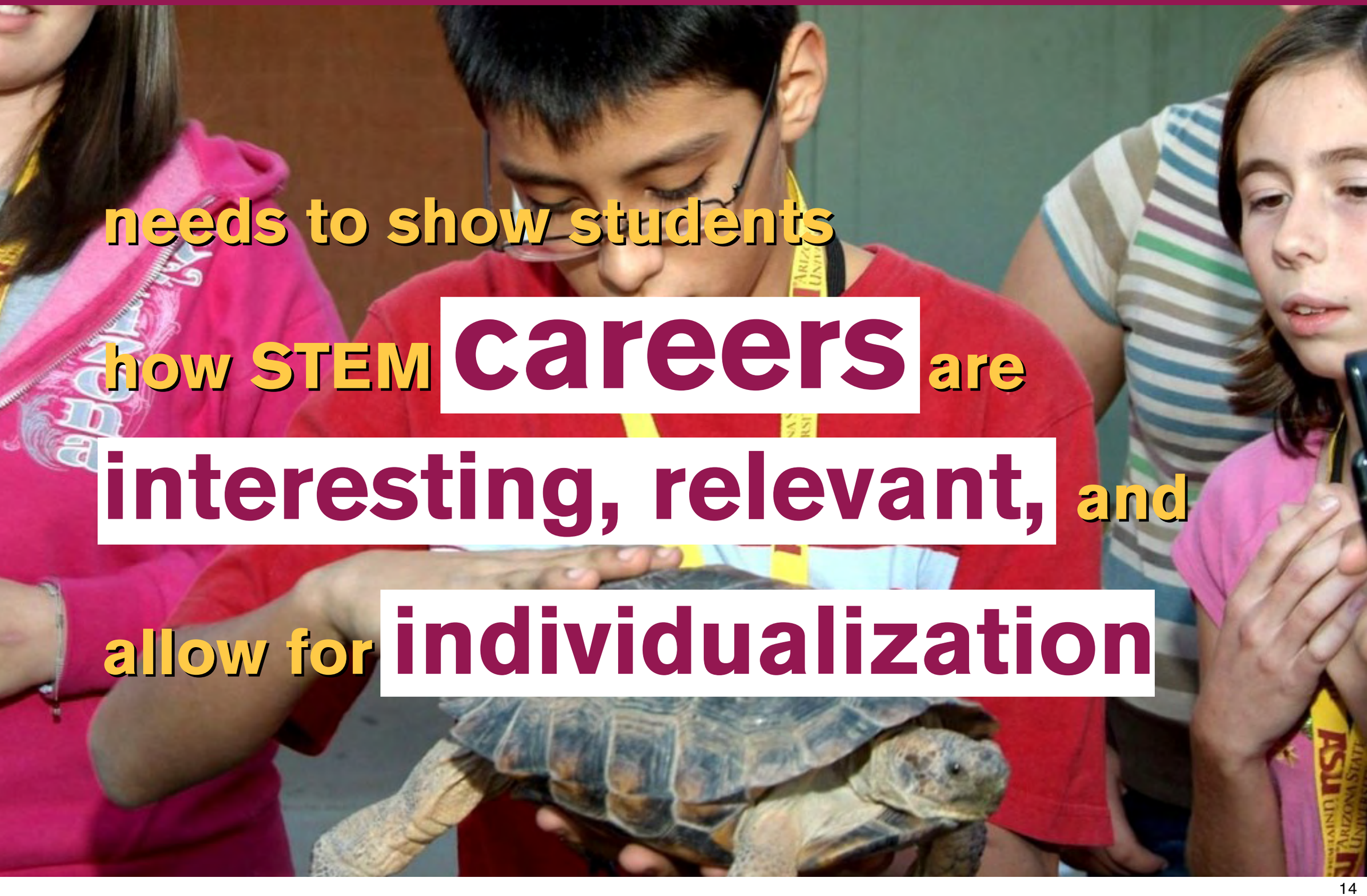
gender-specific

unless integrated STEM education

incorporates

free choice

integrated STEM education



integrated STEM education

is therefore not merely interdisciplinary, but

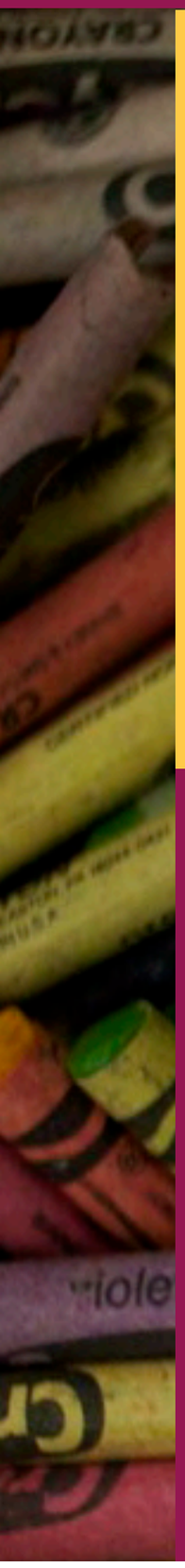
transdisciplinary

integrated STEM education

needs to offer multiple entry points for learners

where the scientific, technical, social, economic, and the political interact with elements of value and culture

integrated STEM education



has the potential to enhance diversity in k-12

to establish evidentiary warrant, long-term research that use multiple approaches are needed

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research needs to:

move beyond describing “what is?”

or confirming “what works?” to

deliberately designing

“what strategy(ies) of intervention might work better?”

Design research

is necessary to develop, test, implement, and diffuse innovative practices to move from socially constructed forms of teaching and learning from malfunction to function or from function to excellence (Kelly, 2003)

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design research attempts to:

a) help design innovations

b) explain their effectiveness or lack thereof, theoretically

c) re-engineer them wherever possible
(Kelly, Lesh, & Baek, 2008)

more than a single **theory** will likely be required to describe, explain, or predict the success or failure of a specific learning innovation

research will unfold over multiple cycles within a study or across a program of studies

iterative in nature

assessment should act as a guide for improving the innovation's potential for learning

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design researchers build

instructional artifacts that improve student learning

underlying theory(ies) of learning should be identified

(based on changes in what a learner masters, rather than one based on achievement, which reduces learning to an assumed terminal point)

design research requires

several phases from

construction of new possibilities

(innovation in education) to tests of causality and generality

ultimately include **scaling and diffusion** research

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