Australian Government
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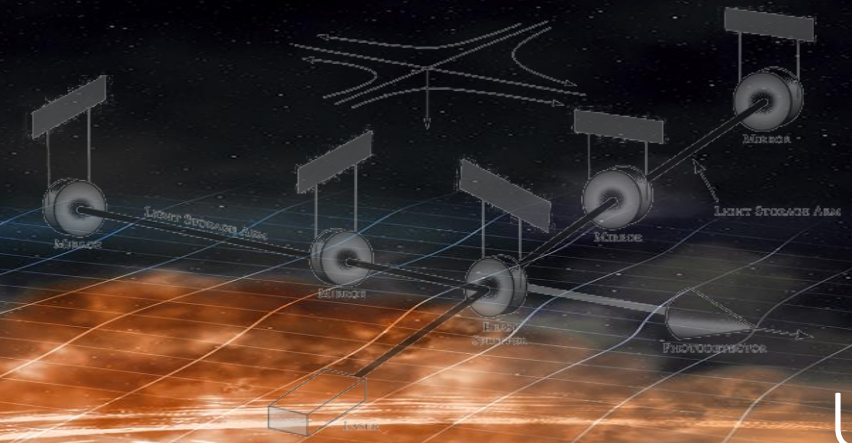
OzGrav



ARC Centre of Excellence for Gravitational Wave Discovery

USE OF VR FOR TEACHING EINSTEINIAN PHYSICS

Jackie Bondell: OzGrav Education and Public Outreach Coordinator

@ARC_OzGRav @jtkst10

Teaching Einsteinian Physics in Schools

Swinburne University of Technology
Australian National University
Monash University
The University of Western Australia
The University of Melbourne
The University of Adelaide

OUTLINE FOR TODAY

Introductions

VR Overview

VR as an Educational Tool

Mission Gravity: A Case Study

INTRODUCTION

Jackie Bondell

- Education and Public Outreach Coordinator, OzGrav
- jbondell@swin.edu.au
- @jtkst10 (Twitter)
- Background:

  Physics Teaching

  Curriculum Design – Project Based Learning and Modelling

  Technology in Education

  Teacher Mentoring

  Accessibility in STEM

* Now a Practitioner

OzGrav

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IMMERSION

The ability to spatially insert a learner in an environment allows for situated, multisensory learning that can move the audience away from the passive consumption of information toward engaged and active participation.

AN OPPORTUNITY WITH VR

A way to immerse people in science.

Potential to increase engagement and learning outcomes in STEM classrooms.

The added advantage of using cutting-edge tech.

WHAT IS YOUR EXPERIENCE WITH VR?

WHAT ARE SOME POSSIBLE BENEFITS OF USING VR IN THE CLASSROOM?

WHAT ARE SOME POSSIBLE DRAWBACKS OF USING VR IN THE CLASSROOM?

CHALLENGE: BUILDING THE OZGRAV SCHOOLS PROGRAM

Existing OzGrav Strengths

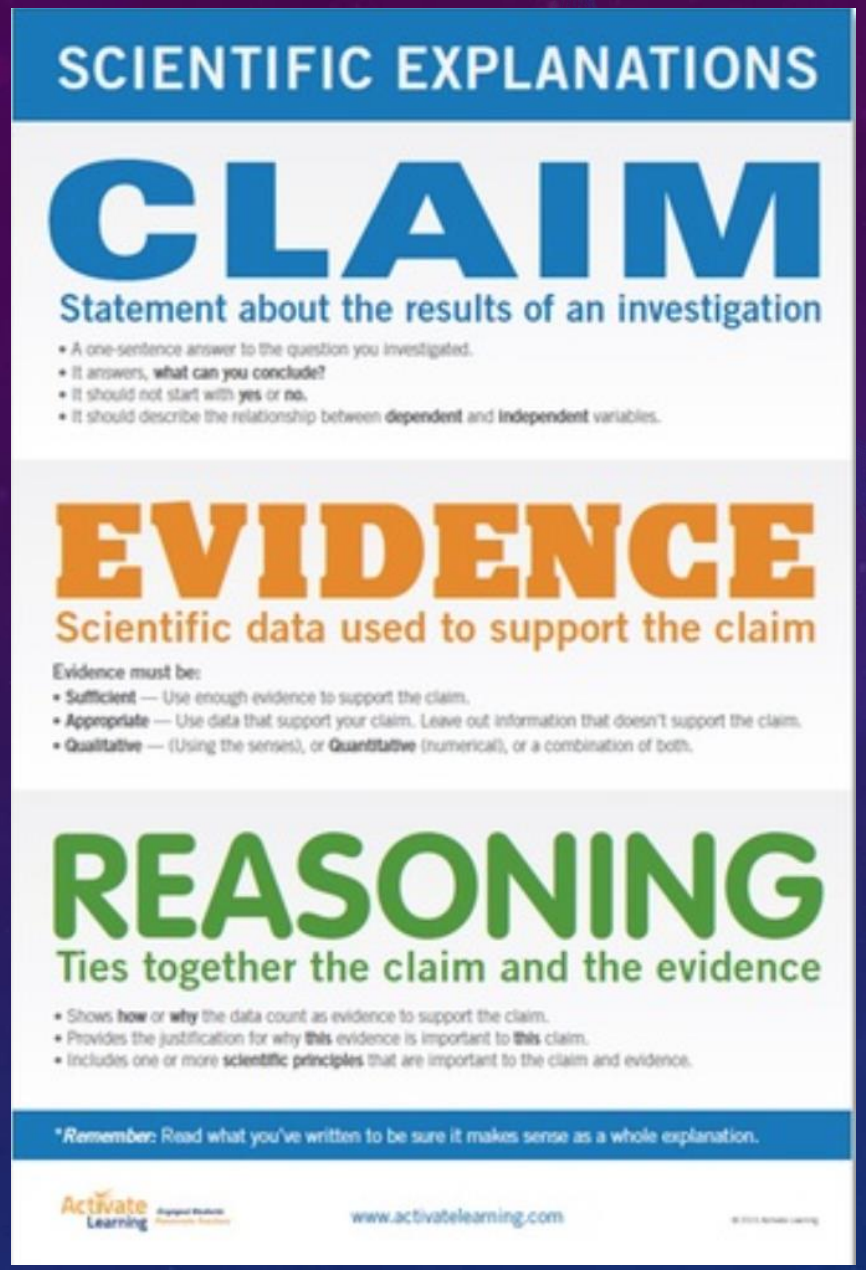
- World Class Scientists
- Existing interactive VR and MR content
- Skilled VR and Digital media specialists
- Commitment to build a schools experience

Existing Education and Curriculum Strength

- Years of curriculum design with tech focus
- Distance and face-to-face teaching
- Scientist and educator training
- Model Building Pedagogies

VR AS AN EDUCATIONAL TOOL

- ***Modeling Curriculum:*** The Modeling Instruction Framework is a student-centered instructional design focusing on letting students be the scientist with the teacher prepared to guide, clarify, and address student misconceptions



- Engage students in understanding the physical world by *constructing and using scientific models* to describe, explain, predict and control physical phenomena.
- Provide students with *basic conceptual tools* for modeling physical objects and processes, especially mathematical, graphical and diagrammatic representations.
- Familiarize students with a small set of basic models as the *content core* of science, technology, engineering, and mathematics (STEM).
- Develop insight into the *structure* of scientific knowledge by examining how models fit into theories.
- Show how scientific knowledge is *validated* by engaging students in evaluating scientific models through comparison with empirical data.
- Develop skill in all aspects of modeling as the *procedural core* of scientific knowledge.

https://www.modelinginstruction.org/sample-page/synopsis-of-modeling-instruction/

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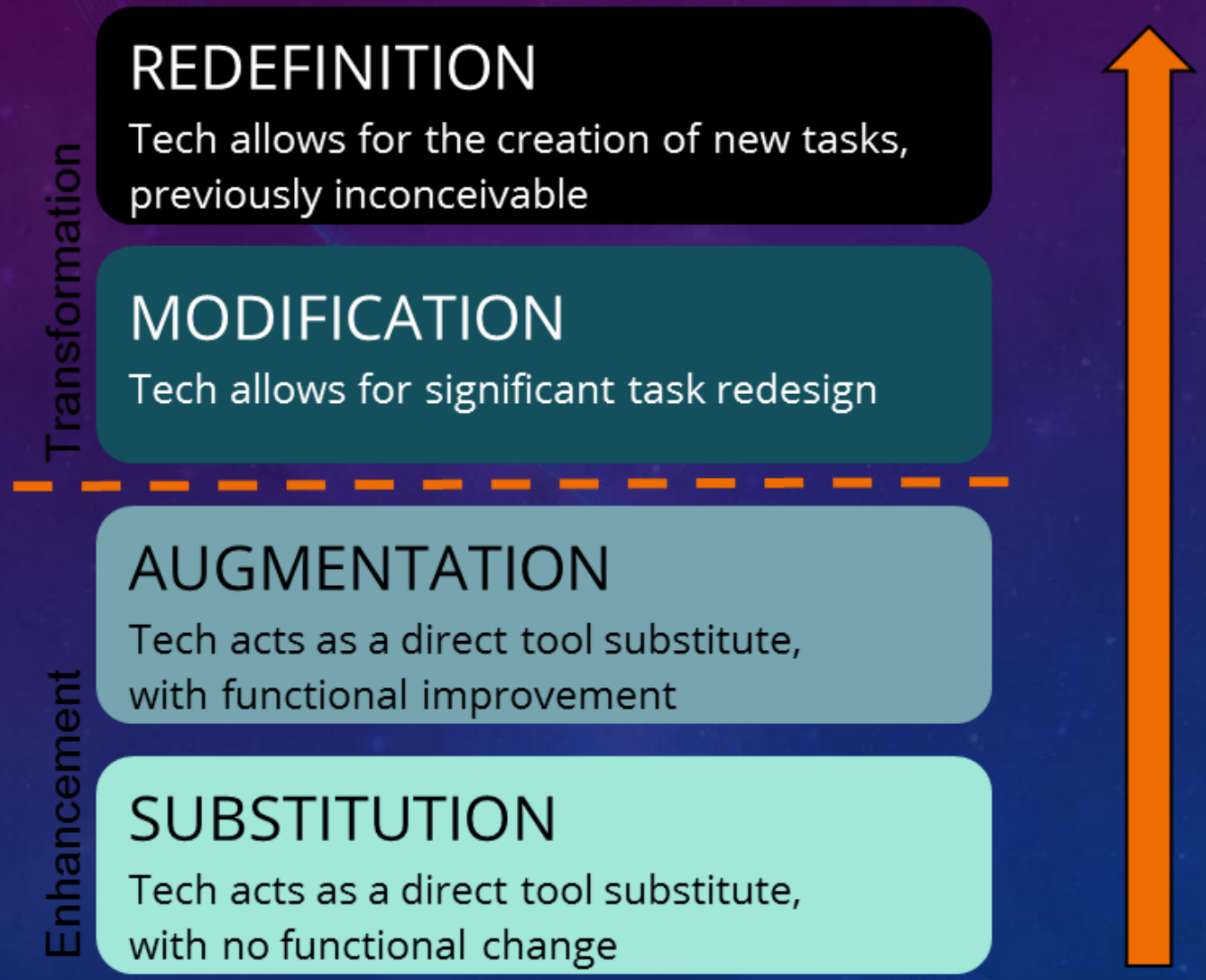
SAMR MODEL (PUENTEDURA)



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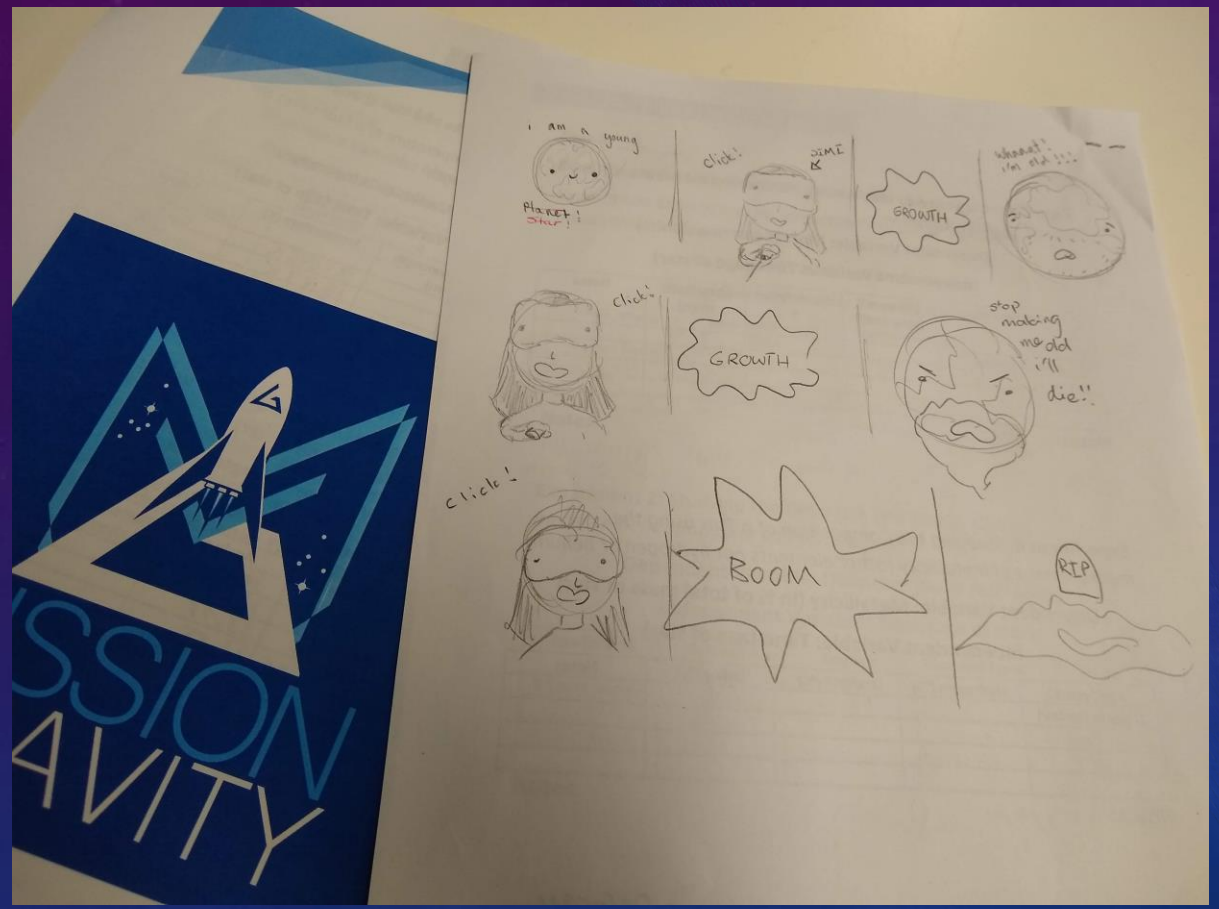
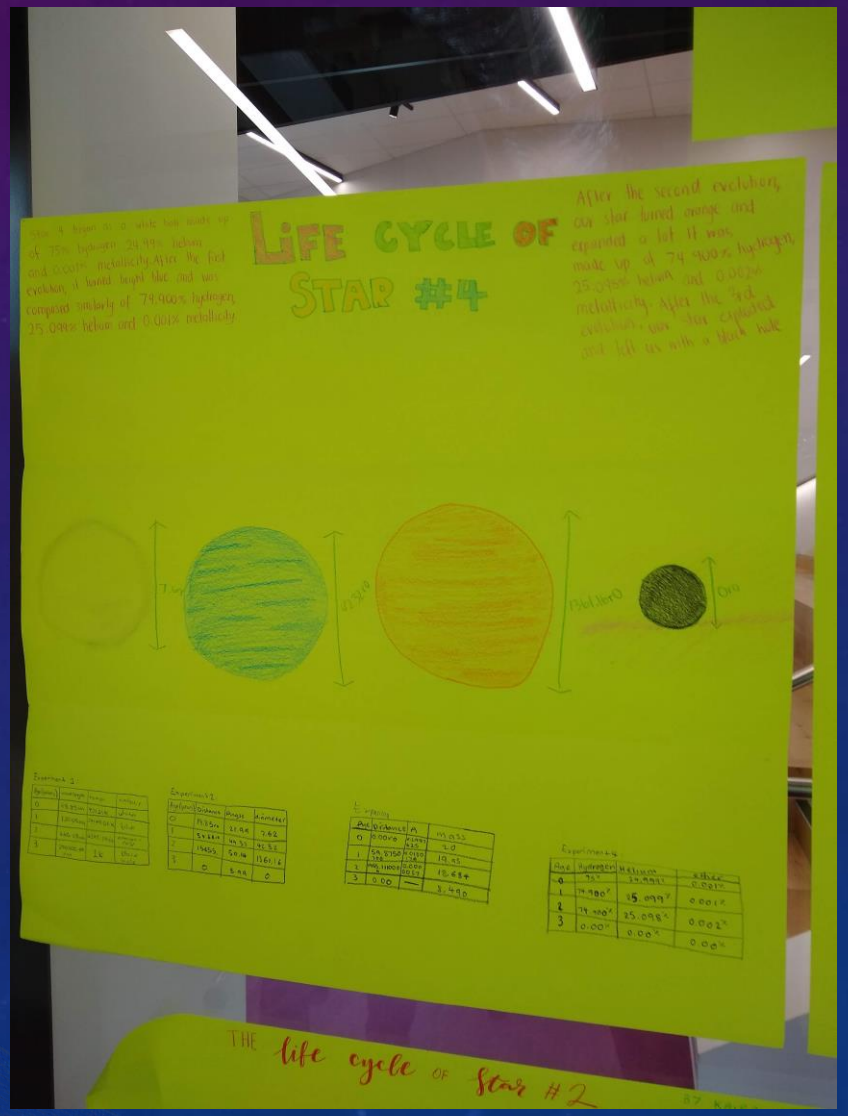
LESSON PLANS





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INTERACTIVE AND COLLABORATIVE SOFTWARE

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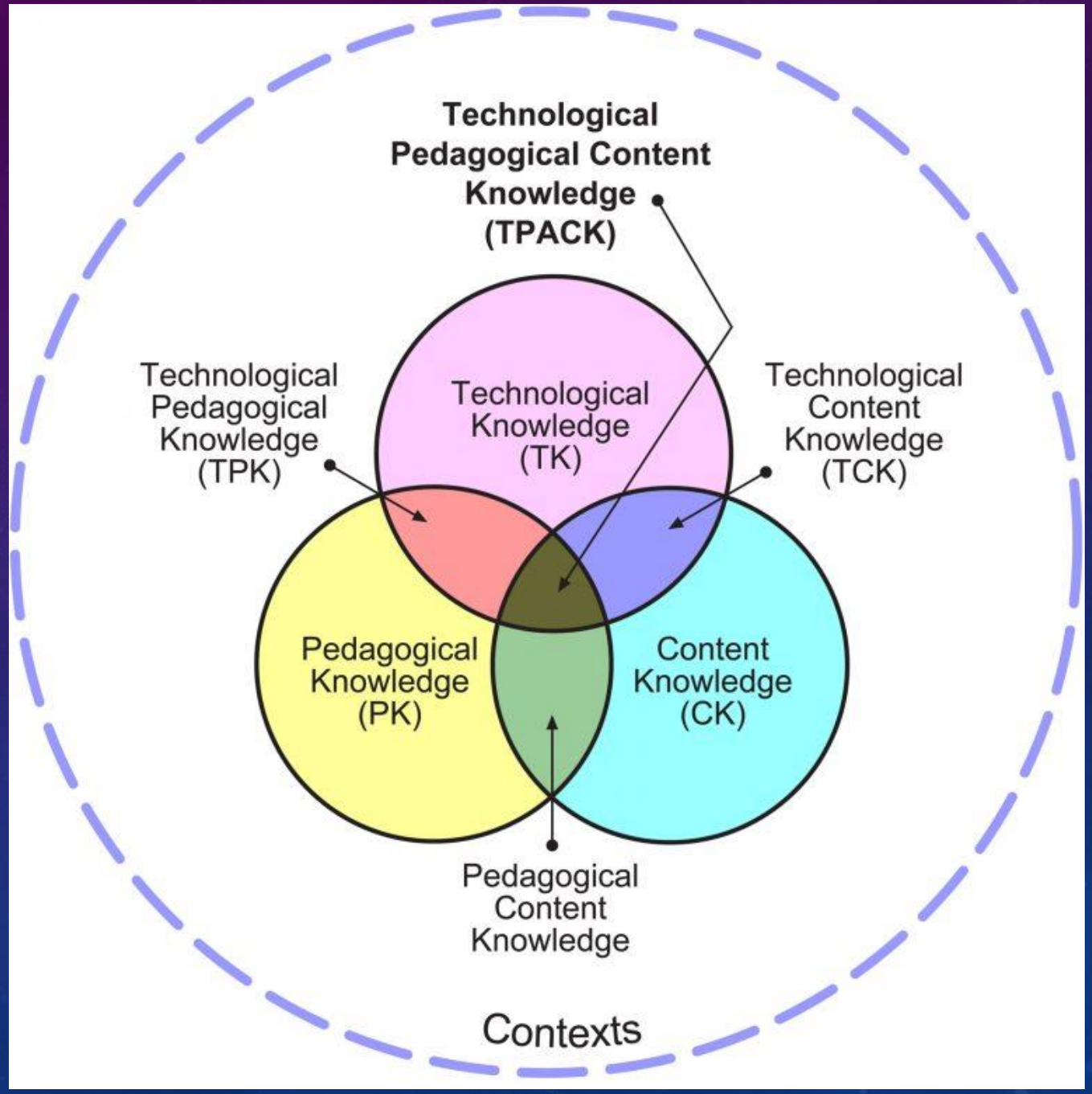
- ***Interactive VR Program Software***: Developed in-house to allow the content to be driven by curriculum choices
- ***Technology Choices***: Equipment chosen due to classroom, bandwidth, & cost constrictions while optimizing experience

TECHNOLOGY CHOICES

TPACK FRAMEWORK



MISSION GRAVITY

Classic scientific modelling and Immersive virtual reality.

Incursion Options / Lesson Plans

- Mission Gravity
- Life of Stars
- Gravitation; BB Radiation; etc.

Students will

- Collaborate in teams to create a model of stellar evolution with specific roles
- Collect and analysing data from a virtual trip to nearby stars
- Use the laws of physics and the freedom of virtual reality to learn about how stars change over time
- Use scientific tools to study stars

OzGrav has developed:

- VR App: able to be scaled and easily updated by OzGrav VR developers
- Lesson Plans and Incursion Slides: provides structure for educators over multiple year levels
- Learning Outcomes and curriculum Links: Provides alignment with schools curricula
- Teacher PD Options: Workshops and Training
- Web Based version – *beta*
- Primary School – *early to mid 2020*
- Assessment - *ongoing*

MISSION GRAVITY FEEDBACK

‘It was a most helpful, relevant, engaging and well-run lesson. The students engaged strongly with the interactive activity.
Students expressed their appreciation of being able to ‘create’ their knowledge of Wien’s law through the interactive exercise.’

‘Aside from using the virtual reality goggles, the best part of the excursion was seeing how Physics concepts learnt in the classroom can be applied in science inquiries.’

‘The mechanics and software were impressively flawless. You were well-prepared and experienced. The ability to cast vision of all head-sets onto the front-screen is exceptionally helpful.’

‘The virtual reality component of it was engaging and enjoyable. It was really easy to understand the concepts that were discussed by having a visual representation. We got so much out of it and I was able to understand ideas that I previously struggled with.’

OZGRAV EDUCATION

Current Relevant Programs and Projects

1. Mission Gravity Schools program using visualisation in VR as an environment for studying the physical properties of stellar evolution and stellar remnants
2. Development of multiple lessons scaled to a variety of year levels
3. Collaborative research project pilot with Monash Uni Astronomy on efficacy of interactive VR

Upcoming Relevant Programs and Projects

1. New VR environment (‘Gravity Explorer’) to allow interaction with varied gravitational fields in conjunction with Einstein-First; New lesson plans to align with these and Aus curriculum
2. Collaboration with Victoria-based school for piloting and assessing current and new programs
3. More teacher PD programs and development of educator’s portal to house all OzGrav developed education materials

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CSIRO
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Australian Research Council

SCIVR LINKS: WWW.SCIVR.COM.AU

SciVR Website

OzGrav PRESENTS

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SCIENCE in VR

SCIVR.COM.AU