Emotional Engagement in the Early Years: The Science of Imaginative Learning

Laureate Professor Marilyn Fleer
Monash University

Catholic Education Tasmania

2025 TEACHING MATTERS
KNOWLEDGE I TRUTH I FREEDOM

Emotional Engagement in the Early Years

THE SCIENCE OF IMAGINATIVE LEARNING

Emotional Engagement in the Early Years

Laureate Professor Marilyn Fleer, Conceptual PlayLab

MONASH University

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FLEER'S CONCEPTUAL PLAYWORLD

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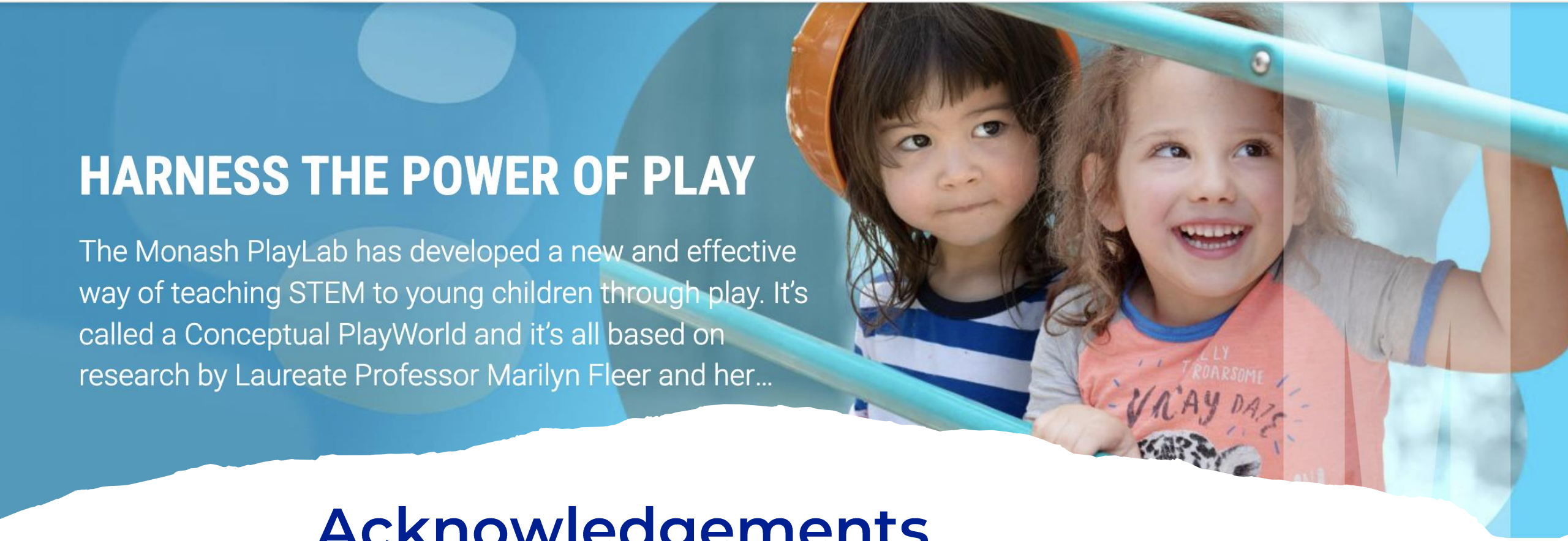

Acknowledgements

Acknowledgement of Australian Research Council & colleagues in Conceptual PlayLab

Foundational research that built our evidence-informed model of a *Conceptual PlayWorld*

Grants	Programmatic research over time: How to design motivating STEM learning through play	Theoretical outcome
DP 2005	The sociocultural construction of science learning. Learning of **scientific concepts within situated playful encounters** in early years context	*Conceptual play*
DP 2011	**Conceptual play**: Foregrounding imagination and cognition during concept formation in early yeas science education	*Affective imagination*
DP 2013	**Affective imagination** in scientific education: Exploring the emotional nature of scientific and technological learning and engaging children and teachers	*Digital play*
DP 2014	An investigation into the relations between **imaginary situations** and **scientific abstractions in** preschool digital play	*Conceptual PlayWorlds (CPW)*
LP 2018	**Playworlds**: Researching development of **executive functions** (working memory, emotion regulation, planning and cognitive flexibility)	*Impact research changing practice*
DP 2018	**Conceptual PlayWorlds**: Researching play, imagination and science teaching	*PD model for multimodal learning of CPW*
FL 2018-24	This programmatic study is researching imagination in play and imagination in science, engineering and technology (and more) using intervention of a **Conceptual PlayWorld**	Intervention play research changing developmental conditions

The evidence and impact of a Conceptual PlayWorld model

Free downloads of our working papers

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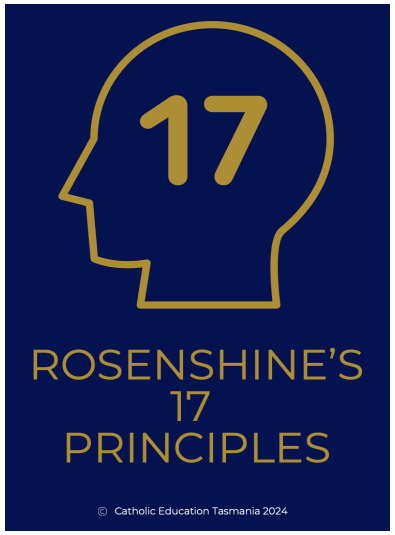
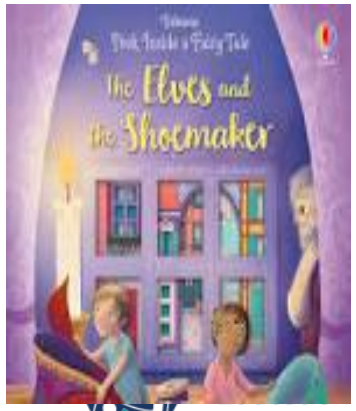
INSIGHT



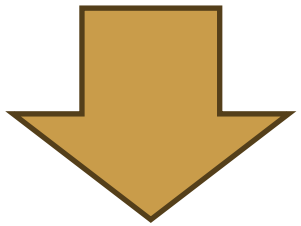
- EXPLORING EMOTIONS AND IMAGINATIVE LEARNING
- THE SCIENCE BEHIND CONCEPTUAL PLAYWORLDS
- CLARIFYING THE SCIENCE OF LEARNING IN EARLY CHILDHOOD
- CASE STUDY: THE ELVES AND THE SHOEMAKER
- CO-TEACHING IN A CONCEPTUAL PLAYWORLD



Tasmania

First: What is *The Science of Learning* (SoL)

Second: What does it mean for us in the Early Years?



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Catholic Education Tasmania

INSIGHT

Trends in Neuroscience and Education 32 (2023) 100206

Contents lists available at ScienceDirect

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Defining the Science of Learning: A scoping review

A.J. Privitera [a,*], S.H.S. Ng [a,b], S.H.A. Chen [a,c,d,e]

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ARTICLE INFO

Keywords:
Science of learning
Learning sciences
Educational neuroscience
Education
Scoping review

ABSTRACT

Background: Interest in research on the Science of Learning continues to grow. However, ambiguity about what this field is can negatively impact communication and collaboration and may inadequately inform educational training programs or funding initiatives that are not sufficiently inclusive in focus.
Methods: The present scoping review aimed to synthesize a working definition of the Science of Learning using Web of Science and ProQuest database searches.
Results: In total, 43 unique definitions were identified across 50 documents including journal articles, theses, conference papers, and book chapters. Definitions of the Science of Learning differed considerably when describing the fields thought to contribute to research on this topic.
Conclusions: Based on findings, we propose a working definition of the Science of Learning for discussion and further refinement: the scientific study of the underlying bases of learning with the goal of describing, understanding, or improving learning across developmental stages and diverse contexts.

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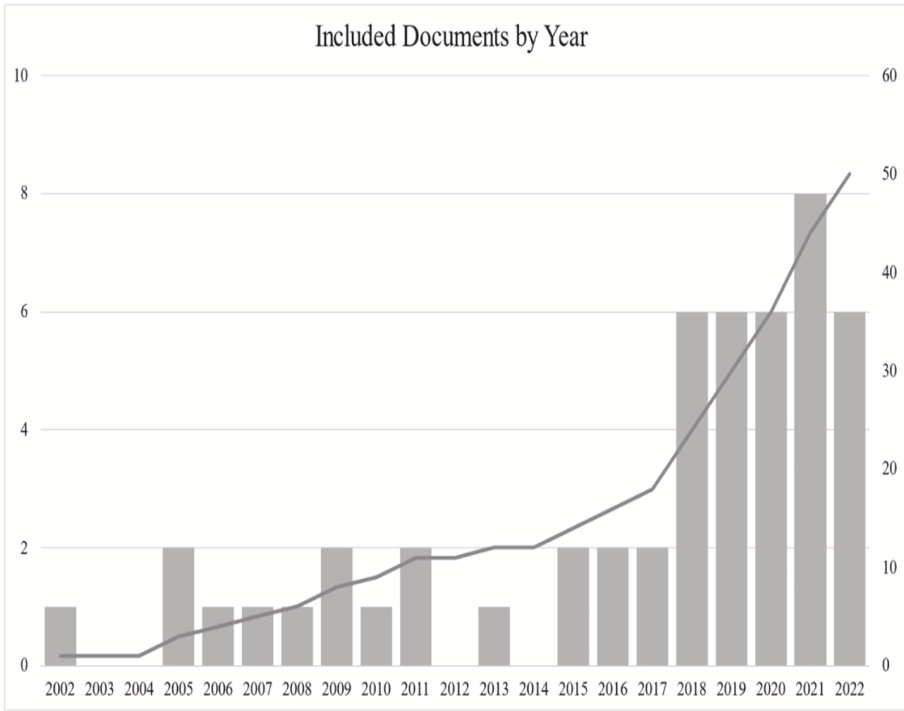

Fig. 2. Historical publication trends by year. Bars reflect number of publications per year (left axis) while the line reflects cumulative publications (right axis).

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Table 4
Fields contributing to the Science of Learning over time.

Field	2006	2007	2009	2011	2015	2016	2017	2018	2019	2020	2021	2022	Total
Anthropology													19%
Behavioral Economics													11%
Cognitive Psychology													37%
Cognitive Science													37%
Computer Science													11%
Developmental Psychology													7%
Developmental Science													4%
Education													37%
Educational Psychology													7%
Learning Sciences													7%
Linguistics													7%
Machine Learning													15%
Neuroscience													56%
Philosophy													7%
Psychology													44%
Social Psychology													7%
Sociology													22%
Other Fields													15%

Note: Darker shading corresponds to higher frequency of reference to a specific field in all definitions published in a given year.
Total represents the total percentage of included definitions which reference a specific field.

Science of Learning: The scientific study of the underlying bases of learning with the goal of describing, understanding, or improving learning across developmental stages and diverse contexts.

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Applied Developmental Science

ISSN: 1088-8691 (Print) 1532-480X (Online) Journal homepage: www.tandfonline.com/journals/hads20

Implications for educational practice of the science of learning and development

Linda Darling-Hammond, Lisa Flook, Channa Cook-Harvey, Brigid Barron & David Osher

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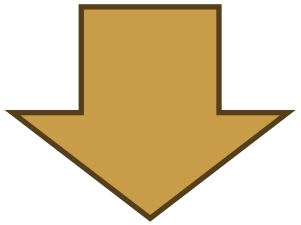
Figure 1. SoLD principles of practice.

First: What is *The Science of Learning* (SoL)



Second: What does it mean for us in the Early Years?

Catholic Education Tasmania

INSIGHT

THE SCIENCE OF LEARNING
IN EARLY CHILDHOOD EDUCATION

BRAIN DEVELOPMENT

- Experiences drive brain development
- Rapid growth in first few years
- Foundation for future learning

ACTIVE LEARNING

- Engaging, hands-on activities
- Curiosity and exploration
- Supports brain connections

ADULT INTERACTION

- Warm, responsive relationships
- Language-rich environment
- Guidance and support

ENVIRONMENT

- Safe and nurturing setting
- Rich in opportunities for play
- Stimulating and inclusive

Figure 1. SoLD principles of practice.

Table 1. Practices aligned with the science of learning and development.

I. Supportive Environment			II. Productive Instructional Strategies		
Structures for Effective Caring	Classroom Learning Communities	Connections among staff and families	Student-centered instruction	Conceptual understanding & Motivation	Learning how to learn
• Small schools • Small class size • Advisories • Block scheduling • Looping • Teaching teams • Longer grade spans	• Intentional community-building • Cultural competence • Identity safety • Consistent routines	• Relational trust • Staff collaboration • Home visits • Regular parent conferences • Authentic family engagement	• Building on prior experience • Teaching to readiness • Personalization • Collaborative learning • Cognitive supports	• Conceptual map of the domain • Inquiry + explicit instruction • Motivating tasks with skillful scaffolding • Interest-driven learning	• Teaching metacognition + learning strategies • Formative feedback, practice & revision • Mastery-oriented performance assessment
III. Social and Emotional Development			**IV. System of Supports**		
Integration of Social Emotional Skills	Development of Habits & Mindsets	Educative & Restorative Behavioral Supports	Multi-tiered systems of support (MTSS)	Coordinated access to integrated services	Extended learning opportunities
• Teach intra- and inter-personal skills,	• Teach executive functions • Develop growth mindset, self-efficacy, nging ess, tools for stress	• Teach students behavioral skills & responsibility • Cultivate community contributions • Repair harm by making amends	• Tier 1: Use universal designs for learning and knowledge of child development • Tier 2: Diagnostically identify additional services needed • Tier 3: Provide intensive interventions	• Wraparound health, mental health and social services • Community partnerships • Family & community engagement	• Before & after school enrichment, mentoring, and academic support • Summer learning opportunities • Tutoring

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Australian Education Research Organisation

Discussion paper

Play-based learning with intentionality

April 2025 | Updated May 2025

Science of Learning: The scientific study of the underlying bases of learning with the goal of describing, understanding, or improving learning across developmental stages and diverse contexts.

An example from Australian Education Research Organisation (2025):

Intentional educators and teachers are critical to maximising all children's opportunities for learning and development

Active decision-making and a repertoire of learning and teaching strategies are required to maximise children's outcomes

Foundational beliefs, knowledge and attitudes enable and impact educator and teacher intentionality within play-based learning

Gaps exist in the evidence base on intentional teaching

Science of Learning in the early years. Implications for educators/teachers:

Teaching Principle	Key Focus
Intentional teaching embedded in play and daily routines	Use planned learning opportunities naturally within play and everyday activities so they feel relevant and engaging.
Build warm, trusting relationships	Establish emotional security and a strong sense of belonging as the foundation for learning.
Introduce concepts within meaningful, real-world contexts	Link new ideas to situations and experiences children encounter in daily life.
Integrate STEM, literacy, and arts meaningfully	Blend different areas of learning in ways that connect to the child's understanding and interests.
Observe and assess learning holistically	View development across cognitive, social, emotional, and physical domains to guide next steps.

PRACTICE EXAMPLE

Second: What does it mean for us in the Early Years?

Catholic Education Tasmania

INSIGHT

Deans for Impact (2015). *The Science of Learning.* Austin, TX: Deans for Impact.

Linking with Tasmania... in the context of the Deans of Education Report

Linking with Tasmania…
Rosenshine's principles of instruction

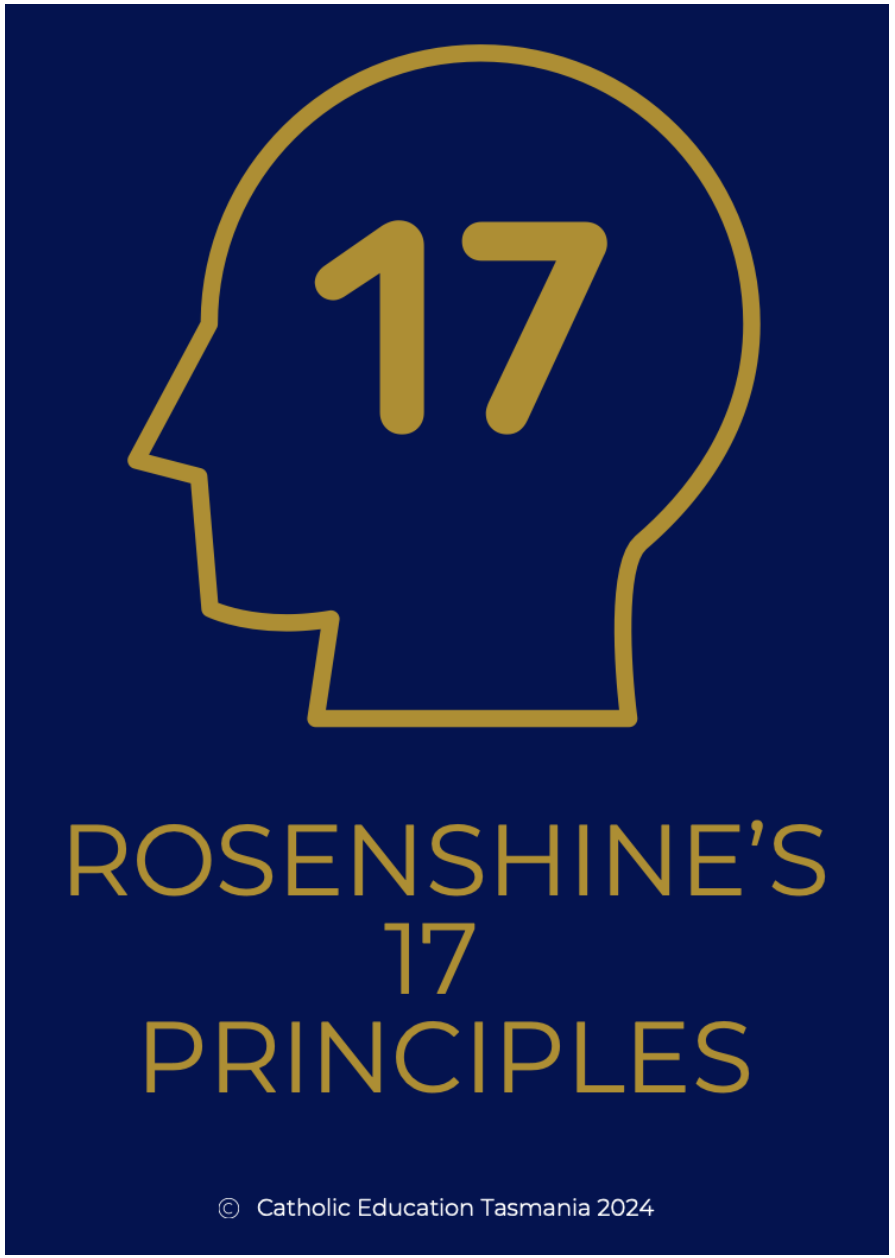
17 Principles of Effective Instruction

The following list of 17 principles emerges from the research discussed in the main article. It overlaps with, and offers slightly more detail than, the 10 principles used to organize that article.

- Begin a lesson with a short review of previous learning.
- Present new material in small steps with student practice after each step.
- Limit the amount of material students receive at one time.
- Give clear and detailed instructions and explanations.
- Ask a large number of questions and check for understanding.
- Provide a high level of active practice for all students.
- Guide students as they begin to practice.
- Think aloud and model steps.
- Provide models of worked-out problems.
- Ask students to explain what they have learned.
- Check the responses of all students.
- Provide systematic feedback and corrections.
- Use more time to provide explanations.
- Provide many examples.
- Reteach material when necessary.
- Prepare students for independent practice.
- Monitor students when they begin independent practice.

–B.R.

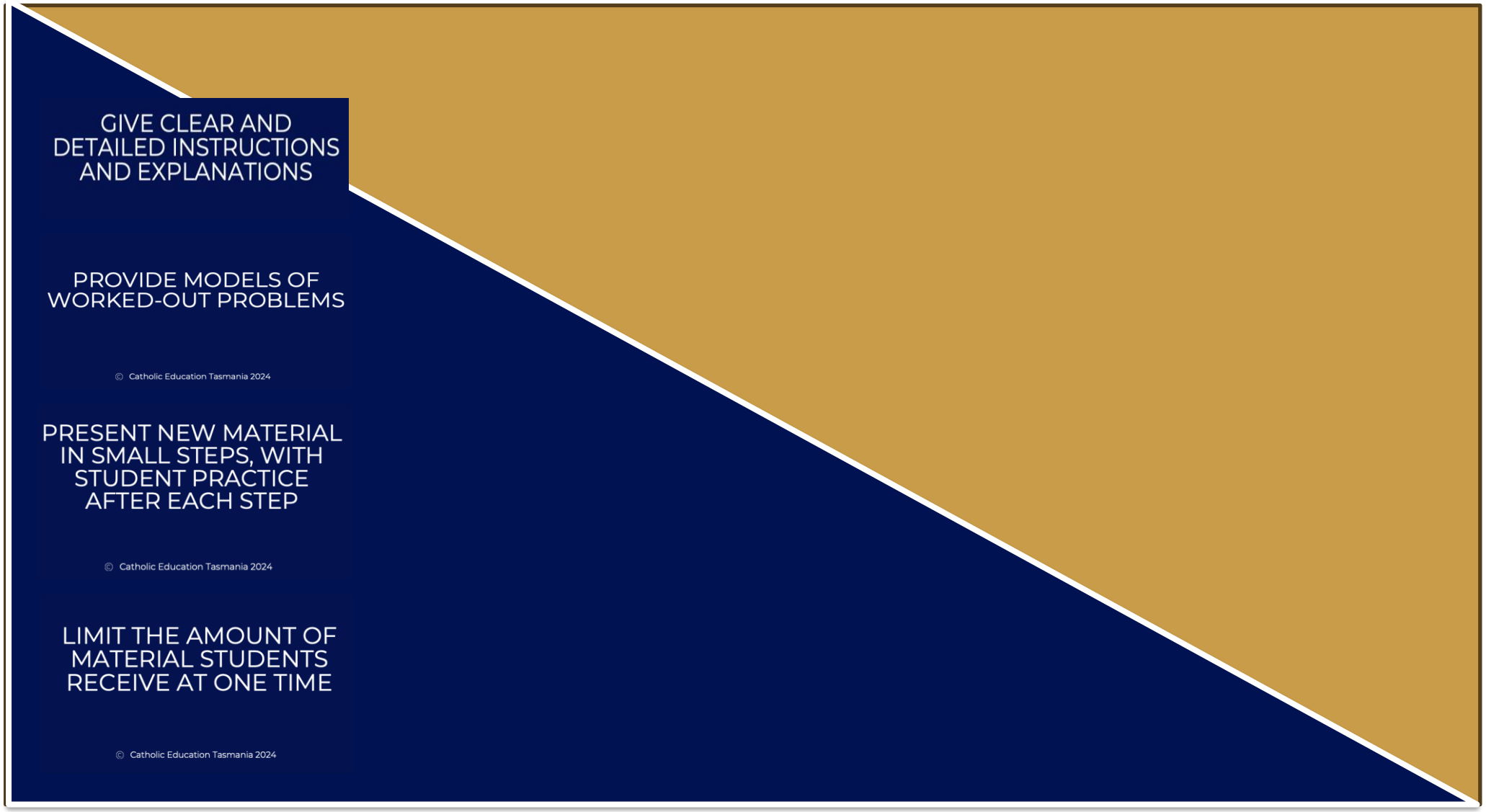
Linking with Tasmania…
Rosenshine's 17 principles of instruction as presented in cards and developed by Catholic Education Tasmania 2024



Student input

Teacher input

Student input



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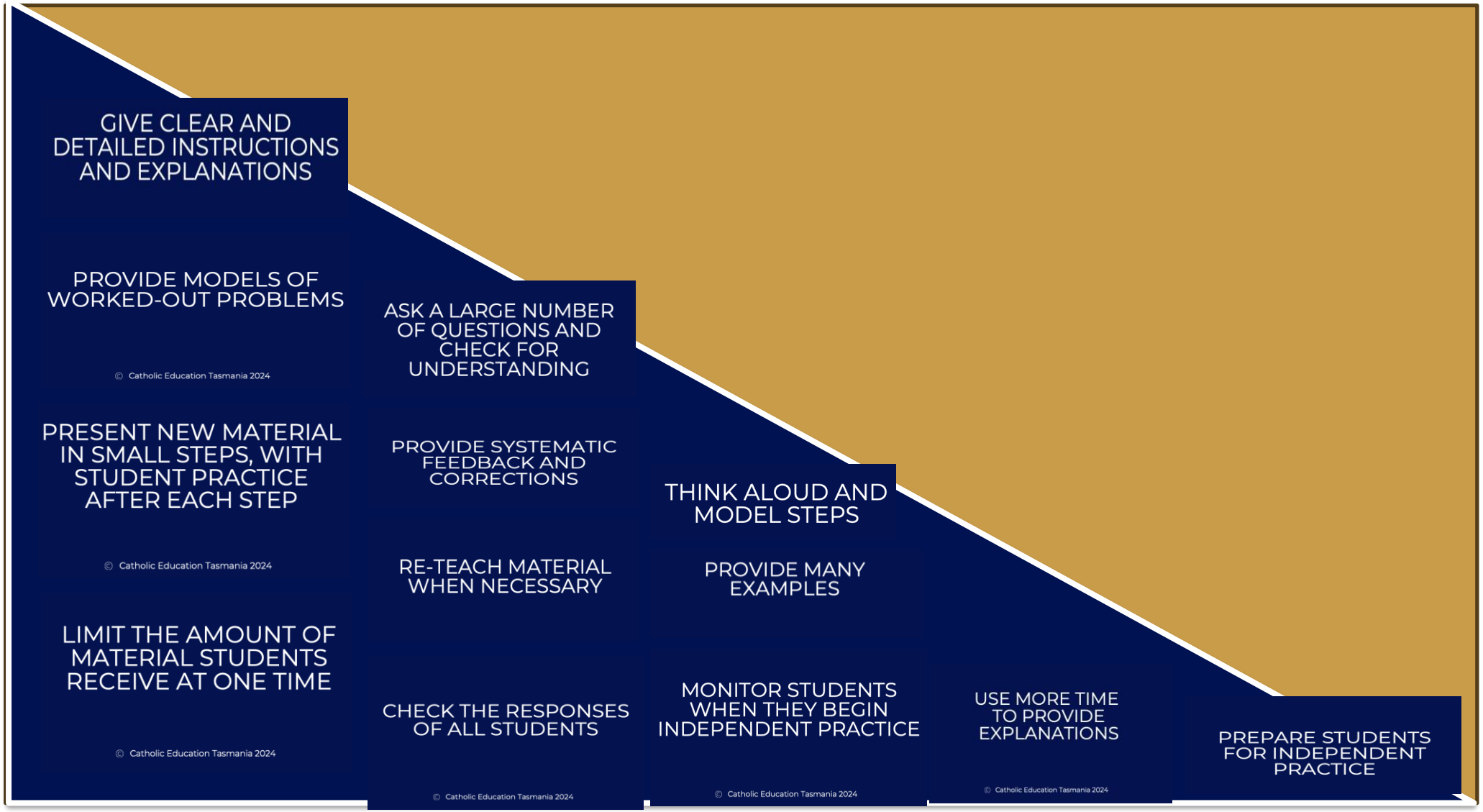

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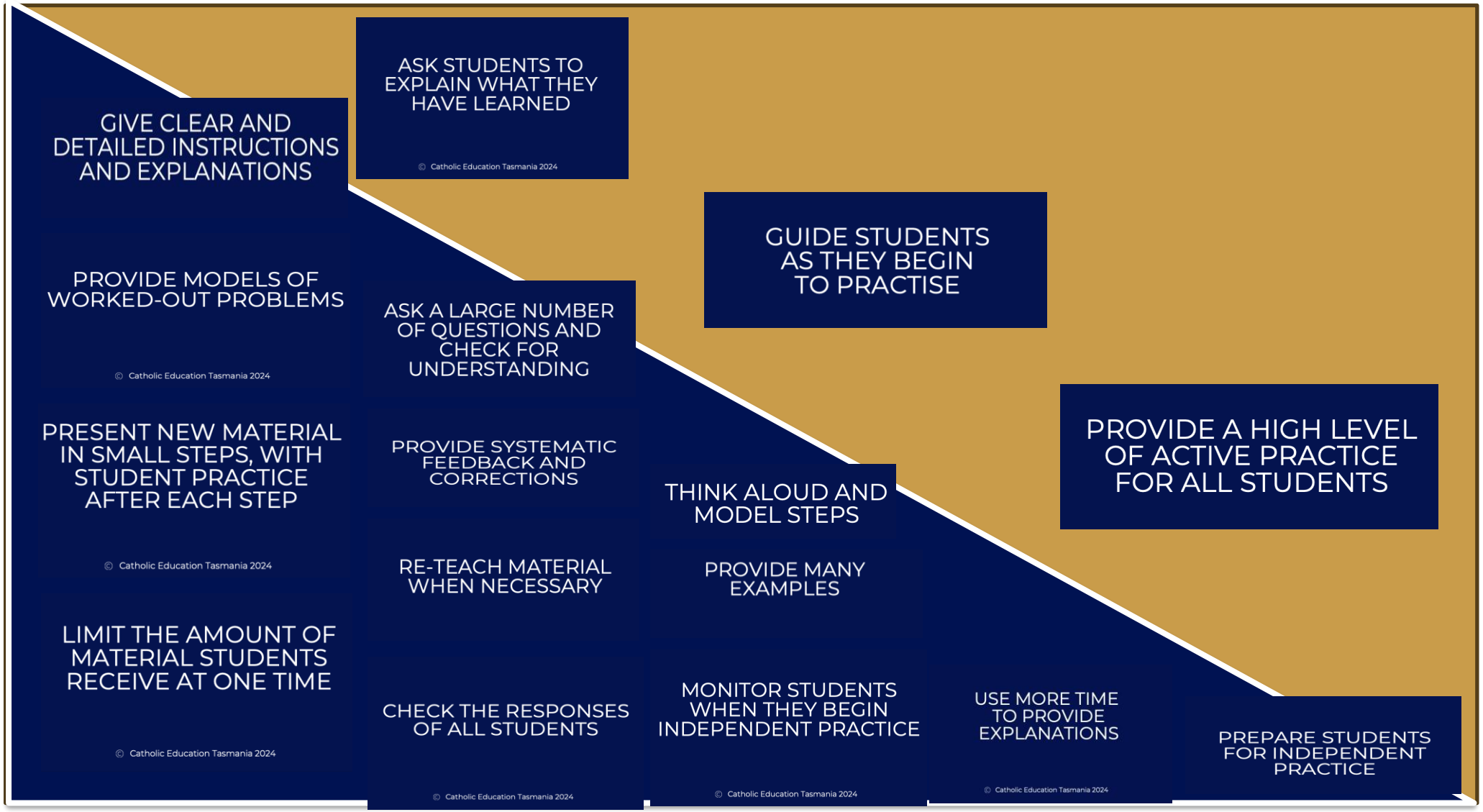


Teacher input

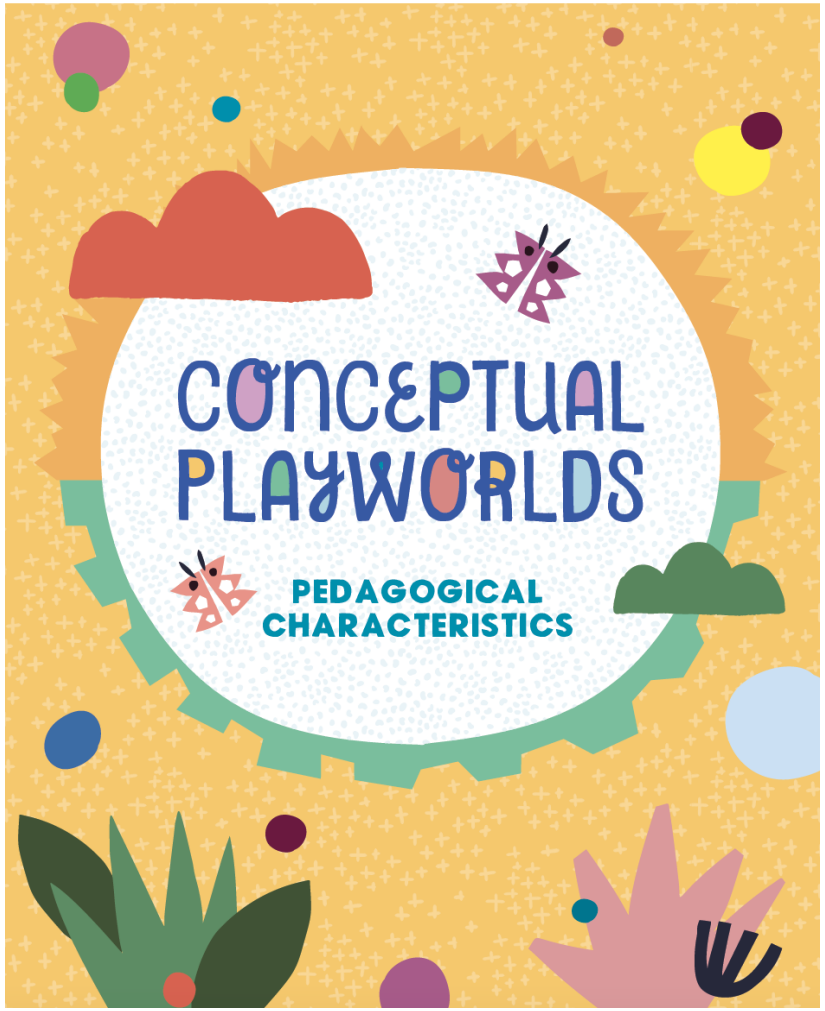
TARGET

Catholic Education Tasmania

INSIGHT

MONASH University

Planning for success – using the proforma of a *Conceptual PlayWorld for intentionality within play-based learning*



Catholic Education Tasmania

INSIGHT

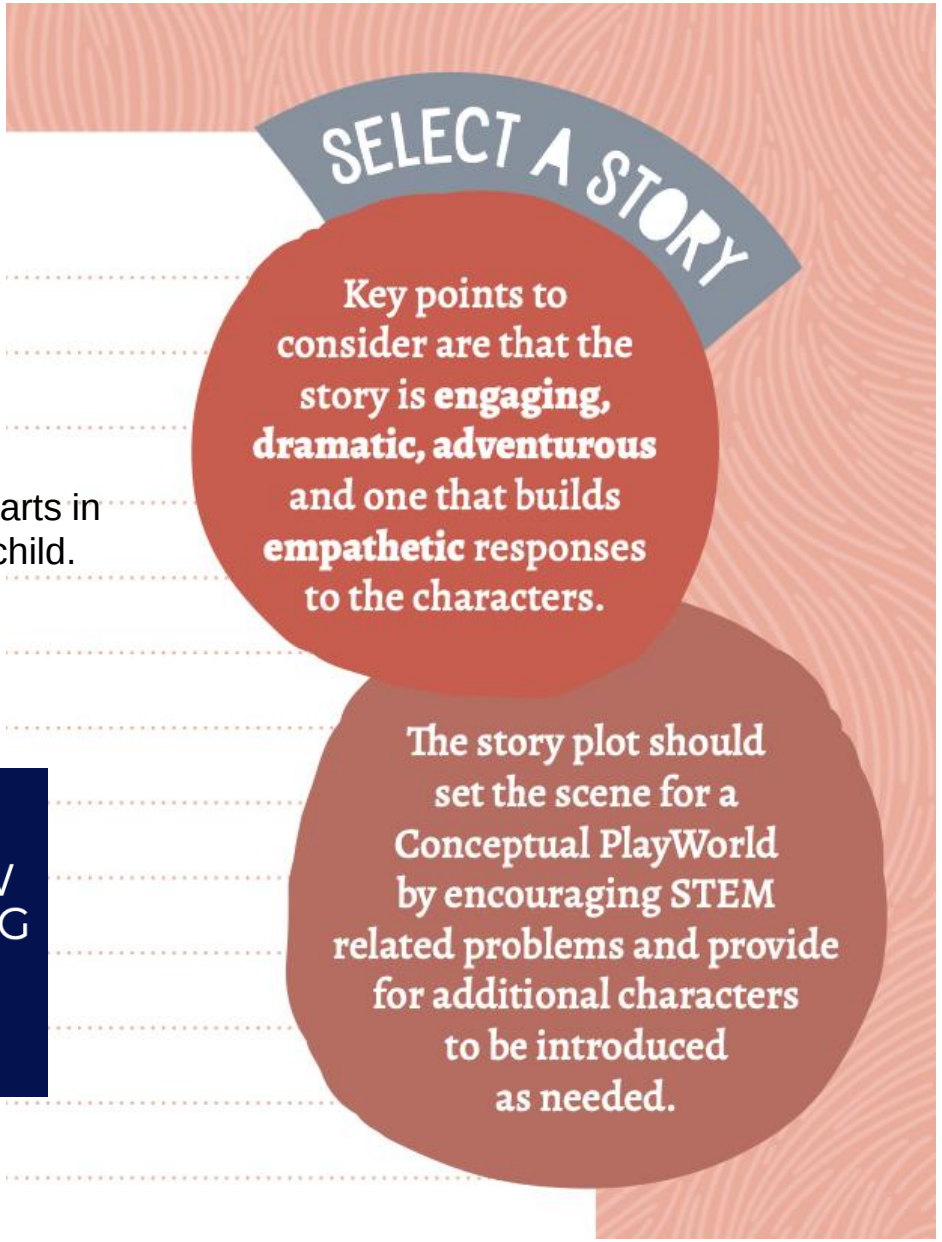
Characteristic 1: Selecting a dramatic story

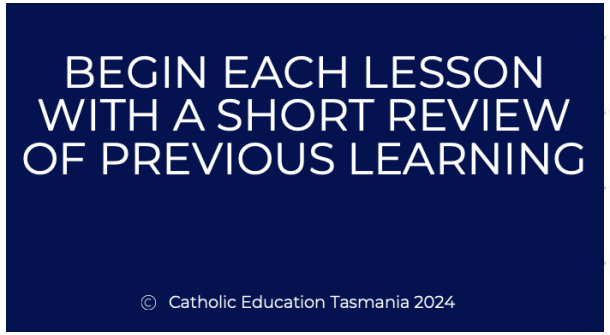
SoL concept/practice:

- Purposeful – motivating task with skillful scaffolding

SoL Early Years

- Integrate STEM, literacy, and arts in ways that make sense to the child.





PROVIDE A HIGH LEVEL OF ACTIVE PRACTICE FOR ALL STUDENTS

Characteristic 2: Designing an imaginary play space

PROVIDE MODELS OF WORKED-OUT PROBLEMS

SoL concept/practice:

- Interest-driven learning

SoL Early Years

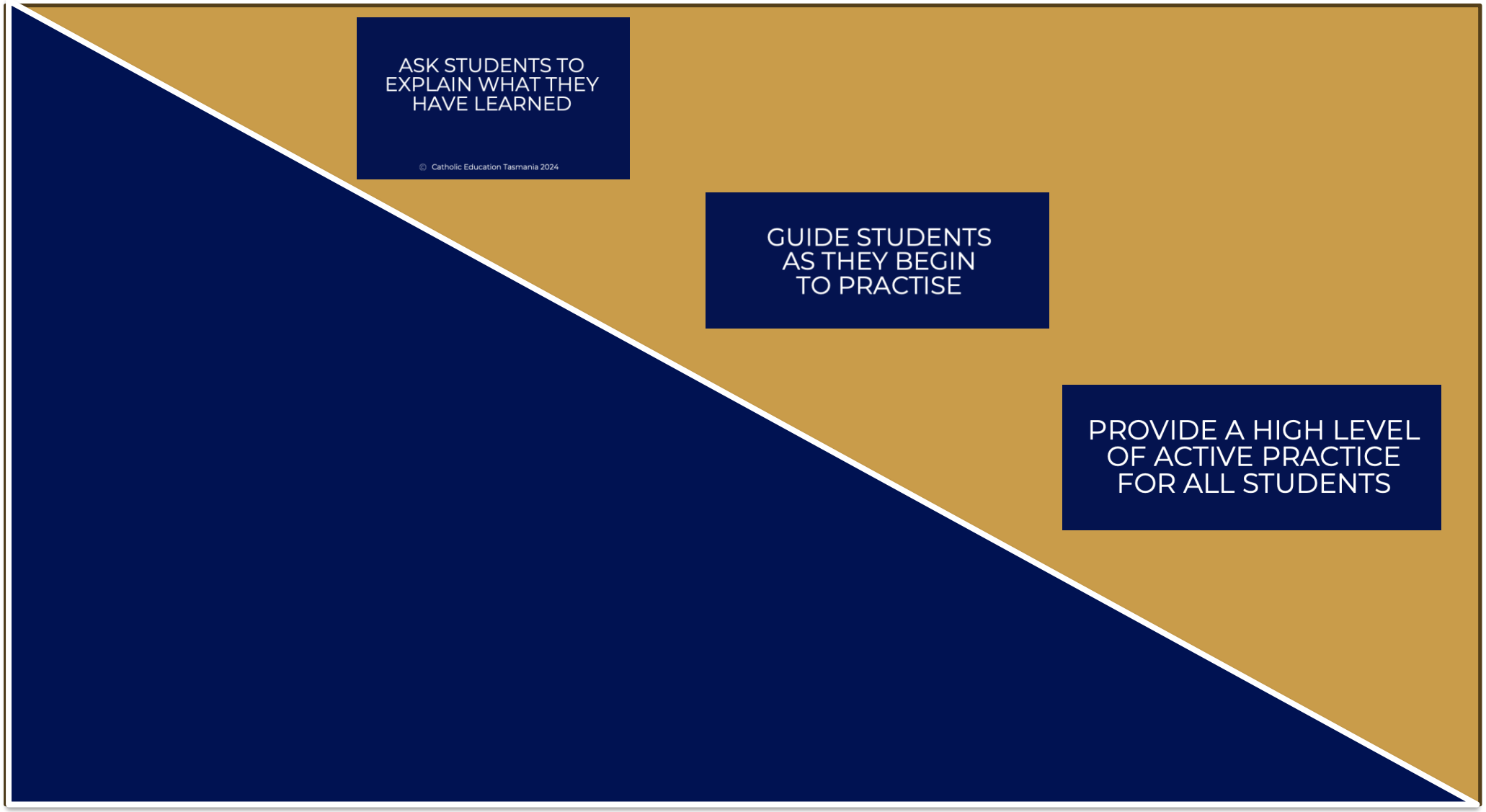
- Build warm, trusting relationships to form the foundation for learning.

Intentionality within play-based learning

DESIGNING A SPACE FOR THE CONCEPTUAL PLAYWORLD

Design a space for your Conceptual PlayWorld. This may be the indoor or outdoor environment. Offer the children a range of activity settings to invite child-initiated play for further exploration and development of the plot and opportunities to represent their ideas and understandings. For example, 3-dimensional modelling, drawing, design stations and assorted fabric of differing textures, blocks and soft toys suitable for infants and toddlers.

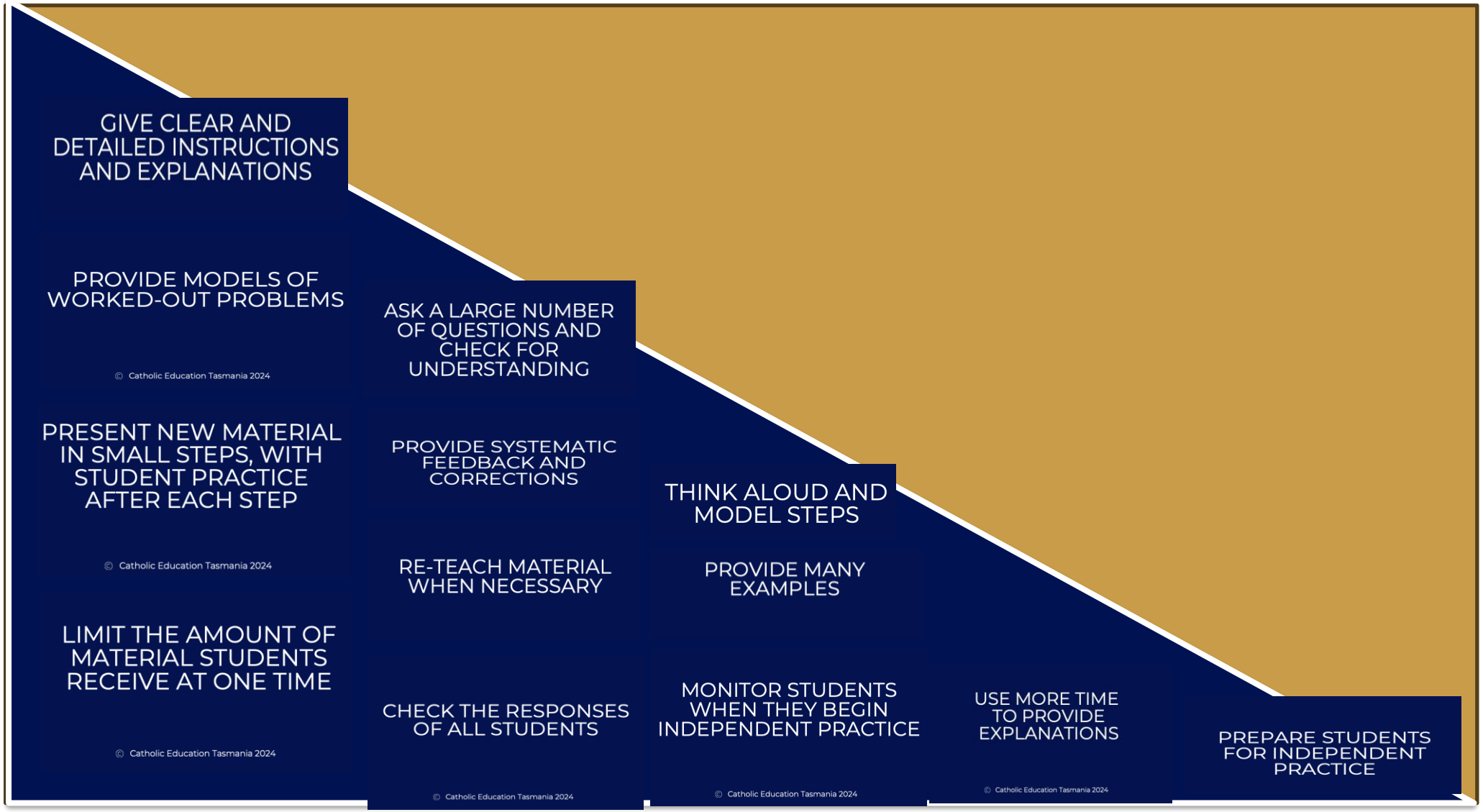
Student input



Teacher input

TARGET

Student input



Teacher input

TARGET

SoL concept/practice:

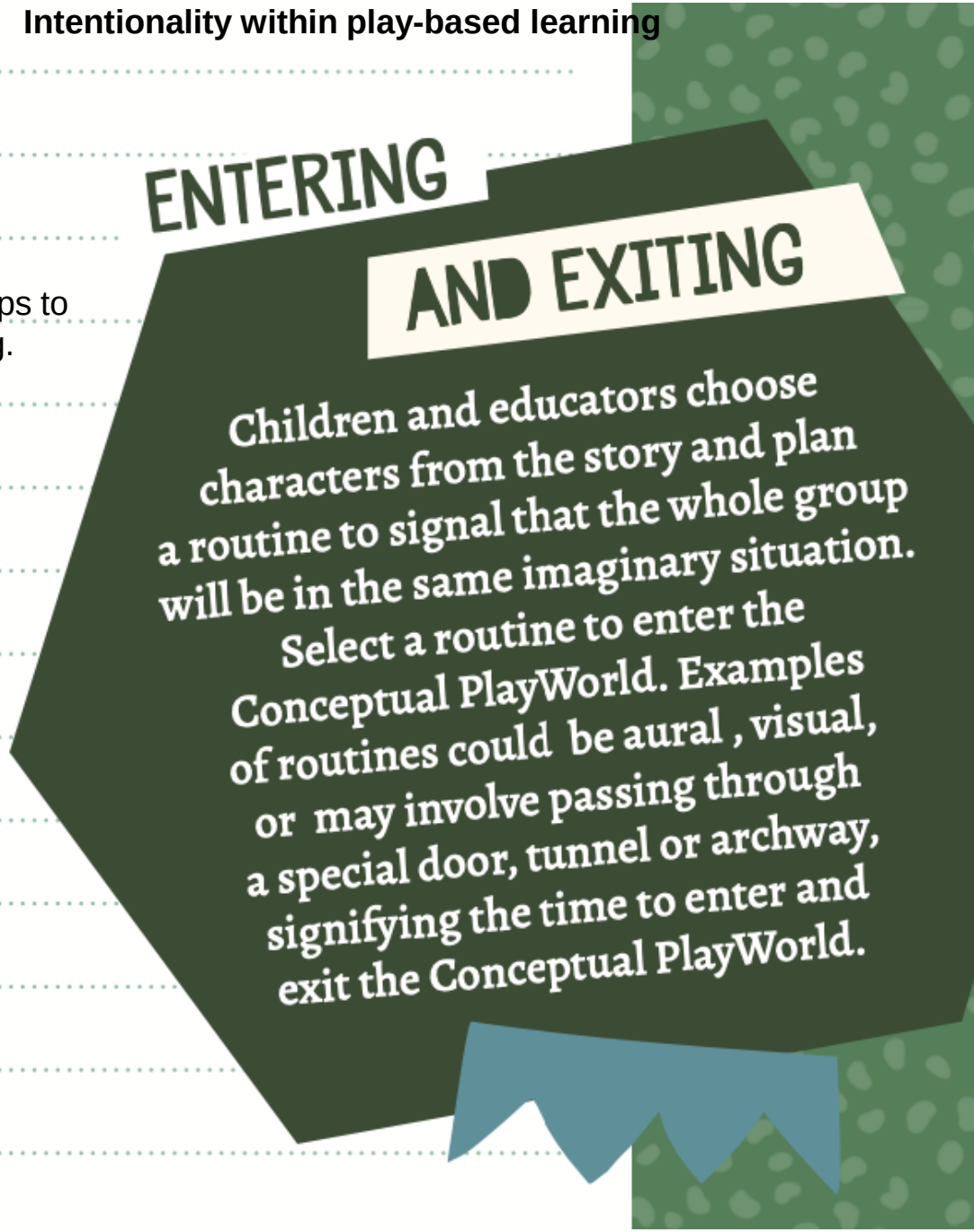
- Interest-driven learning

SoL Early Years

- Build warm, trusting relationships to form the foundation for learning.

Characteristic 3: Entering and exiting routine

GIVE CLEAR AND DETAILED INSTRUCTIONS AND EXPLANATIONS



Characteristic 4: Planning the play problem

ASK A LARGE NUMBER OF QUESTIONS AND CHECK FOR UNDERSTANDING

SoL concept/practice:
- Inquiry and explicit teaching

SoL Early Years:
- Use intentional teaching embedded in play and daily routines
- Concepts introduced within meaningful, real-world contexts.

It is through initially building rich knowledge, that opportunities for creative endeavours emerge

The Elves and the Shoemaker play problem– "The factory burnt down!"

STEM concepts are:

- *Engineering processes (imagining, designing, blueprint, materials, evaluation)*
- *Design For Manufacturing (DFM)*
- *Lean Manufacturing*

Conceptualising an engineering profession:

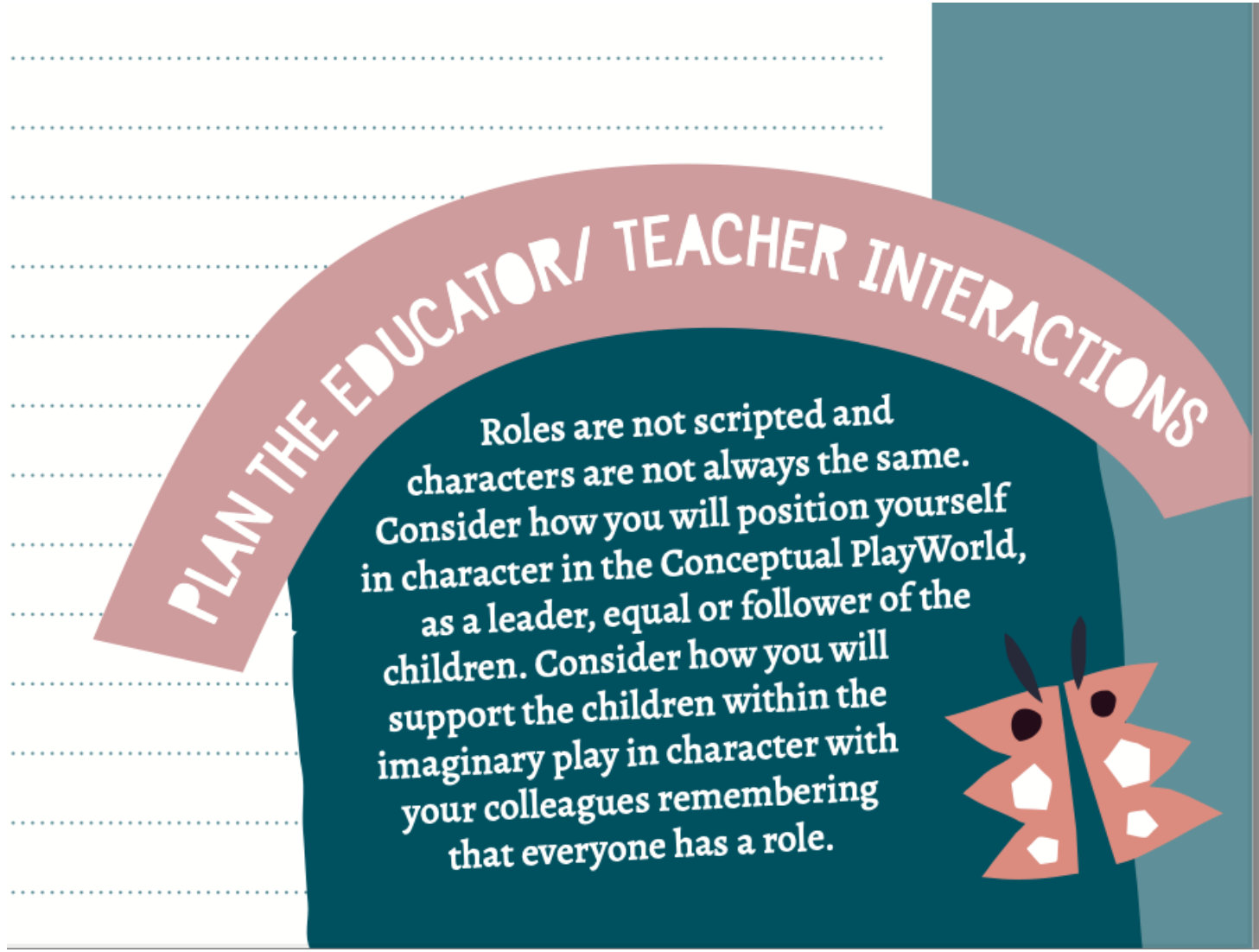
- *Different types of engineers*
- *What is common about engineers*
- *The day in the life of an engineer*

It is through initially building rich knowledge, that opportunities for creative endeavours emerge

Characteristic 5: Planning **educator and teacher role and interactions**

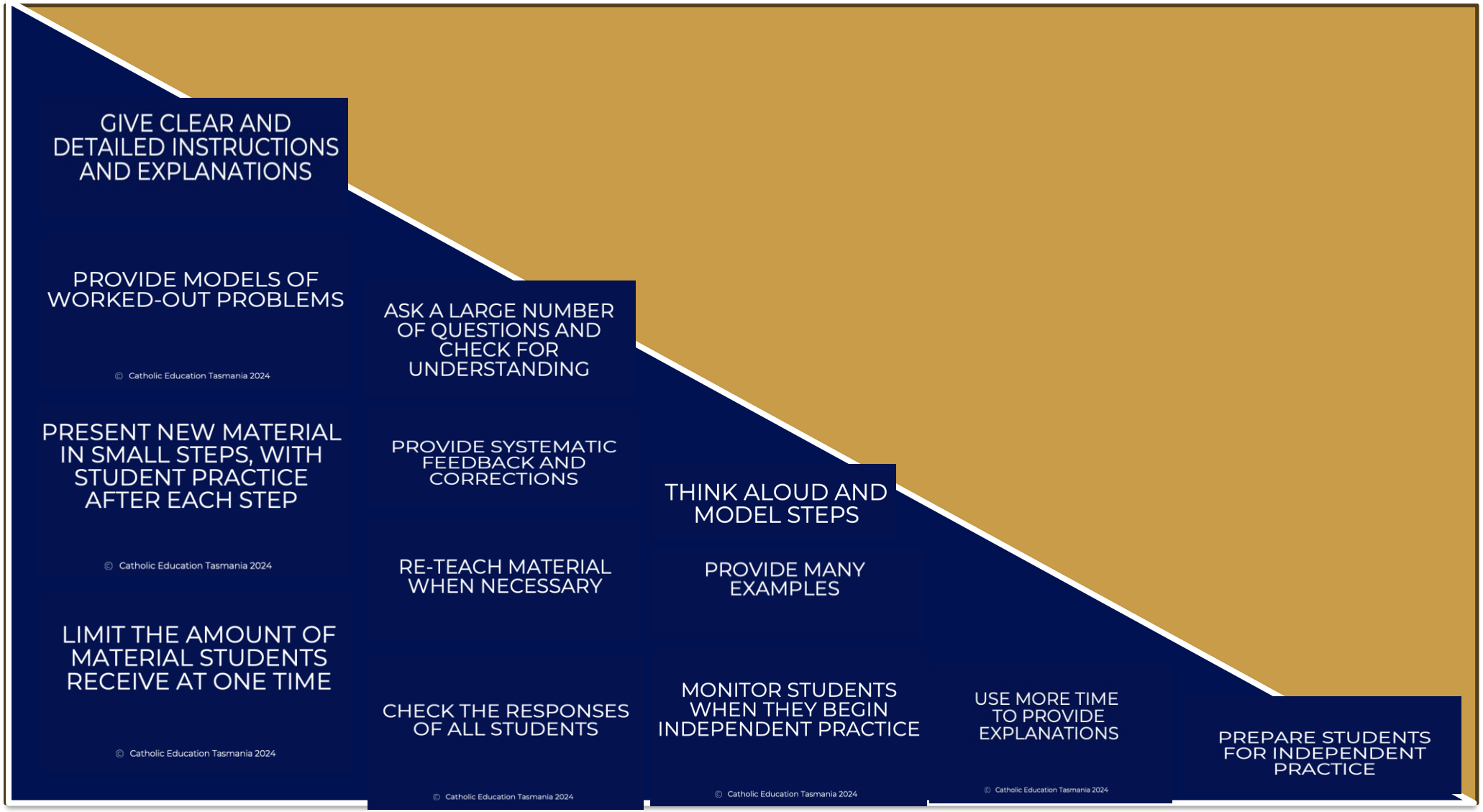
SoL concept/practice:
- Motivating tasks with skilled scaffolding

SoL Early Years:
- Observe and assess learning *holistically*



Co-teaching approach to conceptually resource the program

Student input



Teacher input

TARGET

LET'S STUDY THIS PRACTICE EXAMPLE FROM THE PERSPECTIVE OF: THE SCIENCE OF IMAGINATIVE LEARNING:

SoL:

- Inquiry and explicit teaching
- Motivating tasks with skilled scaffolding
- Purposeful – conceptual understanding and motivation
- Interest-driven learning

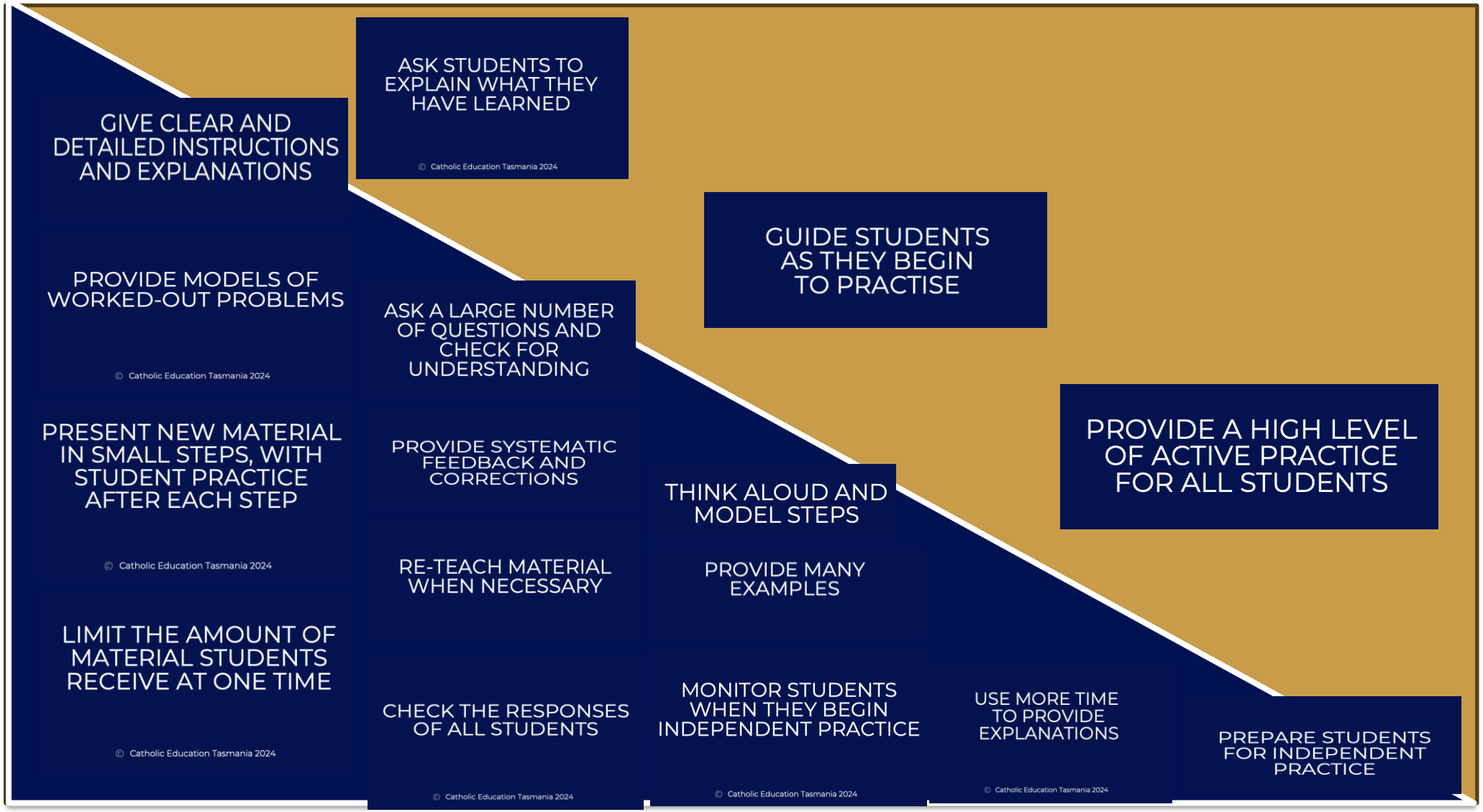
CPW:

- Purposeful planning (5 characteristics)
- Dramatic and imaginative
- Intentional teaching within the motivated conditions of play activity
- It is through initially building rich knowledge, that opportunities for creative endeavours emerge
- Co-teaching approach to conceptually resource the program

Australian Education Research Organisation (2025):

- Teaching that has a purpose or reason behind it.
- Intentional teaching can include **pre-planned** and adult-led learning
- Spontaneous opportunities where educators and teachers respond to **'teachable moments'** that align with their intentions.
- It may also mean **making deliberate decisions** about when to guide play and when to step back from and observe play experiences.

Student input



Teacher input

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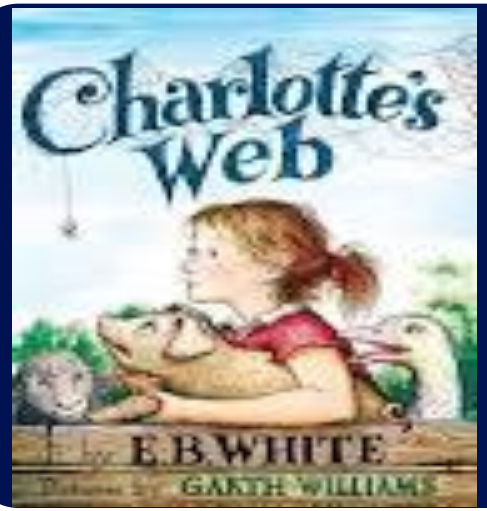
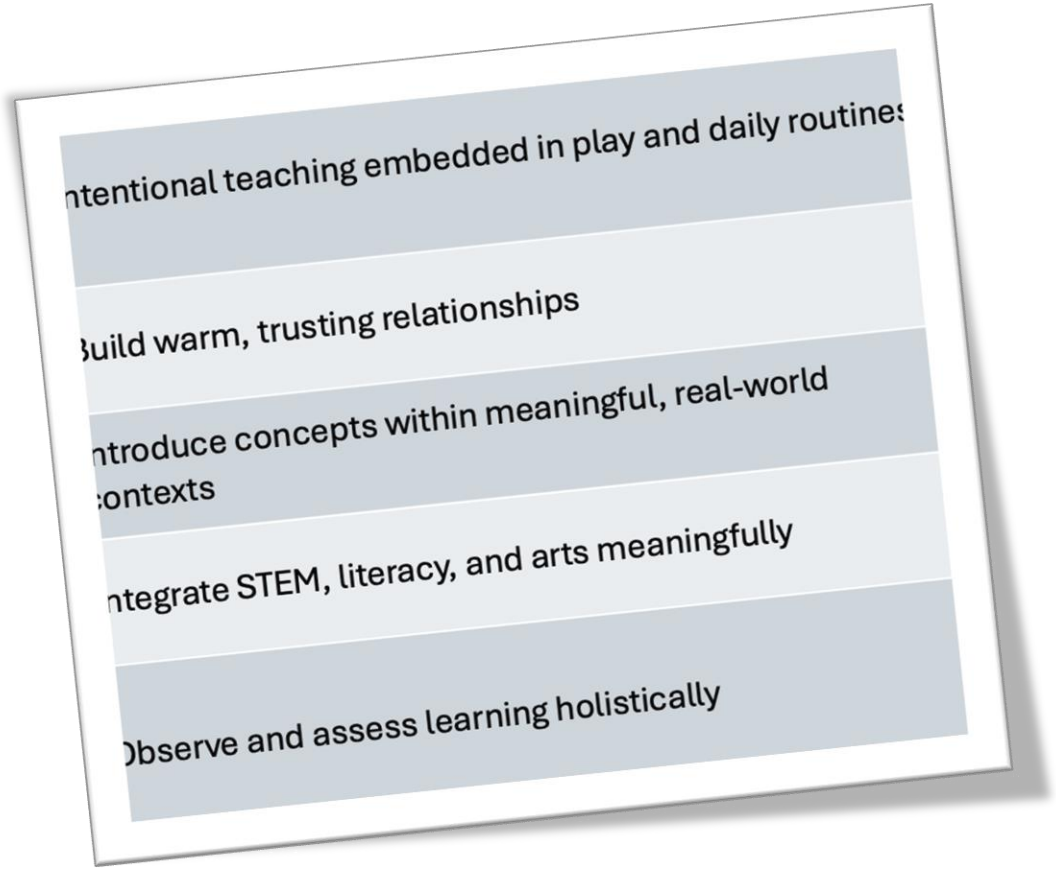
PRACTICE EXAMPLE



Second: What does it mean for us in the Early Years?



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INSIGHT

ONE EXAMPLE OF A CONCEPTUAL PLAYWORLD:

1. Story of (Charlotte's Web)
2. Room turns into (Wilbur's farm)
3. Entry through (the door into the imaginary world of Wilbur's farm)
4. Play problem (Wilbur didn't like his pig stye and the children designed new home for him; Caring for Wilbur)
    1. Concept: Science - living things
    2. Concept: Technologies – Designing, making, appraising/evaluating
5. The teachers are play partners (with the Year 5 children who visited as characters from the storybook)

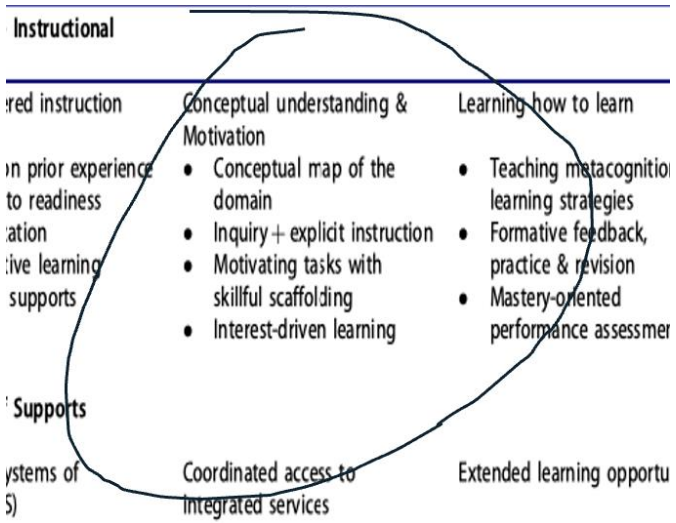
What is the play problem?
"Caring for Wilbur. He didn't like his pig stye and the children designed a new home for him"

- Concept: Science - living things
- Concept: Technologies – Designing, making, appraising/evaluating

Play problem creates motivating conditions

SoL:

- Inquiry and explicit teaching

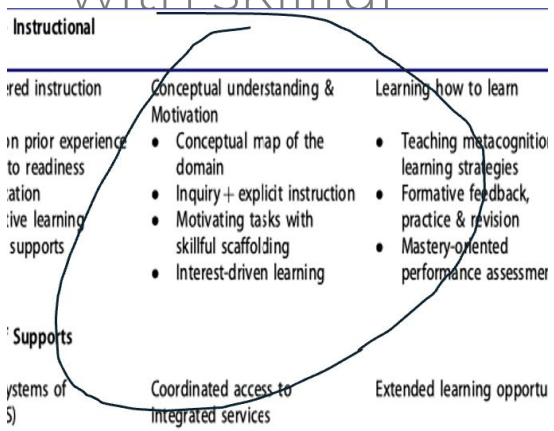


Australian Education Research Organisation (2025):

- To have an intention means to have a purpose or reason for doing something.
- Intentional teaching is, therefore, teaching that has a purpose or reason behind it.

SoL:

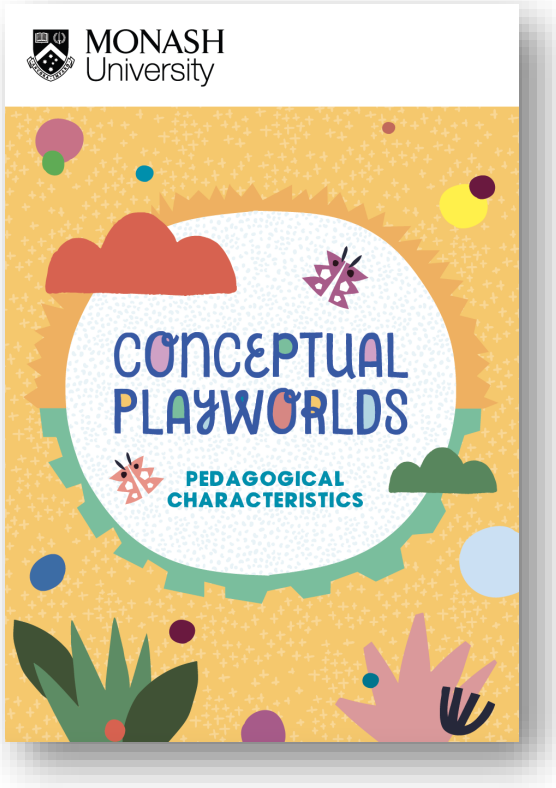
- Inquiry and explicit teaching
- Purposeful – motivating task with skillful

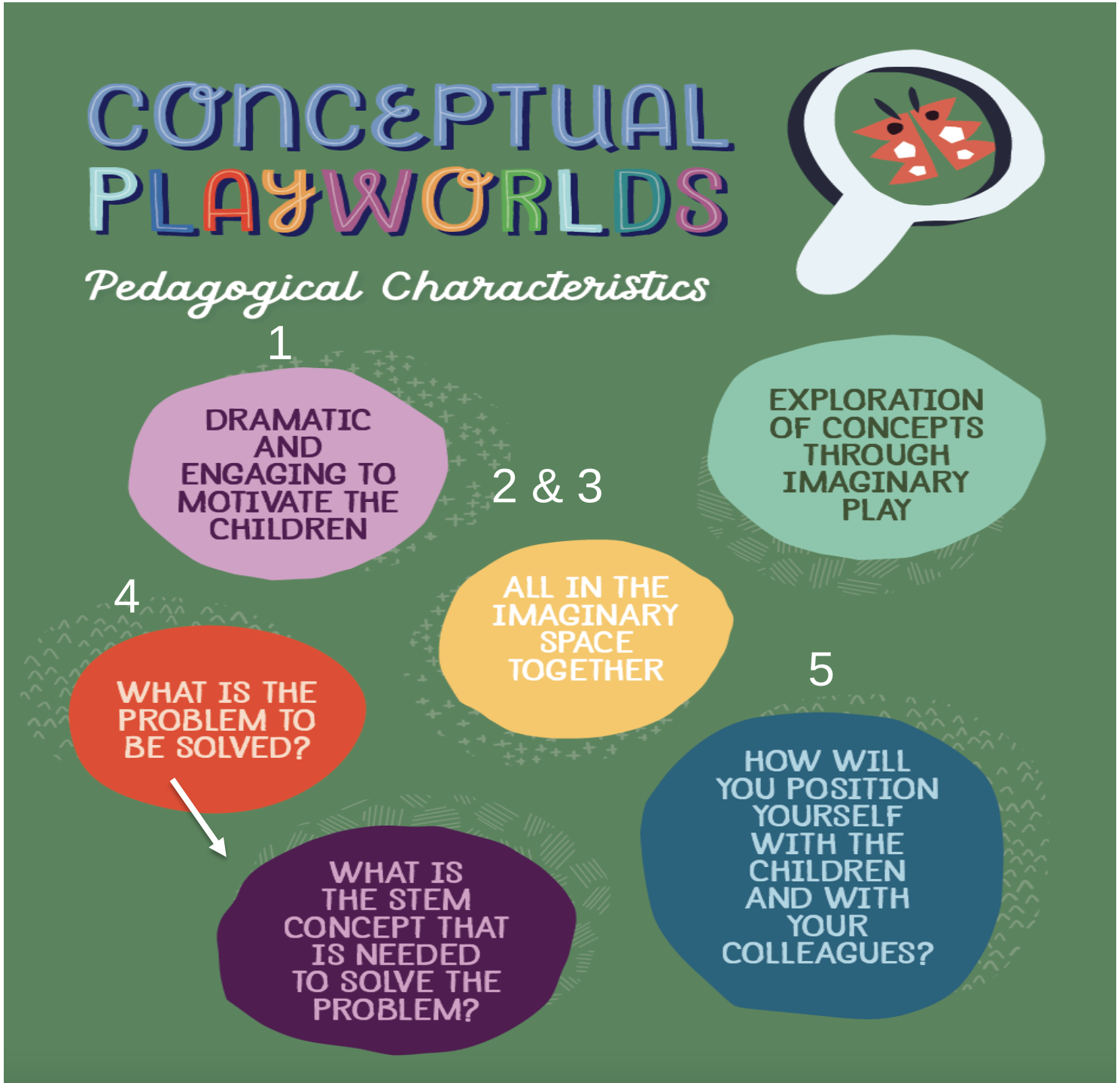


Australian Education Research Organisation (2025):

- Intentional teaching can include **pre-planned** and adult-led learning experiences
- As well as spontaneous opportunities where educators and teachers respond to 'teachable moments' that align with their intentions.
- It may also mean making deliberate decisions about when to guide play and when to step back from and observe play experiences.

Once planned using the 5 characteristics, the implementation is dynamic





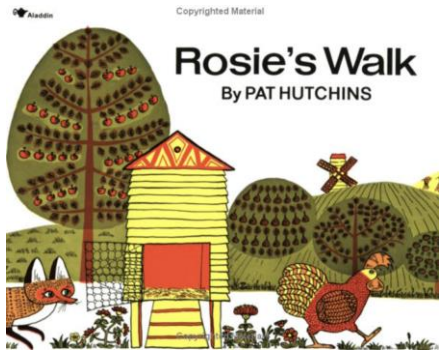
PRESENT NEW MATERIAL IN SMALL STEPS, WITH STUDENT PRACTICE AFTER EACH STEP

LIMIT THE AMOUNT OF MATERIAL STUDENTS RECEIVE AT ONE TIME

MONITOR STUDENTS WHEN THEY BEGIN INDEPENDENT PRACTICE

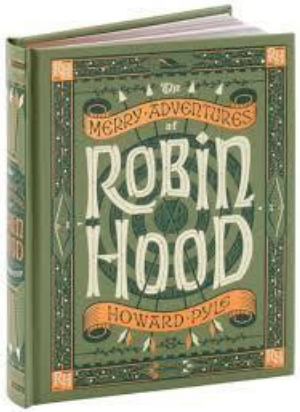
PROVIDE MANY EXAMPLES

PREPARE STUDENTS FOR INDEPENDENT PRACTICE



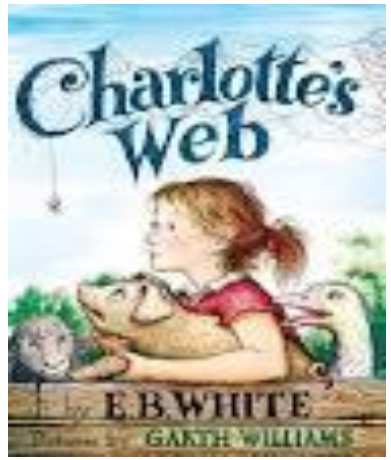
Anticipation

Empathy



Morals - fairness

Inclusion



Ethics

POP-UP CONCEPTUAL PLAYWORLD

Levels of emotional engagement

COMPLEX CONCEPTUAL PLAYWORLD

- EXPLORING EMOTIONS AND IMAGINATIVE LEARNING
- THE SCIENCE BEHIND CONCEPTUAL PLAYWORLDS
- CLARIFYING THE SCIENCE OF LEARNING IN EARLY CHILDHOOD
- CASE STUDY: THE ELVES AND THE SHOEMAKER
- CO-TEACHING IN A CONCEPTUAL PLAYWORLD

Questions?

Thank You!

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