A microcredential supporting out-of-field teachers of mathematics. *Principles guiding* instructional design

A partnership between Southern Cross University and MANSW (2023-2024)
Supported by a Microcredentials Pilot in Higher Education Grant from the Australian Government

2023 UNESCO-OOFTAS Conference (17 August 2023)

Belt and Road Shanghai Autumn 2023 Exchange Project on Integrated Training of Teachers before and after Service

Speakers

Dr Lewes Peddell: Lecturer, Faculty of Education, Southern Cross University
Darius Samojlowicz: Executive Officer, Mathematical Association of NSW (MANSW)

A microcredential supporting out-of-field teachers of mathematics. *Principles guiding* instructional design

A partnership between Southern Cross University and MANSW (2023-2024)
Supported by a Microcredentials Pilot in Higher Education Grant from the Australian Government

Abstract

Australia has a **shortage** of mathematics teachers, **leading to** teachers **teaching mathematics out-of-field**.

Strategies have been employed to support these teachers, **ranging** from school-based **professional development** to **university courses** that provide teachers with qualifications to teach mathematics.

Within this range, **Southern Cross University,** in partnership with the **Mathematical Association of NSW**, has been awarded an **Australian Commonwealth Government grant to design and pilot a microcredential to increase the effectiveness of out-of-field mathematics teachers**.

This presentation shares the principles guiding our approach and how these principles inform the ongoing instructional design.

Mathematical Association of NSW Inc
Promoting Quality Mathematics Education for All

Southern Cross University

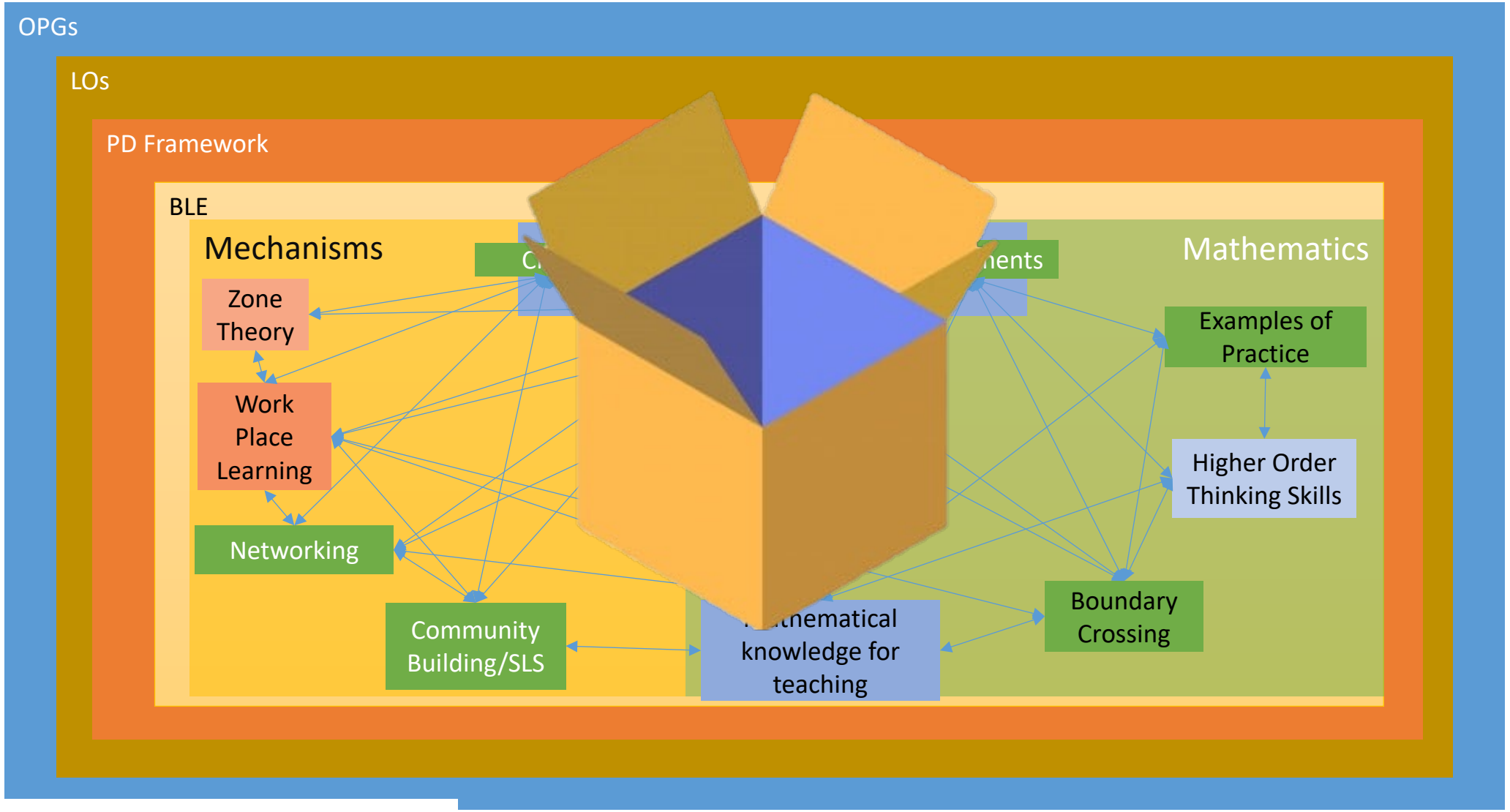
Project Grant Conditions

To develop a microcredential equivalent to 0.25 EFTSL that is closely aligned to the content and objectives of a ‘higher education award’ that targets a national priority in the field of education.

The microcredential materials must demonstrate how students will achieve the learning outcomes or proficiencies of the microcredential.

Deliver pilot in 2024, including project evaluation, and submit a proposal for Stage 2.

Design framework: Professional Certificate Teaching Mathematics



Design framework: Professional Certificate Teaching Mathematics

OPGs

Overarching Project Goals

1. Improve proficiency in teaching mathematics.
2. Increase self-efficacy towards teaching mathematics.
3. Decrease mathematics anxiety and mathematics teaching anxiety.
4. Increase feelings of belonging to a community and network of mathematics teachers (in-field and out-of-field) and resources, with this network sustaining and continually improving practice and enabling contribution to the profession.
5. Increase identity as a mathematics teacher (role identity and belonging to a community).
6. Increase retention of these teachers in the teaching profession.

Note.
The OPGs inform the longitudinal research frame

Design framework: Professional Certificate Teaching Mathematics

OPGs

LOs

Learning outcomes

LO1 **Apply knowledge of mathematics teaching content and strategies**, including ICTs, to develop engaging teaching activities for the Australian Curriculum's Years 7 to 10 mathematics learning area.

LO2 **Develop mathematics teaching content** into coherent, well-sequenced, and engaging learning and teaching programs informed by contemporary evidence-based mathematics education pedagogies, reflection and feedback on teaching practices.

LO3 **Design and implement learning and teaching programs** using knowledge of mathematics curriculum, assessment and reporting requirements to respond to students with diverse needs and cultural backgrounds.

LO4 **Critically analyse and reflect on** the **cognate and non-cognate knowledge** and understanding used to develop effective teaching strategies to support students' numeracy and mathematical achievement.

Two Assessments – both in two parts, with the second part of both reflection based

Design framework: Professional Certificate Teaching Mathematics

OPGs

LOs

PD Framework

Framework for effective professional development

Structural features

Form of the activity

Duration of the activity

Degree of collective participation

Core features

Content focus - replacing with MKT (Ball et al., 2008)

Opportunities for active learning

Fostering coherence (Garet et al., 2001)

Design framework: Professional Certificate Teaching Mathematics

OPGs

LOs

PD Framework

Blended Learning Environment

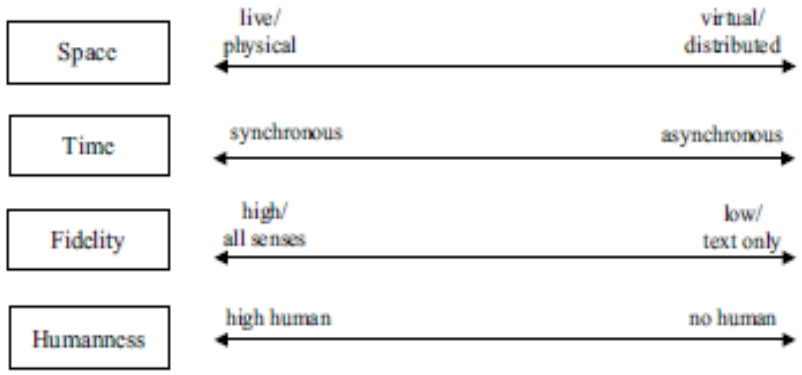
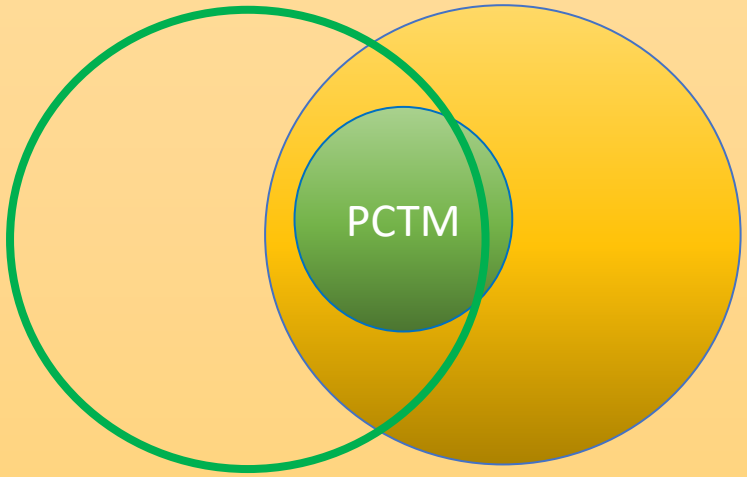


Fig. 1 Dimensions of interaction in face-to-face and distributed learning environments (adapted from Graham, 2006)



Peddell (2023)

Design framework: Professional Certificate Teaching Mathematics

OPGs

LOs

PD Framework

BLE

Mechanisms

Zone Theory

Work Place Learning

Networking

Community Building/SLS

CMF

Value Gen

Reflection

Assessments

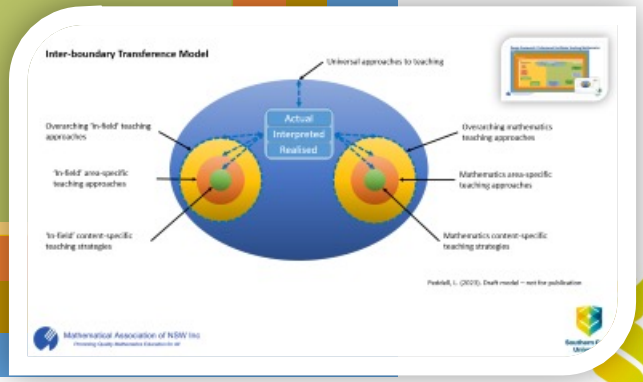
Mathematical knowledge for teaching

Mathematics

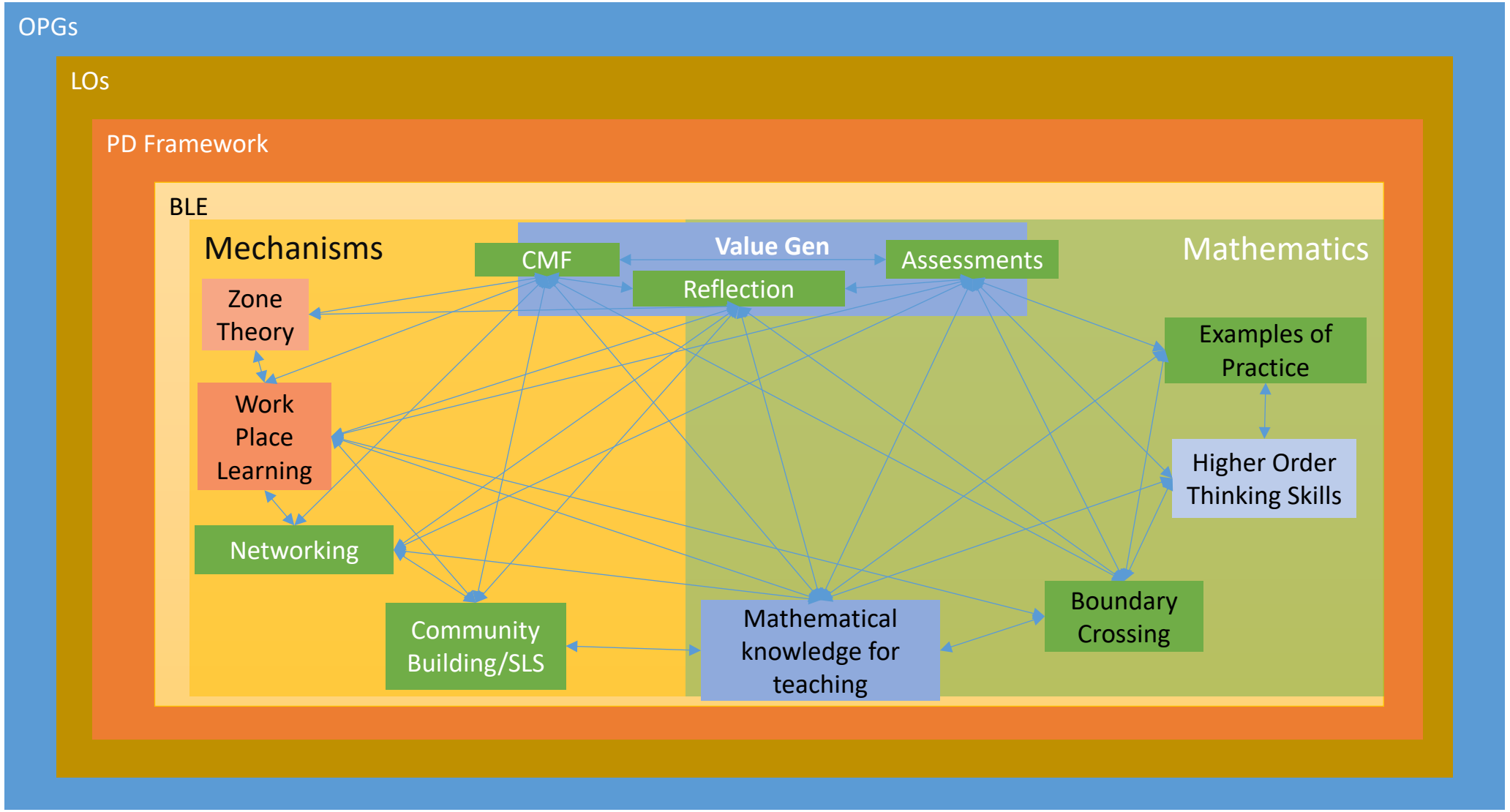
Examples of Practice

Higher Order Thinking Skills

Boundary Crossing



Design framework: Professional Certificate Teaching Mathematics



References

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*(5), 389-407. https://doi.org/10.1177/0022487108324554

Barak, M., & Dori, Y. J. (2009). Enhancing higher order thinking skills among inservice science teachers via embedded assessment. *Journal of Science Teacher Education, 20(5), 459-474. https://doi.org/10.1007/s10972-009-9141-z*

Brown, C., & Poortman, C. L. (2018). *Networks for learning: Effective collaboration for teacher, school and system improvement. Routledge.*

Graham, C. R. (2006). Blended learning systems: definition, current trends, and future directions. In C. J. Blonk & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 3-21). Pfeiffer.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38(4), 915-945.*

Hobbs, L. (2013). Teaching 'out-of-field' as a boundary-crossing event: Factors shaping teacher identity. *International Journal of Science and Mathematics Education, 11, 271-297. https://doi.org/10.1007/s10763-012-9333-*

Kenny, J., Hobbs, L., & Whannell, R. (2019). Designing professional development for teachers teaching out-of-field. *Professional Development in Education, 1-16. https://doi.org/10.1080/19415257.2019.1613257*

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory Into Practice, 41(4), 212-218*

Lane, C., & Ní Ríordáin, M. (2020). Out-of-field mathematics teachers' beliefs and practices: An examination of change and tensions using zone theory. *International Journal of Science and Mathematics Education, 18, 337-355.*

Lynch, D., & Madden, J. (2015). Coaching, mentoring and feedback: The 'how to' in a schooling context. Education Alternatives: *Journal of International Scientific Publications, 13*, 116-129

Scarparolo, G. E., & Hammond, L. S. (2018). The effect of a professional development model on early childhood educators' direct teaching of beginning reading. *Professional Development in Education, 44*(4), 492-506. https://doi.org/10.1080/19415257.2017.1372303

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity. Cambridge University Press.*

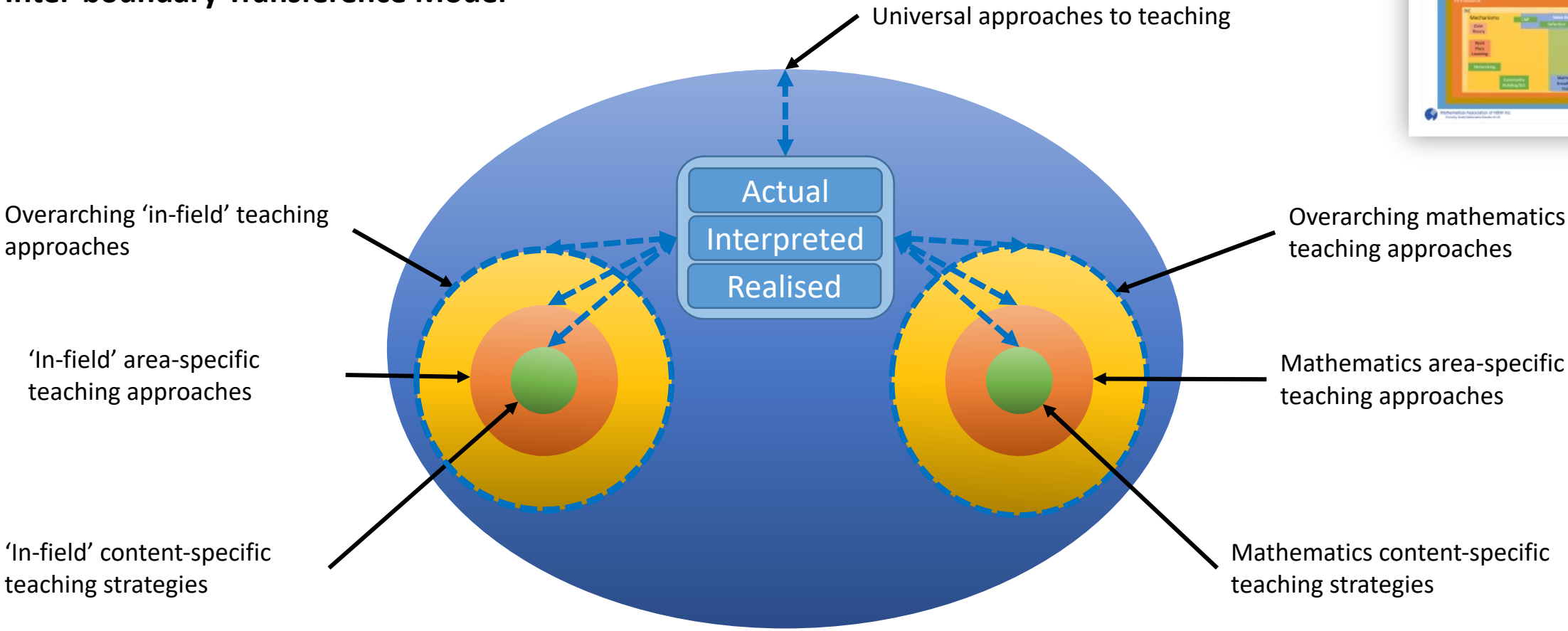
Wenger-Trayner, E., & Wenger-Trayner, B. (2020). *Learning to make a difference: Value creation in social learning spaces. Cambridge University Press https://doi.org/10.1017/CBO9780511803932*

Next steps and discussion

Please contact us …

Dr Lewes Peddell lewes.peddell@scu.edu.au
Darius Samojlowicz darius@mansw.nsw.edu.au

Inter-boundary Transference Model



Peddell, L. (2023). Draft model – not for publication