

How can we prepare teachers to provide equal access for all learners to quality mathematics education?

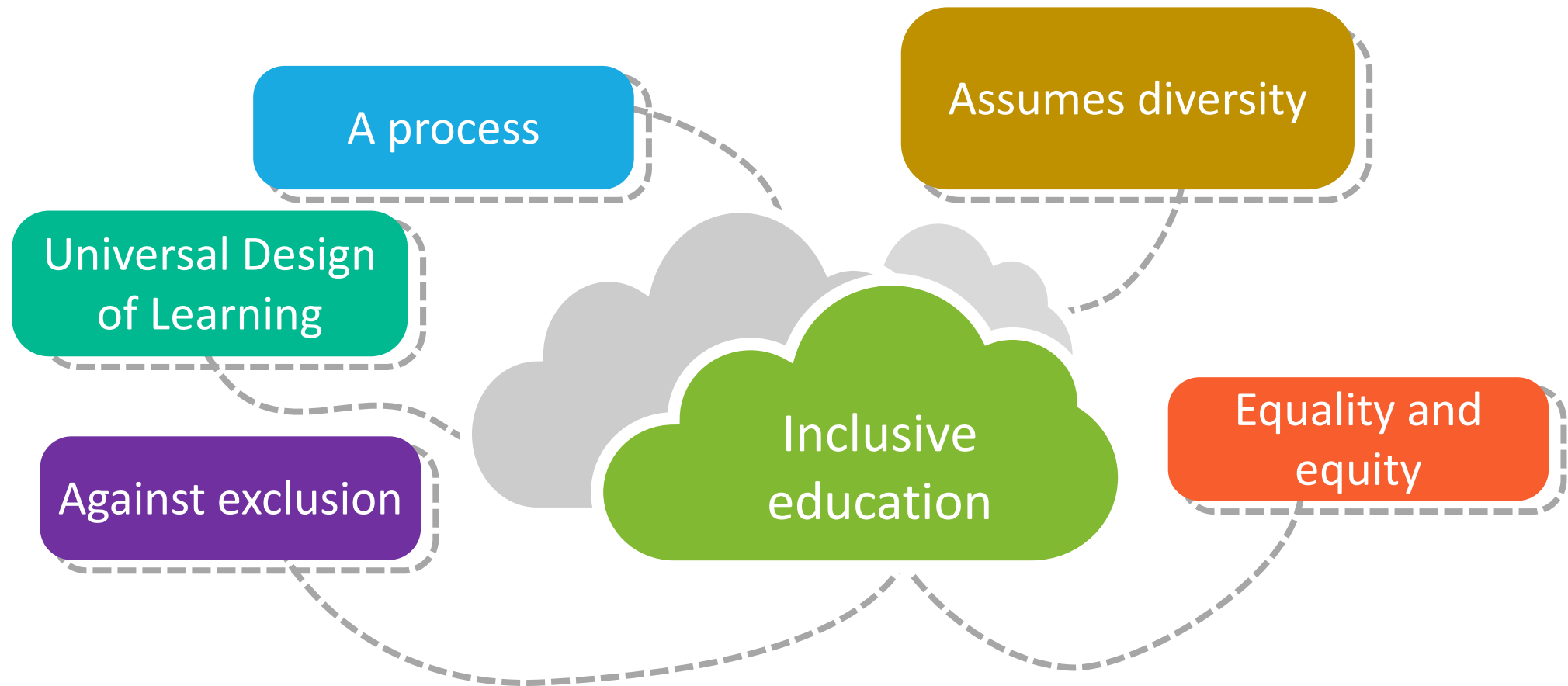
Dr. Edda Óskarsdóttir, Associate Professor
eddao@hi.is

Inclusive education as our guiding light

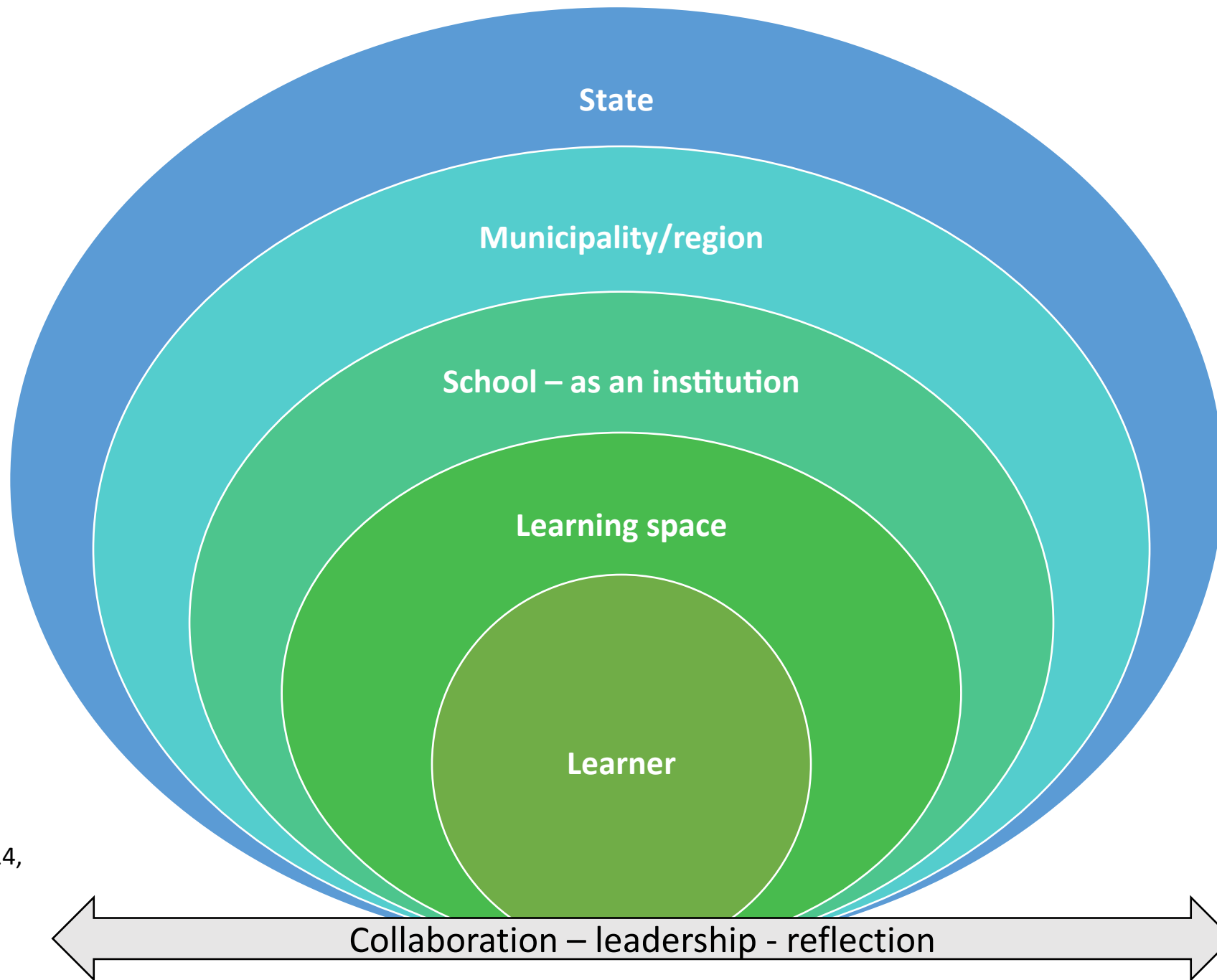
- Inclusive education ► Inclusive society
 - Fundamental aspect of a democratic society
- Inclusive education is a way to increase social and economical well being -
 - This calls for meeting the different needs of individuals and giving them opportunities to succeed in education to prevent social isolation.



The basis of inclusive education



Ecosystem of inclusive education



Anderson, Boyle and Deppler, 2014,
Florian and Black-Hawkins, 2011;
Óskarsdóttir, 2017

Ecosystem of inclusive education

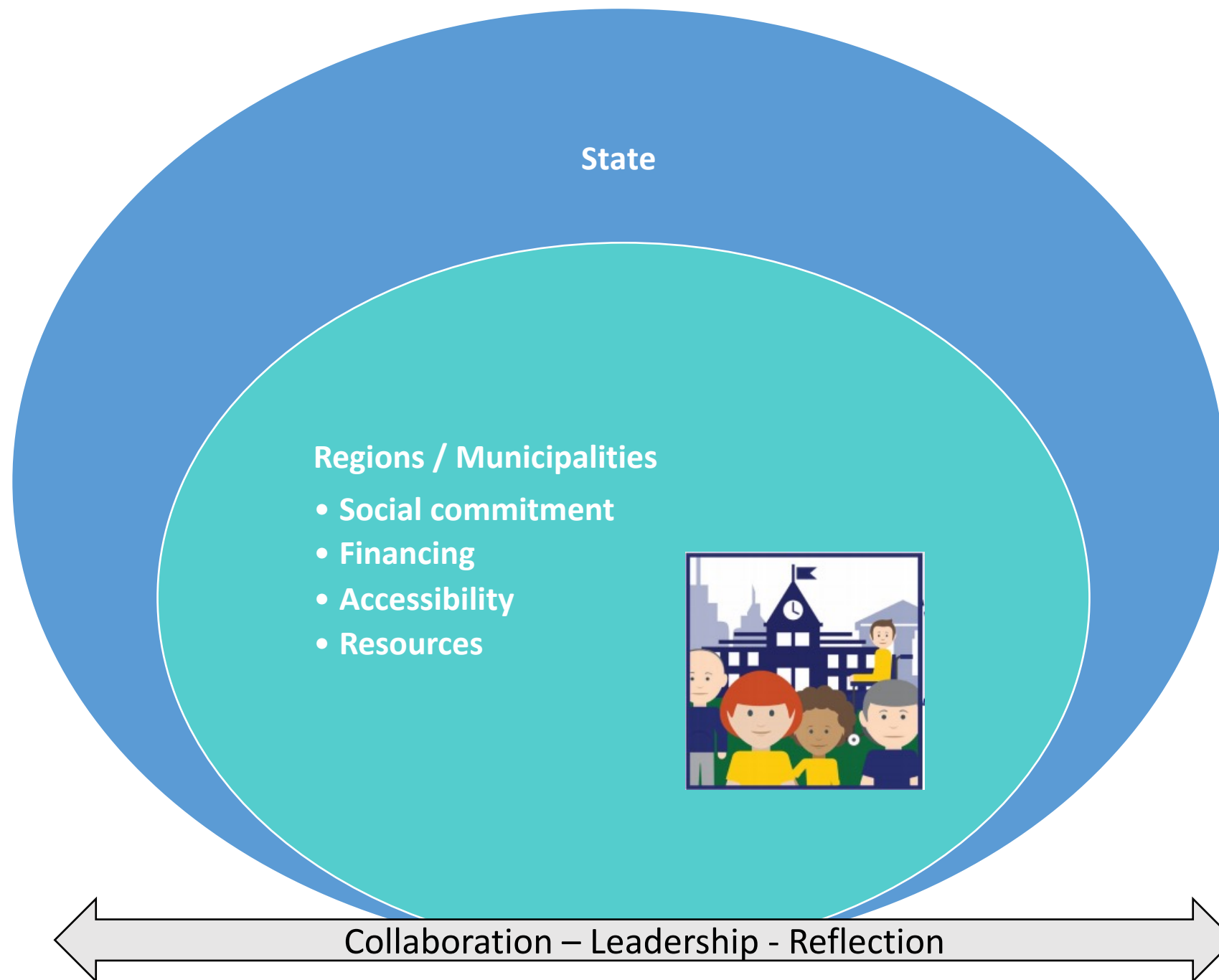
State

- Laws and regulations
- Curriculum and assessment
- Financing of education
- Quality assurance
- Teacher education

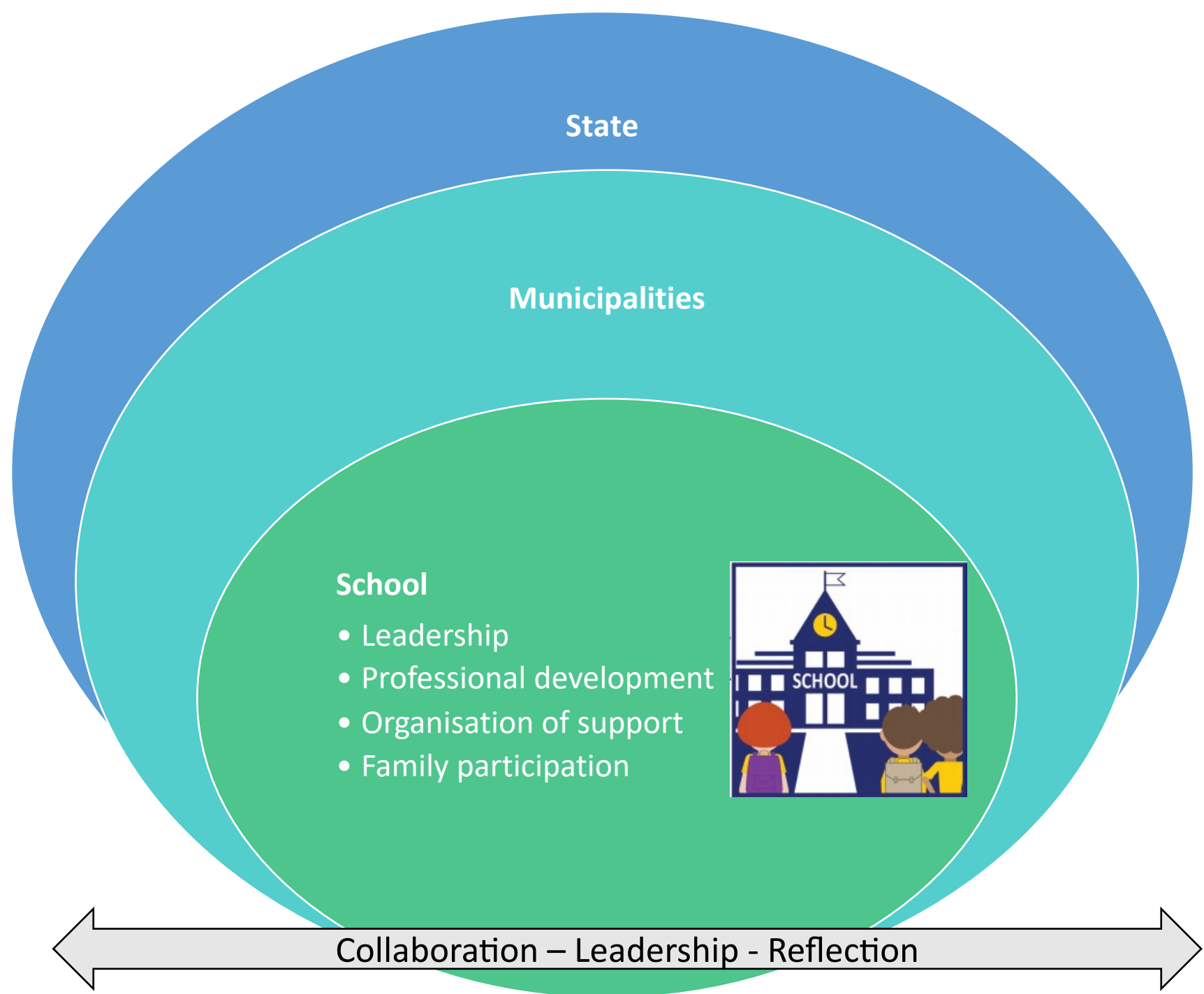


← Collaboration – Leadership - Reflection →

Ecosystem of inclusive education



Ecosystem of inclusive education



The myth of the 'normal learner'



Need to reflect on our ideas about ability and how that concept can be one dimensional.

- ♀♂ Gender identity
- 💰 Social and economic status
- 🌐 Culture and language
- ★ Ability
- ✎ Learning styles
- 🔥 Interest

Developing schools towards inclusion

... attending to the organisation of schooling and school practices are crucial aspects for the development of inclusive education

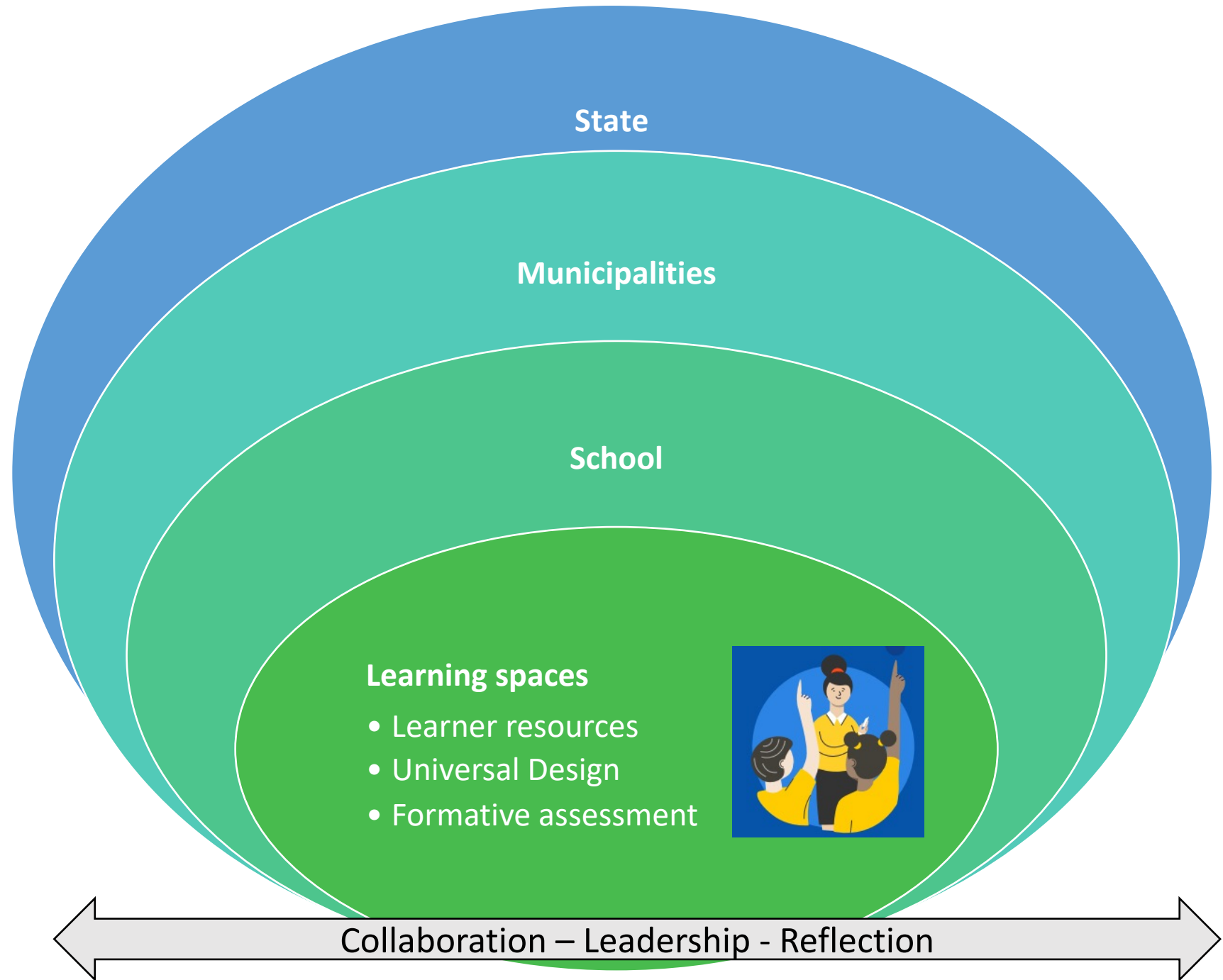
(Slee & Allan, 2001)

...rather than focussing on compensatory measures for the individual learners

(Clark et al., 1999).



Ecosystem of inclusive education



Teachers

- understand their learners' resources and develop a deep personal knowledge of each of them
- differentiate teaching and learning in their classrooms.

The key idea:

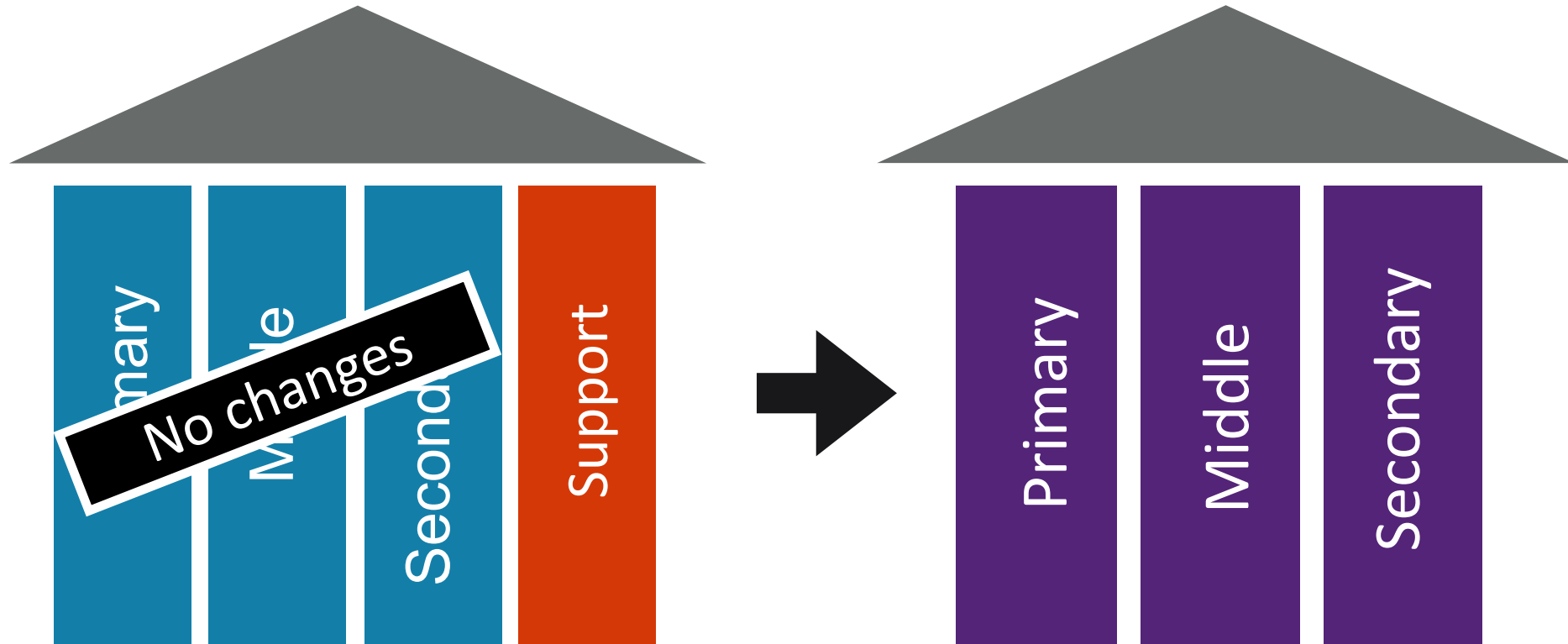
- learners can be different across many dimensions,
- the most significant difference for education resides in the way they approach and respond to learning tasks and situations,
- rather than in their pathological or cultural categorisations.

This idea presents a challenge to teachers in being reactive to those differences and employing responsive practice.

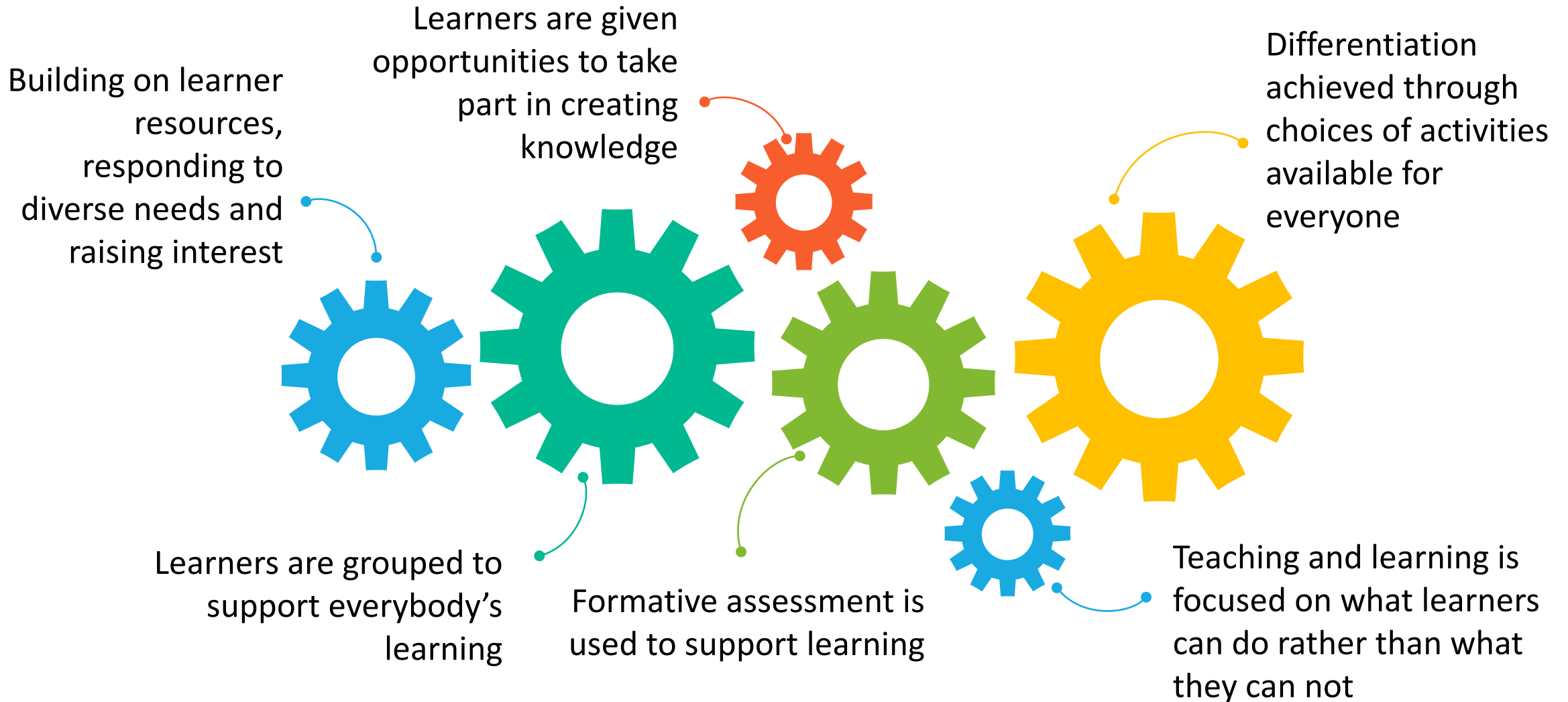


Special education and support

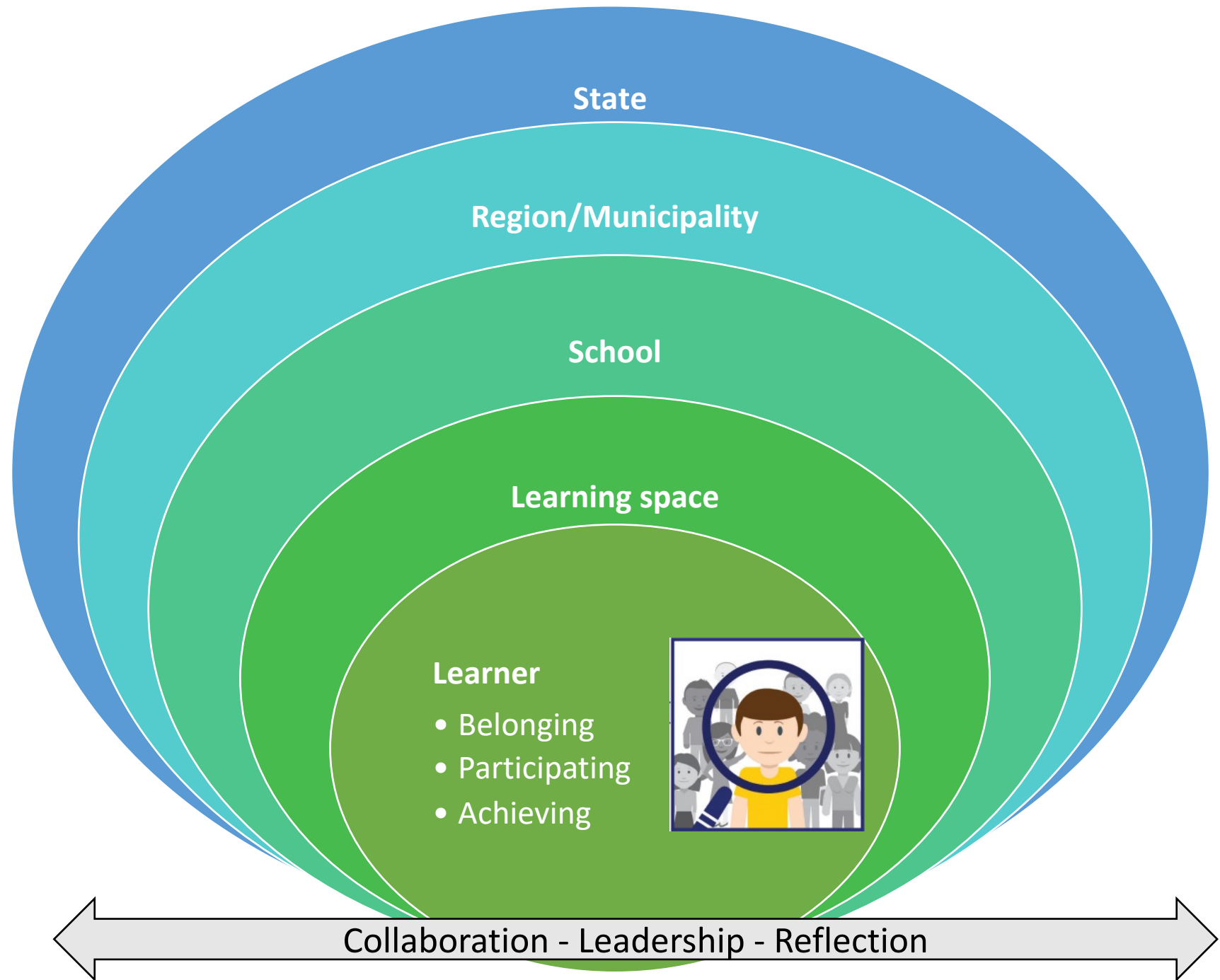
Across school and builds on collaboration and consultation



What do we see in the classroom?



Ecosystem of inclusive education



Learner

- Belonging
- Participating
- Achieving



Collaboration - Leadership - Reflection

Emphasis on learners...

- ...as **valued members** of the school,
- ...belonging to **supportive learning community** in a school where diversity is respected,
- ...having access to **comparable quality** of educational learning experiences and environments,
- ...receiving **intellectually challenging** tasks,
- ...getting **opportunities to succeed**,
- ...having **autonomy to participate** in decisions about their learning and school experiences.



Mathematics for all from a
pedagogical perspective



Reflection...

“When the notion of inclusion is used as an ideology, the most extensive discourse concerns *equity in mathematics education*; when it is used as a way of teaching, the most extensive discourse relates to *teaching interventions for mathematical engagement*.” (Helena Roos, 2016)

What are the main principles of inclusive education practice?



Believing everyone can learn
- *Presume competence*



Students are diverse and learn and show their understanding in diverse ways



Individual differences and diversity is a strength

The principle of everyone

The teacher is responsible for and committed to the education of *all* the learners in the classroom, not just some of them

(Hart et al., 2007)



The principle of co-agency

Where all learners are active agents in their education. Teachers create learning spaces with learners and the learners are responsible for their learning with the support of the teacher

(Hart et al., 2007)



The principle of trust

The teacher trusts that the learners want to learn and does not blame them when they do not

(Hart et al., 2007)



Mathematics for all: Access and equity

- All students have access to **quality education**
- Teachers have **high expectations** regarding the success of all their students
- Mathematics is **content rich** and **meaningful** for students

Quality education:

- Teachers respond to individual differences as they design instruction, teach and assess
- Teachers responsible for making mathematics accessible to learners



Hindrances to access and equity

- Access to quality mathematics learning and teaching is not provided
- Ability tracking (Boaler, 2008)
- Fixed mindset regarding the abilities of students in mathematics (Boaler, 2013)
- Negative discourse of mathematics



Ways to work against the hindrances

- Reflect on expectations and ideas about ability
- Fixed or growth mindset (Dweck, 2017)
- Open ended tasks – Low floor / High ceiling tasks
- Offer supports – take preventive measures
- Mathematical landscape (Lindenskov & Weng, 2020)
- Critically examine the curriculum and ways of teaching (Healy et al., 2013)



Learners who experience difficulties

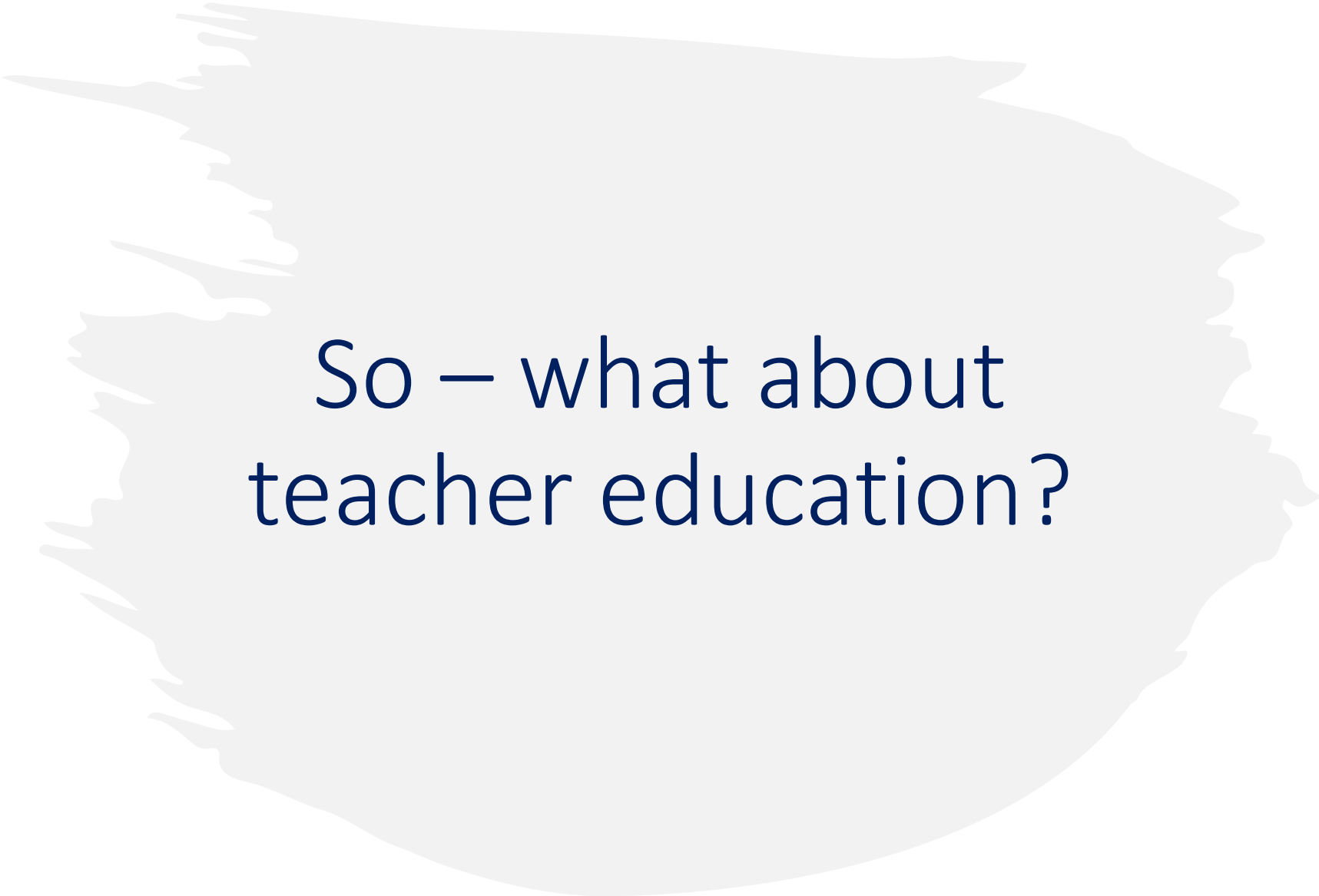
There is difference in saying:

- *Learners in difficulties with math*

or

- *Learners with math disability/difficulties*





So – what about
teacher education?

Responsive teachers



Account for for
difference as
essential aspect
of human
development in
learning



Believe they are
qualified/able of
teaching all
learners



Continually
develop creative/
innovative ways
of working with
others

Responsive teachers

Build their teaching on a good knowledge of each and every learner

Differentiate between learners as they organise learning and with regard to curricula, study materials and subject knowledge

Use the learning environment to support learning



Organise learning opportunities that are interesting and challenging

Support learners to develop responsibility for their learning

Work in collaboration with learners in managing and adapting learning, teaching and assessment

Working with second language learners

- Mathematics teachers need access to professional development opportunities (at both pre- and in-service levels) which clarify or, as Cummins (2015) put it, **'demystify', how academic language works** in the mathematics classroom.
- They should be encouraged to give all students access to high levels of mathematical challenge and be made aware of the **risk of invalidly** judging L2 students as less able (Robertson & Graven, 2020).



The responsibility of teacher education

- emphasise integrating pedagogy with subject knowledge (TALIS, 2017)
- Encourage student teachers to develop their beliefs and abilities in collaboration and to attend to their ongoing professional learning



The responsibility of teacher education

- Emphasize inclusive education - the roles and responsibilities of teachers
- Student teachers who understand the value of inclusive education
 - Are prepared to adapt their teaching to diverse groups of learners, taking into account their diverse backgrounds
 - Will increase the quality of inclusive education for all

(Allday, Neilsen-Gatti, & Hudson, 2013; Council of the European Union, 2010; Florian & Black-Hawkins, 2011; Sharma & Nuttal, 2016)



A course: Mathematics for all

Master level course – 10ECTS with a focus on:

- *inclusive education*
- *multicultural education*
- *How children learn mathematics*
- *How understanding of mathematics develops*
- *Evaluating learners' knowledge and learning processes*
- *Common difficulties learners have and their impact on learning*
- *Teaching methods and learning resources*
- *Using open problems*

Máluðu teningarnir

1. Teningurinn á myndinni er byggður úr rauðum sentikubbum. Hann var svo litaður með bláum lit.

- Hve margir kubbar eru með aðeins eina bláa hlið? 24
- Hve margir eru með tvær bláar hliðar? 24
- En þrjár bláar hliðar? $3n - 3 \times 8$
- Hve margir kubbar eru með allar hliðar rauðar? 8

$3 \times 8 = 24$ $n - 2 \times 12 = 24$

2. Finndu á sama hátt hve margir kubbar hefðu eina, tvær eða þrjár bláar hliðar ef hliðarlengd teningsins væri 5 sentikubbar. Hve margir kubbar væru þá rauðir? 5 x 2 = 10

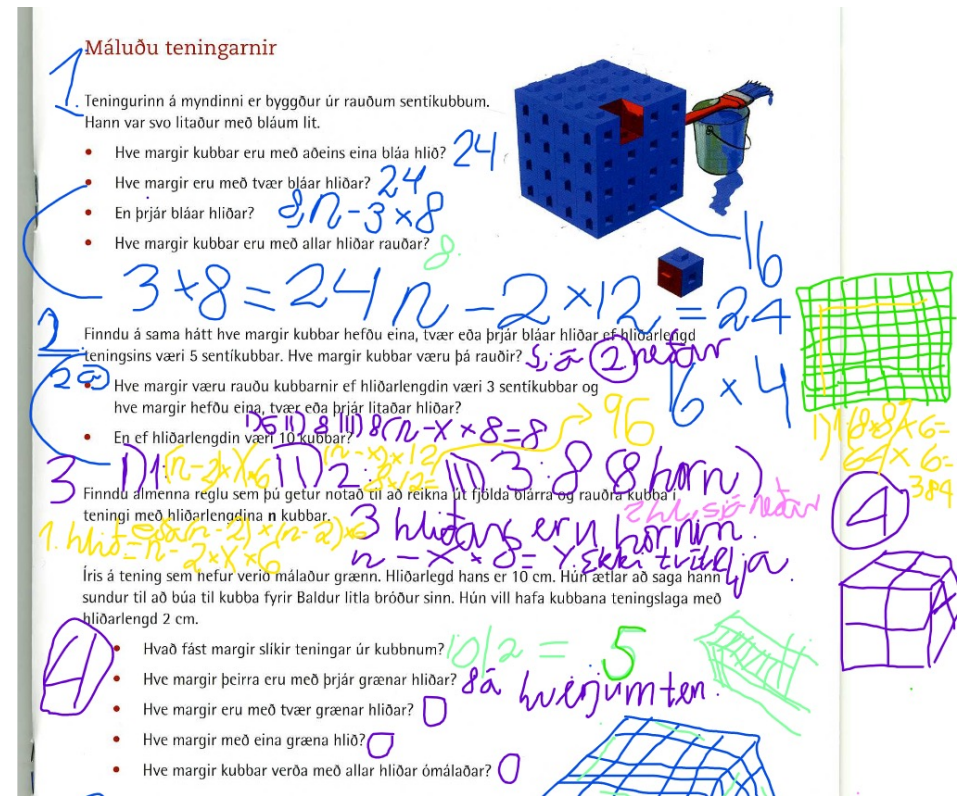
- Hve margir væru rauðu kubbar ef hliðarlengdin væri 3 sentikubbar og hve margir hefðu eina, tvær eða þrjár litaðar hliðar? $25 - 10 = 15$
- En ef hliðarlengdin væri 10 kubbar? $n - x \times 8 = 8 \rightarrow 96$

3. Finndu almenna reglu sem þú getur notað til að reikna út fjölda blárra og rauðra kubba teningi með hliðarlengdina n kubbar. $1) n - 2 \times 6$ $2) n - x \times 12$ $3) 8$ 8 horn

1. hlið = $n - 2 \times 6$ $2) n - x \times 12$ $3) hliðarnir eru hornin.$

Íris á tening sem hefur verið málaður grænn. Hliðarlengd hans er 10 cm. Hún ætlar að saga hann sundur til að búa til kubba fyrir Baldur litla bróður sinn. Hún vill hafa kubbana teningslaga með hliðarlengd 2 cm.

- Hvað fást margir slíkir teningar úr kubbnum? $10/2 = 5$
- Hve margir þeirra eru með þrjár grænar hliðar? 8 x hvejumtan
- Hve margir eru með tvær grænar hliðar? 0
- Hve margir með eina græna hlið? 0
- Hve margir kubbar verða með allar hliðar ómálaðar? 0




Providing equal access for all learners to quality mathematics education

Calls for:

- A shift in education practices
- Attending to the understanding and beliefs of teachers regarding
 - Inclusive education
 - Mathematics
 - How children learn and show their learning in various ways
- Role models in teacher education that
 - consider the subject and what to teach
 - model how to teach (European Agency for Development in Special Needs Education, 2012)





Thank you for
your attention

Edda Óskarsdóttir –
eddao@hi.is