香港教育大學
The Education University of Hong Kong

Promoting student agency via Variation Theory:

Teaching for no teaching

Ellen Zhang (yfzhang@eduhk.hk)

Variation Theory and Learning Study in Hong Kong

- Promoted in in-service teacher education in Hong Kong since 2000

- Adopted in pre-service teacher education in Hong Kong since 2007

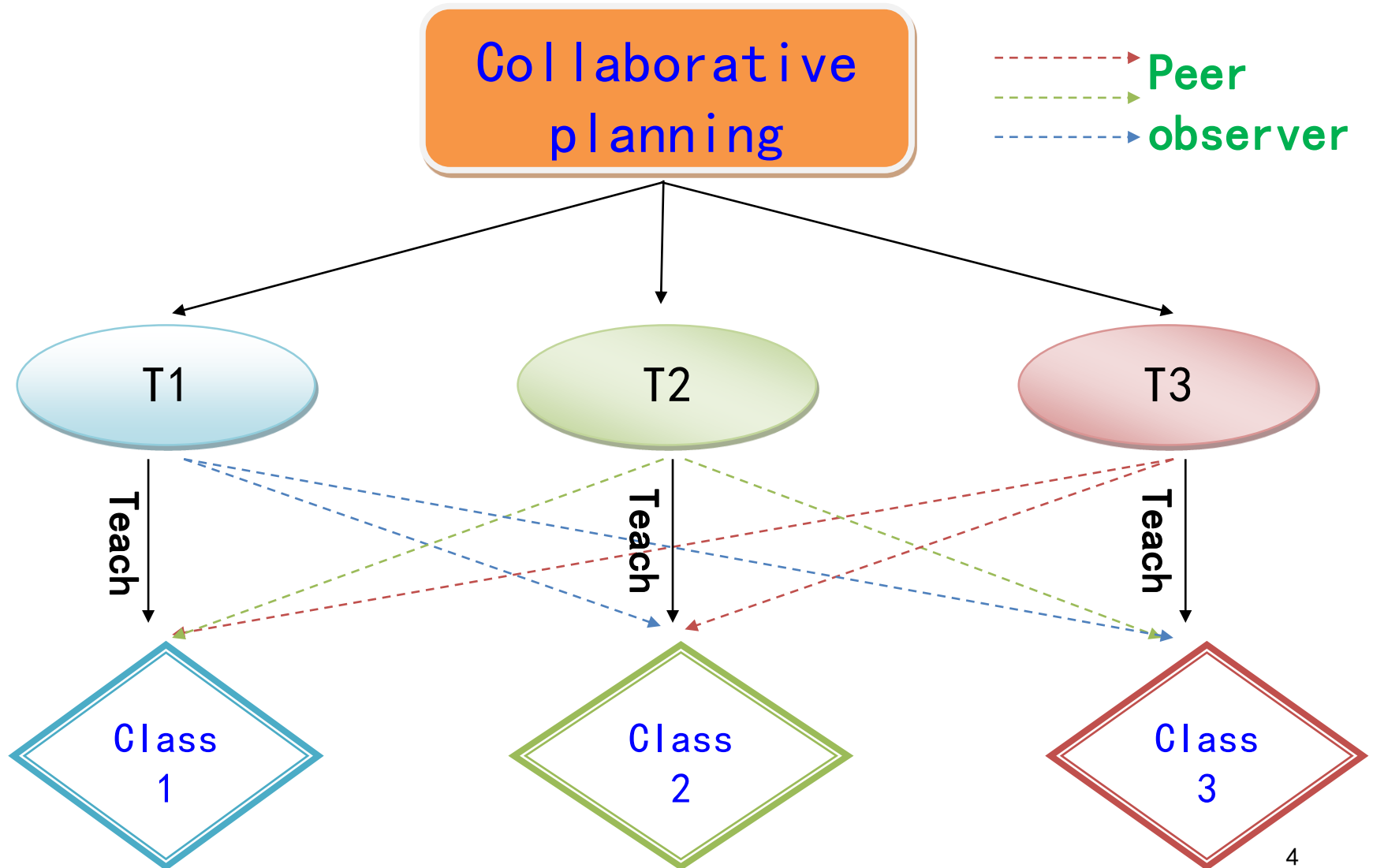- Applying Variation Theory in daily teaching and learning

Reflection on education

- Taught = learned? ([water vapour](#))
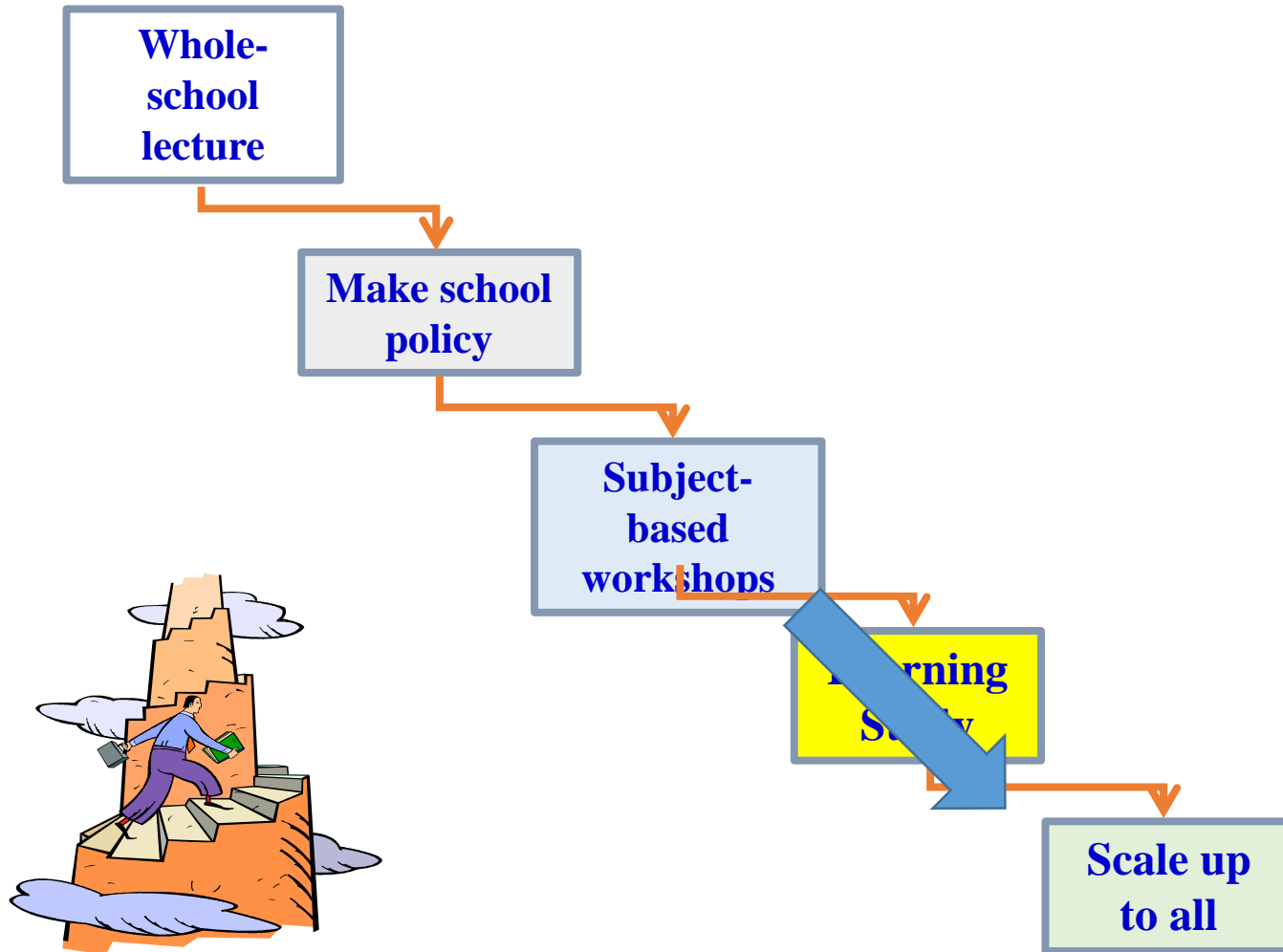- Correct answers = correct thinking? ([subject-verb agreement](#))

Understand student learning:
learning gap, steps /process of learning

LS for We-culture

Enacting education reforms

Whole-school lecture

Make school policy

Subject-based workshops

Learning Study

Scale up to all

（Zhang，2012）

Basic Education Curriculum Guide
- To Sustain, Deepen and Focus on Learning to Learn
(Primary 1 - 6)

The Hong Kong School Curriculum

Text Types for KS1 (P1 – 3)	Additional Text Types for KS2 (P4 – 6)	Additional Text Types for KS3 (S1 – 3)	Additional Text Types for KS4 (S4 – 6)
• Advertisements • Captions • Cards • Cartoons and comics • Charts • Conversations • Coupons • Diaries • Directions • Fables and fairy tales • Forms • Illustrations • Instructions • Labels • Leaflets • Lists • Menus • Notes and messages • Notices • Personal descriptions • Personal letters • Personal recounts • Picture dictionaries • Poems • Postcards • Posters • Product information • Rhymes • Riddles • Rules • Signs • Songs	• Accounts • Announcements • Autobiographies • Biographies • Blogs • Brochures • Catalogues • Children's encyclopaedias • Dictionaries • Directories • Discussions • Emails • Explanations of how and why • Formal letters • Informational reports • Jokes • Journals • Maps and legends • Myths • News reports • Pamphlets • Plays • Procedures • Questionnaires • Recipes • Telephone conversations • Tongue twisters • Weather reports	• Book reviews/reports • Encyclopaedias • Film reviews • Interviews • Itineraries • Letters to the editor • Manuals • Memoranda • Newspaper/ Magazine articles • Presentations • Short films • Short novels • Social media texts • Talks • Trailers	• Abstracts/synopses • Agendas • Debates • Documentaries • Editorials • Essays • Feature articles • Films • Minutes • Novels • Proposals • Speeches • Resumes • Thesauri

Nouns

KS1 (P1 – 3)	Examples	KS2 (P4 – 6)	Examples
Use nouns or noun phrases to • identify people, animals, events and objects • indicate time, days and dates • show possession	He is a teacher. I like dogs. This is a beautiful bag. Today is my birthday. It is half past ten now. Today is Monday. It is 2nd July today. It is Peter's toy car.	Use nouns or noun phrases to • indicate conditions • refer to quantities or units	I have a headache. I need a piece of paper. I bought a pair of trousers yesterday.
Use the singular form of countable nouns to • refer to one person, animal, event and object	I have a bicycle.	Use "-ing" nouns or noun phrases to • refer to activities	I enjoy singing. My brother likes collecting stamps.
Use the plural form of countable nouns to • refer to more than one person, animal, event and object	Jo has two brothers. She has four balloons.	Use plural nouns to • refer to some tools and other things that people use	You can use scissors to cut the thread. Put on your headphones.
Use plural nouns to • refer to some clothes and other things that people wear	Where are my shorts? Miss Lee wears glasses.	Use collective nouns to • refer to a group of people	Our class is very smart. The shopkeeper called the police.
Use uncountable nouns to • refer to uncountable objects • refer to general things which are not used with numbers	I have milk for breakfast. This is good work.	Use the possessive form of nouns to • refer to a point in time	I have to hand in the project in a week's time.

The Seven Learning Goals

1. Know how to **distinguish right from wrong**, fulfil their **duties** as members in the family, society and the nation, and show **acceptance and tolerance** towards **pluralistic values**;

2. Understand their national identity and be **concerned** about society, the nation and the world, and to fulfil their role as a **responsible** citizen;

3. Develop **an interest** in reading extensively and cultivate **a habit** of reading;

4. **Actively** communicate with others in English and Chinese (including Putonghua);

5. Develop **independent** learning skills, especially **self-management** skills and **collaboration** skills;

6. Master the basics of the **eight Key Learning Areas** to prepare for studying in secondary schools; and

7. Lead a **healthy** lifestyle and develop an interest in aesthetic and physical activities and an ability to **appreciate** these activities.

(Curriculum Development Council, 2014)

Existing problems in teaching

- Too much spoon-feeding
- Teacher-led v.s. student-centred /student-led
- Lack of motivation in learning
- Lack of joy of learning
- Severe competition among students
- Students became passive learners

Lifelong learning = the "ongoing, voluntary, and self-motivated" pursuit of knowledge

?

The Seven Learning Goals

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Promoting student agency via VT-plus

1. VT and subject-specific and topic-specific learning methods

2. VT and process of cognitive development (awareness, discernment, storing, retaining, recalling, transferring..) and levels of learning

3. VT and development of generic skills (structure, process, measurement), values and attitudes.

4. VT and other learning strategies (cooperative learning, rote learning, etc.)

5. VT and student agency

Zhang (2017)   13

Two aspects of the object of learning:
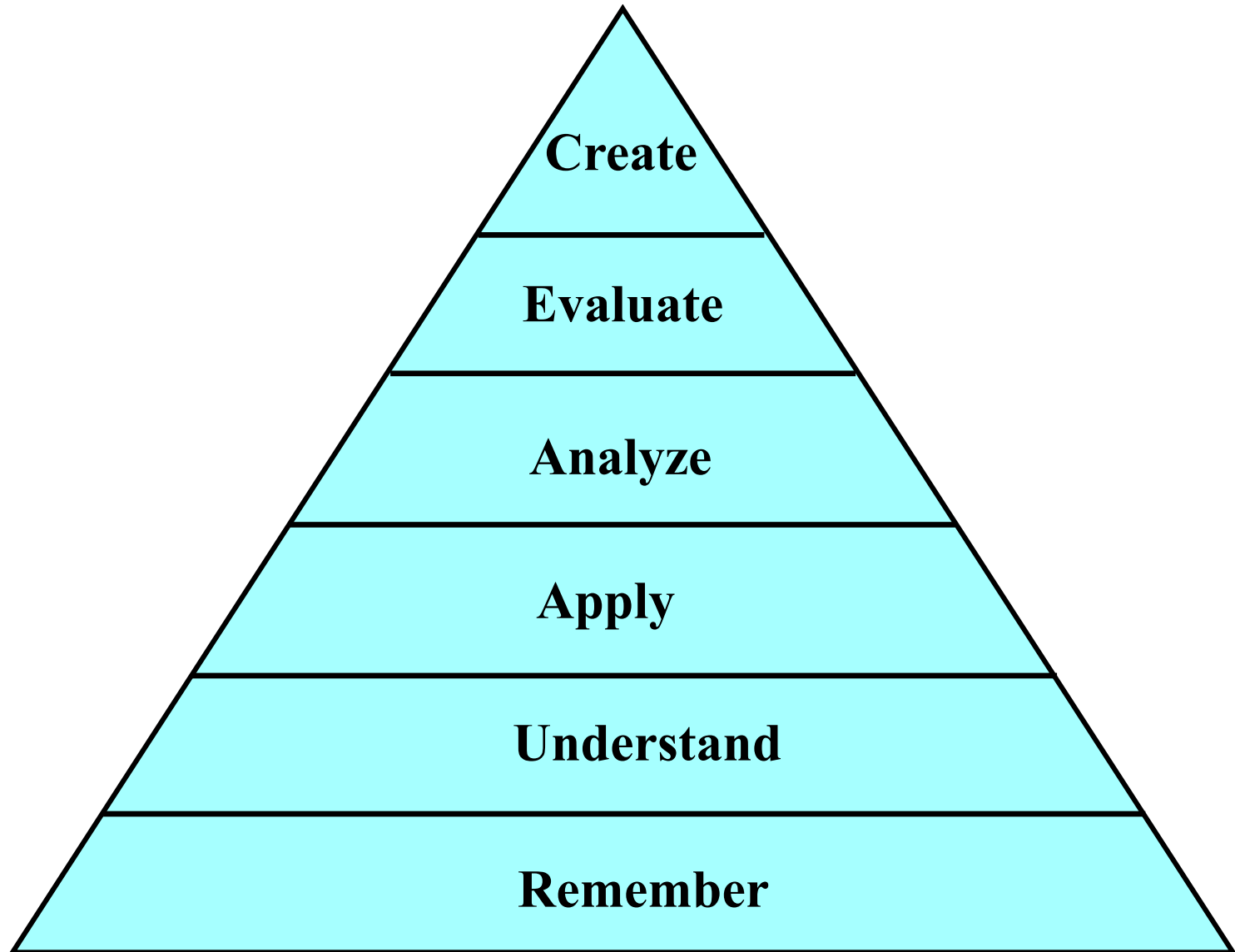
What the students should learn

Specific aspects

（what to learn, short-term targets）

General aspects

（how to learn，long-term targets）

Levels of learning

Three aspects of the object of learning:
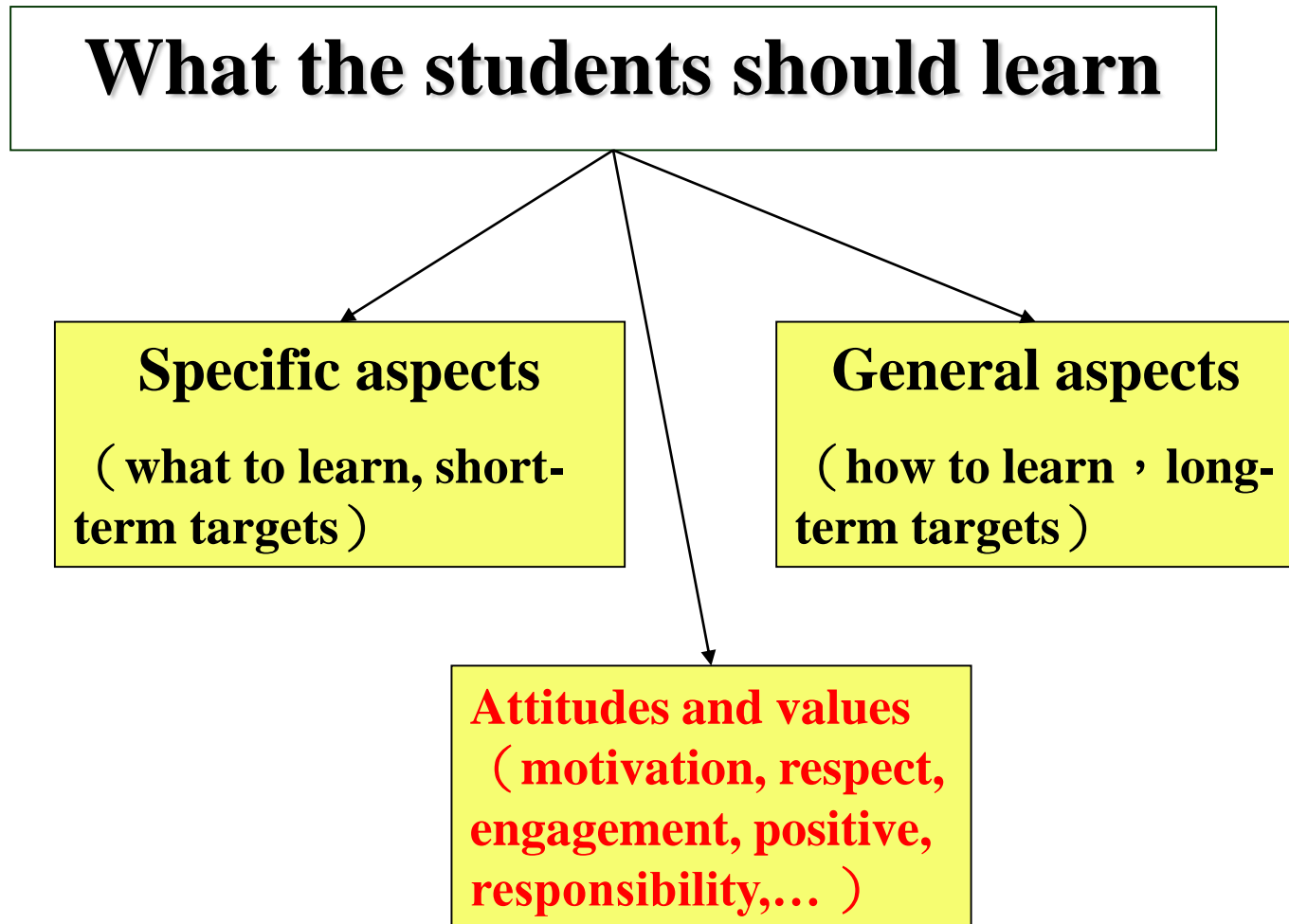
What the students should learn

Specific aspects
（**what to learn, short-term targets**）

General aspects
（**how to learn，long-term targets**）

Attitudes and values
（**motivation, respect, engagement, positive, responsibility,…** ）

Critical aspects (ASK)

Domain	Description
Attitudes	Respect teachers' teaching
Skills	Observing and memorizing
Knowledge	There is water vapor in the air

Pattern of variation enacted in Class 3

What varies	What is invariant	What is to be discerned
Tissue paper in contact with air gets wet Tissue paper not in contact with air remains dry Tissue paper in contact with can remains dry Tissue paper not in contact with can gets wet	Cold can and tissue paper	Only the tissue paper in contact with air gets wet, so the water must have come from air. Water cannot come from inside the can.

Example in variation in Class 2

Critical aspects (ASK)

Domain	Description
Attitudes	Respect teachers' teaching
Skills	Observing, comparing and discerning
Knowledge	There is water vapor in the air

Pattern of variation enacted in Class 3

What varies	What is invariant	What is to be discerned
Tissue paper in contact with air gets wet Tissue paper not in contact with air remains dry Tissue paper in contact with can remains dry Tissue paper not in contact with can gets wet	Cold can and tissue paper	Only the tissue paper in contact with air gets wet, so the water must have come from air. Water cannot come from inside the can.

Critical aspects (ASK)

Domain	Description
Attitudes	Respect teachers' teaching; self-reflection, self-correcting
Skills	Observing, comparing, discerning and critical thinking
Knowledge	There is water vapor in the air; the can is not leaking

P5 music lesson

CF: The right skills to play the base guitar well: pose, use fingers/sting, beat/rhythm, holding the string and their impacts (the right /better way vs the wrong /poorer way)

Critical aspects (ASK)

Domain	Description
Attitudes	Aesthetic appreciation of music; self-reflection, self-correcting
Skills	Observing, analyzing, comparing, applying
Knowledge	The key skills of playing a base guitar

The key skills of playing a base guitar

Skills	Descriptions / impact
How to hold it	To maximize your hand coordination and comfort in playing
How to use your fingers	Find the best body part for playing
Why playing one string at a time	To achieve quality sounds
Why keeping the beat	To be a right part of the whole music
...	…

1. **Which skill you have mastered? Which needs more practice?**
2. **Can we apply these skills in playing other instruments?**

CF1: The right skills to play the base guitar well: pose, use fingers/sting, beat/rhythm, holding the string and their impacts (the right /better way vs the wrong /poorer way)
CFs: The critical aspects for playing a musical instruments / string instrument

Critical aspects (ASK)

Domain	Description
Attitudes	Aesthetic appreciation of music; self-reflection, self-correcting
Skills	Observing, analyzing, comparing, applying, evaluating, transferring
Knowledge	Different ways of playing a base guitar

Levels of learning
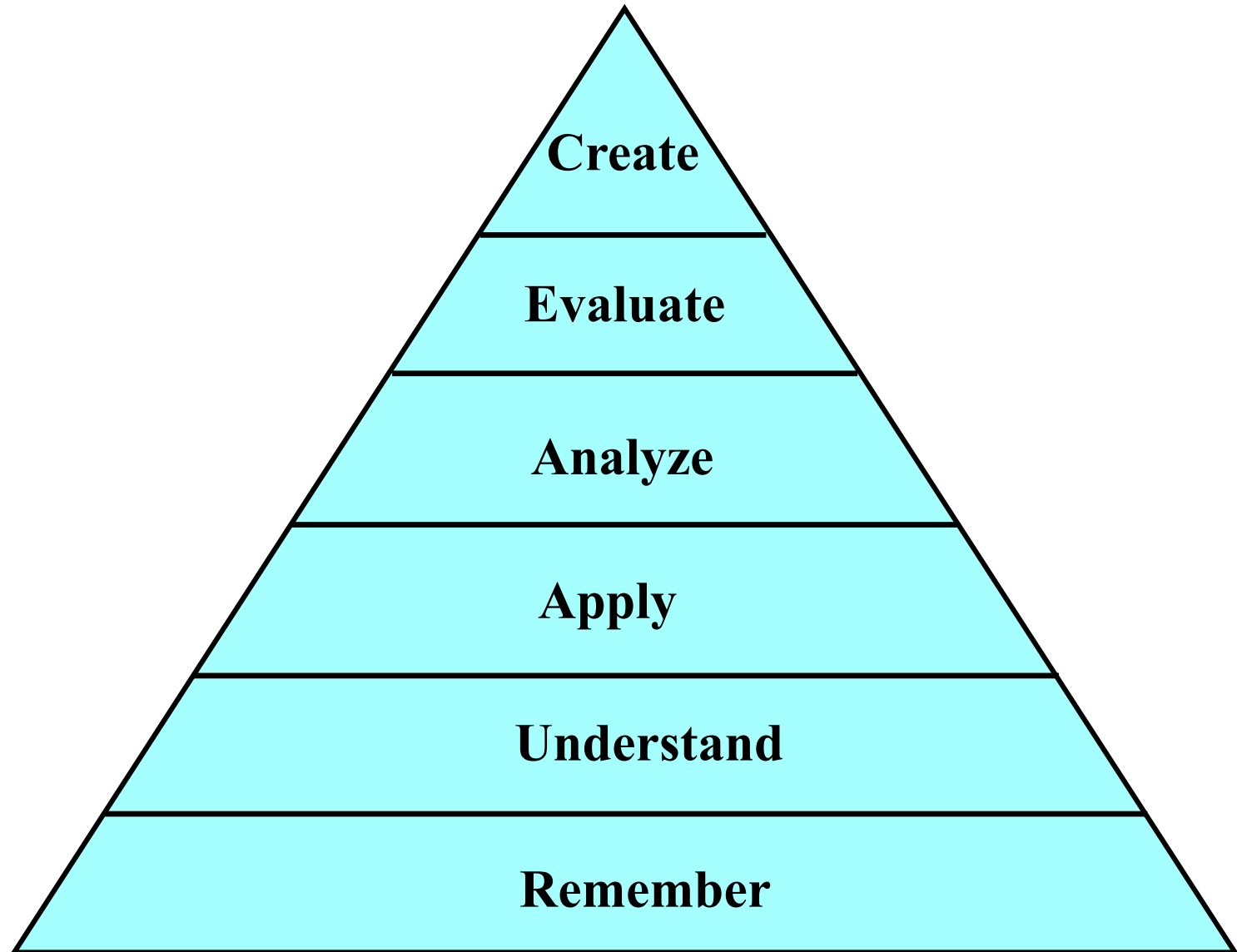
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Zhang (2017)

Learning Pyramid

average student retention rates

- Lecture
- 10% Reading
- 20% Audiovisual
- 30% Demonstration
- 50% Discussion
- 75% Practice doing
- 90% Teach others
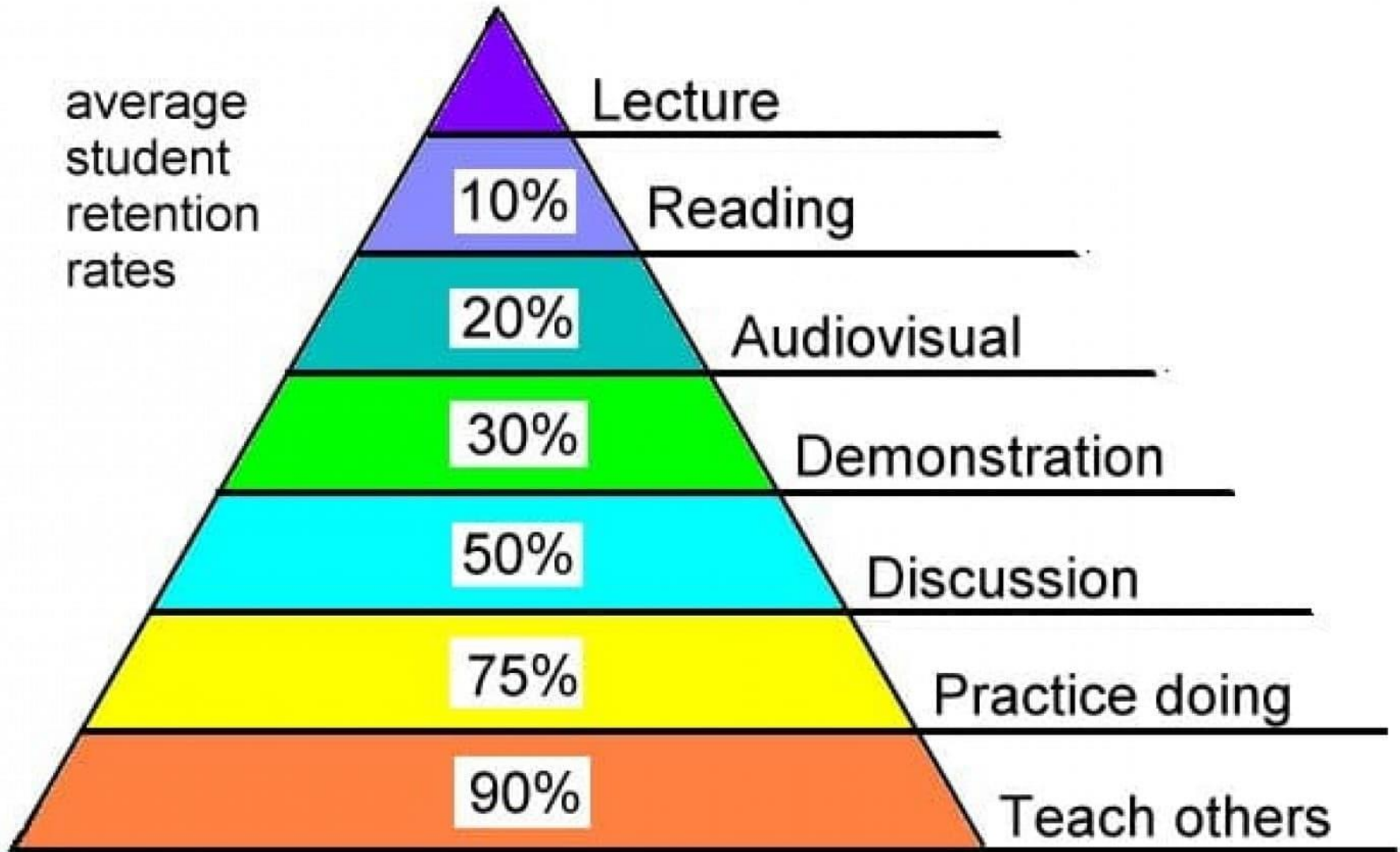
Source: National Training Laboratories, Bethel, Maine

Dale (1946)

Cooperative Learning (CL)

- Johnson, Johnson, and Holubec (1993) define CL as "the instructional use of small groups so that students work together to maximize their own and each other's learning" (p.9).

Relevance structure 3: Related to other learners' learning/perspectives/ contexts
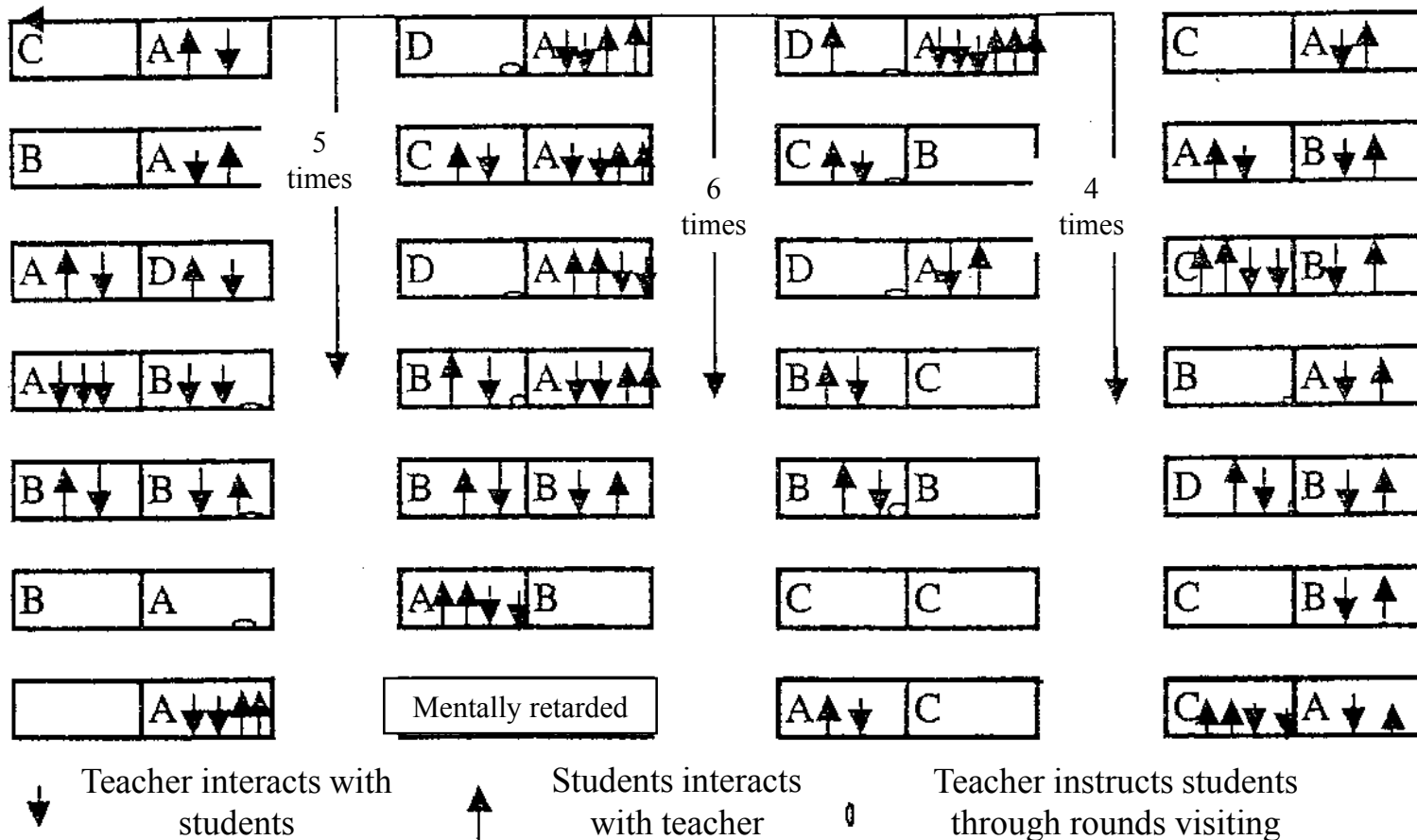
Jacobs, Power & Inn (2002)

Classroom Interaction (1)

Language flow and Teacher made
rounds visiting students

One to one

One to whole class

Podium

Teacher interacts with students

Students interacts with teacher

Teacher instructs students through rounds visiting
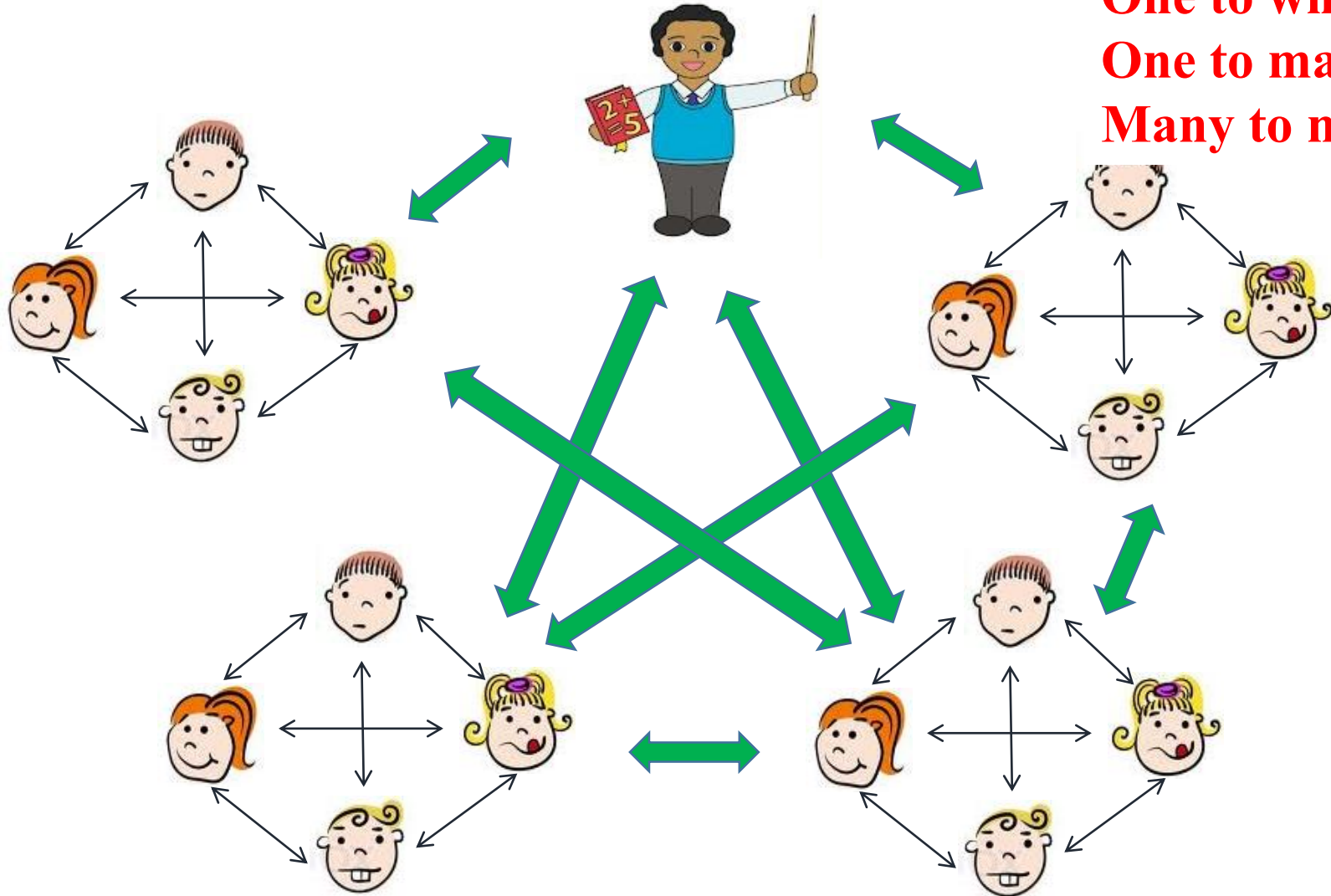
31

Classroom Interaction (2)

One to one
One to whole class
One to many
Many to many

Benefits of collaborative learning

$$1\rightarrow（1+1）>1$$

- Provide peer support and learning
- Enhance participation and autonomy
- Widen horizon and create new knowledge
- Develop skills and strategies
- Increase efficiency and effectiveness

The sum of internal angles are 180°

1. 学生独自在工作纸画一个三角形，并使用量角器来测量，求出三角形内角和。
2. 学生配对轮流分享自己的解题方法，其伙伴提出疑问或建议，并作修订。
3. 老师随机抽出学生将其答案写在黑板上。
4. 全班同学和教师一起评鉴各学生的答案，并讨论三角形内角和是否为180°。

Benefits of collaborative learning

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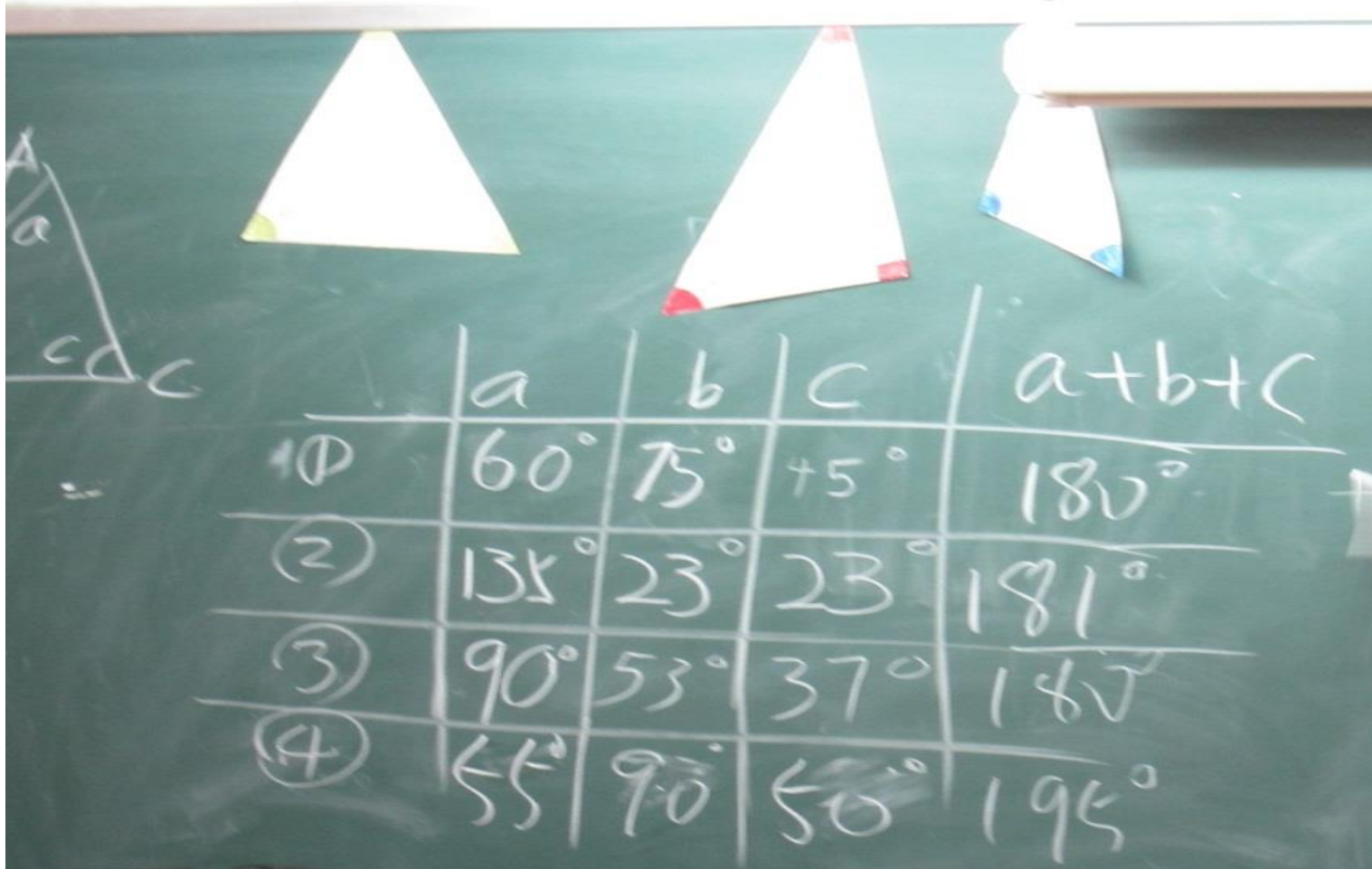
Benefits of collaborative learning

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Critical aspects (ASK)

Domain	Description
Attitudes	
Skills	
Knowledge	The definition of monomial The addition and subtraction of monomial

Huadi Sec School in Guangzhou: Teacher talk for only 10 minutes at most (S1 Maths)

1. Self-study /independent thinking
2. Group leader analyzes the learning difficulties
3. Students co-teach the solutions in groups
4. Students present to the whole class
5. Comments from peers and teacher
6. Students self-correct mistakes

(Gu, 2015)

Students mark their assignments

B. $2x^2 + x + 1$

D. $x + y = 0$

式子表示为（ C ）．

B. $x + \frac{1}{3}y = 4$

D. 以上都不对

中，甲班学生共捐款 266
还多 30 元，设乙班学生捐

$2x + 30$

14"表示成关于 x 的方程

$)x = 14$

列出方程：

大 3；

$\frac{1}{2}$

一半等于 2；

2

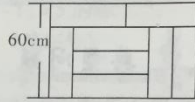的 34%；

34%

数的 2 倍少 31；

$2x - 31$

数的 6 倍加上 1.

$6x + 1$

m，高是 5 cm，面积 40

$x5 \div 2 = 40$

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14. 如图，用 8 块相同的长方形地砖拼成一个长方形地面，设每块长方形地砖的长为 $x$cm，根据题意列方程为 $x + (60-x) = 60$

$3(60-x) = x$

60cm

15. 根据下列条件列出方程：
(1) x 的 5 倍比 x 的相反数大 10；

$5x - (-x) = 10$

(2) x 的 $\frac{3}{4}$ 比它的倒数小 4．

$x - \frac{3}{4}x = 4$ $\frac{1}{3}x = \frac{1}{x} - 4$

16. 根据题意，设未知数，列出方程：
(1) 一个长方形的周长是 20 厘米，面积是 24 平方厘米，求这个长方形的宽；

$x(\frac{1}{2}\times 20 - x) = 24$

(2) 一根铁丝用去 $\frac{4}{5}$ 后还剩下 3 米，求这根铁丝的长．

$(1 - \frac{4}{5})x = 3$

(3) 某校女生占全体学生数的 52%，比男生多 80 人，这个学校有多少名学生？ 解 设有 x 学生

$(1-52\%)x = 80$ $52\%x = (1-52\%)x + 80$

(4) 甲种铅笔每支 0.3 元，乙种铅笔每支 0.6 元，用 9 元钱买了两种铅笔共 20 支，两种铅笔各买了多少支？ 解 设

$0.3x + 0.6(20-x) = 9$

方程的解：能够使方程等号左右两边相等的未知数的值，称为方程的解．

典型问题

1. 下列方程的解是 $x = 2$ 的是（ B ）．
   A. $x - \frac{1}{2} = 0$ $\frac{1}{2}$ B. $6x - 12 = 0$
   C. $-4x + 6 = 0$ D. $2x + 4 = 0$

2. 下列说法中，正确的是（ D ）．
   A. $x = 5$ 是方程 $x + 5 = 0$ 的解
   B. $y = 5$ 是方程 $3y + 15 = 0$ 的解
   C. $z = -1$ 是 $-\frac{z}{4} = 4$ 的解
   D. $x = 0.04$ 是方程 $25x = 1$ 的解

3. 检验下列各题括号里的数是不是它前面的方程的解．
   (1) $3x = x + 4$ $(x = 2, x = \frac{3}{2})$；

证明(1)把 $x = 2$ 代入 $3x = x + 4$ 得
   $2 \times 3 = 2 + 4$
   ∴ $x = 2$ 为此方程的解
(2)把 $x = \frac{3}{2}$ 代入 $3x = x + 4$ 得
   $3 \times \frac{3}{2} = \frac{3}{2} + 4$
   $\frac{9}{2}$ $\frac{7}{2}$ ∴ $x = \frac{3}{2}$ 不为此方程的解

(2) $(x-2)(x-3) = 0$ $(x = 0, x = 2, x = 3)$．

证明(1)把 $x = 0$ 代入 $(x-2)(x-3) = 0$ 得
   $(0-2) \times (0-3) = 0$
   $-2 \times (-3) \neq 0$
   ∴ $x = 0$ 不为此方程的解
(2)把 $x = 2$ 代入 $(x-2)(x-3) = 0$ 得
   $(2-2) \times (2-3) = 0$
   $0 \times (-1) = 0$
   ∴ $x = 2$ 为此方程的解

变式练习

4. $x = -2$ 是下列方程（ B ）的解．$(-2-3)x(-2+2)$
   A. $2x = 6$ $2 \times (-2) = -4$ B. $(x-3)(x+2) = 0$
   C. $x^2 = 3$ D. $3x - 6 = 0$

5. 下列说法中，不正确的是（ D ）．
   A. $x = 0$ 是方程 $\frac{1}{2}(x+3) = 1.5$ 的解 ✓
   B. $x = 2$ 是方程 $x - 10 = -4x$ 的解 ✓
   C. $x = -1$ 是方程 $|x| = 1$ 的解 ✓
   D. $x = 2$ 是方程 $x^2 - 2 = 0$ 的解 ✗

6. 检验下列各题括号里的数是不是它前面的方程的解．
   (1) $y = 10 - 4y$ $(y = 1, y = 2)$；

证明(1)把 $y = 1$ 代入 原式 得
   $1 = 10 - 4 \times 1$
   ∴ $y = 1$ 不为此方程的解
(2)把 $y = 2$ 代入 原式 得
   $2 = 10 - 4 \times 2$
   ∴ $y = 2$ 为此方程的解

(2) $x(x+1) = 12$ $(x = 3, x = 4, x = -4)$．

证明(1)把 $x = 3$ 代入 原式 得
   $3 \times (3+1) = 12$
   ∴ $x = 3$ 为此方程的解
(2)把 $x = 4$ 代入 原式 得
   $4 \times (4+1) = 12$
   ∴ $x = 4$ 不为此方程的解
(3)把 $x = -4$ 代入 原式 得
   $-4 \times (-4 + 1) = 12$
   ∴ $x = -4$ 为此方程的解

Critical aspects (ASK)

Domain	Description
Attitudes	Sharing, support, responsibility, self-reflection, self-correcting
Skills	Reflecting, analyzing, summarizing, problem-solving, valuating
Knowledge	The definition of monomial The addition and subtraction of monomial

Reflection on collaboration

Benefits of collaborative learning

$$1\rightarrow（1+1）>1$$

- Provide peer support and learning

- Enhance participation and autonomy

- Widen horizon and create new knowledge

- Develop skills and strategies

- Increase efficiency and effectiveness

The Borås Team are willing to share open lessons on cooperative learning!

P6 English lesson on the plural forms of nouns

1. Singular and plural forms in Swedish and English			
En ball – ballar En klocka - klockor	-s girl – girls star – stars		
2. Rules of forming the English plural forms			
-es potato – potatoes tomato – tomatoes hero-heroes	-s photo – photos; studio – studios; piano - pianos		-es /is/ horse – horses dish - dishes glass – glasses
Vowel +ys toy – toys boy – boys monkey - monkeys	Consonant +ies candy – candies puppy - puppies		foot – feet mouse –mice tooth – teeth
3. Applications & categorization pencil – pencils baby – babies (categorize it into –ies) echo – echoes			

Critical aspects (ASK)

Domain	Description
Attitudes	Contrastive awareness of languages
Skills	Analyzing, generalising
Knowledge	• Differences between singular and plural nouns in English • Different ways of forming English plural nouns

Promoting student agency in learning

1. Finding the features of singular nouns and plural nouns in English			

girl girls   photo photos horse horses dish dishes glass glasses

studio studios piano pianos star stars potato   potatoes tomato tomatoes

hero heroes toy toys boy boys monkey monkeys candy candies

puppy puppies   foot feet mouse mice tooth teeth

Which is which? Why?

2. How to categorise them based on rules of forming the plural forms

-s girl – girls star – stars	-es potato – potatoes tomato – tomatoes hero-heroes	-s photo – photos; studio – studios; piano - pianos	-es /is/ horse – horses dish - dishes glass – glasses
Vowel +ys toy – toys boy – boys monkey - monkeys	Consonant +ies candy – candies puppy - puppies		foot – feet mouse –mice tooth – teeth

3. Applications & categorization (one example from each student →booklet)

4. Compare the differences between forming plural nouns in Swedish and English

Critical aspects (ASK)

Domain	Description
Attitudes	Contrastive awareness of languages; the habit of comparing language; support, responsibility
Skills	Analyzing, generalizing, categorizing, synthesizing
Knowledge	• Differences between singular and plural nouns in English • Different ways of forming English plural nouns

Teaching for no teaching

- Identify ASK CFs to achieve goals
- Aim @ high levels of learning
- Allow students to lead learning by finding problems, solutions, strategies, supporting each other and assessment and
- Cultivate collaborative learning among students
- Cultivate an open, safe and conducive culture for learning and collaboration
- Encourage and support students to take risk, make mistakes and self-correct, solve problems…

Plan, set goals, and lay out strategies

Use strategies and monitor performance

Reflect on performance

Use results from previous performance to guide the next one

The Cycle of Self-Regulated Learning

Students outdo teachers.

What is Variation Theory?

| Domain	Description
Attitudes	We teachers do not know all! (humble learners) Responsibility for enhancing learning and development
Skills	Teaching is not to transmit knowledge to learners who do know (don't underestimate students); but to develop students based on their existing knowledge, skills and attitudes, co-find better solutions for problems
Knowledge	What learners have known? What learners should learn? How do they learn? How to best support learning of the topics? How to best develop learners' skills and attitudes? (learner- & learning- centred)

Variation Theory People

- Accepting students' current state with a hopeful heart

- Understanding students' problems and causes

- Teaching begins from students' problems (Embrace problems)

- Identifying critical features for learning (Clarity of problems)

- Providing scaffolding/structure for learning for awareness / learning / development /problem-solving (Help, support and empowering students with hopes, solutions and choices)

- Reflecting on students' learning outcome and further needs (Reflective and enquiring)

- Finding the key to student success(Effective and create changes)

Communities of learning
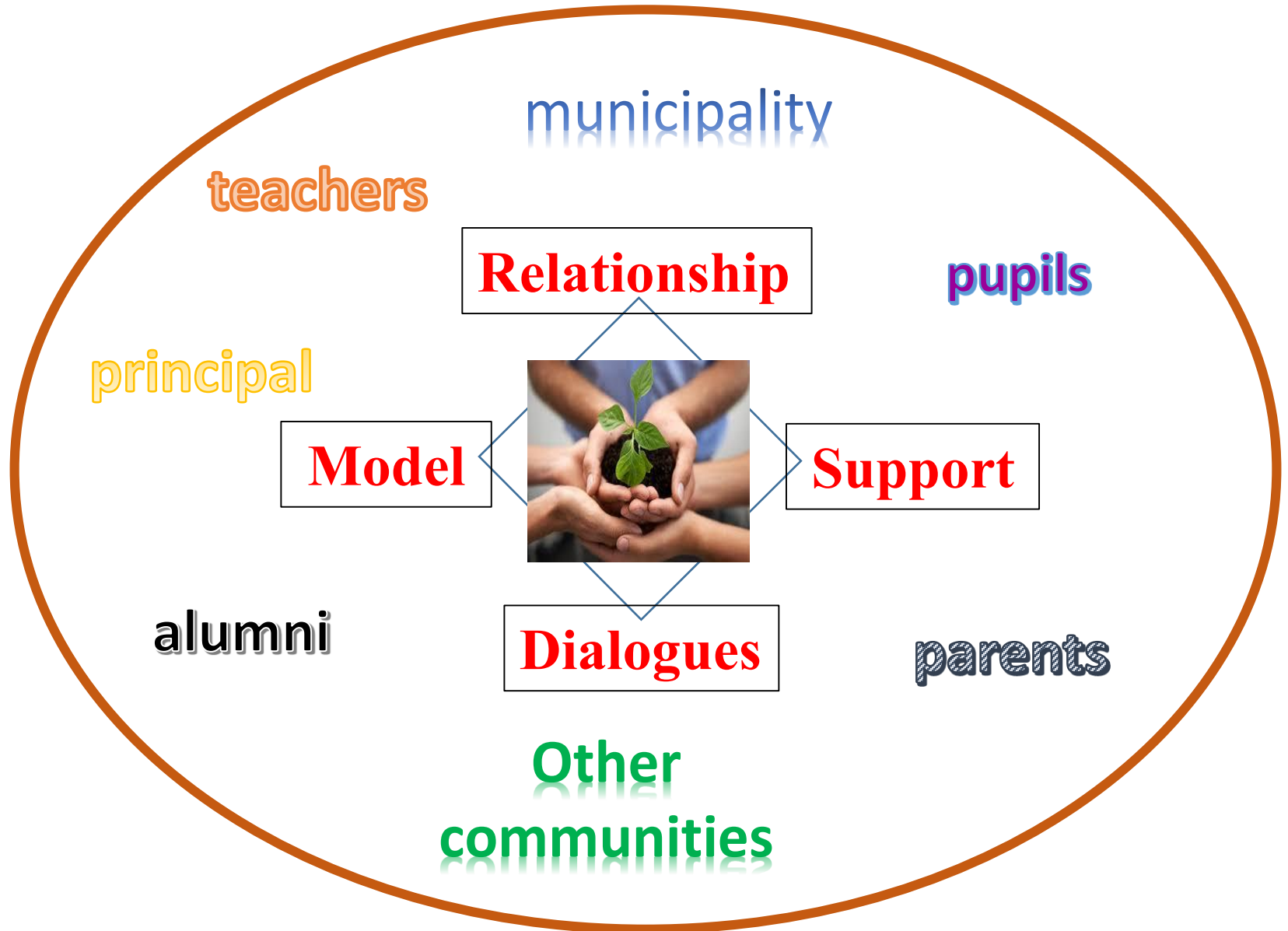
Your daughter is a dancer!

Gillian Lynne

Goal of education is to bring out the best you.

- Know self;

- Trust self;

- Rely on self;

- Love self.

（Cheng & Zhang, 2017）