

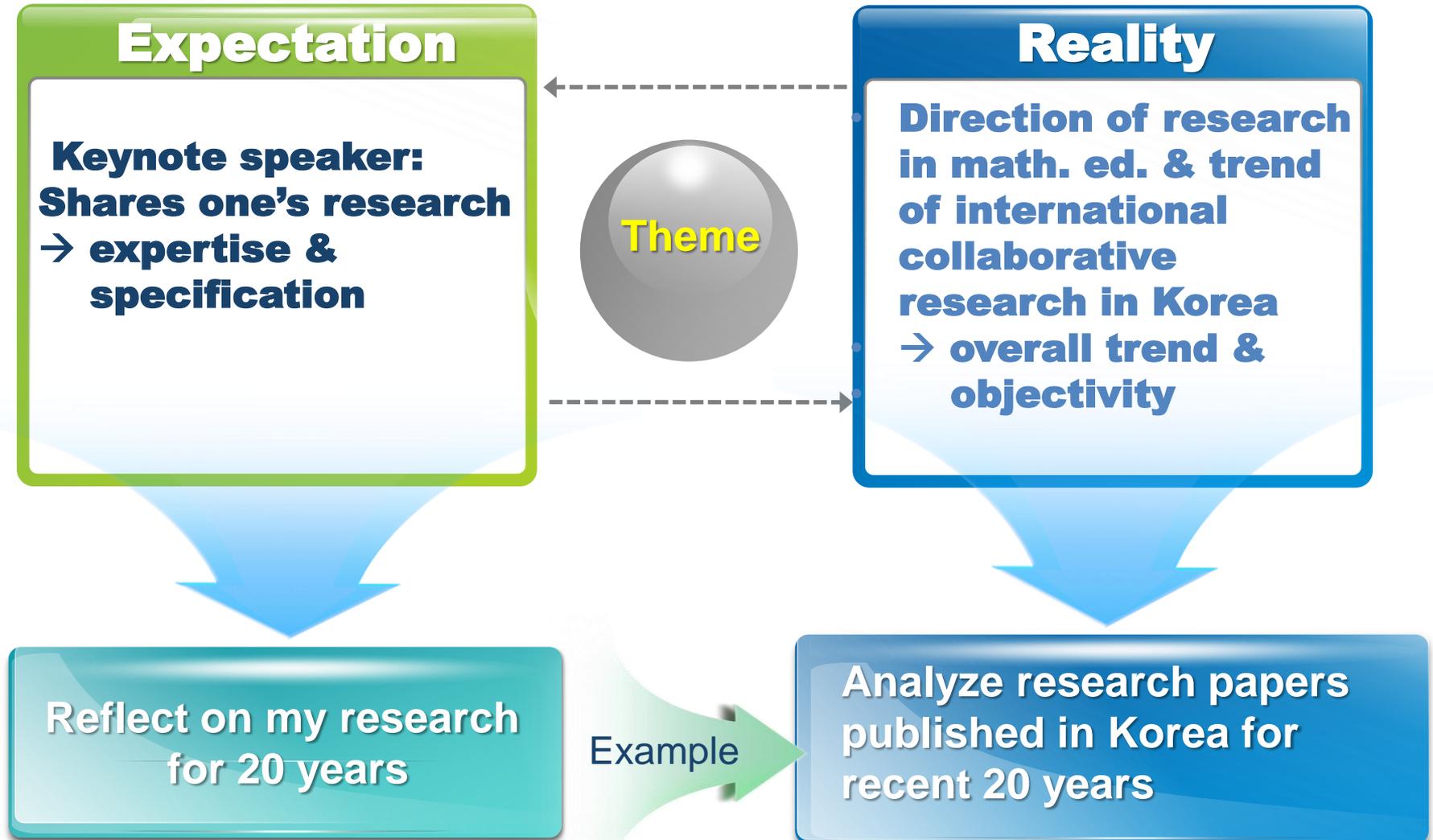


Direction of Research in Math. Ed. &  
Trend of International Collaborative  
Research in **Korea**

JeongSuk Pang (方貞淑)



# From Joy to Challenge





# Overview: Korean research

I

**Brief Background Information**

II

**Analysis on Research Papers**

**Overall Trend**

**International  
Research**

Example

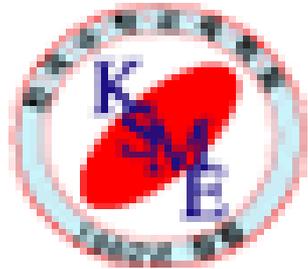
**Direction?  
Issues?**





# I. Background Information:

KSME



한국수학교육학회

- The oldest academic society of math. ed. in Korea
- Members: mathematicians & math educators
- Holds biannual conferences & international conferences
- Publishes 5 journals

Korean Society of  
Mathematical Education

**Series C: Education of Primary School Math.**

**Series E: Communications of Math. Ed.**

**Series A: The Mathematical Education**

**Founded**

1962

1963

1997

2019



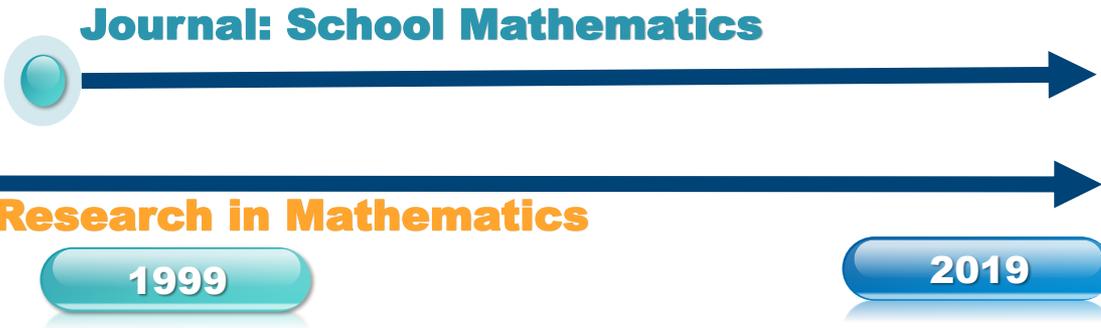
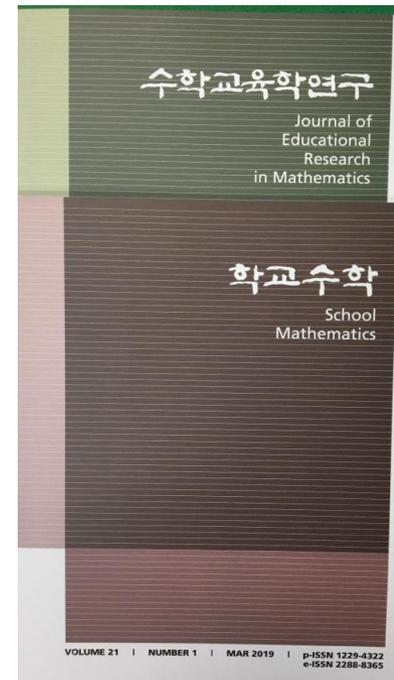
# I. Background Information:

# KSESM



**Korean Society of Educational Studies in Mathematics**

- Advance research findings on practical issues in mathematics education in Korea
- Members: math educators
- Holds biannual conferences & intensive seminars
- Publishes two journals



**Founded**  
**Journal of Educational Research in Mathematics**

1991

1999

2019



## II. Analysis on Research Papers

**7 domestic professional journals**

✓ Listed on the Korea Citation Index: Maintained!

**3 journals from  
KSME**

- The Mathematical Education (1999~)
- Communications of Mathematical Education (2007~)
- Education of Primary School Mathematics (2010~)

**2 journals from  
KSESM**

- Journal of Educational Research in Mathematics (2002~)
- School Mathematics (2002~)

**2 other journals**

- Journal of the Korean School Mathematics Society (2004~)
- Journal of Elementary Mathematics Education in Korea (2008~)

**3044 peer-reviewed papers!!!**  
(published by June of 2019)



## II. Analysis on Research Papers



Publication years

Topics

Research methods

Target research population

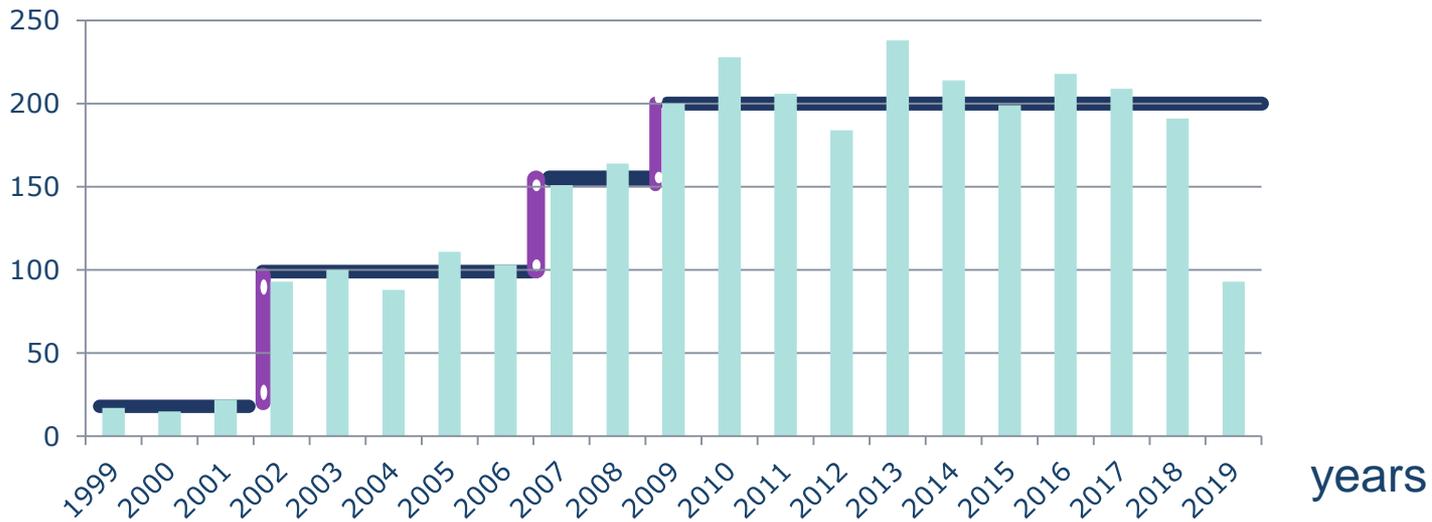
International research



# II. Analysis on Research Papers

## 1. Publication years

papers



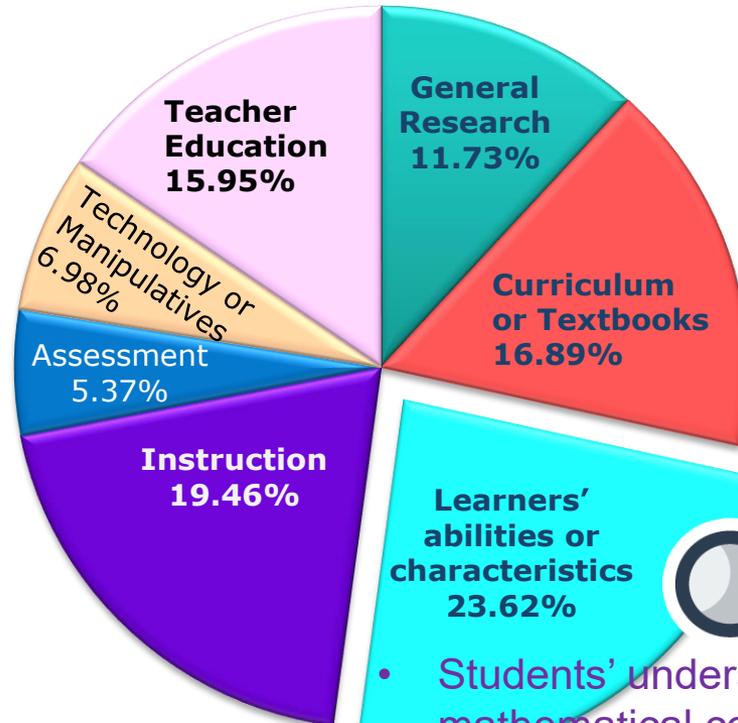
2 journals listed on the KCI in 2002

3 new journals listed on the KCI in 2007, 2008, & 2010



# II. Analysis on Research Papers

## 2. Topics



- Students' understandings or knowledge of mathematical concepts (11.20%)
- Students' mathematical competencies (5.17%)
- Students' attitudes or belief (3.76%)

Example



## II. Analysis on Research Papers

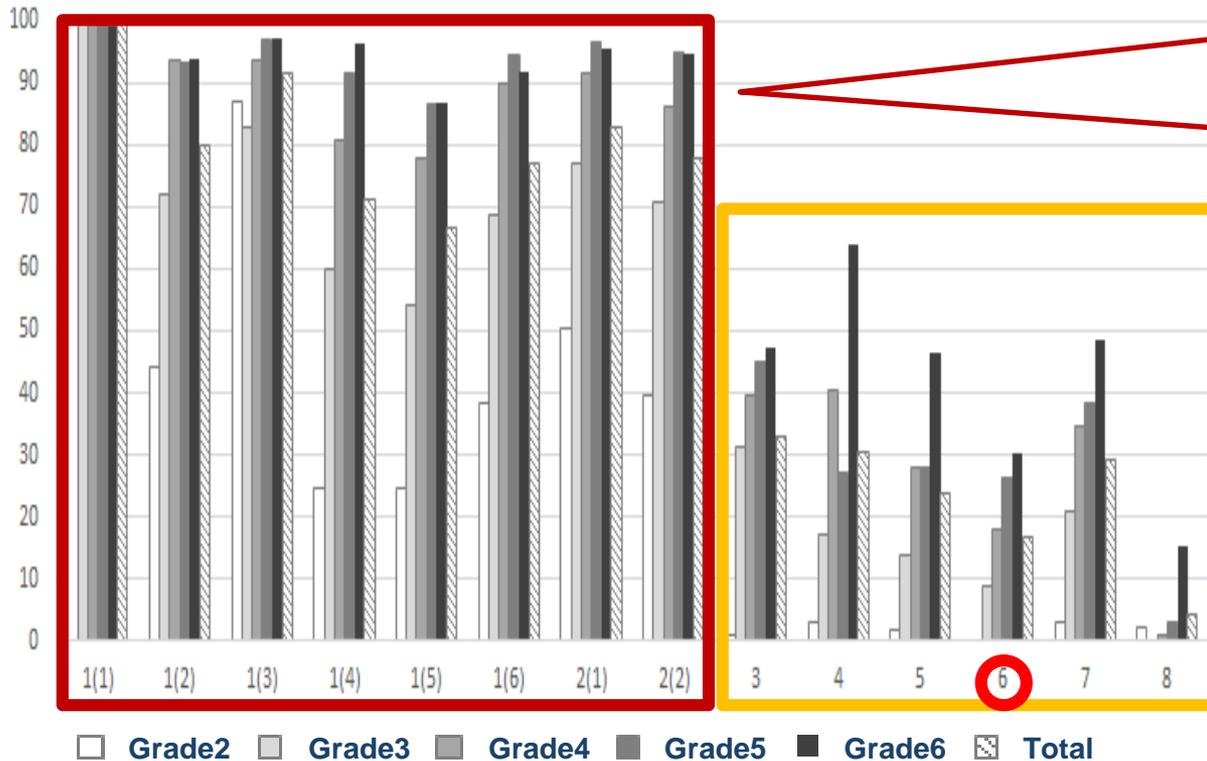
- ✓ Children's understanding of the equal sign, expressions, & equations (Gr. 2~6, n=695)



(Kim, Choi, & Pang, 2016)



# II. Analysis on Research Papers



- Grade-related: High percentage of the correct answers.  
→ Development of understanding equations

- Difficult items even for upper graders  
→ Items testing advanced relational thinking

Equation Structure Items



## II. Analysis on Research Papers

### Item 6

$2 \times 3 = 6$  is true.

Is  $2 \times 3 \times 4 = 6 \times 4$  true or false?

How do you know?

Responses	Correct Answer (%)					
	Gr. 2	Gr. 3	Gr. 4	Gr. 5	Gr. 6	Total
Incomplete explanation	13 (9.9)	15 (10.7)	14 (10.1)	26 (18.1)	13 (9.6)	81 (11.8)
Relational thinking	0 (0)	12 (8.6)	25 (18.0)	38 (26.4)	41 (30.1)	116 (16.8)
Computation	6 (4.6)	44 (31.4)	61 (43.9)	63 (43.8)	67 (49.3)	240 (34.8)



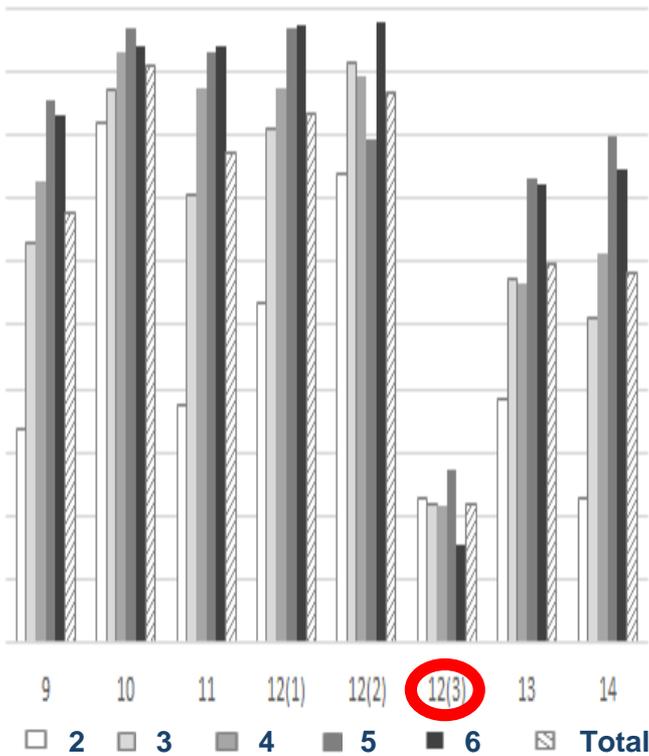
# II. Analysis on Research Papers

## Item 12

Is this a good definition of the equal sign?

Circle good or not good.

- (1) The equal sign means **the same as**.
- (2) The equal sign means **add**.
- (3) The equal sign means **the answer to the problem**.

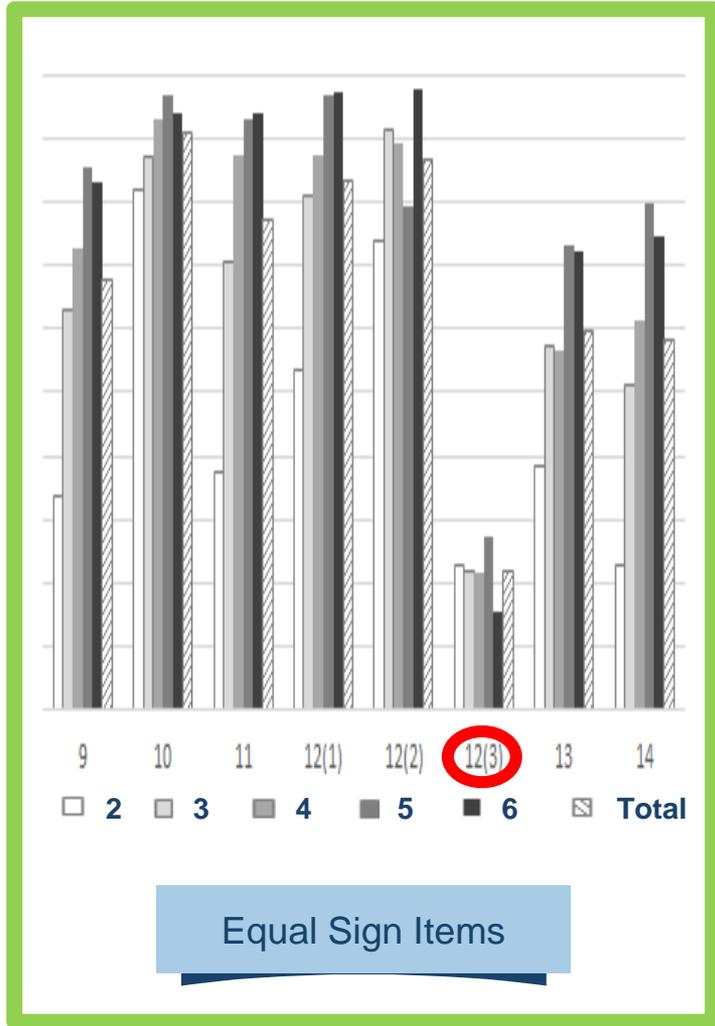


Equal Sign Items

Items	Correct Answer (%)					
	Gr. 2	Gr. 3	Gr. 4	Gr. 5	Gr. 6	Total
(1)	70 (53.4)	113 (80.7)	121 (87.1)	139 (96.5)	132 (97.1)	574 (83.3)
(2)	97 (74.0)	128 (91.4)	124 (89.2)	114 (79.2)	133 (97.8)	595 (86.4)
(3)	30 (22.9)	31 (22.1)	30 (21.6)	39 (27.1)	21 (15.4)	151 (21.9)



# II. Analysis on Research Papers



Textbook 1-1

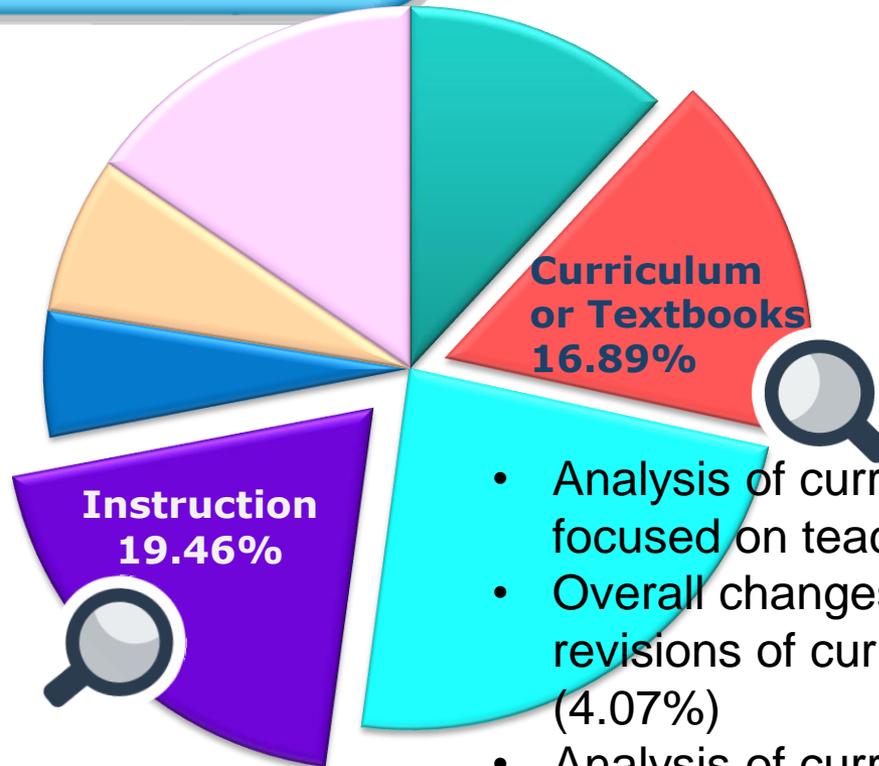
쓰기 $3 + 1 = 4$	읽기 3 더하기 1은 4와 같습니다. 3과 1의 합은 4입니다.
쓰기 $6 - 2 = 4$	읽기 6 빼기 2는 4와 같습니다. 6과 2의 차는 4입니다.

Equation mostly in a standard format



# II. Analysis on Research Papers

## 2. Topics

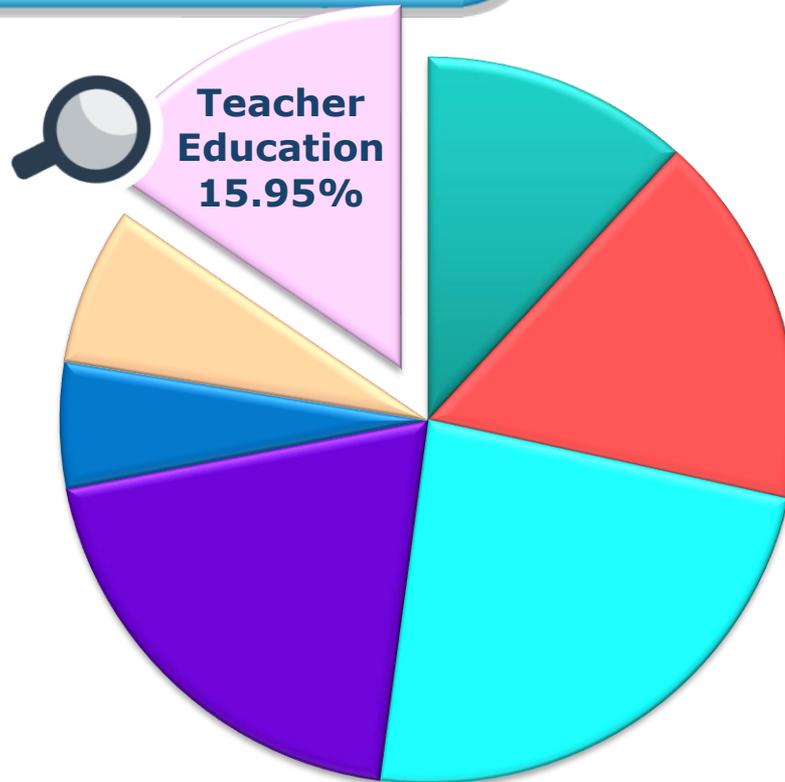


- Analysis of curriculum or textbooks focused on teaching methods (5.75%)
- Overall changes or issues related to the revisions of curriculum or textbooks (4.07%)
- Analysis of curriculum or textbooks focused on mathematical terms (3.55%)
- Development & analysis of mathematical tasks or activities for more effective lesson (8.77%)
- Teaching methods to foster students' mathematical knowledge or skills (3.88%)



# II. Analysis on Research Papers

## 2. Topics



- Teachers' understandings or knowledge of mathematical concepts (4.88%)
- Teacher preparation programs or PD of in-service teachers (4.37%)
- Teachers' belief or values (3.02%)

Example



## II. Analysis on Research Papers

(Pang & Kwon, 2015)

### Purpose

To explore teachers' perspectives of effective math teaching

### Subjects

#### Stratified cluster random sampling

##### Group 1

135 from  
elementary  
school  
teachers

##### Group 2

132 from  
middle school  
math teachers

##### Group 3

124 from high  
school math  
teachers



## II. Analysis on Research Papers

### Questionnaire

#### Part I

Describe any aspects they regarded as important to an effective math lesson & aspects which led to not-good lessons

#### Part II

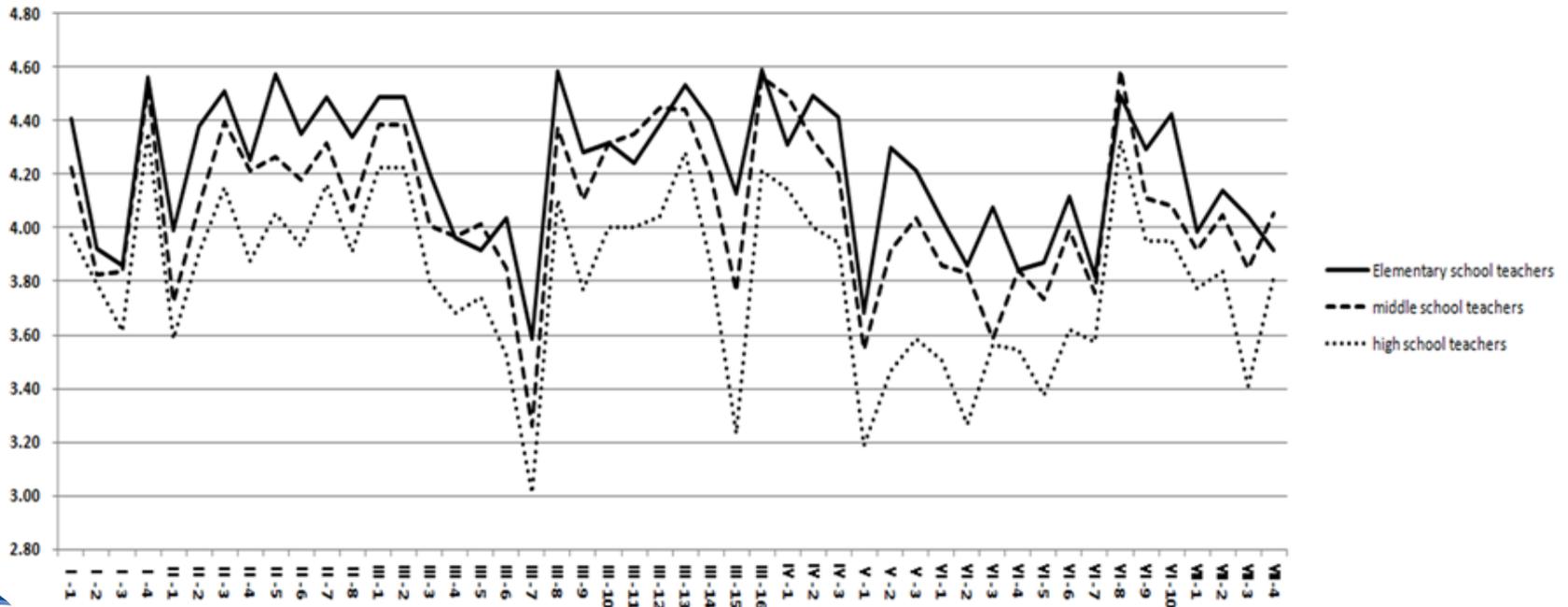
Check how much they agree on the 48 items related to effective math teaching





# II. Analysis on Research Papers

## Result: Part II



(Pang & Kwon, 2015, p.149)



Remarkably similar trends among three groups of teachers

Teachers' perspectives: entrenched in their socio-cultural contexts



## II. Analysis on Research Papers



(Pang & Kwon, 2015)

Teaching by **re-constructing** the mathematics curriculum tailored to **students' various levels**

Teaching by **interaction** between the teacher and students

Teaching to improve students' **self-directed** learning ability

Providing students with **appropriate feedback**

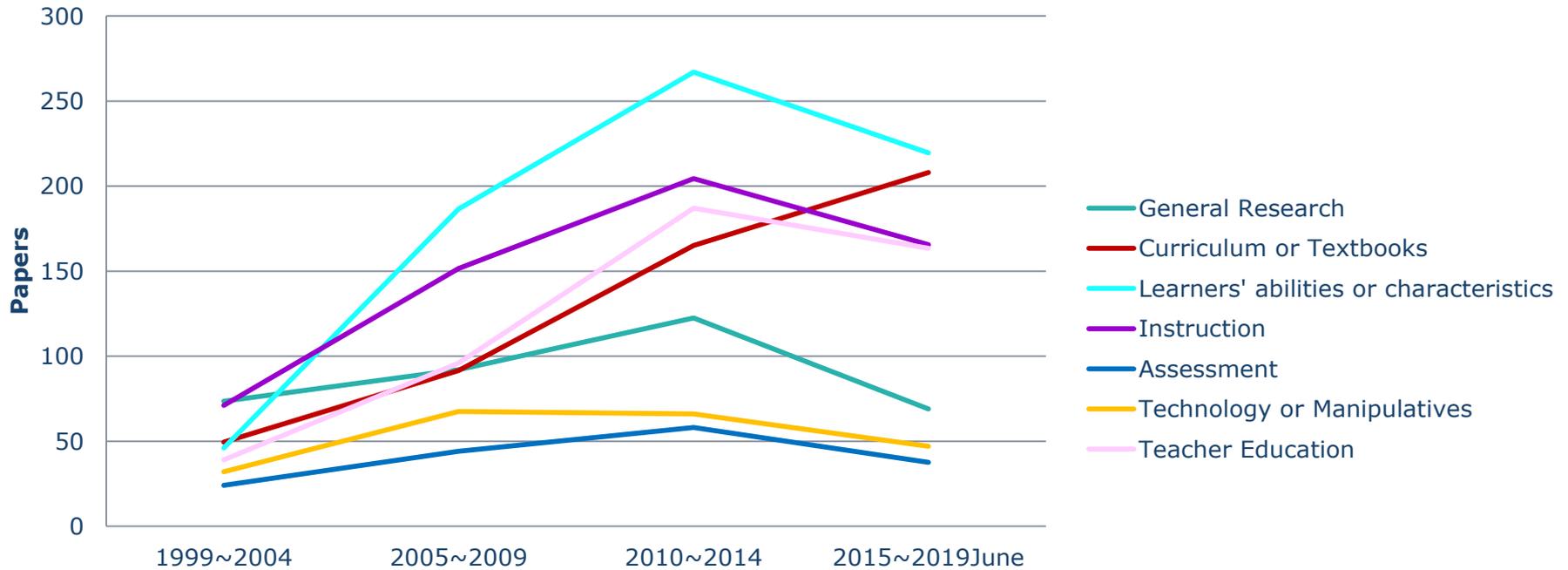
Teaching the **essential concepts** in math

**Recognize the importance of doing meaningful math > teaching a math topic**



# II. Analysis on Research Papers

## 2-1. Topics by periods

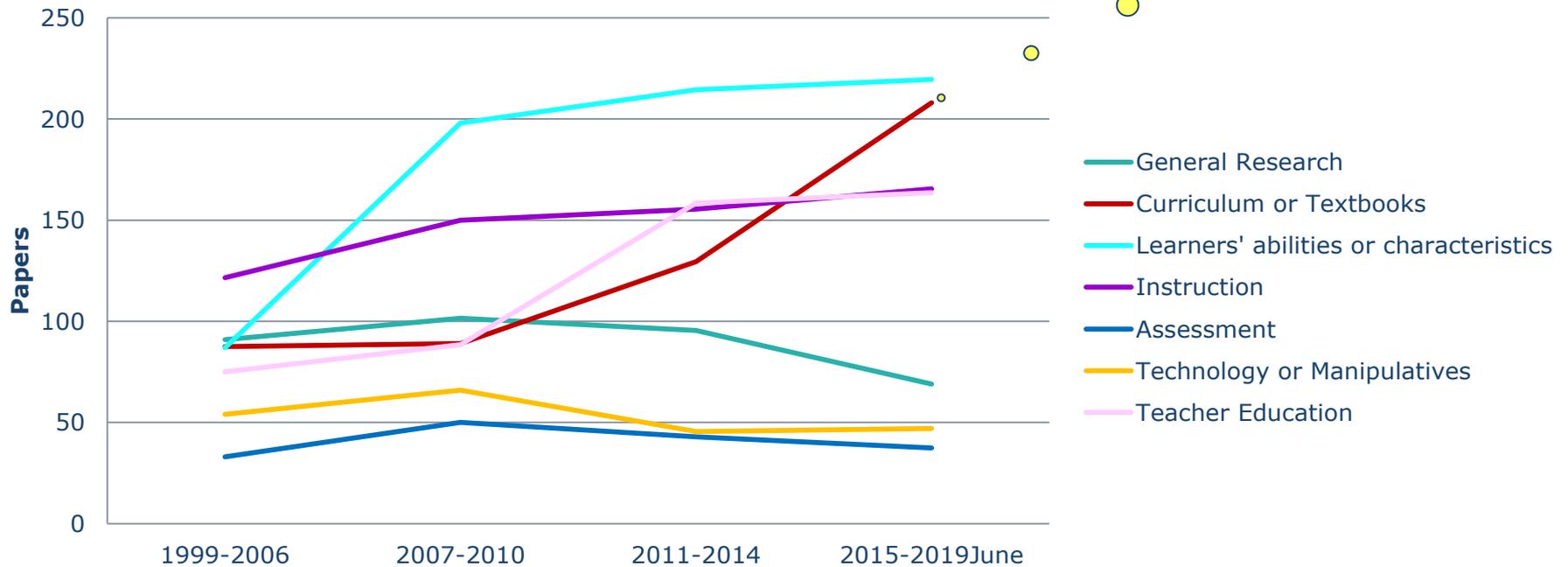




# II. Analysis on Research Papers

## 2-2. Topics by curriculum

Why?





## II. Analysis on Research Papers

### ☑ Importance



- **Existence & Uniqueness**

→ Only one series of elementary mathematics textbooks, workbooks, & teacher manuals for Grades 1 to 6



- **Use of instructional materials**

→ Main resources for pre-service teachers to pass NTET

→ Main resources for in-service teachers to teach mathematics

**Effort to develop best materials!**



## II. Analysis on Research Papers

### Issues

#### Activities

**Do the instructional materials provide key activities tailored to the math topic to be taught regardless of the curriculum changes?**

#### Knowledge

**Do they provide necessary knowledge for teachers?**

#### Students' thinking

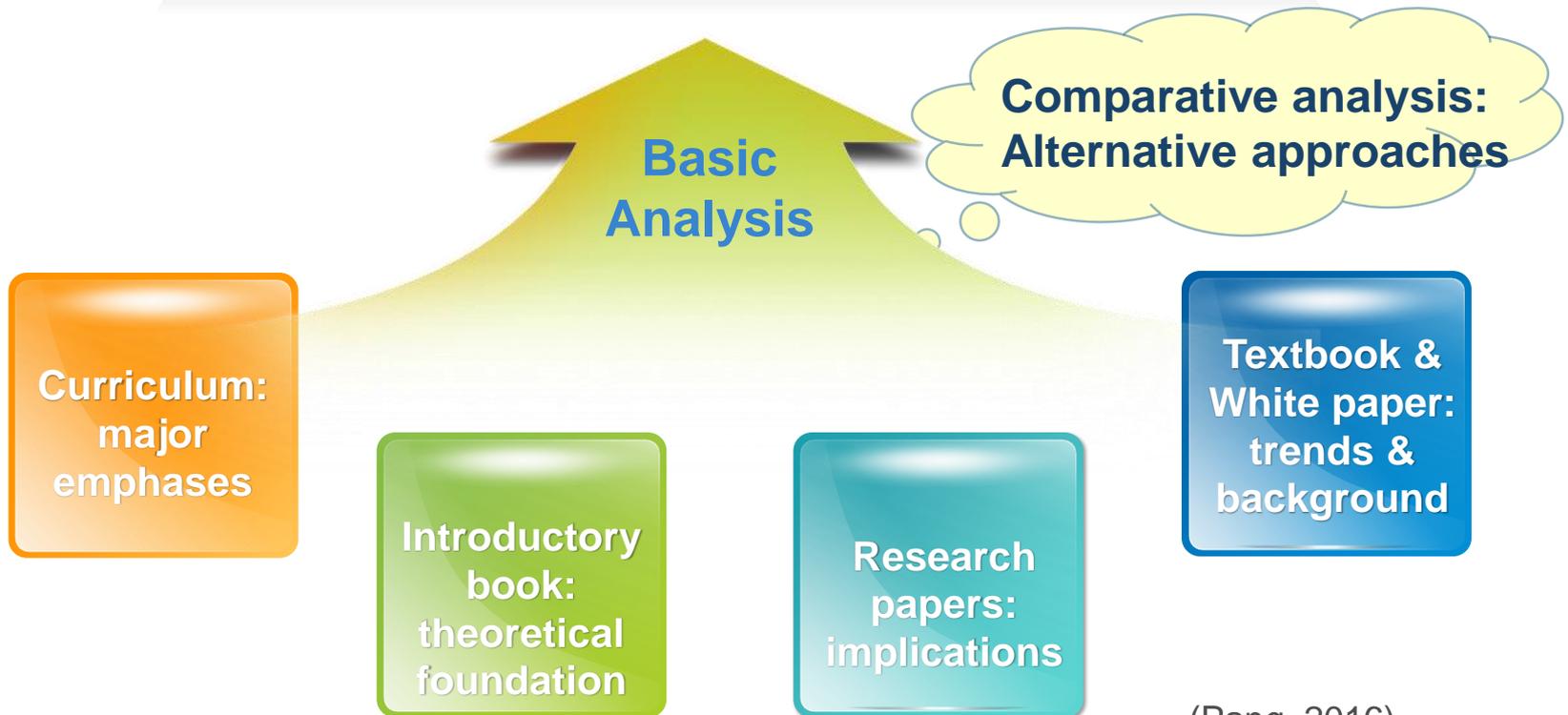
**Do they help teachers be sensitive to students' different responses to the same task?**

(Pang, 2018)



## II. Analysis on Research Papers

### Directions of writing textbooks

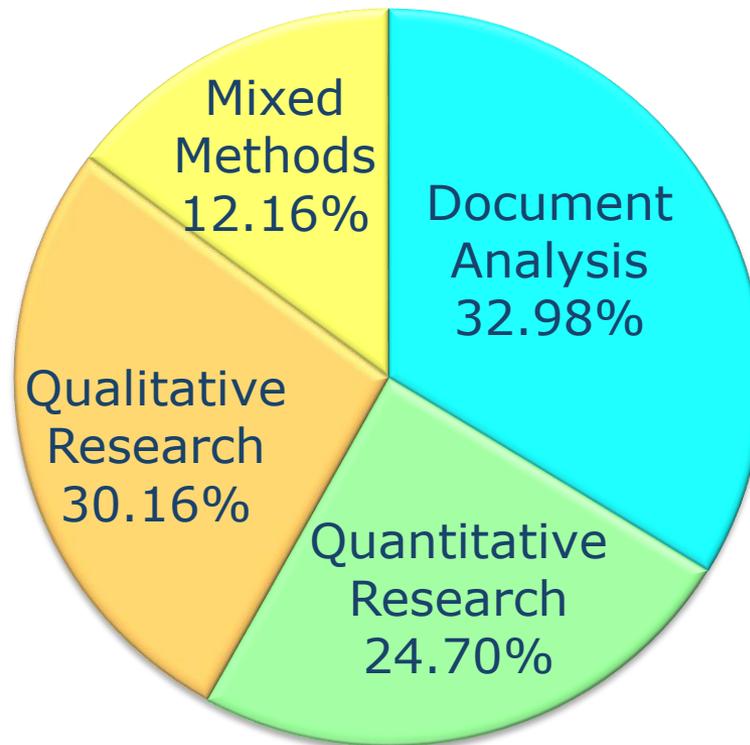


(Pang, 2016)



## II. Analysis on Research Papers

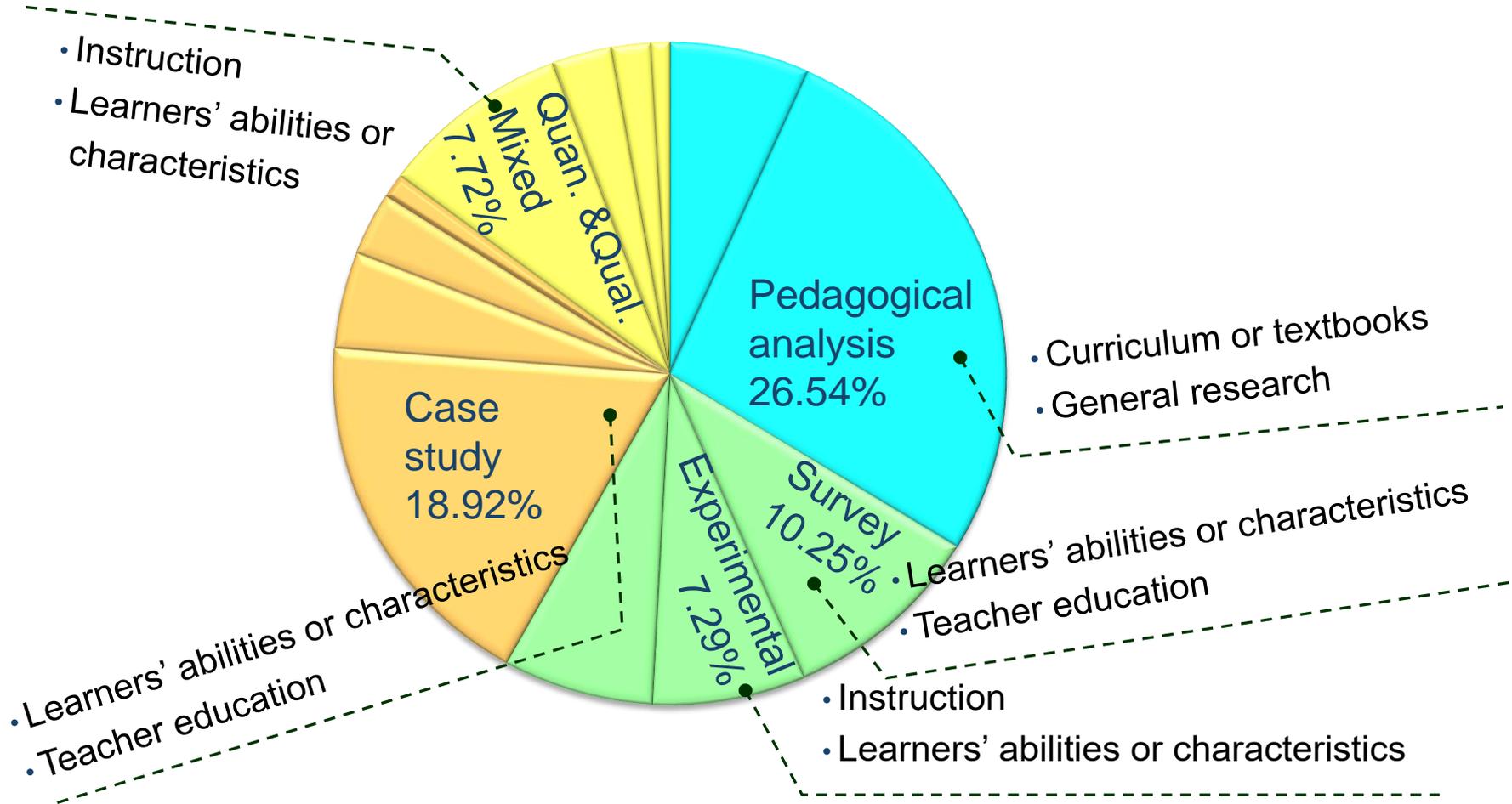
### 3. Research Methods





# II. Analysis on Research Papers

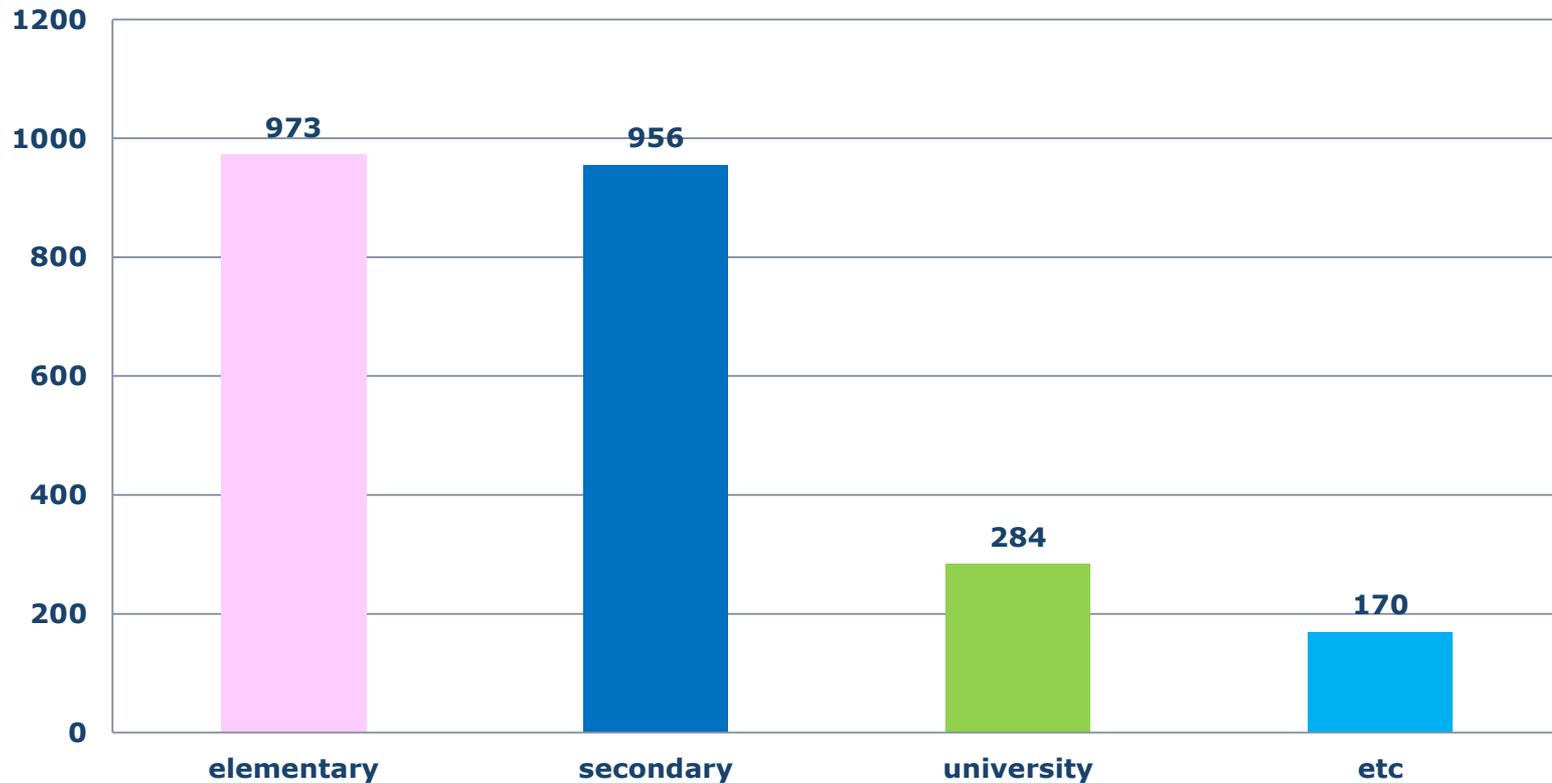
## 3. Research Methods





## II. Analysis on Research Papers

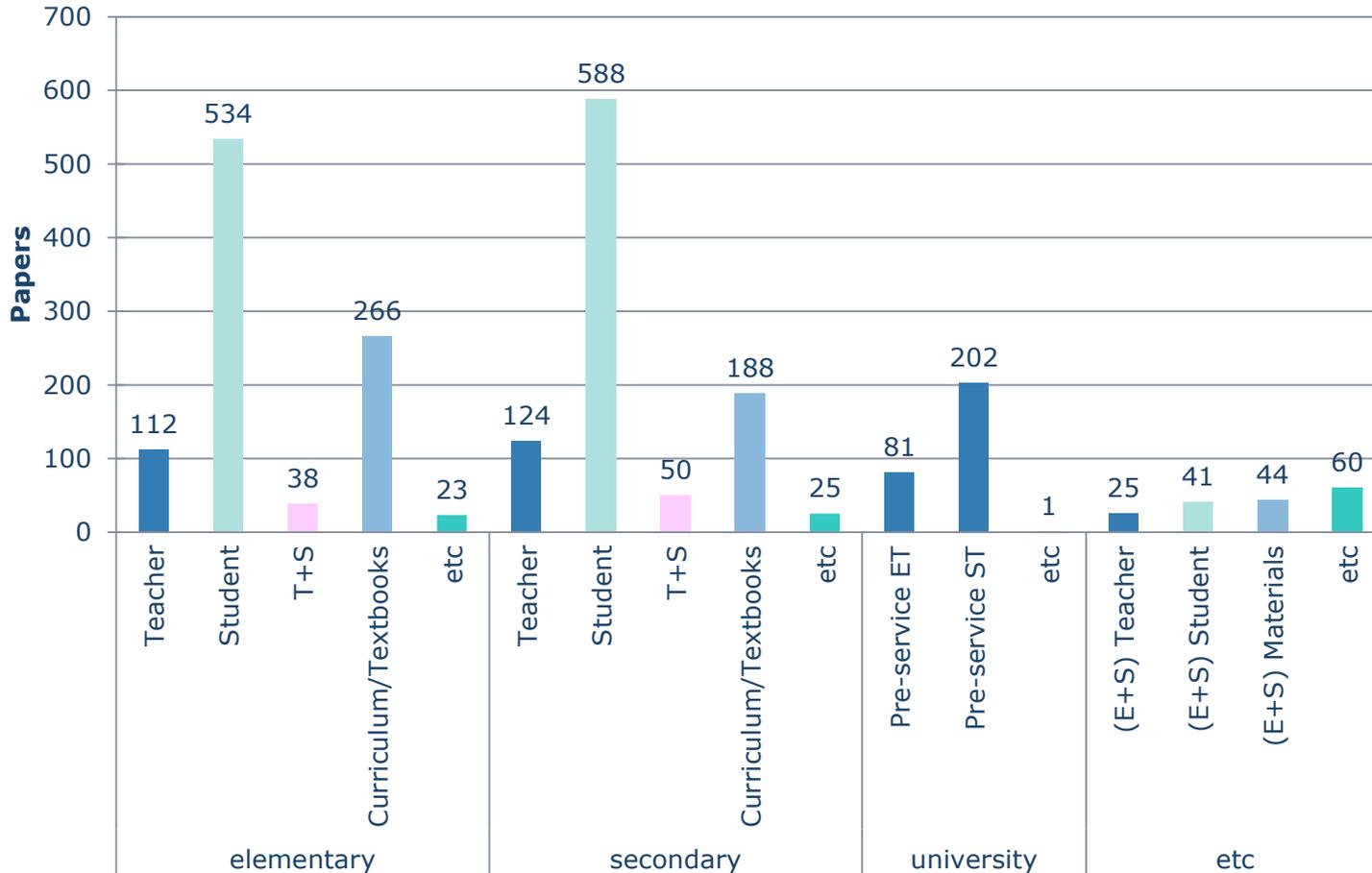
### 4. Target Research Population





# II. Analysis on Research Papers

## 4. Target Research Population

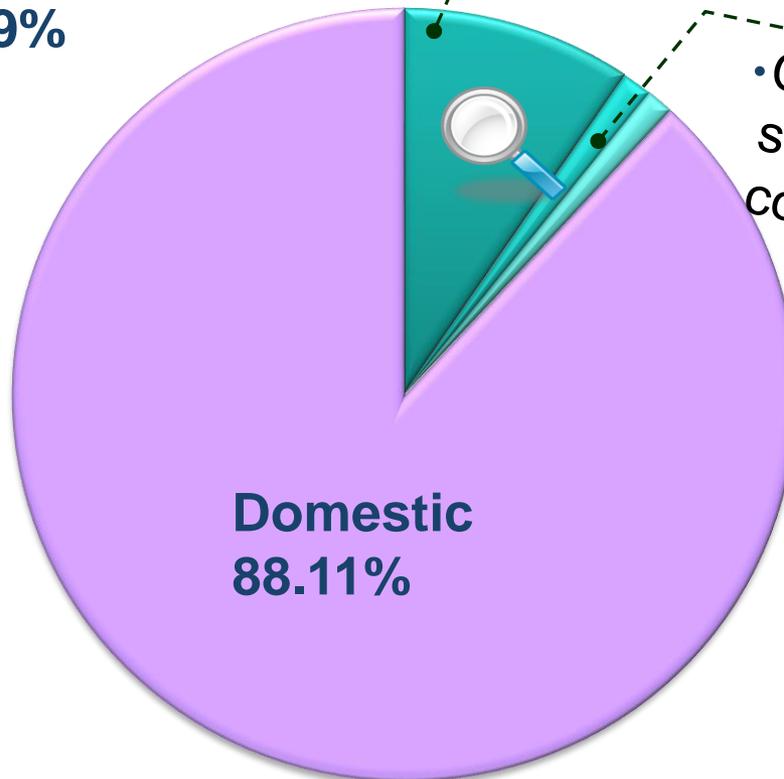




## II. Analysis on Research Papers

### 5. International Research

International  
11.89%



• Foreign documents/  
participants (9.53%)

• Co-authored by  
scholars in other  
countries (1.28%)

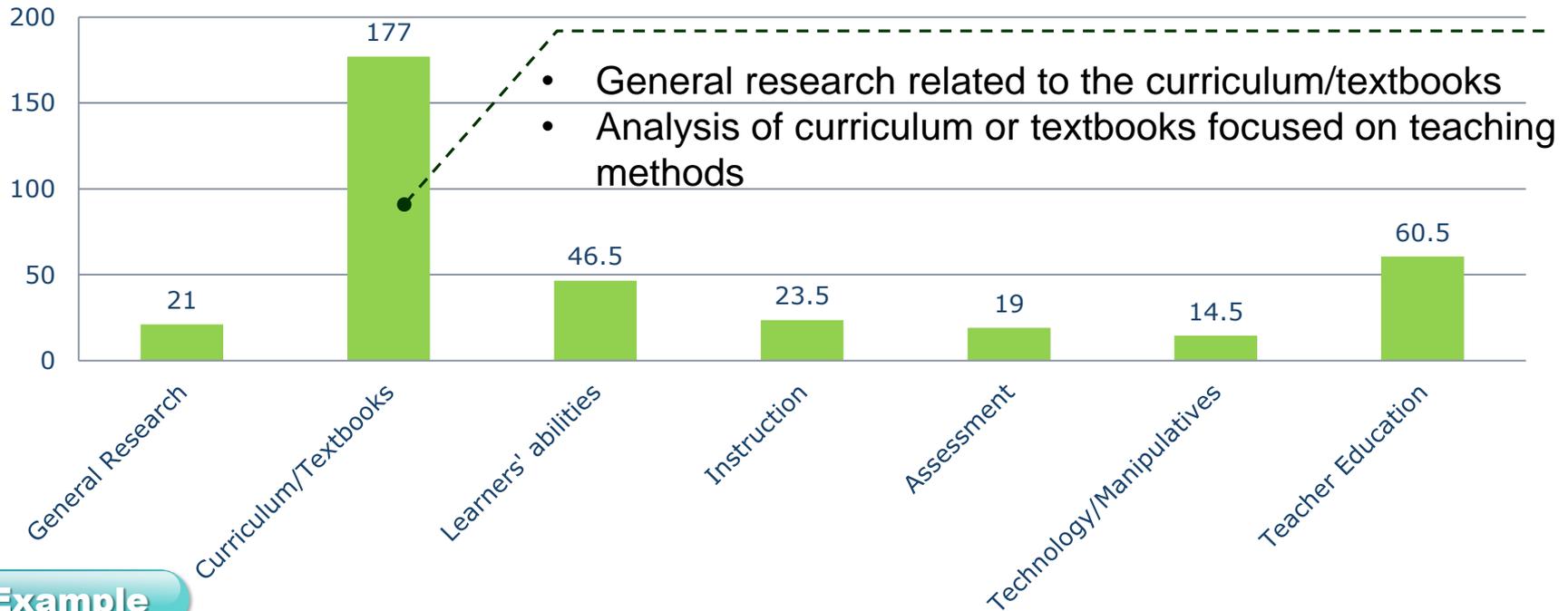
**Comparative studies > collaborative studies**



# II. Analysis on Research Papers

## 5. International Research

### Topics



### Example

An analysis of mathematical processes in elementary math curricula of Korea, China, Japan, & the US (Pang, Lee, Lee, Park, Kim, Choi, & Sunwoo, 2015)

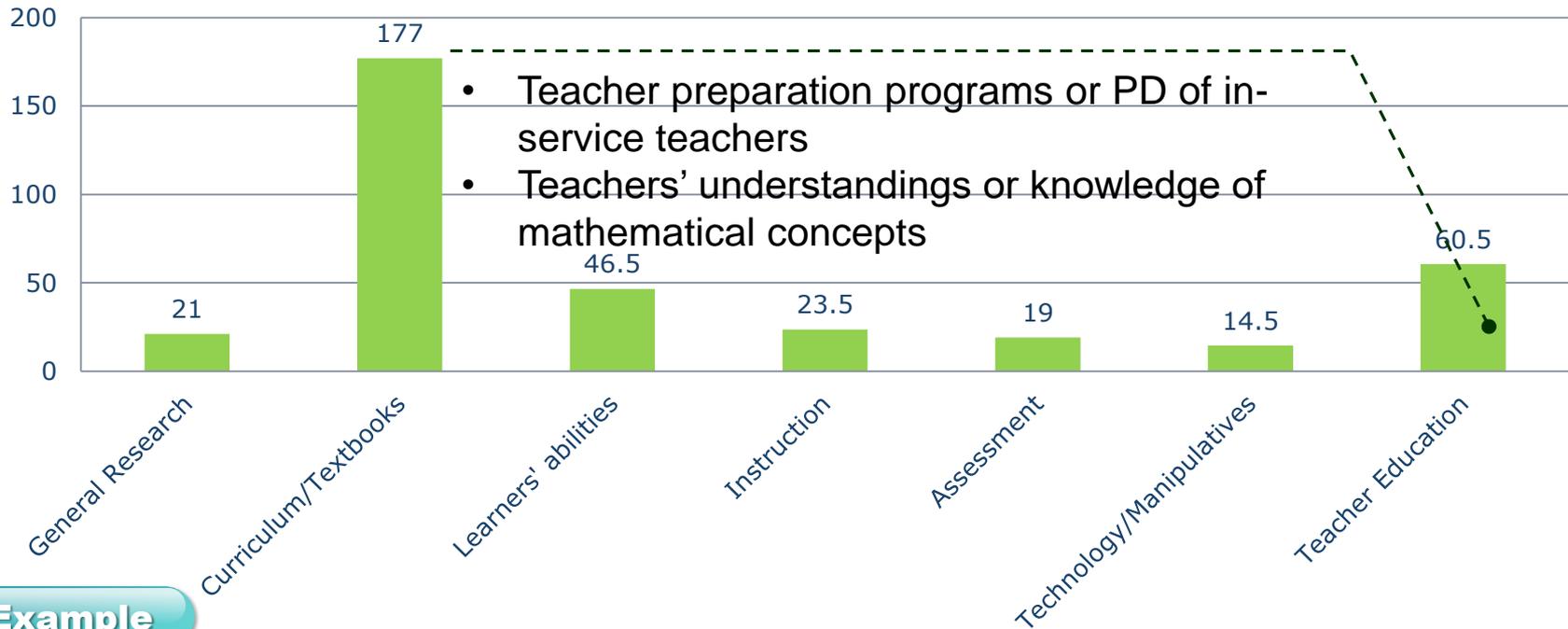
An analysis of the elementary math textbooks in Singapore: Focused on the model method (Pang & Kim, 2017)



# II. Analysis on Research Papers

## 5. International Research

### Topics



### Example

Case study of mathematical pedagogy for prospective elementary teachers in the US (Pang, 2011)

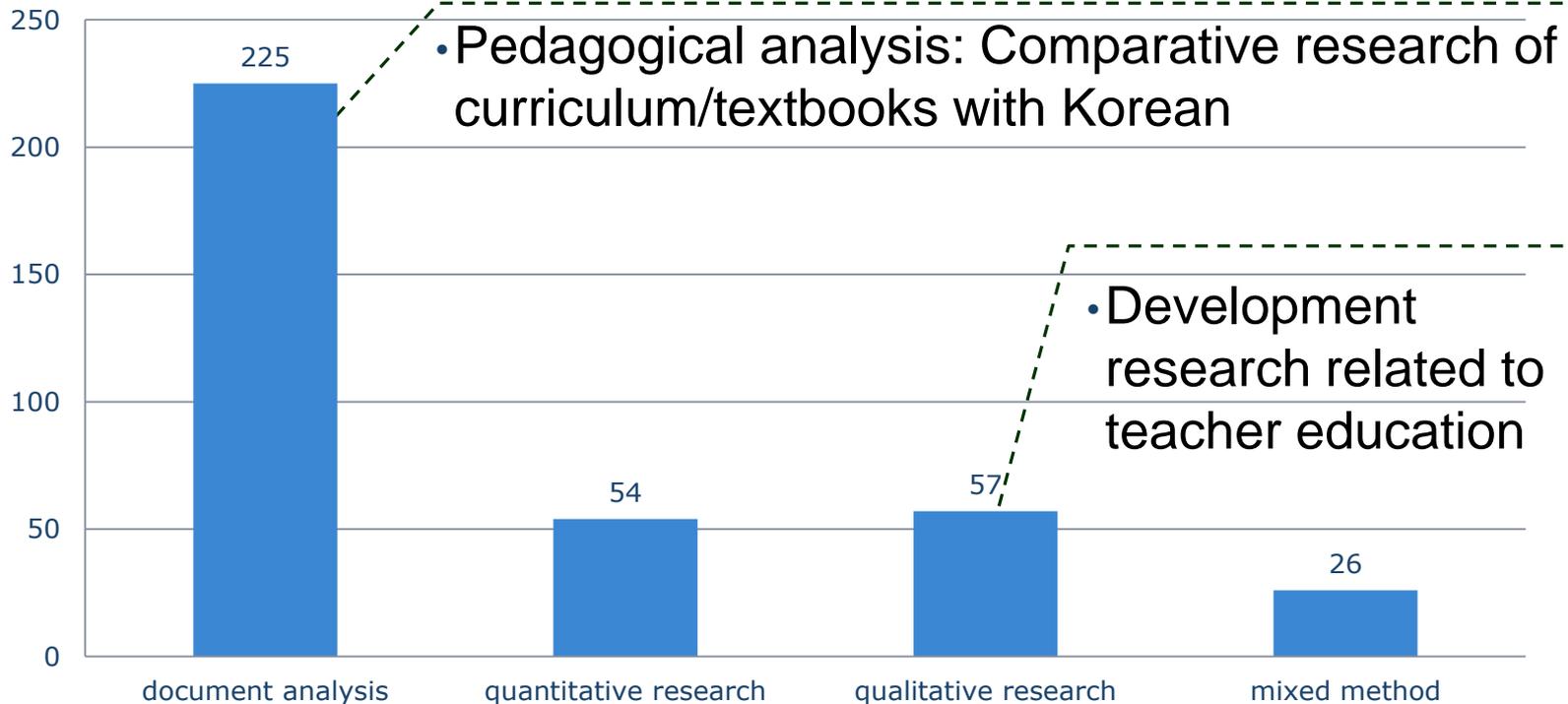
An analysis on the prospective elementary teachers' knowledge in the case of division of fractions (Pang & Li, 2008)



# II. Analysis on Research Papers

## 5. International Research

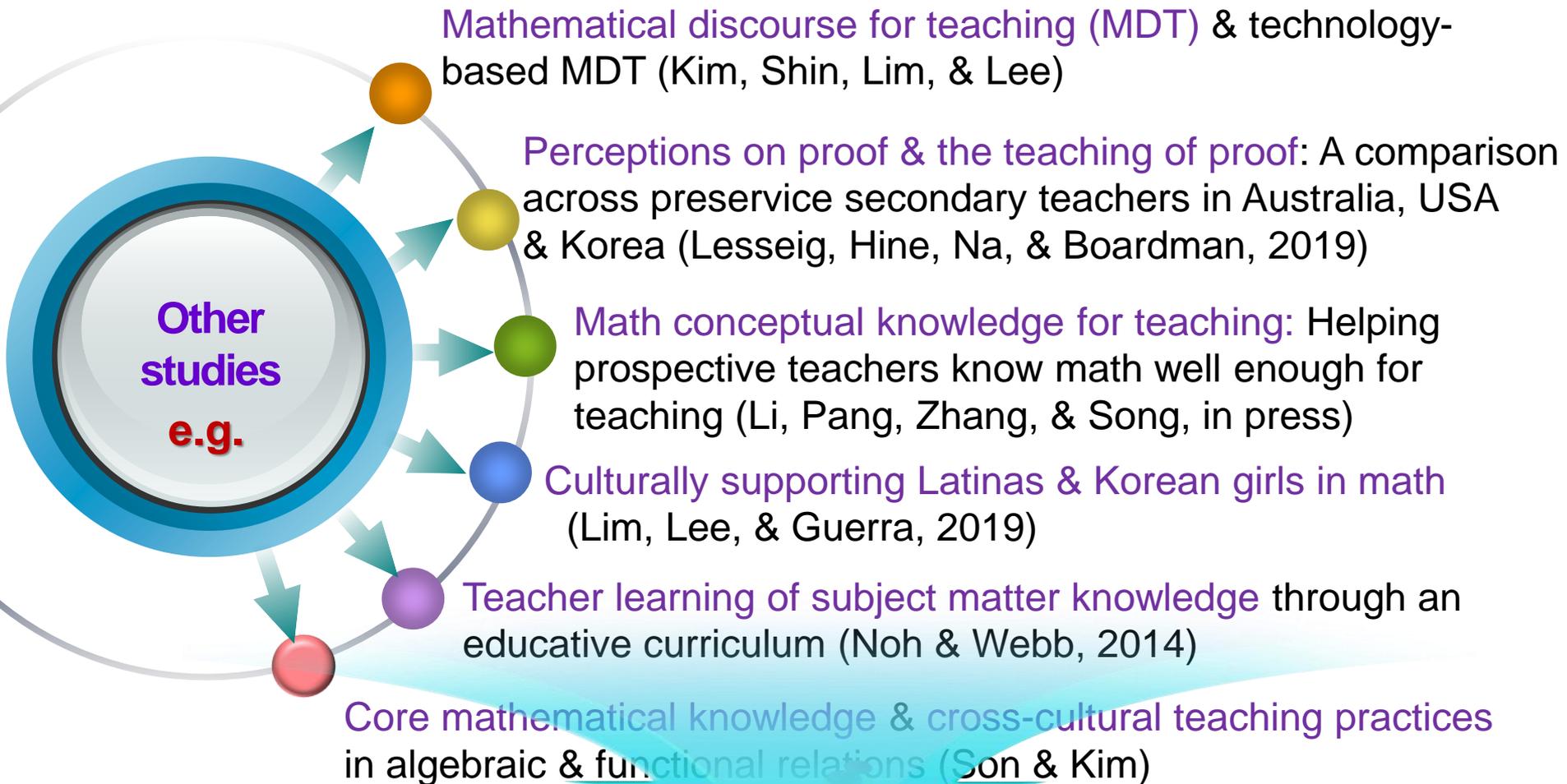
### Research Methods



Domestic journals



## II. Analysis on Research Papers



**Collaboration with Korean scholars in the US**



**Collaboration with foreign scholars via conferences**

ありがとうございます

**Thank you**