## Background \& Learners' context

Students: $2^{\text {nd }}$ graders with no special disabilities or mental disorders. They are aware of American style references and culture, for relevant contextualization School: American school in Pittsburgh, with $100 \%$ average SES in the class Parents: No special support in Math at home expected
Class context: In-class, with 20 students.
Course context: 14-week course, 45 min a week. Conduct at starting $2^{\text {nd }}$ grade

## Subject importance in context

$\rightarrow$ Represent \& Solve problems with addition \& subtraction
$\rightarrow$ Understand/Apply addition \& subtraction properties
$\rightarrow$ Work with equal groups of objects to gain foundations for multiplication Contextualization: Time / Money / Measuring (recipes) / Data / Sport

Goals (Conceptual / Skills / Dispositions - Cog $\rightarrow$ MetaCog)


## Instruction

Classroom climate: Group activities in 4 to 5 students. Children can move in class \& access objects for learning and playing (change the groups regularly to foster a sense of belonging)
Class norms: Set them during first classes (raise your hand if you have a question, be polite, listen to peers, ask for help...). Emphasize reasons.
Class design features
First, hook students' interests (Week 1) with an overview of what students will perform during class (using cool objects, writing a recipe, drawing real-life numbers). Second include formative assessment at class's start about past class's content. Include explanations of instructional activities and targeted feedback. Mix levels in groups to foster peer interactions (feedback \& learning by teaching).
If the lesson contains new content, add an informal assessment of class's prior knowledge before instruction. Finally, prefer group tasks in class and move around giving feedback, providing support and assessing, mainly informally.
Instructional activities \& informal assessment: (example with C.1, week 1 )
Direct Instruction: Week 1, identify numbers from 1 to 1000 (C.1). Show the names of numbers from 1 to 100 and their features.
Facilitation through Instructional activities: Group activities using calendars (1 to 100) to learn number names. Use informal formative assessment (asking questions on
muddy points) as an instructional technique.
Coaching through feedback: Provide group, progress-focused feedback.

## Evaluation Research: impact of ten frames

## Research Question(s):

Do ten frames improve students' understanding of addition and subtraction?
Hypotheses \& Related Predictions:
Better learning of addition \& subtraction when students practice with ten frames rather than unifix
 colored cubes where one only cube represents hundreds/tens/units depending on its color. Experimental Design:


Dependent variable: students' improvement between pre-test and post-test on addition \& subtraction with/without carry. Randomly assigned experimental and control groups with half class in each.
Typical performance tasks design for learning addition \& subtraction in-context

|  |  | $3{ }^{4}$ |  |  | [ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| the vocabulary of numbers and h | 1 | ${ }^{13} 19$ | ${ }_{5}^{5} 5$ | $\square$ | ${ }^{18}$ |
| Approach: guided discovery \& Feedback |  |  |  |  | ${ }^{28}{ }^{29} 3{ }^{30}$ |
| Context: First lessons of the course, need to assess global level and individual |  |  | ${ }^{35}{ }^{35}$ |  | ${ }^{36}$ |
| rections: In groups, match numbers' names in letters with numbers in digits by ma |  | $2{ }^{53} 545$ |  |  | 585 |
| placing papers with numbers on the calendar with numbers. |  | $2{ }^{63} 646$ |  |  | $6^{68} 89$ |
| You can see both the numbers with digits and dhe numbers witten with leters. |  | ${ }^{12} 73$ |  |  | ${ }^{76} 7980$ |
| Representations: calendars with numbers from 1 to 100, ordered in colum |  |  |  |  |  |
| All numbers should be of the same color, except the 5's and 10's to focus on numbers' names and distinctions between every 10 's. |  | 2183 क14 |  |  | 8 |



- All students practice similar paper \& pencil exercises
- Pre-test conducted at the end of the class (rapid $\sim 12$ questions)

Learn adacion \& subtraction wilh rea-world data, week
there are multiple ways to add up numbers to to eeds eestin

Dices with two colors: blue and red. Sudenst take a paper and draw 12 squares:

numbers adding up to the toal number of rolls.

Feeedback from the teacher: Asks sudentss to self-explain their understanding of his property of addition

## Reference

Interiew of Holly Slizman, kindergarten teacher at the chidreren's School.




