

Learning through Exercises: Effects of E.nopi MATH on 4th Graders' Math Skills

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Purpose of the Study

- To examine the impact of E.nopi MATH on students' mathematical proficiency
- To assess the development of students' attitudes toward learning mathematics



Methodology

- Duration: September 2004-June 2005
- Setting: Hanes Intermediate School 4th grade classrooms located in upstate New York
- Implementing E.nopi MATH



Methodology continues

- Pre/post tests
- Observation
- Interviews



Participants

Experimental (E.nopi) Group	Control Group
2 Classes taught by 1 teacher, Miss Fisher	3 Classes taught by 3 different teachers
44 students	47 students



The participating school: Hanes* Intermediate School

- Located in Upstate New York
- About 450 students
- Upper elementary grades (4th-6th graders)
- In 2004, 77% passed the New York State Math Test: (New York State average, 68.1%)

*Alias



Time Line for E.nopi MATH Study

Date	Description	E.nopi MATH
9/2004	Diagnostic, Pretests E.nopi Started	25/45 Minutes
1/2005	E.nopi MATH	12/45 Minutes
3/2005	E.nopi MATH	10/45 Minutes
5/2005	Post test (New York State MATH Test)	
6/2005	Attitude Post Test	



Pre and Post Tests

Pretests	Posttests
Mathematical Inventory Test	New York State Math Test
Math Attitudes Test	Math Attitudes Test



E.nopi diagnostic test results

- The range of 44 students' math ability was from level 6 through 14.

Levels	6	7	8	9	10	11	12	13	14
# of students	3	0	18	1	4	4	9	2	3



E.nopi ending levels

- The range of 44 students' math ability was from level 9 through 17.

Levels	9	10	11	12	13	14	15	16	17
# of students	1	5	8	9	8	8	1	2	1



Beginning E.nopi levels

- Level 6: adding 2 digit numbers
- Level 7: adding 3 digit numbers
- Level 8*: subtracting 1 and 2 digit numbers
- Level 9: subtracting 2 digit numbers
- Level 10: adding 2,3 digit numbers
- Level 11: subtracting 2 digit numbers
- Level 12*: multiplying 1,2 digit by 1 digit



Ending E.nopi levels

- Level 11: subtracting 2 digit numbers
- Level 12*: multiplying 1,2 digit by 1 digit
- Level 13: multiplying 1,2 digit by 1 digit
- Level 14: dividing 2 digit by 1 digit
division with remainders



What is on the New York State test?

- **Fourth grade students are asked to:**
 - **Solve problems, communicate ideas and solutions and demonstrate logical reasoning.**
 - **Collect, analyze and use data in a variety of ways.**
 - **Measure, estimate, determine probability and find patterns.**



Attitudes Test

- **Fennema-Sherman mathematics Attitudes Scale Short Form (Mulhern & Rae, 1998) to test the students' attitudes towards**



Result on Mathematical Fluency

- The students in the experimental group who received lessons using E.nopi showed greater achievement gains than students who received the same content without E.nopi MATH exercise.



Statistics for Math Achievement

	E.Nopi Mean/SD	Control Mean/SD	F-ratio	P
Pretest	21.72/1.05	23.85/1.01	2.135	.147 (NS)
Posttest (NYS)	676.6/3.57	659.2/3.45	12.275	.001



7 Subscale Statistics

Subscale	F-ratio	P Value
Mathematical Reasoning	13.099	.000
Number & Numeration	11.049	.001
Operations	7.190	.009
Modeling/Multiple Representation	7.363	.008
Measurement	9.863	.002
Uncertainty	3.759	.056
Patterns Functions	10.285	.002

Result on Attitudes on Math Learning

- The E.nopi MATH program produces more positive attitudes toward math.

Attitudes Statistics

	E.Nopi Mean/SD	Control Mean/SD	F-ratio	P Value
Pretest	118.2/2.25	116.8/2.18	.205	.652
Posttest	138.5/1.81	115.1/1.75	87.059	.000



Teacher/Year Variables

- No statistically significant differences were found among teachers, years, or the interaction between teachers and years.



Midterm Assessment

- High Confidence
- Check the Level by E.nopi Specialists
- Using Wrong Strategies: Using Fingers



Interviews with students

1. E.nopi MATH means
2. E.nopi MATH helped me learn:
Accuracy, speed and concentration
3. Good things about E.nopi
4. Things I do not like about E.nopi
5. Improving math
6. Math is...
7. Math Strategies



1. When I hear the word, "E.nopi" I think

- Math time (Routine)
- Work and learning
- Oh, no! Here it comes again!



2. E.nopi MATH helped me learn

- To do math better
- To do math faster
- To concentrate better
- Nothing
- Nothing but learned



- “Like, when I got into it, it (math) was like kinda hard, but now it’s like, it’s easier than you think it is. It’s much easier, and it makes me feel good. (*Interview with Don*)



- And like, when you do that, when you do it step by step you’ll learn it and when you do more problems you’ll get faster and faster at it. (*Interview with Ted*)



- Um, it helped me learn how to not go so fast. To not make so many mistakes. Um, it makes me feel better about myself. I don't make as many mistakes.
(*Interview with Lisa*)



To concentrate better

“Learn to think with distractions. Because I know we only have certain amount of time, it has helped me learn to concentrate more also.”



Nothing

- I did not learn anything.
- Nothing because I did the same facts over and over.
- Nothing really because E.nopi makes me do the same things over and over. When I already know them.
- I did most of it last year. It was just review. I already knew it.



Nothing but

- “ I do not think it helped me a lot, but since the beginning of the year it helped me learn my multiplication, because I do think over and over again until it just goes to my mind.”
- I did not learn anything but I get to practice my questions and multiplication better.



Math learning means to

Students

- Learn new concepts
- Know about the concept
- From the teacher
- Learn with others
- Learning should not be boring
- Competition with classmates

E.nopi

- Review/Practice
- 100 % mastery of each level
- Self progressed
- Individual work
- Competition with oneself



Students liked the results but not the means.

- Yes, E.nopi helped us do math faster and be more accurate.
- But it is too boring to do the same thing over and over again and be timed for our practice. (Small steps curriculum)



3. Good things about E.nopi

- Comics
- Critical Thinking Math



4. I do not like E.nopi because

- Doing the same thing over and over again
- Being timed



5. Improving math through

- Practice and one's effort
- No connection between E.nopi MATH exercises and their own beliefs



6. I think math

Fun	Boring
Like it/ love it	Hate it. /don't like it
Good at it.	Not good at it.
	hard



7. Math Strategies

- Using fingers vs. Math strategies



Computational Skills

- NCTM's contradicting position
“A major aim in 3-5 grades is the development of computational fluency with whole numbers. Students should come to view algorithms as tools(NCTM, 2000, p.143).”



National Research Council

- students need to be efficient and accurate in performing basic computations with whole numbers without always needing or having to refer to a table or other visual aides



E.nopi MATH Program

- Developed 30 years ago in Korea for home usage
- Most widely used program to supplement after-school math instruction
- K-9th grade level
- 23 levels, 30 sets per level
- Total of 690 sets



E.nopi MATH

- Individualized leveling
- Regardless of Age/grade level
- Small-steps spiral curriculum
- Prompt Responses
- Mastery Learning



E.nopi Math Structure

- | | |
|------------------------------|-------------------------------|
| • Basic Thinking Math | • Critical Thinking Math |
| 1. Numbers | 1. Patterns and Relationships |
| 2. Arithmetic | 2. Depth perception |
| 3. Application of Arithmetic | 3. Problem solving |
| 4. Equation | 4. Measurement |
| | 5. Reasoning |



Rationale behind E.nopi MATH

- To reach the automatization level of carrying out computations
- To take up little space in working memory
- To have more room to perform complex and higher level math



Conclusion

- Symbolic level of computational skill exercises such as the E.nopi MATH program may offer great opportunities for students to succeed in math.



Future Research: Replication of the study in lower grade levels such as 1st grade to achieve,



With lower grades

- 2-3 consecutive years of implementation
- Narrowing the gap between classroom learning and E.nopi MATH level
- Using same effective math strategies in class and with E.nopi



Confidence/Creativity

- Math is fun
- I am good at it.
- My parents think so too.
- My teacher agrees with that.

