ANALYZING INFLUENCE OF INFORMAL STEM EDUCATION ON RURAL CHILDREN'S SELF-EFFICACY AND COMPUTATION THINKING

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THEME:

STEM education in diverse contexts

BACKGROUND AND AIMS

STEM Camp, as a short-term informal STEM learning project, has been demonstrated that positively impacts students' academic achievement and knowledge skills. However, few studies concerning whether informal STEM learning is appropriate for rural youth. This research aimed to investigate the impacts of STEM education on rural students with different levels (high, medium and low) of self-efficacy and computational thinking skills.

METHODOLOGY

A total of 133 3rd or 4th-grade students participated in the STEM camp from three rural elementary schools in Shanghai (Table 1).

Table 1 Number of students in research

participants	Analytic sample	*SchoolA*	*School B*	*School C*
Boys	85(63.9%)	34	27	24
Girls	48(36.1%)	13	18	17
Total students	133	47	45	41

The research adopts one-group pretest-posttest quasi experimental design (as figure 1) and the questionnaire adapted from the measure developed by Luo et al. (2021) and Korkmaz et al. (2017).

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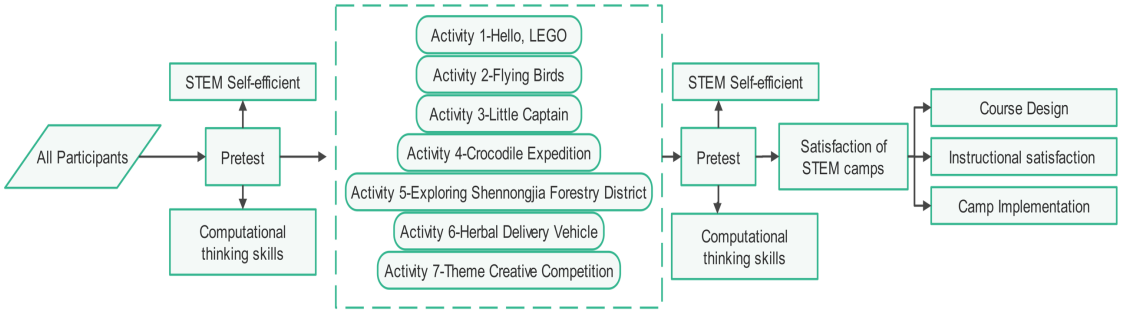


Fig. 1 Research Procedure

RESULTS AND CONCLUSIONS

The paired-t test show that students' self-efficacy and computational thinking skills significantly increase after the camp (as table 2).

Table 2 Pre- and post- impact of STEM camps on students (*n*=133)

	Pre-test		Post-test		Comparison	
	Mean	*SD*	*Mean*	*SD*	*t*	*p*
STEM Self-efficient	21.70	3.08	22.33	3.47	-2.110	0.037*
Computational thinking skills	48.46	5.80	49.71	6.97	-2.403	0.018*

*Significant at the $p < 0.05$ level.

To further investigate the effect on students of different levels, we use K-means clustering (K = 3) in SPSS to divide students into three levels: *high, medium and low,* based on their self-efficacy and computational thinking skills results before and after the camp. With respect to self-efficacy, most of the students switch from low (95.8%) and medium (77.8%) to higher level after the camp (as figure 2).

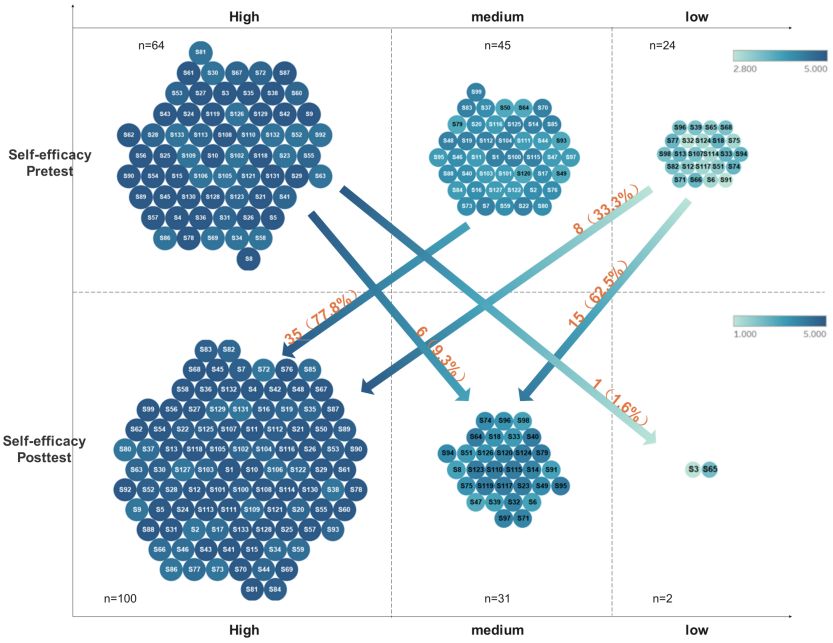


Fig. 2 Pre- and post- Self-efficacy

As to the computational skills, students switch from low (88.1%) and medium (64%) to higher level (as figure 3).

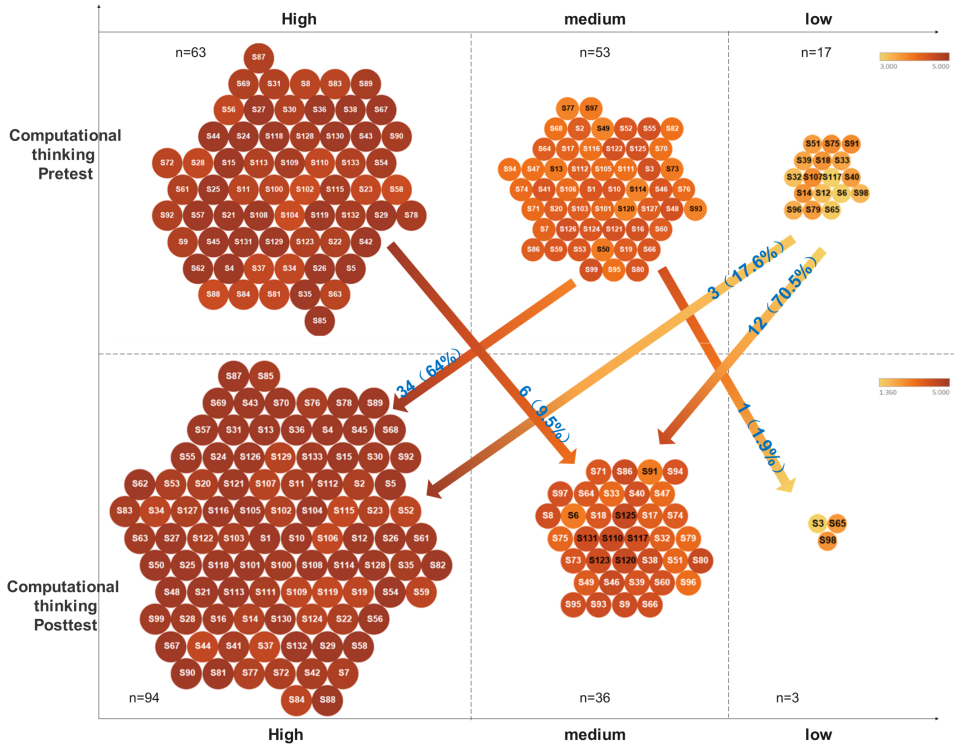


Fig. 3 Pre- and post- Computational thinking skills

According to one-way ANOVA results, there is no significant difference in the satisfaction dimension of students from three rural schools (as figure 4).

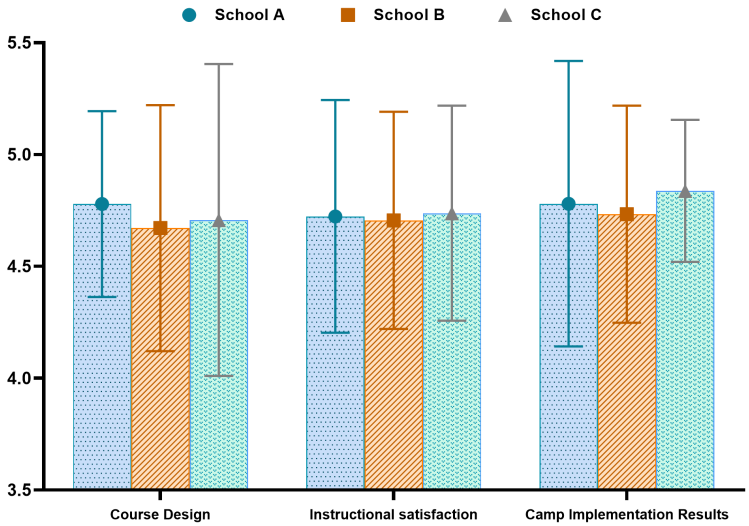


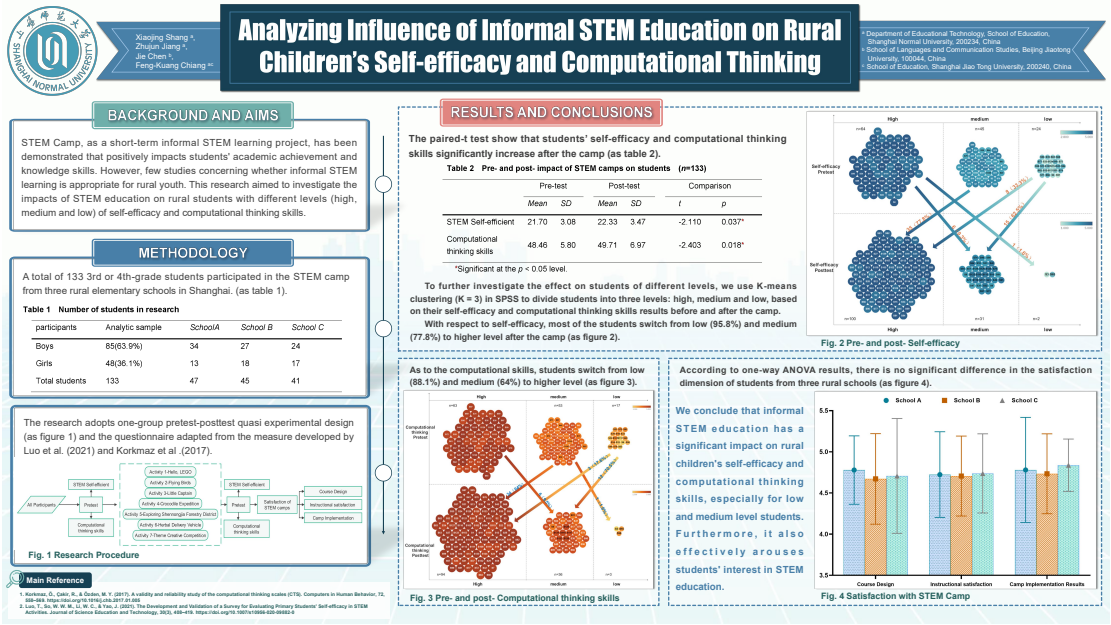
Fig. 4 Satisfaction with STEM Camp

We conclude that informal STEM education has a significant impact on rural children's self-efficacy and computational thinking skills, especially for low and medium level students. Furthermore, it also effectively arouses students' interest in STEM education.

REFERENCES

Korkmaz, Ö., Çakir, R., & Özden, M. Y. (2017). A validity and reliability study of the computational thinking scales (CTS). *Computers in Human Behavior, 72*, 558–569. https://doi.org/10.1016/j.chb.2017.01.005

Luo, T., So, W. W. M., Li, W. C., & Yao, J. (2021). The Development and Validation of a Survey for Evaluating Primary Students' Self-efficacy in STEM Activities. *Journal of Science Education and Technology, 30*(3), 408–419. https://doi.org/10.1007/s10956-020-09882-0



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