Research of the Design and Practice of Mathematical Modeling Learning Scaffold in Senior High School

20204507046

学位论文数据真实性和原创性承诺

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关键词:

Research of the Design and Practice of Mathematical Modeling Learning Scaffold in Senior High School

Abstract

As a tool to solve practical problems, mathematical modeling is an effective way to develop and maintain student's enthusiasm and curiosity about mathematics, which has great educational potential and value.However, through sorting out 26 investigations on mathematical modeling, it could conclude that there are three common problems in the teaching process of mathematical modeling in senior high schools in China :(1) Lack of school's attention; (2) Lack of relevant teachers; (3) Lack of student's experience, and most of them have not even learned about it. Therefore, via reading relevant literature, this paper aimed to design a teaching method scaffold teaching method, which is suitable for beginners in the learning of mathematical modeling, in order to promote the capacity of senior high school students for this subject.

The American High School Mathematical Modeling Contest (HiMCM), a non-profit organization in the United States, is an international mathematics competition sponsored by COMAP. In this paper, combined the award-winning papers of HiMCM students, the preliminary form of mathematical modeling scaffold was designed through text analysis. Then, modified the scaffold s frame to obtain the mathematical modeling scaffold via interviewing four students who won the first prize of HiMCM in the practice school in 2020. Finally, practice the use of scaffold in modeling community in school.

After carrying out the experiment of the whole process in school , and basing on the data analysis of students' mathematical modeling ability and comprehensive level, it can conclude that: (1)Comparing the control group, the students in experiment group

showed better process in the ability of simplification, mathematization and testing; (2)There was no significant difference between the two groups in mathematical modeling.It shows that the scaffold has little effect on students' mathematical modeling ability in the short term; (3)In the pre-test, there was no significant statistical difference between students' mathematical modeling ability and mathematical achievement,However,After studying in the mathematical modeling community, students' mathematical achievement is positively correlated with their mathematical modeling ability; (4)Scaffolds are helpful for students with common mathematical modeling ability, but not for students with excellent mathematical modeling ability. Based on the above conclusions, there is no denying that scaffolds can help beginners in mathematical modeling to quickly improve their abilities of simplification, mathematization and testing, and the effect is more obvious for students with lower mathematical modeling ability.

Keywords:Mathematical modeling; Scaffold teaching methodsenior; high school student

Written by:

Supervised by:

目录

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[3] [J] 2010 20 17 2718-2720
[4] [J] 2006 26 3 412-415

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[5] [D] 2019

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[7] Gloria Ann Stillman Gabriele Kaiser Christine Erna Lampen Mathematical Modelling Education and Sense-making[M] 2020 129-139

[8] Maaß K Mathematisches Modellieren im Unterricht[J] Ergebnisseeiner empirischen Studie Hildesheim Franzbecker Verlag 2004

[9] [M] 2020 286-287

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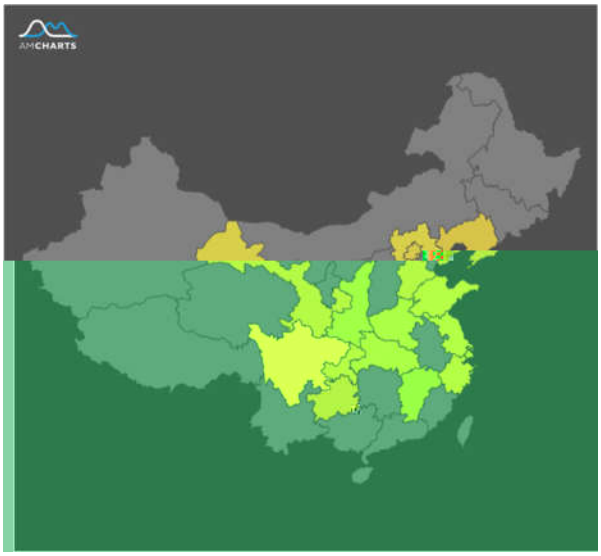

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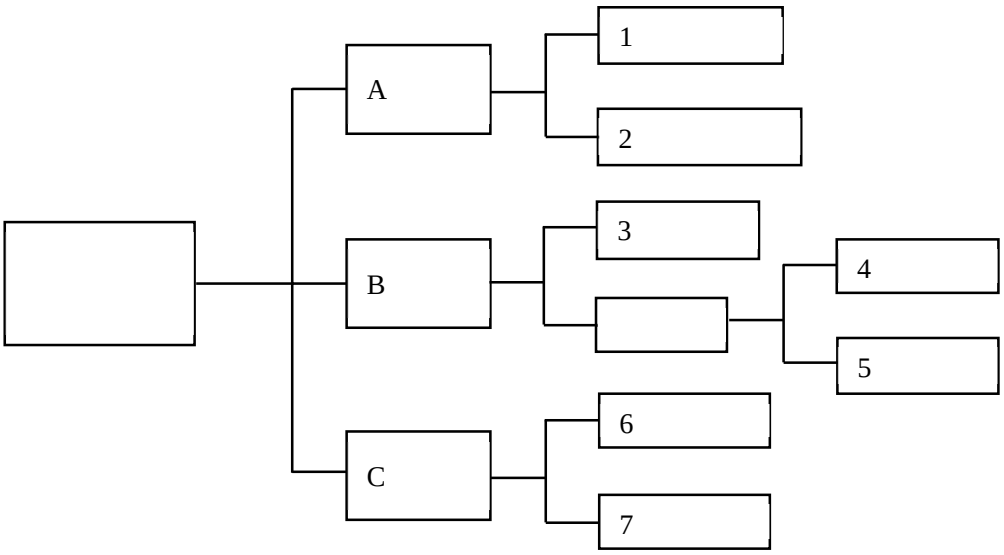

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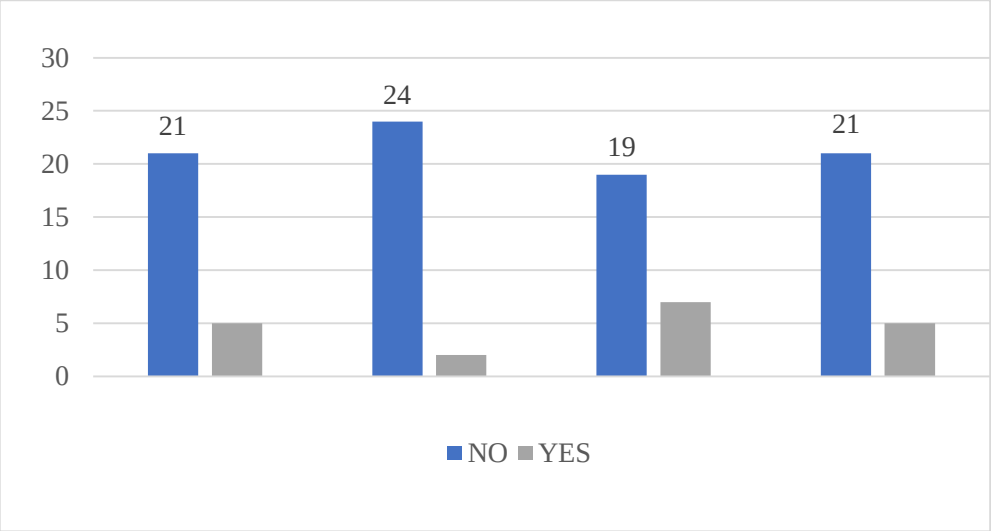

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[53] [M] 1987:111-113

[54] [J] 2020 29 5 10:52

[55] [M] 2015:163

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	/ /	Advisors
1	Palo Alto High School, Palo Alto, CA, USA	Advisor, Radu Toma Eric Foster Kathryn Li Allison Zhang Andrew Lee
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7	Pui Ching Middle School, Kowloon, Hong Kong (SAR)	Lee Ho Fung Wong Tsz Chun Ling Janice Ngai Chi Ki Lynn Shung Hei

3.3.2

Haines

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Haines

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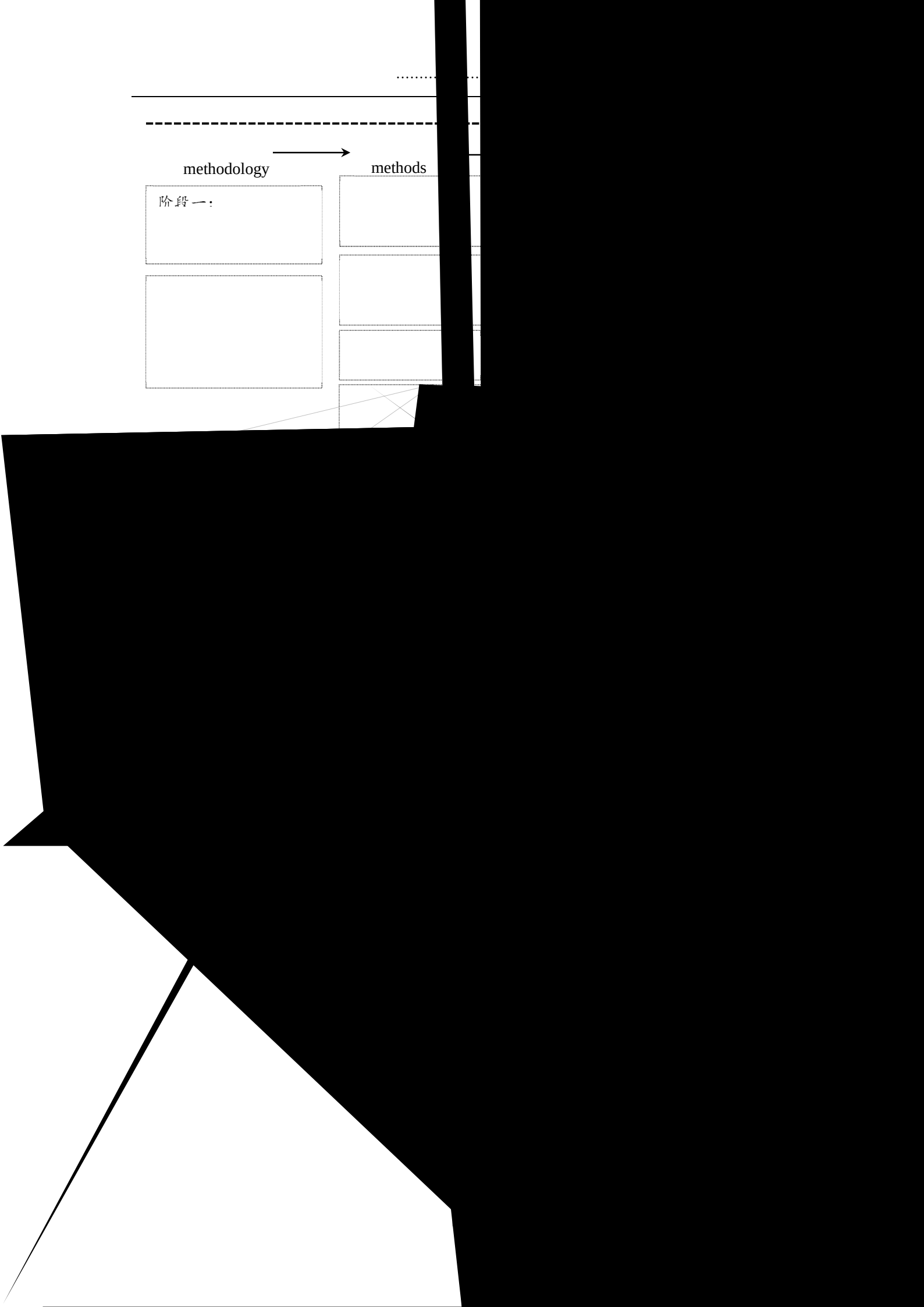
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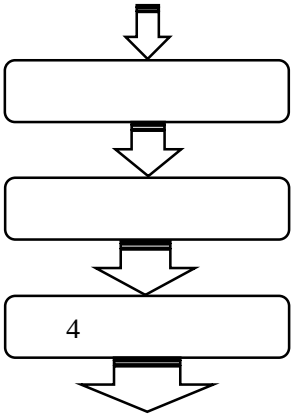

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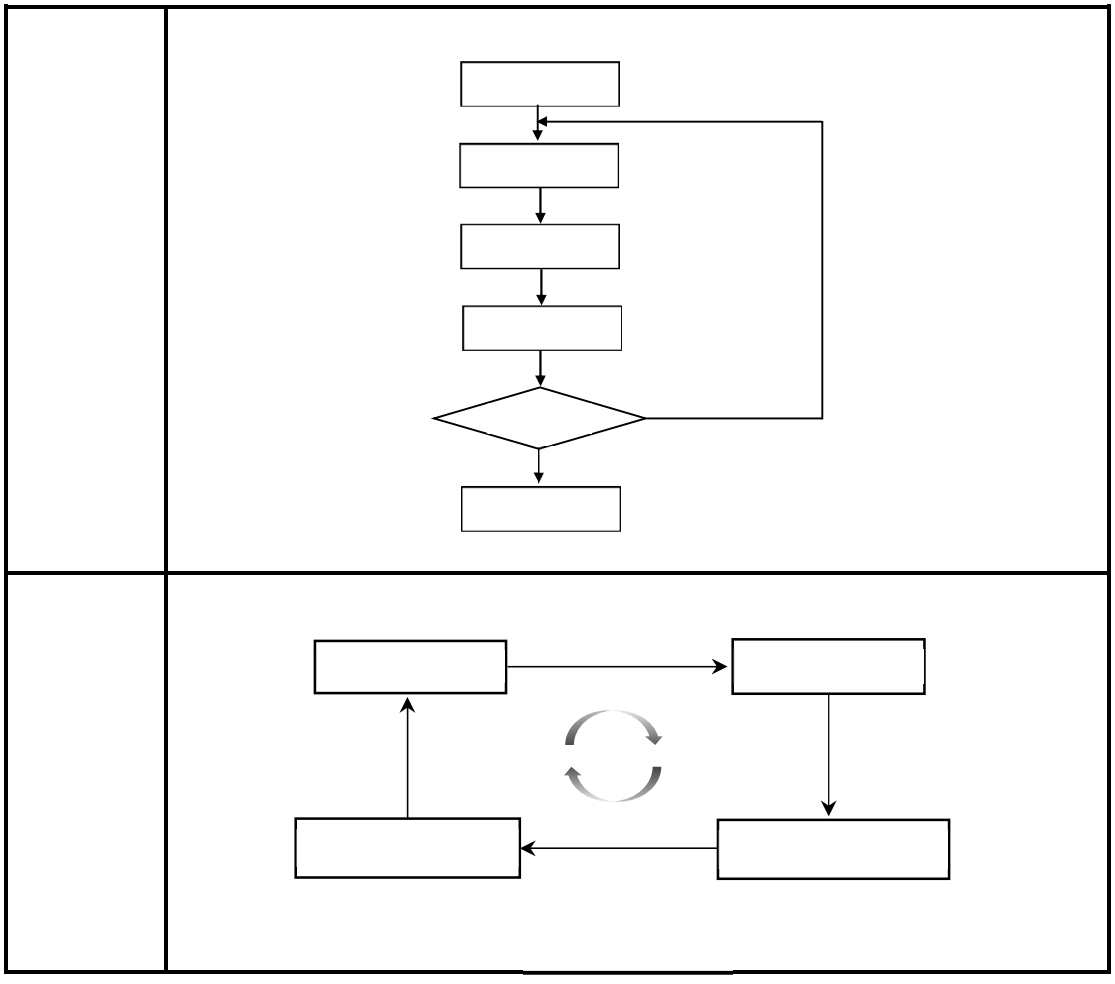

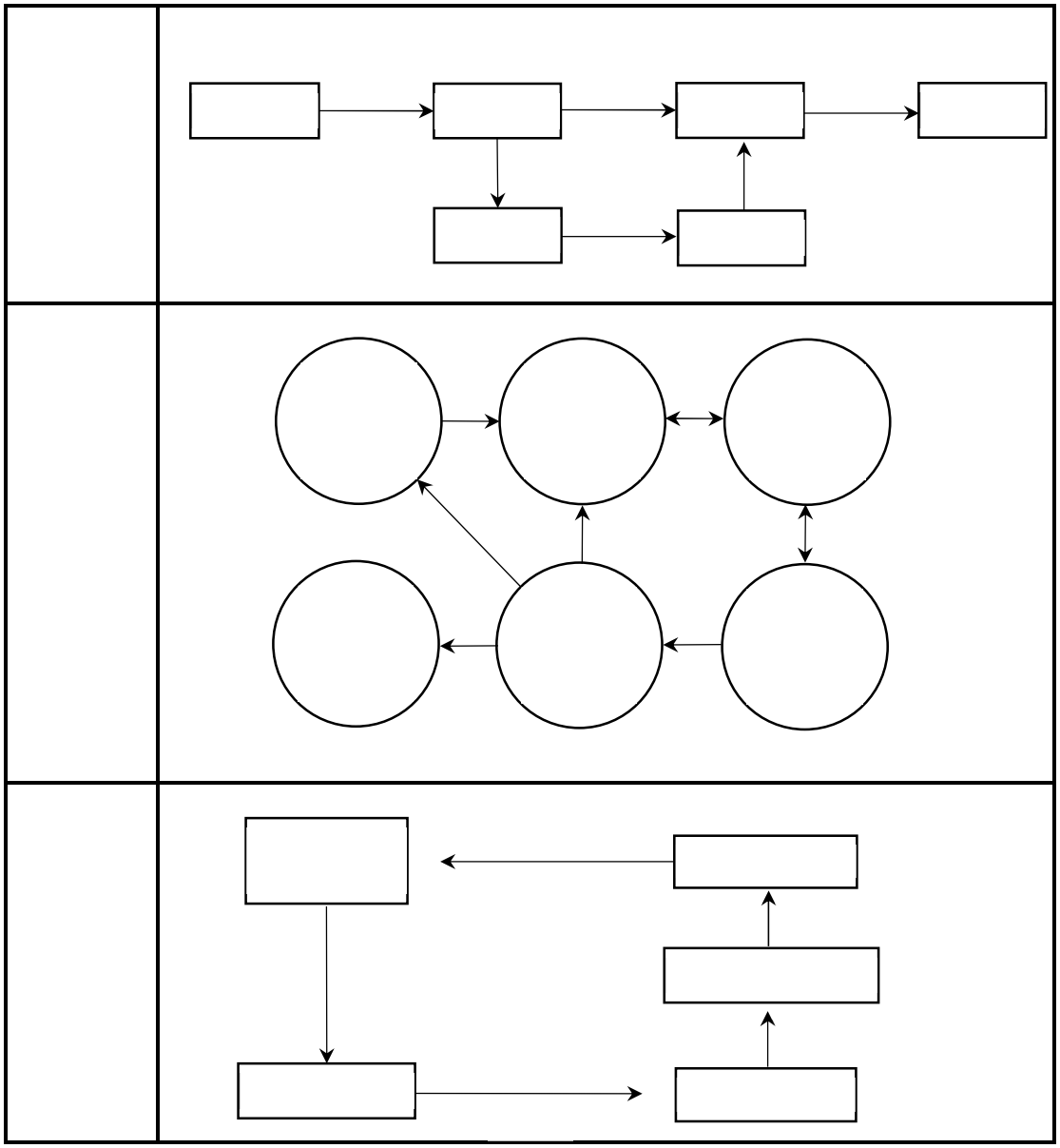

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S4	10	19	18:30-18:40

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[68]

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0		1 4.1%	3 12.5%
1	1	8 33.3%	11 20.8%
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[68] [J] · · 2019 2 100-106

Haines 1-11

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Mann-Whitney U

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z=-.649 *p*=.516>0.05

SPSS

24 10.84 20 2

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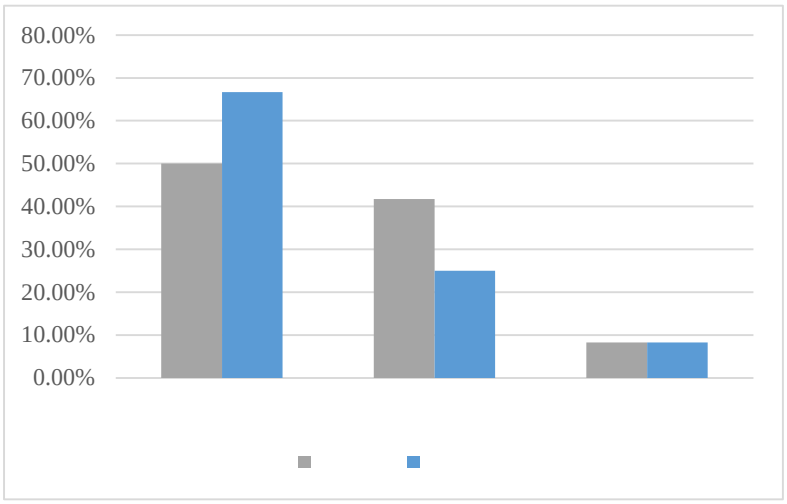
- p=.139>0.05 .

t sig.=.793>0.05

(z=-.813 p=.661>0.05)



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1 50% 1
66.6% 1
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2 41% 22.5%
2 3
1
5.875 6.08

2

Mann-Whitney U

z=-0.178 p=.876>0.05

5.1.2

(z = -1.830 p =.670 > 0.05)

Mann-Whitney U

5-3

		1 %	2 %	3 %
	12	3 25.0%	5 41.6%	4 33.3%
	12	3 25.0%	5 41.6%	4 33.3%
	12	2 16.7%	8 66.7%	2 16.7%
	12	1 8.3%	9 75.0%	2 16.7%
	12	5 41.6%	7 58.3%	0 0.0%
	12	5 41.6%	7 58.3%	0 0.0%
	12	4 33.3%	5 41.6%	3 25.0%
	12	5 41.6%	4 33.3%	3 25.0%

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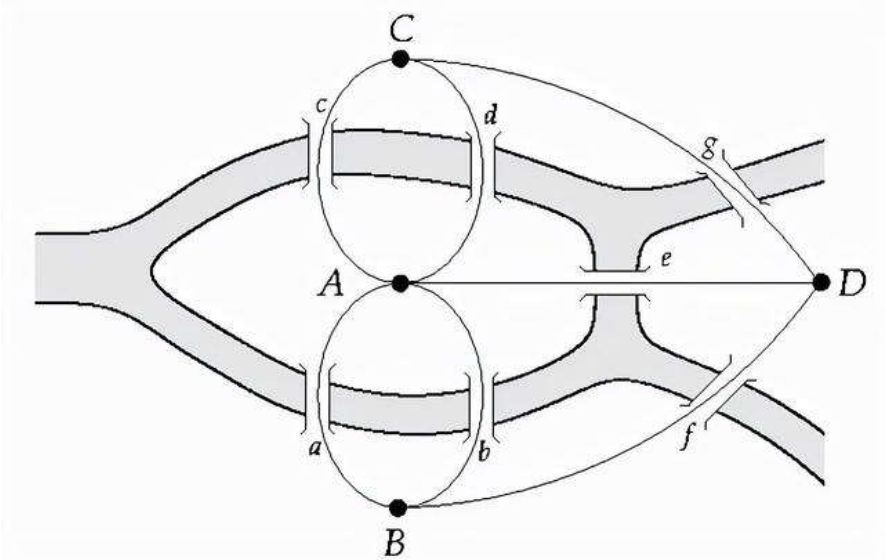

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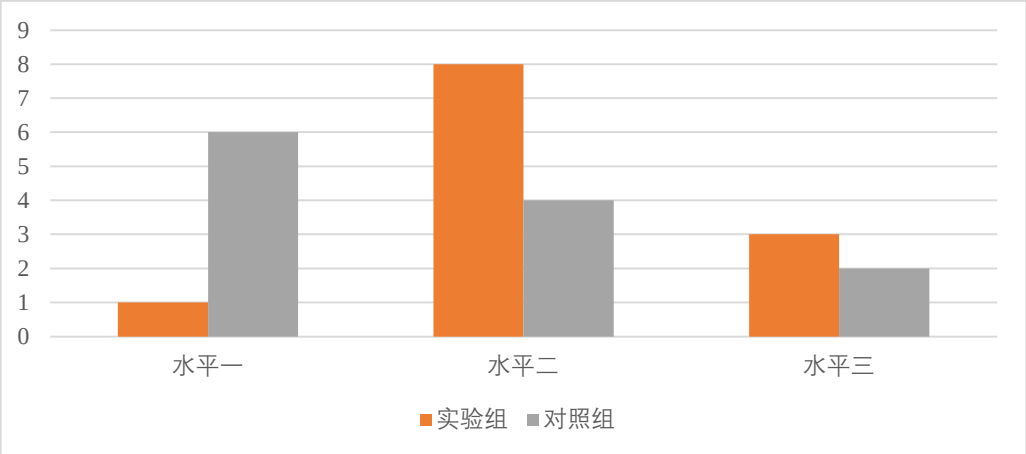

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	12	2 16.7%	7 58.3%	3 25.0%
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	12	6 50.0%	6 50.0%	0 0.0%
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	12	0	0.0%	4	33.3%	5	41.7%

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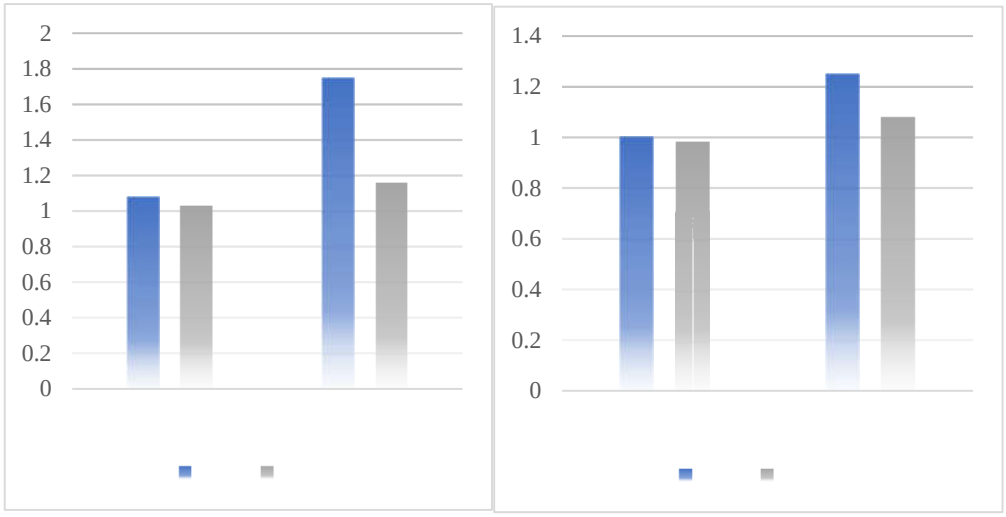

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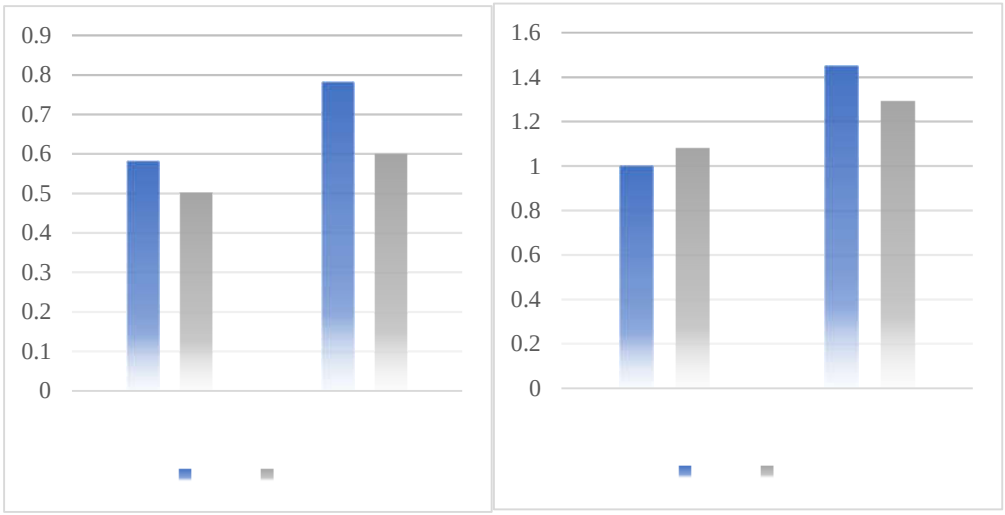

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[68] [J] · · 2019 2 100-106

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E $(x+y)(p+q)$ $(x+y)(C+L) \leq A$

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6 m_1

n_1 m_2 n_2

t *p*

?

A $m_1(p+n_1t)=m_2(p+n_2t)$ B $m_1(p+n_1t)<m_2(p+n_2t)$

C $m_2(p+n_2t)\le m_1(p+n_1t)$ D $m_2(p+n_2t)<m_1(p+n_1t)$

E $m_1(p+n_1t)\le m_2(p+n_2t)$

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“ ” 4 ?

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邮件 1：12 月 7 日上午 10:00	**邮件 2：12 月 7 日上午 10:30**
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9	: 1 ? ? 2 ? 3 ?
邮件 3：12 月 7 日下午 13:00	**邮件 4：12 月 7 日下午 5:00**
1 5 , 15 , 5 25 2 60 60 60 60 60 3 60	

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