

## 2014 年 10 月读书报告

本月读书内容为关于数学态度的一些论文，目的是寻找好的数学态度问卷。通过看阅文献，共发现了以下几个问卷：

### **Machteld Vandecandelaere \*, Sara Speybroeck, Gudrun Vanlaar, Bieke De Fraine, Jan Van Damme (2012) Learning environment and students' mathematics attitude**

#### **Mathematics academic self-concept ( $\alpha = .92$ )**

In general, I'm good at mathematics.  
I'm pretty good at mathematics.  
I usually do well in mathematics.  
Not everyone can be gifted for every school subject. For mathematics, I'm not really gifted.  
For some reason, I can't master mathematics.  
Mathematics is not one of my strengths.  
Mathematics is more difficult for me than for many of my classmates.  
I learn things quickly in mathematics.  
I would like a job that involved using mathematics.  
Sometimes, when I do not initially understand a new topic in mathematics,  
I know that I will never really understand.

#### **Enjoyment of mathematics ( $\alpha = .93$ )**

Mathematics is boring. → 反面描述  
I find mathematics a pleasant school subject.  
Our lessons in mathematics are mostly fascinating and interesting. → 反面描述  
I'm sick of mathematics. → 反面描述  
Especially for mathematics, I'm happy when class is over. → 反面描述  
Without mathematics, school would be much more fun. → 反面描述  
I enjoy learning mathematics.  
I would like to take more mathematics in school.

#### **Perceived value of mathematics ( $\alpha = .83$ )**

I think for most occupations, mathematics is not useful. → 反面描述  
I believe mathematics has little use. → 反面描述  
Most of mathematics can be useful later on.  
I think learning mathematics will help me in my daily life.  
For a lot of things, occurring daily, mathematics is useful.  
I need mathematics to learn other school subjects.  
I need to do well in mathematics to get the job I want.  
I need to do well in mathematics to get into the university of my choice.  
To be good at mathematics, is a case of luck.

**Fogarty, G., Cretchley, P., Harman, C., Ellerton, N., & Konki, N. (2001).**

**Validation of a questionnaire to measure mathematics confidence, computer confidence, and attitudes towards the use of technology for**

*Attitudes to Technology in Mathematics Learning Questionnaire*

Students responded to the following statements on a five-point Likert scale: 1 = Strongly agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly disagree.

The following statements refer to your confidence when learning *mathematics*.

1. I have less trouble learning mathematics than other subjects.
2. When I have difficulties with mathematics, I know I can handle them.
3. I do not have a mathematical mind.
4. It takes me longer to understand mathematics than the average person.
5. I have never felt myself able to learn mathematics.
6. I enjoy trying to solve new mathematics problems.
7. I find mathematics frightening.
8. I find many mathematics problems interesting and challenging.
9. I don't understand how some people seem to enjoy spending so much time on mathematics problems.
10. I have never been very excited about mathematics.
11. I find mathematics confusing.

反面描述

The following statements refer to your confidence when using *computers*.

1. I have less trouble learning how to use a computer than I do learning other things.
2. When I have difficulties using a computer I know I can handle them.
3. I am not what I would call a computer person.
4. It takes me much longer to understand how to use computers than the average person.
5. I have never felt myself able to learn how to use computers.
6. I enjoy trying new things on a computer.
7. I find having to use computers frightening.
8. I find many aspects of using computers interesting and challenging.
9. I don't understand how some people can seem to enjoy spending so much time using computers.
10. I have never been very excited about using computers.
11. I find using computers confusing.
12. I'm nervous that I'm not good enough with computers to be able to use them to learn mathematics.

反面描述

两个部分非常相似,只是修改了一下

The following questions refer to the way you feel about computers and graphics calculators in the learning of mathematics. [The word *technology* is used here to mean *computers* and *graphics calculators*].

- |      |   |
|------|---|
| 反面描述 | 1. Computing power makes it easier to explore mathematical ideas.   |
| 反面描述 | 2. I know computers are important but I don't feel I need to use them to learn mathematics.                   |
| 反面描述 | 3. Computers and graphics calculators are good tools for calculation, but not for my learning of mathematics. |
| 反面描述 | 4. I think using technology is too new and strange to make it worthwhile for learning mathematics.            |
|      | 5. I think using technology wastes too much time in the learning of mathematics.                              |
|      | 6. I prefer to do all the calculations and graphing myself, without using a computer or graphics calculator.  |
|      | 7. Using technology for the calculations makes it easier for me to do more realistic applications.            |
|      | 8. I like the idea of exploring mathematical methods and ideas using technology.                              |
|      | 9. I want to get better at using computers to help me with mathematics.                                       |
|      | 10. The symbols and language of mathematics are bad enough already without the addition of technology.        |
|      | 11. Having technology to do routine work makes me more likely to try different methods and approaches.        |

**Galbraith, P., & Haines, C.(1998). Disentangling the nexus: attitudes to mathematics and technology in a computer learning environment. Educational Studies in Mathematics, 36, 275–290.**

Items 1–8 which form the scale for **Mathematics Confidence**

- |      |   |
|------|---|
|      | 1 Mathematics is a subject in which I get value for effort          |
|      | 2 The prospect of having to learn new mathematics makes me nervous  |
|      | 3 I can get good results in mathematics                             |
| 反面描述 | 4 I am more worried about mathematics than any other subject        |
|      | 5 Having to learn difficult topics in mathematics does not worry me |
| 反面描述 | 6 No matter how much I study mathematics is always difficult for me |
| 反面描述 | 7 I am not naturally good at mathematics                            |
|      | 8 I have a lot of confidence when it comes to mathematics           |

**Vale, C., & Leder, G. (2004). Student views of computer-based mathematics in the middle years: does gender make a difference? Educational Studies in Mathematics, 56, 287–312.**

Code	Items	Adapted or sourced from:
ACBM	Attitude to computer-based mathematics	
	I've improved in maths since we started using computers in maths.	Fennema and Sherman (1976)
	I've gone backwards in maths since we started using computers in maths.*	Fennema and Sherman (1976)
	I am sure I could do difficult maths with the use of a computer.	Fennema and Sherman (1976)
	Even a computer can't help me learn maths.*	Fennema and Sherman (1976)
	Using computers in maths gives you a reason for doing maths.	Fennema and Sherman (1976)
	Using computers in maths does not make maths any more useful.*	Fennema and Sherman (1976)
	I find that using computers helps me to learn maths.	Kissane et al. (1995)
	Using computers in maths means you won't be able to do maths without them.*	Kissane et al, (1995)
	Maths is easier to understand when you use computers.	Kissane et al. (1995)
	Using computers in maths makes maths more confusing.*	Kissane et al. (1995)
	Computers are excellent for doing things for maths.	Vale (1997)
GMA	How good are you at mathematics?	Forgasz (1995b)
MAB	How good do you want to be at mathematics?	Forgasz (1995b)
GCO	How good are you at computers?	Forgasz (1995b)
COB	How good do you want to be at computers?	Forgasz (1995b)

下面列举之前研究的一些数学问卷的优缺点。

问卷	问卷介绍	优缺点
Machteld Vandecandelaere *, Sara Speybroeck, Gudrun Vanlaar, Bieke De Fraine, Jan Van Damme (2012) Learning environment and students' mathematics attitude	三个部分: Mathematics academic self-concept (10 道题), Enjoyment of mathematics (8 道题), Perceived value of mathematics (9 道题)	这三部分可以借鉴,但是描述不是很好,有正反两方面的描述,不太适合重复使用

<p>Fennema and Sherman (1976) scale</p> <p>Fennema, E., &amp; Sherman, J. (1976). Fennema–Sherman Mathematics Attitudes Scales. Instruments designed to Measure attitudes toward the learning of mathematics by females and males. Abstracted in the JSAS Catalog of Selected Documents in Psychology, 6(1), 31 (Ms No. 1225).</p>	<p>measures some constructs of interest to us, has 108 items and according to Tapia and Marsh (2004) one needed to allow students up to 45 min.</p>	<p>provides most helpful models, new items need to be constructed which will be immediately understood by the current student cohort. too long and complex, become dated, meaning of words change</p>
<p>Galbraith and Haines (1998)</p> <p>Galbraith, P., &amp; Haines, C.(1998). Disentangling the nexus: attitudes to mathematics and technology in a computer learning environment. Educational Studies in Mathematics, 36, 275–290.</p>	<p>Australian context, Tertiary(大专) students and their focus, related to particular courses</p>	<p>可推广性不强</p>
<p>Fogarty, Cretchley, Harman, Ellerton, and Konki (2001)</p> <p>Fogarty, G., Cretchley, P., Harman, C., Ellerton, N., &amp; Konki, N. (2001). Validation of a questionnaire to measure mathematics confidence, computer confidence, and attitudes towards the use of technology for learning mathematics. Mathematics Education Research Journal, 13, 154–160.</p>	<p>measure tertiary students’ mathematics confidence, computer confidence and attitudes towards the use of technology for learning mathematics, 37 items including a number of long statements,</p>	<p>可推广性不强</p>
<p>Chapman (2003)</p> <p>Chapman, E. (2003). Development and validation of a brief mathematics attitude scale for primary-aged students. Journal of Educational Enquiry, 4(2), 63–73.</p>	<p>primary aged students “How I feel About Maths” scale 测量的维度可归结为一个, affective engagement</p>	<p>affective engagement 可以作为一个重要的维度, 本研究也用到了</p>
<p>Vale and Leder(2004)</p> <p>Vale, C., &amp; Leder, G. (2004). Student views of computer-based mathematics in the middle years: does gender make a difference? Educational Studies in Mathematics, 56, 287–312.</p>	<p>study of the relationship between gender and attitudes to using computers for learning mathematics their scale is targeted at the same age range as our study (early/middle secondary years), and the issue of gender may</p>	<p>可以参考, 但是不太合适 The Vale and Leder scale had 11 items for ‘ attitude to computer-based mathematics ’</p>

	emerge as an important variable, we want to look more broadly. The Vale and Leder scale had 11 items for ‘attitude to computer-based mathematics’ and only one item for each of four other variables.	and only one item for each of four other variables.
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通过以上的介绍,发现了一篇论文做得比较好,也适合我的论文。

A scale for monitoring students’ attitudes to learning mathematics with  
technology

这篇论文中介绍的问卷题目是 The Mathematics and Technology Attitudes Scale (MTAS), 适用于初中二年级学生, 包括五个维度行为参与、技术信心、数学信心、情感投入、技术融入数学学习的态度 (mathematical confidence [MC], confidence with technology [TC], attitude to learning mathematics with technology (whether computers, graphics calculators or computer algebra systems) [MT], affective engagement [AE] and behavioural engagement [BE])。来自 6 个学校的 350 名教师验证这个问卷是非常有效的。这个也作为自己论文的一个参考问卷。

1.问卷的来源: 问卷的五个维度来源于下图所示的一个假设模型。

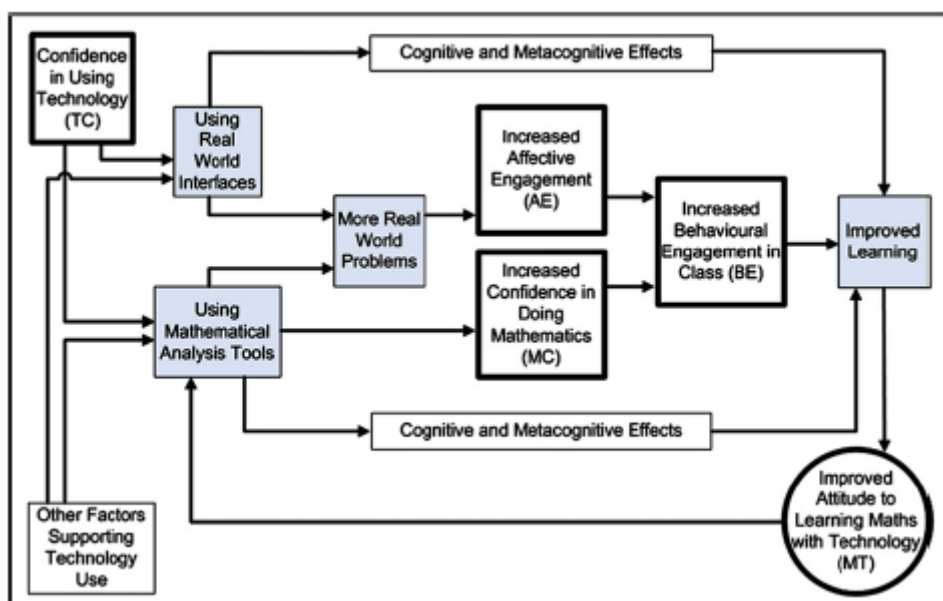


Fig. 1. Illustration of hypothesized affective channel for technology use to improve mathematics learning.

首先，假设在课堂中使用信息技术能够促进更多真实世界的问题解决，这些技术包含真实世界的一些实物（或者接口）还有一些数学分析工具。数学课堂中选择更现实的问题，使用信息技术能够很好地帮助解决这些实际问题，这样的一个过程使数学与学生的生活更加相关，并且使数学课更加有趣。在解决实际问题的过程中，学生的情感投入更多。同时，由于数学的经常使用，学生对学习和使用数学信心也增加了。因为一些技术的存在，减轻了学生的计算负担。学生有了更多的情感投入，对数学使用也更加有信心，无疑会使学生课堂中对数学的参与增加，从而促进学生的学习。这样以后，学生对于技术融入数学学习的态度也会有很大的改善。

使用技术的信心的既有学生课堂中对技术的经常使用的影响也有其他的一些因素影响，例如教师对技术的使用以及有较为合适的技术。

这个研究是依托于作者的一个项目，研究者希望通过数学课使用技术的策略促进数学课中真实数学问题的使用与解决，目的是增加学生的参与与学习数学的信心，从而提高数学成绩。通过追踪学生的数学参与与态度情况，寻找在数学中如何更好地使用技术。

## 2. 问卷设计

之前的研究中态度量表的设计采用了不同的研究方法，如个别访谈焦点小组、日记、观察和问卷调查。之前有些研究者设计了一些问卷，但是作者需要的是一份适合十四岁左右儿童，适合不同学习水平的学生，还可以重复测量的问卷，目前作者通过调研发现还没有完成适合的，因此研究者想自己设计。但是，之前的问卷都有自己的可参考的地方，它们之间也存在一些共性。我们采用了这些共同点，但是避免的一些消极描述。因为，首先我们希望学生能够迅速的准确的做完，消极的描述会导致他们的消极思考。再次，这份问卷学生需要学生在中学阶段做多次，消极的描述会给他们种下消极思考的种子。

## 3. 五个维度

之前的研究都提到信心和参与是非常重要的因素，但是不是那么容易测量的。学生的表示信心和参与的词汇和行为依赖于当地的文化、情境、学生的年龄等。因此这些各个维度描述都要考虑到以上这些内容。

维度	他人观点	研究者观点
Mathematics confidence	Vale and Leder (2004): view students' attitudes to mathematics as <i>students perceptions of their achievement (self-efficacy) and their aspiration to achieve in the disciplines</i>	restricted our meaning of " mathematics confidence " to a student's perception



	Galbraith and Haines (1998) : see mathematics confidence as evidenced by students <i>“who believe they obtain value for effort, do not worry about learning hard topics, expect to get good results, and feel good about mathematics as a subject ”</i>	of their ability to attain good results and their assurance that they can handle difficulties in mathematics.
Confidence with technology	Vale and Leder (2004): view students’ attitudes to mathematics as <i>students perceptions of their achievement (self-efficacy , 自我效能 ) and their aspiration to achieve in the disciplines</i> Galbraith and Haines (1998): students who <i>“feel self-assured in operating computers, believe they can master computer procedures required of them, are more sure of their answers when supported by a computer, and in cases of mistakes in computer work are confident of resolving the problem themselves”</i> (关于技术信心的描述)	closely matches that of Galbraith and Haines
Attitude towards use of technology for learning mathematics	Vale and Leder (2004): the degree to which students perceive that <i>the use of computers in mathematics provides relevance for mathematics, aids their learning of mathematics and contributes to their achievement in mathematics</i> Galbraith and Haines (1998): computer and mathematics interaction	focused broadly on interest and assistance
Affective and behavioural engagement	Vale and Leder (2004) refer to a concept similar to affective engagement as <i>“girls/boys pleasure and computers”</i> but in their study data on this was collected from classroom observations rather than by questionnaire. Chapman (2003) constructed a scale to specifically measure affective engagement. She did this by having students’ respond on a five-point scale to items such as <i>“Mathematics is boring”</i> and <i>“I like mathematics”</i> . Galbraith and Haines (1998) discuss a related concept of <i>‘mathematics engagement’</i> . <i>“Students who score highly on this scale ‘mathematical engagement’ prefer to work through examples rather than learn given material, like to test understanding through exercises and problems, try to link new knowledge to existing knowledge, like to elaborate material with notes, and review their work regularly”</i>	focus on learning behaviour rather than on learning strategies; reflect on how frequently they behave in various ways in their mathematics classes.

问卷如下：

		Hardly Ever	Occasionally	About Half the time	Usually	Nearly Always
1.	I concentrate hard in mathematics [BE]	HE	Oc	Ha	U	NA
2.	I try to answer questions the teacher asks [BE]	HE	Oc	Ha	U	NA
3.	If I make mistakes, I work until I have corrected them. [BE]	HE	Oc	Ha	U	NA
4.	If I can't do a problem, I keep trying different ideas. [BE]	HE	Oc	Ha	U	NA
		Strongly disagree	Disagree	Not sure	Agree	Strongly agree
5.	I am good at using computers [TC]	SD	D	NS	A	SA
6.	I am good at using things like VCRs, DVDs, MP3s and mobile phones [TC]	SD	D	NS	A	SA
7.	I can fix a lot of computer problems [TC]	SD	D	NS	A	SA
8.	I can master any computer program needed for school [TC]	SD	D	NS	A	SA
9.	I have a mathematical mind [MC]	SD	D	NS	A	SA
10.	I can get good results in mathematics [MC]	SD	D	NS	A	SA
11.	I know I can handle difficulties in mathematics [MC]	SD	D	NS	A	SA
12.	I am confident with mathematics [MC]	SD	D	NS	A	SA
13.	I am interested to learn new things in mathematics [AE]	SD	D	NS	A	SA
14.	In mathematics you get rewards for your effort [AE]	SD	D	NS	A	SA
15.	Learning mathematics is enjoyable [AE]	SD	D	NS	A	SA
16.	I get a sense of satisfaction when I solve mathematics problems [AE]	SD	D	NS	A	SA
		Strongly disagree	Disagree	Not sure	Agree	Strongly agree
17.	I like using graphics calculators for mathematics [MTg]	SD	D	NS	A	SA
18.	Using graphics calculators in mathematics is worth the extra effort [MTg]	SD	D	NS	A	SA
19.	Mathematics is more interesting when using graphics calculators. [MTg]	SD	D	NS	A	SA
20.	Graphics calculators help me learn mathematics better [MTg]	SD	D	NS	A	SA

### 翻译后：

本量表分成五个维度：数学信心、技术信心、技术融入数学学习的态度、情感投入、行为参与。问卷答案共有五个维度，分别是几乎没有、偶尔、一般、经常、一直这样，这五个维度分别用 5、4、3、2、1 表示。

编号	内容	几乎没有	偶尔	一般	经常	一直如此
		5	4	3	2	1
1.	我很难集中注意力学习数学。					
2.	我努力去回答老师的提问。					
3.	当数学题目自己出错时，我会努力修改直到改正这个错误。					
4.	当我碰到一些题解不出来时，我会尝试用不同的方法来解题。					

编号	内容	非常不同意	不同意	一般	同意	非常赞同
		5	4	3	2	1
5.	我擅长使用电脑。	5	4	3	2	1
6.	我擅长使用手机、MP3、录像机、DVD 播放机等设备。	5	4	3	2	1
7.	我能够解决很多计算机出现的故障及问题。	5	4	3	2	1
8.	我能够掌握学校要求学习的任何计算机软件。	5	4	3	2	1
9.	我有数学学习的头脑。	5	4	3	2	1
10.	我能够在数学考试中取得好的成绩。	5	4	3	2	1
11.	我知道我能够解决数学学习中的问题。	5	4	3	2	1
12.	我有信心学会数学。	5	4	3	2	1
13.	我对数学中新知识、新内容的学习感兴趣。	5	4	3	2	1
14.	在数学学习中，我的回报来源于我的付出。	5	4	3	2	1
15.	学习数学是件非常享受的事情。	5	4	3	2	1
16.	当我解决数学问题时，我感到一种很强的满足感。	5	4	3	2	1
17.	我喜欢在数学课中用图形计算器	5	4	3	2	1
18.	比起不用图形计算器，我在数学课中使用图形计算器需要额外的努力和付出。	5	4	3	2	1
19.	当用图形计算器软件学习数学时，数学变得更有意思	5	4	3	2	1
20.	图形计算器帮助我学习更好地学习数学	5	4	3	2	1

1-4 行为参与

5-8 技术信心

9-12 数学信心

13-16 情感投入

17-20 技术融入数学学习的态度

修改后可以用的是（修改时，删去了技术信心，因为与我们现在的情况相差太大，比如使用，MP3、录像机、DVD 播放机，也与我的论文关系不大）

#### 数学与技术态度量表

本量表分成五个维度：数学信心、技术信心、技术融入数学学习的态度、情感投入、行为参与。问卷答案共有五个维度，分别是几乎没有、偶尔、一般、经常、一直这样，这五个维度分别用 5、4、3、2、1 表示。

		几	偶	一	经	一
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编号	内容	乎	尔	般	常	直
		没有				如此
		5	4	3	2	1
1.	我很难集中注意力学习数学。					
2.	我努力去回答老师的提问。					
3.	当做数学题目自己出错时，我会努力修改直到改正这个错误。					
4.	当我碰到一些题解不出来时，我会尝试用不同的方法来解题。					

编号	内容	非	不	一	同	非
		常	同	般	意	常
		不同	意			赞
		意				同
		5	4	3	2	1
5.	我有数学学习的头脑。	5	4	3	2	1
6.	我能够在数学考试中取得好的成绩。	5	4	3	2	1
7.	我知道我能够解决数学学习中的问题。	5	4	3	2	1
8.	我有信心学会数学。	5	4	3	2	1
9.	我对数学中新知识、新内容的学习感兴趣。	5	4	3	2	1
10.	在数学学习中，我的回报来源于我的付出。	5	4	3	2	1
11.	学习数学是件非常享受的事情。	5	4	3	2	1
12.	当我解决数学问题时，我感到一种很强的满足感。	5	4	3	2	1
13.	我喜欢在数学课中用 Scratch	5	4	3	2	1
14.	比起不用 Scratch 软件，我在数学课中使用 Scratch 需要额外的努力和付出。	5	4	3	2	1
15.	当用 Scratch 软件学习数学时，数学变得更有意思	5	4	3	2	1
16.	Scratch 帮助我学习更好地学习数学	5	4	3	2	1

读后体会：

1. 搜索这些论文基本上都是用 Springer 数据库，之前都是从 computer&education 中下载的较多。

2. 关于数学态度的问卷比较多，他们也涉及了不同的维度，其中关于数学信心、技术信心和情感体验是描述非常多的。但是由于对象的不同，他们在描述时描述的方法是有不同的。也可以这么说，对于不同

的对象要仔细斟酌如何写问卷中的各个小的题目。

3.上面我翻译的问卷存在问题。

I concentrate hard in mathematics 我翻译成:我很难集中注意力学习数学。这个在当时做这份问卷时没有注意,应该是我努力集中注意力学习数学。

4.关于 13-16 题,在我的论文中,只有实验班可以用,对照班没法用,因为对照班没有学过 Scratch。