

THE CULTURE OF MATHEMATICS LEARNING IN TWO CHINESE PRIMARY SCHOOLS: Drill and Practice

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Abstract*

This paper aims to discuss some preliminary findings of two case studies, which were part of a bigger research project exploring the culture of mathematics teaching and learning in some Malaysian schools. These two case studies focus on exploring the characteristics or culture of mathematics learning in two Chinese primary schools.

The study is interpretative in approach and employs mainly qualitative methods for data collection. These methods include planned interviews with the school administrators, teachers, parents and pupils, videotaped classroom observations and participant observation of selected school activities that related to mathematics teaching and learning.

Preliminary findings of these case studies highlighted the dominant characteristics of “drills and practices” in these Chinese schools. This finding concurred with earlier studies (such as Lim & Chan, 1993; Munirah & Lim, 1996) that it might be true that the quantity of exercises and homework given are comparatively much more than the other types of primary schools, there are other more important contributing factors. These factors include the quality of exercises given, the beliefs and expectation of teachers and parents, the pupils’ image of mathematics and mathematics learning, as well as the cultural values about mathematics education.

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Introduction

Being a multi-ethnic and multi-cultural country, Malaysia has a unique educational system whereby there are three types of primary schools available depending upon the medium of instruction. These are: (a) Malay medium national schools (SK); (b) Chinese medium national type schools (SRJKC); and (c) Tamil medium national type schools (SRJKT). Although the medium of instruction is different, all schools follow a national mathematics curriculum, and all pupils sit for a national examination, the Primary School Achievement Test or UPSR at the end of the six years of primary schooling. For the past decades, the results of the Primary national examinations (UPSR) have shown that pupils from the Chinese medium schools perform consistently better in mathematics than those in the other types of schools. Table 1 displays the percentage of passes of the various types of schools in the UPSR examination.

Table 1: Mathematics Achievement in the UPSR Examination (Percentage of Passes) by Types of Schools

Year	Type of school		
	SK/SRK (Malay medium)	SRJKC (Chinese medium)	SRJKT (Tamil medium)
1991	60.4	86.6	49.9
1992	60.6	86.8	56.1
1993	63.1	87.6	55.8
1994	64.0	86.3	58.1
1995	67.9	87.6	59.0
1996	74.5	90.0	65.2
1997	-	85.5	-
1998	77.5	91.2	68.6
1999	76.2	90.0	70.9
2000	77.5	87.5	73.9
2001	76.0	89.9	74.4

Source: Malaysian Examination Board Yearly Report for the year 1991-2001.

Note: SK/SRK = National/National type Primary school (Malay language as medium of instruction)
 SRJKC = National Type Chinese Primary school (Chinese language as medium of instruction)
 SRJKT = National Type Tamil Primary school (Tamil language as medium of instruction)

This raises concern especially to mathematics educators and the Ministry of Education. The Ministry of Education has since attempted to upgrade the mathematics achievement of the Malay medium schools. Even the Prime Minister himself has advocated the need for the government school authorities to emulate the commitment of the Chinese schools to education. The Malay medium schools were asked to adopt the teaching approaches of the Chinese medium school. Some ministers even suggest the possibility of 'importing' mathematics teachers from Chinese schools to the Malay schools (The Star, 21 January, 1992). However, this proposal is yet to be tried. Indeed, as shown by Table 1, these attempts seem to have shown some success as the achievement gap between the various types of schools is narrowing. Nevertheless, this issue is not that simple. Mathematics is neither culture-free nor value-free (Ernest, 1991) but a form of culturally transmitted knowledge (Bishop, 1988). The success in mathematics learning among these schools may have been related to the school culture and its related community

culture. Thus, can culture be "imported" from one school to another, by merely exchanging the mathematics teachers?

There seems to have an assumption that Chinese medium school pupils perform better in mathematics, because these schools have some "special recipe" in their teaching and learning of mathematics. This assumption has stirred up a lot of interest in researching the secret of success in Chinese primary schools.

Review of related local literature shows that so far three studies (Lim & Chan, 1993; Munirah & Lim, 1996; Yong et al., 1997) have been carried out in Malaysia to compare mathematics learning among the different cultural groups of Malaysia. Lim and Chan (1993) compare the mathematics achievement of two groups of Primary Six Malay pupils, one group studied in SRJKC (Chinese) schools whereas another group studied in SK (Malay) schools. They also compared the teaching strategies, learning facilities, and the amount of exercises given by these two types of schools. Likewise, Munirah and Lim (1996) compared mathematics teaching and learning between one Chinese primary school (SRJKC) and one Malay primary school (SK) which are located in the same area, by classroom observation and interviews with the headmaster, mathematics teachers and some pupils of the respective schools. Unlike the above two studies, Yoong Suan and his colleagues (1997) focus on investigating the acquisition of basic number concepts among the Malaysian Primary One pupils of different ethnic and cultural backgrounds.

Although all the above three studies were exploratory in nature and their findings were far from conclusive, there were at least two significant issues that can be drawn out from these studies. First, language seems to play a significant role in mathematics learning. As pointed out by Yong et al (1997), the Chinese language seems to have a cultural advantage over the other two languages, Malay and Tamil, particularly in terms of its simpler and consistent number-naming system. It follows that any student, be he/she Chinese, Malay or Indian-who is trained to use this numbering system may be able to count and memorize the number system faster than his/her counterparts who use other languages. Second, findings from the above three studies strongly suggest that there are differences in teaching approaches that are adopted by the different medium schools. Chinese medium schools seem to favour more "lively learning atmosphere in class"; "plenty of drills and practices"; "more homework", "more tuition" as well as "more competition and quizzes" (Munirah & Lim, 1996). Consequently, pupils of the Chinese medium schools tend to perform better in computational skills and counting of number, as well as memorisation of multiplication tables. Even Malay pupils studying in Chinese medium schools were found to perform better than their counterparts in other medium schools with regard to computational skills (Lim & Chan, 1993).

Yet are the above two factors: language and teaching approaches (in particular, a lot of drills and practices) sufficient to explain the possible better achievement of the Chinese medium schools? Drill and practice is often equate to rote-learning. Rote learning is taken as learning by memorising and without understanding. Thus, rote learning is not meaningful and often attribute to students' dislike of mathematics. Therefore, how can this dominant culture of drill and practice contribute to the better mathematics achievement of the Chinese primary schools?

A research project that aims to explore the impact of culture on mathematics teaching and learning in some Malaysian schools was carried out in 2001. Here I give a brief description of the study:

The study

In this study, culture is defined as "a system of shared knowledge and beliefs that shaped human perceptions and generates social behaviours" (Bennett, 1990, p.47). It follows that the culture of mathematics learning is conceptualised as "a system of shared knowledge, practices, beliefs and values in mathematics learning".

The objectives of the study are:

- 1) To explore and identify cultural values that are inherent in the teaching and learning of mathematics in different types of Malaysian secondary schools.
- 2) To explore how these cultural values have been manifested in practice and how they act as “host” culture for the teaching and learning of mathematics in these schools.
- 3) To identify the attributes or qualities of a successful mathematics learner in Malaysian schools.

The participants

The study involved four pairs of schools. Each pair consisted of one secondary school and its main feeder primary school. These schools were selected in pair to study the continuity of the cultural influences. It is believed that the inculcation of the culture of learning mathematics begins in primary school and it will be brought into secondary school. A student’s view, beliefs and values of mathematics learning may change as he or she enters higher form, but the primary mathematics learning experiences remain influential.

Eight schools, four each from the state of Kedah and Penang were selected as case studies. Each case study involves the school as a unit and the community in which it is situated. The school consists of its members (that includes school administrators, teachers and pupils) while the community consists of the school board and parents of pupils.

Method

The study is interpretative in approach and employs mainly qualitative methods for data collection. These methods include planned interviews with the school administrators, mathematics teachers, parents and pupils, videotaped classroom observations and participant observation of some school activities that are related to mathematics teaching and learning. For example, the researchers attended and participated in some schools activities like mathematics department meeting (mesyuarat panitia matematik) and motivation camp for additional mathematics. All interviews were tape-recorded and transcribed for qualitative analysis.

However, for the purpose of this paper, only findings of two case studies on two Chinese primary schools will be discussed.

Findings and discussion

Findings discussed here are drawn on the analysis of 47 interview transcripts of the various members of the community of the two schools studied, mainly the school administrators, mathematics teachers, parents and pupils. Here I begin with a brief description of the background of the two schools studied, before I highlight some characteristics of these schools that may have contributed to their success in mathematics. In particular, the beliefs of drill and practice in learning mathematics. It is interesting to observe that these two schools share more similarities than differences in the culture of mathematics learning.

Case 1: Primary school H

Primary school H is a small school with a total enrolment of only 206 pupils, 12 teachers, a headmistress and 2 supporting staff. The ethnic composition of the pupils is majority Chinese (about 98%). All the mathematics teachers are Chinese. It is located in the centre of an urban city. The majority of its pupils live nearby and come from middle to lower income families. As the data indicate, out of the 9 parents whom we interviewed, only one mother is a housewife; all the others are working parents. Most of them are small entrepreneurs such as stationery shopkeeper, photographer, goldsmith, hairdresser or tailor. The school has achieved 100% passes in UPSR mathematics for the last two years (2000 & 2001).

Case 2: Primary school B

Primary school B has 1400 pupils with 51 teachers, 3 deputy headmasters and one headmaster, as well as 9 supporting staff. The ethnic composition of the pupils is 98% Chinese and 2% non-Chinese (Malay, Indian and Siamese). All the teaching staffs are Chinese except two Malay teachers. The supporting staffs are of mixed races with Malay majority. It is located in the outskirts of a fast developing city of Kedah. The majority of its pupils live nearby and come from middle to lower income families. Most parents are working and their occupation ranged from hawkers, businessmen to professionals. The school has achieved 97% and 96% passes respectively in the UPSR mathematics for the past two years (1999 & 2000).

School Motto

The school motto of School H is “diligence and respect your job” (勤学敬业). This ‘bears implications which encompass aspects such as determination and gratitude’. This is also reflected in the name of the school, which means “恒心 (Perseverance)” and “毅力 (Persistence)”. The motto for School B is “誠勤潔毅 (Cheng Qin Jie Yi)”, which means “honesty, diligence, clean and persistence”. It is thus observed that diligence and persistence seem to be the two main values emphasised by these Chinese schools. Manifesting these values into practice, perhaps there is then no surprise that hard work and a lot of practice in mathematics learning is the norm or the characteristic of the Chinese schools.

Belief of learning mathematics: practice makes perfect “熟能生巧”

The most prominent belief of learning mathematics seem to be practice makes perfect or “熟能生巧”. This belief was not only held by the school administrators, mathematics teachers but also parents and pupils of both schools. When the headmaster of school B was asked, in order to teach well in mathematics, what should be the focus, he gave the opinion of “doing a lot of practice”. In addition, he explained,

因为熟能生巧啦!熟能生巧,所以多练习会有帮助。(Because practice makes perfect. More practice will help)
(Headmaster, School B)

The headmistress of School H also echoed the same belief:

“数学它一旦会了它的概念之后,那么他多做了练习,自然就可以了啦!”

(Headmistress, school H)

According to her, once a student understands the mathematical concepts and then practice a lot, he/she will ‘naturally’ be good at mathematics.

Likewise, the mathematics teachers of both schools whom I interviewed also shared the same belief that to be good in mathematics means to do a lot of drill and practice as one of them explained:

我们的观点是这样,数学方面,我们说熟能生巧.你只要做多了,你就自然而然会做.好像应用题,每年的出题方式,大同小异.比如说计算面积,距离,时间那些,全部都是一样,方式大概大同小异,只要你做多几题,熟悉了,知道用什么技巧,你就能够做了.有时它的问题可能会变动一下,人的名字不同,差不了多少,我们认为是这样.你要做对,你就要多做.最重要是熟能生巧.

[Our opinion is like this, in mathematics, we say practice makes perfect, when you do a lot, you will naturally know how to do. For example, the word problems, every year the questions asked are almost the same, such as calculating the area, distance, time etc are asked in nearly the same way. As long as you do more questions, you will be familiar with the format, know which skill to use, you will surely know how to solve them. Sometimes the questions may change a little, such as changing the name of people etc... You want to do right, you must do a lot, and the most important is practice makes perfect...]

(Mathematics Teacher H2)

In brief, the school administrators and mathematics teachers of both schools viewed mathematics learning as “a way of mental exercise” or a skill. A lot of drill and practice do not mean rote learning. Students should be given various types of problems to solve so as to provide them with various learning experiences

about a concept. They fully agreed and understood the importance of “concept understanding” but as mathematics teacher H2 elaborated further that,

如果 CONCEPT UNDERSTANDING 你没有 PRACTICE，也是不能。你 UNDERSTAND，你没有 PRACTICE，你很快就忘记了，就是你要 UNDERSTANDING 又 PRACTICE，两个一起，那么你 PRACTICE 久了，当然你会 UNDERSTAND 一样的，有关联的。但是你一直 PRACTICE，熟能生巧。

[If only concept understanding, but you do not practice, it's also not possible. You understand but you don't practice, you will forget very fast. You have to understand and practice, doing both together. As you practice more and long enough, you will surely understand, both are related. But if you continue to practice, then practice make perfect.]

(Mathematics Teacher H2)

Thus, to these teachers, a lot of drills and practice is much more important than concept understanding as practice aid in understanding of concepts. Moreover, merely understanding of mathematical concepts is not enough, as it needs practice to reinforce and to enhance learning. Therefore, concept understanding and practice are both closely related and reinforce each other.

Consequently, both school authorities have encouraged the pupils to buy additional workbooks and exercise books besides the school mathematics textbook and activity books. Depending on the grade of the pupils, the number of workbooks varies. For Primary one to Primary five, the pupils are required to buy at least two additional workbooks in a year. However, for Primary Six pupils who will be sitting for their examinations at end of the year, they are also encouraged to buy past year examination series, and other examination related reference books. As highlighted by the headmistress that, practising the past year questions will familiarise the pupils with the examination format. This is of great importance and great help when they sit for the examination later.

This belief on the importance of practice in mathematics learning is also well perceived by both parents and pupils of both schools. When some Standard 5 pupils of School H were asked how to be good at mathematics, their answers were:

应该是多做练习. [must do a lot of exercises]

(Student H1, boy)

要做很多练习题,又要专心听老师讲课 [have to do a lot of exercises and keep full attention to the teacher's teaching]

(Student H5, girl)

Yes, it's true. Practice make perfect. The more they [children] practice the more they are exposed to mathematics, then they will learn better compare to those who have less experience, less practice. So it's good [to] make them learn more. If they don't know never mind, [it is] up to the parents to explain. They will have better understanding and approach towards mathematics.

(Parent H4, priest)

With such a pervasive shared belief of “practice make perfect”, perhaps, there is no surprise that all the four parties also agreed upon the importance of homework as discussed below.

Homework

In line with the belief of the importance of practice in mathematics, all the four parties agreed that it is very important to give homework for mathematics learning. Homework refers to mathematical exercises or assignments given to pupils to be completed at home or out of school lesson. According to them, doing homework will help to

给他们多练习 [give them more practice]

(Parent H9, salesman)

因为有帮助到他们，每天老师教的东西，都有给他们功课做，他们可以多练习，可以进大脑。

[because can help them, everyday whatever the teacher taught, give them home work to do, they can then practice more and can be “absorbed” by the brain]

(Parent H3, businesswoman)

Thus, there were no parents whom we interviewed complain that the school had given too much homework to their children. Instead, three of the parents from School H felt that the amount of homework given by the school, especially for the lower primary pupils was not sufficient.

问：你觉得老师给的功课，够不够？

[Do you think the amount of homework given by the teacher is sufficient?]

答：应该还不够，太少了。[should be not sufficient, too little]

问：为什么？[Why?]

答：好像少了，他们学习方面会比较慢一点，不知道在学校他们给的功课多不多，带回家的 HOMEWORK 会比较少一点。

[like too little, their learning will slow down, (I) don't know whether in school how much exercise was given to them, whatever they brought home was comparatively little]

问：大概多少？[about how many?]

答：有时两本罢了，如果 COMPARE 别的学校，别的学校功课比较多，好象做不完这样。[sometimes only two books, if compared to other schools, they have a lot of homework, like cannot finish.]

(Parent H2, photographer)

Consequently, these parents send their children for out-of-school tuition where the pupils are given even more exercises to practice.

Although practice make perfect, but too much homework or too many questions given may not really benefit the pupils, instead, according to one of the mathematics teacher, he found that,

有时候给他们比较多一些题目罢了,明天教回来的功课就乱七八糟了,每一次都是这样.所有我们都给他们适量的,大概这样子他们可以做的很好,那么我们就给这种题目.如果超出这个题目的话,如果一天给他五十题的话,可能他会做到,都变成不会了,全部错了.每次都遇到这种现象.

[Sometimes we gave them a little more questions, what they handed up tomorrow will be in a mess, it is always like that. So we have to give them just sufficient amount, an amount that we estimate they can complete nicely. If we give them more than that amount, e.g. 50 questions a day, those who can do also become cannot do, all become wrong. This phenomenon is common].

(Mathematics teacher H1)

If pupils were given too many questions, they might not do it properly or they might lose their interest in mathematics. Therefore suitable amount of exercise is important. So what is the most suitable amount of exercise? One of the mathematics teacher offer his suggestion,

我是通常，这个数学题目，我大概他们回家半个小时内可以做完，因为我们也考虑到别的功课。

[normally I estimate if they can finish in half an hour if they bring home to do, we have to consider that they have other subject homework to do too]

(Mathematics teacher H1)

In terms of the amount of exercises given, the deputy head teacher of School B explained that, the amount of exercises given varies between the good class and the poorer one. For the good class, questions of higher level and higher number are given. For each unit (for example: addition), pupils are asked to do at least 5 to 6 pages of exercises. As each page consists of about 20 questions, this means about 100 to 120 questions for each unit. After each unit was taught, pupils will be given an assessment test, which consists of at least 40 questions. If the mathematics teacher found that pupils are still weak at certain concepts, then additional questions that related to the particular concepts will be given too. Furthermore, more challenging questions which usually in the form of problem solving will also be given to the good class

pupils after they have finished the basic drilling exercises. For the poorer class, almost the same amount of exercises will be given, but they are of lower level of difficulty.

Even though pupils were given such a considerable amount of exercises to practice, no pupils whom I interviewed complained about it. The following conversation illustrate this:

问：每天老师给很多练习吗? [Do your teacher give you a lot of exercises everyday?]

答：很多. [a lot]

问：多少页,还是怎样? [How many pages or how much?]

答：给很多页,有时复印那些作业给我们做. [quite a lot, sometimes photostated copies of exercises]

问：你觉得功课会太多吗? [Do you find the homework give too much?]

答：不会. 不会啊,可以啊!可以很快做完啦! [No. no! can finish it very fast!]

(Student B6, girl)

Out-of-school Tuition

The majority of the pupils in both schools took “out-of-school tuition” in mathematics. Some of them started as early as Primary one. For example, the data indicate that out of the nine parents of School H interviewed, eight of them have children taking “out-of-school tuition” in mathematics since Primary one or two. Similarly, out of the seven pupils interviewed, three of them have been taking tuition since Primary one. Only two of them did not attend tuition class because one of them was tutored by his elder brother while another by her parents (who were both teachers) at home. It seems that both parents and pupils have strong faith in the benefit of taking “out-of-school tuition”. As they explained,

问:你觉得补习对你有帮助吗? [Do you think tuition is helpful to you?]

答:有.因为可以加强,增加我的知识,然后有不明白的地方可以问补习老师

[Yes, because can improve my knowledge, anything I don't understand, I can ask the tuition teacher.]

(Pupil H2, boy, Primary 5)

我本身很忙的，所以只有靠补习老师的时间来安排给他们多读而已。

[I myself is very busy, so I have to depend on the tuition teacher to get them to read more]

(Parent H6, businesswoman)

他们比较懒散。我们要要求他们，他们就会做。 [They are relatively lazy, we need to force them, and they will do]

(Parent H7, goldsmith)

Thus, the data reflect that pupils are happy to have extra coaching from their tuition teachers while some parents regarded the tuition teachers as a replacement of their parental role in their children's education.

Even the headmistress of school H generally encourages her pupils to take tuition outside school if their families are financially affordable. While the deputy headmistress of School B believes that out of school tuition is only necessary for those average or weak pupils. She believed that tuition could also be helpful for pupils who do not have anybody at home to guide them. For the clever ones, they should not be burdened with tuition. However, she noticed that many parents today send their children for out-of-school tuition because they are afraid that their children will lose out if they do not. Some parents send their children for tuition as early as kindergarten. She observed that some pupils tend not to pay much attention in class because they have learnt faster in their tuition class. As a result, these pupils sometimes create disturbance in class. This represents the possible adverse effect of out-of-school tuition.

While the mathematics teachers of both schools generally denied the necessity of taking out-of-school tuition, as they believe that their schools have provided sufficient drill and practice for their pupils.

Nevertheless, they do believe that tuition can help those pupils who are weak in mathematics. Anyhow, most parents and pupils of both schools seem to have strong faith in the benefit of tuition as a way to provide more practice in mathematics. Again, their actions match what they believe about the importance of drill and practice in the learning of mathematics.

Memorisation of multiplication tables

Again, all the four parties: school administrators, mathematics teachers, parents and pupils of both schools agreed upon the importance of memorising multiplication tables. This is especially emphasised by the mathematics teachers and school administrators. The deputy headmistress of School B strongly believed that if a pupil cannot memorize multiplication tables, then it would be very difficult for him/her to do mathematics.

因为二年级开始,我们的乘法表就放进来了,如果乘法表不能背啦,你不背的话啊,你根本就不用做数学了.[because from Primary Two, we have included the reading of multiplication tables. If you can't memorize the multiplication tables, then you don't have to do mathematics anymore]

(deputy headmistress, School B)

In both schools, all pupils are drilled to memorize multiple tables since Primary two. They start from multiplication of two. All pupils are expected to master the multiplication tables to 9x9 at the end of Primary Two. For those pupils of higher ability, they are encouraged to memorize until 12x12. Some of the strategies suggested by the mathematics teachers include:

1. reciting in class
2. peer tutoring – the better student coaches the poorer student to recite every day before the class starts.
3. Pupils are asked to “dictate in silent” and write down the whole multiplication tables.

Thus, generally the majority of the pupils would have mastered the multiplication tables by Primary 4 and this has somehow enhanced their learning of mathematics. For those who are still weak in memorising multiplication tables, one of the mathematics teachers interviewed has offered other strategies as discussed below.

Culture or language advantage on mathematics

To aid memorising of multiplication tables, one senior mathematics teacher of School B (B1) has used his own creativity to design some strategies to help his pupils. He pointed out that in the Chinese culture, there are some cultural advantages, especially in terms of language. Besides the Chinese number system being more systematic and easier for pupils to remember, he also makes use of “rhyme”(口诀) and certain “sound” of Chinese language and dialects to help pupils memorize multiplication tables and certain mathematical facts and rules. For examples:

- 有括号()不放过,无括号()找乘除,先乘除后加减。[got bracket don't miss it, no bracket check for x & ÷, multiply and divide before add and minus]
- $8 \times 8 = 64$, use the sound as related to 爸爸全都六十四岁'. “我们就说你的爸爸全都六十四岁了,然后那个爸爸是不会错了!他爸爸几岁,他直接就可以讲六十四岁”. [We tell that all your fathers are 64 years old. So when they were asked how old is your father, they will say 64] Note: “8” sounds as 爸, so 88 sound as 爸爸 (father).
- $7 \times 7 = 49$ 应该七七四十九才结婚 [seven seven forty nine years old only get married]
- $3 \times 8 = 24$ 比如说这个三八,怎样会变餓死?
Note: ‘三八’ (san pa) in Hokkein dialect means “stupid” or “idiot” while 餓死 means die of

hunger. Therefore,* if you are stupid or idiot, you may die of hunger. Hokkien is a common dialect for the Chinese in the northern region of Malaysian

- $3 \times 7 = 21$ 不管你三七二十一 [Don't care three seven twenty one, we better run!!]
- 所有五的,你就是五零,五零,五零,其他号码不可以写 [for multiplication of five, it is always 5 & 0, others don't write]

Thus, by taking advantage of language coupled with his creativities, mathematics teacher B1 has helped his pupils to memorize multiplication tables in a much more fun and easy way.

Implications and Conclusion

The findings so far thus illuminate that all the four parties of these schools: administrators, mathematics teachers, parents and pupils, seem to share a similar belief of “practice make perfect”. Consequently all of them work towards this goal by providing and supporting a learning environment that stresses on “practice”, “tuition” and “memorisation of multiplication tables”. The administrators encourage the pupils to buy extra workbooks and exercise books as well as to go for out-of-school tuition. The mathematics teachers provide a lot of drills and practice in school. The parents provide financial and moral support to achieve the same vision. The pupils too have no complaint over the heavy workload. They seem to share the same confidence that as long as they work hard, practice a lot, they are going to achieve good results in mathematics. Findings of this study thus, in part, reconfirm findings by Munirah and Lim (1996) that most Chinese medium schools favour more drill and practice, as well as more homework and tuition.

However, this study also indicates that a lot of drill and practice do not mean rote learning or learning without understanding. Students are first taught a mathematical concept, and then followed by doing many similar exercises with increasing degrees of difficulties. Exercises that provide similar practice or related to a common concept or skill will strengthen students' understanding of the concept or mastery of the skill. In fact, these drill and practice may be considered as aiding the students to build up “a schema”(Skemp, 1971). After constructing a schema, giving exercises with increasing difficulties will help students to expand their schema or making generalisation. This is as suggested by Skemp as a powerful of mathematical generalisation as illustrated below:

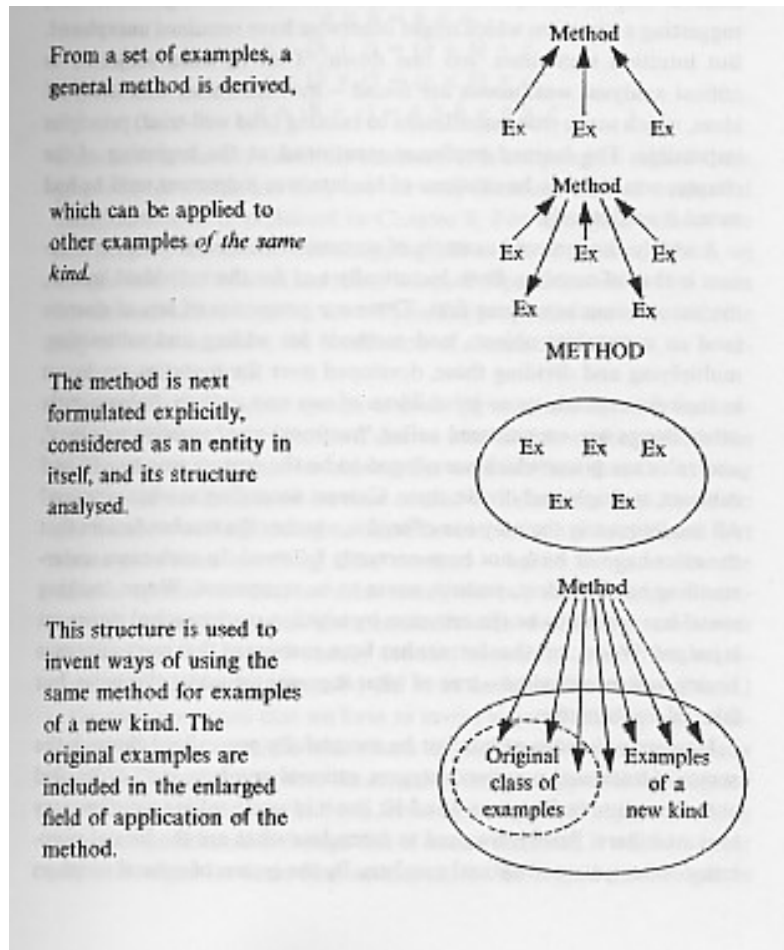


Figure 1: Process of mathematical generalization (adopted from Skemp, 1971, p. 57)

Moreover, the concerted efforts of all parties seem to shape the culture of mathematics learning in these schools, and consequently warrant a higher achievement in mathematics. In brief, the culture of mathematics learning as related to all the four parties may be depicted as in Figure 1.

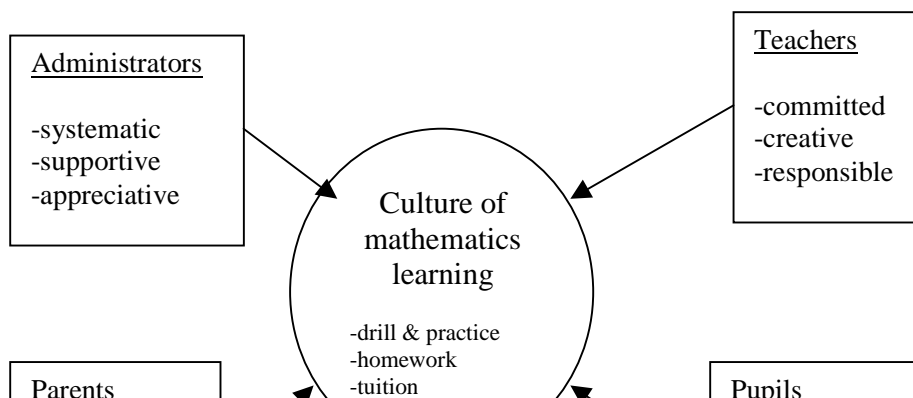


Figure 1

In addition to all pupils, findings suggest that help pupils as well as their confidence and interest in mathematics. al advantages in terms of culture or language. However, the other language to mathematical skills as

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