NUMERACY AND FOLK-ACCOUNTING:

THE LEARNING OF ECONOMIC SKILLS IN RURAL CHINA AND TAIWAN

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1. BACKGROUND

The project is best outlined with reference to two distinct yet overlapping themes:

(1) the learning of numeracy, and

(2) the learning of economic skills.

1.1 NUMERICAL KNOWLEDGE

Anthropologists have paid relatively little attention to human numeracy. As Thomas Crump suggests, this seems especially surprising in the case of East Asia, where numerical knowledge is culturally valued and highly salient in the flow of everyday life (Crump 1990, 1992). In rural China and Taiwan, learning about numbers plays a central role in processes of enculturation/socialization. But this has never been studied in any depth by anthropologists.

By contrast, cognitive psychologists and others have conducted a great deal of research in recent years on numerical cognition and mathematical learning. Karen Wynn, for instance, has examined the extent to which human infants possess innate abilities to conduct simple addition and subtraction tasks (Wynn 1995; for overviews of cognitive science research on numeracy see Butterworth 1999, Deheane 1999). However all specialists in this field stress that numerical knowledge is profoundly shaped by socio-cultural factors – including language, technologies for calculation, pedagogical systems, and the real-world contexts in which numbers are actually put to use (cf. the cognitive anthropologist Lave 1988).

Within the interdisciplinary literature on ‘numeracy and culture’, the Chinese case is seen to be especially interesting (cf. Geary et al 1993, Geary 1994). Studies have focussed, for example, on the particularities of Chinese counting words, and on the organization of mathematics teaching in China and Taiwan (cf. Stevenson & Stigler 1994). However, this literature largely fails to address two important issues which have been taken up in this ESRC project:

(1) how numerical knowledge in China/Taiwan is learned and used in settings outside of schools; and

(2) the relationship in China/Taiwan between numerical knowledge and participation in economic life.

1.2 ECONOMIC KNOWLEDGE AND SKILLS

In his critique of economic theory, Hodgson (1999) suggests that insufficient analytical weight has been given to processes of learning and to the distribution of knowledge. Such matters are not entirely ignored (cf. the social psychology literature on economic socialization), but they are often treated as epiphenomenal – i.e. as not being at the core of economic life. Anthropologists, for their part, have given considerable attention to learning in relation to economic agency – for instance, through studies of apprenticeship, enskilment, and ‘distributed cognition’ among groups of co-workers (e.g. Palsson 1994, Hutchins 1995). However, such studies are primarily seen as contributions to our understanding of learning and cognition, and have not lead to a fundamental rethinking of our economic models.
In the specific case of Chinese economic life, anthropologists have focused on a range of themes, including the role of cultural values in economic processes (e.g. Yan’s analysis of reciprocity [1996]); the social organization of production (e.g. Oxfeld’s analysis of family firms [1993]); and consumption practices in the wake of post-Mao economic reform (e.g. Davis 1999). But again, relatively little direct attention has been given to the learning of economic skills, or to the distribution of economic knowledge (although see Bray 1997).

This seems unfortunate, because economic agency – participation in the give and take of economic life – is significantly premised, in China as elsewhere, on certain types of learned abilities. Even with specific reference to the question of numerical knowledge, these abilities range surprisingly widely in China and Taiwan. They include such things as the ability to count out money, to make accurate measurements, and to ‘account’ (in formal and informal ways) for economic transactions. They also include the ability to engage, at times, in moral accounting: a type of reckoning in which numbers – say prices – may be seen to be morally loaded. For people in rural China and Taiwan, becoming a competent economic agent is partly dependent on the mastery of a surprisingly complex body of numerical and number-related knowledge.

2. OBJECTIVES

Against this background, the project set out to achieve four main objectives:

1) To collect, through participant-observation fieldwork in rural China and Taiwan, empirical data on learning processes related to numeracy and economic life.

A substantial amount of empirical data was collected during seven months of fieldwork. See ‘methods’ and ‘results’ sections below for full discussion.

2) To use these data to contribute to the development of interdisciplinary theories of ‘numeracy and culture’.

The project focussed on elements of numerical learning overlooked both in anthropological accounts of China, and in cognitive science accounts of numeracy. See ‘methods’ and ‘results’ sections below; see also the attached draft publication: ‘Language and numerical learning in rural China and Taiwan’.

3) To use these data to challenge existing theories and accounts of the nature of Chinese economic life.

The project focussed on issues of learning overlooked in most anthropological accounts of Chinese economic life. An international workshop specifically on this theme – ‘Learning and the Chinese economy’ – was convened at the LSE in May 2002. This will result in several publications (see ‘outputs’ section below, and also the attached draft publication: ‘Teacher Ho and Little Yang: learning “economic techniques” in rural China’).

4) To use these data to contribute to anthropological theories of the ‘cultural economy’ – by focusing attention on the problem of learning.

This is an extension of objective 3, above. Here the aim is to make the lessons of a China/Taiwan-specific project relevant within general anthropology. This is to be achieved through publication of the workshop volume, a further monograph in preparation (see ‘outputs’), and a further workshop examining learning and economic agency in cross-cultural perspective.
3. METHODS

During 2000 and 2001, participant-observation fieldwork was conducted for seven months in China and Taiwan. This research built on previous projects (1987-9, 1992-3 and 1996) which focussed on child development, enculturation, informal learning and schooling (cf. Stafford 1995, 2000a).

Fieldwork was carried out in two Han Chinese communities: South Gate, a coastal township (xiang) in southwestern Taiwan with an economy based largely on fishing and fish-farming; and Protected Mountain, a farming township (xiang) in China’s southwestern Yunnan province, with an economy based largely on pig-husbandry, small trade and remittances from migrants.1 In each of these communities, in the context of general ethnographic research, specific attention was given to (1) popular ‘numerical culture’ (e.g. as expressed in the domains of everyday discourse and religious ritual); (2) the learning of numerical knowledge at home and in schools (including an analysis of mathematics textbooks); (3) the learning of economic skills and the conduct of economic life, with special attention to numeracy-related practices such as ‘folk accounting’ and haggling.

The outcomes from fieldwork are discussed below. However one methodological innovation should be noted here. During the course of research I began to focus on the issue of ‘relevance’ (as this term is used by Sperber & Wilson) in relation to numerical cognition. In order to investigate this empirically, I devised a psychological task – to quantify the ability of participants to recall numerical information embedded in a drawing. Although this task was devised primarily for heuristic purposes, the outcomes (discussed in 4.2 below) have been extremely interesting, and I am currently exploring ways of expanding this portion of the research in future projects.

4. RESULTS

4.1 General ethnography of numbers

A large quantity of descriptive ethnographic data was collected in China and Taiwan on aspects of numerical culture. This ranges very widely, but includes data on: (1) the ways in which infants and children are first exposed to numbers at home and in the community; (2) the development of basic and more advanced arithmetical and mathematical skills via public and private schooling; (3) the use of numbers in economic life; (4) the use of numbers in religious rituals and divination; (5) the use of numbers in public calligraphy, poetry and art; (6) the use of numbers in popular and official discourse; (7) the use of numbers in games and gambling.

To cite one example in more detail: when people in Protected Mountain and South Gate organize and talk about religious rituals (e.g. the ‘swing god’ [qiu shen] festivities which are held annually in Protected Mountain), they seem especially interested in the numerical aspects of what they are doing. How many times should one bow before the altar? How many sticks of incense should be held? How much spirit money should be burnt? How much money should be spent on the ritual feast? How many dishes should be eaten at it? How many people should sit at each table? How many families have given money towards the ritual? How much did each family give? After the ritual, how should the offerings be divided among the participants? The answers to these ‘numerical’ questions are often sought through divination – itself sometimes carried out via number-related procedures (the drawing of numbered sticks, the dropping of divination blocks, etc.)

1 South Gate and Protected Mountain are pseudonyms. To protect the privacy of my informants, all place and personal names will be changed in publications arising from this research.
When ethnographic examples of this kind – and dozens more could be given – are put together, the picture which emerges is of a general fascination in rural China and Taiwan with numerical information. People seem to be talking about numbers all the time, in relation to prices and wages, examination results, rituals, lotteries, etc. Taking this one step forward, it can be said that numbers play an important role in Chinese ‘folk cosmologies’ – i.e. in popular ways of thinking about the universe and the position of humans within it. Here numbers are significant because among other things:

- **Numbers provide a way of talking about price or value** – and by extension about success and ‘prosperity’ (fu), a key area of popular concern.

Concrete examples: prices and wages are stated in numbers; haggling involves numerical abilities.

Abstract example: because numbers are felt to be meaningful in China – e.g. odd numbers are used in offerings to the dead, and are therefore sometimes problematic – and because economic exchange is felt to be morally loaded (cf. Stafford 2000b), apparently simple price negotiations may become very complex. For a further discussion of haggling, see the attached paper ‘Teacher Ho and Little Yang’.

- **Numbers provide a means of structuring information about the world.**

Concrete example: official and popular discourse redundantly comes in the form of numerical lists. For instance, people in Protected Mountain live in ‘ten star civilized households’ (shixingxian wenming hu) which are honoured for expressing ‘the five loves’ (wu ai).

Abstract example: in its cultural forms, the Chinese tradition often deploys an explicitly ‘structural’ logic (in the Levi-Straussian sense). This is seen, for example, in the poetic calligraphy (duilian) which is found around virtually every doorframe in rural China during the lunar new year, and which is built up from oppositional couplets. Within Chinese ‘structural logics’ of this kind, numerical information plays an important role.

- **Numbers provide a means of talking about the ‘fate’ (ming) of individuals within the flow of time.**

Concrete example: calendrical information is conceived numerically in China – not least because month-names and day-names are expressed numerically in colloquial Chinese (January is ‘one-month’ [yiyue], February is ‘two-month’ [eryue], etc).

Abstract example: numbers provide a way of ‘calculating’ (suan) the ‘fate’ (ming) of individuals in time. This is typically done through analysing the ‘eight characters’ (bazi) – which specify, in astrological terms, an individual’s time of birth – in relation to the ‘five phases’ (wuxing) which characterise the transformative processes of the universe.

I have so far emphasized two things about numerical culture in Protected Mountain and South Gate. The first is that numbers play an important part in everyday conversations and practices; ordinary people appear to take numbers very seriously. The second – rather more abstract – point is that numbers are pervasive in Chinese folk cosmologies. At this point, however, I should stress that the Chinese/Taiwanese fascination with numbers is subject to significant historical and regional variation. Taiwanese numerical culture is not the same as mainland (or Yunnanese) numerical culture, and the project focused as much on the differences as on the similarities. In mainland China, for instance, Maoist-era rhetoric and practice was in some respects highly numericized (cf. numerical slogans, the ‘work point’ system, production quotas
etc). If the post-Mao reform era seems equally number-obsessed, it is undoubtedly so in very different ways – with farmers talking of stock markets, lotteries, and price fluctuations.

Still, there are strong continuities in Chinese numerical culture across space and time, and the impact of this is strongly felt in rural communities such as Protected Mountain and South Gate. Against this background, I set about trying to address two questions:

1. What is the relationship between Chinese/Taiwanese ‘numerical culture’ and the development, by children, of numerical knowledge?

2. What role do (acquired) numerical skills play in the practices of Chinese economic life, i.e. in the exercise of economic agency?

4.2 Numerical culture and numerical cognition

As outlined in the attached paper, ‘Language and numerical learning in rural China and Taiwan’, children in the communities where fieldwork was conducted grow up in complex numerical learning environments. As might be expected, their early understandings of number are partly shaped by highly specific features of the Chinese language (e.g. by its tonality) and by their explicit training – first at home and later in school – in counting skills and basic arithmetic. Among other things, the project has served to:

- highlight significant features of the Chinese language which have been overlooked by those studying numerical cognition (see paper);
- collect data on explicit arithmetical/mathematical learning in the Chinese and Taiwanese countryside (previous studies have largely focussed on urban schools).

But my primary interest has been elsewhere: in the fact that children in South Gate and Protected Mountain also receive a more implicit training in numbers and mathematics through their general immersion in a socio-cultural environment (outlined in section 4.1 above) which repeatedly highlights – and tends to value – different kinds of numerical knowledge. What impact does this have on numerical cognition, and on the development of mathematical skills? It seems inconceivable that China’s highly pervasive numerical culture should not have an impact on children’s basic understandings of what numbers are. The project sought to elucidate this ethnographically – e.g. through interviews with mathematics teachers and students, and through observation of numerical learning environments in the countryside.

In order to take matters forward analytically, the project also built on the work of Sperber and Wilson (1995). Briefly, they suggest that the attribution of ‘relevance’ – intended here in a very specific sense – is a fundamental feature of human communication and cognition. Thinking involves processes of selection – knowing (perhaps intuitively because of ‘domain-specific’ abilities) or figuring out (e.g. because someone draws our attention to it) which information in a given cognitive environment merits attention. Relevance factors are at the core of why we actually engage with a particular subset of the knowledge which surrounds us.

How does this bear on the study of numerical cognition in rural China and Taiwan? I’ve suggested above that a generalized importance is attached (via shared cultural representations) to numbers in Protected Mountain and South Gate. As a starting point, I therefore hypothesized that numerical information would effectively always come, in China and Taiwan, with a guarantee of relevance. That is, numerical information would be seen – by enculturated agents – to be of intrinsic importance, virtually regardless of context.
In order to attempt to test this empirically – but primarily for heuristic purposes – I devised a simple pilot project. This was a number-recall task which made use of a drawing of a street scene in which (among other things) numerical information was embedded. A matched sample of informants from Taiwan (18 elementary school children and 16 adults) were shown this drawing for fifteen seconds, after which they were asked eight questions related to (1) colour of objects (‘what colour was the dog?’ etc); (2) written words (‘what words were written on the road sign?’ etc); (3) ‘explicit’ numbers (‘what is the car license plate number?’ etc.); and (4) ‘implicit’ numbers (‘how many birds were in the drawing?’ etc). I wanted to measure to what extent people would pay attention to information of different kinds in the drawing. In order to have a comparative data-set, the task was replicated in the UK (again, with 18 school children and 16 adults). My assumption was that participants from Taiwan, having been exposed to Chinese numerical culture from early childhood, would be more sensitive to numerical information than participants from the UK (who, as Butterworth [1999] has suggested, appear to ignore numbers at every turn).

In fact, the preliminary results – which should be treated with extreme caution given the methodological limitations of this pilot project – appear to show the opposite. The Taiwanese participants were somewhat more likely than UK participants to recall written words and the colour of objects in the drawing, and somewhat less likely to recall both ‘implicit’ and ‘explicit’ numbers. This result – which seems at odds with the ethnographic evidence – may be explained, in part, by problems of matching the two groups of participants. Sperber and Wilson themselves also suggest that it is extremely difficult to test relevance under artificial conditions – because attributions of relevance are fundamentally context-specific.

Nevertheless, the pilot project was invaluable in helping me to refine my research questions and analytical approach. Among the key issues which have arisen are the following:

- The task was based on memory (number recall etc.) and this raises the question of whether or not the ability to remember numerical information is necessarily linked to its relevance.
- The task was based on visual cues (objects in a drawing) and this raises the question of whether or not visually-prompted relevance of numerical information is the same as that of other kinds.
- The task raises the question of the ‘folk concept of number’ – namely: when we say that people are paying attention to numbers, what exactly is it that they are paying attention to? What – for them – is a number?

Having outlined the relevance task and some of the issues arising from it, I should stress that it formed only one part of the overall research. The main contribution of the project, taken as a whole, has been to position numerical learning in China and Taiwan more fully within a social and cultural context. In Protected Mountain and South Gate, children begin to develop basic numeracy within a socio-cultural setting which redundantly emphasizes the importance and value of numerical information. Among other things, Chinese numerical culture helps link up the ‘meaningless’ uses of numbers – e.g. in pure mathematical calculation – with more ‘meaningful’ ones – e.g. in the morally loaded contexts of gift-giving and exchange.

4.3 Numerical culture and economic life

The second main focus of the project was on the learning of economic skills, with special attention given to skills linked back in some way to numeracy and/or numerical culture. To this end, a substantial amount of original data was collected on economic life in Protected Mountain and South Gate, including: (1) economic histories of the two (very different) communities; (2) accounts of popular conceptualisations of exchange and reciprocity; (3) information on a range of contemporary livelihoods; (4) data (including life histories) about economic learning – i.e. on how individuals become competent economic agents; (5) information on the use of numbers in
economic life, including their use in ‘folk accounting’ (informal accounting in households and small businesses), and as a way for economic agents to ‘reckon’ their fate and fortune.

With regard to this research focus, two preliminary points should be made. The first is that in contemporary Protected Mountain and South Gate people engage in an extremely wide range of occupations, and this complicates the effort to generalize about economic learning. In order to carry out the research in any depth, it was necessary to focus on individual occupations, and on individual histories of economic learning. In Protected Mountain my detailed case studies included a farmer (who engaged in pig husbandry), two craftsmen, a small trader, and a teacher. In South Gate, my detailed case studies included a fish-farmer, a small trader, and a teacher. Needless to say, competence in fish-farming is very different from competence in teaching, and each case had to be looked at individually before comparisons could be drawn between them. The second preliminary point is that both Protected Mountain and South Gate have seen dramatic economic change in the past century. Occupations which were central to the communities a generation or two ago (e.g. salt production in South Gate) have virtually disappeared, whereas others (e.g. jade-carving in Protected Mountain) have come in and out of fashion. Under these circumstances, how is economic knowledge transmitted and learned?

As I’ve noted in the attached paper on economic agency (‘Teacher Ho and Little Yang’), certain types of simple skills appear to be learned with relative ease over the short-term – following changes in the economic landscape as they arise. But the inculcation, over the long-term, into a whole way of thinking about economic life – e.g. about the morality of exchange, or about one’s own particular place within a moral economy – is clearly much more complex. Part of this complexity arises from the fact that learning itself is constrained by the historically specific circumstances in which one lives. As a result, acts of economic learning – short-term or long-term – must by analysed with reference to the long socio-historical trajectories which make them possible in the first place.

One of the leading ideas behind my research proposal was that studies of the Chinese economy had underestimated the significance of skills and techniques, focusing attention instead on issues such as the moral basis of economic life. I wanted to reverse this priority. Going into the project I suspected – to put it in rather simplistic terms – that my informants would be more interested in things like proper accounting, and less interested in things like Confucian ethics, than the literature had suggested. To make the link back to numerical culture, I also expected them to be interested in technical skills such as accounting precisely because of the general importance attached to numbers.

These assumptions were not entirely borne out by the research. First of all, my key informants in both Protected Mountain and South Gate did not in general consider the narrowly technical aspects of their jobs to be especially significant. This may be in part because they have ‘naturalized’ the skills required to do what they do, and take them for granted. In some cases, it may be because the skills required are not, in fact, very sophisticated. On the specific question of numbers and accounting, the scale of their economic operations is normally very limited, and they usually proceed on a cash basis. As a result, they do not normally engage in long-term planning, and there is little need for sophisticated record-keeping and accounting practices.

Does this mean that numerical knowledge and Chinese numerical culture are in fact not very important to economic agency in Protected Mountain and South Gate? My answer would be that they are very important, but perhaps not in the ways I might have expected before the project began. Here consider briefly three different cases: those of Teacher Ho, Little Yang and Mrs Wang.

- Little Yang (a trader) is constantly attuned to numerical meanings, and makes strong connections – in part via numbers – between gambling, price-negotiations, economic
success, and the exigencies of fate. His relationship to numbers is not purely technical – on the contrary, numbers for him are saturated with meanings. He is also keenly aware that his shortcomings as a businessman (and former bankrupt) are directly linked to failures of technical knowledge. He now aims to be more ‘scientific’ (kexue), and this partly means relying more closely on numerical facts (e.g. about profit and loss).

- Teacher Ho, by contrast, is in some respects ‘anti-number’, in part because he is not very heavily engaged in trading activities. Although his ancestors were businesspeople – ‘Confucian-traders’, rushang – he dislikes what he sees as the avarice of today’s Chinese farmers and rural businessmen. He also explicitly situates himself within a Confucian tradition which honours classical/literary ‘learning’ (xuewen) over all other pursuits – and over the crude materialism and scientism of the modern age.

- Mrs Wang is fascinated by numbers. And although she is both illiterate and innumerate, she is felt by her family and friends to be ‘very good at business’ (hen hui zuo shengyi). A farmer’s wife, she sells pork and tofu at outdoor markets to non-agricultural workers – having been told by her family what to charge, and then trusting her customers to sort out the tricky problem of accurate payment. Her success rests, I was told, on the fact that people like her and actively ‘want to buy her things’ (yuanyi mai ta de dongxi). Her relationship to technical skills and numerical knowledge, as such, is clearly very different from that of Little Yang or Teacher Ho.

Considering examples of these kinds, a highly complex picture emerges of the relationship between the learning of economic skills in the narrow sense – including numerical ones – and the inculcation of individuals into a whole way of conceiving economic life. By shifting the focus to learning, many of the questions of economic analysis can be seen in a new light.

5. ACTIVITIES

To date, the main public activity arising from the project has been the convening of an international workshop in May 2002 on ‘Learning and the Chinese Economy’. This was held at the LSE with participants from UCLA, Stanford, McGill, Middlebury, Ottawa, Tsinghua (Taiwan), Manchester and London. The workshop was intended to help achieve objectives 3 and 4 of the project – to ‘challenge existing theories and accounts of the nature of Chinese economic life’, and to ‘contribute to anthropological theories of the “cultural economy” specifically by focusing attention on the issue of learning’.

With reference to objective 4, it is now intended to hold an additional conference at the LSE during the 2003-2004 session on ‘Learning and economic agency in cross-cultural perspective’. Funding for this will be sought from STICERD (the Suntory-Toyota Institute for Research in Economics and Related Disciplines).

Outcomes from the project – specifically those related to numerical cognition in China – have also been discussed at seminar presentations at the University of Lisbon, the University of Coimbra, and the London School of Economic; further presentations are planned at Brunel University (2003) and at a Beijing University conference on ‘mathematics and culture’ (2004).

6. OUTPUTS

The attached paper on ‘language and numerical learning’ will be published in the French anthropological journal Terrain in early 2003.
Papers from the 2002 workshop at the LSE are currently being revised for an edited volume entitled *Learning and the Chinese economy*. The attached paper on ‘economic agency in rural China’ will be a chapter in the volume.

A monograph entitled *Numbers and economic agency in rural China and Taiwan* is now in preparation. This will include four main sections on (1) Chinese numerical culture; (2) the development by children in China and Taiwan of numerical knowledge; (3) the role of numerical culture in Chinese/Taiwanese economic agency; (4) ways in which a focus on learning can reshape anthropological understandings of economic life.

7. IMPACTS

The project was envisaged as ‘basic oriented’ research, and its outcomes have been aimed at academic audiences. During the course of the project I worked in collaboration with anthropologists and students of anthropology in China, Taiwan and the UK (who in some cases have helped me as research assistants). During fieldwork, I also discussed my research plans and outcomes with local educationalists and teachers, and my hope is that the final outputs of the project – in particular the monograph on *Numbers and economic agency* – will be of interest to non-academic users and policy-makers in the UK and East Asia.

8. FUTURE RESEARCH PRIORITIES

8.1 Research on numerical cognition

I am currently liaising with psychologists and cognitive scientists about issues arising from the project. It is hoped that issues which came out of the ‘relevance’ pilot project can be addressed in future research. There is a clear need for more cross-cultural research by anthropologists on numeracy and numerical cognition.

8.2. Research on learning and economic agency

As noted above, one aim of the project has been to shift anthropological economics in the direction of studies of learning. I hope to continue pursuing this in future research projects, in part through cross-cultural comparison, and by drawing on the psychological and anthropological literature on skill.

9. REFERENCES


K. Wynn. 1995. Infants possess a system of numerical knowledge, *Current directions in psychological science* 4:172-177