

RESEARCH ACTIVITY 2: Skill acquisition: cultural differences in learning to count

In Research Activity 1 for this chapter (Skill acquisition and the Power Law), the acquisition rates of a cognitive skill (learning to count in a foreign language) and a motor skill (learning to juggle) were compared. You were required to choose a foreign language with which you are unfamiliar. If you chose Spanish (the example given) then you may have noticed that the numbering system was similar to English – each number greater than ten is represented by a new word that is a derivative of the two digits. For example, in English “nineteen” is derived from “nine” and “ten”. In Spanish, “nineteen” is “diecinueve” and is derived from “nueve” (nine) and “diez” (ten). However, note that the way the numbers are said changes slightly. For other numbers the change is greater, such as “twenty” for “two tens” and “viente” for twenty in Spanish.

If, in Research Activity 1, you chose an Asian language, such as Cantonese, you may have noticed that the numbering system was much more regular. For example, nineteen in Cantonese is “sap gau”, which is derived directly from “sap” (ten) and “gau” (nine). In other words, in Asian languages such as Cantonese the way numbers are said makes the fact that a decimal system is being used more obvious (since the numbers greater than ten use combinations of the unit numbers). In contrast, Western languages, such as English, French and Spanish, do not always use combinations of the unit numbers for referring to numbers greater than ten.

The greater regularity and consistency of Asian numbering systems when compared to Western numbering systems in itself predicts that Asian children should learn to count more quickly than Western children. Indeed, research shows Asian children perform much better than Western children in tests of mathematical ability (Stevenson et al., 1990). Miura et al. (1994) tested the prediction that the numbering systems were partly responsible for this difference in mathematical ability in 6- and 7-year-old Asian and Western children. The result was that Asian children consistently outperformed Western children.

The aim of this activity is to repeat Research Activity 1, but instead of comparing motor and cognitive skills this time you will compare your ability to learn to count in a Western language and an Asian language, both of which you should be unfamiliar with.

Instructions: learning to count in another language

First, you should identify one Western language (or one with a low-consistency numbering system) that you are completely unfamiliar with, and one Asian language (or one with a high-consistency numbering system) that you are completely unfamiliar with. You will perform the following task on both languages, beginning with either the Asian or the Western language at the toss of a coin.

You will need the numbers 1 to 20, from the language with which you have no experience, printed in word form. Draw two columns on the paper and title the first column as “Trials” and the second column as “Number completed”. Number the rows in the trial column from 1 to 30. The aim of the exercise is to attempt to learn to count (by writing the numbers) in the foreign language, with the goal of counting to 20 without a single error.

The method of learning

The following table provides a list of the numbers 1 to 20 in a number of languages. If you want to look at more then follow this link:

WEBLINK: Number systems of the world

www.sf.airnet.ne.jp/~ts/language/number.html

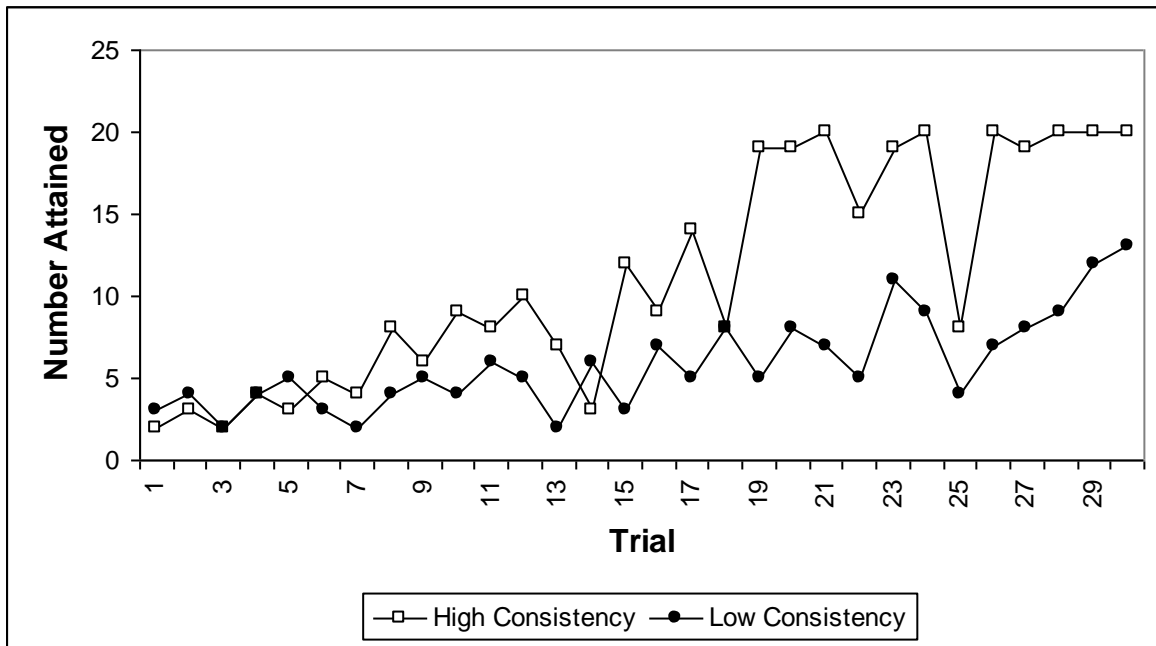
	High consistency			Lowish consistency		
	Cantonese	Arabic (feminine forms)	Japanese	Urdu	French	German
1	yat	ihda	ichi	ek	un	zwei
2	yee	ithnan	ni	do	deux	drei
3	sam	thalath	san	teen	trois	vier
4	say	arba	yon	char	quatre	fünf
5	ung	khamasa	go	panch	cinq	sechs
6	lok	sitt	roku	chae	six	sieben
7	chat	sab	nana	sath	sept	acht
8	bat	thaman	hachi	aath	huit	neun
9	gau	tis	kyuu	nao	neuf	zehn
10	sap	ashr	juu	das	dix	elf
11	sap yat	ihda ashra	juuichi	giyara	onze	zwölf
12	sap yee	ithnata ashra	juuni	bara	douze	dreizehn
13	sap sam	thalatha ashra	juusan	tiara	treize	vierzehn
14	sap say	arba a ashra	juushi	choda	quatorze	fünfzehn

15	sap ung	khamasa ashra	juugo	pandra	quinze	sechzehn
16	sap lok	sitta ashra	juuroku	solah	seize	siebzehn
17	sap chat	sab a ashra	juushichi	satrah	dix-sept	achtzehn
18	sap bat	thimaniya ashra	juuhachi	atarah	dix-huit	neunzehn
19	sap gau	tis a ashra	juuku	unees	dix-neuf	zwanzig
20	yee sap	ashrun	nijuu	bees	vingt	zwei

1. Read the list of numbers from 1 to 20.
2. Hide the numbers, and write down the word for 1.
3. Check your answer and if it is correct go to step 4, otherwise score 0 for this trial and go to step 1.
4. Hide the numbers, and write down the words for 1 and 2.
5. Check your answers and if they are perfectly correct go to step 5, otherwise score 1 for this trial and go to step 1.
6. Hide the numbers, and write down the words for 1, 2 and 3.
7. Check your answers and if they are perfectly correct go to step 8, otherwise score 2 for this trial and go to step 1.
8. Hide the numbers, and write down the words for 1, 2, 3 and 4.
9. Check your answers and if they are perfectly correct go to step 10, otherwise score 3 for this trial and go to step 1.
10. Continue this process by increasing the target number by 1 if you have made no mistakes. Each time you make a mistake, record the number you counted correctly to and go to step 1. Do this for 30 trials.

Dealing with the data

You can either plot a graph of the number attained in each trial (for each language), or you can do a log plot, to see if the data conform to a straight line (and thereby confirming to the Power Law of Practice – see Research Activity 1 for this chapter).



Graph 1. A plot of some example data.

Ask yourself

1. Which type of numbering system was acquired better, the system with high or low consistency?
2. Are the two lists of numbers equated for word length or ease of pronunciation? If not, how would this affect the data?
3. At which number does the difference appear to be greatest? Why is this?
4. Do you think the consistent numbering system would give a child native to that language a clear advantage in learning to count over a child learning to count in a language in which the numbering system has low consistency?
5. You could add a modification to the task – write out some simple addition and subtraction sums and record the time taken to provide the answer in either a consistent or inconsistent language.

Predictions

According to Miura et al. (1994), children of Asian languages that have a highly consistent numbering system learn to count, add and subtract much more quickly than children of Western languages that tend to have a lower-consistency numbering system. This predicts that it is easier to learn the numbering system of a second language when it is consistent than when it is inconsistent. This view also predicts that the time taken for a learner to provide the answers to a series of simple arithmetic problems will be shorter for the consistent language than for the inconsistent language.

References

- Miura, I.T., Okamoto, Y., Kim, C.C., Chang, C.M., Steere, M. & Fayol, M. (1994). Comparisons of children's cognitive representation of number: China, France, Japan, Korea, Sweden, and the United States. *International Journal of Behavioral Development*, 17(3): 401–11.
- Stevenson, H.W., Lee, S., Chen, C., Stigler, J.W., Hsu, C. & Kitamura, S. (1990). Contexts of achievement. *Monographs of the Society for Research in Child Development*, 55(1–2).