
Title	Cognitive activation in mathematics lessons: Relations to mathematics achievement and dispositions towards mathematics
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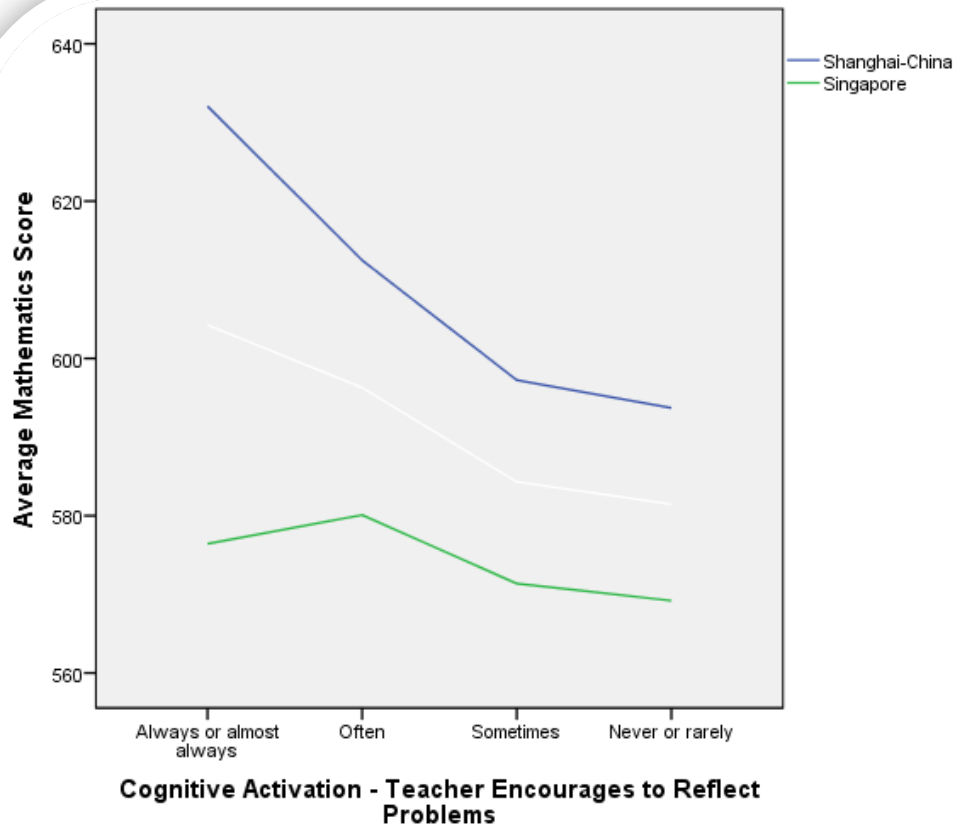
Cognitive Activation in Mathematics Lessons

**Relations to Mathematics
Achievement and Dispositions
towards Mathematics**

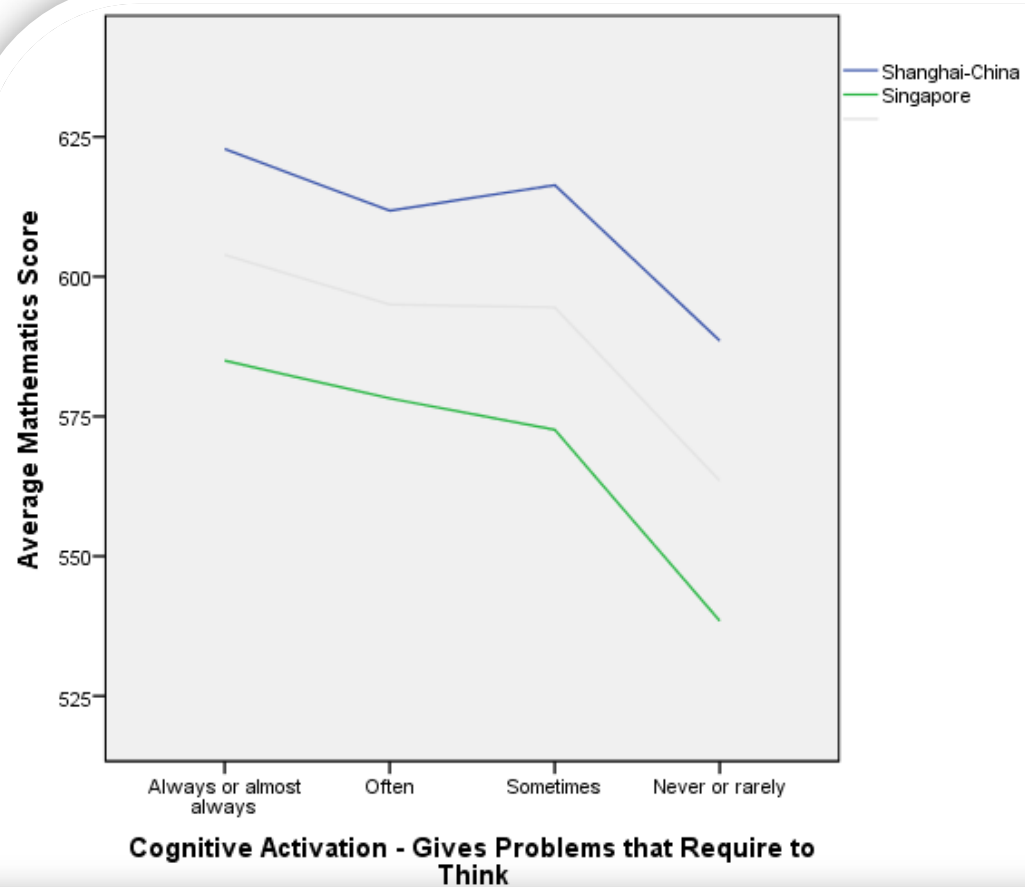
Teachers' use of cognitive-activation strategies

- A** The teacher asks questions that make us reflect on the problem
- B** The teacher gives problems that require us to think for an extended time
- C** The teacher asks us to decide on our own procedures for solving complex problems
- D** The teacher presents problems for which there is no immediately obvious method of solution
- E** The teacher presents problems in different contexts so that students know whether they have understood the concepts
- F** The teacher helps us to learn from mistakes we have made
- G** The teacher asks us to explain how we have solved a problem
- H** The teacher presents problems that require students to apply what they have learned to new contexts
- I** The teacher gives problems that can be solved in several different ways

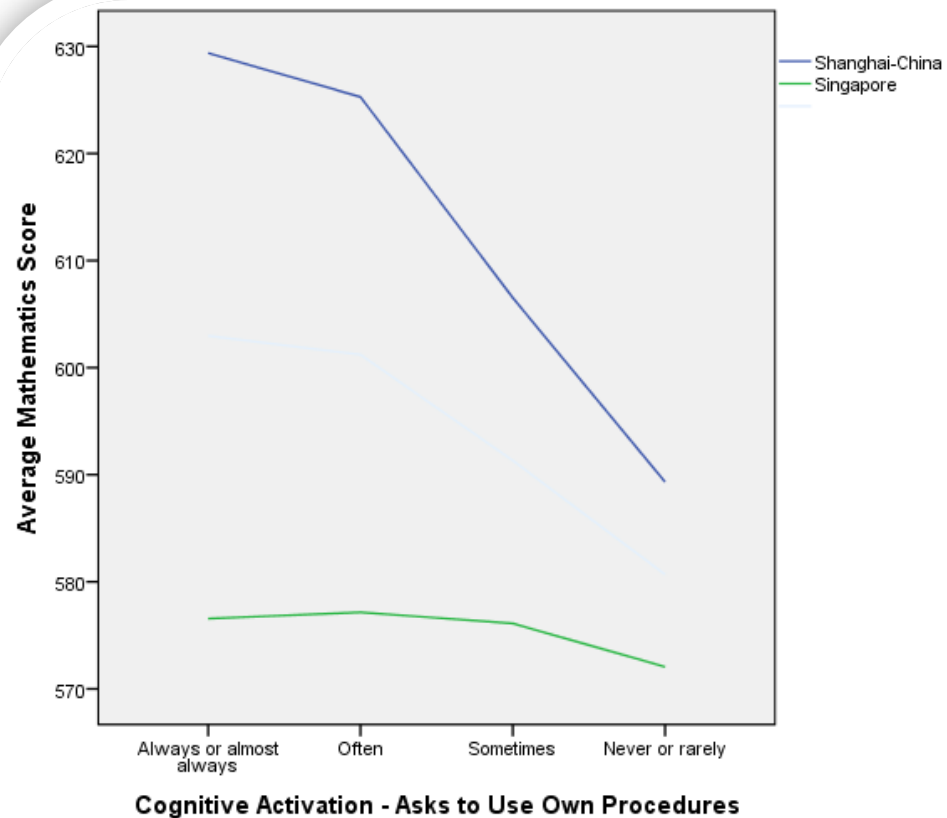
Relations to Mathematics Achievement



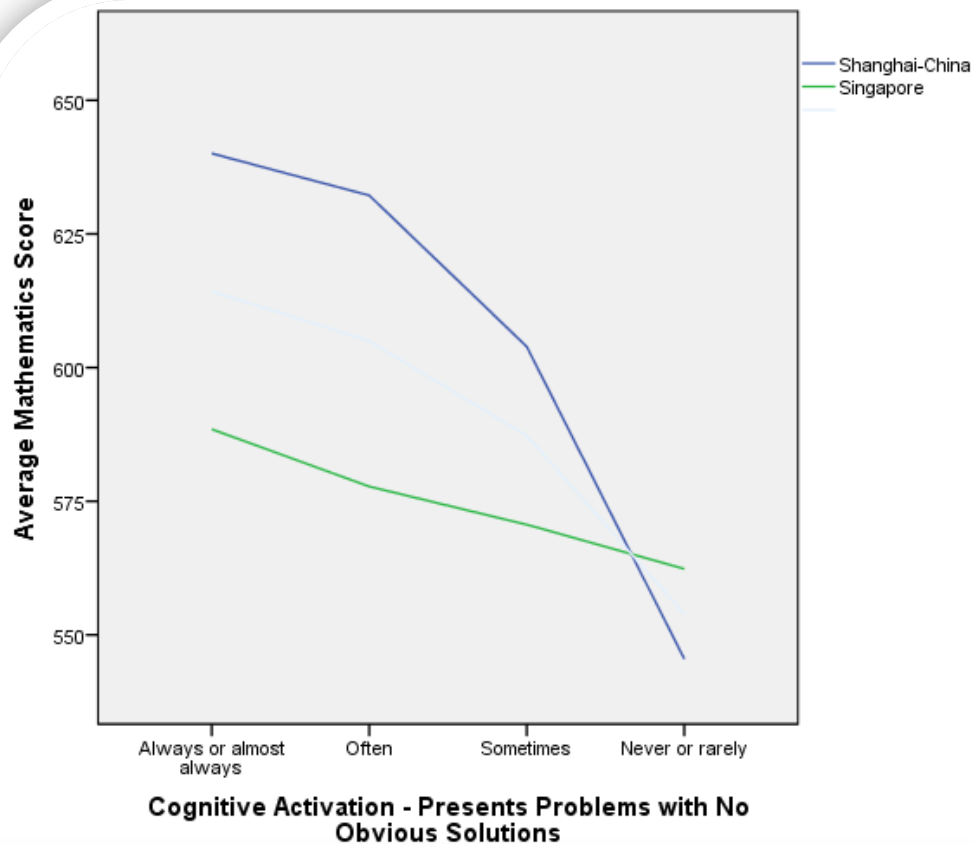
Cognitive Activation - Teacher Encourages to Reflect Problems		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	28.31	1.12	632.06	4.36
	Often	37.50	1.04	612.48	4.60
	Sometimes	28.80	.87	597.24	4.13
	Never or rarely	5.38	.36	593.70	8.92
Singapore	Always or almost always	19.69	.66	576.43	3.79
	Often	39.74	.88	580.09	2.72
	Sometimes	32.26	.87	571.37	2.94
	Never or rarely	8.31	.45	569.20	7.81



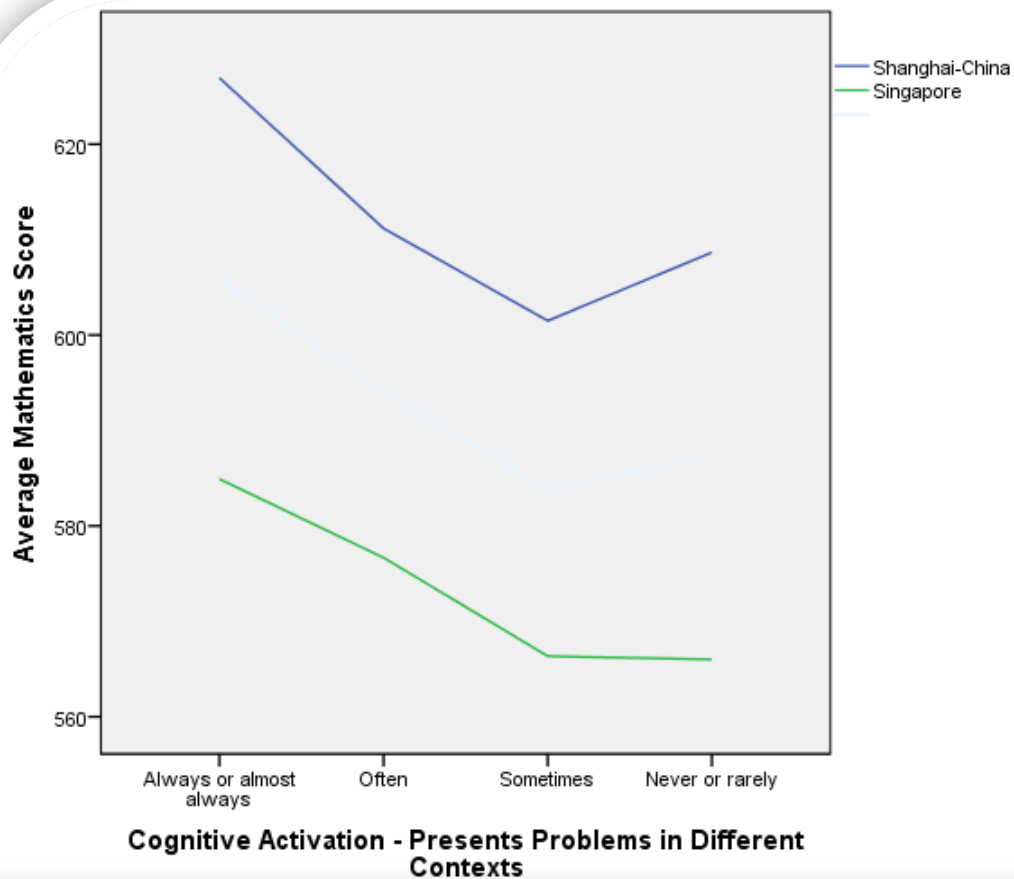
Cognitive Activation - Gives Problems that Require to Think		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	10.46	.58	622.82	6.16
	Often	20.65	.71	611.79	5.35
	Sometimes	55.94	.90	616.37	3.54
	Never or rarely	12.95	.59	588.53	5.62
Singapore	Always or almost always	21.06	.69	584.98	3.78
	Often	43.17	.77	578.23	2.73
	Sometimes	30.35	.77	572.62	3.59
	Never or rarely	5.42	.41	538.45	7.94



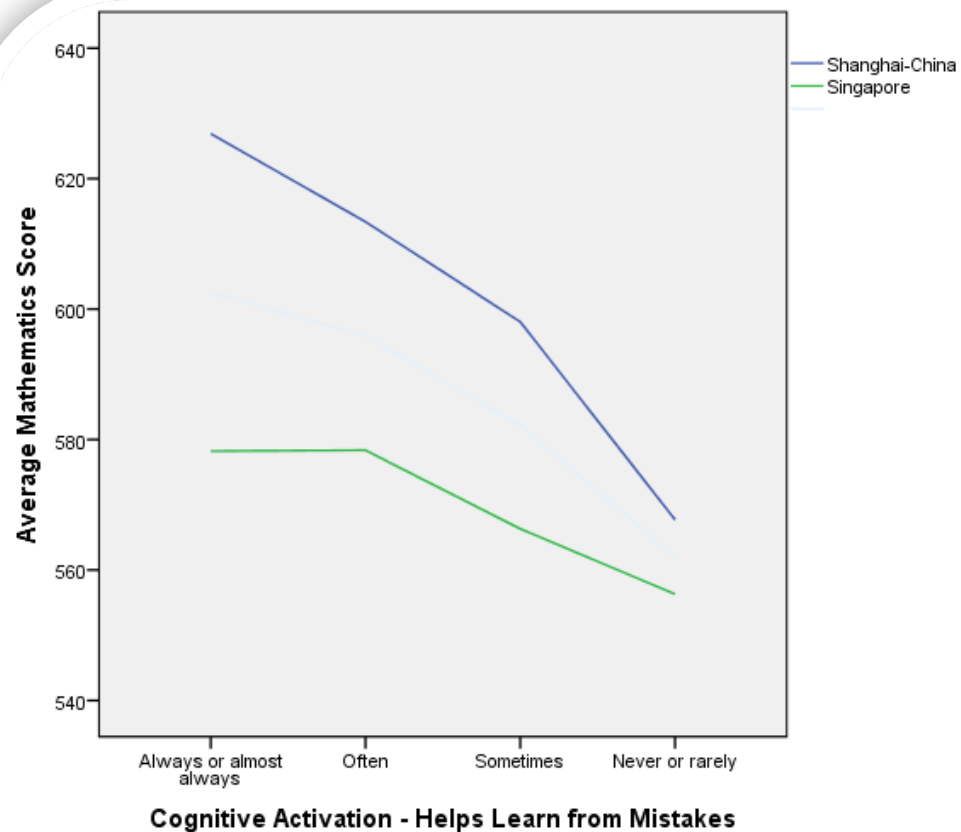
Cognitive Activation - Asks to Use Own Procedures		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	14.45	.73	629.37	6.02
	Often	28.03	.76	625.28	4.14
	Sometimes	43.44	.99	606.53	3.74
	Never or rarely	14.08	.62	589.31	5.28
Singapore	Always or almost always	13.08	.57	576.56	5.44
	Often	34.38	.82	577.15	3.38
	Sometimes	37.50	.78	576.11	2.40
	Never or rarely	15.05	.62	572.06	5.07



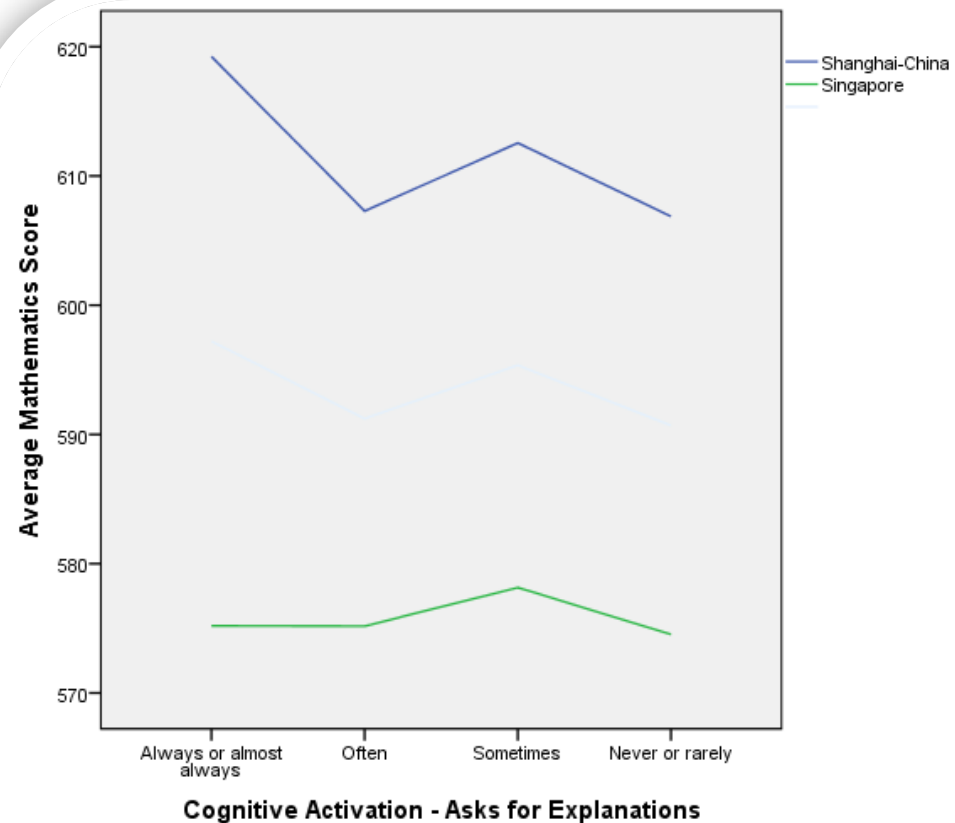
Cognitive Activation - Presents Problems with No Obvious Solutions		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	15.01	.81	640.05	6.39
	Often	32.51	.98	632.21	3.98
	Sometimes	42.43	1.01	603.92	3.32
	Never or rarely	10.05	.72	545.52	7.45
Singapore	Always or almost always	18.24	.63	588.47	3.83
	Often	38.32	.89	577.76	2.87
	Sometimes	33.92	.83	570.63	3.04
	Never or rarely	9.52	.54	562.34	5.77



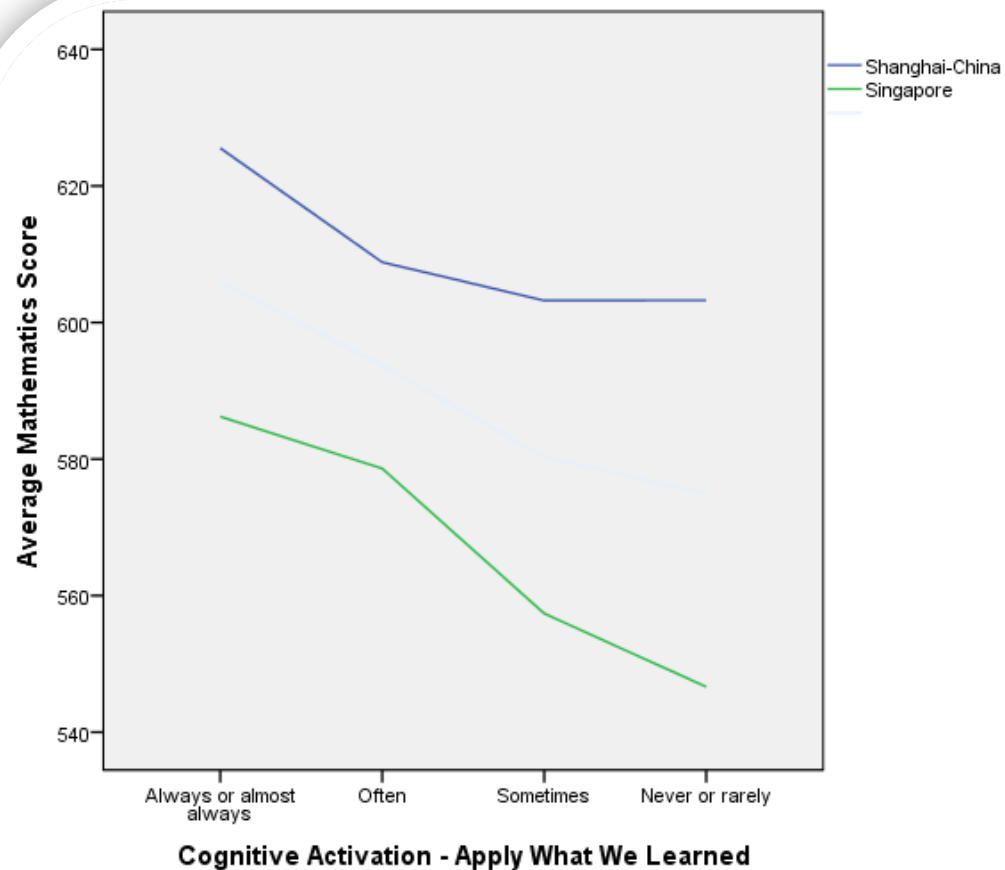
Cognitive Activation - Presents Problems in Different Contexts		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	27.56	.91	626.95	4.36
	Often	37.78	.75	611.18	3.98
	Sometimes	27.23	.80	601.50	5.04
	Never or rarely	7.44	.41	608.66	6.72
Singapore	Always or almost always	26.19	.79	584.91	3.58
	Often	45.27	.95	576.67	2.76
	Sometimes	24.01	.88	566.35	3.90
	Never or rarely	4.54	.38	566.00	9.74



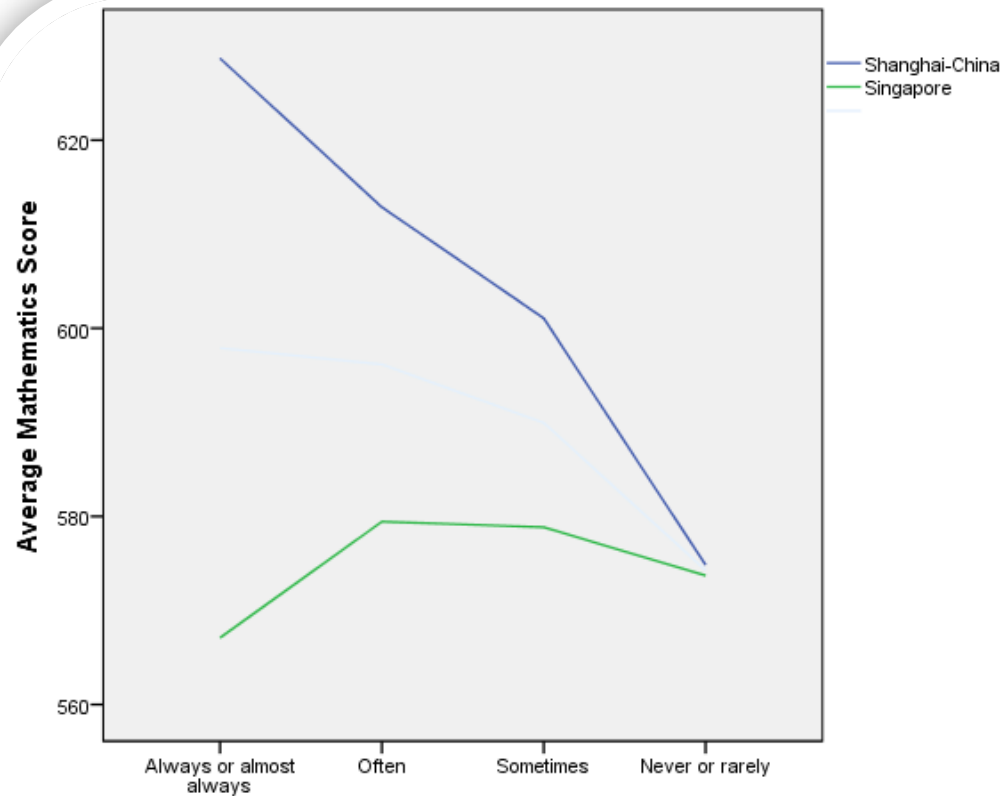
Cognitive Activation - Helps Learn from Mistakes		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	36.06	1.05	626.88	3.81
	Often	38.15	.86	613.39	4.04
	Sometimes	20.24	.67	598.04	5.09
	Never or rarely	5.55	.35	567.71	8.70
Singapore	Always or almost always	37.79	.87	578.23	2.93
	Often	43.98	.83	578.37	2.55
	Sometimes	15.79	.59	566.31	4.85
	Never or rarely	2.44	.26	556.31	13.28



	Cognitive Activation - Asks for Explanations	Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	35.48	1.04	619.23	4.02
	Often	33.60	.88	607.28	4.10
	Sometimes	24.20	.87	612.55	4.55
	Never or rarely	6.72	.61	606.87	10.01
Singapore	Always or almost always	29.70	.82	575.19	3.52
	Often	38.40	.89	575.17	2.91
	Sometimes	24.68	.76	578.16	4.05
	Never or rarely	7.22	.50	574.53	7.07



	Cognitive Activation - Apply What We Learned	Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	33.16	.91	625.54	4.30
	Often	36.53	.96	608.82	4.34
	Sometimes	24.08	.83	603.22	4.67
	Never or rarely	6.23	.40	603.25	7.91
Singapore	Always or almost always	32.03	.84	586.22	3.23
	Often	45.47	.89	578.61	2.40
	Sometimes	19.37	.64	557.37	4.24
	Never or rarely	3.13	.30	546.63	12.11



Cognitive Activation - Problems with Multiple Solutions

Cognitive Activation - Problems with Multiple Solutions		Percent	Percent (s.e.)	PVMATH (Mean)	PVMATH (s.e.)
Shanghai-China	Always or almost always	30.99	.93	628.70	4.51
	Often	35.01	.88	612.87	4.43
	Sometimes	29.53	.68	601.06	3.92
	Never or rarely	4.47	.36	574.84	8.82
Singapore	Always or almost always	26.15	.79	567.10	3.81
	Often	43.98	.92	579.45	2.44
	Sometimes	26.43	.77	578.85	3.54
	Never or rarely	3.44	.36	573.72	11.82

Relations to Dispositions towards Mathematics

Mathematics self-efficacy

Using a <train timetable> to work out
how long it would take to get
from one place to another

Calculating how much cheaper a TV
would be after a 30% discount

Calculating how many square metres
of tiles you need to cover a floor

Understanding graphs
presented in newspapers

Solving an equation like $3x+5=17$

Finding the actual distance between
two places on a map with
a 1:10 000 scale

Solving an equation
like $2(x+3)=(x+3)(x-3)$

Calculating the petrol-consumption
rate of a car

Mathematics self-concept

I am just not good
at mathematics

I get good <grades>
in mathematics

I learn mathematics
quickly

I have always believed
that mathematics is
one of my best subjects

In my mathematics class,
I understand even
the most difficult work

Intrinsic motivation to learn mathematics

I enjoy reading
about mathematics

I look forward to
my mathematics lessons

I do mathematics
because I enjoy it

I am interested in
the things I learn
in mathematics

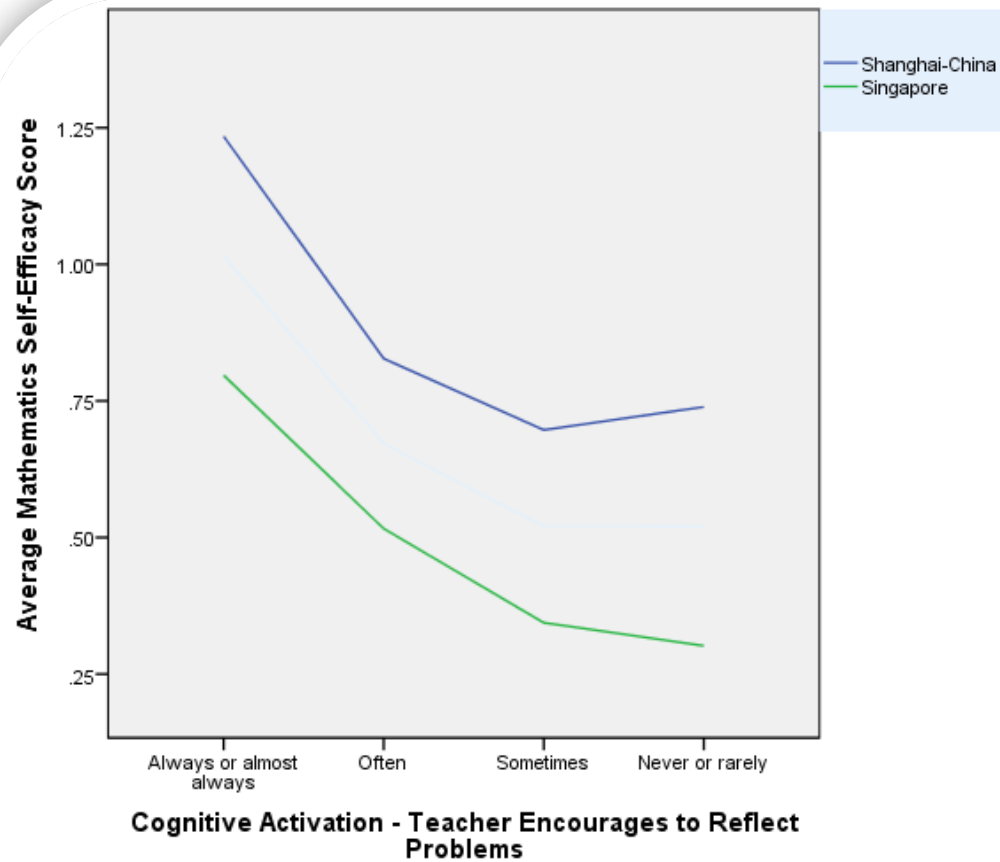
Instrumental motivation to learn mathematics

Making an effort in mathematics is worth it because it will help me in the work that I want to do later on

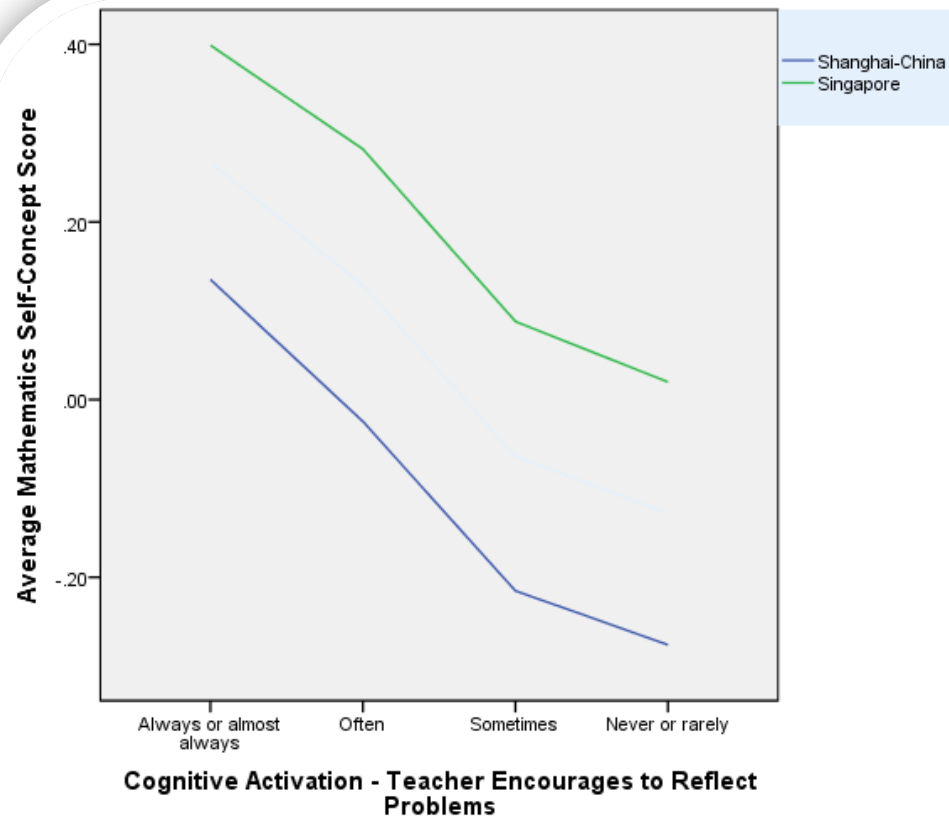
Learning mathematics is worthwhile for me because it will improve my career prospects and chances

Mathematics is an important subject for me because I need it for what I want to study later on

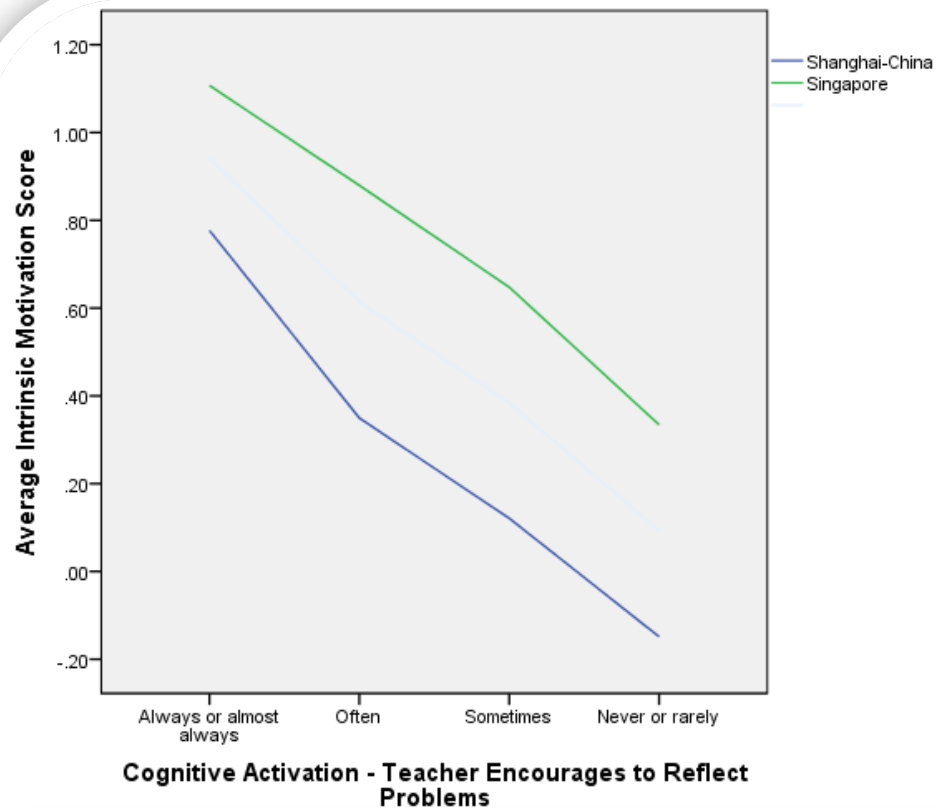
I will learn many things in mathematics that will help me get a job



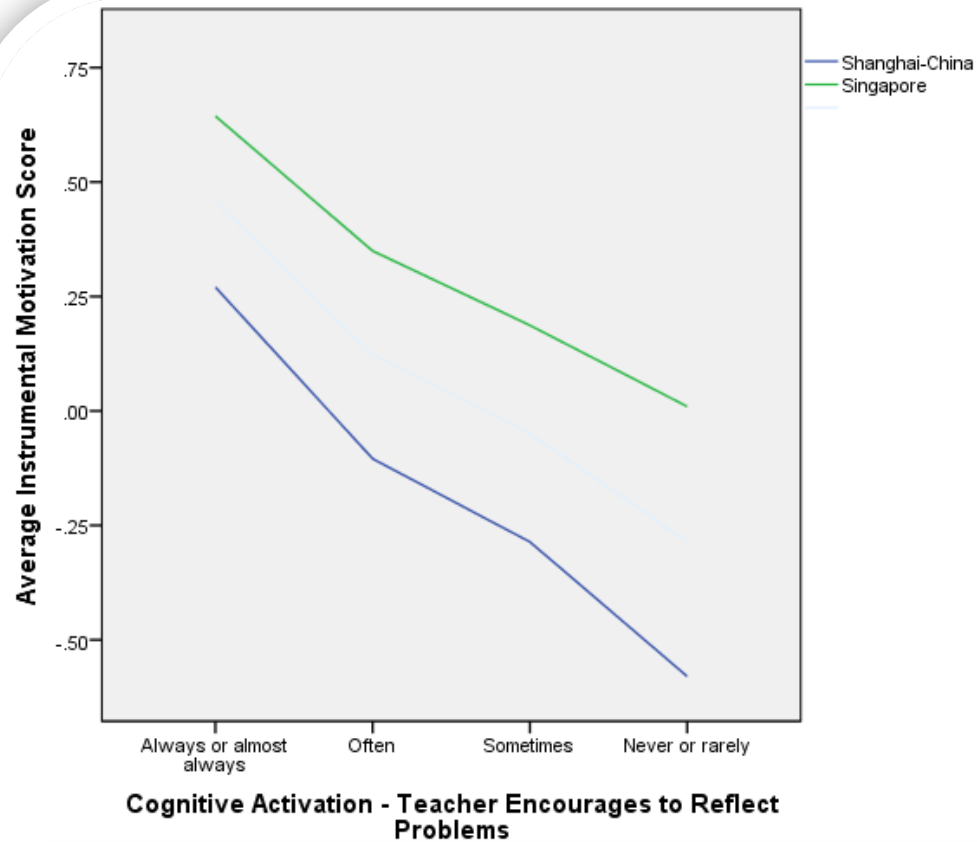
Cognitive Activation - Teacher Encourages to Reflect Problems		MATHEFF (Mean)	MATHEFF (s.e.)
Shanghai-China	Always or almost always	1.23	.05
	Often	.83	.05
	Sometimes	.70	.05
	Never or rarely	.74	.12
Singapore	Always or almost always	.80	.05
	Often	.52	.04
	Sometimes	.34	.04
	Never or rarely	.30	.09



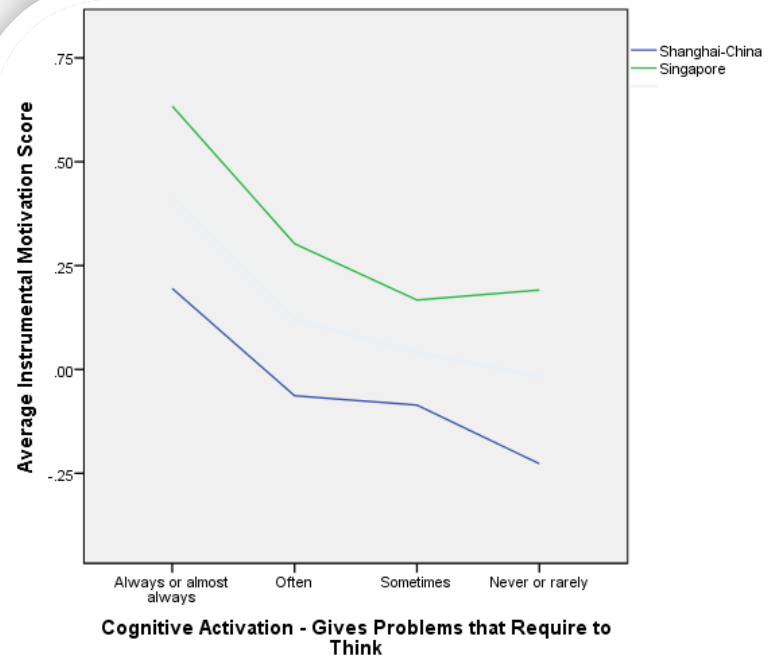
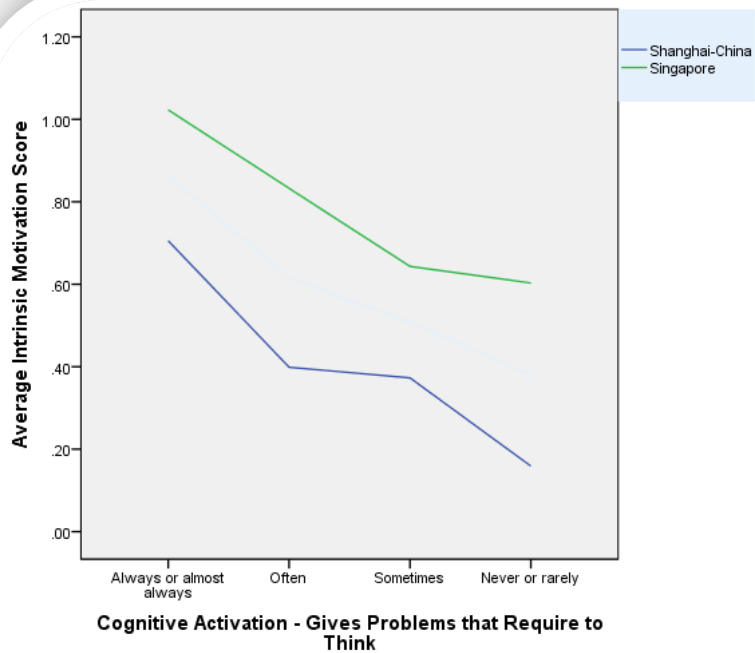
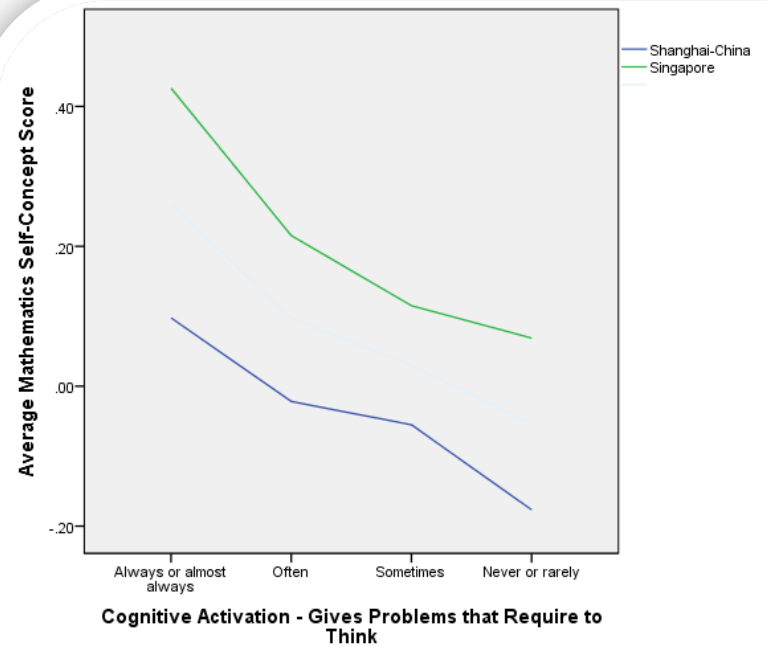
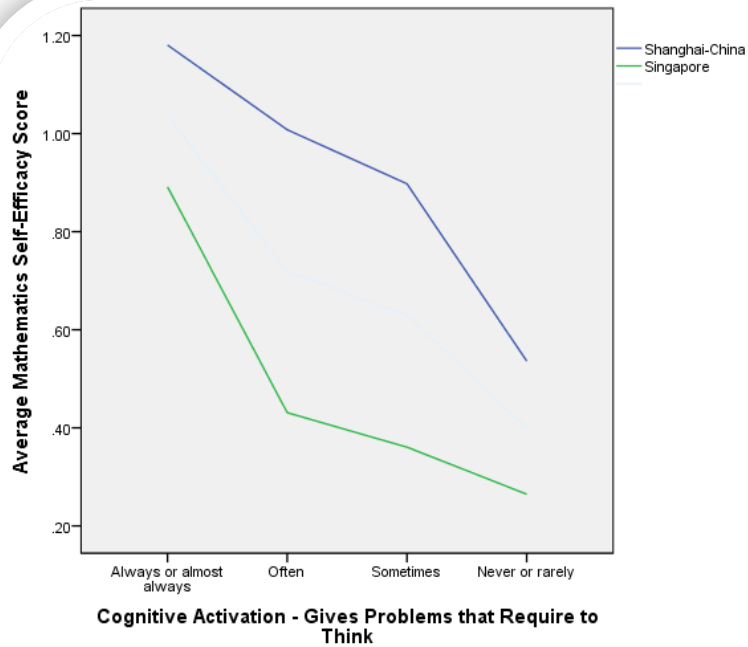
Cognitive Activation - Teacher Encourages to Reflect Problems		SCMAT (Mean)	SCMAT (s.e.)
Shanghai-China	Always or almost always	.14	.03
	Often	-.02	.02
	Sometimes	-.22	.02
	Never or rarely	-.28	.07
Singapore	Always or almost always	.40	.03
	Often	.28	.02
	Sometimes	.09	.03
	Never or rarely	.02	.07

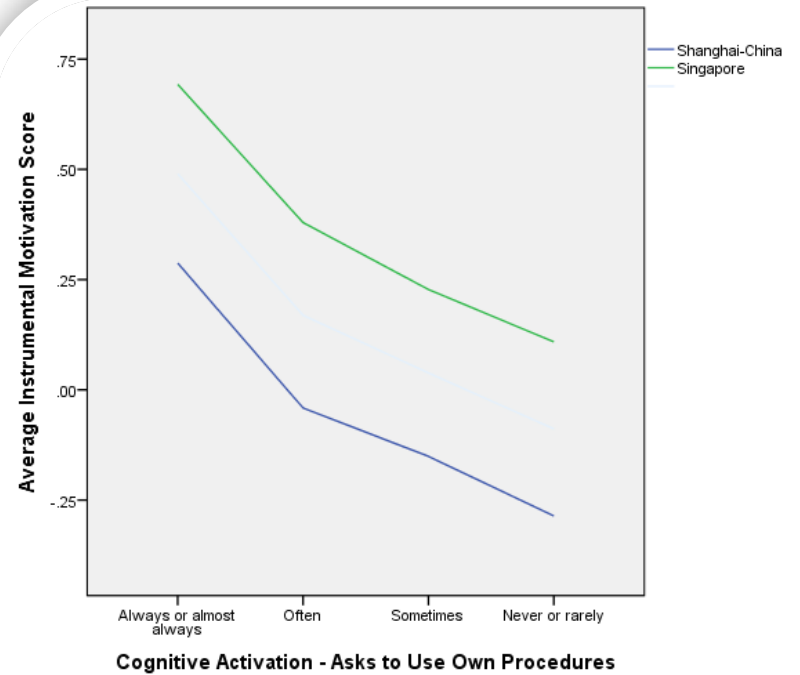
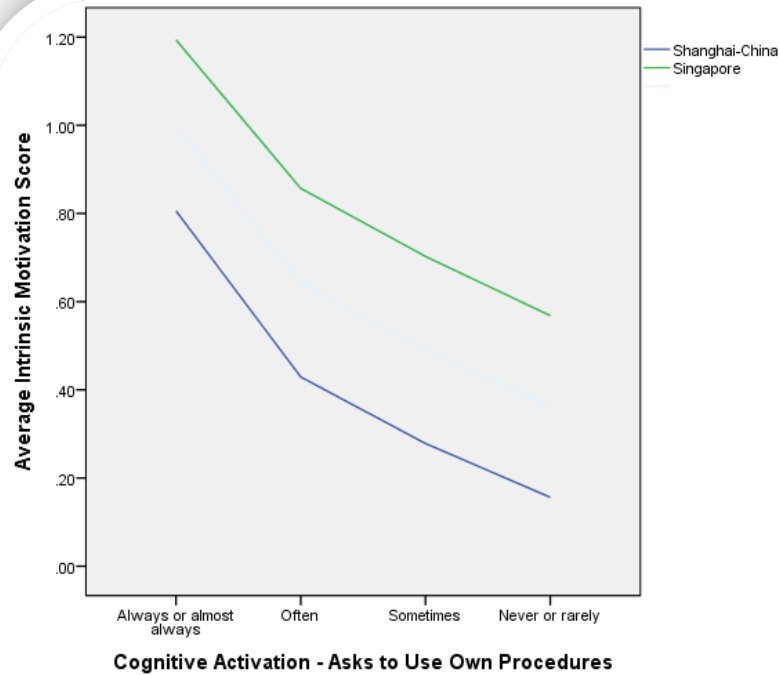
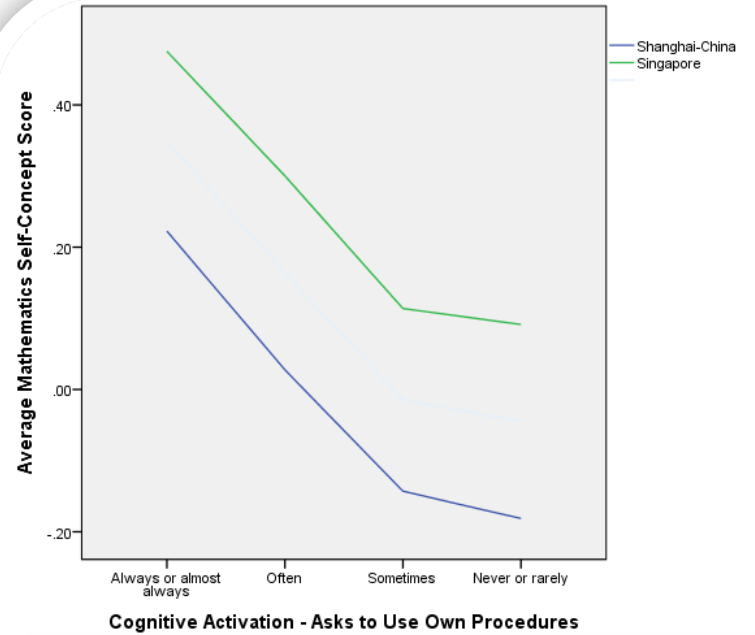
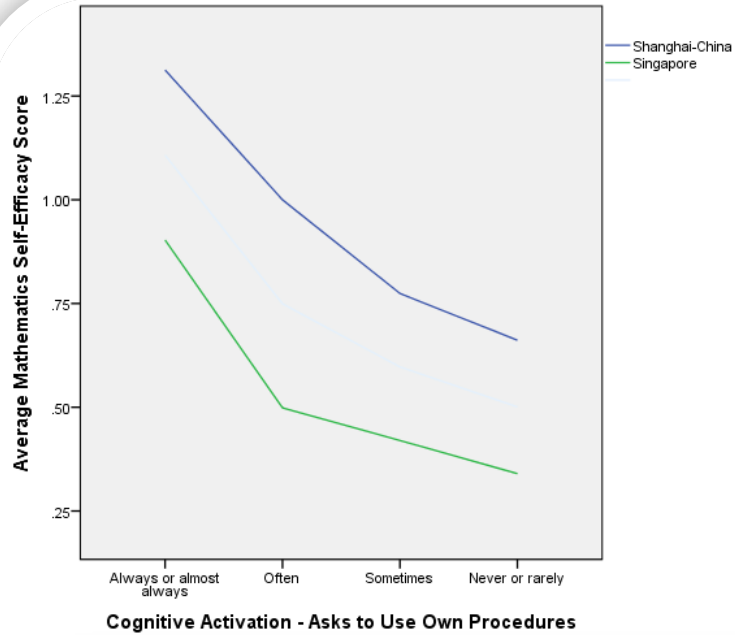


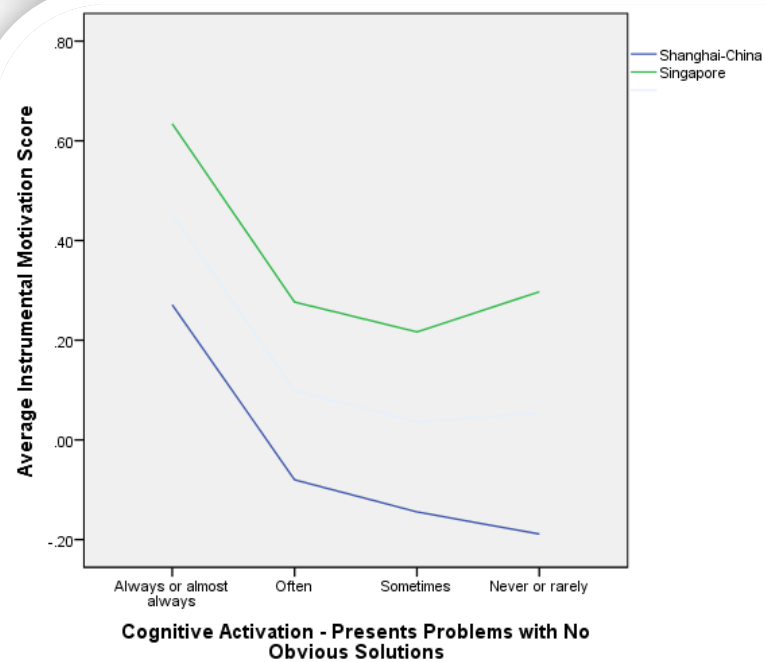
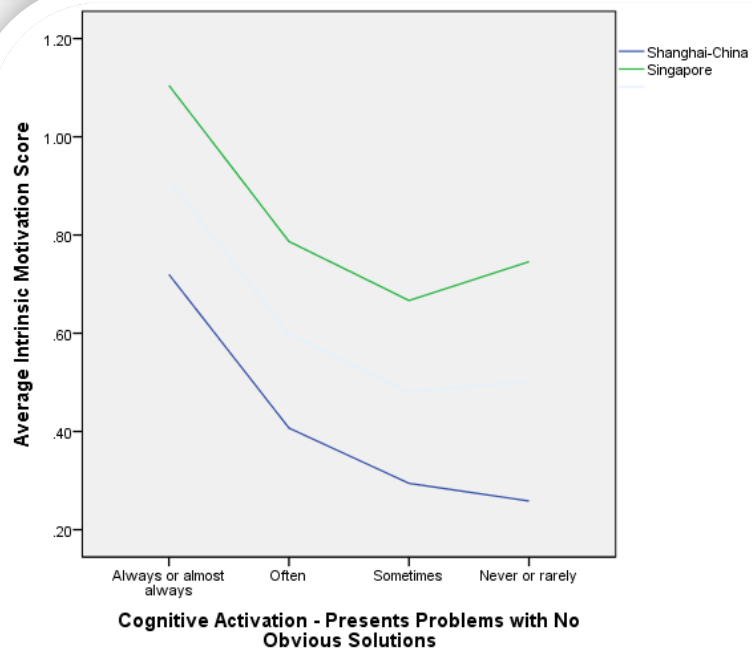
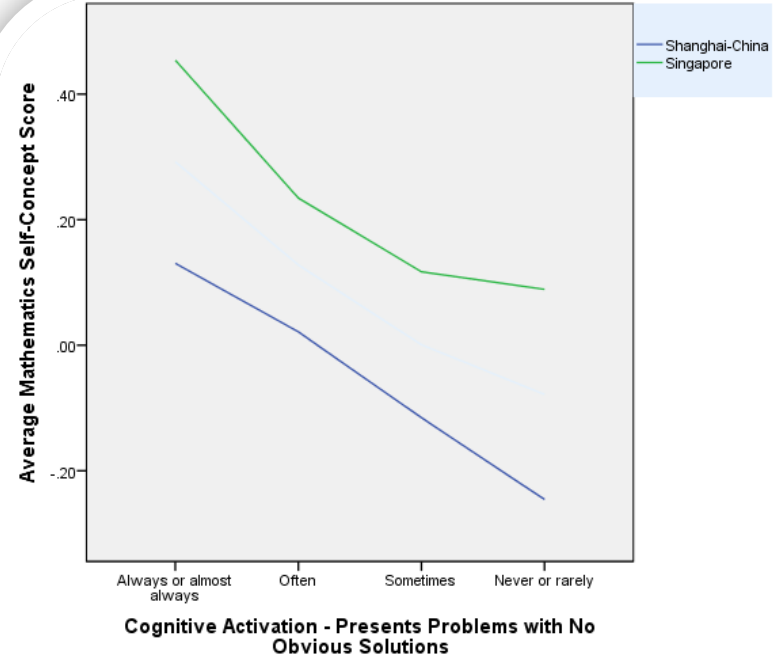
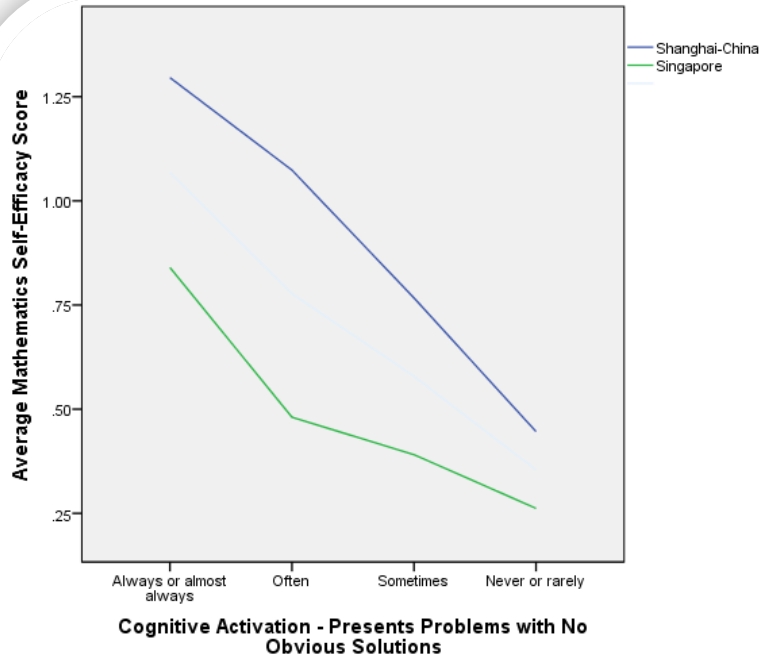
Cognitive Activation - Teacher Encourages to Reflect Problems		INTMAT (Mean)	INTMAT (s.e.)
Shanghai-China	Always or almost always	.78	.05
	Often	.35	.03
	Sometimes	.12	.05
	Never or rarely	-.15	.11
Singapore	Always or almost always	1.11	.05
	Often	.88	.03
	Sometimes	.65	.04
	Never or rarely	.33	.09

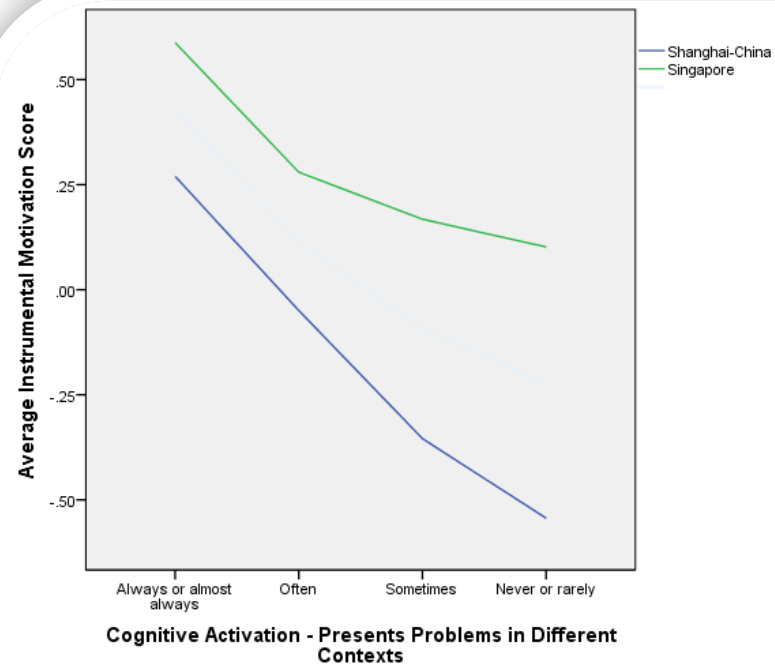
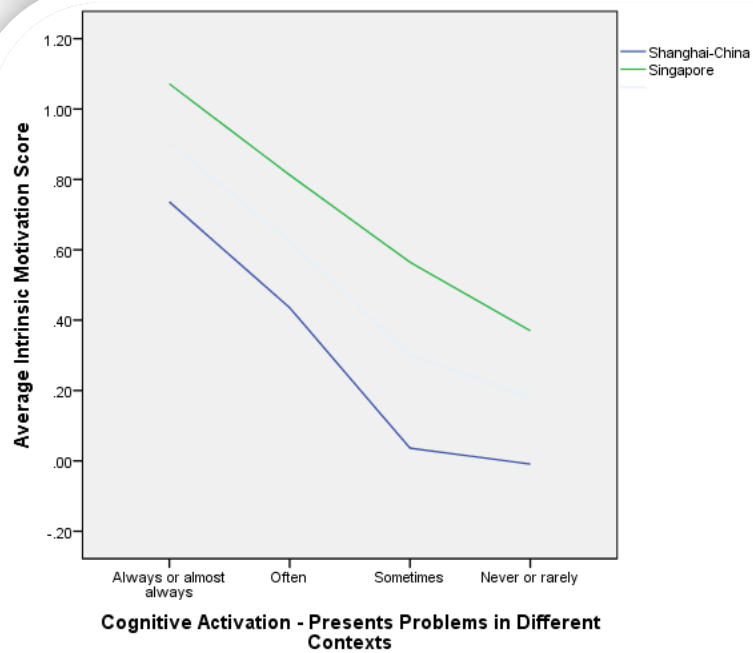
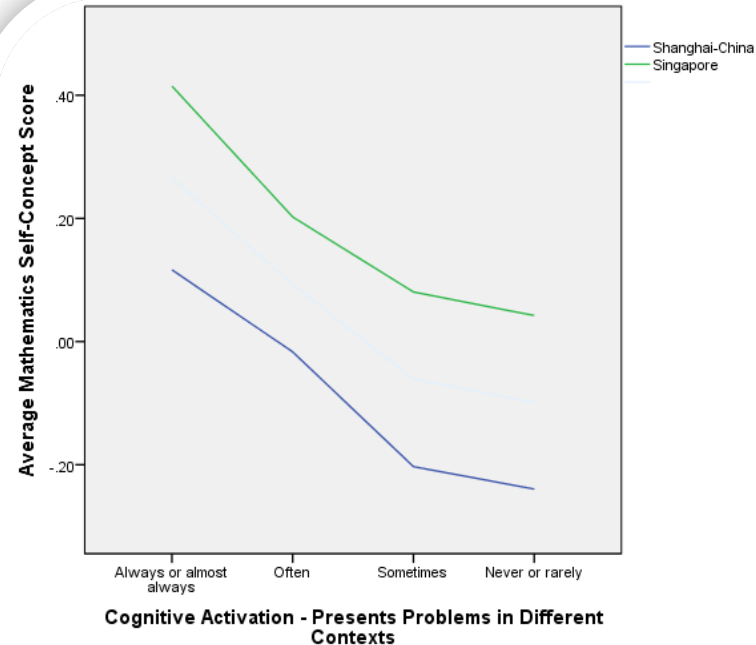
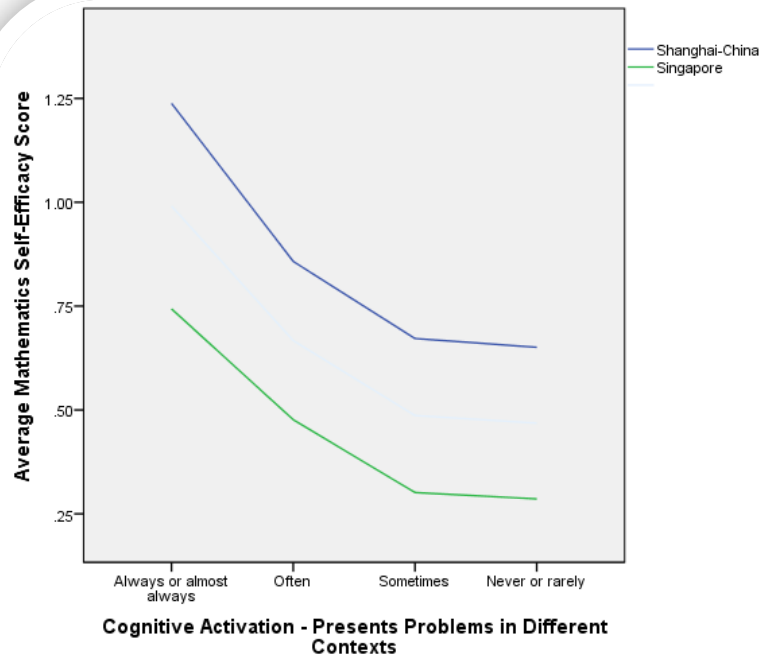


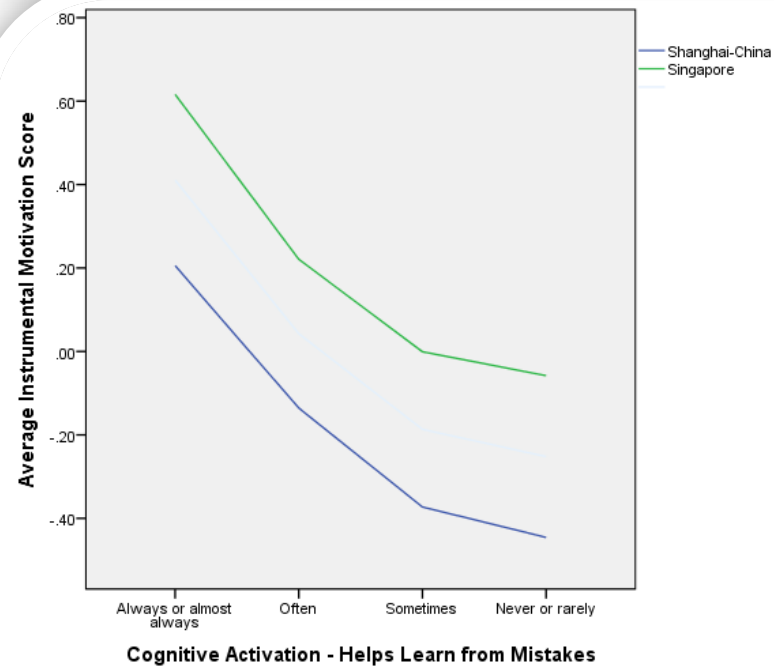
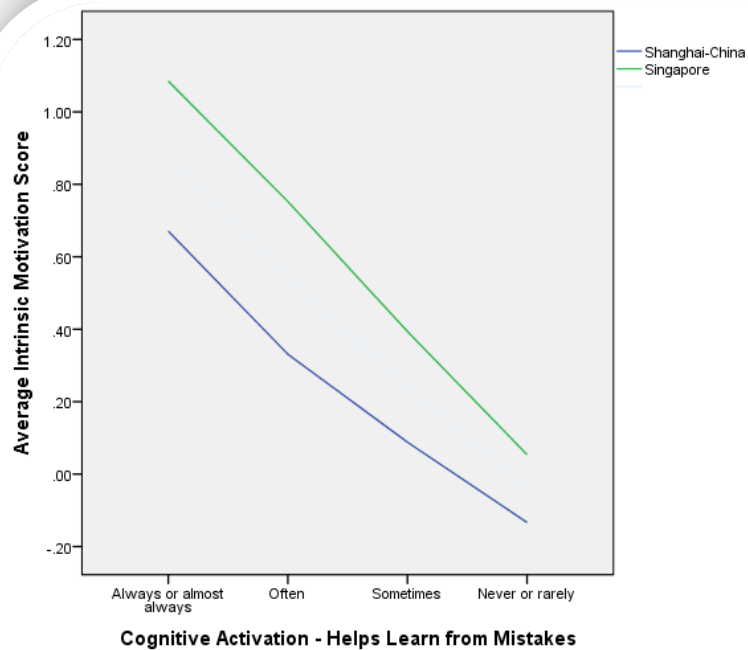
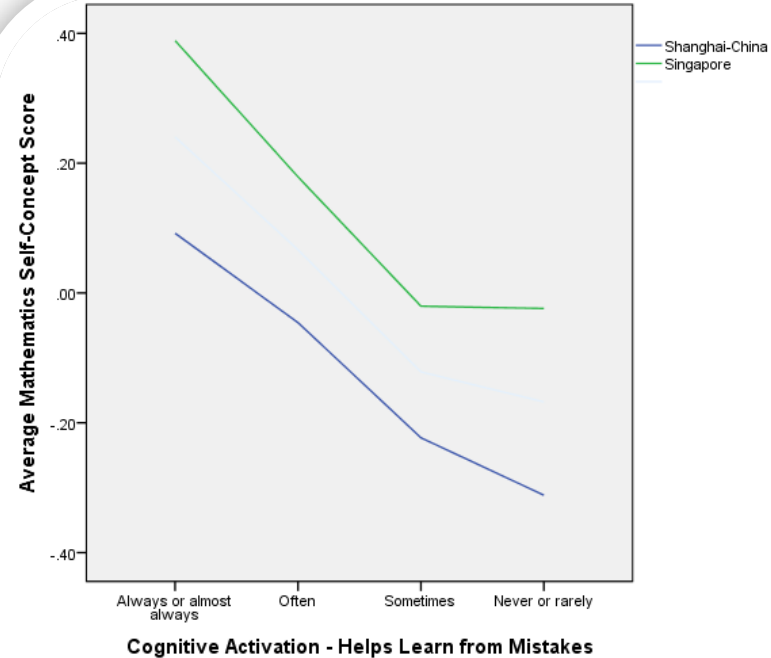
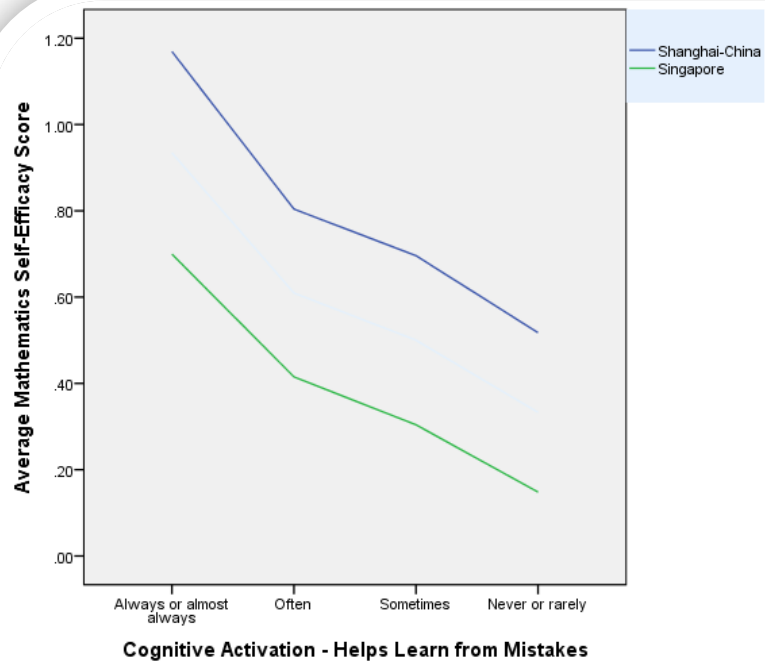
	Cognitive Activation - Teacher Encourages to Reflect Problems	INSTMOT (Mean)	INSTMOT (s.e.)
Shanghai-China	Always or almost always	.27	.05
	Often	-.10	.03
	Sometimes	-.29	.04
	Never or rarely	-.58	.11
Singapore	Always or almost always	.64	.06
	Often	.35	.03
	Sometimes	.19	.03
	Never or rarely	.01	.08

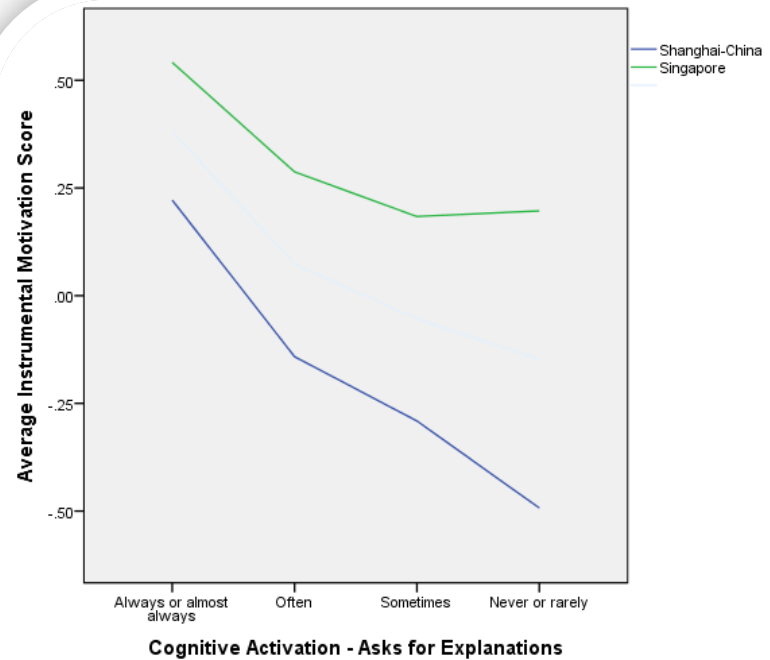
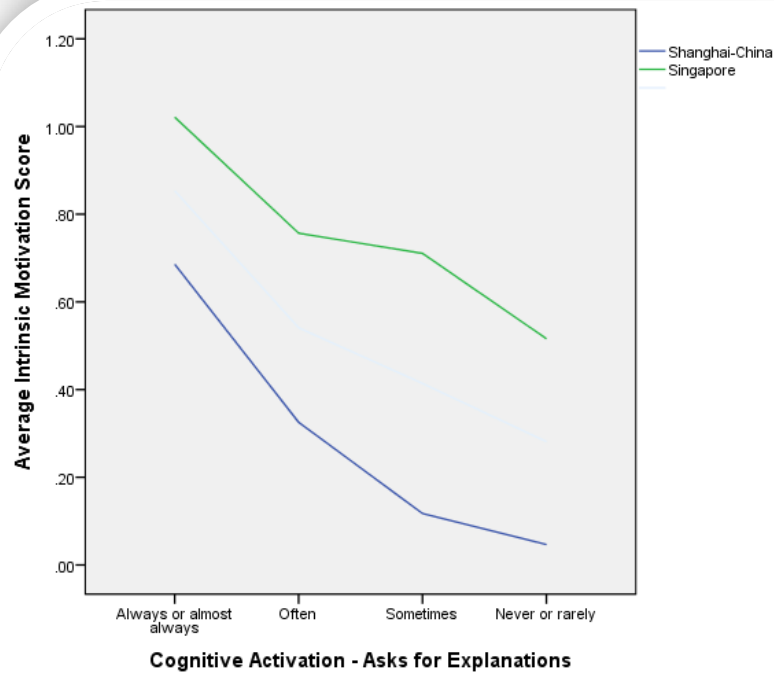
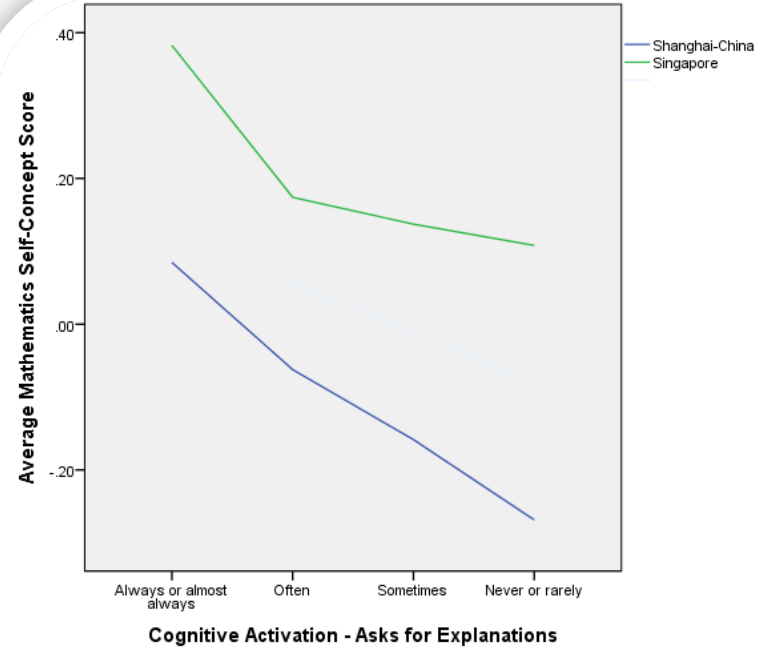
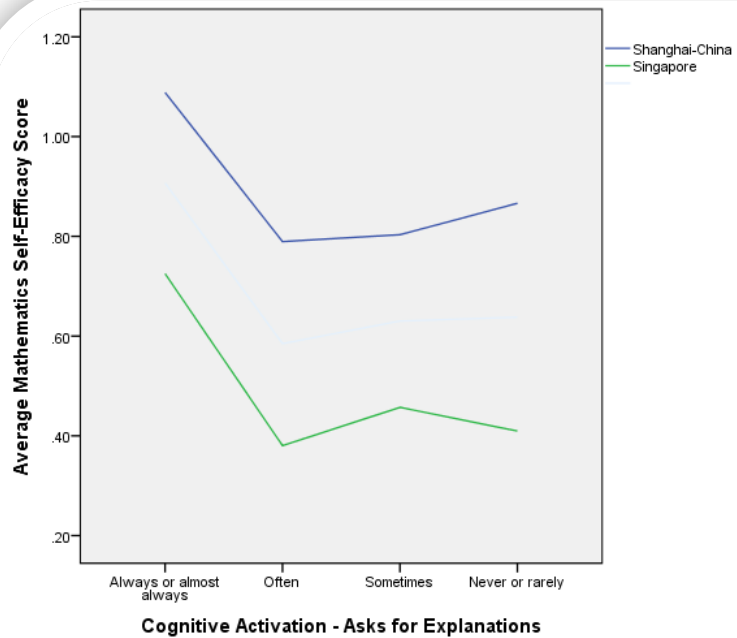


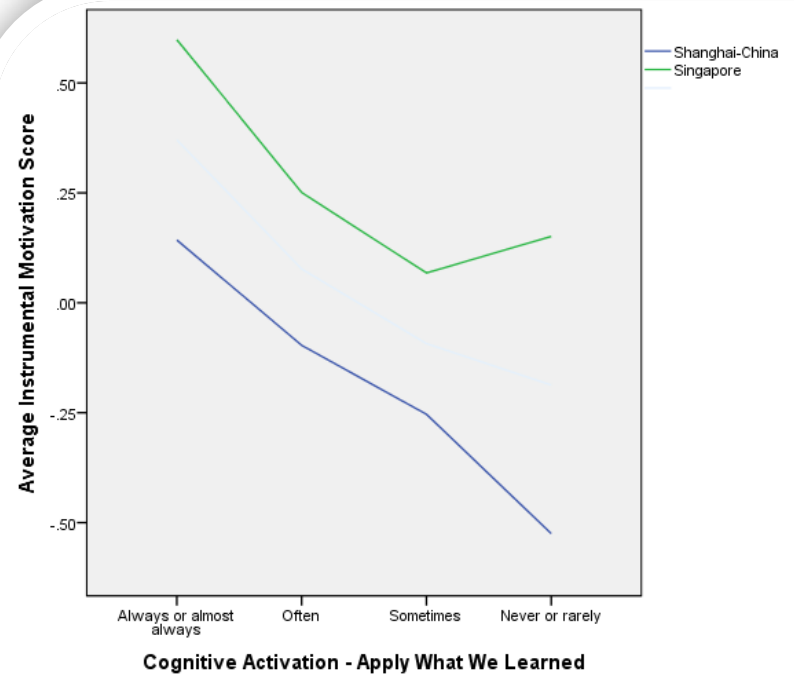
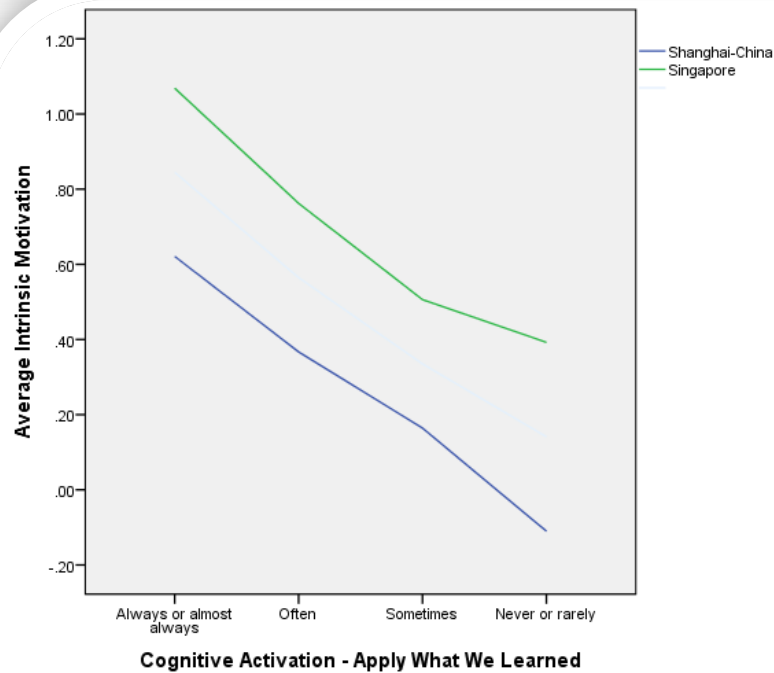
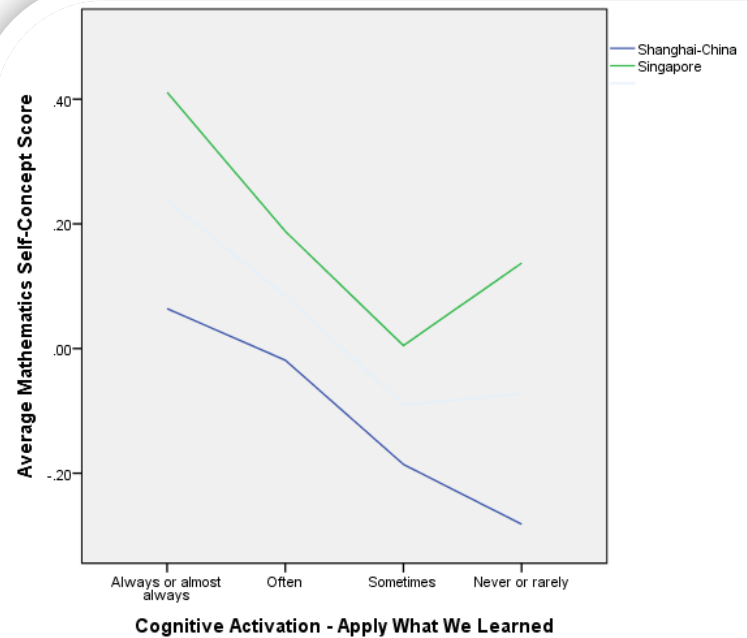
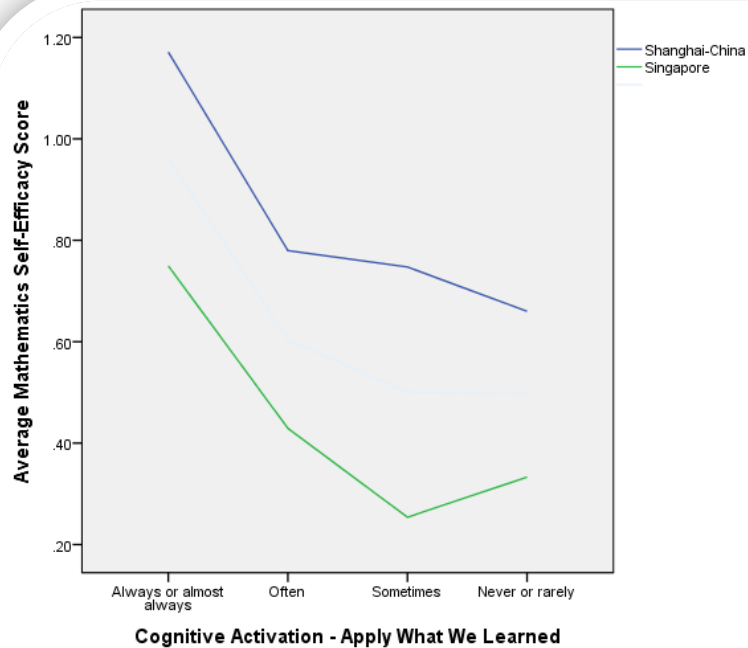


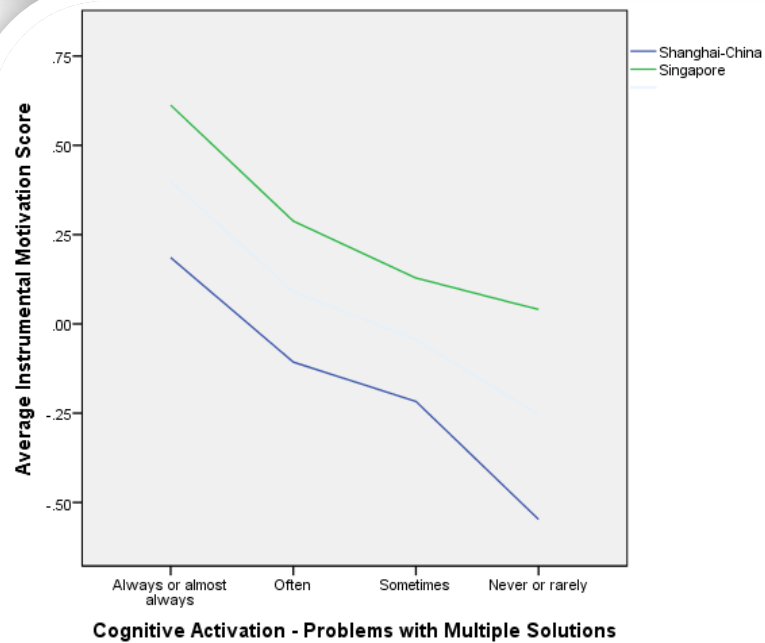
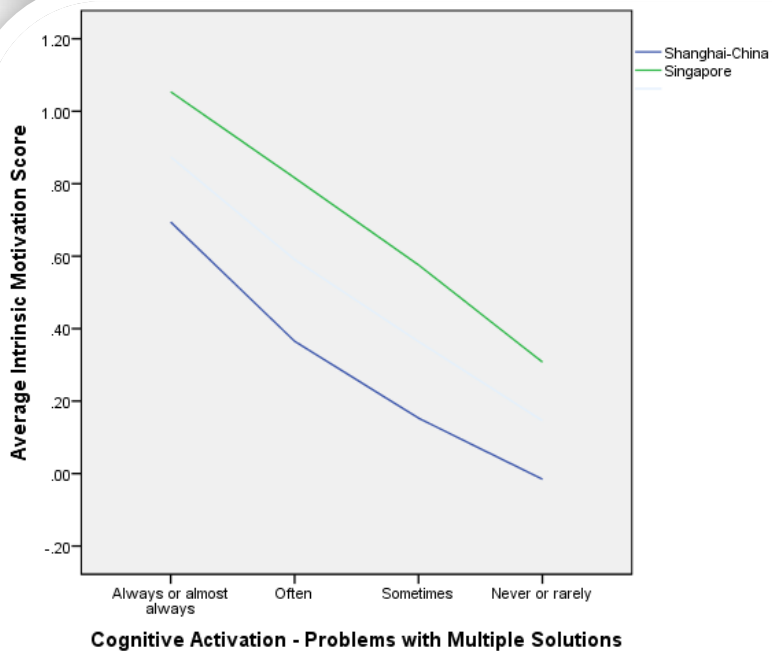
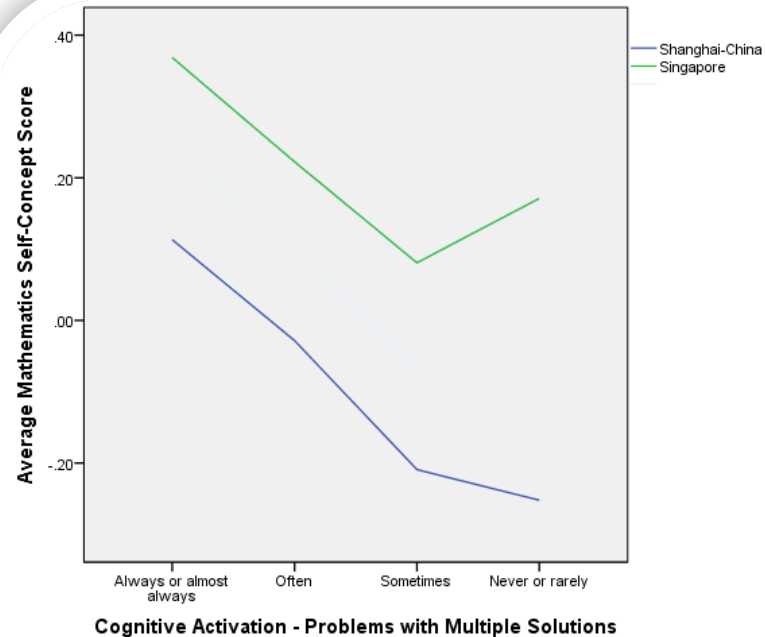
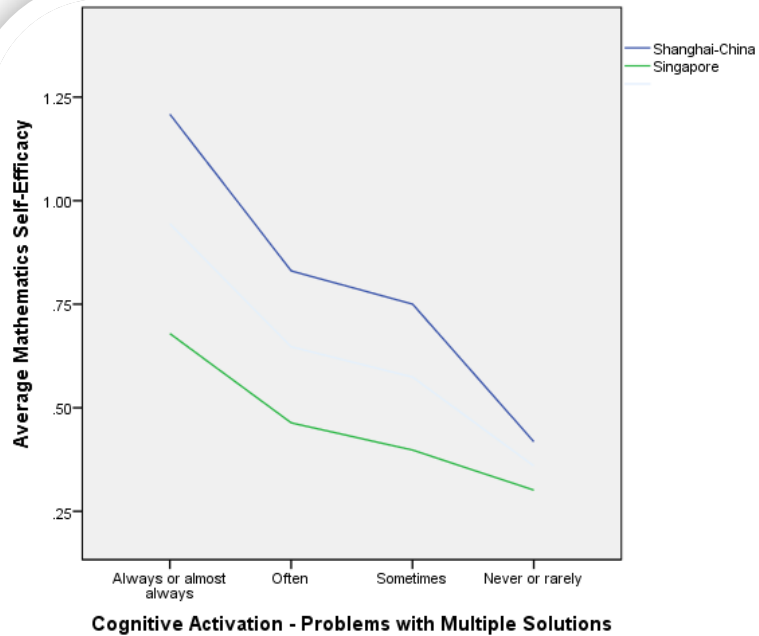












Thank you!