

ATTITUDES TOWARD MATHEMATICS INVENTORY

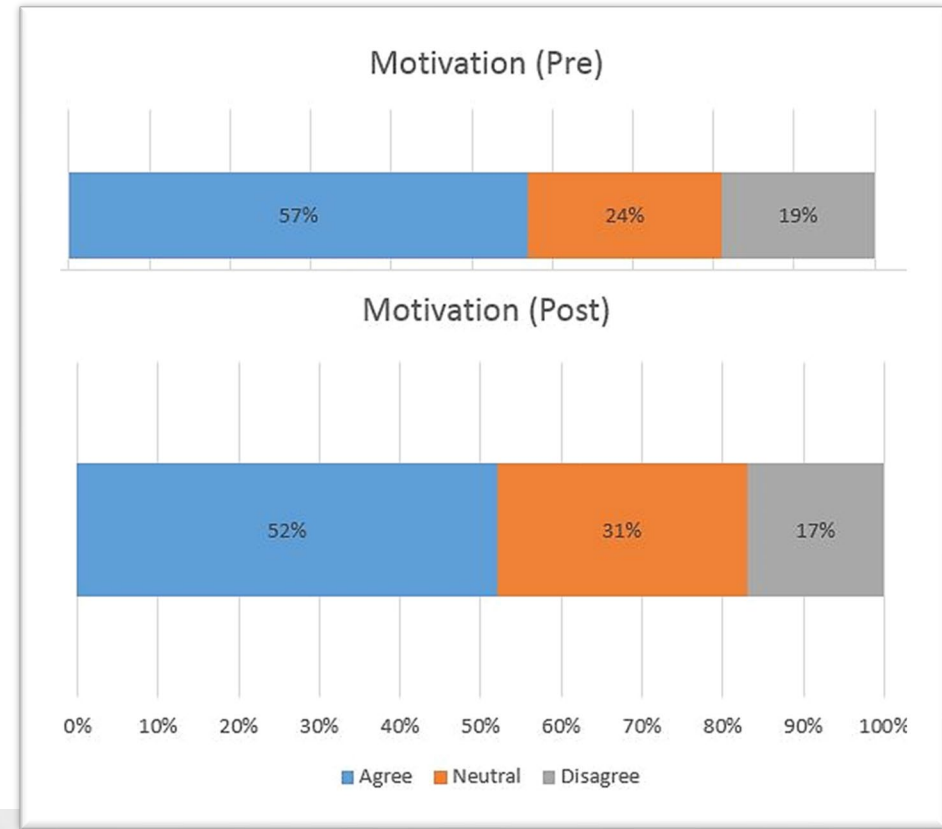
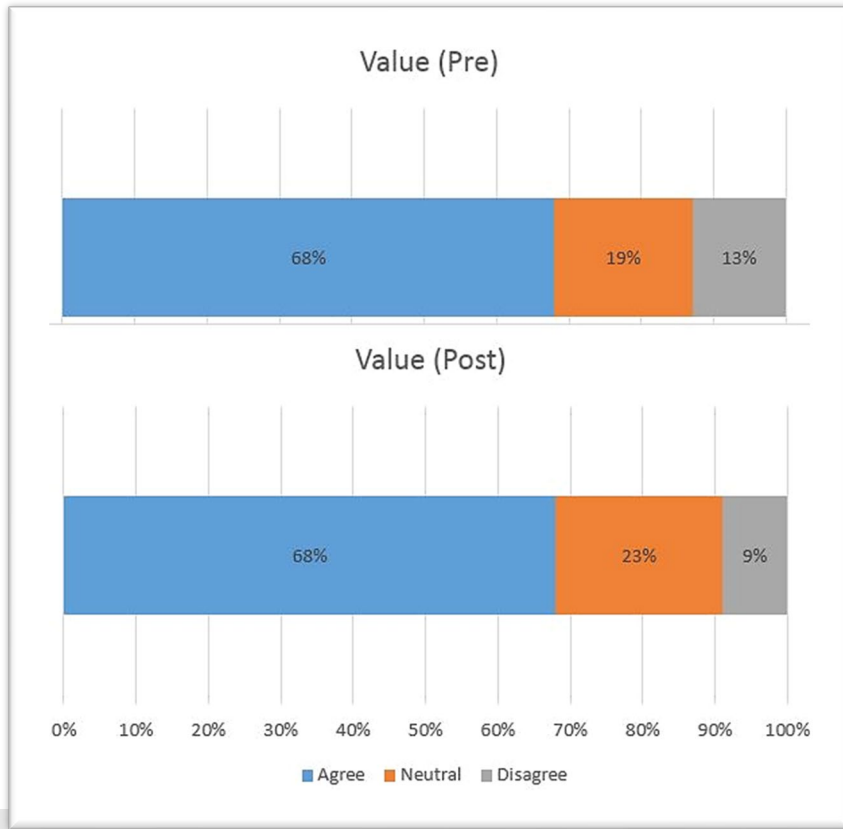
EXAMINING ITS USEFULNESS IN ELEMENTARY STUDENTS



Matthew Bonhamgregory

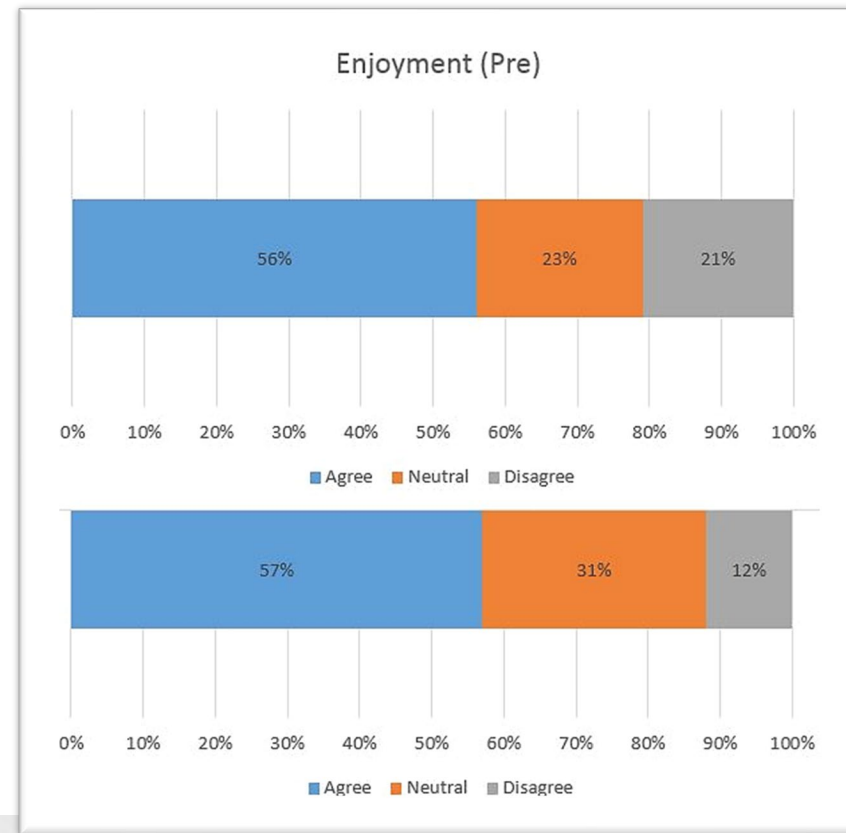
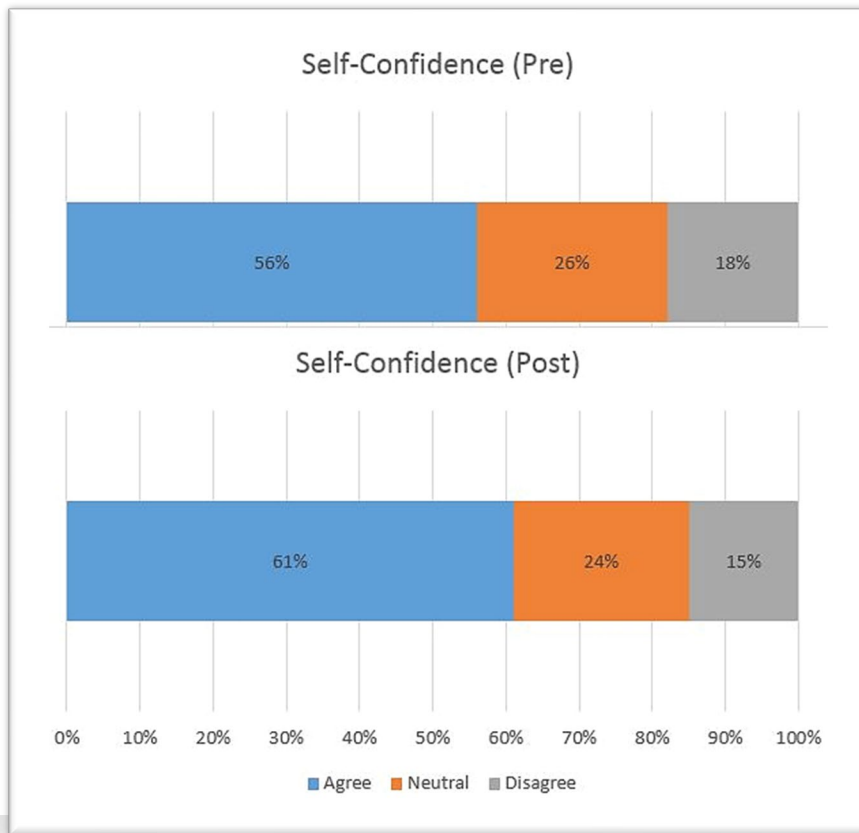
BACKGROUND

- FALL 2014 - Academic Perseverance In An Elementary Mathematics Classroom study
 - Attitudes Toward Mathematics Inventory (Tapia, 1996)
 - 12-Weeks, Pre and Post given
 - Looking for changes in feelings about mathematics



BACKGROUND

- Ability to statistically analyze data kept the analysis on a surface level – lacked depth
- For the purposes of THAT study, a decrease in “disagree” responses is desired



BACKGROUND

- Ability to statistically analyze data kept the analysis on a surface level – lacked depth
- For the purposes of THAT study, a decrease in “disagree” responses is desired
- The attitudes toward mathematics survey conflicted with the self-reported perseverance survey.

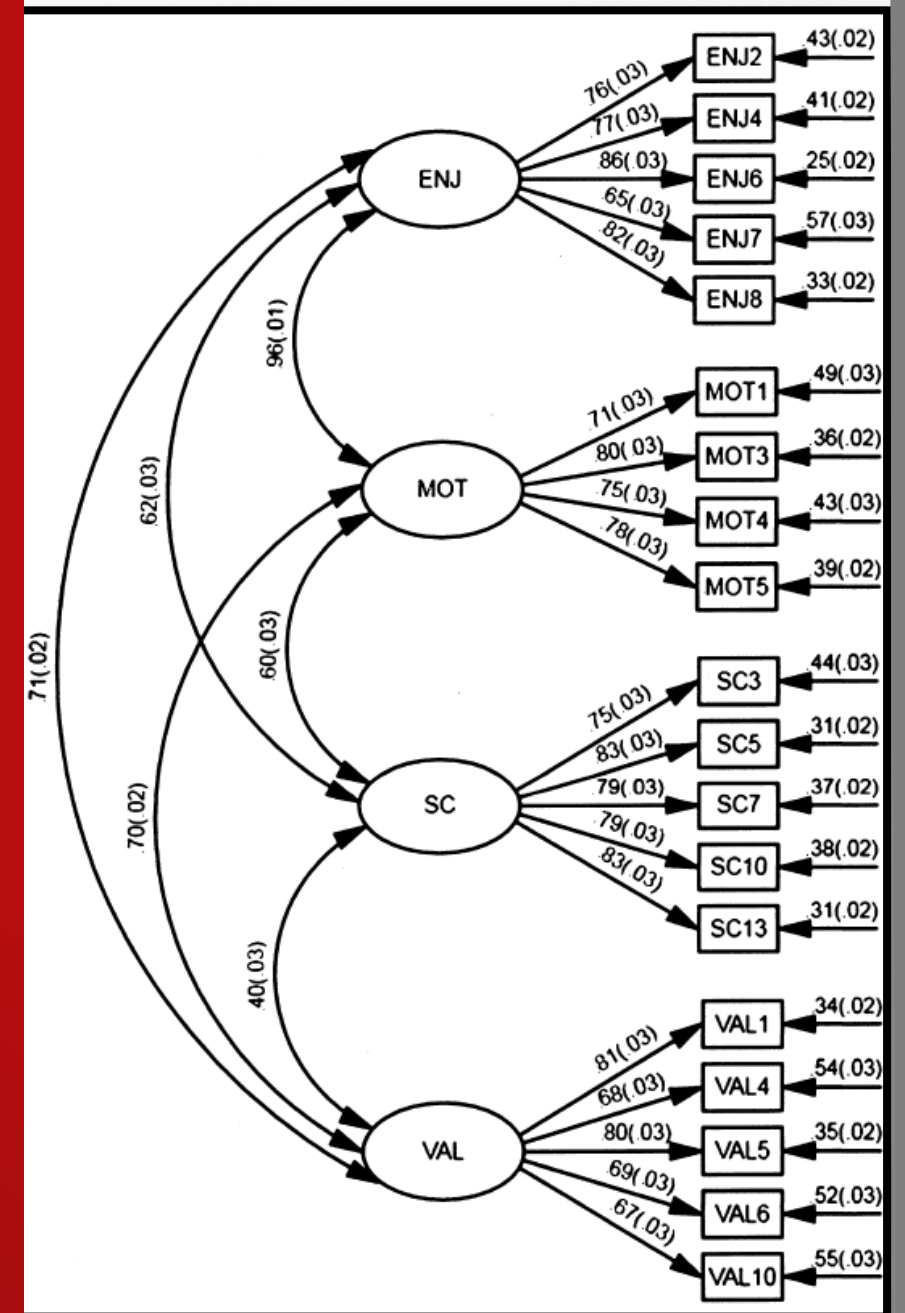
SURVEYS

Original ATMI (Tapia, 1996)

- 544 private bilingual preparatory school in Mexico City
- Value, anxiety, motivation, confidence, enjoyment, and adults' perspectives - .96 reliability
- Designed for middle and high school students
- 49 questions
- Dropped to 40; anxiety and adults' perspectives factors were dropped - .97 reliability

Short Form ATMI (Lim & Chapman, 2012)

- Felt original was too long (1 agree)
- Felt some questions were redundant
- Wanted to create survey for <10 min
- 1,601 participants from Singapore; pre-tertiary
- 19 questions; same four factors
- For the full scale=.93, and mean α for individual subscales=.87
- .75 across all subscales for 1-month period (test-retest)



DESCRIPTIVE STATISTICS

Campus

- Title-I elementary school in Texas
- pre-kindergarten through fifth-grades
- 481 students: 53% hispanic, 39% white, 4% two or more race, and 2% black.
- 5th Grade: departmentalized, 72 students.

Survey Participants

		Ethnicity			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	26	46.4	46.4	46.4
	Asian	1	1.8	1.8	48.2
	Black/African American	1	1.8	1.8	50.0
	White	27	48.2	48.2	98.2
	Two or More	1	1.8	1.8	100.0
	Total	56	100.0	100.0	

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	27	48.2	48.2	48.2
	Male	29	51.8	51.8	100.0
	Total	56	100.0	100.0	

RELIABILITY

ALL 19 ITEMS

Reliability Statistics

Cronbach's Alpha	N of Items
.694	19

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
VAL1	41.67	75.743	.573	.655
VAL4	41.60	74.800	.496	.658
VAL5	42.07	75.809	.592	.655
VAL6	41.65	74.934	.570	.654
SC3	43.27	89.165	-.135	.722
SC5	43.16	98.843	-.520	.754
SC7	43.09	94.899	-.335	.748
SC10	43.15	96.571	-.440	.746
SC13	43.02	89.500	-.150	.720
MOT1	42.40	71.948	.585	.645
ENJ2	42.29	78.284	.323	.677
ENJ4	42.16	76.769	.346	.674
ENJ6	41.93	72.439	.587	.646
ENJ7	42.25	74.304	.423	.664
ENJ8	41.93	71.995	.737	.637
MOT3	42.15	72.904	.607	.646
MOT4	41.87	76.484	.504	.661
MOT5	41.55	75.401	.597	.653
VAL10	41.58	77.396	.376	.671

Scale: Reliability_without_Self-Confidence

Case Processing Summary

		N	%
Cases	Valid	56	100.0
	Excluded ^a	0	.0
	Total	56	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.891	14

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
VAL1	34.43	110.468	.643	.881
VAL4	34.39	111.188	.487	.887
VAL5	34.82	111.531	.610	.882
VAL6	34.43	111.377	.559	.884
MOT1	35.14	105.070	.670	.878
ENJ2	35.04	112.399	.424	.890
ENJ4	34.93	109.086	.501	.887
ENJ6	34.68	107.422	.610	.881
ENJ7	35.05	107.215	.533	.886
ENJ8	34.71	108.717	.680	.879
MOT3	34.93	107.268	.666	.879
MOT4	34.68	111.531	.557	.884
MOT5	34.30	111.743	.589	.883
VAL10	34.34	109.465	.559	.884

RELIABILITY – MUCH BETTER!

Perceived Value

Cronbach's Alpha	N of Items
.764	5

Item Statistics

Mean	Std. Deviation	N
2.95	1.069	56
2.98	1.286	56
2.55	1.043	56
2.95	1.135	56
3.04	1.279	56

Item-Total Statistics

Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
11.52	12.072	.580	.708
11.48	11.709	.473	.746
11.91	11.610	.679	.676
11.52	12.218	.507	.731
11.43	11.777	.469	.748

Motivation

Cronbach's Alpha	N of Items
.789	4

Item Statistics

	Mean	Std. Deviation	N
MOT1	2.23	1.388	56
MOT3	2.45	1.249	56
MOT4	2.70	1.127	56
MOT5	3.07	1.059	56

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
MOT1	8.21	7.953	.577	.755
MOT3	8.00	8.073	.671	.698
MOT4	7.75	8.882	.632	.721
MOT5	7.38	9.766	.530	.769

Enjoyment

Cronbach's Alpha	N of Items
.770	5

Item Statistics

	Mean	Std. Deviation	N
ENJ2	2.34	1.325	56
ENJ4	2.45	1.426	56
ENJ6	2.70	1.334	56
ENJ7	2.32	1.503	56
ENJ8	2.66	1.133	56

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ENJ2	10.13	16.766	.478	.749
ENJ4	10.02	17.472	.352	.793
ENJ6	9.77	14.727	.704	.670
ENJ7	10.14	14.888	.566	.720
ENJ8	9.80	16.379	.660	.696

Self-Confidence

Cronbach's Alpha	N of Items
.662	5

Item Statistics

	Mean	Std. Deviation	N
SC3	1.33	1.292	55
SC5	1.44	1.244	55
SC7	1.51	1.451	55
SC10	1.45	1.214	55
SC13	1.58	1.166	55

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SC3	5.98	13.277	.253	.6
SC5	5.87	10.632	.635	.5
SC7	5.80	11.644	.361	.6
SC10	5.85	11.201	.572	.5
SC13	5.73	13.387	.303	.6

ANALYSIS OF EACH FACTOR

I don't like the self-confidence factor...

FACTOR ANALYSIS

TWO RULERS EMERGED FROM THE
REMAINING THREE FACTORS.

Well, almost...

- Perceived Value of Mathematics & Motivation to do Mathematics
- Enjoyment of Mathematics

COMPONENT ONE

MOT4
VAL10
MOT1
MOT3
MOT5

COMPONENT TWO

ENJ6
ENJ8
ENJ2
ENJ7
VAL1

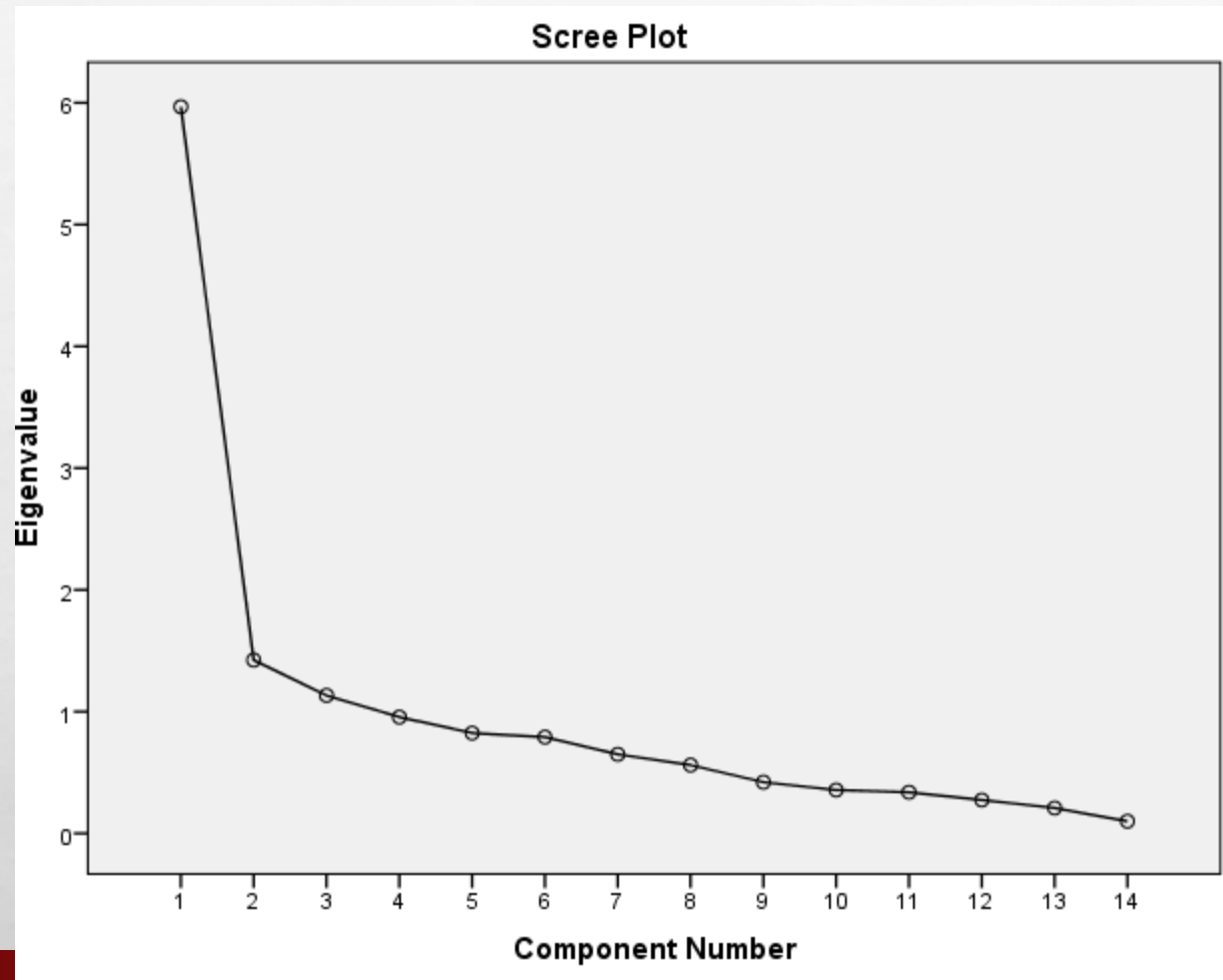
Rotated Component
Matrix^a

	Component	
	1	2
MOT4	.800	
VAL10	.733	.107
MOT1	.688	.326
MOT3	.662	.352
MOT5	.641	.271
VAL4	.564	.210
ENJ4	.558	.207
VAL5	.549	.420
VAL6	.535	.363
ENJ6	.146	.886
ENJ8	.277	.834
ENJ2	.106	.635
ENJ7	.285	.598
VAL1	.455	.569

Extraction Method: Principal
Component Analysis.
Rotation Method: Varimax with
Kaiser Normalization.

a. Rotation converged in
3 iterations.

SELF-CONFIDENCE REMOVED



FACTOR GROUPS

- FACTOR

Enjoyment

Items: Q1, Q24, Q29, Q30, Q31

- FACTOR

Motivation_PercievedValue

Items: Q33, Q39, Q23, Q32, Q36, Q5, Q26, Q6, Q7

Case Processing Summary^a

	Included		Cases Excluded		Total	
	N	Percent	N	Percent	N	Percent
Factor_Motivation_PercievedValue * Ethnicity	56	100.0%	0	0.0%	56	100.0%
Factor_Enjoyment * Ethnicity	56	100.0%	0	0.0%	56	100.0%
Επιχείρημα Έασις Έυλολωση *	56	100.0%	0	0.0%	56	100.0%

FACTOR GROUPS

- FACTOR -

Enjoyment

Items: Q1, Q24, Q29, Q30, Q31

- FACTOR

Motivation_PercievedValue

Items: Q33, Q39, Q23, Q32, Q36,
Q5, Q26, Q6, Q7

Hispanic (Group 1)

Total	N	26	26
	Mean	2.5684	2.6846
	Std. Deviation	.82272	.81814

White (Group 2)

Total	N	27	27
	Mean	2.7654	2.4667
	Std. Deviation	.86140	1.11769

Cohen's d, Enjoyment

Group 1		Group 2	
Mean (M):	<input type="text" value="2.6846"/>	Mean (M):	<input type="text" value="2.4667"/>
Standard deviation (s):	<input type="text" value=".81814"/>	Standard deviation (s):	<input type="text" value="1.11769"/>
Sample size (n):	<input type="text" value="26"/>	Sample size (n):	<input type="text" value="27"/>

Success!

Cohen's $d = (2.4667 - 2.6846) / 0.979435 = 0.222475$.

Cohen's d, Motivation_PercievedValue

Group 1		Group 2	
Mean (M):	<input type="text" value="2.5684"/>	Mean (M):	<input type="text" value="2.7654"/>
Standard deviation (s):	<input type="text" value=".82272"/>	Standard deviation (s):	<input type="text" value=".86140"/>
Sample size (n):	<input type="text" value="26"/>	Sample size (n):	<input type="text" value="27"/>

Success!

Cohen's $d = (2.7654 - 2.5684) / 0.842282 = 0.233888$.

FACTOR GROUPS

Rotated Component Matrix^{a,b}

	Component	
	1	2
ENJ6	.884	.102
ENJ8	.861	.206
VAL1	.708	.195
ENJ2	.695	
ENJ7	.631	.209
VAL5	.589	.581
ENJ4	.566	.296
MOT4		.857
VAL10		.704
MOT3	.352	.628
MOT1	.469	.624
MOT5	.143	.577
VAL4	.287	.569
VAL6	.326	.479

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

- a. Rotation converged in 3 iterations.
- b. Only cases for which Ethnicity = White are used in the analysis phase.

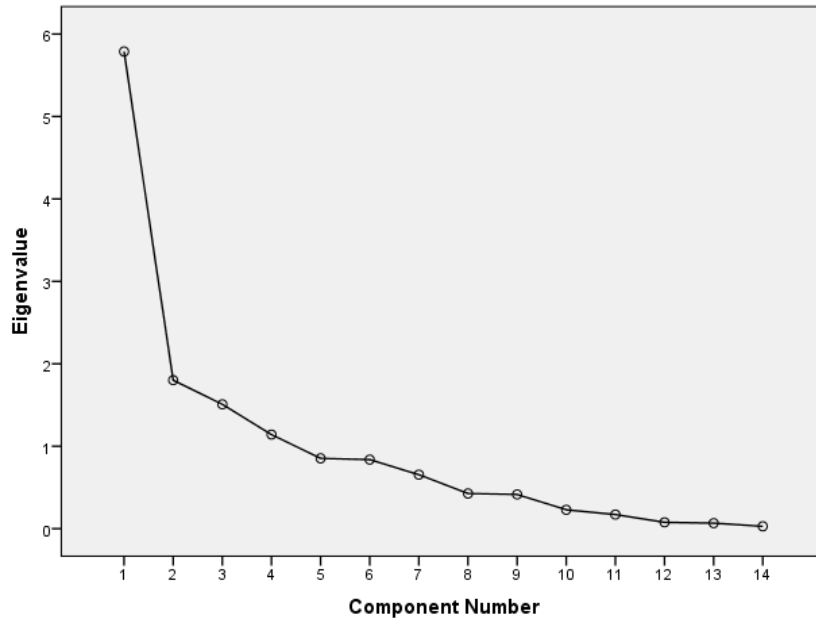
Rotated Component Matrix^{a,b}

	Component	
	1	2
ENJ8	.780	.259
ENJ6	.759	.139
ENJ7	.743	
VAL10	.715	.368
VAL5	.628	.167
MOT5	.581	.577
VAL6	.575	.510
VAL4	.467	.266
MOT1	.171	.879
ENJ4		.748
MOT4	.400	.628
VAL1	.500	.608
MOT3	.538	.606
ENJ2	.259	.594

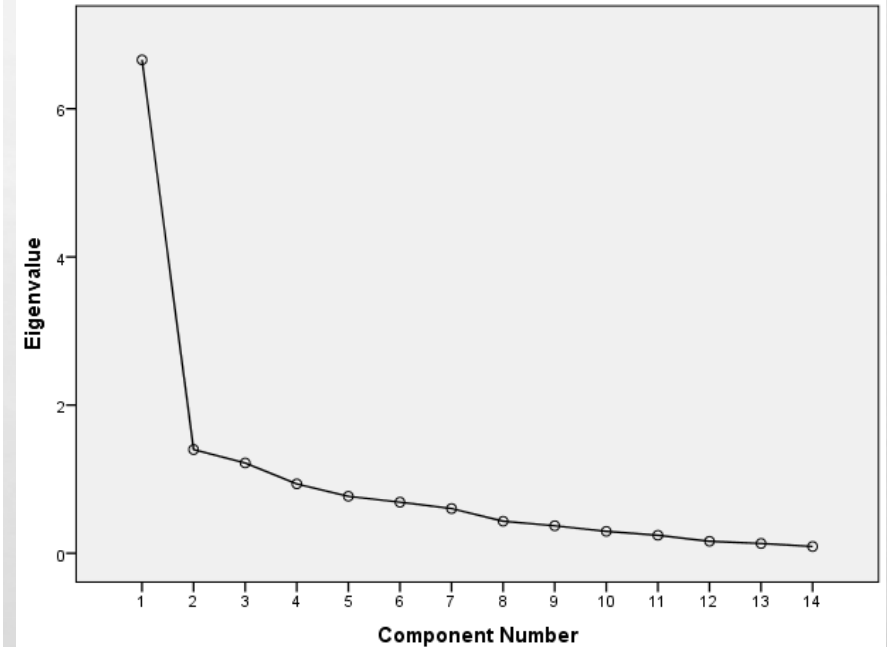
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

- a. Rotation converged in 3 iterations.
- b. Only cases for which Ethnicity = Hispanic are used in the analysis phase.

Scree Plot



Scree Plot



One-way

Descriptives

Factor_Enjoyment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Hispanic	26	2.6846	.81814	.16045	2.3542	3.0151	.40	4.00
White	27	2.4667	1.11769	.21510	2.0245	2.9088	.40	4.00

ANOVA

Factor_Enjoyment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.303	4	.576	.597	.667
Within Groups	49.214	51	.965		
Total	51.517	55			

ONE WAY ANOVA

DEPENDENT LIST – ENJOYMENT
FACTOR – ETHNICITY

Descriptives

Factor_Motivation_PerceivedValue

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Hispanic	26	2.5684	.82272	.16135	2.2361	2.9007	.33	3.67
White	27	2.7654	.86140	.16578	2.4247	3.1062	1.22	4.00

ANOVA

Factor_Motivation_PerceivedValue

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.620	4	.655	.922	.458
Within Groups	36.214	51	.710		
Total	38.834	55			

ONE WAY ANOVA

- DEPENDENT LIST – MOTIVATION/PERCIEVED VALUE
- FACTOR – ETHNICITY

CONCLUSION

- **THE TWO SCALES SEPARATED OUT ---**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Factor_Motivation_PerceivedValue	39.9679	145.450	.926	.	.904
Factor_Enjoyment	40.0873	144.522	.837	.	.905

These two rules scales are well constructed and valid

The shortened, short form ATMI seems appropriate for this age group

FINAL THOUGHTS

- Question -- What was it about the self-confidence subscale that worked for the older students that did not here? Wording? Self-concept?
- Need to further analyze each of the four subscales with the pre and post test data
- Continue searching to see if a study has been conducted with elementary students
- Interested in this because I would like to use this as part of my dissertation