Multiculturalism, Migration, Mathematics Education and Language

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Ethnomathematics: weaving culture, education and mathematics

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This lecture

Ethnomathematics around the world

A systematic research on integration of Ethnomathematics in school

My vision

Mathematics

of the people

for the people and

by the people

Ethnomathematics – my definition

Weaving mathematics and culture (Amit, 2013)

The definition of Ethnomathematics

Ethnomathematics is a research program of the way in which cultural groups understand, articulate and use the concepts and practices which we describe as mathematical, whether or not the cultural group has a concept of mathematics. (Barton, 1996).

Ideas about Ethnomathematics

- D'Ambrosio (2000, 2002) :

  Education must take cultural values into account….

. The lack of such integration is particularly harsh in mathematics education, which often has no connection to the world children experience.

Background on Ethnomathematics

- Cultural aspects must be integrated into students' learning environment in a holistic manner that includes its content, the classroom culture and the approach to learning mathematics. (Adam, Alangui & Barton, 2003)

Background on Ethno-Mathematics

- Learning mathematics without a cultural context can be a factor in lower mathematical achievements amongst students.
- Conversely, when students are exposed to different mathematical cultures, they discover that they have useful knowledge beyond traditional mathematics; this may strengthen their self-confidence and may make them more willing to learn. (Gilmer , 1990)

Background on Ethno-Mathematics

- Powell & Frankenstein (1997) found that Ethno-mathematics can help students solve more complex problems

- Lipka et al. (2012) found that teaching mathematics by means of cultural elements changed attitudes towards math, increased mathematical understanding and significantly improved students' test scores.

The research

Bedouin ethnomathematics- identification, implementation and impact on confidence and motivation.

With the help of Fouzi Abu-Quaider,
a Bedouin teacher and my grad student.

Methodology- Research questions

- What traditional units for measuring length and weights can be found among the Bedouins?

- How integration of ethno-mathematical elements into mathematics curriculum influence students' motivation, self-esteem and achievements?

Four Stages Process

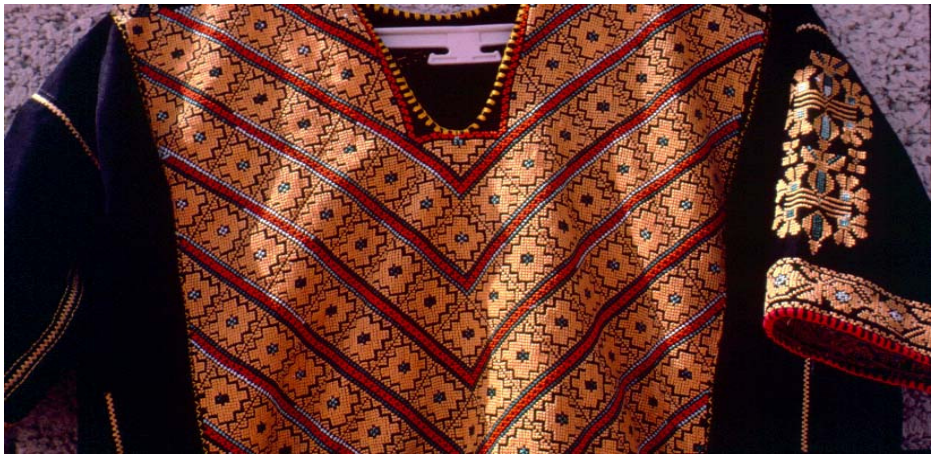
1. Exploring Bedouin's units of measuring length and weight.
2. Designing a integrated teaching unit of ethnomathematics and "regular" curriculum.
3. Implementing the teaching unit.
4. Testing its effect on self-concept, motivation and achievements.

First Stage

- The first stage data was collected through videotaped personal interviews of elders from a desert tribe.

- Following are some results:

Units of Measurement: Length



Units of length and distance

- Almost all units are taken from everyday life.
- Units are taken from the human body or clothes.
- A relative inaccuracy at comparing the units to meters.

Examples: Traditional units of length and weight

- Concept: مقرط العصا Read: M'krat ala'sa –
- Literal meaning: stick throwing distance. (more of an expression)
- In fact, it is a vector with a magnitude of 3-4 Kilometers and a direction.

Units of length

- Concept: شوط Read: Shoot
  Literal Meaning: the distance a horse rider can cover at a run in one burst without stopping. Approximately 18 km.

- Concept: قامة Read: Kama
  Literal Meaning: the height of an average person. Approximately 170 cm. This unit of measurement was used to measure depths, camels and humans.

Categories and Notes

- Three Categories of units:
- Small units, Medium units, Large units.

- نجوم السماء – stars in the sky, meaning "infinite"
- ظل شمس الظهرية – noonday shadow, meaning "zero"
- The measurement, "finger" (اصبع) – equal to 5 cm.

Units of Measurement: Weight

- General characteristics:
  - Units are taken from Bedouin's tools.
  - Accurate compared to the units of kilogram.

Examples

- Concept: قربة Read: Kerbh
- Literal meaning: vessel for carrying water or milk
- The kerbh is a vessel made of goatskin for keeping milk in the tent or cooling water. One kerbh is worth 30kg.

Concepts

- Concept: وقية , الاوقية Read: Wakeh
  Literal meaning: none
- This is the most basic Bedouin unit of weight, measured with a deep plate. About 250 grams.

- Interestingly, some interviewees claimed that it was worth 1/12th of a retel, and if the retel is worth 3 kg, then 1/12 of that comes to 250 grams.

Cultural phenomena

- Length (distance) – inaccurate
- Weight – absolutely accurate
- Reflects the life in the desert

Second and Third Stage – Teaching Unit Design and Implementation

- Experimental group: 75
  Studied math according to the cultural integrated program.

- Control group: 70
  Studied according to school program of the Ministry of Education.

Teaching Unit

- Integrative curriculum
- Use of Ethnic measures and standard ones for comparison, measuring and estimation.

Example


قنطار :
من أشهر الموازين التي كانت منتشرة عند البدو
واهل الجبال في فلسطين
ويقدر القنطار بـ1000 كيلو غرام
اي طن كامل
مقارنة وقيه برطل
1
12
مقارنة وقيه برطل
1
4000

Fourth Stage

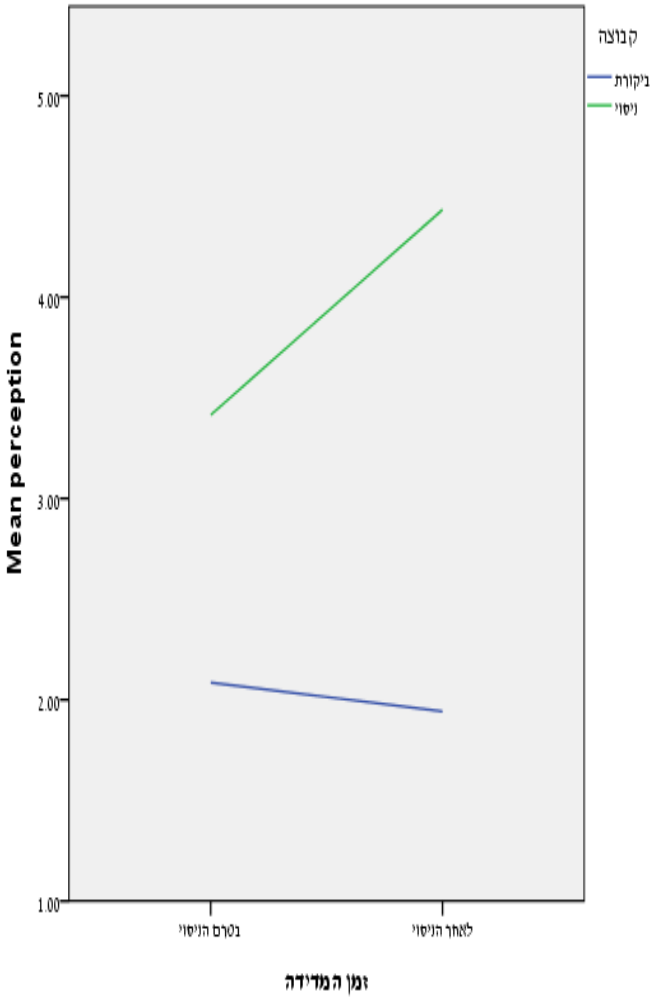
- Tailor made questionnaire to test self esteem and motivation (attitudes).

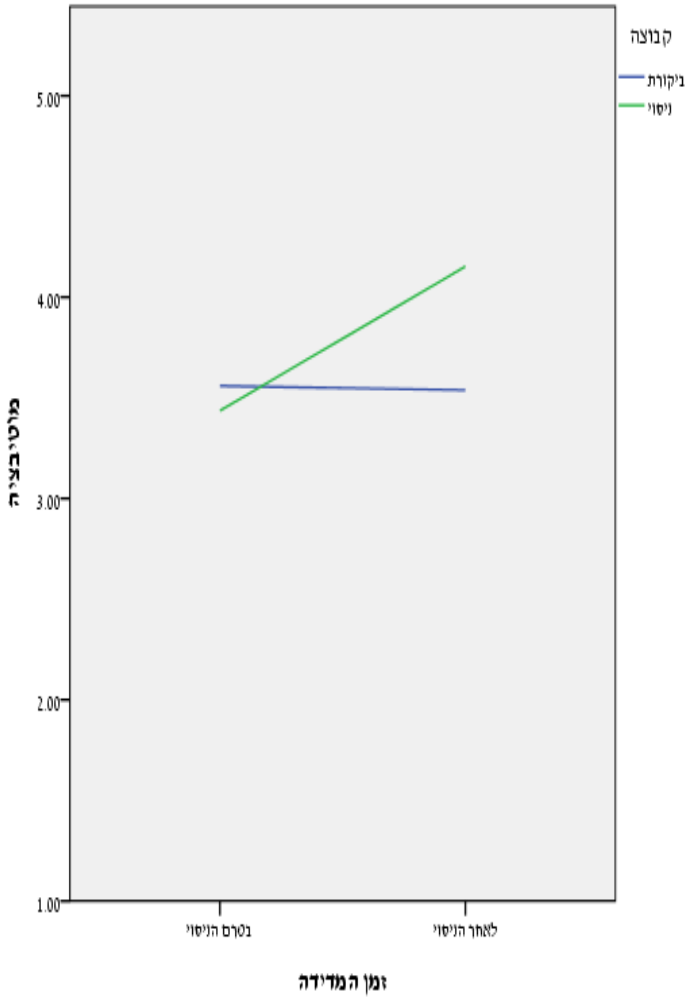
- Administered to all the participants pre and post implementation of the teaching unit.

Findings

- Experimental group: both motivation and self-perception were significantly higher after the implementation of the integrated teaching unit than before it.
- Control group: no significant differences were found.
- No impact at all on achievements (standard tests) for any group.

Changes in perception in both groups according to the measurement time





Summary

- Students had a “meaningful experience” .
- Increase of motivation and self esteem.
- In the short run: no impact on achievement.
- In the long run (6,12 month): a tremendous improvement in achievement

Extra value

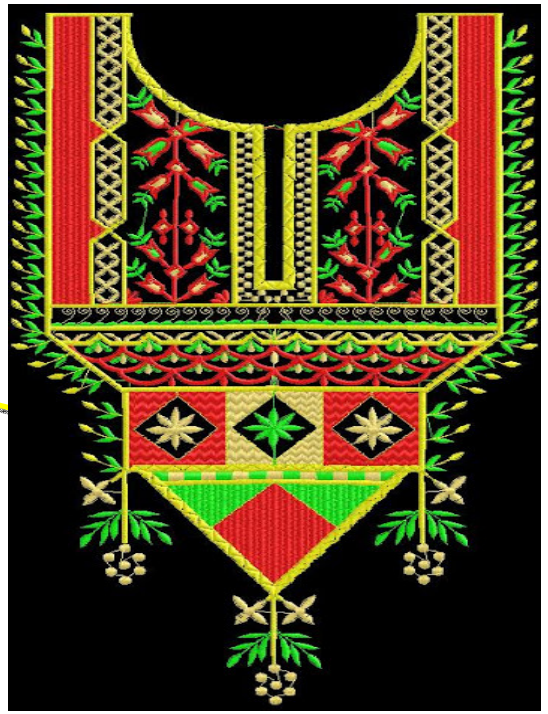
- Increase of appreciation and respect to elders and to their own tradition and culture
  “my grandma knows mathematics even if she can not read and write..”

Conclusions for the Future of an underprivileged society

- The study proved without a doubt that added cultural elements will contribute to improving the mathematics' education in our society.
- Today our society goes through a huge transition but it is still incomplete.
- We always claim that new topics in mathematics are based on old topics. So we suggest to use the values □□and the tools from the daily lives of students which includes their history.

Next steps in the Ethnomathematics research

- The ethnic geometry of the cultural embroidery and integration in school curriculum, such as:



Recommendations

- Planning and organizing educational programs for all ages, from elementary school to academic institutions which incorporate the cultural values while teaching mathematics.
- Teachers in academic courses or continuing education programs must enrich their cultural background, in order to train them in different teaching skills for - cultural multicultural education.
- Introducing such a reform process in education in general, and mathematics education in particular increases the chances of achieving a considerable contribution to mathematics education.

Personal epilogue

Mathematics is important,
but more important still is the people –
their uniqueness, their variety
Their human spirit