

## TEACHING STATISTICS IN THE ARAB COUNTRIES: THE AMBITIONS AND THE NEEDS

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*For last two decades, most of the Arab countries have been involved in Mathematics Education reform. Data Analysis and Probability is one of the standards upon which the new mathematics school curriculum is built. There are many changes related to statistics content and objectives. A new vision concerning learning statistics can be found in the mathematics frameworks and outlines such as: formulating questions, collecting, organizing, representing, analyzing, and interpreting data. In spite of this apparent change, careful examination reveals that in practical terms, teaching and learning statistics still reside within an old tradition of procedural knowledge. In order to achieve the new goals of teaching statistics, teachers need to embrace the view that statistics is a tool for a daily critical thinking and problem solving. They also need statistical content and pedagogy knowledge and skills to achieve the new vision of statistics education.*

### INTRUDUCTION

Most, if not all, of Arab countries have launched education reforms to be implemented over the next coming years (Masri, 2009). These new educational strategies are designed to prepare students for the challenges of life by improving their thinking skills (see for example: Jordan MOE, 2012; RAND, 2007; UAE, MOEU, 2000; World Bank, 2009). Focusing on thinking skills especially *critical thinking* is a vital issue stressed in the reform documents. For example the United Arab Emirates (UAE) 2010 strategy statement says “*The strategy aims to produce school graduates who are trained to inquire, think critically, analyze and communicate effectively*” (MOE, 2010).

Consequently, during the last two decades, most of the Arab countries have been undergoing some form of school mathematics reform. The mathematics curriculum in these reforms is largely based on the international educational standards movement. Consequently, for Arab countries, their mathematics reform was influenced by the fact that statistics was one of the major standards in the school mathematics standards for developed countries. Consequently, the importance of statistics content in the Arab mathematics curriculum has been increased.

This paper highlights three issues related to teaching statistics in the Arab countries; statistics in mathematics curriculum’s outlines and documents, the reality of teaching and learning statistics in schools including the results of the international mathematics and science study TIMSS, and the requirements related to statistics to achieve the goals of the ambitious theoretical educational reform.

### STATISTICS IN MATHEMATICS CURRICULUM

Aligned with the international voices, there is a substantial agreement that statistics ought to be taught to improve reasoning related to data. Thus, statistics education in the Arab countries has been going through several stages of significant changes. Educational reform related to mathematics curricula and textbooks began in 2000 such countries as UAE, Oman, and Jordan. A comparison of statistics and probability in the old and new mathematics curricula reveals substantial differences. For example, students in the new curriculum study statistics from the first grades instead of the middle and secondary grades.

In the new mathematics curriculum outlines, approaches to learning statistics and probability can be found as with the concept of *formulating questions, collecting, organizing, representing, analyzing, and interpreting data* (UAE MOEU, 2001, Jordan MOE, 2013). This improvement is a consequence of *Data Analysis and Probability* being one of the standards upon which the new mathematics school curriculum is built (see for example national mathematics textbooks in Bahrain 2010, Saudi Arabia 2012, and Iraq 2011).

Yet, in spite of the substantial documentary change in statistics and probability within the mathematics curricula, statistics and probability are still being taught in the old traditional way

where the concentration is still largely on mastering some formulas and rules (Innabi, 2007). Evidence show that students lack the conceptual understanding of the basic statistical concepts. For example students may succeed in computing the value of an arithmetic mean but at the same time, they lack the understanding of this concept as representative that has some characteristics (Innabi, 2008).

**PERFORMANCE ON “DATA AND CHANCE” IN TIMSS 2011**

The results of the international mathematics and science study TIMSS 2011 (Mullis, Martin, Foy & Arora, 2012) provides an indication of the status of learning statistics in the Arab countries. Students achievement in overall mathematics and four content domains; number, algebra, geometry, and “data and chance” were calculated for each participating country.

Table 1 presents the average achievement for TIMSS 2011 of Arab countries participants in the eighth grade content domain of “data and chance” relative to overall mathematics achievement. First column presents the average overall mathematics achievement, followed by the average achievement in the content domain data and chance together with the difference between achievement in overall mathematics and achievement in data and chance. The “ \* ” in the last column is used to indicate whether a country’s average “data and chance” score is significantly higher or lower than its overall mathematics average score.

Table 1 shows that all Arab countries except Bahrain, performed less well in data and chance comparing to their total mathematics performance. These results are important and require that action be taken.

Table 1. Arab countries performance on mathematics content domain “Data and Chance”

| Country                 | Overall math score | Data &Chance score | Difference (overall –data) | Significantly |
|-------------------------|--------------------|--------------------|----------------------------|---------------|
| United Arab Emirates    | 456 (2.1)          | 440 (2.4)          | -15 (0.6)                  | *             |
| Lebanon                 | 449 (3.7)          | 393 (5.2)          | -56 (2.5)                  | *             |
| Tunisia                 | 425 (2.8)          | 398 (3.3)          | -27 (1.7)                  | *             |
| Qatar                   | 410 (3.1)          | 390 (3.6)          | -20 (1.7)                  | *             |
| Bahrain                 | 409 (2.0)          | 407 (2.6)          | -2 (2.1)                   |               |
| Jordan                  | 406 (3.7)          | 379 (3.7)          | -26 (1.5)                  | *             |
| Palestinian Nat'l Auth. | 404 (3.5)          | 368 (3.6)          | -36 (1.3)                  | *             |
| Saudi Arabia            | 394 (4.6)          | 387 (5.1)          | -7 (2.7)                   | *             |
| Syrian Arab Republic    | 380 (4.5)          | 343 (4.7)          | -37 (1.8)                  | *             |
| Morocco                 | 371 (2.0)          | 332 (2.0)          | -39 (1.7)                  | *             |
| Oman                    | 366 (2.8)          | 342 (3.1)          | -24 (2.0)                  | *             |

**THE NEEDS**

In theory, mathematics curriculum documents imply a new vision of teaching statistics in most of Arab countries. What is needed is to activate this vision by applying it in the teaching and learning situations. To achieve this, teachers need to possess perceptions, statistical content and pedagogy knowledge, and skills.

Considering that statistics is a tool for critical thinking (Ennis, 2002; Ennis, 1985; Paul & Elder, 2001), teachers need to believe that statistics is a tool for a daily critical thinking and problem solving. Also, teachers need to believe that the teaching of statistics has to be shifted from procedural knowledge and drills where, meaningless data is used to constructing statistical knowledge, to a teaching method where problem solving teaching techniques are employed. This requires students to go beyond memorizing meaningless data and formulas into formulating questions and collecting real and meaningful data (Mvududu, 2005).

Another components necessary to activate this shift in Statistics Education in the Arab World is research. Very little research on statistics has been conducted in the Arab world. Considering that research is a vital factor for the real changes and real reform, there is an urgent

need in the Arab countries for research on teaching and learning statistics, particularly concerning the tools and strategies that can help teachers help their students to become statistically literate.

The improvement of critical thinking skills' statements espoused in MOEs' documents should not remain a mere political decision or rhetoric. It needs to be put in practice. Educational decision makers need assistance in understanding how critical thinking can realistically be improved. This can be done by providing them with practical ideas that can be applied and monitored (Innabi & El-Sheikh, 2007). These ideas could come from experts and researchers who study and understand dynamics. This could encompass issues such as school and class environment, assessment, or professional development. It could also relate to specific subject matter such as curricula and methods of teaching (Burrill, 2007).

## CONCLUSION

In Arab countries, there is a gap between the theoretical view of teaching statistics and students' learning of statistics. The theoretical view, as can be found in Ministries of Education's mathematics documents, can be judged—relatively speaking—as ambitious improvements of statistics. However students' learning is still way far of these ambitions. This paper suggests that in order to improve students' learning, the perceptions of public community especially the educational community that includes teachers, parents, supervisors, administrators, should be changed. This community have to understand that statistics – if taught and learnt in a meaningful way, it - is one of the most powerful tools in fostering critical thinkers which is a key goal of the education reform within Arab countries.

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