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Title:	A Study of the 'TIMSS' Mathematics of Fourth Grade:A Comparative Study between Iran and Oman
Findings:	The findings of parameter estimation revealed that many items could not fit the model well. However, about 25% of the items' slipping index was higher than 0.50 which showed the students who possessed all attributes, have answered the items incorrectly. Furthermore, the RMSEA value for all items was below 0.05 excluding item 40. Hence, skill probability estimation identified that Iranian students' attribute probabilities were greater than Omani students. The results of the IRT analysis showed no same difficult items for both countries.

Abstract

The present research work is a **Study of the TIMSS Mathematics of Fourth Grade: A Comparative Study between Iran and Oman.** Furthermore, the study attempted to apply cognitive diagnostic modeling (CDM) to assess Omani and Iranian fourth-grade mathematics items in the TIMSS 2015. The study included multiple parts: the first was to

apply the deterministic input noisy output and gate (DINA) model for assessing fourth-grade mathematical attributes to compare boys' and girls' skill probability mastery. The second part of the study aimed to analyze the psychological properties of the TIMSS 2015 fourth-grade mathematics' items by applying the IRT and CDM item analysis approaches. The third part of the study applied differential item functioning (DIF) analysis to detect the DIF of mathematics items between boys and girls. The fourth part attempted to illustrate students' ICT usage status, the status of ICT among them, and the relationship between students accessibility to ICT facilities with their achievement rate in the TIMSS mathematics assessment. Furthermore, the fifth part

of the study focused on finding out an association between the mathematics teaching-learning process and schools' infrastructures with students' achievement in the TIMSS assessment. Moreover, the sixth part of the study analyzed the difference between parents' education levels with students' performance in theTIMSS assessment. The research methodology of the present study would be defined as thesecondary analysis and descriptive-comparative and correlational approach. The statistical samples have been selected from all Omani and Iranian students who participated in the TIMSS 2015 mathematics assessment. The data have been analyzed by the CDM package through the R programming and the SPSS program version 24. The findings of parameter estimation revealed that many items could not fit the model well. However, about 25% of the items' slipping index was higher than 0.50 which showed the students who possessed allattributes, have answered the items incorrectly. Furthermore, the RMSEA value for all items was below 0.05 excluding item 40. Hence, skill probability estimation identified that Iranian students' attribute probabilities were greater than Omani students. The results of the IRT analysis showed no same difficult items for both countries. However, 22 items wereidentified as very easy items in both Oman and Iran data. Furthermore, the IRT showed just 5 appropriate items for Omani and Iranian students that were the same. Besides, the CDM approach found 9 most difficult items for both Omani and Iranian students. Consequently, the CDM analysis could analyze better the psychological properties of the items. Moreover, to analyze the DIF, the Mantel-Haenszel method was applied. The outcomes of the study revealed that no DIF items were found between boys and girls. The findings discovered thatOmani and Iranian students' ICT usage status was low. However, Omani students' ICT usagestatus was greater (M=29.67, SD=1.17) than Iranian students' (M=14.76, SD=5.39). Furthermore, Omani and Iranian boys' ICT usage status showed a greater portion than girls'. Consequently, there was a significant relationship between students' accessibility to ICT facilities with their achievement rate in mathematics for

both Iran and Oman (Oman= **r:** 0.111; **Sig:** .000; P<0.01; Iran= r: 0.210; **Sig:** .000; P<0.01). The results showed that there is a statistically significant difference between Omani girls' and boys' performance in the TIMSS 2015 mathematics assessment. Hence, the Iranian boys' and girls' t-test results showed no statistically significant difference between Iranian boys' and girls' mathematics performance. Moreover, the ANOVA analysis displayed that there is a significant differencebetween parents' educational level with students' mathematics achievement.

Keywords: CDM, DINA, Mathematical Skills, Schools' Infrastructures, Item Analysis