

# SOCIOECONOMIC DISPARITIES AND STUDENT PERFORMANCE IN MATHEMATICS AND SCIENCE IN THE GULF STATES



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## Introduction

The Gulf States – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE – are among the richest regions globally, united through the **Gulf Cooperation Council (GCC)**. Despite free public schooling and substantial investments in education, these countries face **persistent educational challenges**. With over **40 million inhabitants** and **high labour migration rates**, the region is marked by demographic diversity and socio-economic inequality.

Driven by **Vision 2030/2040** and aligned with **SDG 4**, GCC states have launched ambitious **reforms** to reduce dependency on natural resources, promote **STEM education**, and strengthen **human capital**. However, their educational outcomes remain below those of countries with comparable income levels, highlighting ongoing gaps in quality and equity. Public schools are largely reserved for nationals, while **migrant children rely on private education**, often of **varying quality and accessibility**. Socio-economic disparities shape educational opportunities and student performance.

## Research Questions

**What trends in educational inequality and student performance can be observed in the Gulf States between 2011 and 2023?**

- How are these trends related to **long-term educational reforms** in the region?

- What are the key **challenges** to equity and quality in **STEM education** in the Gulf States, and how do **private schools** and **migration** contribute to **socio-economic disparities** and the **educational paradox**?

- To what extent can **Boudon's** and **Bourdieu's theories** explain educational inequalities in the specific **socio-cultural context** of the GCC countries?

## Theoretical Background

**International assessments** such as **TIMSS**, **PIRLS**, and **PISA** show that Gulf States consistently perform **below global averages**, despite significant **educational reforms** (Mullis et al., 2020; Mosly, 2022). The gap between **years of schooling** and **actual learning levels** remains wide (El-Saharty et al., 2020).

Research highlights the strong influence of **socio-economic status (SES)**, **school resources**, and **teaching quality**—especially in **STEM subjects** (Bouhlila & Hentati, 2022). **Cultural capital** and a **supportive learning environment** are key factors (Jakubowski et al., 2019). A notable phenomenon is the **educational paradox**, where **migrant children** sometimes outperform their **native peers**—particularly in science and in early grades (Rejjal, 2019).

This study applies the **models of educational inequality** developed by **Boudon (1974)** and **Hußmann et al. (2017)**, adapted to the **socio-economic** and **institutional context** of the **Gulf States**.

## Data and Methods

- Data source:** TIMSS 2011, 2015, 2019, 2023
- Sample:** at least **4,000 students**, **150–200 schools** per GCC country and cycle
- Subjects:** **Mathematics and Science, Grade 4**
- Study design:** **Cross-sectional**, repeated every 4 years, GCC participation since 2011
- High-quality and standardized data collection procedures**

## Statistical Analysis

- Multilevel models** to examine factors influencing student performance
- Key predictors:** parental education, resources at home (e.g., number of books, internet), migration background
- Controls for school-level variation** (e.g., school average SES, resources)
- Trend analyses** from 2011 to 2023 to detect longitudinal developments

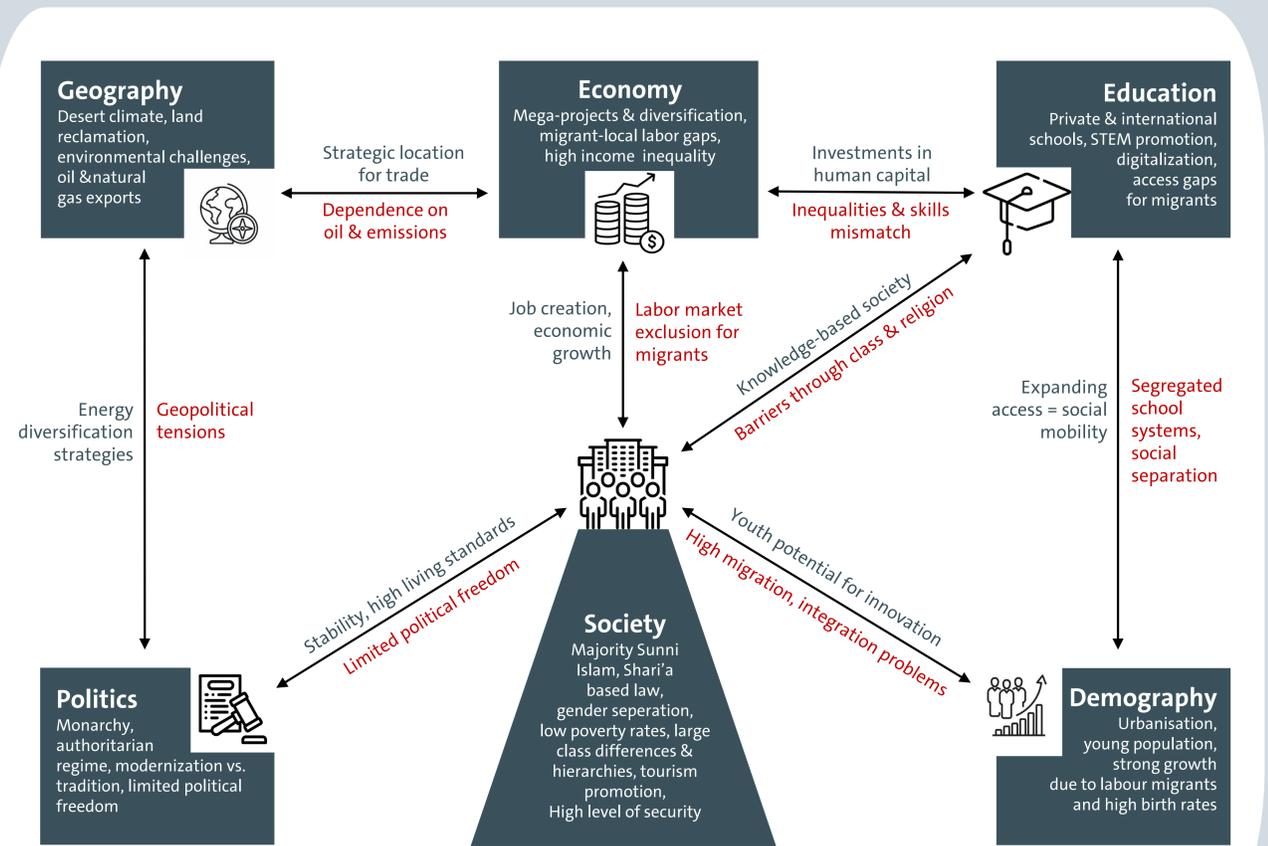


Figure 1: Key Factors shaping the Gulf States: Economy, Education, Demography, and Environment (own illustration: Martje Lott)

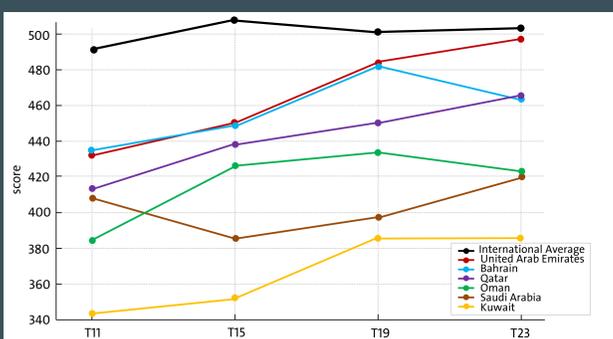


Figure 2: Average Mathematics Achievement 2011-2023

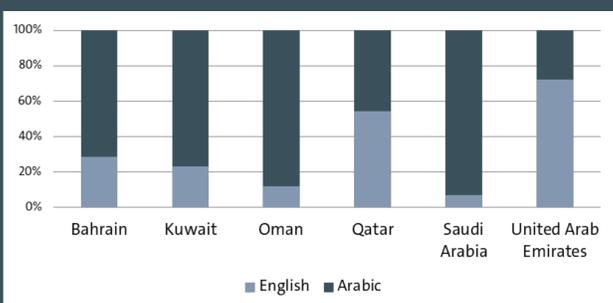


Figure 3: Test Language 2023

## First Results of the Analysis

- Progress over time:** UAE improved in mathematics from **434 (2011)** to **498 (2023)**, while **Saudi Arabia** dropped after 2011 but returned to a similar level 2023 (detailed information under <https://timss2023.org/>).
- Mathematics lag behind global average:** GCC average mathematics score (2023): **441**, vs. global center point of **503** – UAE highest (498), Kuwait lowest (382) (von Davier et al. 2024).
- Test language varied strongly by country (2023):** **72%** of UAE students took the test in **English**, vs. only **7%** in **Saudi Arabia**. Across GCC, 50% tested in English, 50% in Arabic.
- Migration paradox:** In **Kuwait (2023)**, **migrant students outperformed nationals** in mathematics in Grade 4 by **~37 points** on average. Similar advantages appear in **Qatar (+45 points)** and the **UAE (+53 points)**.
- Parental education effect:** Students from **Bahrain (2023)** whose parents had **tertiary education** scored **58 points higher** in mathematics than peers with parents **did not reach this level** (490 vs. 432).
- Home learning resources:** Students with more resources scored on **average 19 points higher in mathematics** (SD > 1; r = 0.22, 2023, GCC average). Strongest correlation in **UAE (r = 0.29)**, lowest in **Saudi Arabia (r = 0.13)**.

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