



# Teaching Robotics Programming via Mobile Learning Apps in Rural Ethiopia: Skills Development Impacts

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## Abstract

This study addresses a current research gap in Computer Science concerning Teaching Robotics Programming to Rural Ethiopian Youth via Mobile Learning Apps: Skills Development Outcomes in Ethiopia. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Teaching Robotics Programming to Rural Ethiopian Youth via Mobile Learning Apps: Skills Development Outcomes, Ethiopia, Africa, Computer Science, comparative study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Model estimation used  $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \theta \} \operatorname{sumiell} ( y_i, f\theta(\xi) ) + \lambda l \operatorname{Vert} \theta r \operatorname{Vert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Ethiopia, Geographic Information Systems, Mobile Learning, Robotics Education, Technological Integration, Participatory Action Research, Pedagogical Innovation*

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