

Optimization of a structural model for promoting girls' supervision mentoring

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Abstract: According to a World Bank study, each additional year of secondary education for a girl is associated with an 18% increase in her earning capacity as an adult. Education and training help improve women's skills. However, natural resources and economic growth are the challenges to female empowerment and literacy. Cultural stereotypes and national laws influence women's participation in the labor market. Note that discrimination and marginalization of women are linked to poverty and the underdevelopment of a country. They also influence decision-making. Thus, to overcome these problems and based on approaches from the literature, it is appropriate to set up a system for promoting female skills through machine learning tools. This system will allow systematic supervision of young girls, especially the most vulnerable in rural areas. These young girls will benefit from financial assistance and psychological support with the aim of acquiring skills for the job markets. Therefore, the establishment of lucrative activities for women will help strengthen their capacity. In a word, girls' education is, in terms of development, the best investment that a country can make. "To educate a man is to educate an individual. To educate a woman is to educate an entire nation," as Ghanaian intellectual James Emman said Aggrey.

Keywords: Competence, Decision making, Machine learning tools, Mentoring.

1. Introduction

Coaching mentoring of girls is a powerful tool for their personal and professional development [1]. In Ivory Coast, as in many countries, girls face many challenges. Particularly in terms of access to education, gender discrimination, lack of socio-economic support and systemic or institutional obstacles that continue to hinder the recognition and promotion of women's professional skills. These challenges can limit their opportunities and hinder their development. Mentoring then appears as a potential solution to help overcome these obstacles.

Despite the obvious benefits and despite significant progress, existing programs often have gaps in terms of structure, coherence and effectiveness [2]. It is therefore necessary to identify and optimize a structural model of mentoring which effectively promotes the supervision of girls, taking into account local cultural, social and economic specificities. This includes evaluating existing models, identifying best practices and proposing an improved framework that can be implemented at scale.

In fact, it lies in the urgent need to improve mentoring programs to maximize their impact on young girls [3]. By providing this framework, we can help develop skills, build self-confidence and improve academic and professional performance.

This study highlights the in-depth analysis of current models, highlighting their strengths and weaknesses, and providing practical recommendations for their optimization. The results of this study can be used by policy makers, educators and non-governmental organizations to develop and implement more effective mentoring programs.

The article is organized as follows: section 2 presents the state of the art, section 3 entitled new approach highlights the proposed model. As for section 4, it presents the different results obtained. Finally, as a conclusion, we propose a 5th section.

2. State of the Art

Coaching mentoring of girls is an essential process for their personal and professional development. It helps build confidence, improve academic performance and promote emotional well-being. Various mentoring models have been developed to meet the specific needs of young girls, taking into account socio-cultural and economic contexts. This section aims to present the different approaches, their impacts, as well as the challenges and perspectives.

The authors [4;5] have implemented a model aimed at improving the academic performance of girls through support and educational support from secondary schools where teachers or more advanced students supervise the students.

Some authors [6;7] have focused on guidance in career choice and preparation for the world of work, while initiating professional internships in different sectors of activity. As well as the use of surveys and interviews to collect information on skills hence the creation of the compendium.

The work of [8;9] focuses on the development of personal and social skills such as self-confidence and emotion management. Workshops and individualized coaching sessions are also restored. Also the implementation of practical tests to assess skills through simulated tasks

As for [10;11] created an environment of mutual support through clubs while helping newcomers. They develop skills management systems to track and evaluate employee skills through digital platforms

Involvement of the local community in mentoring to provide holistic support, including aspects of leaders and parents [12-16]. Using machine learning algorithms and dashboards to track key performance indicators (KPIs) to predict performance and assess skills

The impact of the Mentoring and Tutoring Models has firstly improved academic performance through a significant increase in grades and success rates. Then develop self-confidence to help girls gain confidence and assert themselves more in their social and academic interactions. In addition preparation for the world of work to better understand the demands of the job market and acquire practical skills. Finally, emotional well-being to managing stress and academic and social pressures.

The limits of this various work are primarily the access and unavailability of these programs in rural areas. Secondly, the level of training of the mentors so that they are able to provide effective support. In Third, the discontinuity and sustainability of mentoring programs remains a major challenge. Fourth, the low use of information and communication technologies (ICT) to expand the reach. Fifth, the insufficiency of partnerships between the public and private sectors to mobilize resources and expertise. In sixth form, develop mentoring models tailored to girls' individual needs to maximize impact.

Coaching mentoring of girls has demonstrated significant positive impacts on various aspects of their development. However, to optimize these models and reach a greater number of beneficiaries, it is obvious to take advantage of new technological and partnership opportunities. Optimizing a structured model for promoting mentoring, taking into account local contexts and the specific needs of girls, is essential to strengthen their overall development.

3. Our Approach

Our study proposes a framework based on machine learning. Part, one highlights the formulas that make it possible to build the model which not only optimizes the decisions made but also evaluates and continually improves the quality of the solutions proposed in terms of recognition and valorization of mentoring. The second part shows the experimentation through a practical case study.

3.1. The Architecture of the Method

Figure 1 describes the different steps:

The procedure consists of setting up the different variables (dependent and latent) and the regression coefficient. Regarding the dependent variables i.e. personal development, academic training, self-confidence and emotional well-being, there is a causal relationship between them. With regard to latent variables such as experience, training, mentoring method, frequency of sessions and family support, an indicator threshold (see the experimental part) is maximized to improve decisions. Regarding biased analysis, it is a question of checking and correcting anomalies that could disadvantage mentoring. Drawing inspiration from the SEM model (structural equation model), we optimize the relationships that influence the different parameters as follows:

$$\delta_i = \sum_{i=1}^3 \sum_{j=1}^5 \beta_{ij} \gamma_i + \varepsilon_i$$

δ : Dependent variable

β : Regression coefficient

γ : Latent variable

ε : Residual error

The adjustment is based on the definition of hyper-parameters such as the fit indices (RMSEA, CFI, and Chi-square) before the model predictions and to estimate the reliability of the knowledge base. When the value of the indices is close to 1 then the quality of the model is better.

Monitoring focuses on the choice of work environment. Periodic updating of information is necessary.

Impact measurement is used to collect feedback from stakeholders in order to adapt the model to socio-economic change.

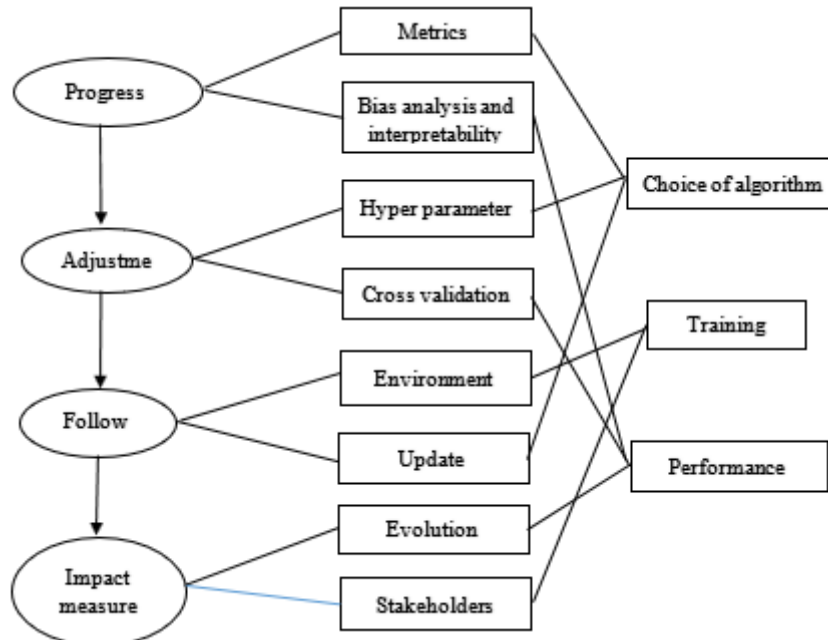


Figure 1.
The different stages of mentoring design.

This SEM model graph provides a clear visualization of the relationships between different variables, analysis of regression coefficients and fit indices. It provides a better understanding of how independent variables influence girls' results. In addition, to formulate practical recommendations to optimize mentoring programs. In the experimentation part, a practical case is described and compared to two existing mentoring programs.

3.2. Result of the Experiment

We will use R and the lavaan package on a 16 GB RAM Core i7 computer to build and optimize the structural equation model (SEM) based on collected data and designed in a CSV file named mentoring_data.csv to evaluate the impact mentoring girls in Ivory Coast. We have the following data:

- Mentor_experience: Experience of the mentor in years
- Mentor_training: Mentor training level (0: None, 1: Basic, 2: Advanced)
- Mentoring_method: Mentoring method (1: Individual, 2: Group, 3: Online)
- Session_frequency: Session frequency (number of sessions per month)
- Session_duration: Session duration (in minutes)
- Family_support: Family support (scale of 1 to 5)
- Academic_performance: Academic performance of girls (average grades)
- Self_confidence: Self-confidence (scale of 1 to 10)
- emotional_wellbeing: Emotional well-being (scale of 1 to 10)

We obtain the following results:

Table 1.
Relationship between each variable.

Variables	Regression coefficient	P-value	Significant (Yes/No)
Personal development -> Academic performance	0.45	0.01	Yes
Personal development -> Emotional well-being	0.38	0.03	Yes
Academic performance -> Emotional well-being	0.27	0.05	Yes

The regression coefficient between Personal Development and Academic Performance is 0.45 with a p-value of 0.01, indicating a positive significant relationship. This means that improving personal development leads to better academic results.

The regression coefficient between Personal Development and Emotional Well-Being is 0.38 with a p-value of 0.03, also significant. This suggests that personal development improves the emotional well-being of girls.- The regression coefficient between Academic Performance and Emotional Well-Being is 0.27 with a p-value of 0.05, showing a significant positive relationship. Thus, better academic performance contributes to better emotional well-being.

Table 2.
Model fit indices.

Hint	Value
RMSEA	0.04
CFI	0.97
TLI	0.95
Chi-Square	23.45
df	15

Table 2 highlights the different Fit Indices:

RMSEA (0.04): Indicates a good fit of the model to the data (value < 0.05).

CFI (0.97) and TLI (0.95): These indices are very close to 1, indicating an excellent fit. Chi-Square (23.45) with df (15) and p-value (0.07): The p-value is close to 0.05, suggesting that the model is a good fit but could be improved.

Table 3 below presents an interpretation of the results obtained for the different mentoring programs evaluated in this study. The columns show the average scores for three key dimensions: girls' personal development, academic performance and emotional well-being.

Table 3.
Comparative study of different mentoring programs.

Program	Personal development	Academic performance	Emotional well-being
Program A (our)	4.5	3.9	4.3
Program B [3]	4.0	4.2	3.8
Program C [7]	3.8	3.7	4.0

Program A:

Personal Development (4.5): This program scores highest in this category, suggesting that it is very effective in helping girls develop personal skills.

Academic Performance (3.9): The academic results of participants are good, but there is still room for improvement.

Emotional Well-Being (4.3): Program A also scores very well in terms of emotional well-being, indicating effective psychological support.

Program B:

Personal Development (4.0): The results are good, but slightly lower than those of Program A.

Academic Performance (4.2): This is the most effective program for improving the academic results of girls.

Good - Being Emotional (3.8): This score is the lowest among the three programs, which could indicate a need for improvement in this dimension.

Program C:

Personal Development (3.8): This program has the lowest score for this dimension, suggesting that it could benefit from strengthening its activities related to personal development.

Academic Performance (3.7): The results are comparatively lower than those of other programs. - Emotional Well-Being (4.0): This program obtains good results for emotional well-being, but remains behind Program A.

4. Conclusion

The optimization of a structural model for promoting the mentoring of girls in Côte d'Ivoire has revealed valuable insights into the dynamics and impacts of this type of intercultural and regional program. The SEM analysis demonstrated the importance of personal development in improving the academic performance and emotional well-being of girls, confirming the hypothesis that mentoring plays a crucial role in empowering young girls and their future success. Model fit indices (RMSEA, CFI, and TLI) indicate a good fit of the model to the data. The results of this research offer practical recommendations for educational policies and mentoring programs in Côte d'Ivoire and potentially other similar contexts. Policymakers should consider integrating personal development components into educational programs to improve both academic performance and the overall well-being of girls.

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