

# Sustainable hybrid education model and its relationship to academic achievement among postgraduate students in some Egyptian universities according to international quality standards

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**Abstract:** Sustainable hybrid education is an educational approach that combines multiple kinds of instruction. Online education and traditional face-to-face education will be implemented in tandem to propel the educational process towards contemporary approaches, with the aim of achieving high-quality outcomes and staying abreast of scientific and technical advancements. The objective of this study is to determine the correlation between hybrid education, which is a sustainable model, and the academic performance of graduate students in select Egyptian universities, based on international quality criteria. The study employed a descriptive analytical methodology, and data was collected using a meticulously designed computerized questionnaire, whose validity and reliability were verified using proper statistical techniques. The study sample comprised 2235 postgraduate students enrolled in Egyptian universities, specifically Cairo, Helwan, and Ain Shams. The study's findings determined that the extent of hybrid education and the efficacy of the procedure. The sample members possess a high level of education, and hybrid education has a significant positive influence on the quality of the educational process. Hybrid education mostly impacts the academic components, and there are variations among universities in implementing hybrid education, with Ain Shams University being particularly favorable towards it. The study proposed enhancing the university's human resources for students, faculty, and staff, as well as assuring the availability of diverse gadgets and resources utilized in the hybrid education setting.

**Keywords:** academic achievement; human resources; hybrid education model; international quality standards; postgraduate students

## 1. Introduction

The worldwide spread of the COVID-19 pandemic has caused major disruptions in education systems globally, necessitating institutions to quickly adjust to new methods of teaching and learning. Moreover, this pandemic has compelled movements and organizations to swiftly modify their policies and adopt preventive measures to halt and address this pandemic in all spheres of life, including advocating for the adoption of distance education as a substitute for conventional in-person education (Gleason et al., 2020). Furthermore, the transition to virtual learning has become essential in the contemporary context, as social distancing measures have emphasized the necessity of remote connections instead of in-person ones. As a result, numerous educational institutions have shifted to online platforms to distribute educational materials and interact with students (Hodges et al., 2020; Wahab, 2020).

Hybrid education, which combines aspects of traditional in-person teaching with

online learning, has become a practical alternative in the face of these difficulties. Hybrid education integrates the advantages of both traditional and digital teaching methods, creating a well-rounded approach to learning. It allows students to actively engage in the learning process and receive tailored instruction (Mollo-Flores and Deroncele-Acosta, 2021). Furthermore, the adoption of hybrid education offers other advantages, such as increased student involvement, adaptability in learning, and the cultivation of crucial digital competencies. Hybrid models assist instructors in maximizing educational resources and adapting to various learning demands, ultimately resulting in enhanced learning outcomes (Ali, 2022).

Conversely, there has been a growing emphasis on quality assurance in higher education, aiming to guarantee that educational institutions provide education of superior quality that aligns with the changing demands of the job market (Abdullah, 2022). Faculty development programs are essential for providing educators with the necessary skills and competencies to effectively incorporate technology into the curriculum (Darling-Hammond et al., 2009).

In conclusion, hybrid education, as a sustainable model, represents a promising approach to address the challenges posed by the COVID-19 pandemic and advance the quality of higher education. By harnessing the benefits of both traditional and online learning modalities, hybrid education offers a dynamic and flexible learning environment that prepares students for the demands of the modern workforce while ensuring the continued delivery of high-quality education.

### **Study problem**

The COVID-19 epidemic has had a significant impact on students in Egypt, resulting in extensive interruptions in higher education as a result of preventive measures such as social separation and the suspension of activities. As a result, the Supreme Council of Universities in Egypt explored different educational methods and ultimately decided to implement hybrid education as a possible solution. Hybrid education is a blend of conventional and digital learning approaches, providing both benefits and drawbacks. Therefore, researchers sought to examine the influence of hybrid education on the quality of the educational process. The study examined the following inquiries:

- 1) What is the extent of hybrid education and the quality of the educational process in higher education among the participants in the study?
- 2) Does hybrid education have a significant impact on the many dimensions of the quality of the educational process (including non-academic features, academic aspects, reputation, and accessibility) for postgraduate studies (Master or PhD) at Cairo, Ain Shams, and Helwan universities, with a significance level of 0.05?
- 3) Is there a statistically significant variation in the perspectives of hybrid education among the sample members, depending on the university they belong to (Cairo, Ain Shams, and Helwan), with a significance level of 0.05?

## **2. Materials and methods**

This chapter employed a descriptive analytical strategy to elucidate the influential link between the study variables. A random sample of graduate students was selected

due to the huge population size.

### 2.1. Study population and sample

The researchers utilized the basic random sample method to gather data. The study participants were chosen based on a confidence level of 95% and a standard score of 1.96, with a standard error of 5% for the sample. By referring to statistical tables from Krejcie and Morgan (1970), it was determined that a sample size of 387 male and female students was appropriate, **Table 1** shows the study population and sample size.

**Table 1.** Study population and required sample size.

Sample	Percentage	PhD		Master		University
		Male	Female	Male	Female	
66	17%	725	572	1410	1032	Cairo
175	45%	1959	1718	3859	2323	Ain Shams
146	38%	1519	1228	3520	2170	Helwan
387	100%	4203	3518	8789	5525	Total

Source: Ministry of Higher Education, Minister’s Office Sector, General Administration of the Information and Documentation Center.

We have prioritized these universities according to their high rankings in the English classification of the QS World University Rankings: Sustainability 2024. Moreover, the distinguishing attributes of graduates from these colleges render them more competent for the job market compared to graduates from other Egyptian universities.

### 2.2. Validity and reliability of the study tool: Study tool

The educational institution in the Arab Republic of Egypt relied on the standards set by the National Authority for Quality Assurance and Accreditation of Education (2020) as a self-assessment supplement for the quality requirements of the distance learning component in their hybrid education system. The quality standards for the educational process were based on HEDPERF, developed by Abu Warda (2007). The final version of the first questionnaire consisted of six items related to hybrid education, while the second questionnaire consisted of nineteen items assessing the quality of the educational process. Both questionnaires used a five-point scale to rate the paragraphs.

#### Test the validity and reliability of the study tool

In order to determine the importance of the accuracy of measurement tools in hybrid education and the quality of the educational process, the researcher initially sought the input of five arbitrators. The researcher relied on the integrity of these arbitrators to provide their observations, which were then considered in order to arrive at the final version of the survey questionnaire. The validity and reliability of the data were assessed using the Alpha Cronbach coefficient and the Kaiser-Meyer-Olkin (KMO) coefficient. The results of the validity and reliability tests are presented in the following table.

The validity of the scale is determined by two criteria. Firstly, the Cronbach

Alpha coefficient, as proposed by Malhotra and Birks (2006), indicates that the scale is valid if the values of its elements are greater than 6. Secondly, the square root of stability, as suggested by Zehir et al. (2016) indicates that the scale is valid if the value of its constituent elements is greater than 5.

**Table 2** displays the strong validity and reliability of all items in the survey list variables. This information is crucial for establishing confidence and distributing the survey to the study sample in order to meet the objectives and test the questions.

**Table 2.** Validity and reliability coefficients for hybrid education and quality of the educational process.

KMO	Cronbach's alpha coefficient	Number of items	Variable
0.731	0.942	16	Hybrid Education
0.737	0.969	35	Quality of the Educational Process

### 2.3. Statistical methods

The present investigation employed the statistical markers of arithmetic mean, standard deviation, Karnapach's alpha coefficient of stability, and one-way ANOVA, utilizing the statistical software package (SPSS) version 26. The response level was categorized into three tiers: low, medium, and high. The low tier ranged from 1 to 2.33, the medium tier ranged from 2.34 to 3.66, and the high tier ranged from 3.67 to 5.00.

The authors must include a comprehensive description of the methodology employed during the study outlined in the report. This will facilitate the readers in acquiring a lucid comprehension of the research and enable them to reproduce the study in subsequent endeavors. Authors must ensure that they include a comprehensive description of each method employed, including proper citations for any previously described processes. Refrain from engaging in any form of discourse within this section pertaining to methodologies or outcomes.

Research articles that document extensive datasets that have been stored in an accessible public database should explicitly state the location of the data deposition and include the corresponding accession codes. If the accession numbers are not available at the time of submission, please indicate that they will be provided during the review process. Prior to publication, these must be provided.

Studies that include animals or humans and require ethical permission must clearly state the authority that granted approval and the related ethical approval guidelines.

## 3. Results

This section encompasses a comprehensive presentation of the results obtained from the analysis, processing, and subsequent discussion of the data.

To answer the first question:

### 3.1. What is the level of hybrid education and the quality of the educational process among the sample members?

To answer this question, the arithmetic averages and standard deviations of the

level of hybrid education and the quality of the educational process among the sample members were calculated. **Tables 3** and **4** illustrate this.

**Table 3.** Arithmetic averages and standard deviations of the hybrid education variable among sample members.

Items	Arithmetic mean	Standard deviation	Coefficient of variation	Percentage of impressions
The university applies effective methods to identify students' needs in dealing with distance education technology.	3.91	0.97	0.25	75%
The university provides financial support methods to students to provide adequate educational materials and guidance for their use.	3.54	1.11	0.31	69%
The university makes educational materials available to students in an organized and archived manner to ensure that they reach all students at all times.	4.04	0.83	0.21	79%
The university implements training programs for students regarding the rules and methods of distance assessment.	3.39	0.97	0.29	71%
The university follows up on students' commitment to teaching hours	3.88	0.50	0.13	87%
The university implements corrective actions in light of students' suggestions about the quality of distance education systems and support services provided.	3.77	1.17	0.31	69%
Total	3.76	0.93	0.25	75%

**Table 4.** Arithmetic mean and standard deviations of the quality of the educational process variable among sample members.

Items	Arithmetic mean	Standard deviation	Coefficient of variation	Percentage of impressions
here is equality between students in treatment and respect	3.95	1.28	0.32	68%
Professors show positive attitudes towards students	3.20	0.81	0.25	75%
There is efficiency in dealing with complaints and grievances	3.70	0.98	0.27	73%
Good communication skills on the part of employees exist	4.29	0.92	0.21	79%
Feel the efficiency of the explanation inside the classroom	4.13	0.78	0.19	81%
College buildings are clean	4.10	0.92	0.23	77%
Non-academic aspects	3.90	0.95	0.25	76%
Courses contain knowledge and applications	4.25	0.66	0.15	85%
Means of simplifying and communicating information are used	3.86	0.53	0.14	86%
There is a response from professors to students' feedback and comments	3.66	0.60	0.16	84%
The staff is courteous and well-mannered	3.92	0.84	0.22	78%
Students are allowed a reasonable amount of freedom to express their opinions.	3.42	0.94	0.27	73%
Academic aspects	3.82	0.71	0.19	81%
Employees are competent in performing the work assigned to them	3.89	0.51	0.13	87%
The university enjoys a good reputation for the quality of its academic programs.	3.92	1.28	0.33	67%
There is an update in the educational style followed by the university	3.86	1.23	0.32	68%
The administration prioritizes caring for students	3.80	1.09	0.29	71%
Availability of academic and educational experiences at the university	3.88	0.55	0.14	86%
Reputation/Reputation	3.84	0.81	0.21	79%
The university is close to the parking lots	3.97	0.86	0.22	78%
There are guidance boards that help you reach the classrooms	3.64	1.16	0.32	68%
The university is near my family's place of residence	3.89	0.91	0.24	76%
Accessibility	3.83	0.77	0.20	80%
Quality of the educational process	3.86	0.89	0.23	77%

Analyzing the numerical data, it is evident that most of the sample items exhibit a significant level of hybrid education, with an average of 3.76 and a coefficient of difference of 25%. This indicates a low level of dispersion, suggesting a high degree of agreement among the participants, with a tendency to agree by 75%. Specifically, the findings indicated that all elements of the hybrid education scale were rated highly by the participants in the sample.

By interpreting the numerical values, it is evident that most of the sample items exhibit a high level of educational quality, with an average score of 3.86 and a coefficient of variation of 23%. This low degree of dispersion suggests a high level of agreement among participants, with a consensus rate of 77%. The results indicated that all dimensions of the educational quality scale were rated highly. The majority of dimensions had a response rate of 81%, following the academic aspects. Access facilities had a response rate of 80%, and reputation had a response rate of 79%. Ultimately, non-academic factors exhibit a response rate of 76%.

**3.2. Second question: Is there an impact of hybrid education on the dimensions of the quality of the educational process (non-academic aspects, academic aspects, reputation, accessibility) for postgraduate studies (Master-PhD) at universities (Cairo-Ain Shams-Helwan)?**

To answer this question, simple and multiple linear regression were used to investigate the relationship between variables and find out the impact of hybrid education on the quality of the educational process. **Table 5** shows the results of the multilinear regression analysis of hybrid education on the quality of the educational process. To find out the impact of hybrid education on the quality of the educational process, multiple linear regression was used.

**Table 5.** The degree of correlation between the independent variable (hybrid education) and the dependent variable (educational quality).

Regression line equation	F. test		Regression constant	$\beta_i$	$R^2$	R	Variable
	Value	Significance					
$Y = 0.316X + 2.67$	380.701	0.000	2.67	0.316	0.50	0.704	Quality of the educational process

**Table 5** shows the following:

There is a significant and strong positive relationship between hybrid education and the quality of the educational process. The correlation coefficient is 70.4%, with a significance level of less than 0.01. This means that activating more elements of hybrid education leads to a higher quality of the educational process in higher education at Cairo University, Ain Shams, and Helwan.

The independent variable, hybrid education, accounts for 50% of the total variation in the dependent variable, the quality of the educational process, according to the coefficient of determination,  $R^2$ , which is 50%. Other factors are responsible for the remaining percentage.

We used the regression model to evaluate the overall significance of the model's quality. We found the *F*-test value of 380.701 to be significant at a level below 0.01, indicating the substantial impact of the regression model on the dimensions of

educational process quality.

By measuring the indicators of hybrid education, we can use the relationship model to predict the quality of the educational process. According to this model, each increase of one correct amount in the indicators of hybrid education leads to a 0.316 increase in the quality of the educational process.

We used simple linear regression to assess how hybrid education affected the various components of the educational process.

**Table 6.** Multiple regression by the inter method the effect of multiple regression of hybrid education on the dimensions of the quality of the educational process.

Variable	R	R <sup>2</sup>	$\beta_t$	Regression constant	F. test		Regression line equation
					Significance	Value	
Non-academic aspects	0.931	0.87	0.469	2.015	0.000	657.767	$Y = 0.469X_1 + 2.015$
academic aspects	0.678	0.46	0.294	2.726	0.000	328.616	$Y = 0.294X_2 + 2.726$
Reputation/Reputation	0.636	0.41	0.343	2.678	0.000	262.729	$Y = 0.343X_3 + 2.678$
Accessibility	0.270	0.08	0.155	3.278	0.032	30.497	$Y = 0.155X_4 + 3.278$

X: Hybrid Education, Y: Dimensions of the Quality of the Educational.

**Table 6** shows the following:

1) Non-academic aspects:

There is a significant and strong positive relationship between hybrid education and non-academic aspects. The correlation coefficient is 93.1%, which is statistically significant at a level of less than 0.01. This indicates that the activation of hybrid education elements leads to an increase in non-academic aspects in higher education at Cairo University, Ain Shams, and Helwan. The coefficient of determination ( $R^2$ ) is 87%, indicating that the independent variable (hybrid education) accounts for 87% of the overall change in non-academic aspects. Other factors can account for the remaining percentage, and by measuring the hybrid education index and applying the model, we can predict the scores of non-academic aspects. This suggests that for every one-unit increase in the hybrid education index, there is a corresponding increase of 0.469 in the non-academic aspects.

2) Academic aspects:

There is a statistically significant positive relationship between hybrid education and academic aspects. The correlation coefficient is 67.8%, with a significance level of less than 0.01. This indicates that the activation of hybrid education elements leads to an increase in academic aspects in higher education at Cairo University, Ain Shams, and Helwan. The coefficient of determination,  $R^2$  is 46%, indicating that the independent variable (hybrid education) explains 46% of the total change in academic aspects. Hybrid education does not explain the remaining percentage. By measuring the hybrid education index and applying the model, we can predict the scores of academic elements while considering other criteria.

This indicates that every increase of one correct amount in the index of hybrid education leads to an increase of (0.294) in the academic aspects.

3) Reputation/reputation aspects:

There is a significant positive relationship between the different aspects of hybrid

education. The correlation coefficient is 63.6%, which is statistically significant at a level of less than 0.01. This indicates that the activation of hybrid education elements leads to an increase in the reputation of higher education institutions at Cairo University, Ain Shams, and Helwan. The independent variable of hybrid education accounts for 41% of the variation in reputation, as indicated by the coefficient of determination,  $R^2$ . Other factors influence the remaining percentage. We can predict reputation scores by measuring the hybrid education index and applying the model. Furthermore, a one-unit increase in the hybrid education index leads to a 0.343 increase in reputation.

4) Accessibility aspects:

There is a statistically significant, weak positive relationship between hybrid education and access facilities. The correlation coefficient is 0.27, with a significance level of less than 0.01. This indicates that the activation of hybrid education elements leads to an increase in access facilities in higher education at Cairo University, Ain Shams, and Helwan. The coefficient of determination ( $R^2$ ) is 0.08, indicating that the independent variable (hybrid education) explains 8% of the total change in access facilities. Other factors explain the remaining percentage. The hybrid education index can be used to predict accessibility scores, with each correct increase in the index leading to a reputational increase of 0.155.

**3.3. Third question: Does the application of hybrid education differ according to the variable of the type of university (Cairo-Ain Shams-Helwan)?**

In order to address this inquiry, we computed the arithmetic means and standard deviations. Our study also used a one-way ANOVA test to see if there were statistically significant differences in the average answers from the people in the study sample based on the variable of university type (Cairo, Ain Shams, and Helwan). **Table 7** presents the results of this analysis.

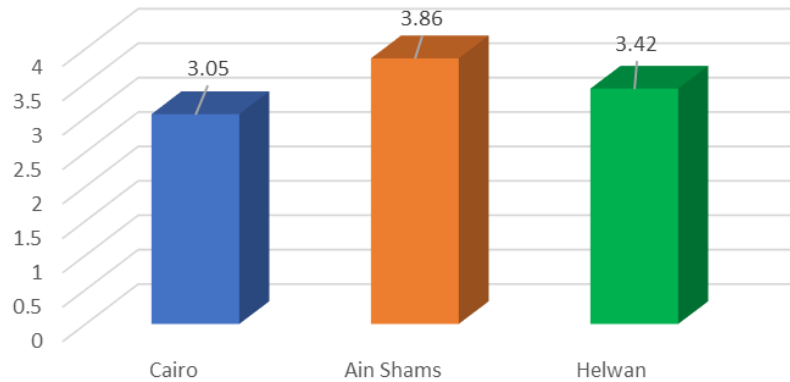
**Table 7.** Fields by hybrid education variable according to mean and standard deviations.

University	Mean	Standard deviation	Coefficient of variation
Cairo	3.05	0.79	25%
Ain Shams	3.86	1.72	44%
Helwan	3.42	0.900	26%

The data presented in **Table 7** and **Figure 1** indicate that the average hybrid education score at Cairo University is 3.05, with a coefficient of difference of 25%. This suggests a weak degree of dispersion, indicating a high level of agreement among participants, with 75% expressing a positive attitude towards hybrid education. Similarly, at Helwan University, the average hybrid education score is 3.42, with a difference coefficient of 26% and a weak degree of dispersion. This also indicates a high level of agreement among participants, with 74% expressing a positive attitude towards hybrid education. Finally, the average hybrid education score at Ain Shams University is 3.86. The difference factor of 44% indicates a significant degree of



dispersion, suggesting a lack of homogeneity in opinions and a tendency to agree by 56% on the implementation of hybrid education. The study sample reveals that Cairo University is the most popular choice for hybrid education. To determine if there are differences between the universities in the implementation of hybrid education, a one-way ANOVA test was conducted. **Table 8** presents the results of this test.



**Figure 1.** Field by academic rank variable according to mean.

**Table 8.** One-way ANOVA analysis to find out the effect of hybrid education on the variable of university type.

Variable	Source of Variation	Sum of Squares	Degree of Freedom	Mean of Squares	Value (F)	Significance
hybrid Education	Between groups	36.945	2	18.472	10.688	0.000
	Within groups	665.396	385	1.728		

**Table 8** reveals the differences in the application of hybrid education among the universities under study. We used Scheffe’s method to compare the arithmetic averages of the university-type variable to determine these differences. **Table 9** presents the results of these comparisons.

**Table 9.** Scheffe test results for post-hoc comparisons of the arithmetic means for the university type variable.

Universities	Difference between means	Significance
Cairo with Ain Shams	-0.80	0.000
Cairo with Helwan	-0.36	0.132
Ain Shams with Helwan	0.44	0.009

The **Table 9** indicates a disparity in the implementation of hybrid education between Cairo University and Ain Shams University, with Ain Shams University having a more favorable outcome. Similarly, the application of hybrid education between Ain Shams University and Helwan University differs, with Ain Shams University again having a more favorable outcome.

#### 4. Discussion

The study revealed that the participants rated all items on the hybrid education scale and dimensions of the educational quality scale highly. This suggests that implementing the hybrid education system in the educational process enhances it and leads to qualified, empowered, creative, and well-suited individuals who meet the

demands of the labor market. Abdullah's (2022) research, which emphasized the excellence of higher education outcomes and their contribution to meeting job market demands, aligned with the findings of this study. The study indicated that there was a high level of cognitive and professional skills.

The findings suggest that hybrid education has a significant positive influence on the quality of the educational process. Non-academic aspects are the most affected by hybrid education, followed by reputation and academic aspects. However, the impact on accessibility is relatively weak. Alwan (2022) conducted a study that examined the interactive role of digital skills in the relationship between educational platforms and the quality of the educational process, which aligns with these results. The study found a positive relationship between educational platforms and the quality of the educational process. Similarly, another study by Insha (2022) revealed that different components of ICT have distinct implications for universities, faculty, and students using online platforms. These implications contribute to effective student learning, knowledge acquisition, and satisfaction.

The findings revealed variations in the implementation of hybrid education among universities. Kebili and Khadra's (2022) study, which emphasized the need to establish the necessary infrastructure for distance e-learning, aligns with these findings. This includes preparing competent personnel and providing reliable internet connectivity to facilitate the transfer of education across different locations. Additionally, it is crucial to develop training programs for students, teachers, and administrators to optimize the utilization of quality assurance in Algerian higher education institutions. This serves as a key factor in enabling these institutions to effectively address the challenges they encounter. These recommendations are completely comparable to our current study.

## **5. Conclusion**

The aforementioned findings of the present study affirm the importance of providing training to university faculty in utilizing distance education methods and enhancing their academic, personal, social, and interactive competencies, which are closely associated with their advancement in academic skills. This will enable them to effectively engage with students. According to the findings, the study suggests that university students should devise suitable strategies to ensure the effectiveness of distance learning during times of crisis. This includes providing internet access and implementing training programs for both faculty and students. The goal is to educate individuals on the use of technology in remote learning and provide appealing components for therapeutic initiatives. We introduce students to the Internet, design interactive programs based on their skills and characteristics, provide appropriate activities, and arrange convenient times for remote sessions. Hence, scholars propose the imperative of devising strategies to deliver instructional content to college students in order to mitigate global crises and prevent their exacerbation in the future.

## **6. Recommendations**

Emphasis should be placed on enhancing the human capital inside the university, encompassing students, faculty members, and employees, by means of... The

university should provide comprehensive training programs that encompass all aspects of hybrid education.

Guarantee the availability of diverse equipment and resources utilized in the hybrid educational setting, both for students and the institution, in order to prevent any hindrance to the process of learning.

Assessing the efficacy of hybrid education, quantifying educational achievements, leveraging the findings, and refining it for implementation in the educational sphere.

The user did not provide any text. It is critical to train professors and administrative staff on contemporary techniques and tools that align with current advancements, particularly in the areas of distance learning and evaluation. Regular training sessions can achieve this.

**Author contributions:** Conceptualization, ABA and AMAA; methodology, AMAA; software, ABA; validation, AMAA and FSN; formal analysis, ABA; investigation, FSN; resources, AOA; data curation, FSN; writing—original draft preparation, FSN; writing—review and editing, AOA; visualization, AMAA; supervision, ABA; project administration, FSN; funding acquisition, ABA. All authors have read and agreed to the published version of the manuscript.

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