

How to use structural modeling methodology in studying social Phenomena (An applied study)

كيفية استخدام منهجية النمذجة البنائية في دراسة الظاهرة الاجتماعية (دراسة تطبيقية)

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Date of submission: 20/05/2026

Date of acceptance: 09/06/2026

Date of publication: 30/06/2026

Abstract:

This research aims to study how structural modeling can be used to examine a social phenomenon and to identify its key concepts.

The structural modeling methodology was used with the Amos software on a sample of students in Laghouat to investigate the impact of smart phones on academic achievement.

The study concluded that the hypothetical model was relatively well-conformed, as evidenced by statistical indicators of good model fit.

Keywords: Conformity indicators, structural modelling, the Amos program, structural validity.

الملخص:

يهدف هذا البحث الى دراسة كيفية استخدام النمذجة البنائية في دراسة مثال عن الظاهرة الاجتماعية، وتحديد أهم المفاهيم المتعلقة بها .

تم استخدام منهجية النمذجة البنائية عن طريق برنامج الاموس لعينة من التلاميذ حول أثر الهاتف الذكي على التحصيل الدراسي بالاغواط.

توصلت الدراسة إلى أن بناء النموذج الافتراضي للفرضيات تحققت نسبيا من خلال احصاءات مؤشرات حسن مطابقة للنموذج.

الكلمات المفتاحية: مؤشرات المطابقة، النمذجة البنائية، برنامج الاموس، الصدق البنائي.

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1- Introduction

Academic achievement is a concept in the field of education and its social effects are multiple and vary according to the fields of study. It is what the student benefits from within the educational institution, and it is a station that enables the student to acquire scientific information in life from a group of societal systems. The goal of it is the student's outcome that distinguishes his personality from the rest of the members of society. In recent years, we have noticed the emergence of the concept of artificial intelligence through smartphones and computers, which has a great impact on the student's academic achievement.

2 - The problem

Recently, we have observed numerous influences on students' academic achievement, most notably artificial intelligence applications through the use of smartphones and computers. These applications can directly or indirectly affect students' academic performance, similar to other factors such as social, familial, economic, cultural, school-related, pedagogical, curriculum, and teaching programs, as well as the student's personal, psychological, physical, and intellectual characteristics. All these factors influence students' academic achievement to varying degrees. However, the emergence of artificial intelligence applications on smartphones can be more electronically appealing to students and thus can affect their academic performance, both positively and negatively. Therefore, we must research and investigate this topic to arrive at more effective results in using sound methods to address this influence on students' academic achievement. Based on the problem statement of our study, we can pose a central question within a central framework suitable for research and study:

- ✓ Main Question:
 - To what extent does Smartphone use affect students' academic achievement?
- ✓ Sub-questions:
 - How does artificial intelligence via Smartphone affect students' academic achievement?
 - How do electronic games played via Smartphone affect students' academic achievement?

To answer these questions, we must consider the theoretical approach adopted in formulating our problem statement so that we can build a conceptual framework based on the theory adopted in this study.

✓ The hypotheses were formulated as follows:

- Main hypothesis: Smartphone use affects students' academic achievement levels.
- ✓ Sub-hypotheses:
 - Excessive use of artificial intelligence via Smartphone leads to a decline in students' academic achievement levels.
 - Excessive use of electronic games via Smartphone negatively affects students' academic achievement levels.

3 - Theoretical approach to the study

In the field of sociology of education, proponents of functionalist theories believe that educational institutions are the key to development and building modern society.' By doing away with giving explicitly to everyone what it implicitly demands of everyone, the educational system demands of everyone alike that they have what it does not give. This consists mainly of linguistic and cultural competence and that relationship of familiarity with culture which can only be produced by family upbringing when it transmits the dominant culture(Bourdieu, 1977, p. 494).

Since, according to Bourdieu, the educational system presupposes the possession of cultural capital, which only a minority of students in fact possess, there is a great deal of inefficiency in "pedagogic transmission". This is because students simply do not understand what their teachers are trying to get across. For Bourdieu, this is particularly apparent in the universities, where students, afraid of revealing the extent of their ignorance '...minimise the risks by throwing a smoke-screen of vagueness over the possibility of truth or error(Bourdieu, 1977, p. 496).

Here it becomes clear that the phenomenon of teaching and education is linked to several reasons and factors that affect it.

Skinner's ideas about behaviorism were largely set forth in his first book, *The Behavior of Organisms*.' Here, he gives a systematic description of the manner in which environmental variables control behavior. He distinguished two sorts of behavior which are controlled in different ways:

Respondent behaviors are elicited by stimuli, and may be modified through respondent conditioning, often called classical or pavlovian conditioning, in which a neutral stimulus is paired with an eliciting stimulus. Such behaviors may be measured by their latency or strength.

Operant behaviors are 'emitted', meaning that initially they are not induced by any particular stimulus. They are strengthened through operant conditioning (aka instrumental conditioning), in which the occurrence of a response yields a reinforcer. Such behaviors may be measured by their rate'(Skinner, 1991, p. 143)

Both of these sorts of behavior had already been studied experimentally, most notably: respondents, by Ivan Pavlov (Pavlov, 1927, p. 112) and operants, by Edward Thorndike(Thorndike, 1911, p. 79). Skinner's account differed in some ways from earlier ones(Skinner B. F., 1990, p. 204)

Therefore, when education functions as the cause and factor influencing students' academic achievement, this demonstrates the application of theory to the field. We will attempt to identify a robust theory upon which to base our scientific theoretical approach, from which we will derive the theoretical application to the field data in this study. This theory is Pierre Bourdieu's theory of cultural capital in sociology. It is the closest to our study among other theories and is a fundamental theory supported by John Watson's behaviorist school of learning theory. This is one of the most prominent psychological schools that focused on studying human behavior from an empirical perspective based on observation and measurement. Burckhardt contributed to this school, viewing behavior as a response to external stimuli. The remaining theories support our study, allowing us to construct a hypothetical model that integrates these previous theories.

4 - General theoretical constructivist model for the study hypotheses

After establishing a theoretical framework that included a review of the scientific literature and the results of previous field studies, we developed a hypothetical theoretical model. This model clarifies the indicators and provides a precise description of the type and nature of the relationship between the study variables. The aim is to illustrate the trajectory of these relationships graphically, using arrows and diagrams specific to structural equation modeling. To answer the research questions, we used SPSS version 21 and the structural modeling methodology software Amos version 21. We employed precise modeling techniques using fitting methods and statistics.

5 - Concepts of the Hypothetical Constructivist Model of the Study

When we used the structural equation modeling methodology as a powerful modern statistical method for verifying the error of the proposed model, we found ourselves dealing with a topic consisting of two independent variables: electronic games and artificial intelligence, with gender as the mediator and academic achievement as the dependent variable. These are indicators and dimensions that, after being deconstructed to build the analytical model for the study's hypotheses, are: the indicators for the independent variable (smartphones) are: students' use of artificial intelligence and students' use of electronic games. The indicators for the mediator are gender (students), and the indicators for the dependent variable are academic achievement. From the above, it can be clarified that there are four latent variables: two measurement models for the independent variable (students' use of artificial intelligence and students' use of electronic games), one measurement model for the mediator (gender), and one measurement model for the dependent variable (academic achievement). All these measurement models represent a general hypothetical constructivist model, according to the analytical model for the study's hypotheses, as follows:

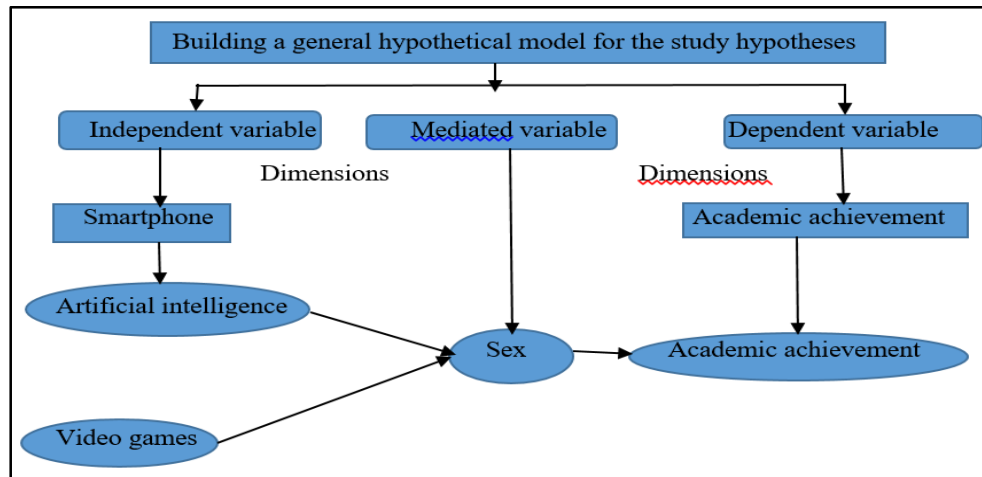
5-1 - Constructing the hypothetical analytical model for the study hypotheses

The concepts of the original hypothesis were analyzed and broken down into dimensions and then into indicators according to the following diagrams:

5-1-1- Constructing the general hypothetical analytical model for the original study hypothesis

Smartphone use affects the academic achievement of students at Dani Taher Primary School in Laghouat.

Figure N° 1:Shows a diagram of a general theoretical constructivist model assumed according to the analytical model of hypotheses.



Source: Prepared by the researcher

It is clear from the previous figure that this hypothetical structural model includes four latent variables.

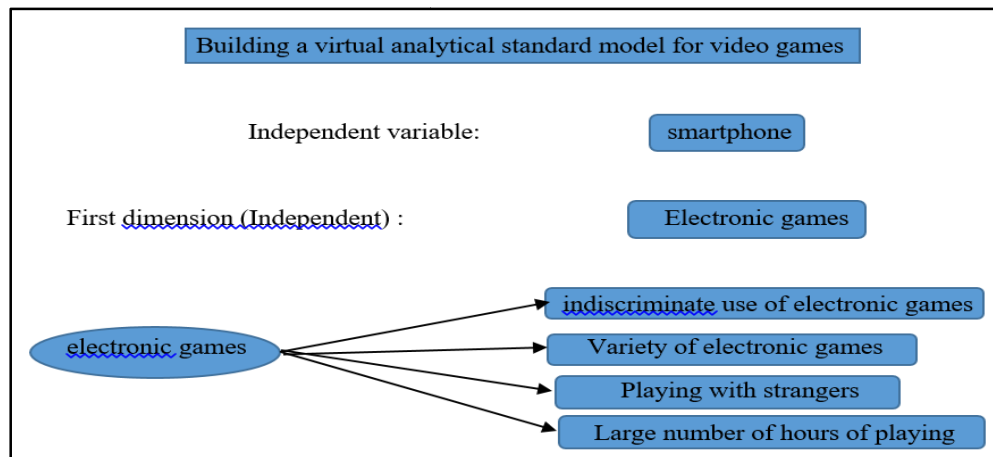
5-1-2- Constructing the Analytical Hypothetical Standard Model for the Study's Sub-Hypotheses

- Excessive use of artificial intelligence via Smartphone leads to a decline in academic achievement levels.
- Excessive use of electronic games via Smartphone negatively affects academic achievement levels.

After drawing this theoretical model, we will attempt to conceptualize the relationship between the variables as indicators for the hypotheses as follows:

**5-1-2-1- Constructing an Analytical Hypothetical Standard Model for
the Indicators of the First Independent Variable: Electronic Games:**

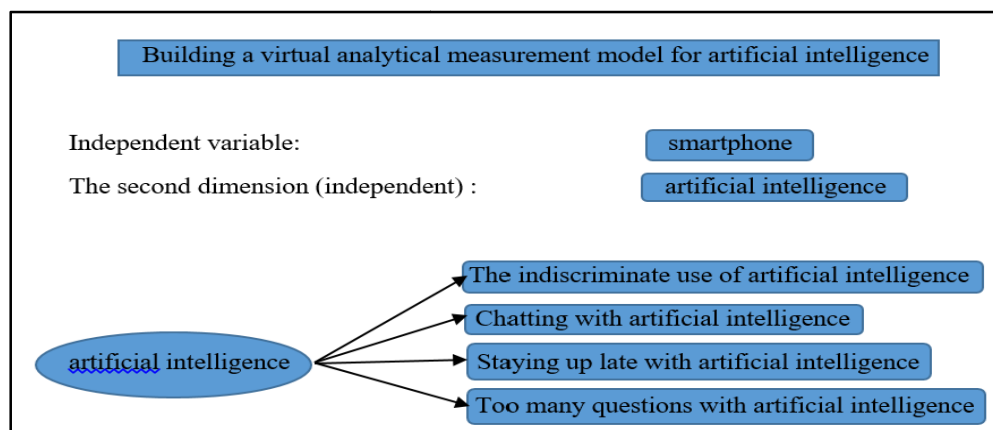
Figure N° 2:Shows a diagram of a hypothetical standard structural model
for the indicators of the first independent variable, electronic games.



Source: Prepared by the researcher

**5-1-2-2- Constructing a standard, hypothetical, analytical model of the
indicators for the second independent variable, artificial intelligence:**

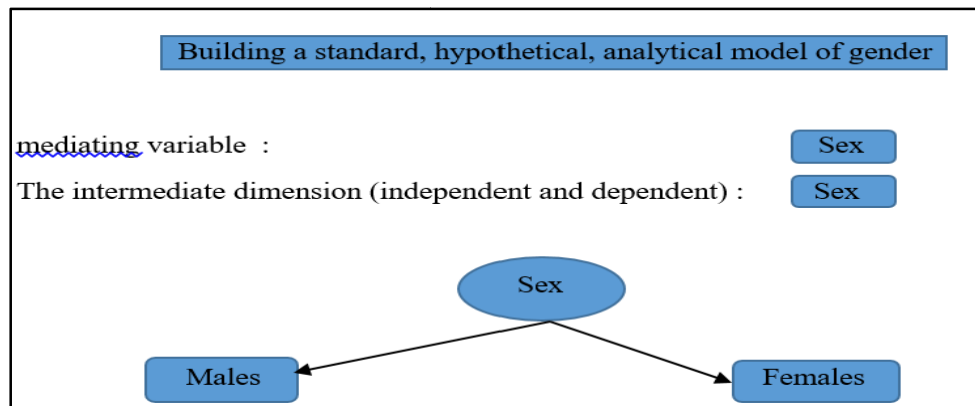
Figure N° 3:Diagram of a hypothetical standard structural model for the
indices of the second independent variable, artificial intelligence.



Source: Prepared by the researcher

**5-1-2-3- Constructing a hypothetical analytical standard model for the
indices of the mediating variable, gender:**

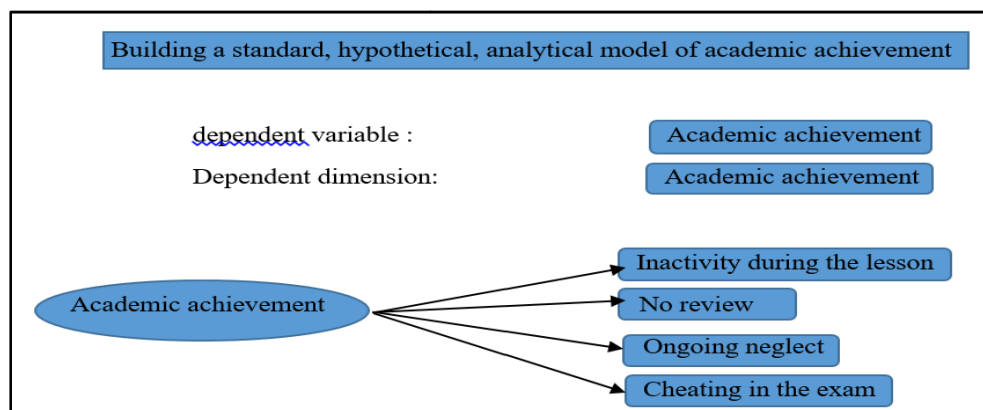
Figure N° 4:Diagram of a hypothetical standard structural model for
indicators of the mediating variable, gender.



Source: Prepared by the researcher

**5-1-2-4- Constructing a hypothetical standard analytical model for
indicators of the dependent variable, academic achievement:**

Figure N° 5: Diagram of a hypothetical standard structural model for
indicators of the dependent variable, academic achievement.



Source: Prepared by the researcher

After deconstructing the hypotheses from variables to dimensions and then indicators, and visualizing the theoretical projection with field data derived from robust theories, while considering the specificities of the region within the community, and through the integration of Pierre Bourdieu's theory of cultural capital in sociology, John Watson's behaviorist

school of learning theory (which focused on studying the experimental individual's behavior based on observation and measurement as a response to external stimuli), and Bürhaus Friedrich's theory, we constructed a hypothetical model based on these two theories, according to the specificities of the region. Following the previous models, we adopted the methodological steps of structural equation modeling, relying on the statistical methods of SPSS version 21 to collect field data and the modeling program AMOS version 21 to construct the hypothetical structural model for the study hypotheses, according to the following steps:

6- Methodological Steps for Drawing a Hypothetical Constructivist Model in Amos v.21

We will draw a hypothetical general constructivist model for the study hypotheses in Amos, derived from two powerful theories: Pierre Bourdieu's *Cultural Capital of Education* and Bürhaus Friedrich's behaviorist theory of external stimuli response.

- ✓ Original Hypothesis: Smartphone use affects the academic achievement of students at the Dani Taher Primary School in Laghouat.

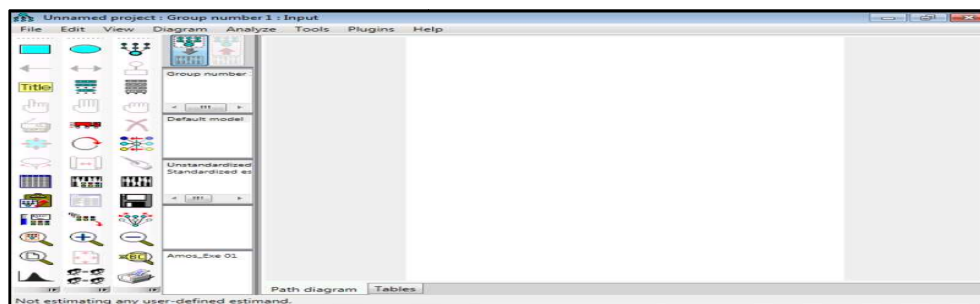
6-1- How to Draw a Hypothetical Constructivist Model in Amos v.21

We will attempt to draw a hypothetical constructivist model based on the previously mentioned general constructivist model and the analytical model for the study hypotheses in Amos v.21. We will follow these steps:

6-1-1- Open Amos v.21:

When the program is opened, the program screen appears in full but in a small size. To its right is a set of control keys for drawing the model suggested in the Amos v.21 program, as shown in the following figure:

Figure N° 6: The first screen shows the Amos v.21 program.



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

The first step is to open a new window in Amos by pressing the "View" key. Then, go to the first item in the menu and click on "Interface Properties." Another small window will appear; select the "Paper Size" button within it. A menu will appear; select either "landscape - A4" or "landscape - Legal," then click "Apply." The Amos window will immediately change and appear in a larger size so that the researcher can clearly draw their structural model, as shown in the following image:

Figure N° 7:The first screen after resizing for Amos v.21



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ8V7DR4GYJBNC4BMJQU8XFN

The first step is to draw a diagram of the path analysis model for the study hypothesis, using rectangular shapes and arrow keys for the theoretical construct of the path analysis model, derived from previously mentioned robust theories. Then, we proceed directly to defining the model's fit criteria. These are the most important parameters in the structural model analysis for path analysis:

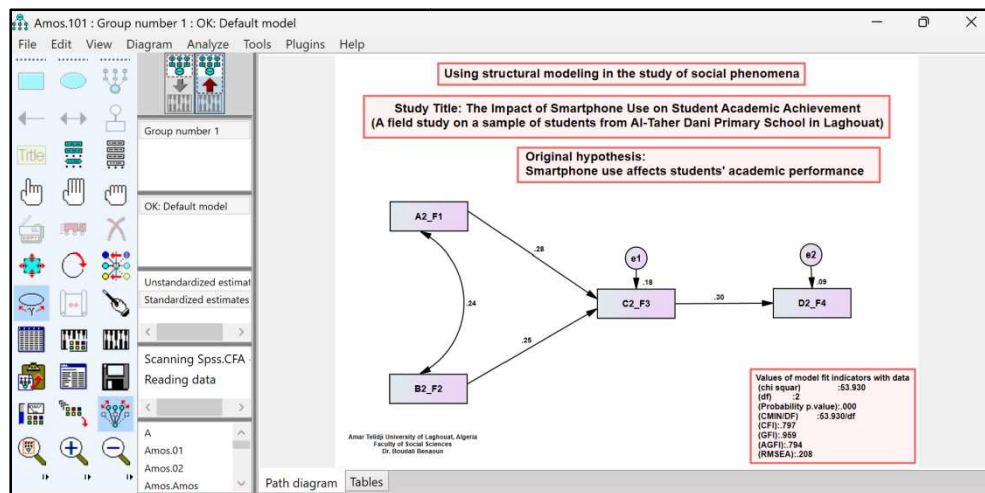
- ✓ Chi-square (χ^2)
- ✓ Degrees of freedom (df)
- ✓ Probability (p-value)
- ✓ Standardized chi-square (χ^2/df)
- ✓ Comparative fit index (CFI)
- ✓ Tox-Lewis index (GFI)
- ✓ Corrected good fit index (AGFI)
- ✓ RMSEA index

If the theoretical model assumed for path analysis matches the field data obtained from SPSS version 21, we immediately activate the red arrow at the top of the program. This is the final key to starting the analysis of the

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accepted model. We then proceed to analyze the results, as the model may not necessarily be a perfect match and may require modifications to the theoretical approach adopted in the study. After confirming the accuracy of the above model results, we select the text below it, which reads "Standardized estimates." This will display additional results in the model, representing the output of standardized estimates used in our analysis. Once the results appear in the model, we re-enable the "View the output path diagram" option, as shown in the following image:

Figure N° 8:Diagram for constructing a path analysis model for the study hypothesis



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNCE4BMJQU8XFN

7- Results of the virtual structural model output for path analysis in the AMOS program

After the results appear in the model format, we select the output results of the AMOS data analysis by clicking the (View test) button. A window then appears showing all the results of the matching criteria previously defined in the model. After testing the model in AMOS, version 21, the output results appear, which are summarized in the following table:

Table N°1 : It shows the results of the path analysis model matching indicators for the study hypothesis

The valuable	test
χ^2 (Chi-Square)	51.893
RMSEA	0.204
GFI	0.960
AGFI	0.801
CMDN/DF	51.893/df
CFI	0.810
df	2
P.Value propability	0.00

Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

8- Analyzing the Path Analysis Model Results for the Amos Program

Obtaining results in the path analysis model does not necessarily mean the model is a perfect match. There are three families of conformance indicator criteria that must be verified, and their results are listed in the tables of conformance indicator families for the theoretical model in the appendices. Using the tables of standard conformance indicators in the appendices, we can compare the program output results for the hypothetical theoretical path analysis model with the conformance indicators for the model in the previous table. Therefore, it is essential to adhere to and verify the main criteria mentioned in the conformance indicator table.

9- Discussion of Data Analysis Outputs: Path Analysis Model

After extracting the assumed theoretical model for path analysis, the results can be read, analyzed, and interpreted. We observed the results of the AMOS v.21 model using a set of fit indicator tests. The impact of construct errors on the underlying median and dependent variables was identified, and each indicator of the independent, median, and dependent variables was determined. The measured impact of smartphones (electronic games and artificial intelligence) on students' academic achievement showed varying correlation values. The model fit indicator results indicate that the path analysis model's hypothesis fit, as the Chi-Square(X^2) (CMIN) value is 53.930 at a significance level of 0.00 (P-value). This falls within the acceptable range for model indicator quality (less than 2) due to the strong correlation between the hypothesis indicators. The degree of freedom (df) is 2, and the significance level is 0.000. The values fell within the ideal range

and are considered non-statistically significant, as they conform to the model and approach relative validity. The value of (RMSEA) (0.208) does not fall within the lower bounds for model acceptance (0 to 0.1). The values of (CFI) (0.797), (GFI) (0.959), and (AGFI) (0.794) all fall within the lower bounds for model acceptance (0 to 1), but not within the model's goodness of fit. This confirms the validity of the path analysis measurement model and its relatively good conformance to the assumed theoretical model with the field data. The study's hypotheses are relatively well-founded in the field. It should be noted that the first linear correlation, e-gaming on the mediator gender, is 0.28, indicating a weak correlation, as is the second linear correlation, artificial intelligence on the mediator gender, which is 0.25. Therefore, the gender of the students is affected here, and this requires a construction error, which represents the residual effect size with a correlation coefficient of 0.18. This is a very weak correlation due to external influences that we were unaware of, and which can affect the study of the phenomenon without being able to detect them in the field data. Here, scientists consider this to constitute a construction error. As for the linear correlation between the mediating variable, which is the students' gender, and the dependent variable, which is academic achievement, with a value of (0.30), this is a weak correlation, and it is affected by a construction error, which represents the residual indicators of the dependent variable with a value of (0.09). This is a very weak correlation due to external influences that we are unaware of in the field data, as shown in the model above.

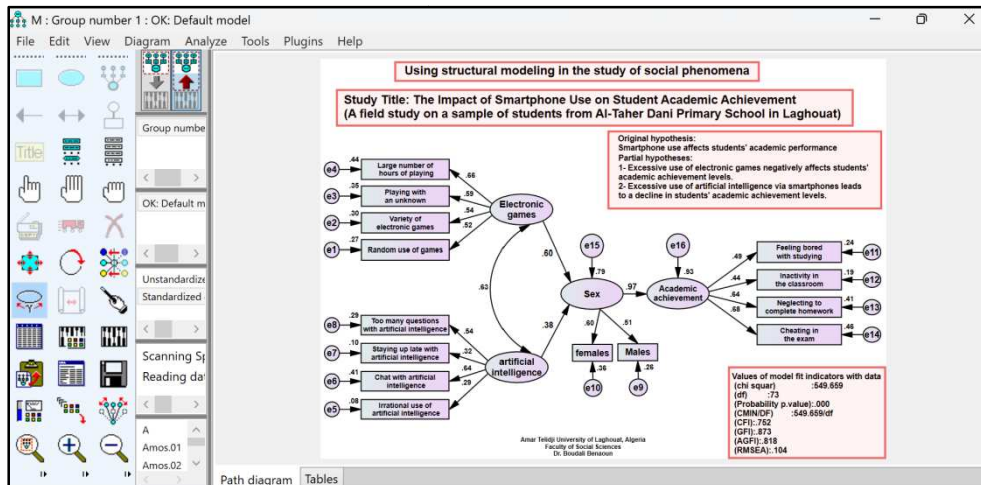
10- Drawing a diagram of a hypothetical integrated theoretical structural model in Amos v.21

We open another window in Amos v.21 and draw a hypothetical integrated theoretical structural model derived from the previously mentioned robust theories. We use the oval, rectangle, and arrow keys and begin drawing the model according to the hypothetical model diagram for the study hypotheses. Then, we proceed directly to defining the fit criteria in the integrated structural analysis model. After setting the values of the model fit indicators with the data which are the most important in the study of integrated structural analysis, as previously mentioned if the hypothetical theoretical model matches the field data obtained from SPSS v.21, we immediately activate the red arrow at the top of the program. This is the final key to starting the analysis of the accepted model. We then proceed to analyze the results, as the model may not necessarily be a perfect match and may require modifications permitted by the theoretical approach adopted in the study. After confirming the accuracy of the above model results, we

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select the text below it, which reads "Standardized estimates." This will display additional results in the model, representing the output of standardized estimates used in our analysis. Once these results appear in the model, we activate the "View the output path diagram" button (the red arrow). The program results will then be displayed as shown in the following image:

Figure N° 9: The Integrated Structural Analysis Model illustrates the study hypotheses in the Amos software.



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ8V7DR4GYJBNC4BMJQU8XFN

11- Results of the outputs of the integrated virtual structural model for the Amos program

After the results appear in the form of the model we use for analysis, we select the output results of the AMOS data analysis by clicking the "View test" button. This displays a large window containing all the results for the conformance criteria previously defined for this study. After testing the hypothetical theoretical model for the original hypothesis in AMOS version 21, the output results appear and are summarized in the following table:

Table N°2 :Shows the results of the indicators of conformity of the hypothetical structural analysis model to the original study hypothesis.

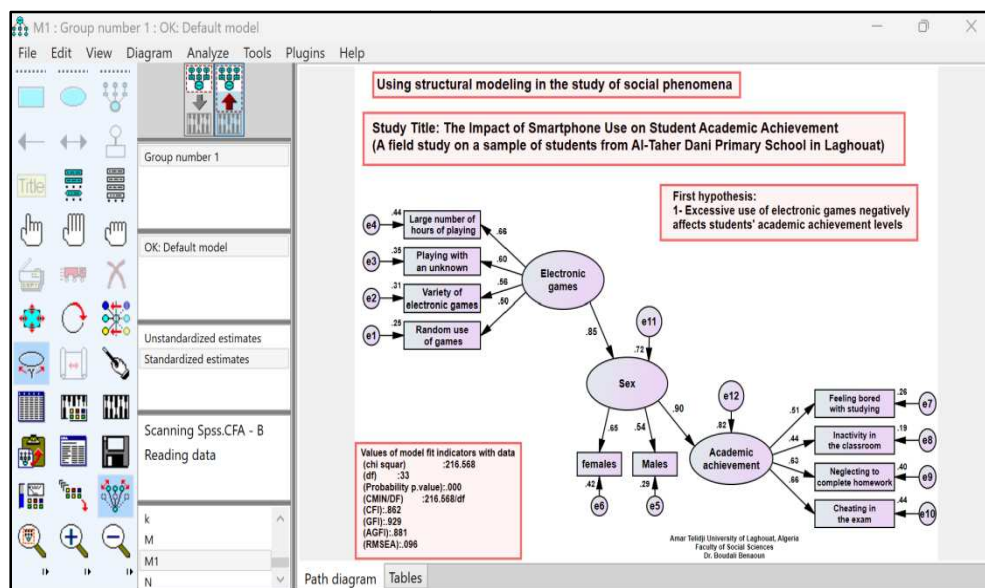
The valuable	test
χ^2 (Chi-Square)	549.659
RMSEA	0.104
GFI	0.873
AGFI	0.818
CMDN/DF	549.659/df
CFI	0.752
df	73
P.Value propability	0.00

Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

We observe from the hypothetical theoretical model that there are two hypotheses: The first is:

- Excessive use of electronic games on smartphones negatively affects students' academic achievement levels. This is illustrated in the following structural model:

Figure N° 10:The integrated hypothetical structural analysis model illustrates the first hypothesis in the Amos program.



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

12- Results of the outputs of the integrated virtual structural model for the first hypothesis of the Amos program

After the results appear in the model format, we determine the output results of the data analysis for the first hypothesis using the AMOS V21 program. This reveals the results of the conformity criteria previously defined for this hypothesis. After testing the model for the first hypothesis, the output results are summarized in the following table:

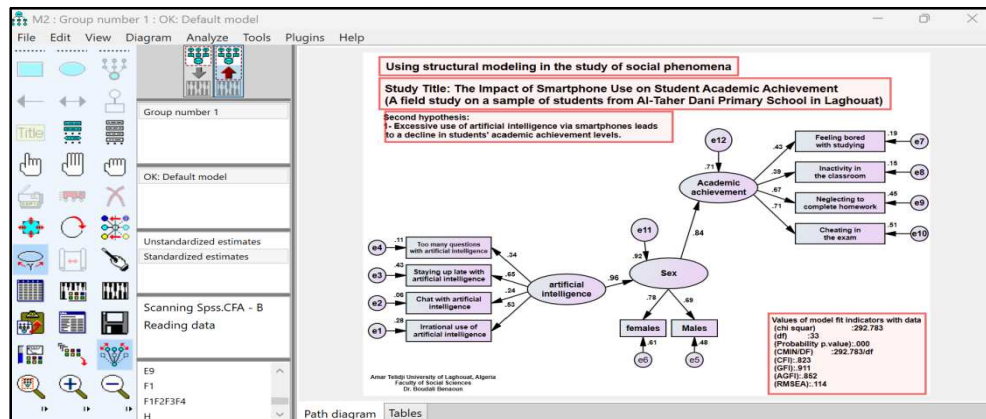
Table N°3 :Shows the results of the conformity indicators of the hypothetical structural analysis model for the first study hypothesis

The valuable	test
χ^2 (Chi-Square)	216.568
RMSEA	0.096
GFI	0.929
AGFI	0.881
CMDN/DF	216.568/df
CFI	0.862
df	33
P. Value propability	0.00

Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

The second hypothesis is: the effect of artificial intelligence on the decline in students' academic achievement levels.

Figure N° 11: The integrated virtual structural analysis model for the second hypothesis is shown in the Amos program.



Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQ08V7DR4GYJBNC4BMJQU8XFN

13- Results of the Integrated Virtual Structural Model Outputs for the Second Hypothesis of the AMOS Program

After the results appear in the model format, we determine the output results of the data analysis for the second hypothesis of the AMOS program, version 21. The results of the conformity criteria previously defined for this hypothesis are then displayed. After testing the model for the second hypothesis, the output results are presented and summarized in the following table:

Table N°3 :Shows the results of the conformity indicators of the virtual structural analysis model for the second hypothesis of the study

The valuable	test
x ² (Chi-Square)	292.783
RMSEA	0.114
GFI	0.911
AGFI	0.852
CMDN/DF	292.783/df
CFI	0.883
df	33
P.Value propability	0.00

Source: Produced by the researcher, using IBM SPSS Amos 21.0 software under the code: MUK2LCLVNQ8KZQOKQYNCPZPJ9I4O89USQCNQ3ETL54P32S22B63ELQO8V7DR4GYJBNC4BMJQU8XFN

14- Analysis of the results of the integrated hypothetical structural model for the Amos program

Obtaining results in the model does not necessarily mean the model is a perfect match or fulfilled. There are three families of conformance indicator criteria that must be verified, and their results are presented in the tables of conformance indicator families for the theoretical model in the appendices. Using the tables of standard conformance indicators in the appendices, we can compare the program output results for the hypothetical theoretical model with the conformance indicators for the model in the preceding tables. Adherence to and verification of the main criteria mentioned in the table of conformance indicators for the original study hypothesis are essential.

15- Defining the analysis specifications for the integrated virtual structural model of the Amos program

Defining the analysis specifications is one of the most crucial stages in structural equation modeling. This pivotal stage determines whether the hypothetical theoretical model matches the field data of the study, based on several essential conditions that must be adhered to when analyzing the outputs of the AMOS program. There are several basic methods for analyzing the results of the hypothetical structural model for this study, including:

15-1- Analysis using model conformance indicators for the high probability stage

When you open the Amos output, a file interface appears containing all the results of the Amos program output. The file displays the analysis titles on the left and the details of each analysis on the right. At first glance, on the left side of the file, you will see notes for the model (the default model). These are:

15-1-1- Calculating Degrees of Freedom

This section of the output explains how Amos calculates degrees of freedom as the difference between the different sample sizes and the number of different coefficients to be estimated. The different sample always includes both the variances and the covariance's. In multigroup data analysis, both the different sample sizes and the number of different coefficients to be estimated are summed for all groups. (Amos.v.21). It also presents observations regarding the model in Amos.v.21. Therefore, we found the following in these results:

15-1-1-1- Sample size with varying responses

The sample size with varying responses is 105 out of a total sample of 600. This is acceptable and does not indicate the presence of outliers or missing values. This condition is met in our study.

15-1-1-2- Number of different parameters (arrows between variables) to be estimated

There are 32 arrows representing the relationships between indicators and dimensions among two underlying independent variables, each with four measured indicators, one underlying mediator related to two measured indicators, and one underlying dependent related to four measured

indicators. This is the minimum acceptable correlation between variables in the model. This condition is also met in our study.

15-1-2- Probability level(p.v)

It must not be a statistical function, and it must be the opposite of the results obtained in the SPSS program. In this study, we found its value in the output of Amos.v.21 to be 0.000, which is not a statistical function. This means there are no differences between the hypothetical structural model and the field data of the study; that is, there is a match between the hypothetical theoretical model and the field data. Therefore, the condition for a statistically significant level in this study is met.

15-1-3- Degrees of Freedom (df)

The value of the degree of freedom is 73, and it affects the significance level in determining the extent of the squared significance of the model.

15-1-4- Value of the chi-square (χ^2)

It is one of the quality of fit indicators, determining the accuracy with which the proposed model represents real-world data by measuring the difference between the expected (theoretical) and actual covariance matrices. It measures the degree of difference between these matrices, and its value in this study is 549.659. The condition for accepting the chi-squared value is that it is linked to a significance level of 0.000 and 73 degrees of freedom. Since this value is not significant, there are no differences between the hypothetical construct model and the field data of the study. In other words, there is a fit between the hypothetical theoretical model and the field data because they fall within the quality of fit indicator for the model (it must be at a significance level less than or equal to 2). Therefore, the condition for a sufficient chi-squared indicator in this study is met. Consequently, the result of the hypothetical model has achieved its minimum requirement.

15-1-5- Comparative Conformity Index (CFI) Value

This is one of the fit quality indicators. It compares the study model with the null model, meaning it relies on comparing the null model with an alternative model such as H0 and H1. The alternative model, H1, indicates that there is a relationship between the model's dimensions. The null model, H0, indicates that there is no relationship between the indicators. Therefore,

if there is a relationship between the variables, we obtain the value of the comparative indicator.

In this study, we found its value to be 0.752. This falls within the acceptable minimum range (0 to 1) and not within the indicator quality range for the model (between 0.90 and 0.95). Therefore, the model is relatively acceptable, and the condition is met. We found these values in the Amos output by clicking the "View Test" button on the right side of the program. Then, we went to the "Model Fit" section in the Amos v.21 output results. In the left-hand pane of the Baseline Comparisons table, we saw a CFI value of 0.752, indicating an acceptable model. We also noted that the CFI values (NFI = 0.727), (RFI = 0.660), (IFI = 0.755), and (TLI = 0.691) in the table all meet the model's acceptability score (from 0 to 1), but not the model's indicator quality score (from 0.90 to 0.95). Therefore, the model is relatively acceptable, and the condition is met.

15-1-6- Value of the Remittance and Compliance Index (RMSEA)

It is one of the fit quality indicators, measuring the degree to which the assumed model matches the field data and the variances and differences between the model matrix and the sample size. In this study, we found its value to be 0.104, which falls close to the minimum acceptable range (0 to 0.1). However, it does not meet the model quality indicator criteria, which require a value less than 0.08: 0.000 represents a perfect fit, $0.01 \geq$ excellent, $0.05 \geq 0.08$ good, $0.08 \geq 0.1$ acceptable, and 0.1 or higher is rejected. Therefore, the model is rejected with respect to the RMSEA indicator, and the condition is not met. This does not affect the model's overall validity as long as most of the indicators fall within the acceptable range.

15-1-7- Value of the conformity index, Good Conformity Index (GFI)

It is one of the fit quality indicators, measuring how well the assumed model matches the field data and assessing variances and differences. In this study, we found its value to be 0.873, indicating an acceptable model. Here, we note that it falls within the acceptable minimum range (0 to 0.1), but not within the indicator's quality range for the model (it should be greater than 0.90). Therefore, the model is relatively acceptable, and the condition is met.

15-1-8- Value of the conformity index Corrected Good Conformity Index (AGFI)

It is among the goodness-of-fit indicators, measuring how well the hypothetical model matches the actual data. Taking into account the model's complexity, the Goodness-of-Fit (CFI) index modifies the lower end of the standard for more complex models with fewer features, adjusting values based on the model's degree of freedom, thus making it more robust for simpler models. This ensures the model can explain actual variances and differences without relying on an increase in the number of features. In this study, we found a value of 0.818, indicating an acceptable model. While this falls within the acceptable range (0 to 0.1), it does not meet the minimum acceptable value for the model's goodness-of-fit (which should be greater than 0.90). Therefore, the model is relatively acceptable, and the condition is met.

15-1-9- Value of the Root Mean Square Index of Residues (RMR)

It is a statistical measure of varying values, known as the second-order mean, and is generally used when there are both positive and negative values. It is among the indicators of goodness of fit and measures variances and differences. We found its value in this study to be 0.123, which indicates the goodness of the model indicator (the lower the value, the better). Therefore, the model is relatively acceptable, and the condition is met in this study.

16- Conclusion of Model

From the above, we observe that all the model fit criteria used in this study are relatively met except for the RMSEA index. This does not affect the model's fit. Therefore, we continue to analyze and interpret the correlational relationships between the model dimensions using the first method of the major probability stage. We note that we have not established correlations or variances between the first, second, and third independent dimensions, which should have correlation values (0.20 to 0.90) in the standard. If the correlation value exceeds 0.90 between the dimensions, then they should be combined together, and this is called (convergence), which is evidence of the concept of convergence validity. If it is less than 0.90, this indicates that there is (distinction) between the two (factors), and therefore it is evidence of the concept of differentiation validity.

17- Discussion of the outputs of data analysis: Integrated Virtual Structural Analysis Model

After establishing the proposed integrated theoretical model for AMOS v.21, the results can be discussed. We observed the model's structure through a set of fitting indicators, identifying the impact (construction errors) of each factor of the underlying mediating and dependent variables, and the impact (measurement errors) of each indicator of the measured independent and dependent variables. This analysis examined the effect of smartphones (electronic games and artificial intelligence) on students' academic achievement, revealing varying correlation values. The model fitting indicators indicate that the proposed integrated structural analysis model for the study's hypotheses exhibits a fit, as evidenced by the Chi-Square(X^2) (CMIN) values at (P, Value). These values fall within the acceptable range for the model's quality, given the strong correlation between the hypothesis indicators, the degree of freedom (df), and the significance level (0.000). These values fall within the optimal range and are considered non-statistically significant, indicating a fit for the model and relatively satisfactory. The value of the RMSEA index, however, falls within the lower bound for model acceptance (0 to 0.1). The remaining conformity indicators, including CFI, GFI, AGFI, RMR, IFI, NFI, and TLI, all fell within the lower bounds of model acceptance (0 to 1), not in terms of model conformity quality. This confirms the validity of the measurement model and the relatively good conformity of the theoretical model with the field data.

The statistical results for the conformity of this model indicate that the hypothetical constructivist model for these hypotheses showed relative conformity and relative alignment with the data. The independence of the hypothesis variables, x^2 , at the significance level of p.v and the degree of freedom df, is not statistically significant, but it is relatively conformable and relatively well-founded, as it falls within the quality of the hypothetical model's indicator and its ideal value for the significance level (less than 2). This indicates that there are no differences between the field data and the proposed model. This means that there is a conformity such that the model relatively matches the field data in the study on the effect of smartphones (electronic games and artificial intelligence) on students' academic achievement. The remaining conformity indicators fell within a somewhat acceptable range, which indicates that this model is close to a good conformity in interpreting the field data. This confirms the relative validity of the integrated hypothetical constructivist analysis model for this study.

We observe that the CFI index value is low and does not fall within the ideal range. The minimum acceptable value for the model is (0-1), which is met, indicating that the model conforms to the acceptable limit but not the ideal one. This necessitates modifying the model, if possible, without distorting the theory. Similarly, the GFI index is low and does not fall within the ideal range because it does not meet the model's quality index value (greater than 0.90), which is not met. The minimum acceptable value for the model is (0-1), which is met. This indicates that the model is acceptable but not ideally so, and therefore requires modification if possible. The significance level (P.V.) is 0.00, which is statistically significant and falls within the model's quality index. This indicates that the theoretical model matches the study's field data, and is an indicator of model acceptance. The degree of freedom is 73, which varies according to the study variables. Furthermore, the RMSEA index value of 0.1 is within the model acceptance range, as it falls within the model quality index, where the ideal standard value is less than 0.08, and the minimum acceptable range for a model is 0 to 1. This indicates that the model is acceptable at the minimum level. This suggests that there are no discrepancies between the field data and the proposed model, and that the model largely matches the field data in this study on the impact of smartphones (electronic games and artificial intelligence) on students' academic achievement.

Therefore, based on the conformity indicators, it can be said that the model largely matches the theoretical framework, and the hypotheses are relatively well-founded. The model can be further improved in future studies, if possible, after reviewing the literature related to the theory adopted in this study.

- Conclusion

After adopting the methods of structural modeling using the conformity indicators in the Amos program from the Carl Pearson test and the goodness of conformity indicators in this study, and after building a model of the dimensions and indicators of the hypotheses and verifying the conformity of the scale, it became clear that the construction of the integrated virtual structural model for our study is relatively consistent with the field study. This shows that the study hypotheses are relatively fulfilled, and that the indicators of academic achievement through the gender of the students for their use of the Smartphone (electronic games and artificial intelligence) confirmed that the excessive use of these sites and sitting for long periods in chatting and other things greatly affected their academic achievement.

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- Appendices

Appendix No. 01 shows the output results of the integrated virtual structural model for the original hypothesis of the Amos program:

Number of distinct sample moments: 105
 Number of distinct parameters to be estimated: 32
 Degrees of free dom (105 - 32): 73

1- Result (Default model)

- 2- Minimum was achieved
- 3- Chi-square = 549.659
- 4- Degrees of freedom = 73
- 5- Probability level = .000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	32	549.659	73	.000	7.530
Saturated model	105	.000	0		
Independence model	14	2014.685	91	.000	22.139

Model	RMR	GFI	AGFI	PGFI
Default model	.123	.873	.818	.607
Saturated model	.000	1.000		
Independence model	.405	.536	.464	.464

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.727	.660	.755	.691	.752
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.802	.583	.603
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	476.659	405.836	554.960
Saturated model	.000	.000	.000
Independence model	1923.685	1781.338	2073.400

Model	FMIN	F0	LO 90	HI 90
Default model	.912	.790	.673	.920
Saturated model	.000	.000	.000	.000
Independence model	3.341	3.190	2.954	3.438

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.104	.096	.112	.000

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Model	RMSEA	LO 90	HI 90	PCLOSE
Independence model	.187	.180	.194	.000

Model	AIC	BCC	BIC	CAIC
Default model	613.659	615.292	754.574	786.574
Saturated model	210.000	215.357	672.375	777.375
Independence model	2042.685	2043.400	2104.335	2118.335

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.018	.900	1.148	1.020
Saturated model	.348	.348	.348	.357
Independence model	3.388	3.151	3.636	3.389

Model	HOELTER .05	HOELTER .01
Default model	104	115
Independence model	35	38

Minimization: .001
 Miscellaneous: .360
 Boot strap: .000
 Total: .361

Source: Amos.V.21 program outputs, Produced by the researcher, using IBM SPSS Amos 21.0 software under the code

•MUK2LCLVNQQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQO8V7DR4GYJBNC4BMJQU8XFN

Appendix No. 02 :shows the output results of the integrated virtual structural model for the first hypothesis of the Amos program:

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 55
 Number of distinct parameters to be estimated: 22
 Degrees of freedom (55 - 22): 33

Result (Default model)

Minimum was achieved

Chi-square = 216.568

Degrees of freedom = 33

Probability level = .000

Model	NPART	CMIN	DF	P	CMIN/DF
Default model	22	216.568	33	.000	6.563
Saturated model	55	.000	0		
Independence model	10	1375.449	45	.000	30.566

Model	RMR	GFI	AGFI	PGFI
Default model	.098	.929	.881	.557

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Model	RMR	GFI	AGFI	PGFI
Saturated model	.000	1.000		
Independence model	.465	.551	.452	.451

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.843	.785	.863	.812	.862
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.733	.618	.632
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	183.568	140.729	233.906
Saturated model	.000	.000	.000
Independence model	1330.449	1213.095	1455.187

Model	FMIN	F0	LO 90	HI 90
Default model	.359	.304	.233	.388
Saturated model	.000	.000	.000	.000
Independence model	2.281	2.206	2.012	2.413

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.096	.084	.108	.000
Independence model	.221	.211	.232	.000

Model	AIC	BCC	BIC	CAIC
Default model	260.568	261.386	357.447	379.447
Saturated model	110.000	112.044	352.197	407.197
Independence model	1395.449	1395.821	1439.485	1449.485

Model	ECVI	LO 90	HI 90	MECVI
Default model	.432	.361	.516	.433
Saturated model	.182	.182	.182	.186
Independence model	2.314	2.120	2.521	2.315

Model	HOELTER .05	HOELTER .01
Default model	132	153
Independence model	28	31

Minimization: .001

Miscellaneous: .150

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Boots rap: .000

Total: .151

Source: Amos.V.21 program outputs, Produced by the researcher, using IBM SPSS Amos 21.0 software under the code

:MUK2LCLVNQQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQO8V7DR4GYJBNC4BMJQU8XFN

Appendix No. 03 :shows the output results of the integrated virtual structural model for the second hypothesis of the Amos program:

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 55

Number of distinct parameters to be estimated: 22

Degrees of freedom (55 - 22): 33

Result (Default model)

Minimum was achieved

Chi-square = 292.783

Degrees of freedom = 33

Probability level = .000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	22	292.783	33	.000	8.872
Saturated model	55	.000	0		
Independence model	10	1509.927	45	.000	33.554

Model	RMR	GFI	AGFI	PGFI
Default model	.119	.911	.852	.547
Saturated model	.000	1.000		
Independence model	.450	.554	.455	.454

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.806	.736	.824	.758	.823
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.733	.591	.603
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	259.783	208.787	318.249
Saturated model	.000	.000	.000
Independence model	1464.927	1341.700	1595.534

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Model	FMIN	F0	LO 90	HI 90
Default model	.486	.431	.346	.528
Saturated model	.000	.000	.000	.000
Independence model	2.504	2.429	2.225	2.646

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.114	.102	.126	.000
Independence model	.232	.222	.242	.000

Model	AIC	BCC	BIC	CAIC
Default model	336.783	337.600	433.661	455.661
Saturated model	110.000	112.044	352.197	407.197
Independence model	1529.927	1530.299	1573.963	1583.963

Model	ECVI	LO 90	HI 90	MECVI
Default model	.559	.474	.655	.560
Saturated model	.182	.182	.182	.186
Independence model	2.537	2.333	2.754	2.538

Model	HOELTER .05	HOELTER .01
Default model	98	113
Independence model	25	28

Source:Amos.V.21 program outputs, Produced by the researcher, using IBM SPSS Amos 21.0 software under the code

:MUK2LCLVNQ8KZQOKQYNCPZPQJ9I4O89USQCNQ3ETL54P32S22B63ELQO8V7DR4GYJBNC4BMJQU8XFN