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presents:

STRENGTHS AND LIMITATIONS OF QUANTITATIVE RESEARCH APPLIED IN THE EDUCATIONAL SCIENCES



International Conference
The Future of Education



Paper goals



Main aim:

Identifying the most common advantages and limitations of quantitative research applied in the educational sciences.

Paper goals

There are explored the main quantitative tools:

I. factory analysis,

II. clusters analysis

III. multiple regression technique

Present your project in Word,
PowerPoint, or Visio

Integrating the new technologies

The educational approach of integrating the **new technologies** led to some researchers' preoccupation to create innovative models based on correlating technological and educational components

Present your project in Word,
PowerPoint, or Visio

Integrating the new technologies



Mixed resources:

- Interactive technologies (interactive whiteboard, online educational platform, online collaborative applications) and an online environment as a pedagogical component

and

- a set of interactive and collaborative learning strategies adapted to an online environment as a pedagogical component

Integrating the new technologies

Qualitative analysis was used to investigate the effects produced by the use of the new technologies on school results, student's motivation or perception

- To investigate teachers' degree of acceptance or rejection of mixed resources used in education (*like modern learning management system that is easy to use on ceramic interactive whiteboards*).
- To provide to the persons involved in educational policies a feedback related to implementation of educational technologies in teaching-learning activities.
- To test the efficacy of new training methods.

Why Quantitative Research?

Goals



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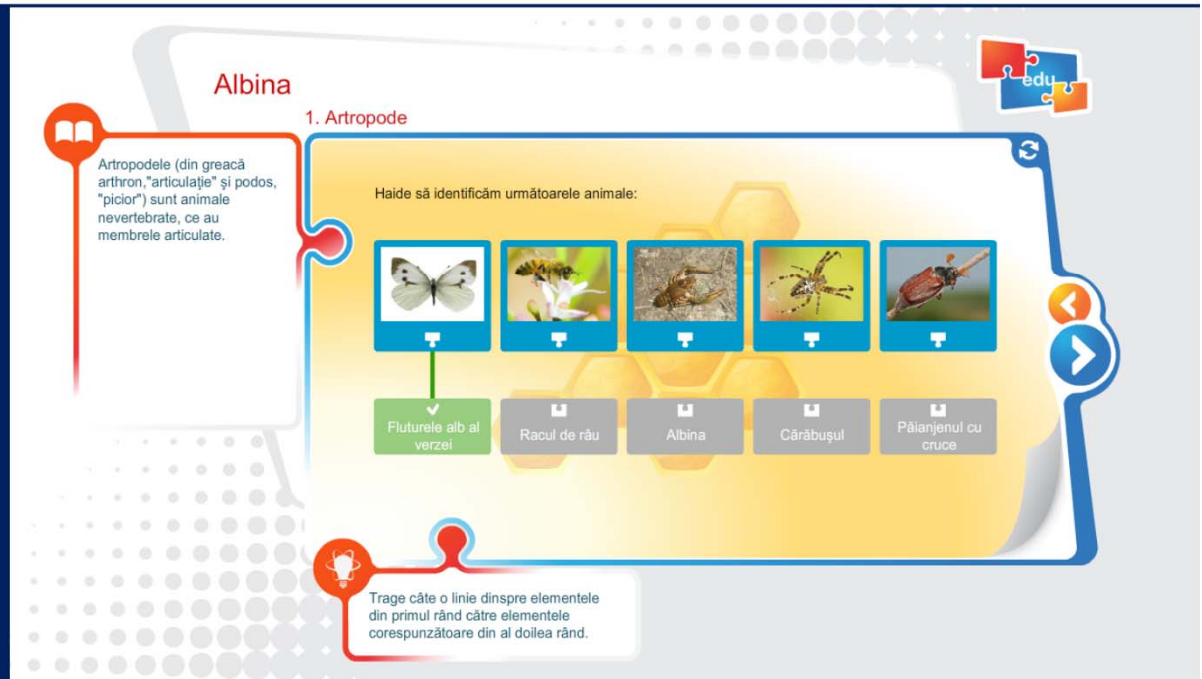
Platforma eLearning

Here are some of the goals that mixed resources fulfills and can be investigated with quantitative research:

- ✓ Supporting the continuous learning process through a modern learning management system that is easy to use both on ceramic interactive whiteboards and educational platforms;
- ✓ Providing support for the computer assisted instruction in various fields;
- ✓ Creating a virtual space where the student and the teacher can meet;
- ✓ Creating and presenting a set of interactive, appealing classes that fit the needs of each student;
- ✓ Easing the learning process by stimulating the students' creativity and their competitive spirit;

Why Quantitative Research?

Advantages



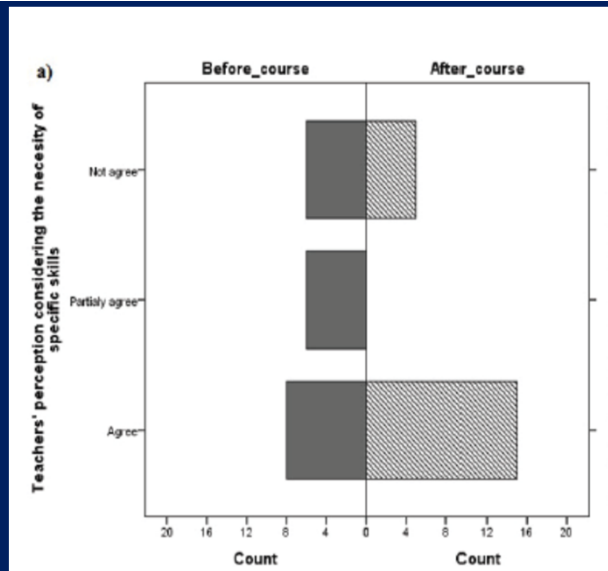
High accessibility regardless of the geographic area: the content is available anywhere, at any time.

- ✓ **The individualization** of the learning process.
- ✓ Low maintenance costs.
- ✓ The information is spread quickly.
- ✓ The use of various multimedia learning resources and *the internet* (short clips, games, simulations, photo galleries, videos, audio clips)

Paper contents

- Context of the research
- Research approach/question
- Theoretical framework
- Research methodology
- Findings
- Implications for teacher education

Context of the research

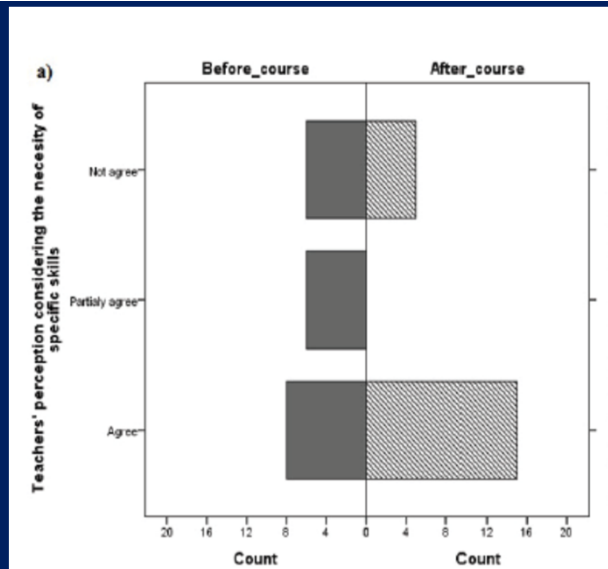


The need of this current study starts from noticing the fact that quantitative research have in the same time the strong points and weaknesses. In order to performed a good model to investigate an educational research subject **we must identify from the start the proper tools and avoid unnecessary ones.**

Measurement:

- Populations Size
- Sampling
- Random Assignment
- Ethical rules

Context of the research



The need of this current study starts from noticing the fact that quantitative research have in the same time the strong points and weaknesses. In order to performed a good model to investigate an educational research subject **we must identify from the start the proper tools and avoid unnecessary ones.**

Time:

Pilot study

Experts & repeated measures

Validate the model

Context of the research

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In present, different kinds of multivariate analyses are used to investigate variables behaviour that are easy to identify and results can be generalized to larger populations. In social sciences many researchers prefer quantitative methods because they provide clear objective based on data that can be evaluated.

Context of the research

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There have been done studies which approach the development of some valid research tools based on exploratory factor analysis or multiple regression models. In the educational field, there can be identified studies which use the principal component analysis, clusters analysis and multiple regression for different interpretations of the recorded experimental data. However, interesting research topics, but who have low results due to failed research design are still disseminated.

Context of the research

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Methods for Quantitative research

Experiments and Quasi-experiments

Behavioral Measures

Questionnaires and Surveys

Context of the research

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ALCANTARA **ASCENDIA**

We present most relevant quantitative analyses methods based on multivariate analysis which, applied in the educational sciences, can complete qualitative analysis to reveal latent information based on results and can facilitate implementing an integrated policy for education in development.

Also, this study provides a new approach on the initial research design.

From this perspective, this theoretical study presents the advantages and limitations of quantitative analyses that we will have to take into account for improving the research related to perception of new technologies used in education.

Defining quantitative research. EFA and CFA

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are used to understand common variance of measured variables which are assigned to a latent factor. However, EFA and CFA are conceptually and statistically different.

EFA is a technique for identifying clusters of dependent variables in order to understand the relationship between the variables that we have measured. This type of multivariate analysis allows the identification of latent structure among the investigated variables. This thing is done by estimating the variance common at their level.

Defining quantitative research. EFA and CFA

Each factor can be presented in terms of the variables measured and the factor score regression coefficient. More than that, the analysis of the factors is based on Pearson linear correlation.

That is why the variables must present a linear association, in order to be introduced in the analysis. In many cases, we notice an abnormal distribution (the negative asymmetry is predominant) for natural dependent variables. But taking into consideration the significant number of respondents, we will consider the normality condition as not compulsory.

Defining quantitative research. EFA and CFA

The use of KMO index Kaiser-Meyer-Olkin represents a measure of sampling adequacy and Barlett's test of sphericity, offers us information about the existence of multicollinearity. There is a KMO index for each variable, and their sum indicates the KMO global index.

Communality values are multiple correlation coefficients for each variable as dependent variable, using the factors as predictors.

Defining quantitative research. EFA and CFA

The higher value of KMO index as well as the significance level of Barlett's test of sphericity suggests the existence of one or more common factors which justifies the use of a factor reduction.

CFA allows testing the suitability of models established "a priori", for example, to verify the structure of the instrument scale. Primary statistical analysis of the data is used to test the factorial structure of the instrument.

Defining quantitative research. CA.

Cluster analysis, based on the results of factor analysis, indicates that participants can be classified into several clusters with particular characteristics in their behavior. Thus, starting from the scores obtained from the instruments, the respondents can be classified.

Defining quantitative research. CA.

The dependent variables are built on the basis of the results of factor analysis. For each main factor, a global score will be calculated by adding scores for each included element and dividing it to the number of items which represent the factor. Thus, all factors will have the same scale and thus, standardization will not be necessary anymore.

Defining quantitative research. CA.

The construction of clusters can be made by the method of interactive updating of centers, either by partitioning techniques, thus the distance among the internal elements of groups should be smaller, and the distance among groups should be bigger.

After the number of clusters was established, k means clusters method is recommended, as being suitable for medium size samples. The database of respondents can be used as analyzed bodies and weighing factor analysis as dependent variable.

Defining quantitative research. Regression.

Regression models are used to identify the types and degree of relation between the dependent and the independent variables of the study. A regression model can be established for each dependent variable separately, based on a single or a combination of independent variables (predictors).

Defining quantitative research. Regression.

In order for the chosen model to explain the relationships between variables, the value of determination ratio (R^2) should be between 0 and 1 and the value of statistical significance index (Sig.) should be less than 0.05. When the relationship between the dependent variable and the independent variable is not linear, the estimation of the regression curve is recommended.

STRENGTHS

- the data are shown as descriptive terms and can be used to create graphical models easier to interpret;
- can be applied to large numbers of people;
- allow the identification of latent structure among the investigated variables;

STRENGTHS

- contribution of each variable as dependent variable can be estimated;
- the respondents can be classified under certain categories (types) which present similar answer models;

LIMITATION

- natural dependent variables usually presents an abnormal distribution;
- all variables with communality values lower than 0.5 are recommended to be eliminated thus results can be lost;

LIMITATION

- separate and randomized cases are needed to validate and confirm the instrument scale, increasing the investigation period;
- quantitative research not explain why and how social and economic factors contribute to education.

CONCLUSIONS

- The purpose of factor analysis is to test a hypothesis or theory about the structure obtained on the basis of interdependencies among variables.

This type of analysis enables the identification of the main categories of factors, and groups the participants.

CONCLUSIONS

- Through the exploratory factor analysis, data can be summarized by bringing together the variables that were interrelated in the early stages of research.

The validation of the measurement tool can be performed by analyzing the internal consistency with Cronbach alpha index.

CONCLUSIONS

- Based on particular characteristic of the participants, using cluster analysis they can be classified into similar answers' models, while regression analysis can be used to identify the types and degree of influence of the particular characteristics.

Acknowledgements

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Thank you for attention!