

## **Method Article**

Cognitive skills strengthened during the course of Research Methodology in  
Medical Sciences careers

### Abstract

What happened in 2020 fostered creativity and synergy, as higher-level teachers. The objective was to analyze the degree of acceptance of the strategies and activities implemented during the Research Methodology course in the year 2021 by the students of the careers of Phonoaudiology, Medicine, Nutrition and Kinesiology and Physiatry of a privately run University. and from the Geography and Mathematics careers of a Teacher Training Institute, Mar del Plata, Argentina. The research carried out by the teaching team was developed in a descriptive way, with a sample of 189 students. They identify the follow-up developed on COVID in different countries for more than 200 days as extremely interesting, pointing out that it allowed them to strengthen skills such as recognizing, comparing, interpreting, analyzing, designing, explaining, and evaluating. Every problem, as has been the case during the Pandemic, becomes a challenge, a new mountain to climb that as teachers we transform into an opportunity to continue growing.

Keywords: strategies, cognitive skills, pandemic, COVID-19

### Introduction

What has happened in 2020 has fostered creativity and synergy in higher level teachers, in the search for teaching strategies and activities to strengthen cognitive skills. This coincides with what was indicated by Ordorica (2020) who reflects on the challenges that have arisen since 2020 due to the COVID 19 Pandemic, in all institutions. Román (2020: pp.21-22) addresses the situational analysis of Higher Education from a different point of view due to the change from face-to-face to virtuality contemplating the perspective of students, teachers and administrators. The Methodology chair also went through this paradigmatic path, which determined a series of decisions that translated into adaptations of proposals carried out in person until 2019. ICTs offer a series of alternatives that allowed the implementation of activities considered by students as innovative, creative and original. With regard to teaching strategies, reference is made to those indicated by Anijovich and Mora (2009: pp.24-25) who recognize them as decisions made by teachers to motivate student learning. The objective of this research carried out by the teaching team of the chair is to analyze the degree of acceptance of the strategies and activities implemented during the Research Methodology course in 2021 by Medicine students of the Bachelor of Nutrition, in Kinesiology and Phonoaudiology from a privately run university and from the Biology and Geography Faculty of a Teacher Training Institute in Mar del Plata, Argentina. The work team also wanted to investigate what cognitive abilities were developed/strengthened with each proposal implemented.

### Developing

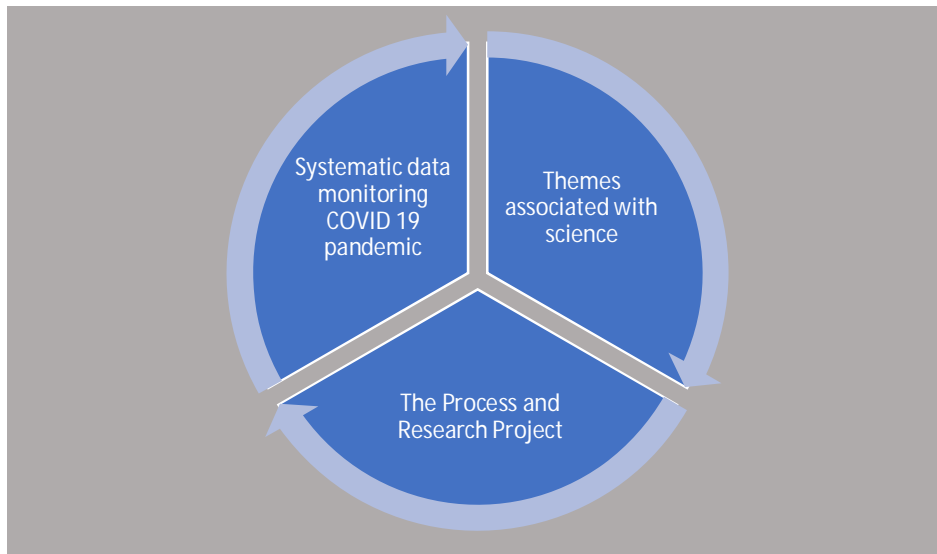
The subject is designed on three backbones that are intertwined during the year with different practical work. In addition, the resolution of an interdisciplinary activity is proposed where the four careers of the Faculty of Medical Sciences and two careers of the ISFD participate

**Comment [vr1]:** Should the word 'as' be replaced with 'among'? This sentence structure is not clear.

**Comment [vr2]:** Ensure the correct tense is used throughout the manuscript.

**Comment [vr3]:** Outcome here does not match the objective of the research stated above.

**Comment [vr4]:** Objective of the study expanded here and not stated in the abstract. You may want to add this in the abstract.



**Figure 1:** Backbones of the Research Methodology subject

Bloom's taxonomy is still valid, with a series of updates such as the so-called "Bloom's Taxonomy in the digital age" as Olivera (2011) points out, it refers to "higher and lower order cognitive processes" Below are tables that make it possible to visualize the contents addressed by axis and activities implemented

**Table 1** Themes associated with Science

Contents	Developed activities
Science, Scientific Knowledge Basic/Applied Science Discovery Context, Validation Application	Article Analysis Projection of interviews with specialists Reading and analysis of scientific articles video projection Treasure hunting Elaboration of a conceptual network

In the development of this axis the students integrate contents in the Treasure Hunt where a series of readings are presented and at the end of each one of them in group form they elaborate a conceptual network that is enriched as the reading progresses, presenting networks that They make it possible to visualize how the complexity increases in each one of them and the great treasure would be the association of everything worked with a theme specific to each career. Treasure Hunting is a strategy that can act as a road map for students (Minnaard, V., & Minnaard, C. L. (2017).

Next, it is presented how the second axis is developed

**Table 2:** The Process and the Research Project

Contents	Developed activities
<b>Gestation of an annual research project where the transfer of the theoretical to the practical is visualized</b>	Creation of a multimedia production Triangulation Research problem, General objective, Specific objectives Design of the Theoretical Framework: Tree of concepts indicating selected concepts and selected bibliographical citations Concept sequencing Formulation of hypotheses Research Scope Selection and Design Variables, variable mapping, conceptual and operational definition Population, Unit of analysis, Sample. sampling techniques Reflection on informed consent and ethical implications in research Selection of the instrument. Elaboration of the same and implementation in a small sample Preparation of graphs and analysis of data matrix Sum of qualitative look to transform into a mixed investigation. Creation of an interactive poster that accounts for the process that has gone through and that includes filming of the students explaining different stages Presentation at Research Athenaeum

The development of this axis is processual, and weekly the students organized in groups of 5 present the advances that allow the faculty to generate a space for exchange in the synchronous meeting that is carried out through video call programs, making online meetings possible. A few classes before the end of the course, the Youth Research Athenaeum is held where each group presents their productions. This meeting was always held in person, but given the health situation that the Preventive Social Isolation generated, a gallery of interactive productions of the four participating Medical Sciences careers was designed in the virtual classroom of the subject within the university platform.

As for axis three, which arose in times of the Pandemic, the groups carried out daily monitoring for 180 days on the information provided by the portals of those of 21 different countries on COVID 19.

**Table 3:** Systematic monitoring of COVID-19 Data

Contents	Developed activities
Health situation in relation to COVID 19 worldwide	Group selection of a country and weekly monitoring of infected, deaths, vaccinated, health decisions Creation of a multimedia production Weekly presentations with the data of each monitored country in graphs Comparison of healthcare decisions and modifications over time Hypothesis formulation Reflection on fluency of knowledge Exhibition in Productions Gallery

The students state that the systematic monitoring of data on this topic provided by the portals of each country is very interesting and has allowed them to strengthen different skills.

**Table 4** Opinion of students about the systematic monitoring of data

*“It seems to me an interesting activity, since we know the global context of the evolution of COVID-19, which vaccines are applied in greater and lesser quantity and what are the policies that are adopted before it in order to compare with Argentina and have a founded opinion. In addition, we learn to carry out a data record that in the near future will be important to know.”*

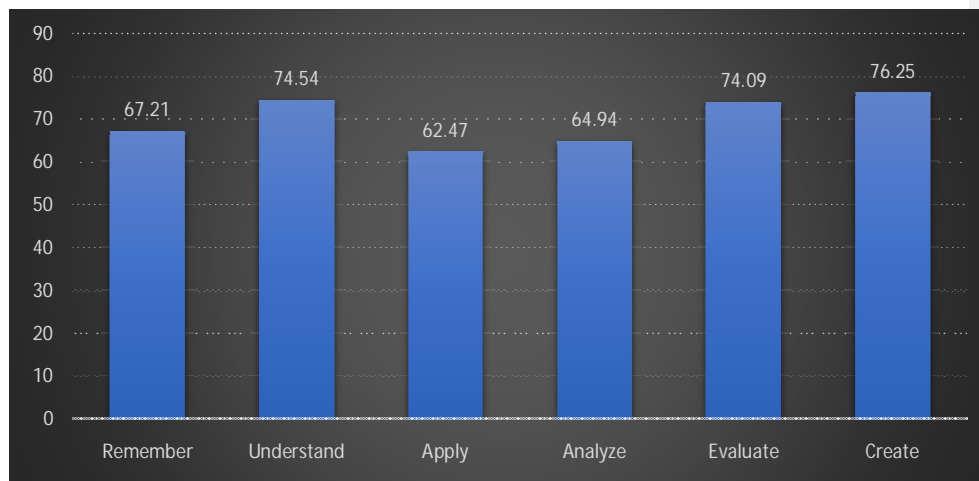
*“It is very enriching to analyze in depth the state of other countries regarding COVID19 in addition to ours, not only to know the situation of each one of them in this pandemic but also to compare them with Argentina. Expand our knowledge on the subject.”*

*“It seems to me a useful activity not only for the subject itself, but to be informed of the general situation of the country and the world regarding this pandemic that is not going through”.*

Below is the response of 189 students of Medical Sciences and two careers of the ISFD who have responded to a form sent online that investigates what skills they recognize as strengthened with the activities in the three backbones of the subject.

**Table 5:** Cognitive skills that students identify as strengthened

		Frequency	Percentage			Frequency	Percentage
Remember	Copy	111	58,7	Understand	Sort out	138	73,37
	Define	117	62,2		Compare	163	86,24
	Quote	120	63,4		Explain	155	82,46
	Track	105	55,5		Infer	79	41,79
	Relate	142	75,13		Interpret	174	92,06
	Recognize	159	84,2		Resume	134	71,34
	To locate	135	71,4				
Apply	Apply	136	72,33	Analyze	Separate	121	64,02
	Show	133	70,75		Tidy	165	87,30
	To complete	110	58,57		Explain	130	68,78
	To illustrate	114	60,62		Compare	154	81,48
	To show	127	67,19		Select	118	62,43
	Review	99	52,38		Infer	101	53,43
	Relate	98	51,85		Arrange	63	33,33
	Sort out	125	66,13		Sort out	130	68,78
Evaluate	To size	134	71,34	Create	Design	164	86,77
	Evaluate	166	87,83		Visualize	142	75,13
	Justify	127	67,19		Elaborate	169	89,41
	Opine	129	68,25		Hypothesize	132	69,84
	Compare	153	81,76		Compile	113	60,10
	To debate	143	75,66				
	Explain	126	66,66				



**Figure 2:** Percentage of students who identify cognitive abilities strengthened in activities carried out

**Table 6:** Categories of identified cognitive abilities

Remind	Understand	Apply	Analyze	Evaluate	Create
67,21%	74,54%	62,47%	64,94%	74,09%	76,25%
Lower order cognitive processes			Lower order cognitive processes		
68,07			71,76%		



It is possible to observe that in the lower order cognitive processes all are higher than 50%, being the Understanding process the one that reaches a higher percentage than 74.54%. Likewise, it is observed that in higher order cognitive processes all are higher than 50%, with the Create (76.25%) and Evaluate (74.09%) processes reaching the highest percentages.

When applying a test of difference of proportions between lower cognitive processes and higher cognitive processes, no significant difference is observed between both processes ( $\alpha=0.05$ ;  $p=0.645$ ).

Null hypothesis  $H_0: p_1 - p_2 = 0$

Alternative hypothesis  $H_1: p_1 - p_2 \neq 0$

Méthod	Valor Z	Valor p
Normal approximation	-0,46	0,645

### Conclusions

The results obtained allow, in principle, to confirm that the chosen methodology has been widely accepted by the students since it has provided the possibility of enriching the training proposal of the students with the monitoring and recording of specific data. Applying this type of methodology in formal education contexts makes it possible to identify successes and difficulties, giving the possibility of reflecting on those necessary changes to be implemented. The pandemic became empowered as a historical milestone, marking a before and after, generating changes in all areas and not only in the academic. Although this generated uncertainty and confusion, it led to a series of virtual meetings with the members of the teaching team that favored creativity and innovation, in turn the permanent training of the teaching team, responding to the needs of the moment.

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