

## Study of the attitude towards the usefulness of mathematics in precalculus students enrolled in the I Cuatrimestre 2022

Didier Alberto Castro Mendez<sup>1</sup><sup>[0000000244648541]</sup>

<sup>1</sup>Latin American University of Science and Technology, San José, Costa Rica  
dcastro@ulacit.ac.cr

**Summary.** The research in question focuses on assessing the attitude of students in the ULACIT precalculus course towards the usefulness of mathematics. The sample comprised 315 students enrolled in the first quarter of 2022, in a blended learning environment due to restrictions imposed by the COVID-19 pandemic. The main objective of the research was to analyze the level of attitude towards the usefulness of mathematics in precalculus students in the first quarter of 2022 at ULACIT. In addition, three specific objectives were established: to investigate whether there are significant differences in the attitude towards mathematics according to sex, area of study and educational modality of students. The results of the study revealed that there are no statistically significant differences in the attitude towards the usefulness of mathematics depending on the sex or area of study of the students. However, significant differences were found in relation to the educational modality: students who took the course in person showed a more positive attitude towards the usefulness of mathematics compared to those who opted for the virtual modality.

**Keywords:** educational mathematics, socio-affective factors, mathematical utility

### 1 Introduction

Although affective factors have an undeniable impact on students' academic performance (McLeod, 1987; Gomez, 2000), research emphasizes that learning is completely cognitive. Pérez-Tyteca (2012) states that the attitude towards the usefulness of mathematics is directly related to how useful it is in various contexts (everyday, work, professional). The importance of studying this process lies in the fact that "the usefulness that a student gives to mathematics is fundamental to determine their interest, motivation and persistence in the subject" (Pérez-Tyteca, 2012, p. 59). Students must constantly respond to the pressure they suffer in learning mathematics, so it is of great importance to recognize those factors that have a positive and negative impact on mathematics.

Aschcraft (2005, as cited in Primi, et al. 2014, p.51), states that interest and motivation decline as the student grows, and math anxiety is thought to develop in secondary education, coinciding with the increasing difficulty of the mathematics curriculum.

For Mato et al. (2014, as cited in Aguero et al. 2017, p.5) the attitude towards the usefulness of mathematics decreases as students go through each school year. In turn, the previous authors propose that such behavior can be explained by: "... the way mathematics is presented, in many cases, separated from real life, decontextualized so that students do not perceive what is the relationship of the contents given in school and the mathematics of everyday life and in the first years of schooling is different" (Mato et al., 2014, p.57).

The educational community is aware of the impact of affective and emotional factors on the learning of mathematics, therefore, in recent years, the number of works that deepen the influence of mathematics has increased (Gómez-Chacón, 2010).

This research provides Costa Rican society with more data in relation to the attitude towards the usefulness of mathematics in university students and finds a strong connection with various researchers in the region in these constructs that intervene directly in the teaching-learning processes of mathematics.

## **2 Method**

The research is of quantitative approach specifically of descriptive type (Hernández et al., 2006) since properties, characteristics and important features of the phenomenon that was analyzed were specified. The summer study population consists of all precalculus students, namely 455 from said university educational center enrolled for the first semester of 2022. The sample was integrated with the total number of students who completed the online survey within the deadline established for a total of 315. As a measuring instrument, the scale of Fennema and Sherman (1976) "attitude towards the usefulness of mathematics" was used, as it has been validated over more than forty years and conforms to the concepts of the research. This instrument consists of a Likert-type questionnaire composed of 12 items, in which, for each one, there are 5 response possibilities ranging from "Strongly agree" to "Strongly disagree", with the neutral option "Neither agree nor disagree". Data collection was carried out through the application of the measuring instrument, using the Google Forms platform. This form was applied to the 14 precalculation groups offered in the first quarter of 2022 in the first three weeks of said school period. It is important to emphasize that this application was made in both face-to-face and virtual classes due to the established governmental and institutional protocols in the face of COVID-19.

## **3 Results**

The results obtained establish that 85.08% of students show a high and very high level of attitude towards the usefulness of mathematics. This coincides with research already carried out in the university context including Meza and Muñoz (2019), Morales and Arce (2017) and Vega (2017) where almost 90% of students present high levels

in relation to the construct of this research, so educational activities can be established to improve mathematical performance. The level of attitude towards the usefulness of mathematics tends to increase as the student advances in their studies as reflected by applied studies in secondary school (Castro and Madrigal, 2021).

Data analysis showed that there are no statistically significant differences with respect to the average level of attitude towards the usefulness of mathematics, according to sex and area of study. But it did show that, if there are statistically significant differences of this variable in relation to the educational modality, where the students who enrolled the face-to-face course demonstrate a greater attitude.

#### 4 Conclusions

From the above analyses, the following conclusions are drawn:

- Approximately 85.08% of the students who make up the sample present an average level of attitude towards the usefulness of mathematics high and very high.
- There are no statistically significant differences in the level of attitude towards the usefulness of mathematics in relation to sex.
- There are no statistically significant differences in the level of attitude towards the usefulness of mathematics in relation to the area of study.
- If there are statistically significant differences in the level of attitude towards the usefulness of mathematics in relation to the educational modality, where students who enrolled the course in person demonstrate a greater attitude.

#### References

- [ 1 ]. Aguayo, M. (2004). How to perform "step by step" a hypothesis test with SPSS for Windows and alternatively with EPIINFO and EPIDAT: (II) Association between a quantitative variable and a categorical variable (comparison of means between two or more independent groups).
- [ 2 ]. Agüero, E., Meza, L. G., & Suárez, Z.(2017). ESAUMEM: Study of the attitude towards mathematical utility in high school students. Final report of the research project. <https://repositoriotec.tec.ac.cr/handle/2238/9167>
- [ 3 ]. Arce, C. & Morales, E. (2017). Study of the relationship between mathematical anxiety, mathematical self-confidence and attitude towards the usefulness of mathematics in students of Health Sciences of a private university in Costa Rica (Unpublished undergraduate thesis) Technological Institute of Costa Rica.
- [ 4 ]. Burga, A. (2005). The One-dimensionality of a measuring instrument: factorial perspective. Ministry of Education.
- [ 5 ]. Castro, D. & Madrigal, Y. (2021). Study of the relationship between "mathematical self-confidence" and the "attitude towards the usefulness of mathematics" in students of the diversified cycle of the Minor Seminary Colegio Seráfico San Francisco de Asís, Cartago, Costa Rica. (Bachelor's thesis). Technological Institute of Costa Rica.
- [ 6 ]. Cea, M.A. (1999) Quantitative methodology: strategies and techniques of social research. Synthesis.

[ 7 ]. Céspedes, Y., Cortés, R., & Madrigal, M. (2011). Validation of an instrument to measure the perception of the quality of pharmaceutical services of the Public Health System of Costa Rica. *Revista Costarricense de Salud Pública* (20), 75-82.

<http://www.scielo.sa.cr/pdf/rcsp/v20n2/art2v20n2.pdf>

[ 8 ]. Fennema, E., & Sherman, J. A. (1976). Fennema-Sherman mathematics attitudes scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *Journal for research in Mathematics Education*, 7(5), 324-326. DOI: 10.2307/748467

[ 9 ]. Gómez, I. (2000). Emotional mathematics. Affects in mathematical learning. Narcea S.A.

[ 10 ].Gómez-Chacón, I. (2010). Students' attitudes in learning mathematics with technology. *Science Education*, 28(2), 227–244. <http://eprints.ucm.es/21500/1/IGomez1.pdf>

[ 11 ].Hernández, R., Fernández, C., & Baptista, P. (2006). *Research methodology*. McGraw Hill.

[ 12 ].Jiménez, K. & Montero, E. (2012). Application of the Rasch, in the psychometric analysis of a diagnostic test in mathematics. *Digital Journal Mathematics, Education and the Internet*, 13(1), 1-23.

[ 13 ].Lozano, L. & De la Fuente- Solana, E. (2009). Design and validation of questionnaires. Basic manual for the realization of dissertations, theses and research works. Editorial EOS.

[ 14 ].Mato, M., Espiñeira, E. & Chao, R. (2014). Affective dimension towards mathematics: results of an analysis in primary education. *Journal of Educational Research*, 32(1), 57-72. [doi.org/10.6018/rie.32.1.164921](https://doi.org/10.6018/rie.32.1.164921)

[ 15 ].McLeod, D. (1987). Beliefs, attitudes, and emotions: Affective factors in mathematics learning. *Proceedings of the 11th Conference of the International Group for the Psychology of Mathematics Education*. Montreal.

[ 16 ].Meza, L., Muñoz, E. (2019). Study of the attitude towards the usefulness of mathematics in students of management careers of a private university. *Digital magazine: Mathematics, Education and Internet* (20).

<https://revistas.tec.ac.cr/index.php/matematica/article/view/4592>

[ 17 ].Morales, A. & Arce, C. (2017). Study of the relationship between mathematical anxiety, mathematical self-confidence and attitude towards the usefulness of mathematics in students of Health Sciences of a private university in Costa Rica (Bachelor's thesis). Technological Institute of Costa Rica.

[ 18 ].Perez-Tyteca, P. (2012). Mathematical anxiety as the center of a predictive causal model of career choice. (Doctoral thesis) University of Granada.

[ 19 ].Perez-Tyteca, P., Monje, J., & Castro, E. (2013). Affection and mathematics. Design of an interview to access the feelings of adolescent students. *Research Advances in Mathematics Education*, 4, 65-82.

[ 20 ].Primi, C., Busdraghi, C., Tomasetto, C., Morsanyi, K., & Chiesi, F. (2014). Measuring math anxiety in Italian college and high school students: validity, reliability and gender invariance of the Abbreviated Math Anxiety Scale (AMAS). *Learning and Individual Differences*, 34, 51-56. [doi:10.1016/j.lindif.2014.05.012](https://doi.org/10.1016/j.lindif.2014.05.012)

[ 21 ].Vega, A. (2017). Study of the relationship between "mathematical anxiety", "mathematical self-confidence" and the "perception of the usefulness of mathematics" in students of a private university in Costa Rica (Bachelor's thesis). Technological Institute of Costa Rica.