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DATA LITERACY-MINDED TEACHING OF TOPICS IN FUNCTIONS

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Data literacy education is typically connected with the teaching of statistics. Yet classroom teaching practice at No. 2 HS of ECNU reveals that data literacy education also contributes to the teaching of other parts of precalculus such as functions. Teaching experiments on topics of radian measure and the base of natural logarithm are provided to support our claim.

RESEARCH QUESTION

Does the data literacy-minded teaching of functions have positive effect on students' learning of functions, particularly with the topics of radian measure and natural logarithm?

TEACHING PRACTICE

Data literacy-minded teaching of the radian measure

Step 1. Approximate $\sin 1°$ with formulas of $\sin\frac{x}{2}$, $\sin(x+y)$ and sum $1° = \left(\frac{3}{4}\right)° + \left(\frac{3}{16}\right)° + \ldots + \left(\frac{3}{4^n}\right)° + \ldots$;

Step 2. Plot the x-sin x graph in Excel for $x = \left(\frac{3}{4^n}\right)°$ ($1 \le n \le 10$, $n \in \mathbb{N}^*$) and observe its best fitting line;

Step 3. Seek for the slope of the best fitting line and interpret it geometrically to reveal the nature of radian measure: change of units to simplify the calculation with circular functions!

The case of natural logarithm

A similar plan following Napier's construction was carried out to explore the origin of number e, the base of natural logarithm. We compared the performance of two groups of students on certain test items from AP Calculus concerning natural logarithm one year after they learned it. The class of 2018 learned natural logarithm in a traditional way, with number e being introduced as a "given" number, while the class of 2020 learned natural logarithm in our new approach. The results are summarized in Table 1 below.

Group of Students	Overall	Test Item 1	Test Item 2	Test Item 3
Class of 2018	71.45/120	97%	55%	29%
Class of 2020	77.17/120	97%	67%	48%

Table 1: Performance on differentiating natural logarithms

CONCLUSION AND REFLECTION

- Data literacy-minded teaching of functions, like visualization for geometry, can help students to clarify certain mathematical notions due to the concreteness of data.
- Retrospectively, data literacy-minded teaching of non-statistical units from precalculus can help the students to build basic data literacy.

References

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