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Personalized Self-Assessment Tool Using a Telegram Bot: A Case Study on Data Structures and Algorithms

INEDA Group: Teaching innovation in data structures and algorithms

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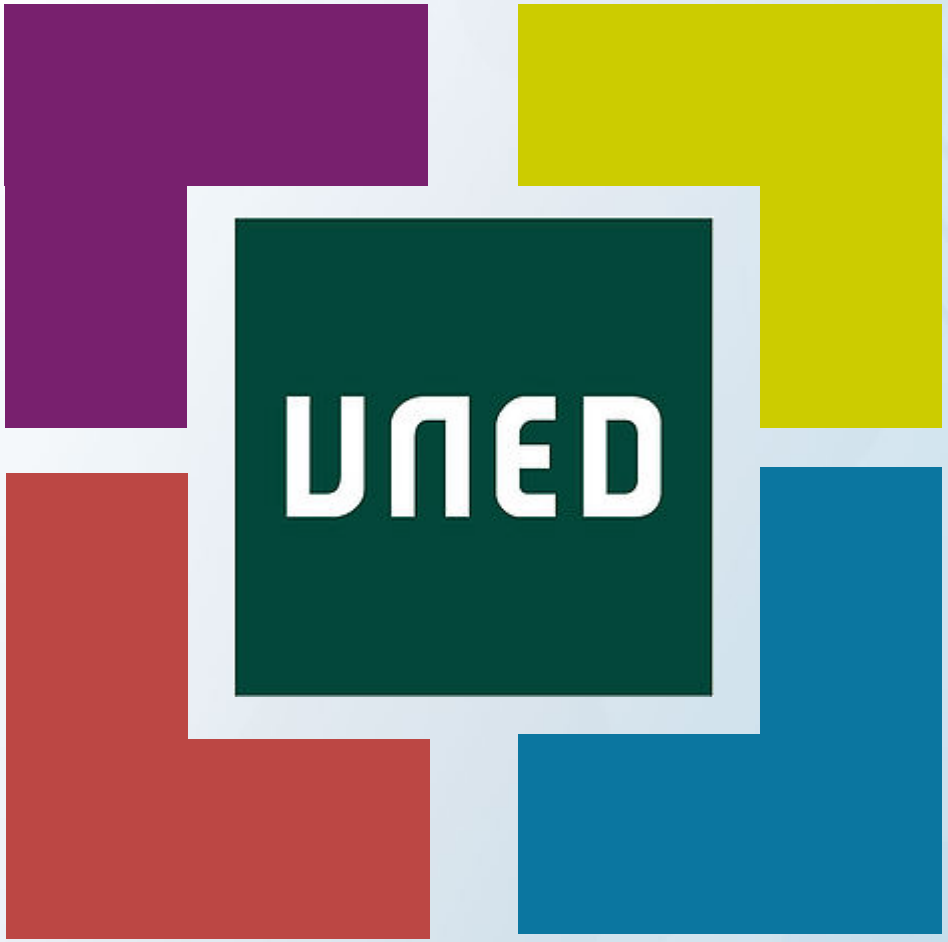
Personalization of self-assessment

- Self-assessment tools are essential on a distance-learning environment
- Resources are available anywhere, any time
- Different students means different needs, different progress speed
- Allow students to focus on areas where they need more practice

Students of the UNED University

70 % of students are older than 30 y.o.



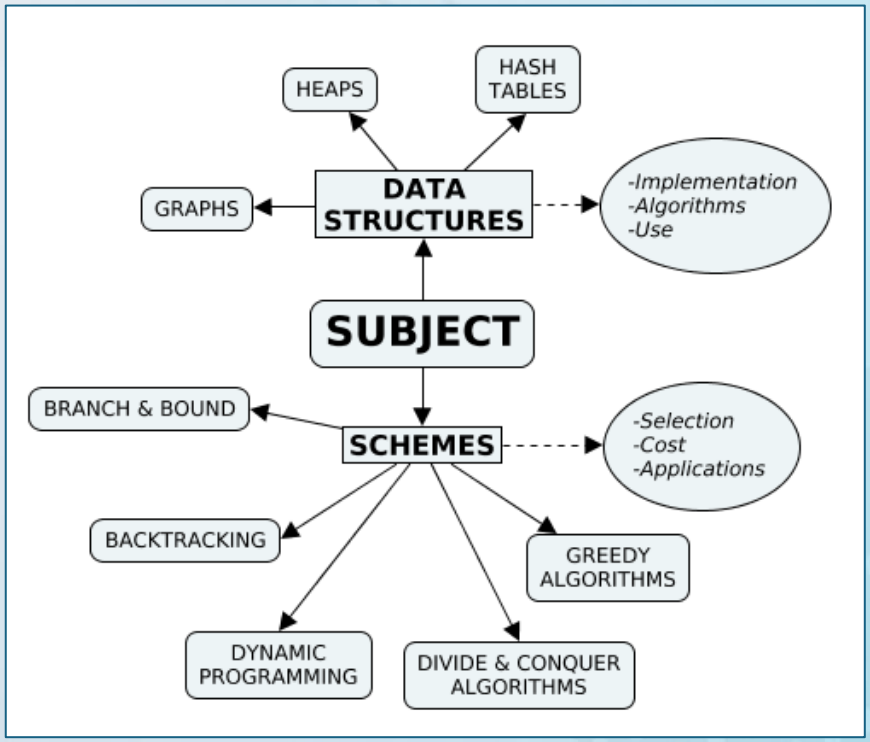
The mayority of students have a full time job and family duties

An important percentage of students already hold an university degree

Very high drop-out

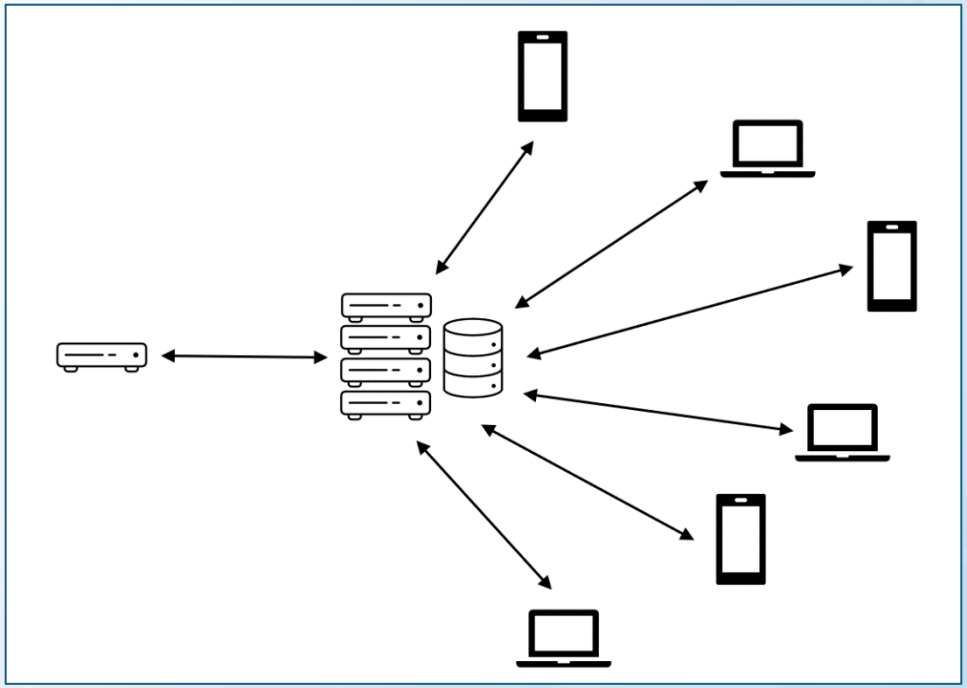
Data Structures and Algorithms

- Second course of Computer Science undergraduate degree
- Given a problem, the best algorithmic scheme and data structures have to be selected to design the solution
- Crucial part of a computer scientist's training, but includes topics of high difficulty for the students

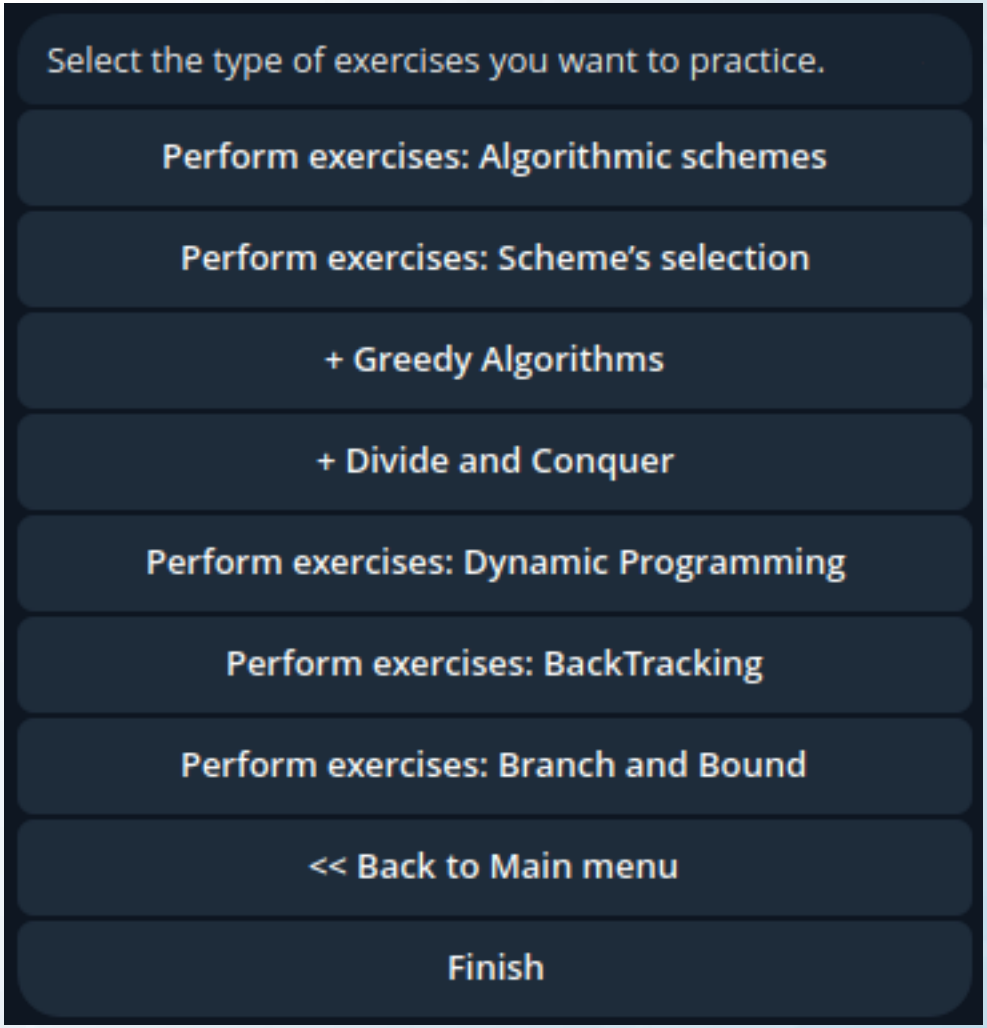


Our proposal

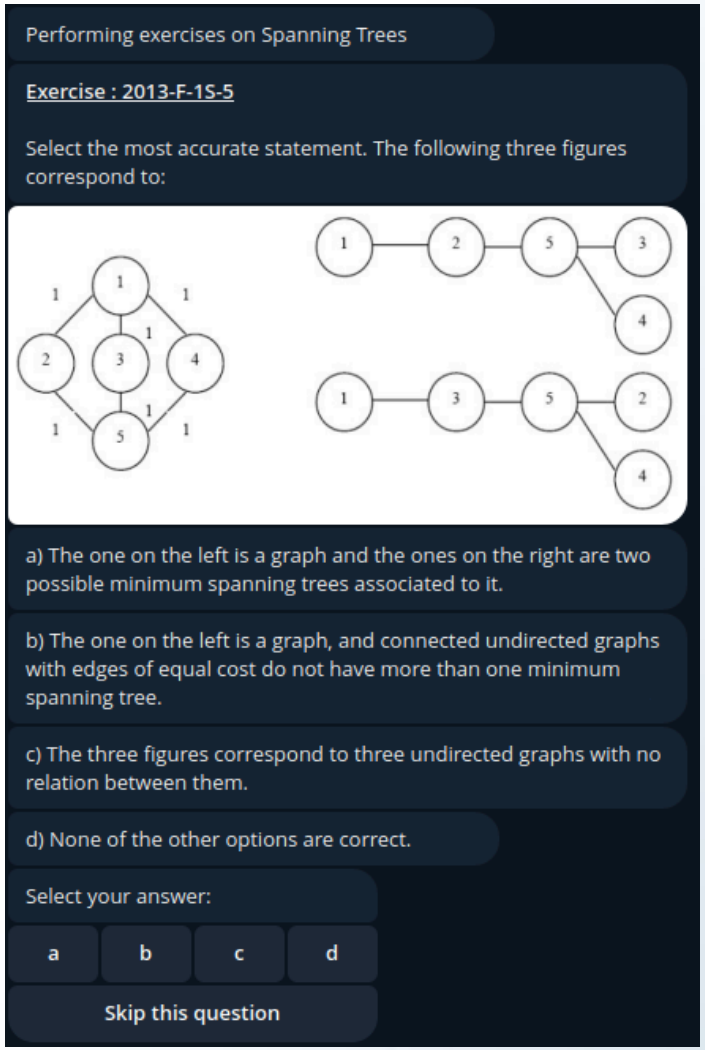
- Self-assessment tool with two personalization mechanisms
- Suggestion of **multiple-choice exercises**
- Implemented as a **Telegram Bot**



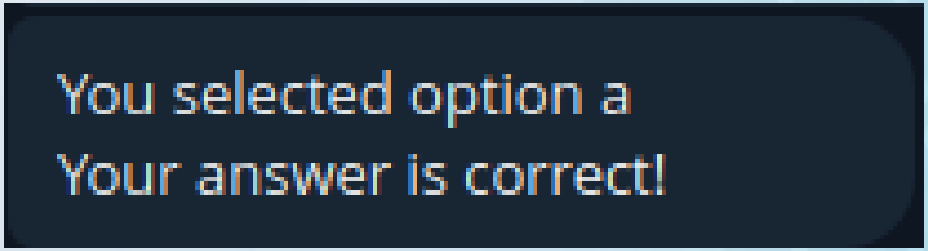
Navigation through topics' hierarchy



Suggestion of exercises

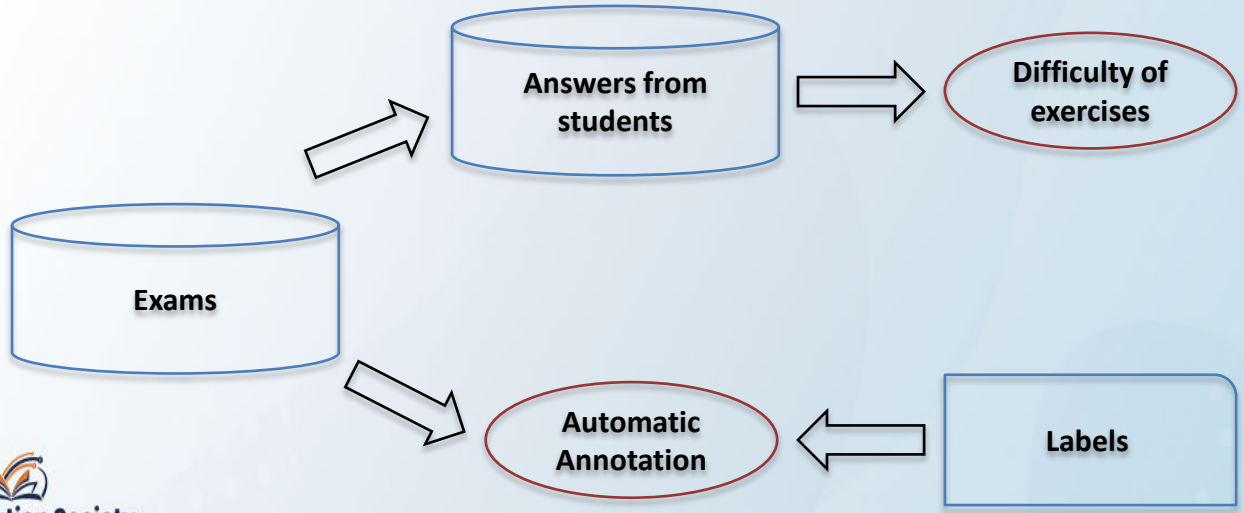


- Tool suggests exercises to practice the selected topic
- The student can skip the question or select one of the possible answers



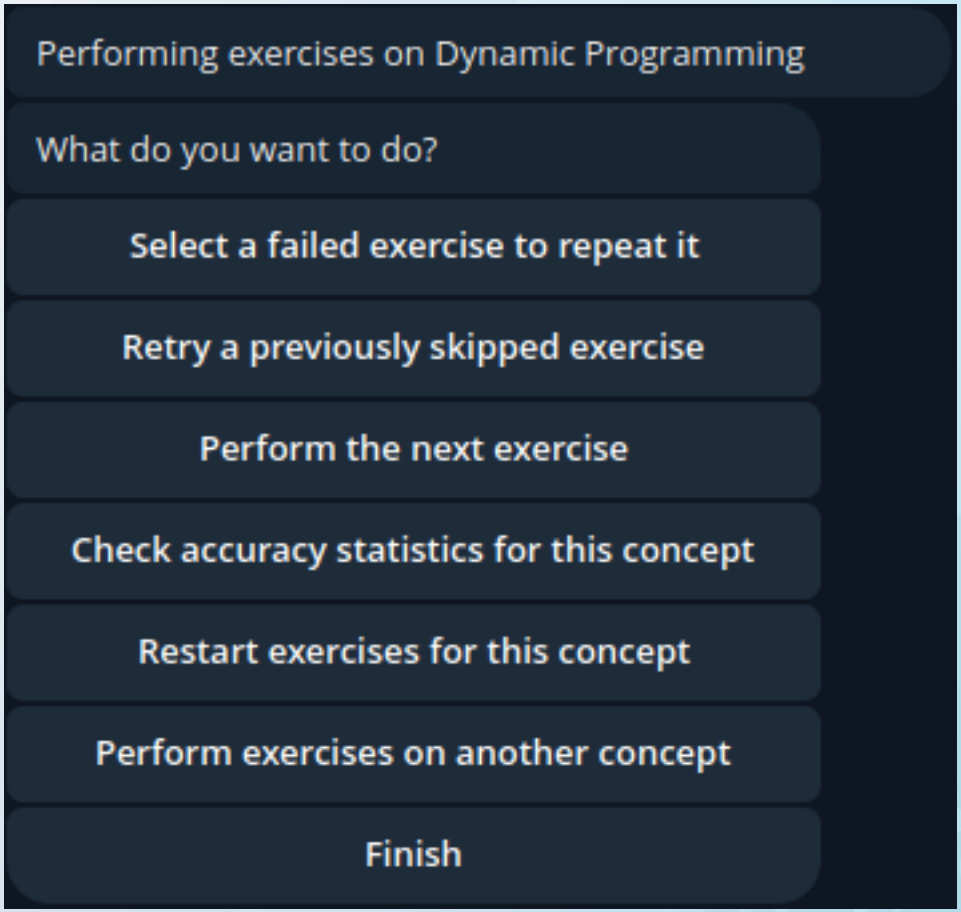
Difficulty of exercises

- Exercises taken from previous exams, automatically labelled with all the related topics
- Difficulty ↔ percentage of correct answers
- Questions more frequently failed or unanswered → most challenging



Record of student's history

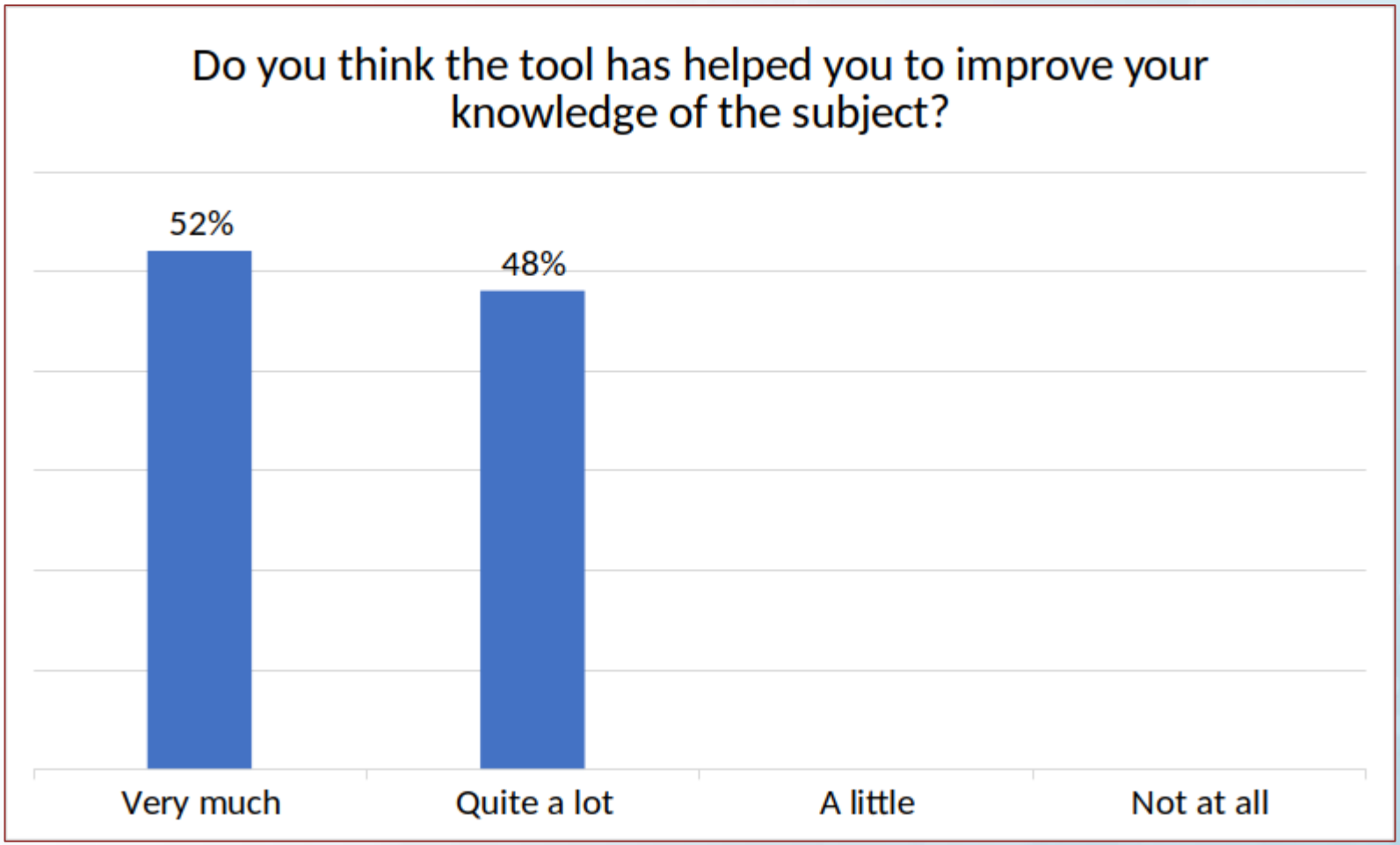
- Tool records a log of the user's action for each exercise suggested
- Students can retry previously failed or skipped exercises, check accuracy statistics or delete history of interactions



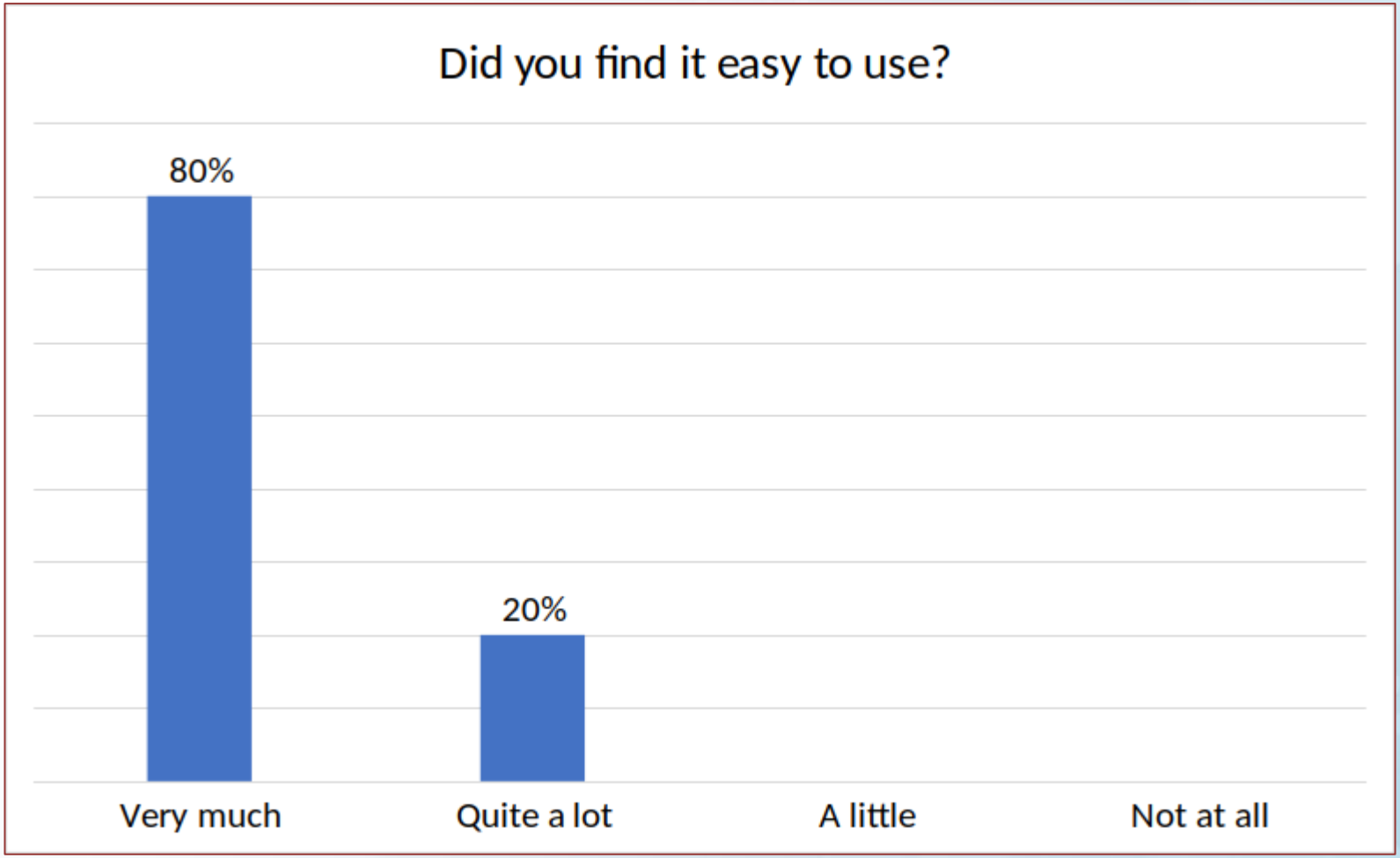
Record of student's history

- Each user on Telegram have unique ID
- Interactions stored using the ID
- SHA-256 hashing function ensures anonymity
- The user can erase **all data** stored by the tool
- Each student can resume her own study sessions at the same point, even on different platforms.

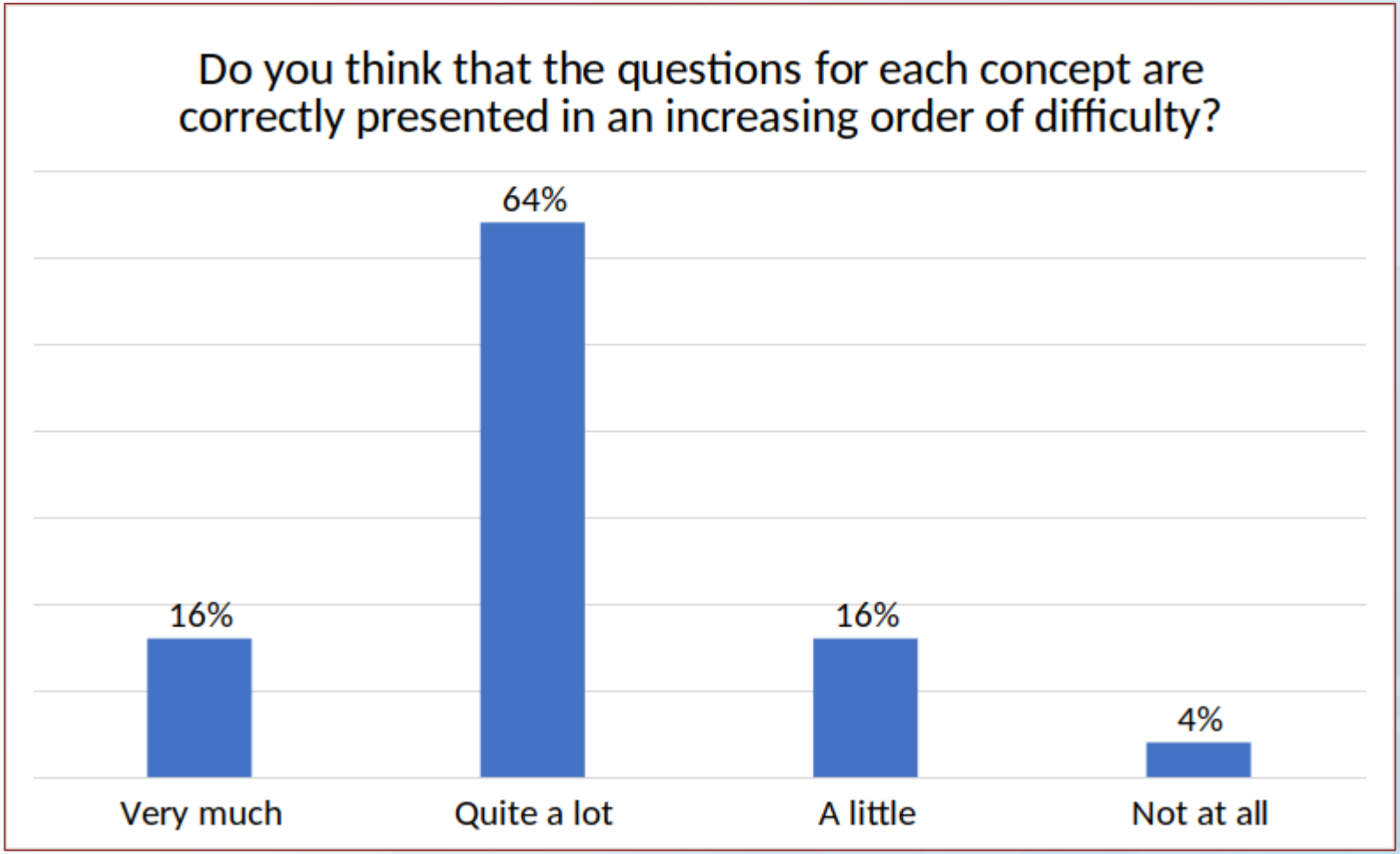
Evaluation


Do you think the tool has helped you to improve your knowledge of the subject?
52%
48%
Very much
Quite a lot
A little
Not at all

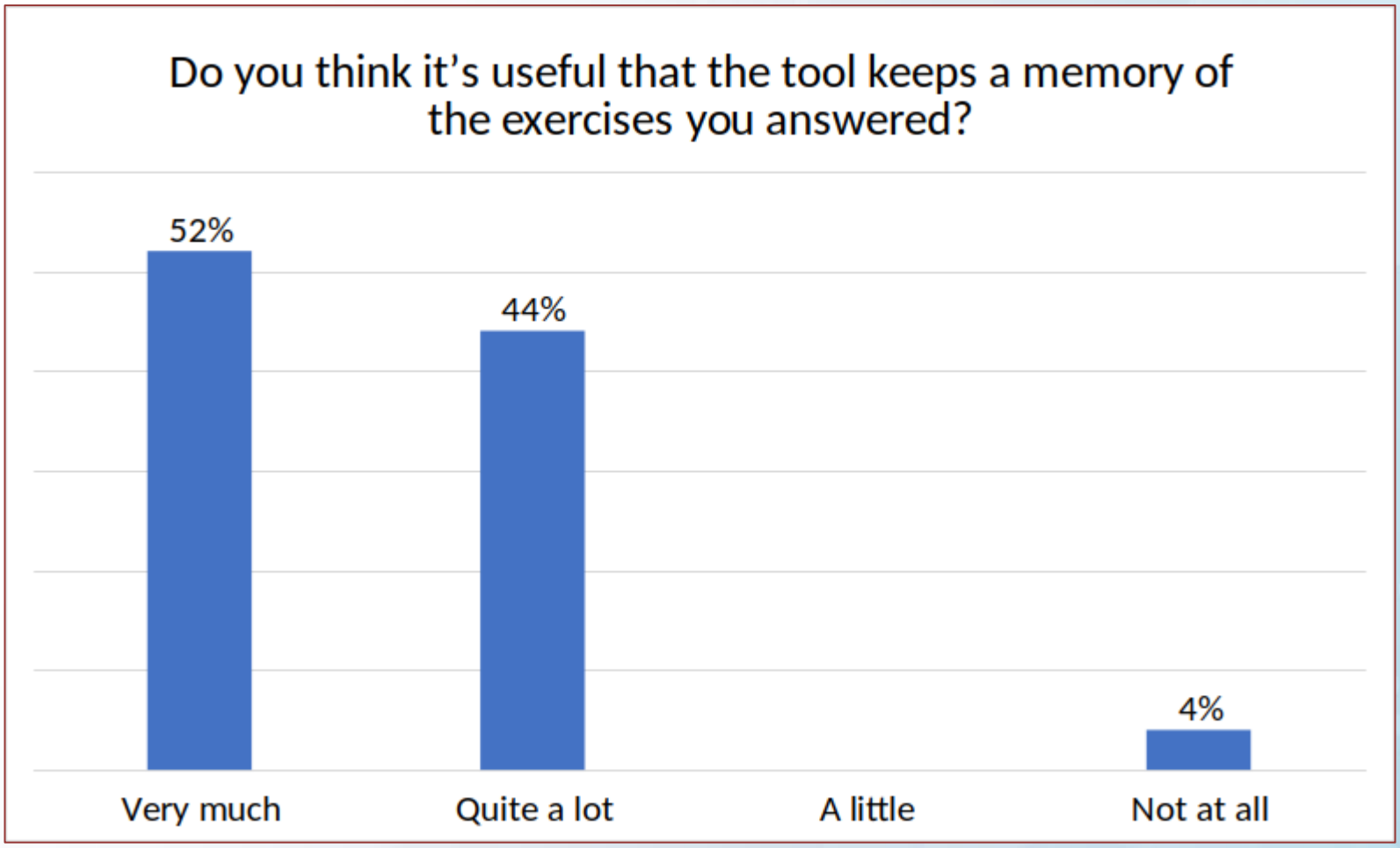
Evaluation


Did you find it easy to use?
80%
20%
Very much
Quite a lot
A little
Not at all

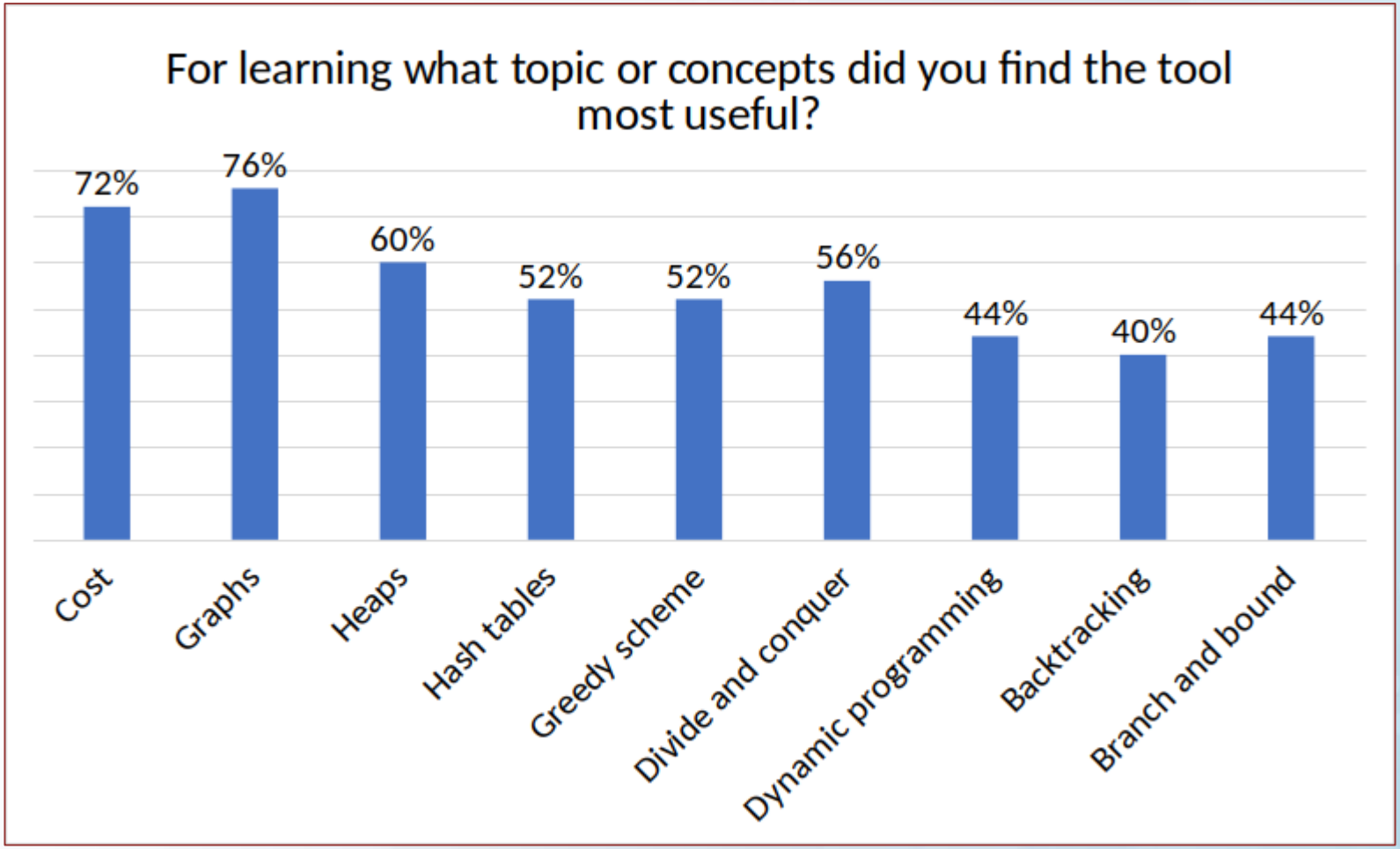
Evaluation


Do you think that the questions for each concept are correctly presented in an increasing order of difficulty?
64%
16%
16%
4%
Very much
Quite a lot
A little
Not at all

Evaluation

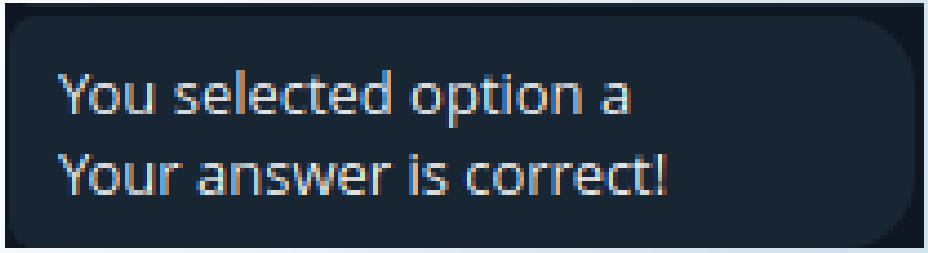

Do you think it's useful that the tool keeps a memory of the exercises you answered?
52%
44%
4%
Very much
Quite a lot
A little
Not at all

Evaluation


For learning what topic or concepts did you find the tool most useful?
72%
76%
60%
52%
52%
56%
44%
40%
44%
Cost
Graphs
Heaps
Hash tables
Greedy scheme
Divide and conquer
Dynamic programming
Backtracking
Branch and bound

Conclusions and future work

- Self-assessment tool with two personalization mechanisms
- Excellent acceptance among students: highly useful, easy to use, benefits of personalization
- Future work: introduce more elaborated feedback, apply the tool to other subjects and areas



Why?

Thank you very much for your attention

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