Identifying the most difficult topics in a computer science subject taught with distance methodology
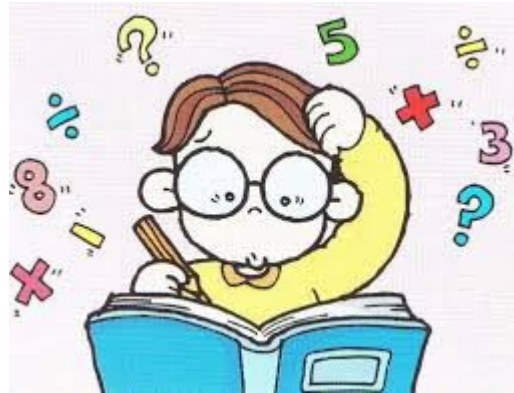
Lourdes Araujo
Fernándo López
Juan Martinez-Romo
Laura Plaza

Departamento de Lenguajes y Sistemas Informáticos

UNED

Motivation

- Topics in a subject may have quite different difficulty

- Pay more attention to the difficult topics, improve materials for them

Motivation

- Reasons of difficulty:
  - Abstraction level
  - Prior knowledge required (Logic, Mathematics, etc.)
  - Combination of more elements
  - Particular student profile

- Are these differences subjective and depend of each student, or are they general and appear in aggregate data?

Objectives

- Verify if there are significant differences between topics, that do not depend on the student using aggregated data from evaluation tests.

- If so, identify the most difficult topics according to the results obtained in those tests.

- Identify correlations with the practical or theoretical character of the topic

The subject

- Subject in the 2º course of a degree in Computer Science

- Distance Learning Methodology

- Related to data structures and algorithms

- Theoretical and practical components

- Previous knowledge required: logic and mathematics, basic data structures, computational cost, programming in Java.

The subject
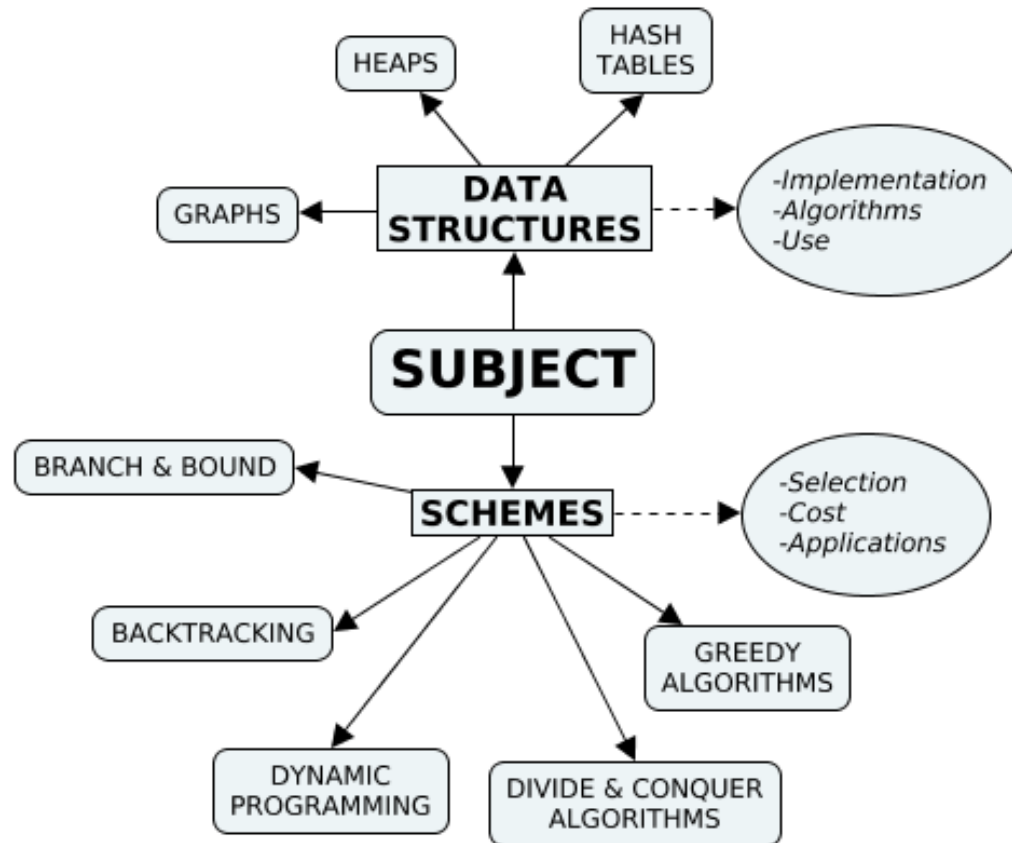
Methodology

- Collection of multiple-choice exams with:
  - Results for each question (success, fail, blank)
  - Labels to characterize the topics and aspects of each question:

    DS (data structures), SQUEMES (alg. schemes), HEAPS, GRAPHS, HASH, GREEDY, ESQ-SEL(alg. Scheme selection), PRACTICAL,THEORETICAL, COST (computational cost), etc.

- Data Analysis:
  - success, fails and blank rates,
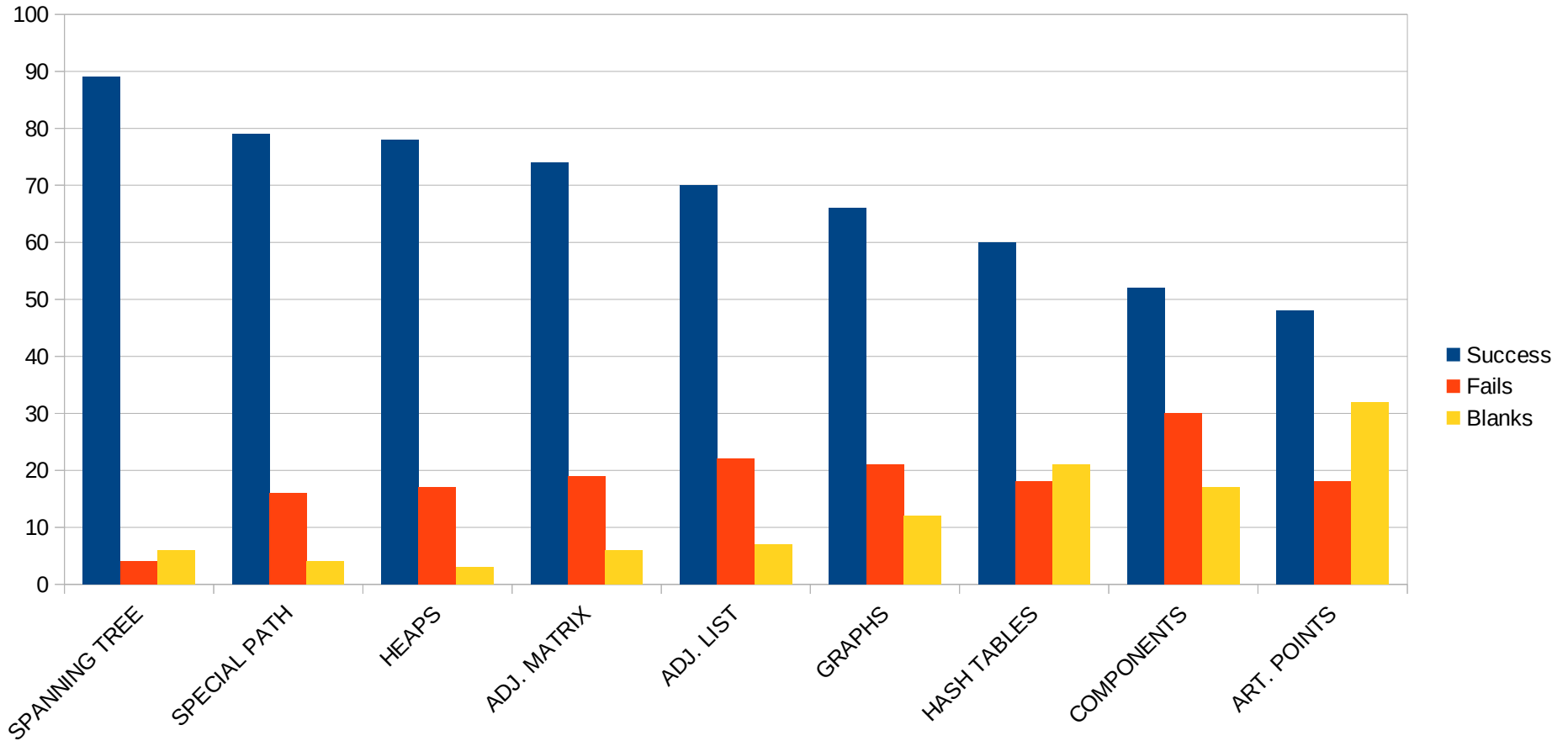 - co-relation with the practical character of the questions
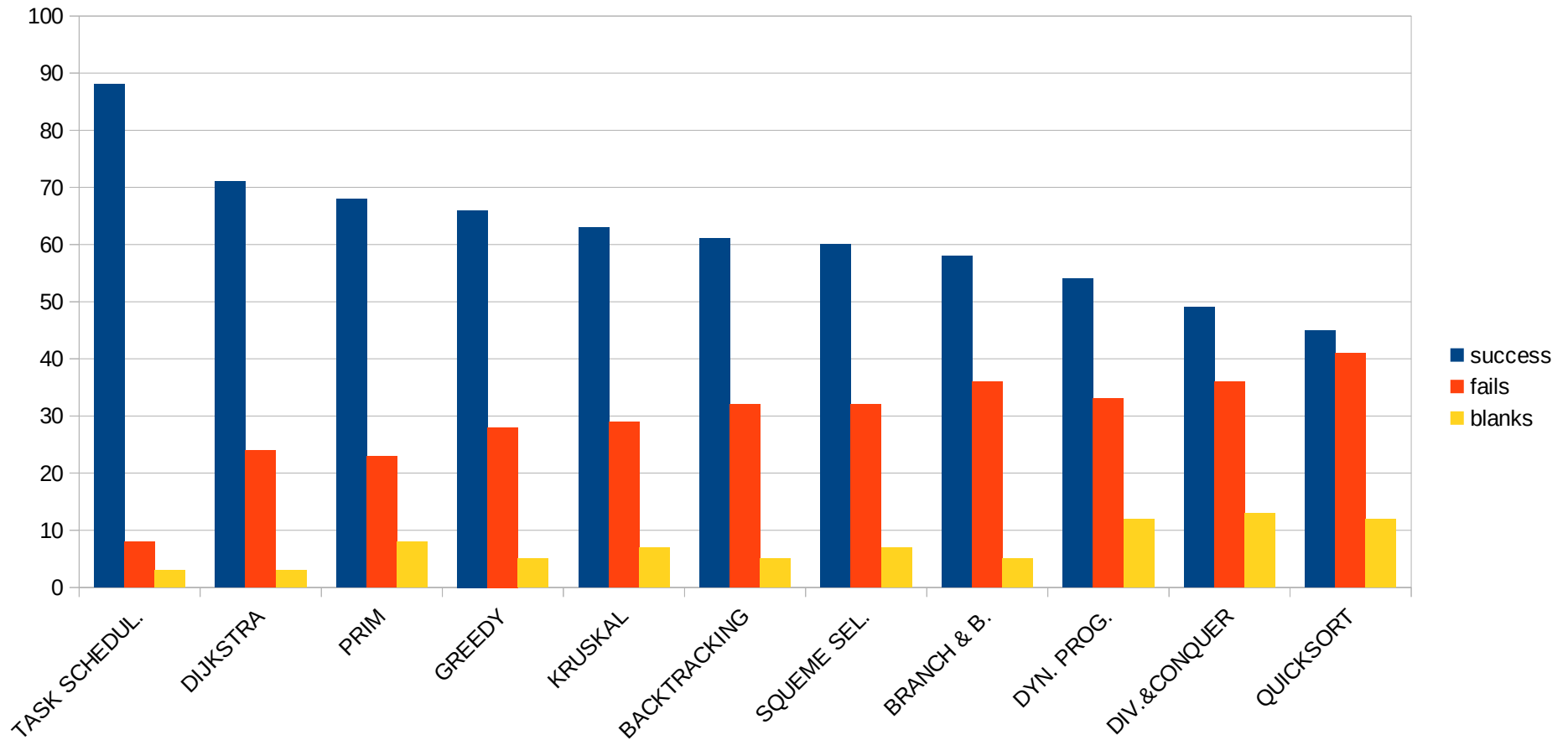
- Improve materials

Methodology
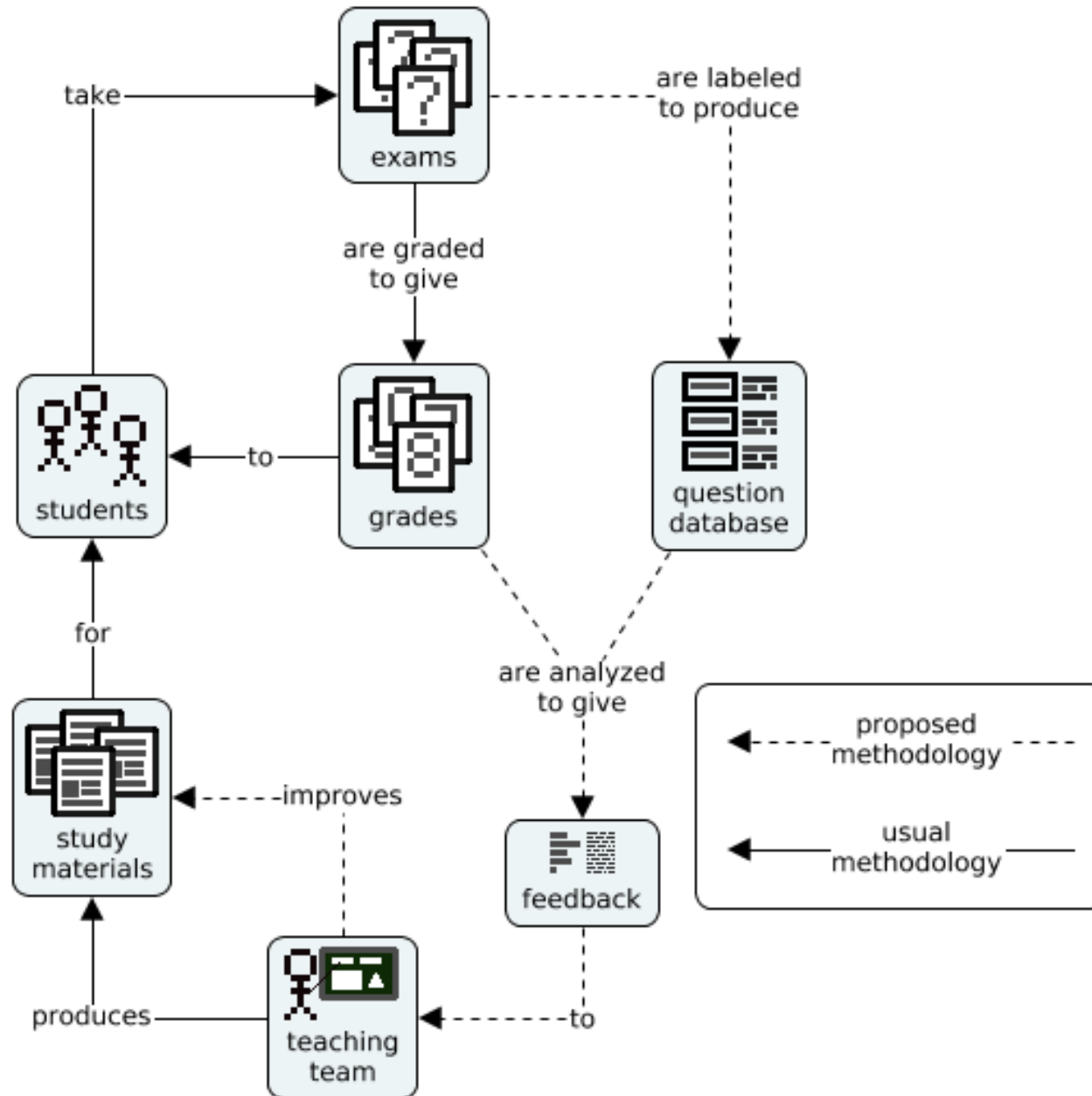
Results: general aspects
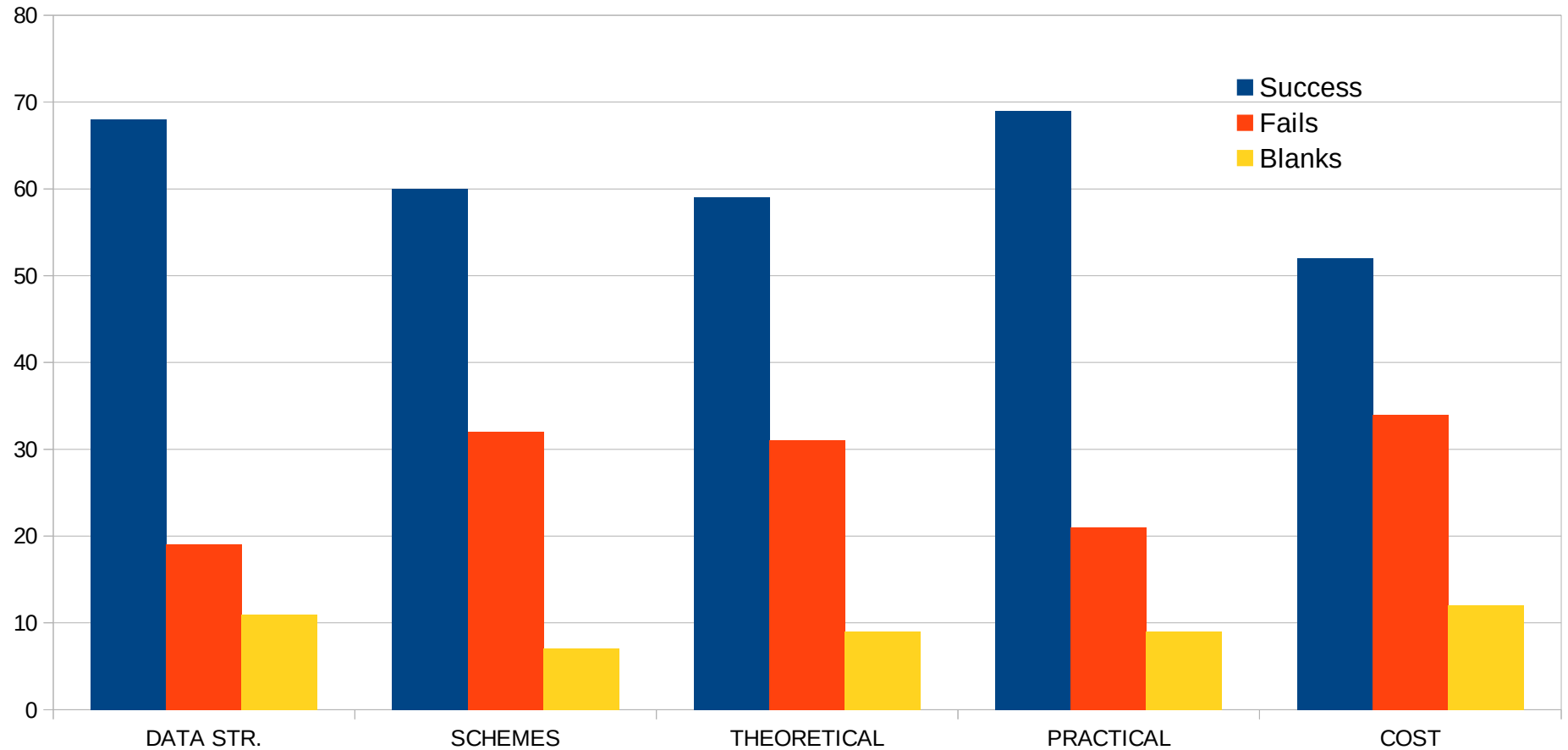
Results: Data structures

Results: Algorithmic schemes

Conclusions

- There are significant differences between topics:
  - Task scheduling: 88% success.
  - Quicksort: 45 % success.

- There are differences between the practical and theoretical nature of the questions:
  - Practical: 69%
  - Theoretical: 59%

Future works

- Extend the analysis to other subjects

- Further statistical analysis of the data:

  - Make an analysis of the temporal evolution of results

  - Analyze the influence of increasing the subject materials

Thanks!