# Student Cognition in Physics Group exams

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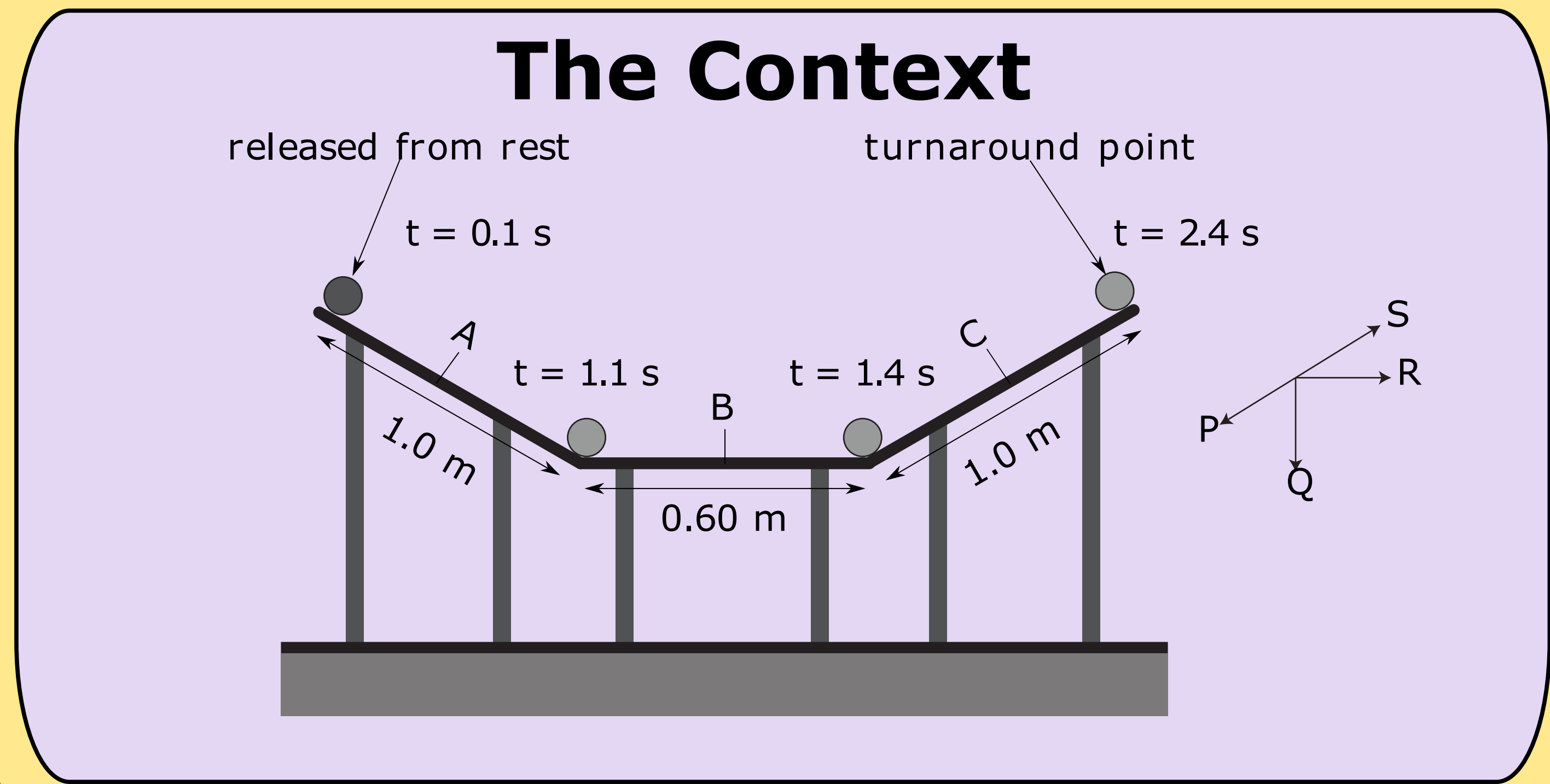
Individual Exam

Abstract

Exams are intended to give faculty information about what students know, and where they need more support. But traditional analyses that get shipped with the exam results we get from the university scoring office focus on the exam items, not students' ideas. Moreover, one of our goals for students is building thier cognitive network of physics concepts. When answering a single item, a single concept is being assessed. But with sets of contextually related questions, we can analyze students' cognitive network as applied to a particular context. We report on a tool that we have developed to identify patterns in student responses, and apply that tool to a particular two-phase group exam.
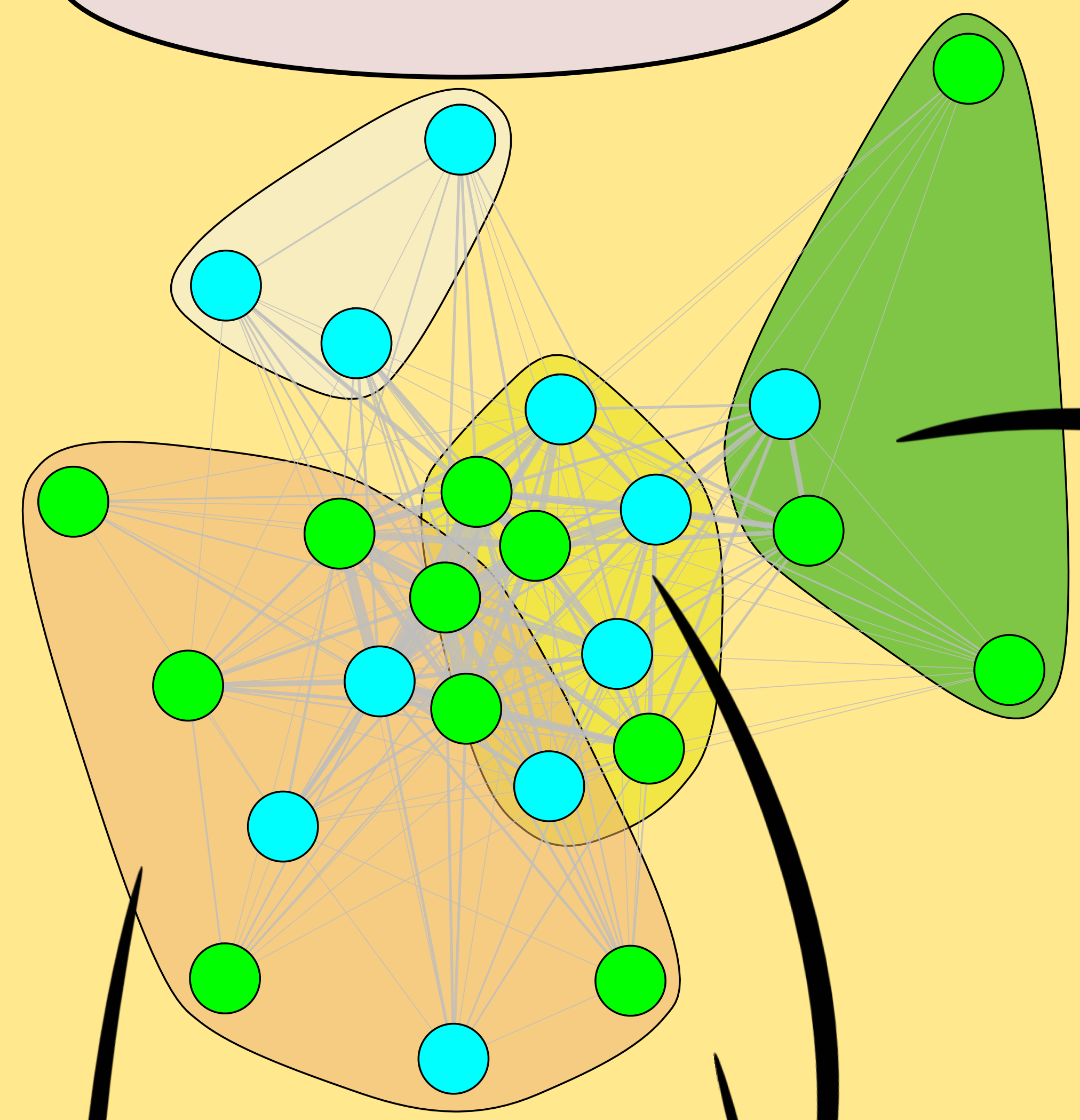
- Acceleration = 9.8m/s^2 everywhere
- Ball is 'free falling' down ramp?
- Associated with 'straight down' direction **only on group exam**

The Context

released from rest   turnaround point
t = 0.1 s   t = 2.4 s
A   t = 1.1 s   t = 1.4 s   C
          B
1.0 m   1.0 m
        0.60 m
                              S
                          R
   P
                          Q

- Static friction is **always** proportional to normal force.
- Acceleration is straight down...?
- Static friction misconception **not present** in group exam graph.

Group Exam

Question Classification

- 🟩 Discriminatory and Difficult
- 🟦 Not Discriminatory, but Difficult
- 🟧 Discriminatory but not Difficult
- 🟥 Not Discriminatory or Difficult

- Assuming **constant velocity** and using result to calculate **acceleration**...
- Acceleration confused with velocity in direction and magnitude.
- Still **fully present** in group exam.
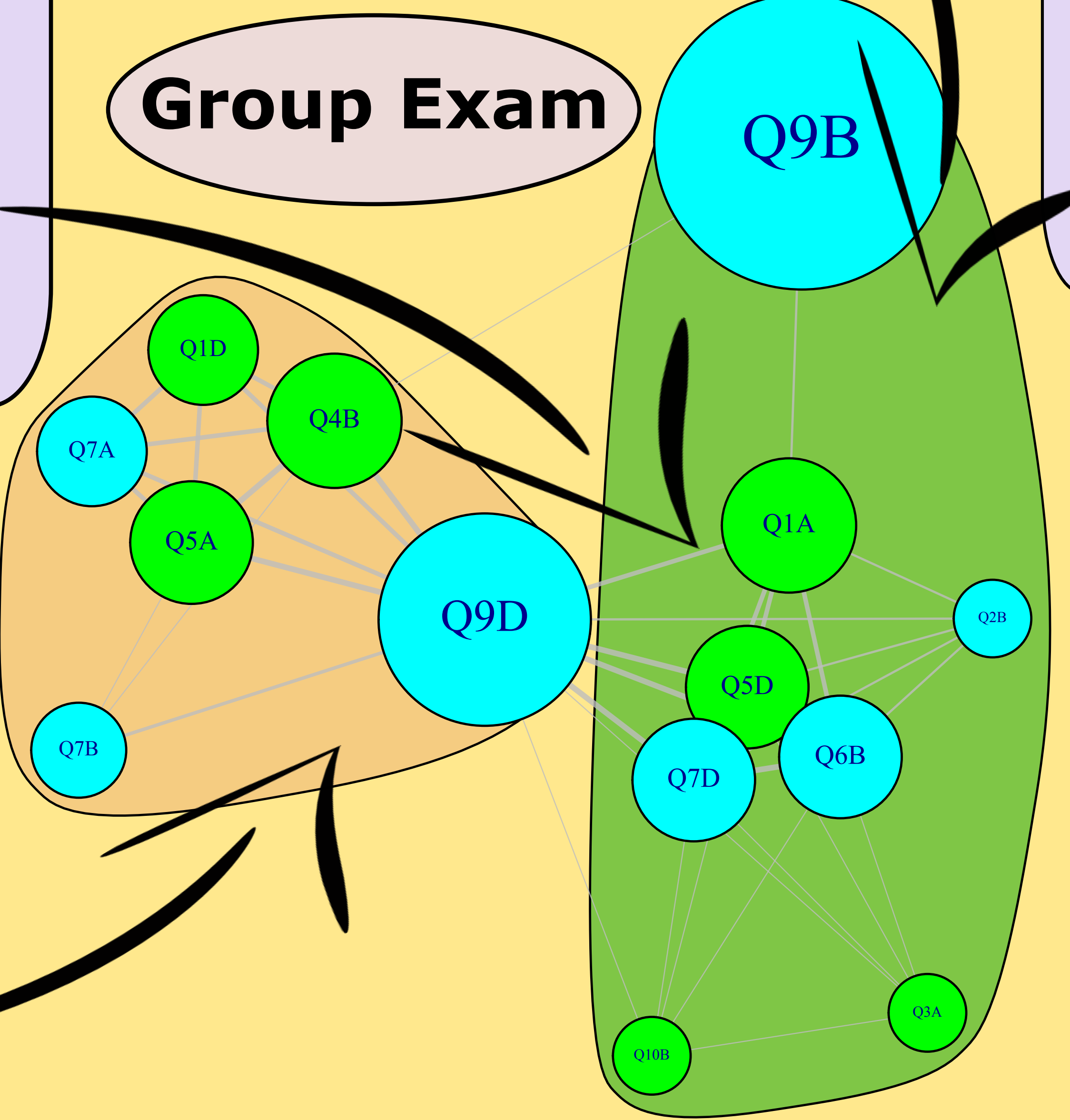
Conclusion

By using cognitive networks on both individual and group network data, we were able to identify the main misconceptions of the test and determine how group collaboration affected them. While misconceptions were far less common, one of those which appeared in the group data was improved in terms of consistent logic.