

Educational Data Mining: Results from *In Vivo* Experiments to Teach Different Physics Topics

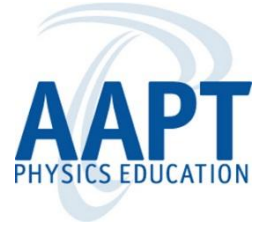
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Introduction

- Educational Data Mining (EDM) uses different algorithms for analyzing response and behavior in the teaching-learning process for obtaining useful patterns.
- These algorithms let to analyze and classify students' behavior or state of knowledge from different concepts.





Introduction

- Most of these algorithms have not been tested in Physics Education Research.
- This work presents the results obtained from applying algorithms used by EDM for teaching different physics concepts applied to *in-vivo* experiments.

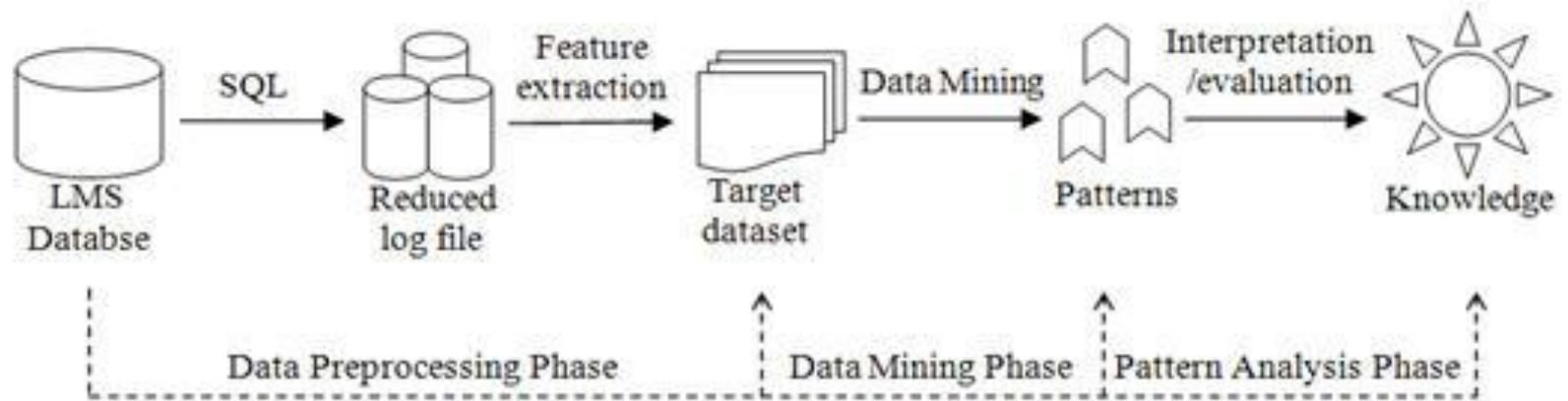
EDM Data sets*		
non-Physics	Physics	Total
67	27	94
71%	29%	100%

* Pittsburgh Science of Learning Center (PSLC - CMU). Data Shop Public Data Sets.
<https://pslccdatashop.web.cmu.edu/index.jsp?datasets=public>





How Educational Data Mining works?





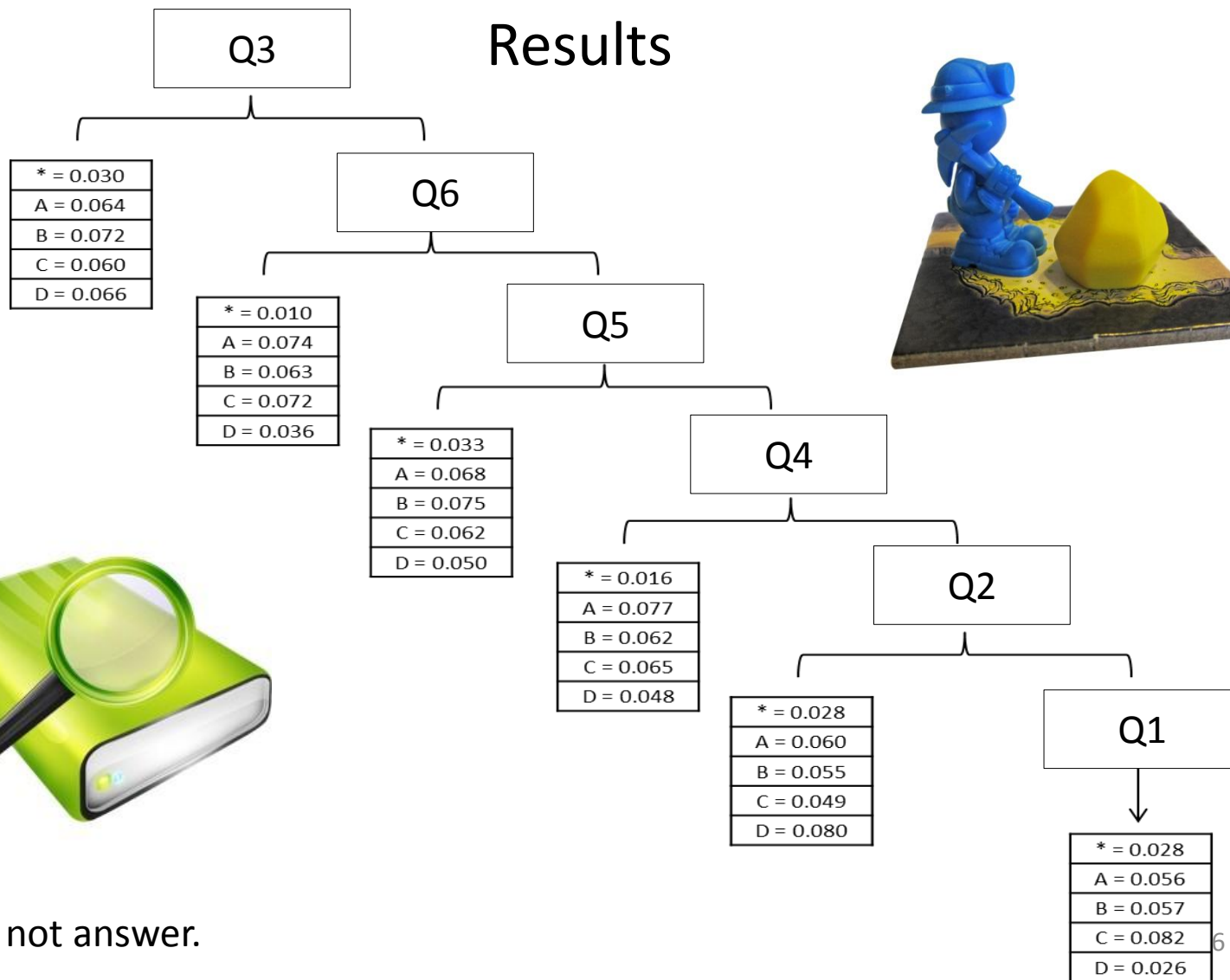
Implementation

- EDM algorithms (Tree Decision Making, C4.5); were applied with $N = 395$ students.
- Level: High-school students.
- Topic: Electric Circuits and Ohm's Law.
- Multiple choice questions: 6 (Academy design, aprox. Electric Circuits Concept Evaluation - ECCE).





Results



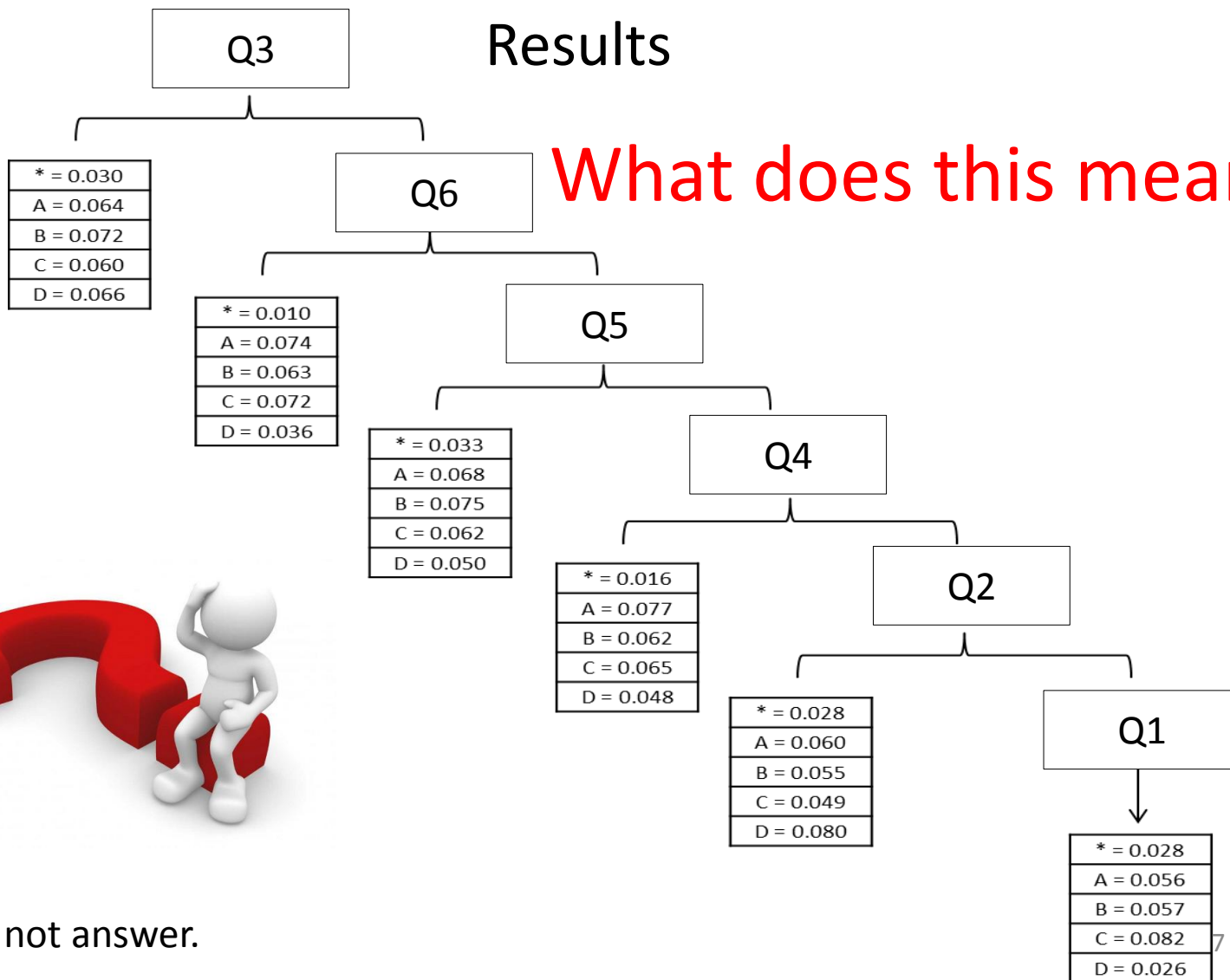
* Did not answer.





Results

What does this mean?



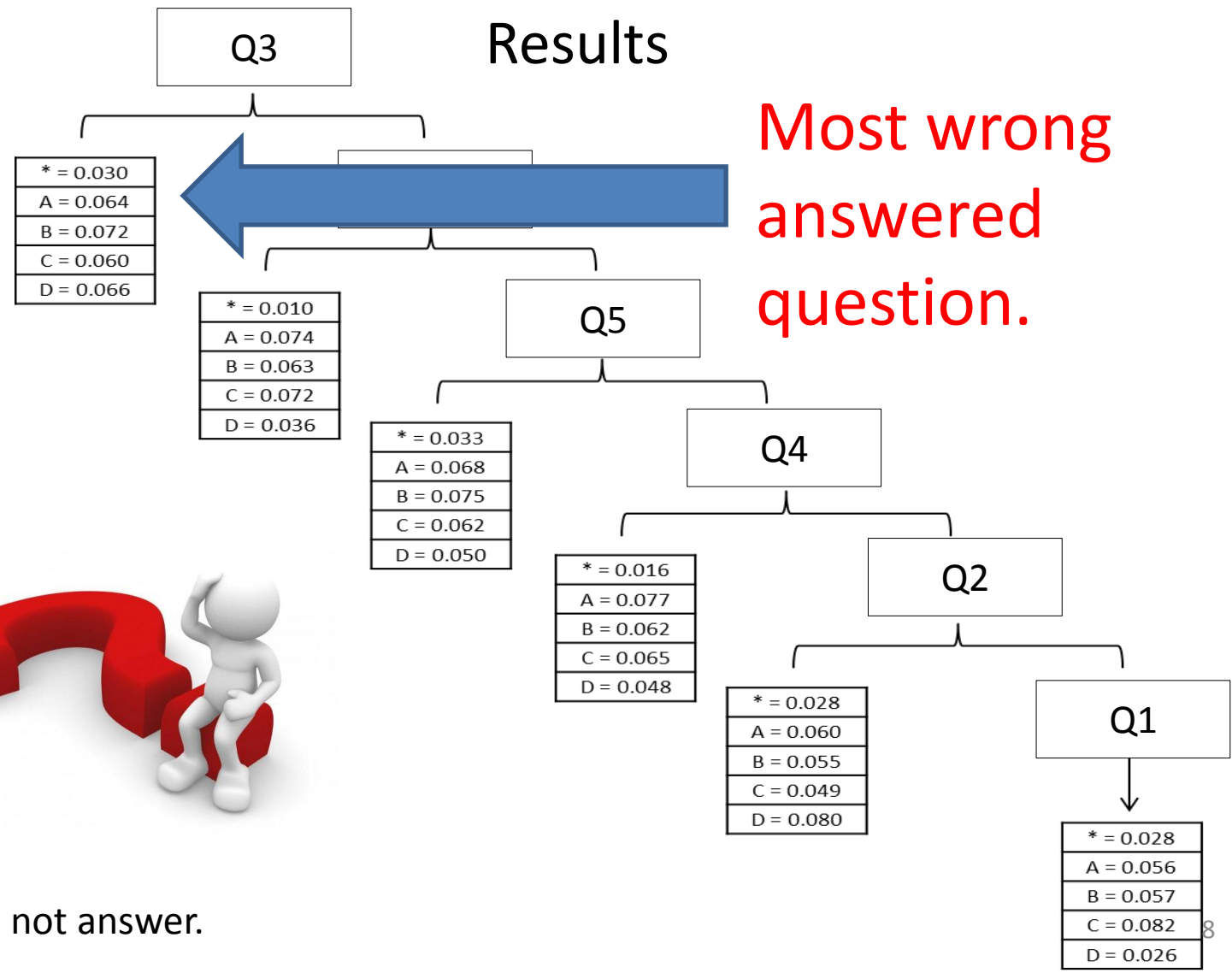
* Did not answer.





Results

Most wrong answered question.

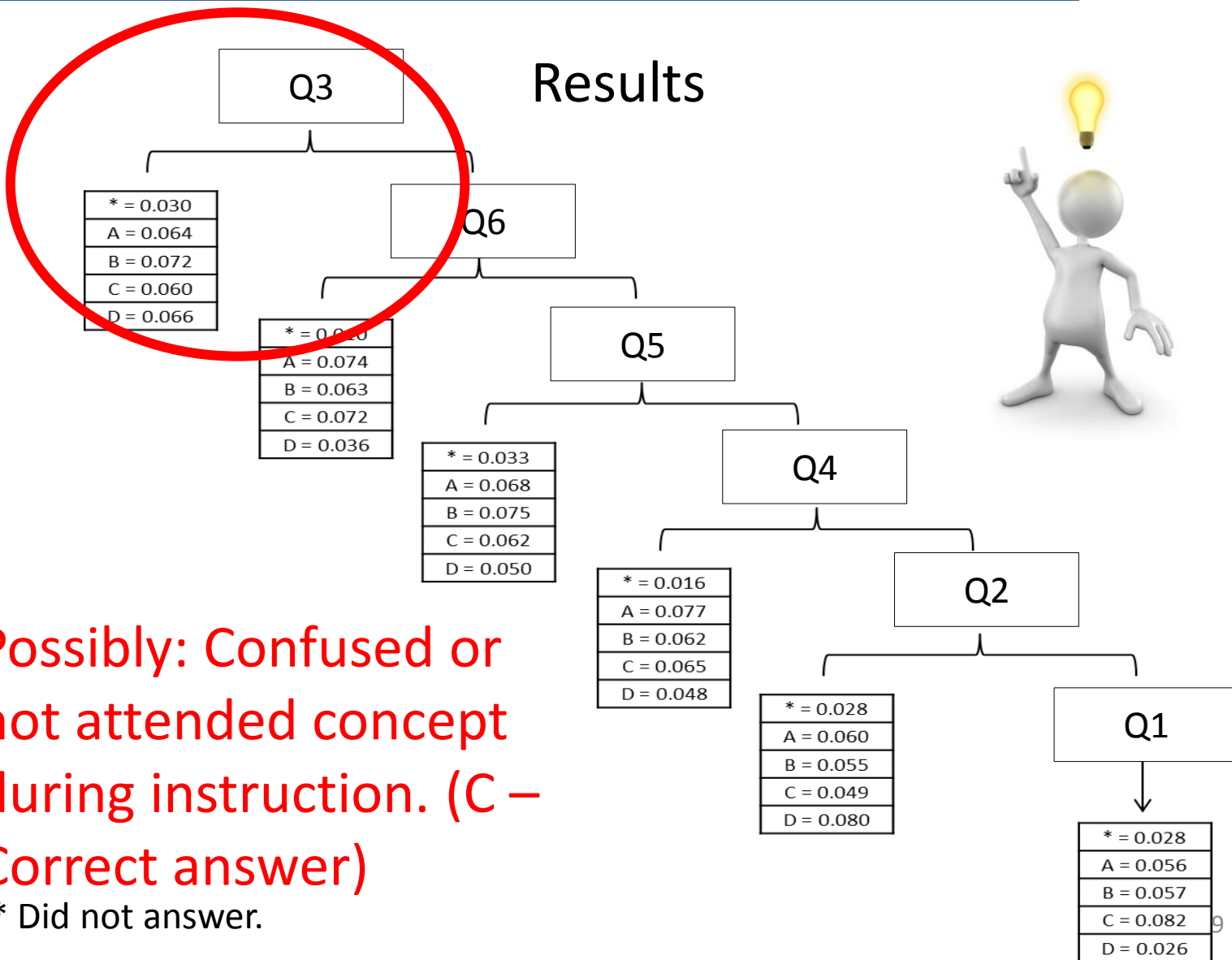


* Did not answer.





Results



Possibly: Confused or not attended concept during instruction. (C – Correct answer)

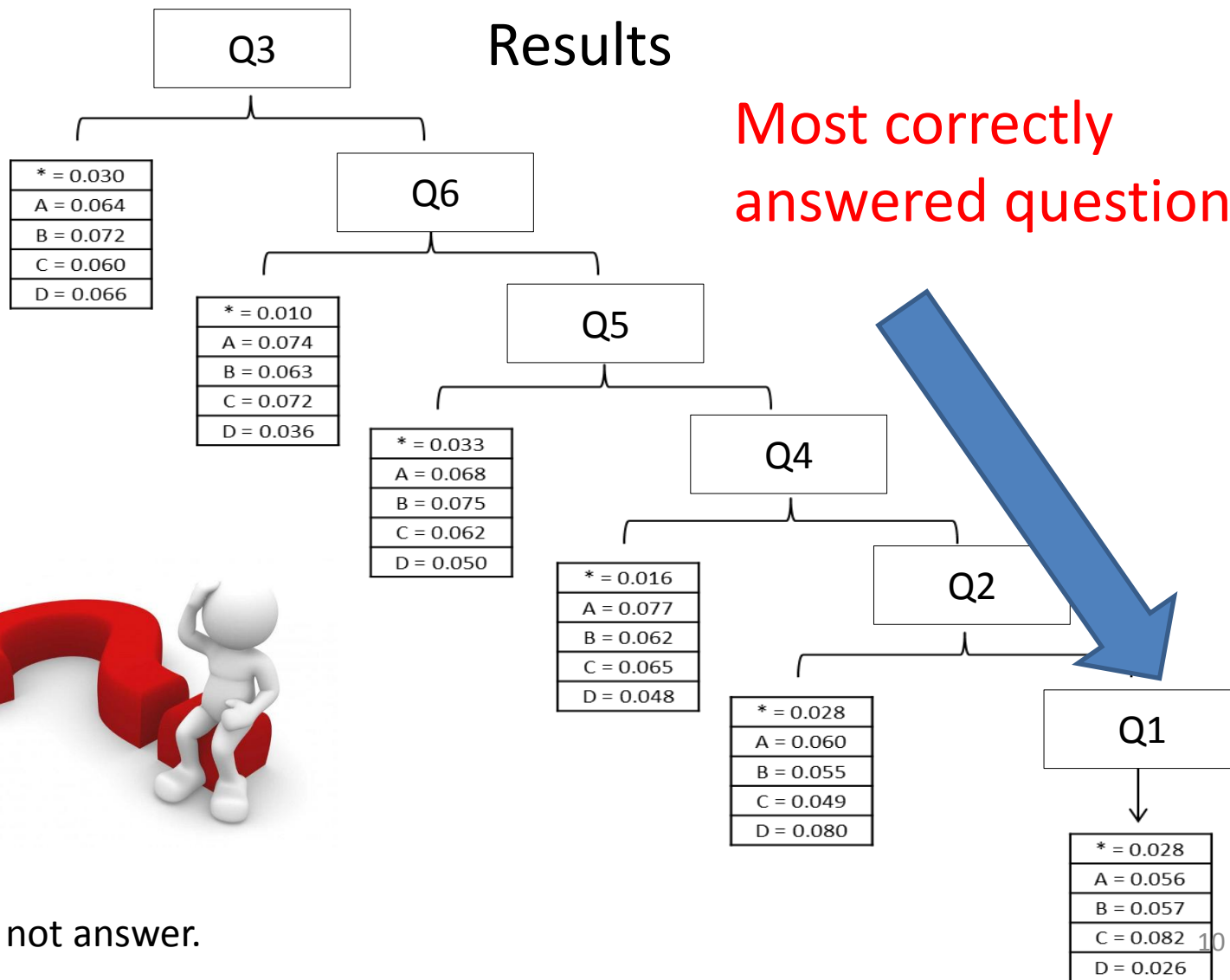
* Did not answer.





Results

Most correctly answered question.

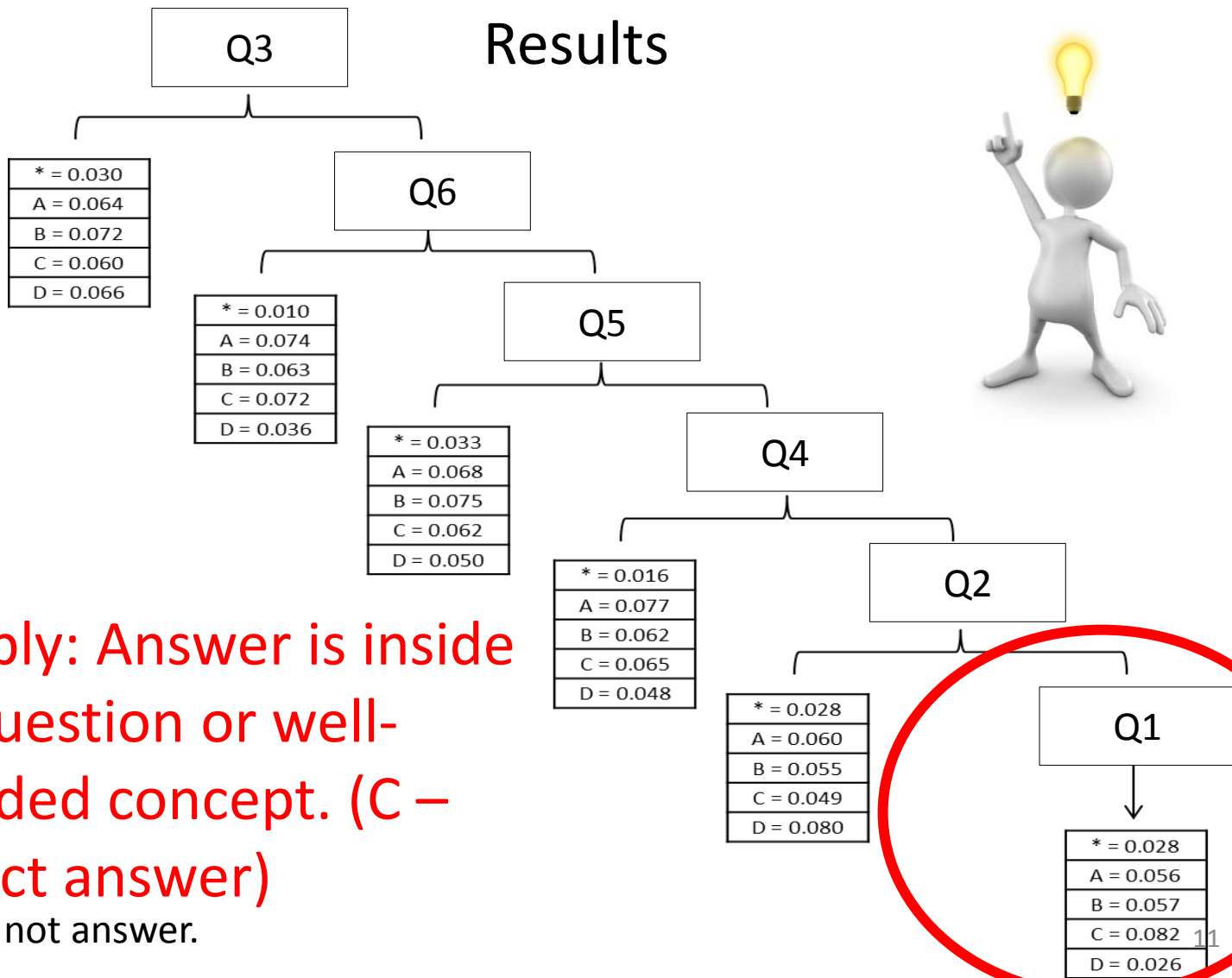


* Did not answer.





Results



Possibly: Answer is inside the question or well-attended concept. (C – Correct answer)

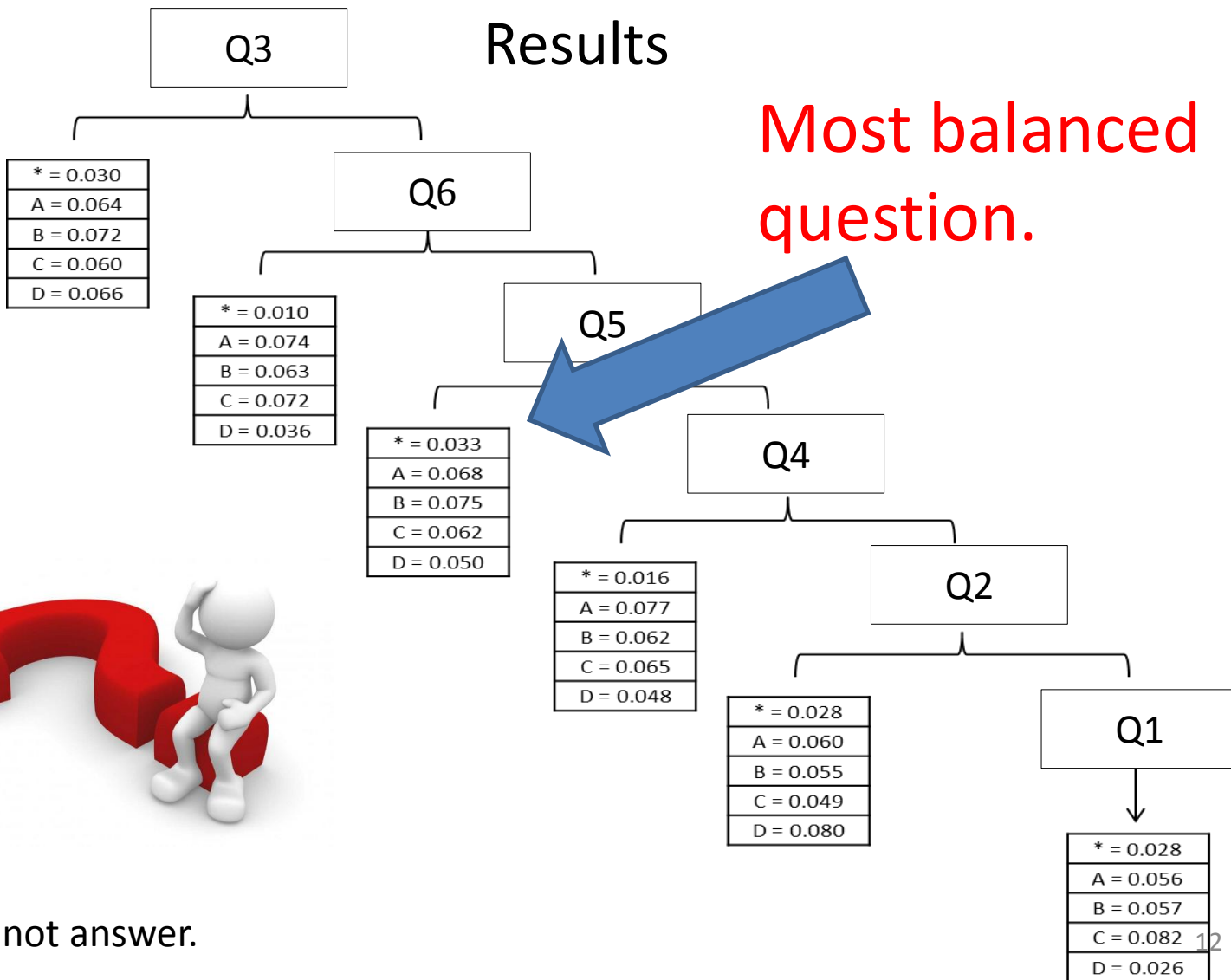
* Did not answer.





Results

Most balanced question.

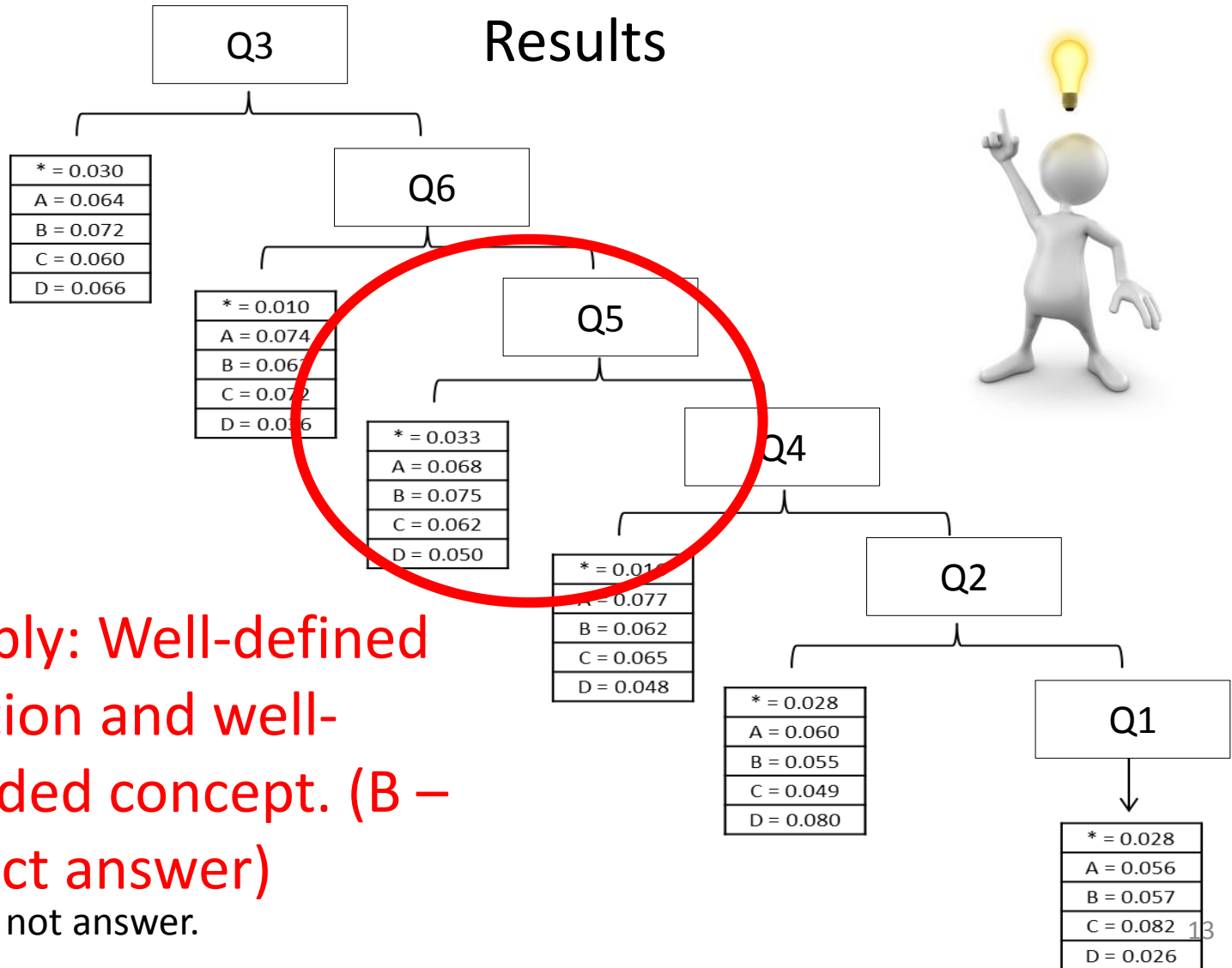


* Did not answer.





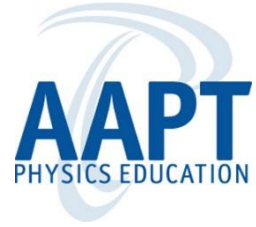
Results



Possibly: Well-defined question and well-attended concept. (B – Correct answer)

* Did not answer.





Results

- It is necessary to apply these algorithms with more students for having a fine-grained results.
- The use of valid inventories/test would eliminate mistakes.
- Patterns obtained let us to identify mistakes and wrong questions applied to students, also instruction could be highly improved.





Questions?

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