Evaluating Teachers' Perceptions of Students' Questions Organization

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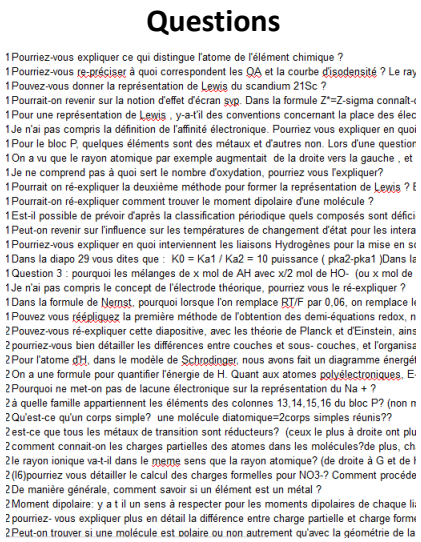
Introduction: learners' questions are crucial

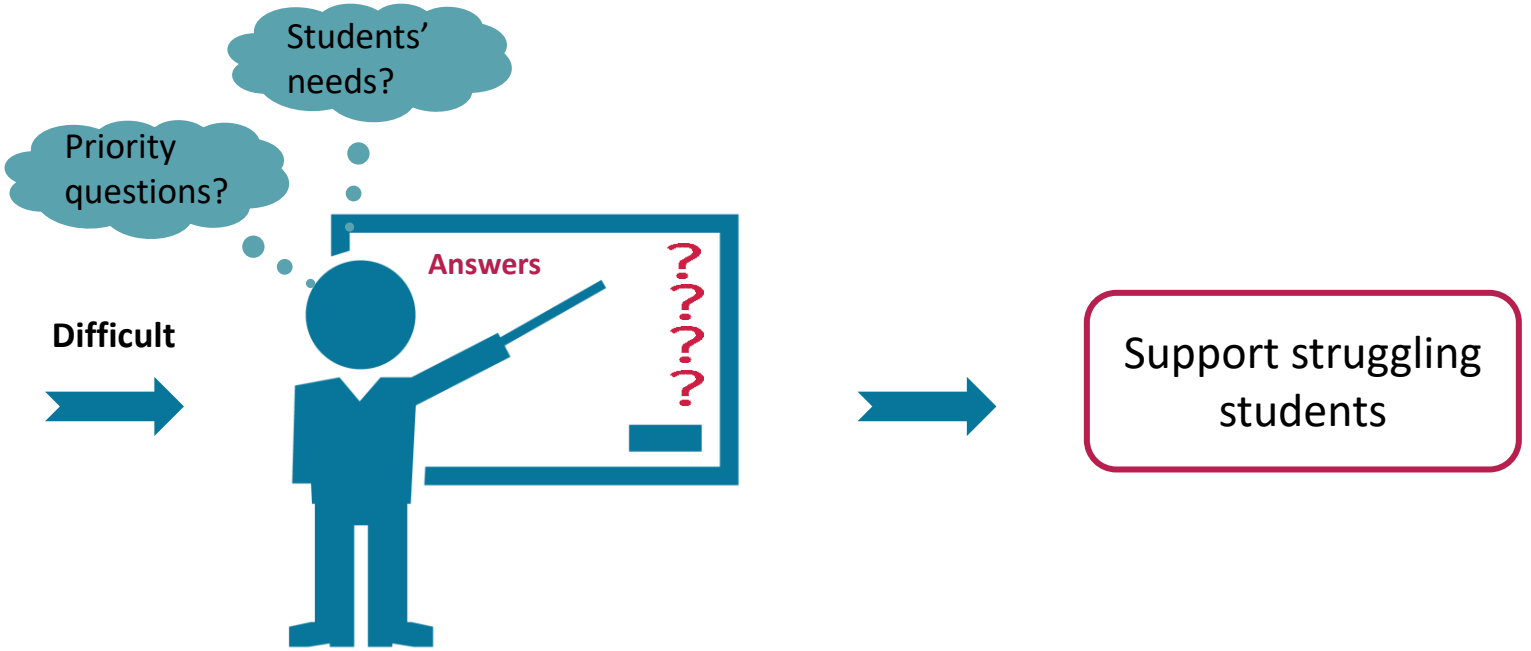
Learners' questions

Improve their level

Help teachers to understand students' needs

Prioritizing questions: a tricky task when online





Introduction: goal and research question

Our **goal** is to provide teachers with additional information (types of questions and learners' profiles) to help them choose questions

(Harrak et al., 2019, 2020)

Which type of question organization best fits the needs of teachers to prepare their Q&A session in a blended learning context?

Overview

- Introduction

❑ **Related work**

- Pedagogical Context
- Alternative organizations
- Survey Analysis & results
- Conclusion and perspectives

Related work

Role of students' questions has been proved in many studies to improve understanding of students' needs [Chin et al. 2008]

Contexts studying students' questions [McNamara et al. 2017]:

- Provide answers to students (e.g. AutoTutor [Graesser, 2017], iSTART [McNamara, 2014])
- Examine how questions relates to a reference text (e.g. ReaderBench [Dascalu et al. 2014])

Students' profiles vs. questions nature (students' needs)

- Students' profiles can help in better time allocation [Essa & Ayad, 2012; Lonn & Teasley, 2014]
- Better understanding students' needs can increase their performance [Kiemer et al. 2015; Sierens et al. 2009]

Increasing the visibility of students' pedagogical needs and students' profiles

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- Related work

❑ Pedagogical Context

- Alternative organizations
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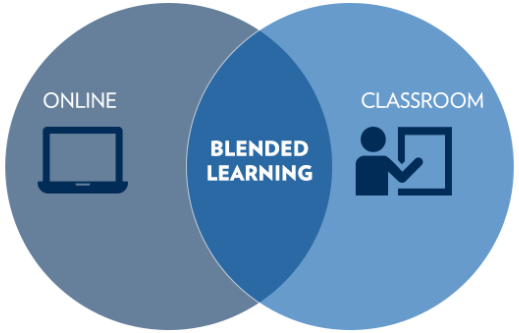
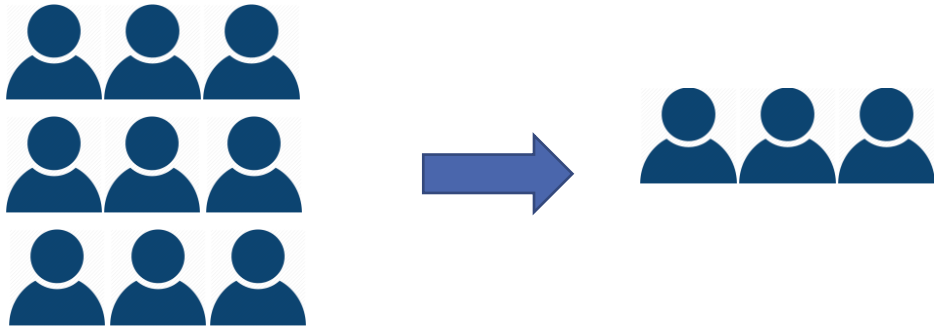
Pedagogical context

Specific hybrid training system from Grenoble University



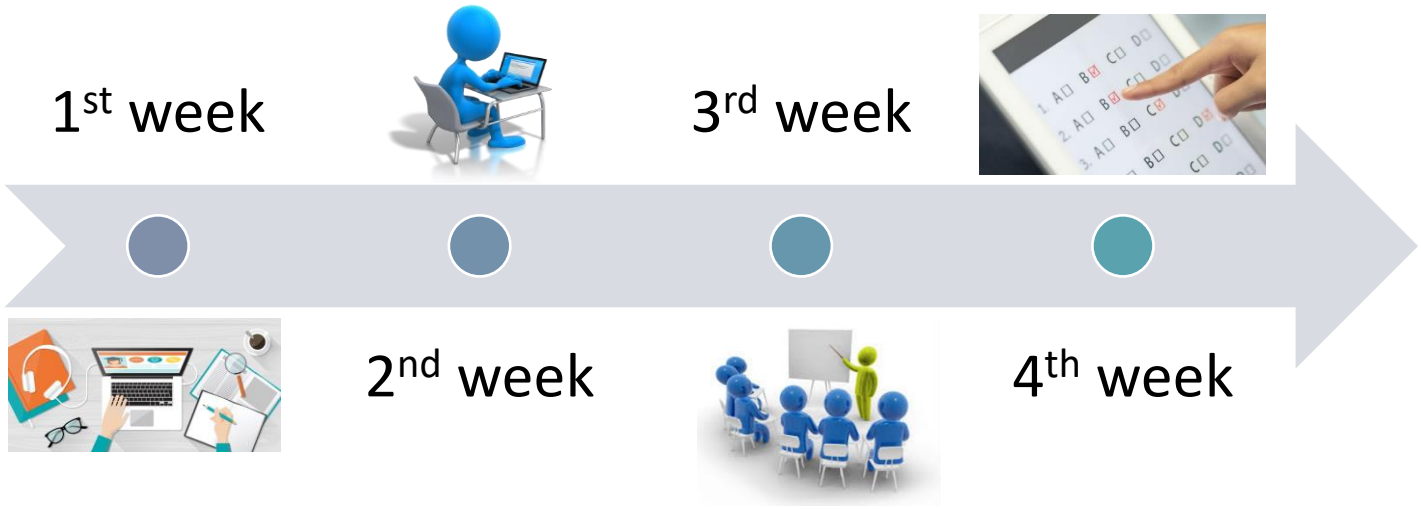


1600
1st year

200
2nd year

Pedagogical context

Specific hybrid training system from Grenoble University



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Categorization of questions

Example (translated from French):

"Could you **detail** the **differences between** the atomic radius of the anion and the cation of two atoms?"

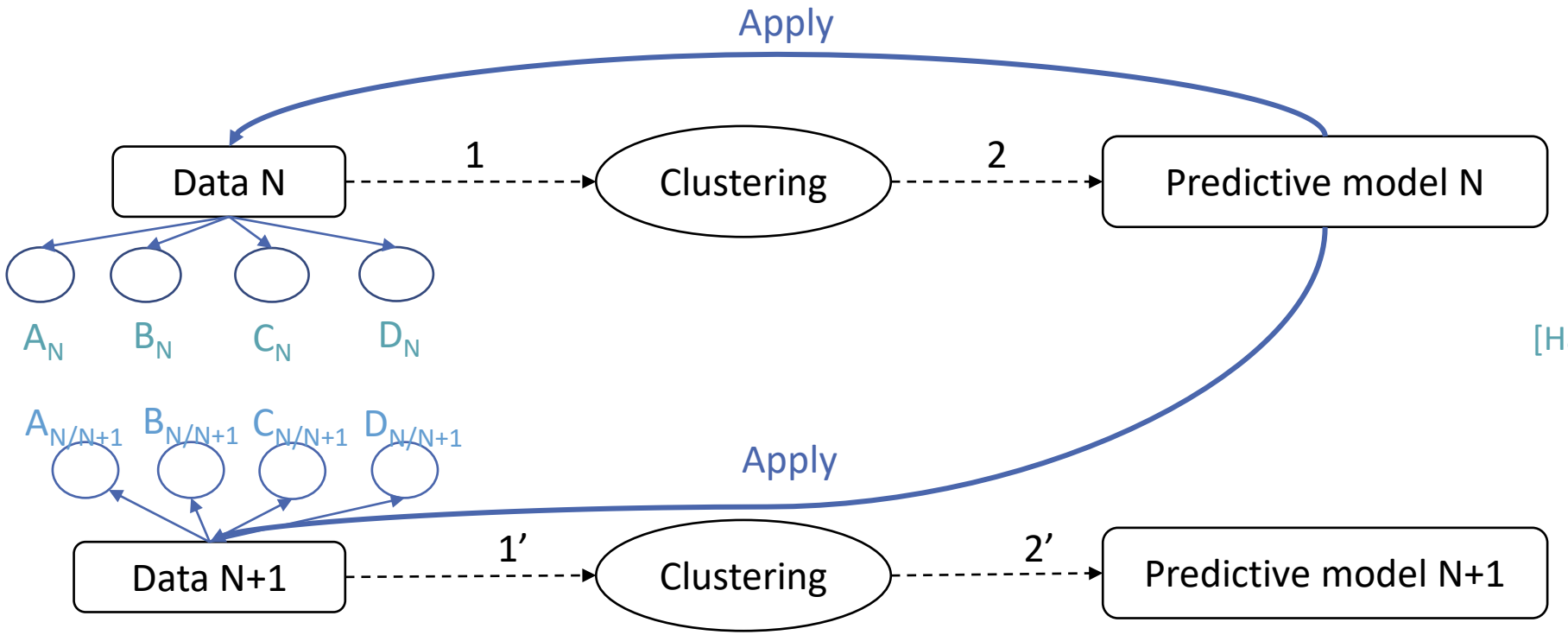
represented by the vector [Dee,0,Lin,0]

Questions' coding scheme have been defined to analyze students' questions in terms of intentions

Dim1	Question type
Ree	Re-explain/ redefine
Dee	Deepen a concept
Ver	Validation/ verification
Dim2	**Explanation modality**
Exa	Example
Sch	Schema
Cor	Correction
Dim3	**Explanation type**
Def	Define
Man	Manner (how?)
Rea	Reason (why?)
Rol	Roles (utility?)
Lin	Link between concepts
Dim4	**Verification type (optional)**
Mis	Mistake/ contradiction
Kno	Knowledge in course
Exp	Expected knowledge in exam

[Harrak et al., LAK 2018]

Towards prediction of students' profiles
(based on their questions)



[Harrak et al., JLA 19]

1. Constant clusters across several years
2. Similar students' profiles on year N+1 with students who asked similar questions on year N

Questions' organization

Goal: Help teachers to choose students' questions in Q&A session (with additional information than vote) and feed their reflection

3 organizations proposed to the teacher:

- Organization based on students' pedagogical needs
- Organization based on the predicted students' profiles
- Mixed organization (combining the two)

Questions' organization: students' needs

Dim1	Question type
Ree	Re-explain/ redefine
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Re-explanation questions

➡ Ask for an explanation already done in the course material

Questions:

1. Could you **re-explain** how to find the dipole moment of a molecule?
2. Could you **revise** the notion of buffer solutions, particularly on how to create a buffer solution?

Deepen questions

➡ Broaden a knowledge, clarify an ambiguity or request for a better understanding

Questions:

3. **How** can we compare two atoms that are neither in the same row nor in the same column?
4. Could you **explain** what distinguishes the atom from the chemical element?

Verification questions

➡ Verify or validate a formulated hypothesis

Mistake/ contradiction

Questions:

5. It seems there is an **mistake** in the speech on slide 5: you say that ``the Na+ and Nacl (Cl-?) ions
6. Hello, in the example on electrophoresis you say that the aa are negatively charged with ph=1, whereas their ph < phi it should not be positive as presented on the example of mixture separation?

Knowledge in course

Questions:

7. are all transition metals reductive?

Exam

Questions:

8. Should we learn the metals of block P by heart?

Other questions

Questions' organization: students' profiles

	Struggling passive	Nitpicking active	Actively understanding
	Cluster A	**Cluster D**	**Cluster B**
#students	18-29%	14-25%	36-40%
Grades	lower	higher	higher
Attendance	low	high	high
#questions asked	low	high	high
#votes	popular	unpopular	popular
% Retaking students	low	high (42%)	average (31%)
Questions type	Re-explanation & definition	Verification: mistake or contradiction	Verification of knowledge & link between concepts
Majority of questions asked	1st half	2nd half	1st half
#students	18-29%	14-25%	36-40%

Struggling students: grades < to the average

Questions:

2. Could you **revise** the notion of buffer solutions, particularly how to create a buffer solution?
7. are all transition metals reductive?

Average students

Questions:

1. Could you **re-explain** how to find the dipole moment of a molecule?
3. **How** can we compare two atoms that are neither in the same row nor in the same column?
5. It seems there is an **mistake** in the speech on slide 5: you say that ``the Na+ and Nacl (Cl-?) ions
8. Should we learn the metals of block P by heart?

Good students: grades > to the average

Questions:

4. Could you **explain** what distinguishes the atom from the chemical element?
6. Hello, in the example … it should not be positive as presented on the example of mixture separation?

Questions' organization: mixed

N	Re-explain questions	Struggling	Average	Good
1.	Could you **re-explain** how to find the dipole moment of a molecule?	X		
2.	Could you **revise** the notion of buffer solutions, particularly on how …?	X		
N	**Deepen questions**	**Struggling**	**Average**	**Good**
3.	**How** can we compare two atoms that are neither in the same row …?		X	
4.	Could you **explain** what distinguishes the atom from the chemical element?		X	
N	**Verification questions**	**Struggling**	**Average**	**Good**
	• **Mistake/ contradiction**			
5.	It seems there is an **mistake** in the speech on slide 5: you say that …		X	
6.	Hello, in the example on electrophoresis you say that the aa … ?			X
	• **Knowledge in course**			
7.	are all transition metals reductive?			X
	• **Exam**			
8.	Should we learn the metals of block P by heart?		X	

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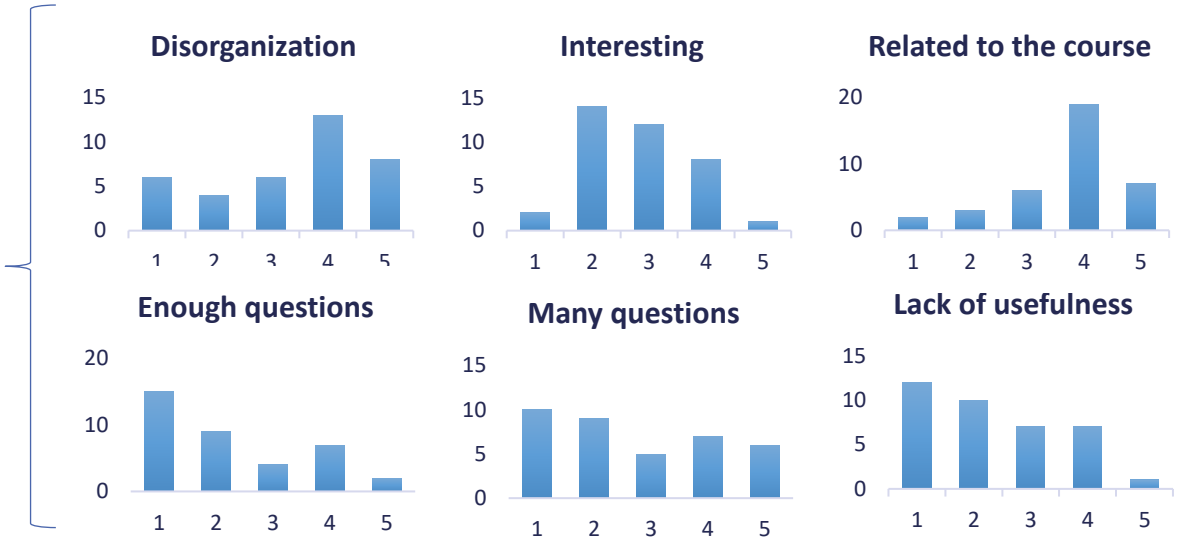
❑**Survey Analysis & results**

- Conclusion and perspectives

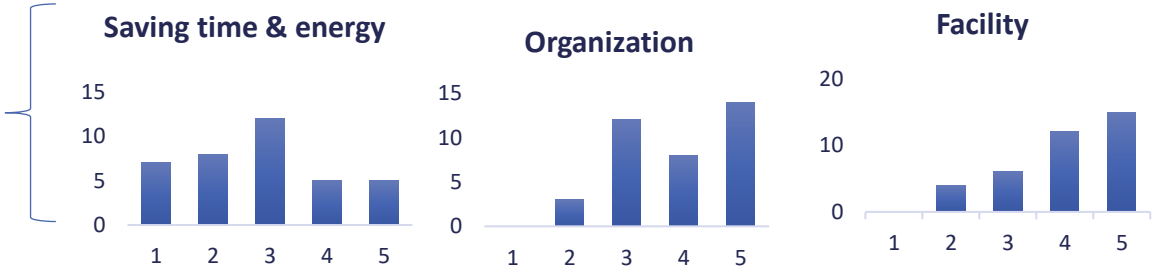
Survey analysis

Survey made of 28 questions, answered by N=36 teachers involved (different ages and experience), to evaluate:

Teachers' experience in Q&A



Flipped classroom appreciation



Analysis of organizations' choices

Perception of proposed organizations

Students' needs organization	Students' profiles organization	Mixed organization	Current organization
11	3	11	11

"... this system will only work if used correctly by students"

"I am not for favoring the good over the struggling ones (this is a risk), our goal is to help them all"

"a bad method added to a good one"

Analysis of organizations' choices

Perception of proposed organizations

Students' needs organization	Students' profiles organization	Mixed organization	Current organization
11	3	11	11

→ No consensus over a particular organization

Are the differences in teachers' organizations choices related to their different Q&A session experience or their perception of the flipped classroom?

Preferred organization according to the teachers background

Clustering (K-Means) teachers, the features:

- Experience in Q&A session
- Flipped classroom (saving time, facility, organization)

	Cluster1	Cluster 2
#teachers	22	14
Seniority	less	more
Received questions	high	low
Addressed questions	average	high
Flipped classroom	less appreciated	More appreciated

Characterization of clusters

Variables related to the organizations' choices for each teacher:

- Facility
- Utility
- Appreciation according to the curent organization

Results did not reveal any clear differences in the choices made by the teachers of the two clusters

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❑**Conclusion and perspectives**

Conclusion

3 questions' organizations proposed to teachers:

- Pedagogical needs (nature of questions), students' profiles (students' level) and mixed
- No preferred organization choices

Some limits:

- Misinterpretation some of the questions asked and the principle of the proposed organizations
- Difficulty for choosing a relevant questions' organization (other factors beyond the Q&A experience)

Conclusion

3 questions' organizations proposed to teachers:

- Pedagogical needs (nature of questions), students' profiles (students' level) and mixed
- No preferred organization choices

Perspectives:

- Towards personalized dashboards instead of "one size fits all"
- Source of inspiration about how to deal with students' questions

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