ITK 2014

research workshop

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Diagnosing nursing students' errors in medication calculation
Designing a method based on the *4 Cs* teaching model for analysing mathematical proficiency

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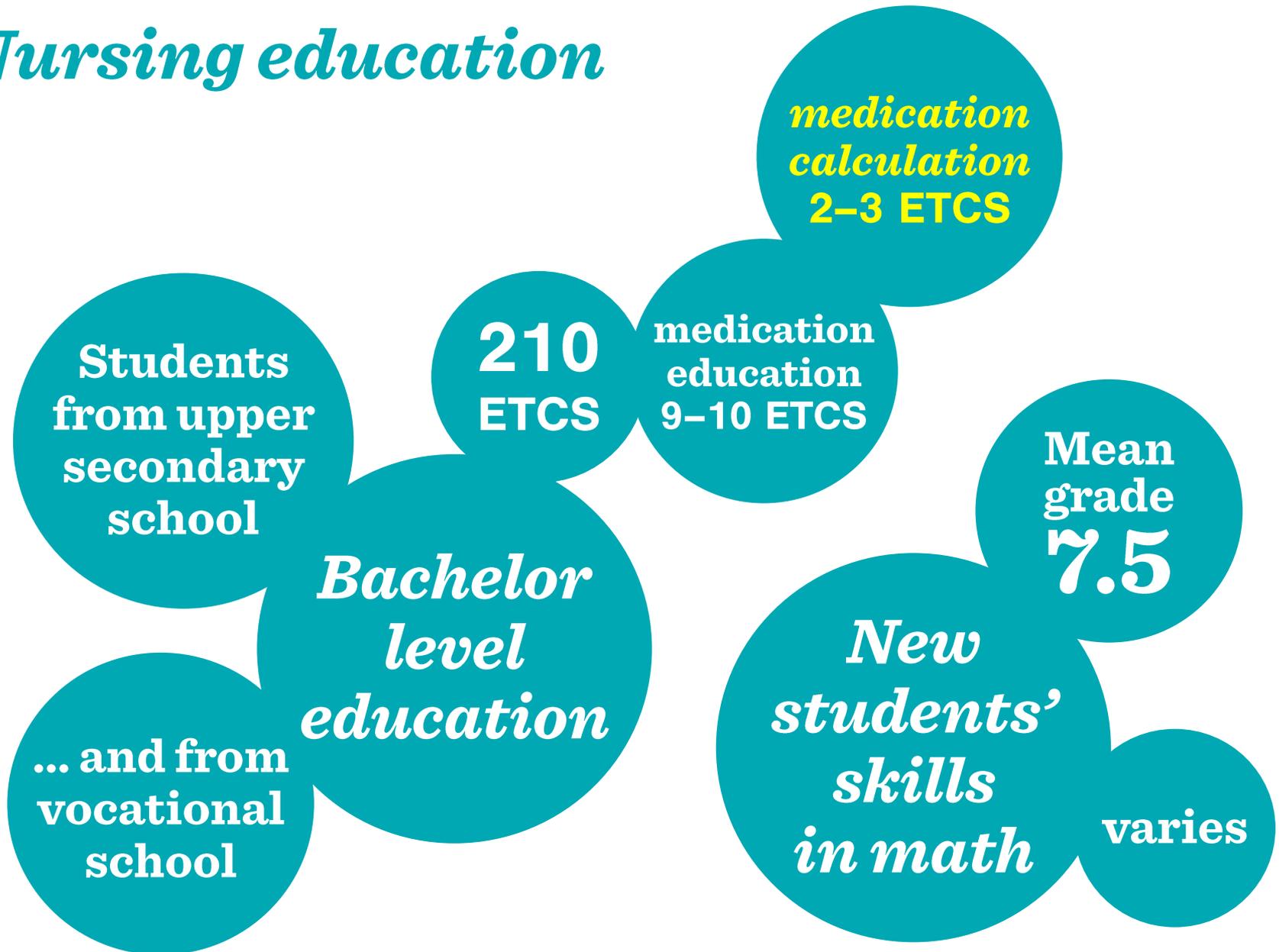Jarmo Malinen, Antti Rasila, Hannu Tiitu
Aalto University

A?
Aalto University

✦ARCADA

In Kalmar, Sweden

On February 24th, 2002, a baby was born. The baby showed some signs of seizures, and an anti-epileptic drug was started three days later. The seizures continued, and the drug was changed in May to Xylocard-infusion with the concentration 4 mg/ml.
The nurse prepared a new infusion. An error occurred, and the concentration of the infusion was 40 mg/ml. The baby died.

Nursing education

medication calculation 2–3 ETCS

Students from upper secondary school

210 ETCS

medication education 9–10 ETCS

Mean grade 7.5

Bachelor level education

New students' skills in math

... and from vocational school

varies

Challenges

- Work-force mobility
- Learning difficulties
- Dosage errors on the rise
- Outdated learning materials
- Theory & practice
- Flexible studies
- Proficiency monitoring & certification

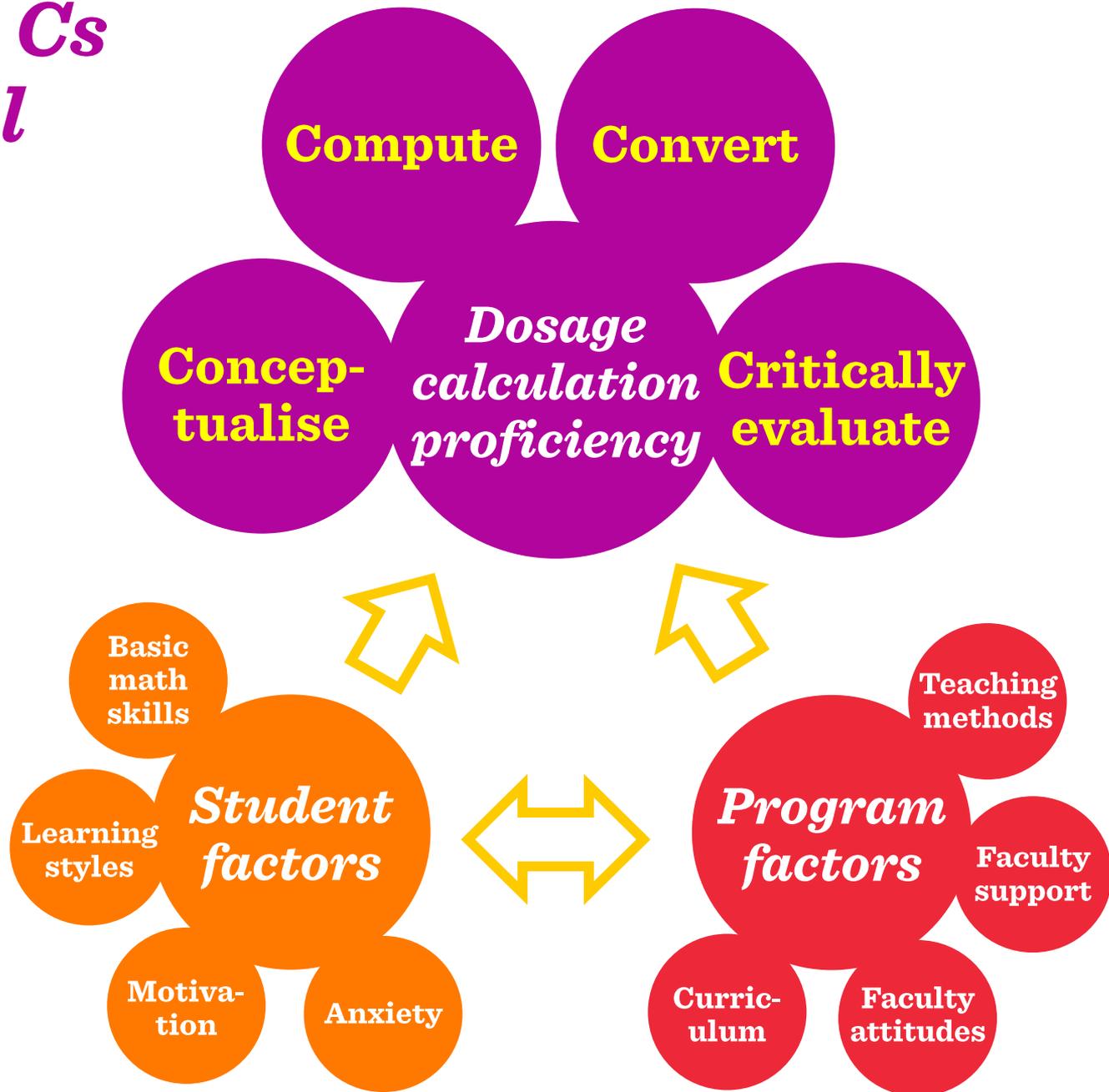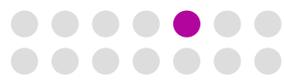# Medication calculation process & proficiency in Arcada

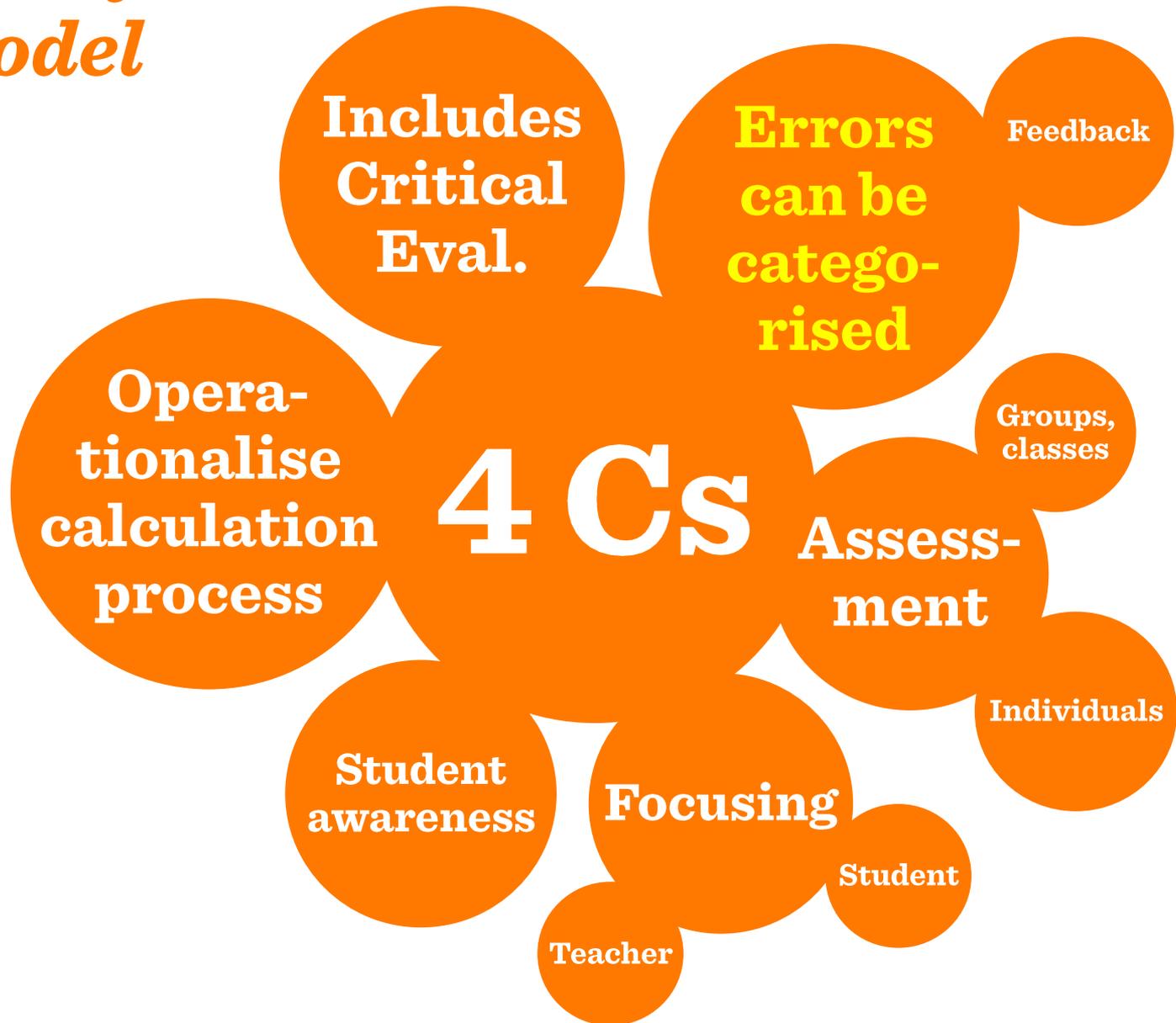**100 %**

Compute

Convert

Concep-
tualise

4 Cs

Critically
evaluate

Benefits of the 4 Cs model

4 Cs

Includes Critical Eval.

Errors can be catego-rised

Feedback

Opera-tionalise calculation process

Groups, classes

Assess-ment

Individuals

Student awareness

Focusing

Student

Teacher

The learning environment Sigma

Authenticity & quality

Cases

Structured to support learning

Collected from Vnr database

Pharmaco-logical

Several view-points

Recom-mended practice

From real life

Peda-gogical

Match needs

Moni-tored
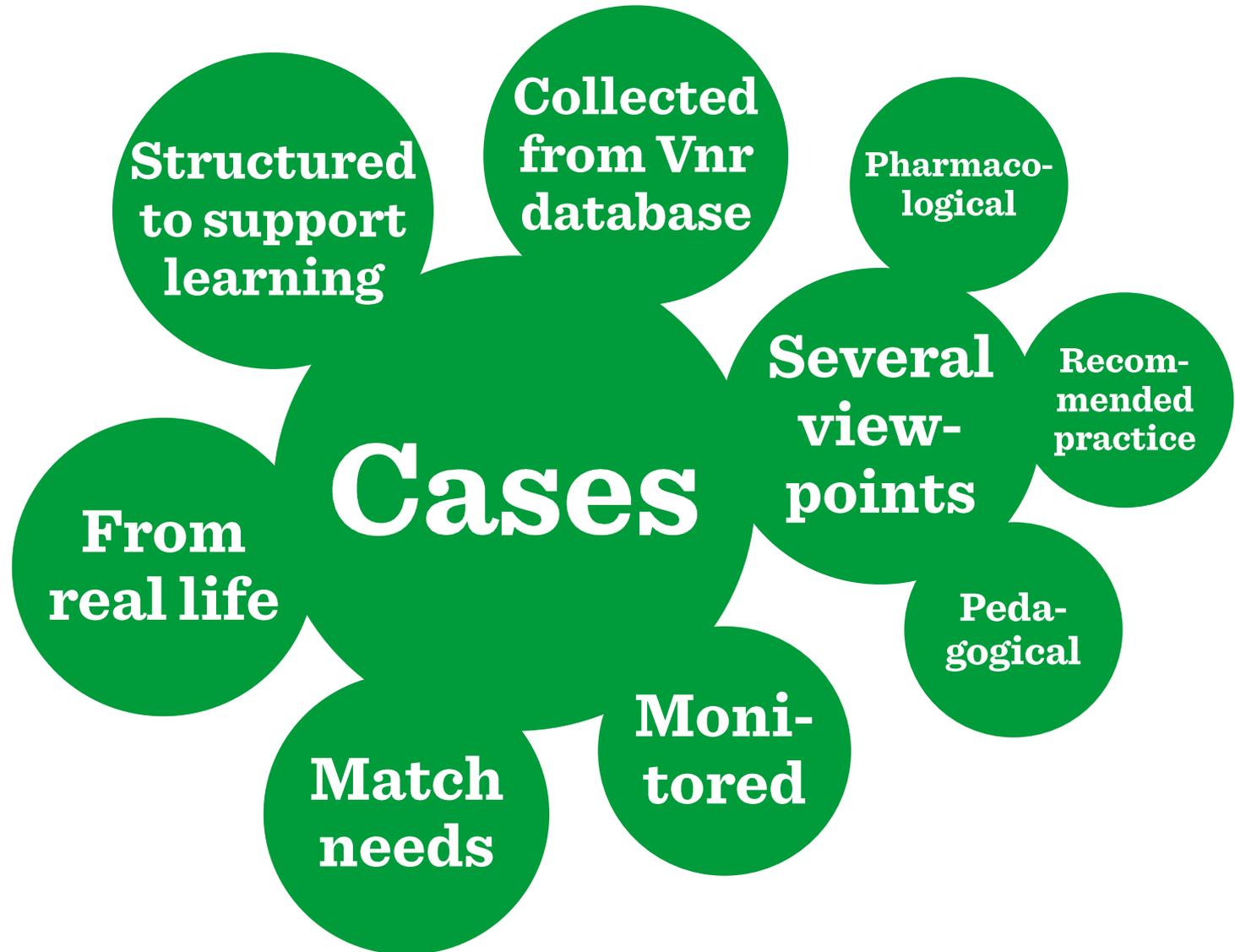
Harjoittelu - 3/5

① Tausta: Keuhkosyöpää sairastavan potilaan kivunhoitoon käytetään oraaliliuosta.
② Lääkemääräys: Oraaliliuos OxyNorm® 15 milligrammaa per os.
③ Lääke: OxyNorm® 10 mg/ml oraaliliuos (oksikodonihydrokloridi).
④ Laskutehtävä: Kuinka monta ml annat potilaalle?

Vastaus1: 1,5   millilitraa

Pyöristys: Ei

Lähetä

Laskutoimitus

○ Flashsovellus (BETA) ◉ Tekstikenttä

$$\frac{15 \text{ mg}}{10 \text{ mg/ml}} =$$

$$\frac{15 \text{ ml}}{10} = 1,5 \text{ ml}$$

strategy

The project

Arcada Sigma

Aalto STACK

Earlier experi-ences

Guides learning

Validation & certification

New learning environ-ment

AI

Game-like

More realistic

More authentic

Motivating

HCI

More interactive
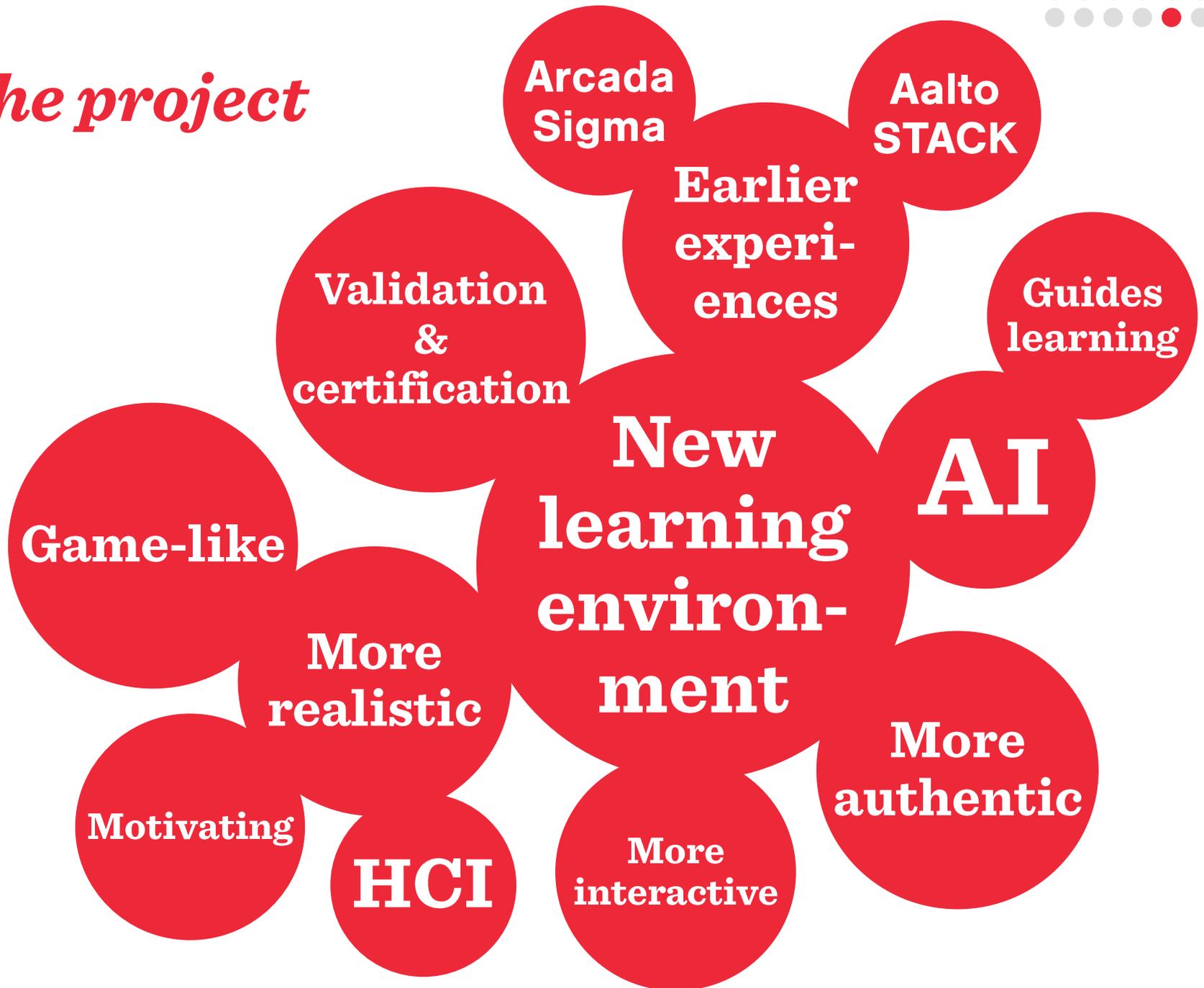
LE guides learning process

Designing the Ⓧ

4 Cs
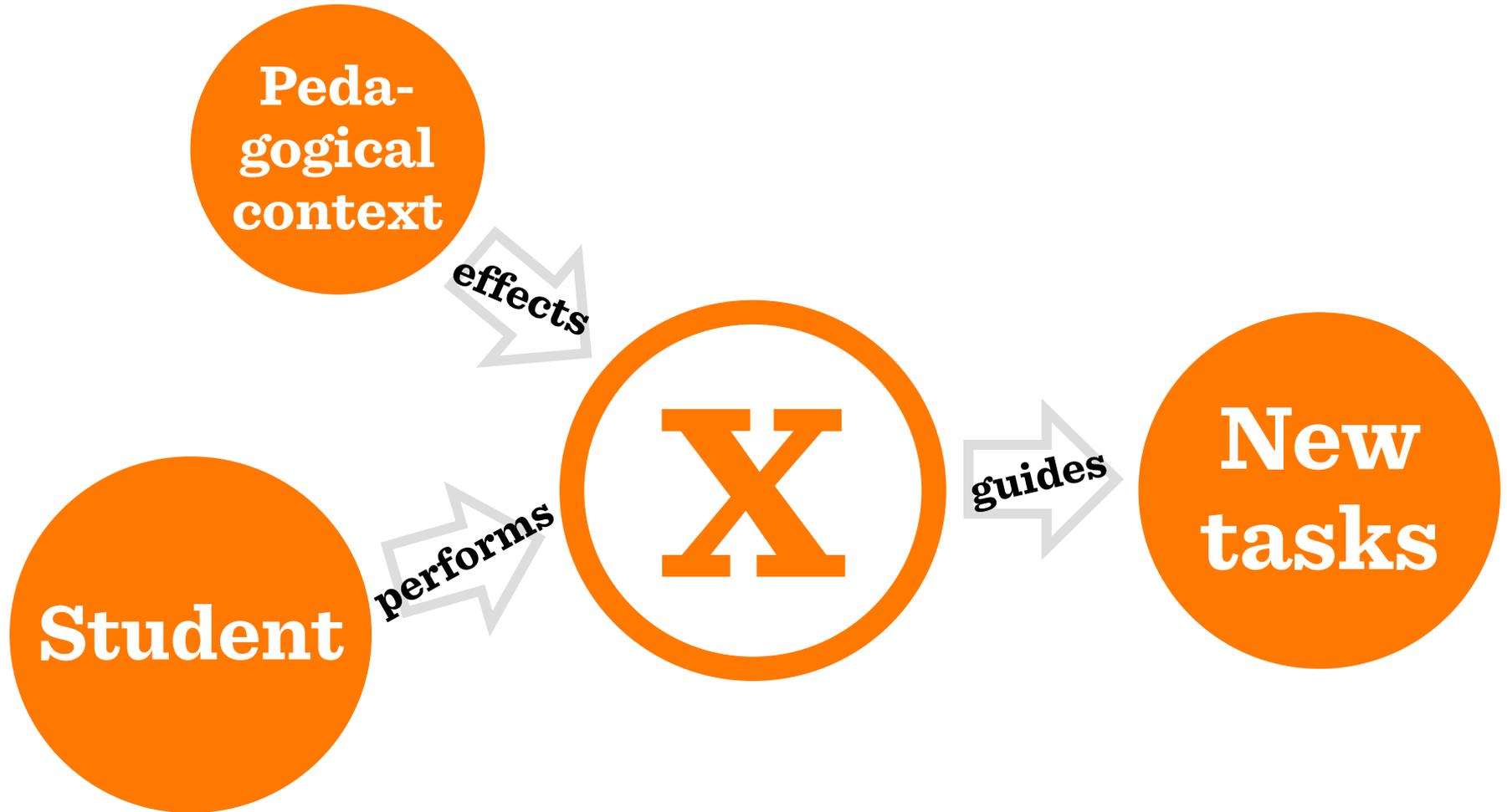
Test categori-sations

Clusters

Hidden vari-ables

Learning process

1

Error analysis

2

Teachers' categorisat-ions consis-tent?

③

Can it be done by a computer?

4

Qs

Modifying categories

Do the 4 Cs work for categorisation

?

Intersectional classes

Method, k-means