Specification By Example for Educational Purposes

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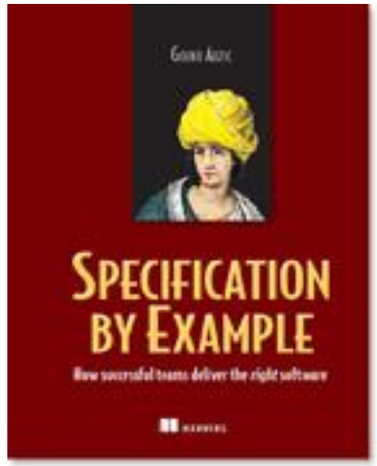
Specification By Example



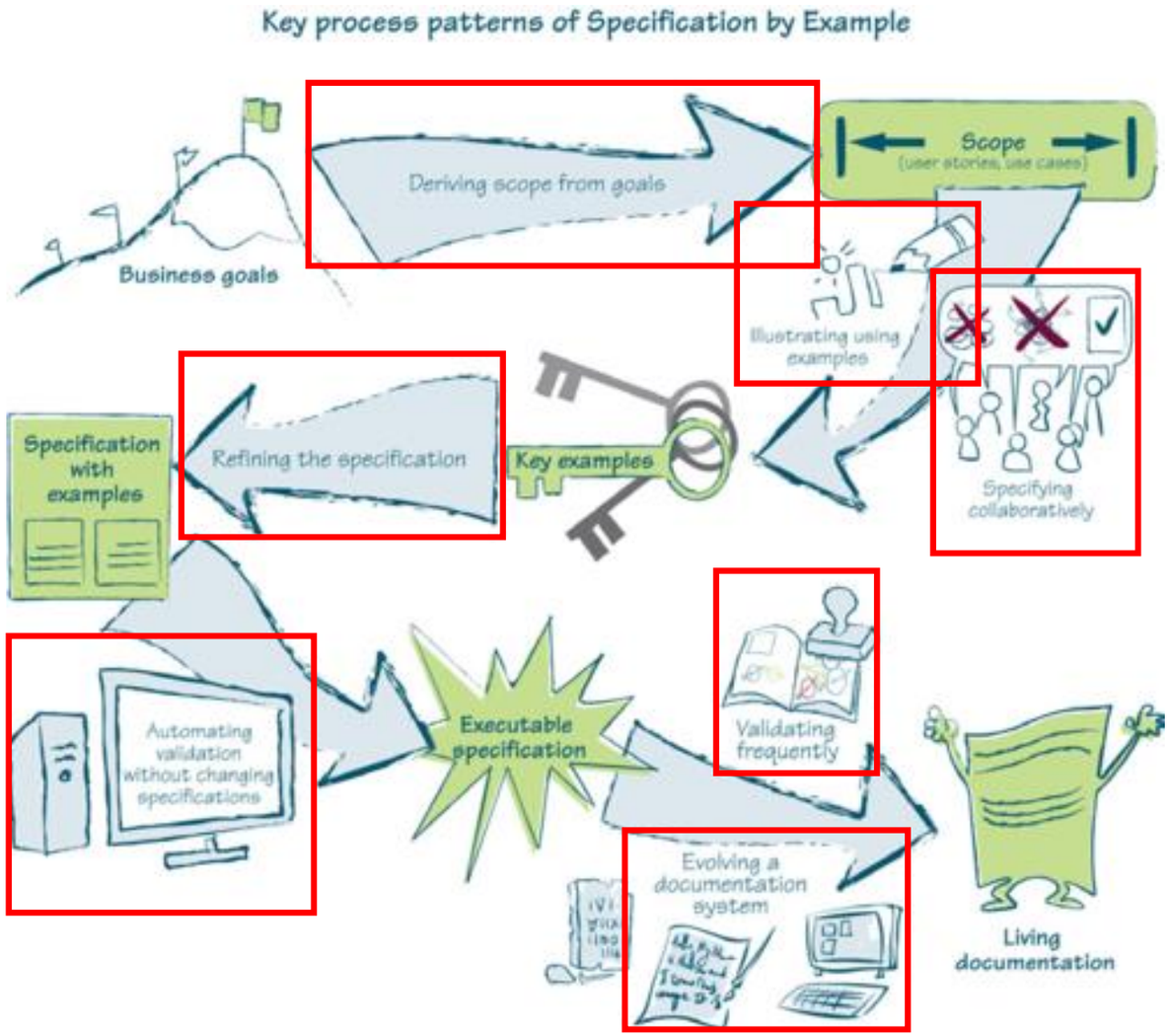
Specification by example (**SBE**) is a **collaborative approach**
for specifying requirements and business-oriented functional tests.

*It is a guideline that assures delivery team and business skateholders that the **product software build it's right for its purpose***

It defines **expectations clearly,**
makes ***validation efficient***
and produces **living, reliable documentation.**

It consists on **seven process patterns.**
(identified by studying over 50 software projects)

The 7 Process Patterns of Specification By Example



1. Deriving scope from goals
2. Specifying collaboratively
3. Illustrating requirements using example
4. Refining the specification
5. Automating validation without changing specification
6. Validating frequently
7. Evolving a documentation system

What about in Educational Context ?

A fact : Boredom, inattention, discouragement, poorly results on tests,… when mismatches between **learning and teaching styles** [1]

To improve this alignment,
why not trying a connection between Software Engineering & Educational ?

Could not a **course** be considered as a **product** ?

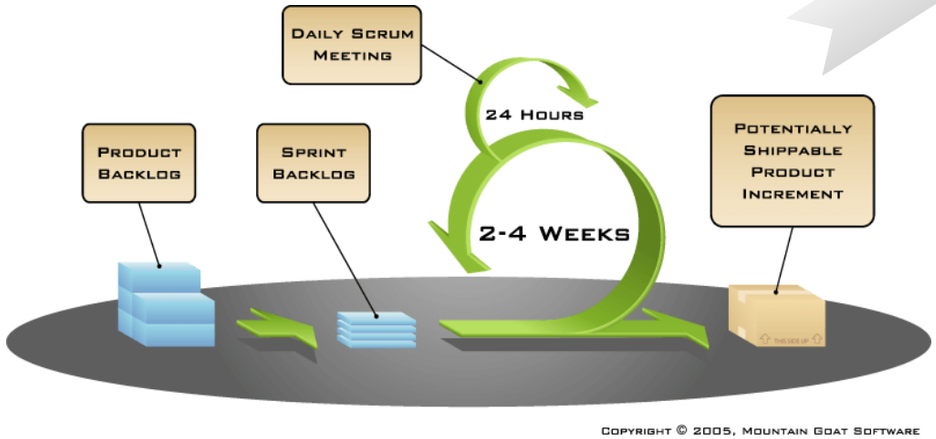
Could not a **Syllabus** be considered as a **Requirements ?**

Credit: Thinkstock

[1] R. M. Felder and L. K. Silverman. Learning and teaching styles in engineering education. Engineering education, 78(7):674–681, 1988

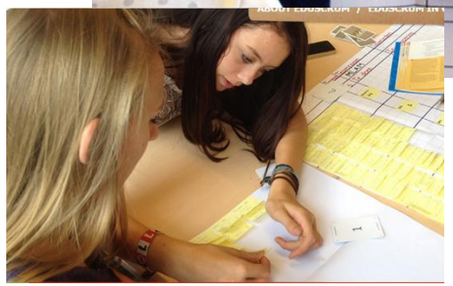
Some transpositions already exist …

… inspired by Scrum



eduScrum

http://eduscrum.nl/en/



Scrum :
iterative and incremental
agile software development framework
for managing product development

http://approchealpes.info/

(private joke in french :
Agi**L**es pour la **P**édagogie dans l'**E**nseignement **S**upérieur)

Also (individual) experiments of *Agile Pedagogy* … inspired directly by agile values and principles

From a plan-driven paradigm to a value-driven paradigm

From traditional teaching approaches to new learning approaches

In France : https://pedagogieagile.com/
Individual experiments of a teacher in a Junior high school

… As in spain

https://es.fpdgi.org/upload/projecte/1329.pdf

But only transposition around delivery process, … No transposition around the design ….

Could not a **Course Designer** be considered as a **Product Manager ?**

Why not transposing each process pattern of Specification by Example in Educational context to improve the design of a course ?

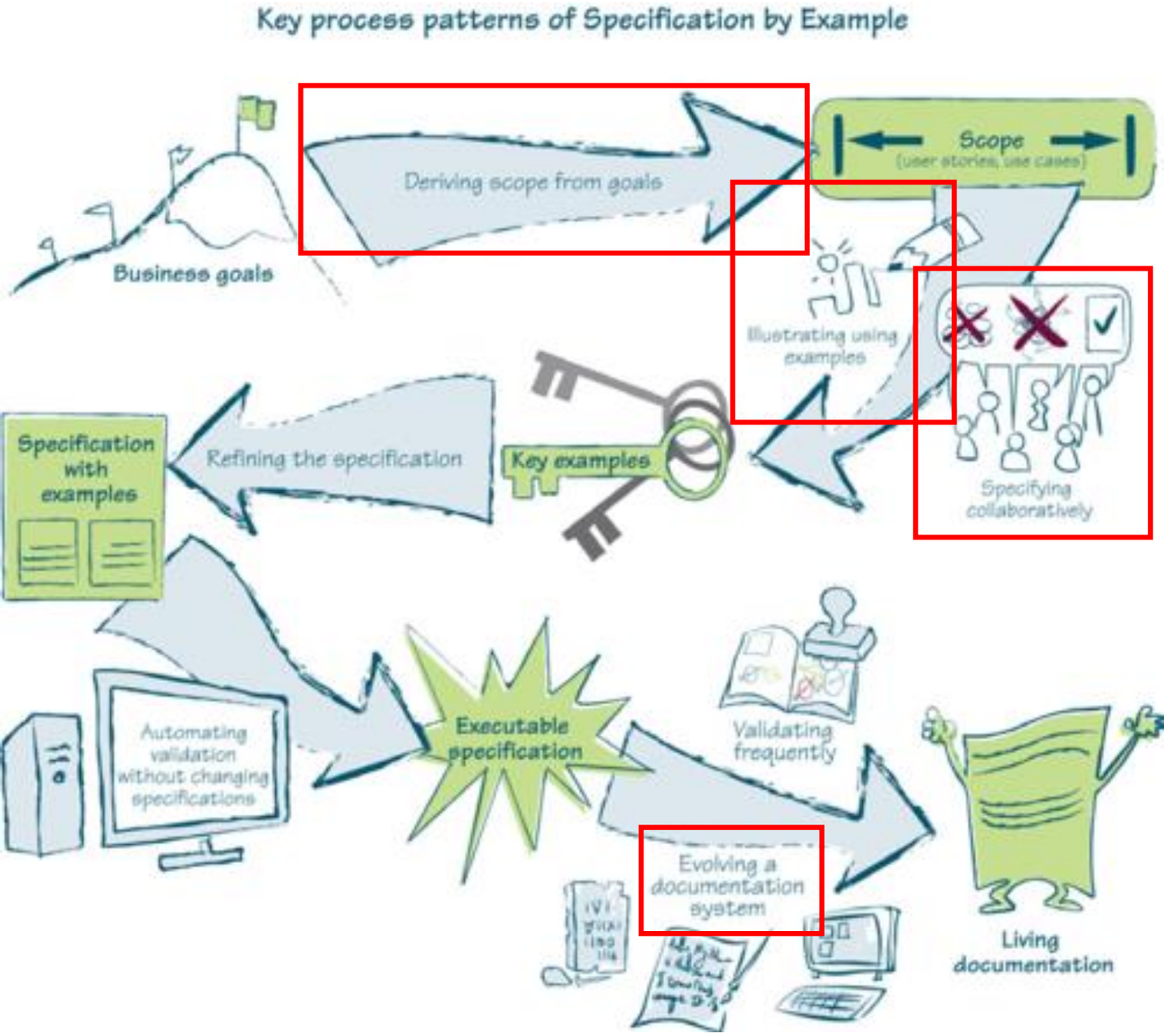
Transposition of each pattern in 3 steps

→ **Overview** of the **original pattern**

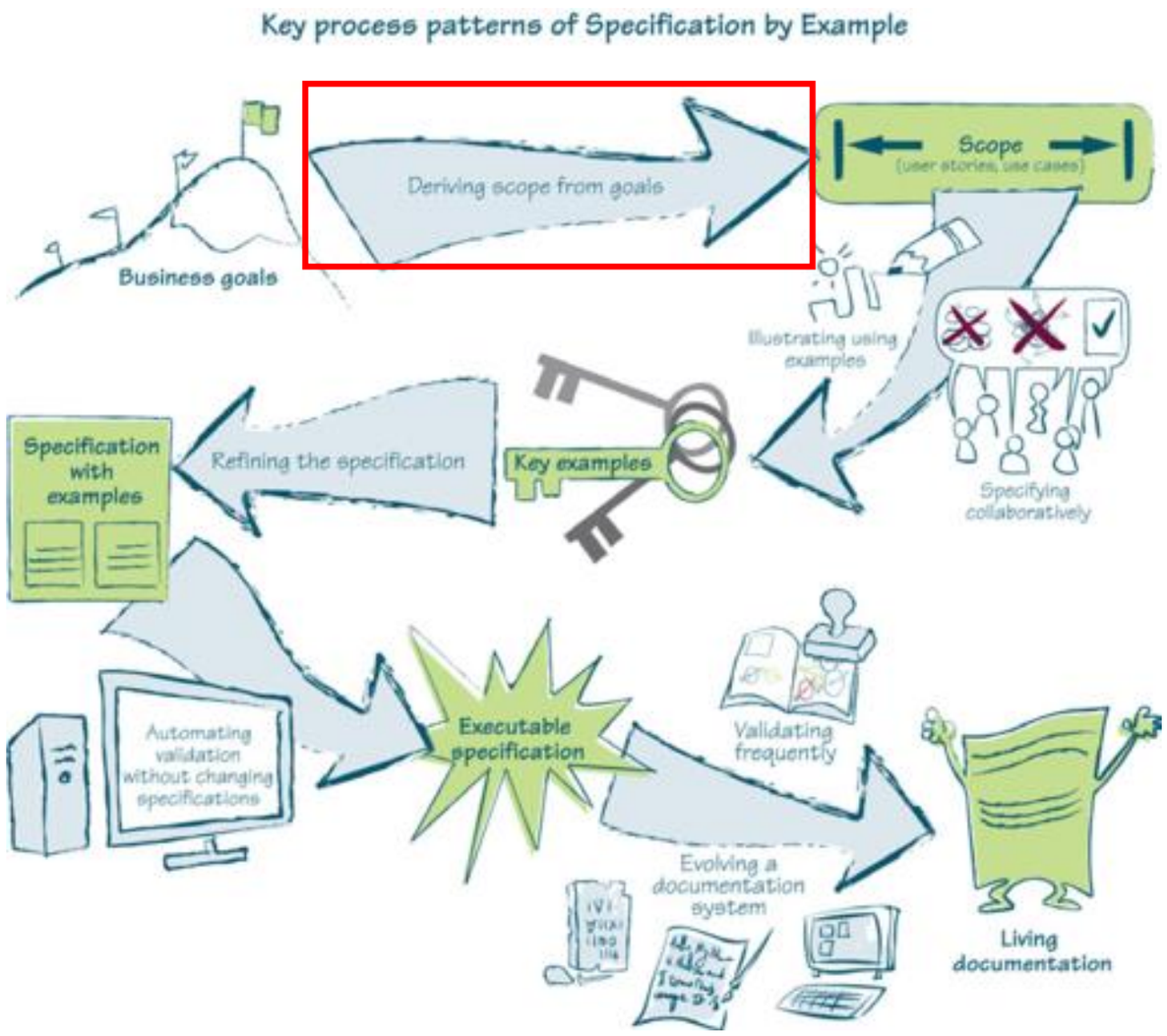
→ Corresponding **pattern in teaching-domain**

→ **Example** of the teaching-domain pattern
on a software development course

Today, focus only on 4 Patterns



A full presentation is avalaible on :
https://github.com/iblasquez/acm-sbe-educational



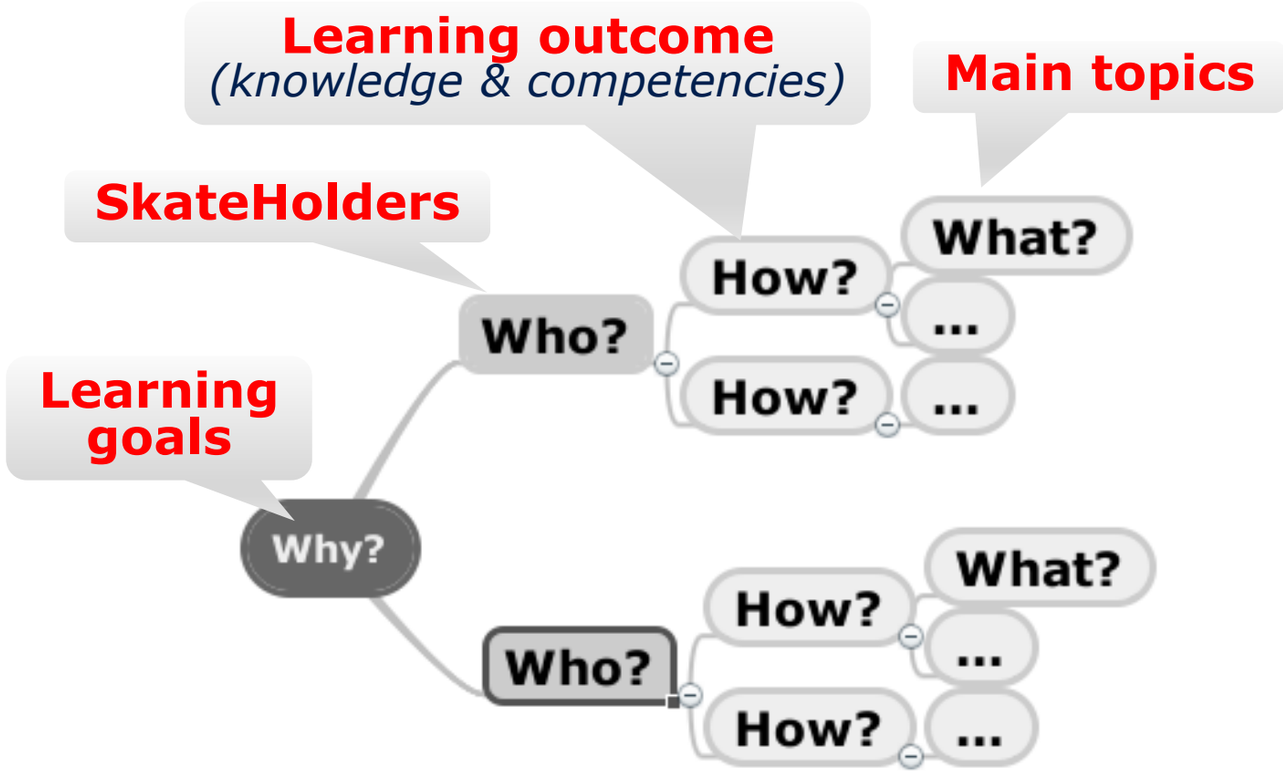
Pattern 1 :

Deriving scope from goals

From *why* to *what*

Overview & corresponding pattern

⇒



Course's Vision : Example

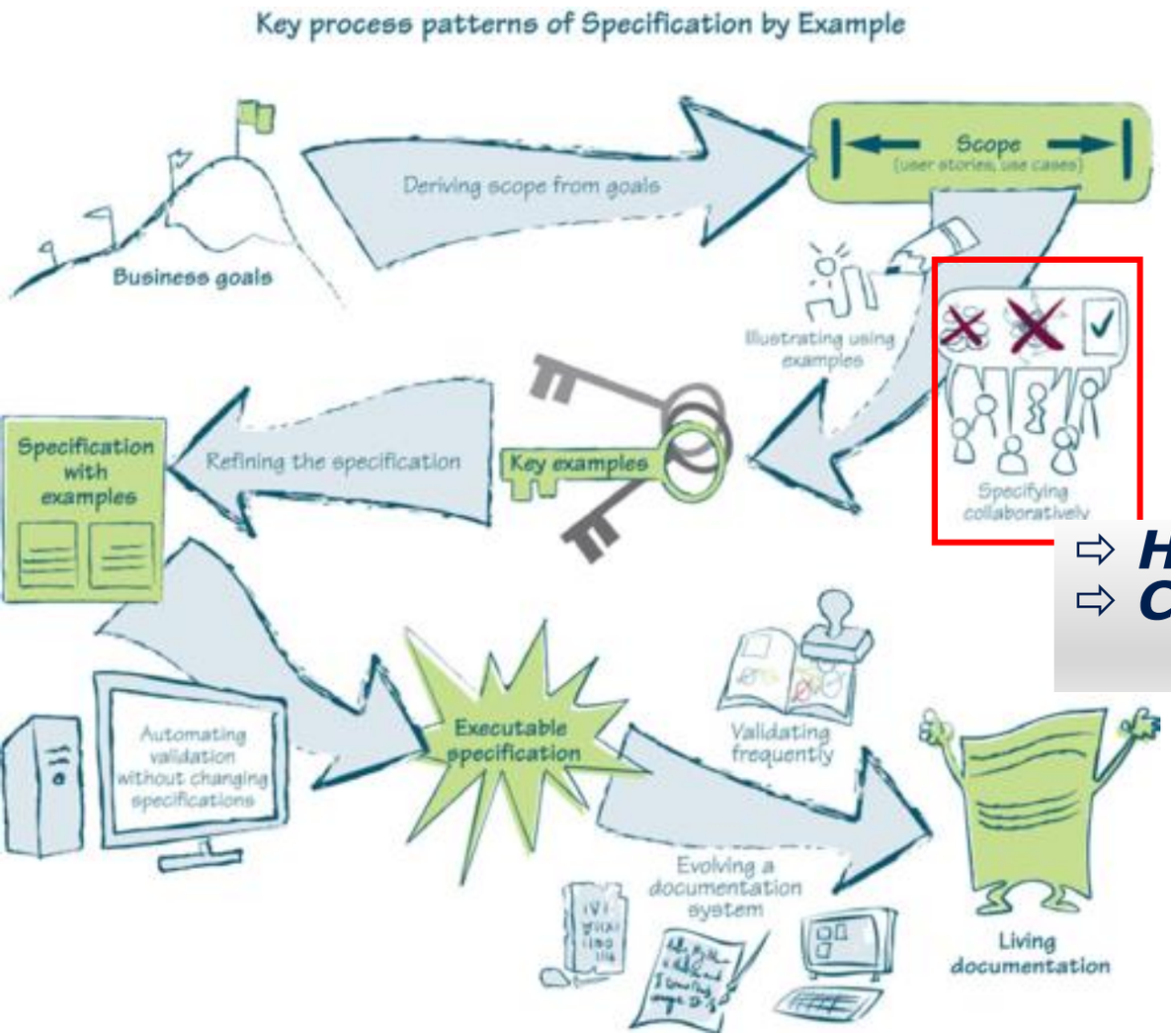
Students

- **Delivering the right product**
  - Requirements: focus on vision
  - Requirements: from vision to features
- **Delivering the product right**
  - Tests
- **Delivering fast and regularly**
  - Introduction to Scrum
- **Agile values and principles**
  - Introduction to agile software development
  - Overview of collaborative tools

Introduction to agile software development in agile mindset

Teacher

- **Facilitator posture**
  - Collaborative workshops

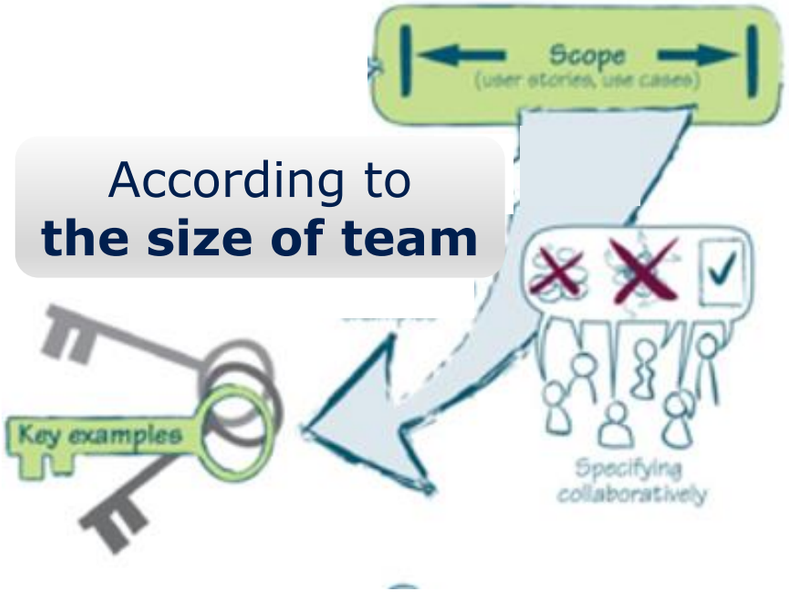


Pattern 2 :

Specifying collaboratively

⇨ ***Harness the knowledge and the experience***
⇨ ***Create a collective ownership of specifications (engagement in the delivery process)***

Overview & corresponding pattern



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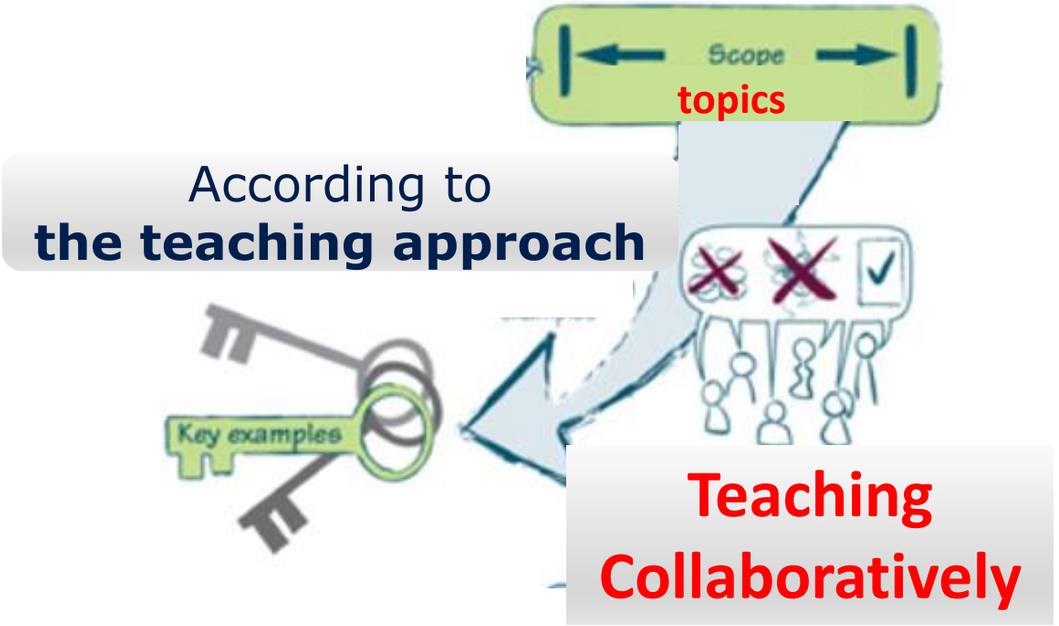
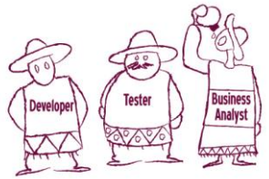
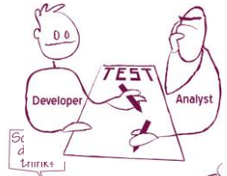


All-team workshops

Smaller workshops
(clarify)



Pair-writing
(mature or complete)



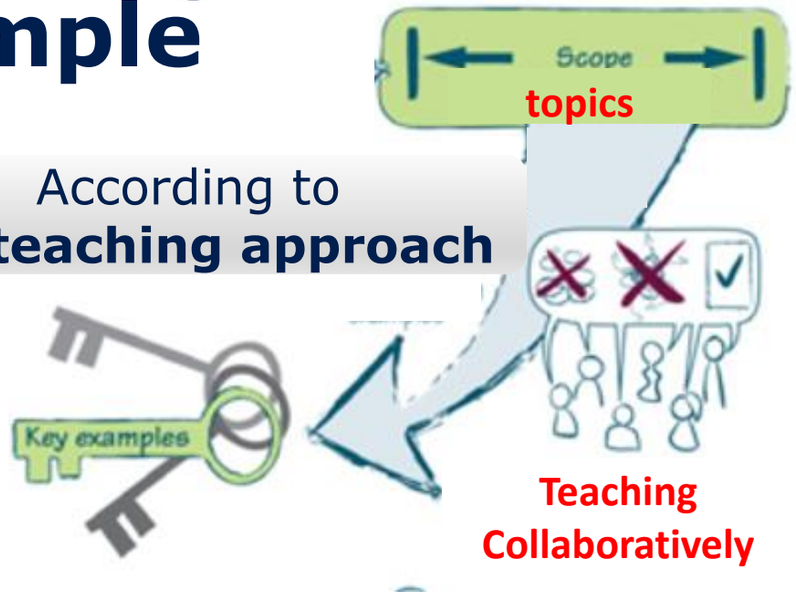
Informal conversations
(several perspectives)

Inductive workshops
(from particulars to generalities)
→ Problem Based Learning, discovery learning, inquiry learning (constructivism)
→ Active learning (involvement of students) and collaborative learning (groups)

Deductive workshops
(traditional teaching approach)

Pictures from : http://www.methodsandtools.com/archive/collaborativespecifications.php

Teaching Collaboratively : Example



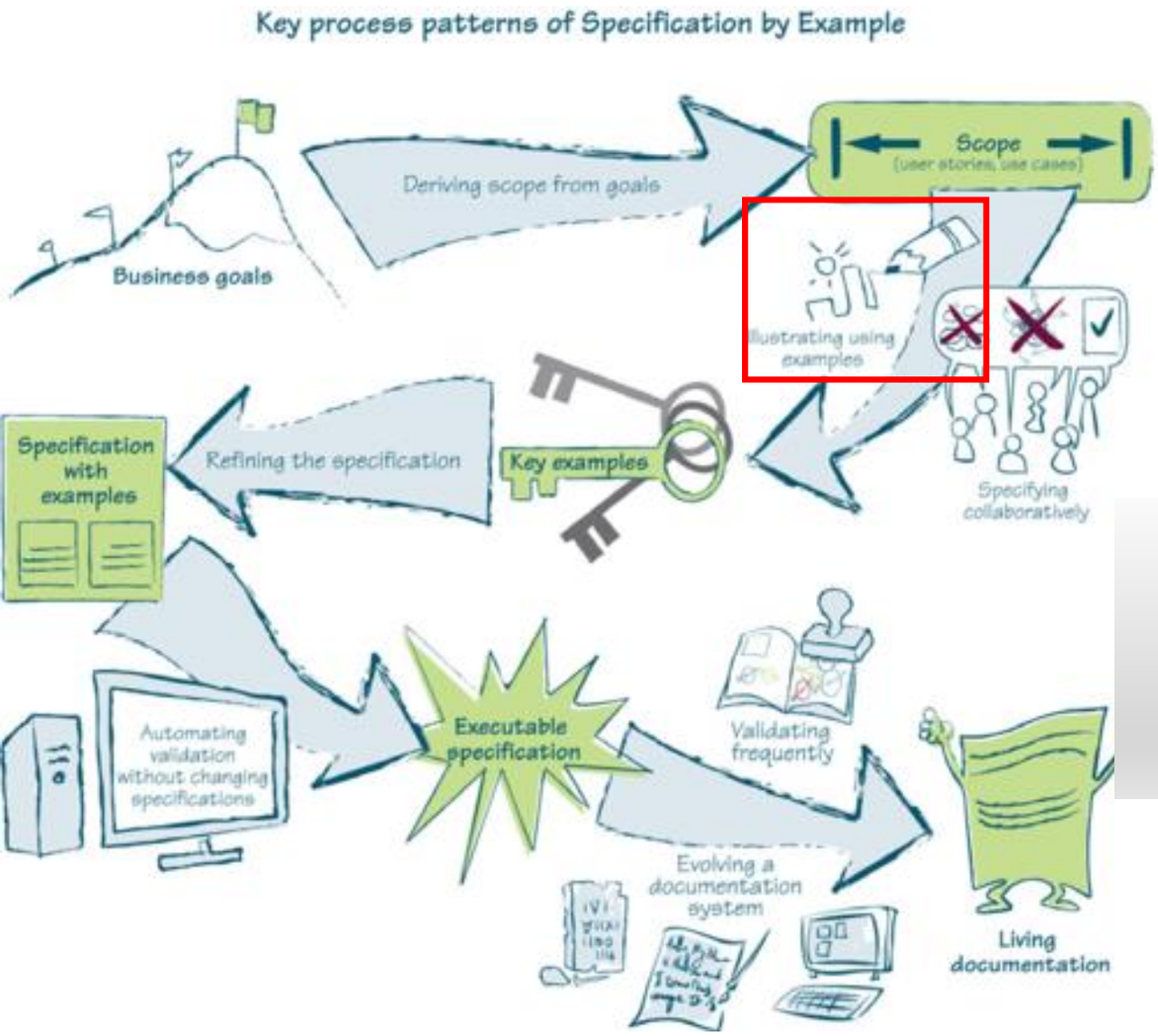
Inductive workshops (mostly)

Autonomous team of 4-6 students who collaborate to achieve the required learning goal

Teacher becomes **facilitator** and ensures trust behaviors
(*demonstrate respect, create transparency, keep commitments, extended trust…*)

Assertion time (at the end) :
- **Workshop review :** presentation of work
- **Retrospective :** to reflect on the most significant events to have occurred, examine the lessons learned and take decisions aiming at improvement.

→ Promote the emergence of Agile Values in Collective Intelligence process



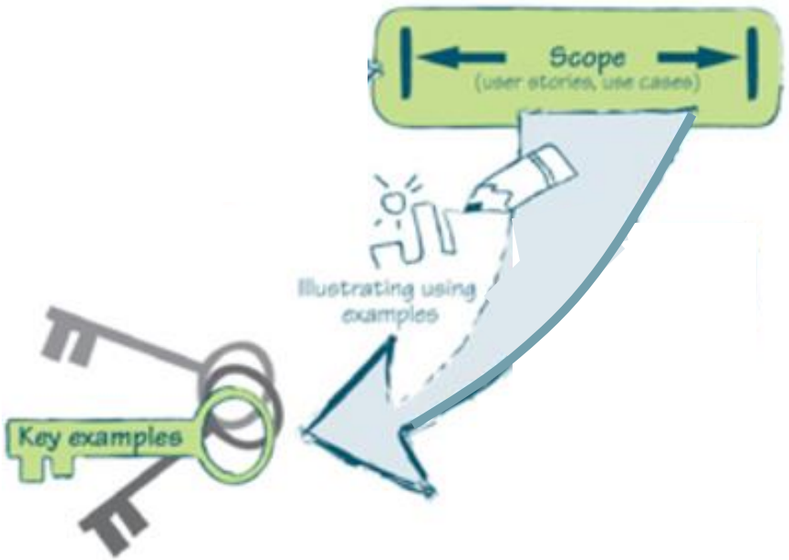
Pattern 3 :

Illustrating requirements using example

Ensure that the delivery teams focus on the right product

Shared understandings of what the business users expect

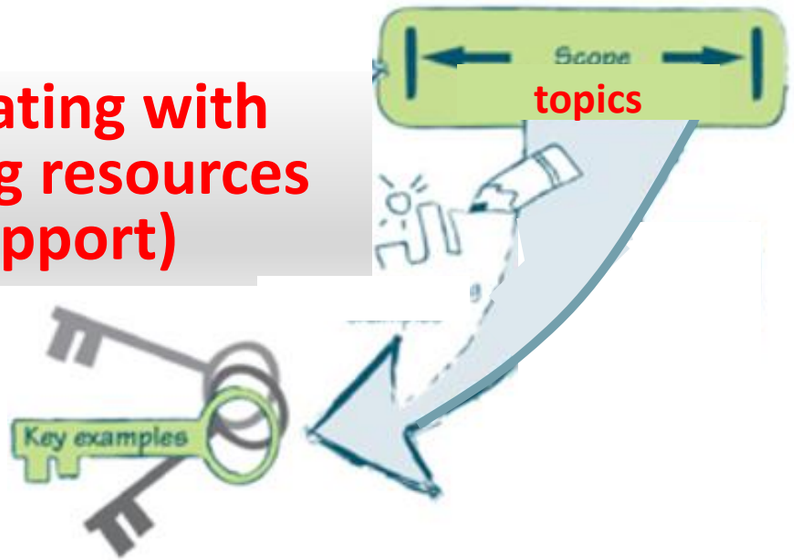
Overview & corresponding pattern



Example

⇒

Illustrating with teaching resources (support)



Teaching resource
activity used by a teacher
to engage students
in learning
to achieve required
learning goal

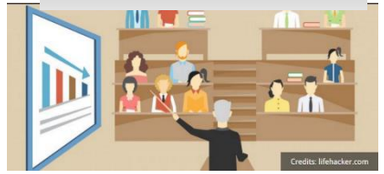
Examples (everyday conversation)
→ clarify meaning
→ concrete & unambiguous

Examples (from requirements analysis to testing)
→ small
→ precise
→ realistic
→ easy to understand

Illustrating with teaching resources : Example

Choose the best teaching resources to engage students in learning

Lecture



To introduce or clarify a concept

Tutorial, Lab

Project Based Learning

Student centered approach :
Work in groups on a real world problem,
Guidance provided by the teacher
Resulting products shared with the community

Collaborative workshops

Gamification

process of using-game based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problem [1]

(Game ⇒) culture happiness ⇒ learning ⇒ productivity [2]

[1] K. Kapp. The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education. Wiley, 2012
[2] D. Mezick. The Culture Game: Tools for the Agile Manager. FreeStanding Press, 2012

Illustrating with teaching resources : Example (in picture)

Project Based Learning

Student centered approach :
Work in groups on a real world problem,
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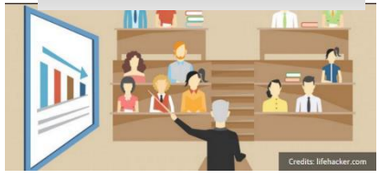
Lecture

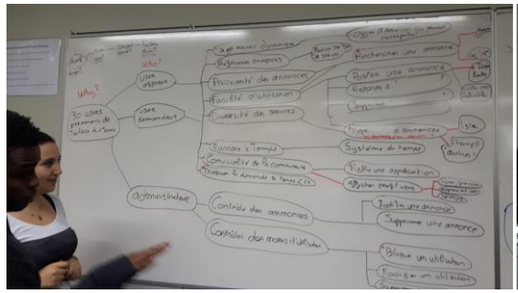


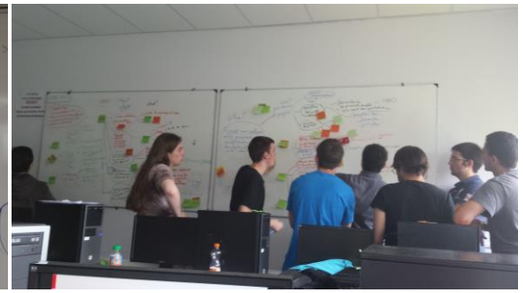
Choose the best teaching resources to engage students in learning

Tutorial, Lab

To introduce or clarify a concept

Collaborative workshops





Gamification

Serious Game
(to discover a concept)

Innovation Games
(to work)

Happiness to work (photos taken by students during PBL workshops)

Game/Collaborative Workshop ↔
culture happiness ↔ learning ↔ productivity

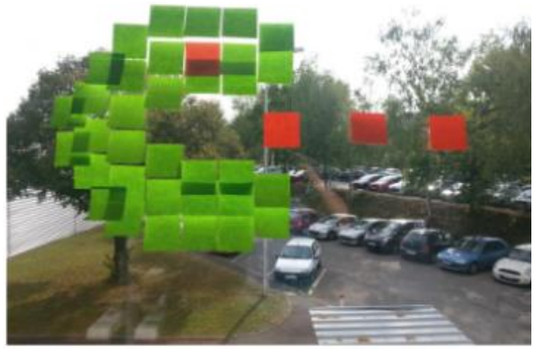
Photo prise lors de l'atelier des User Stories

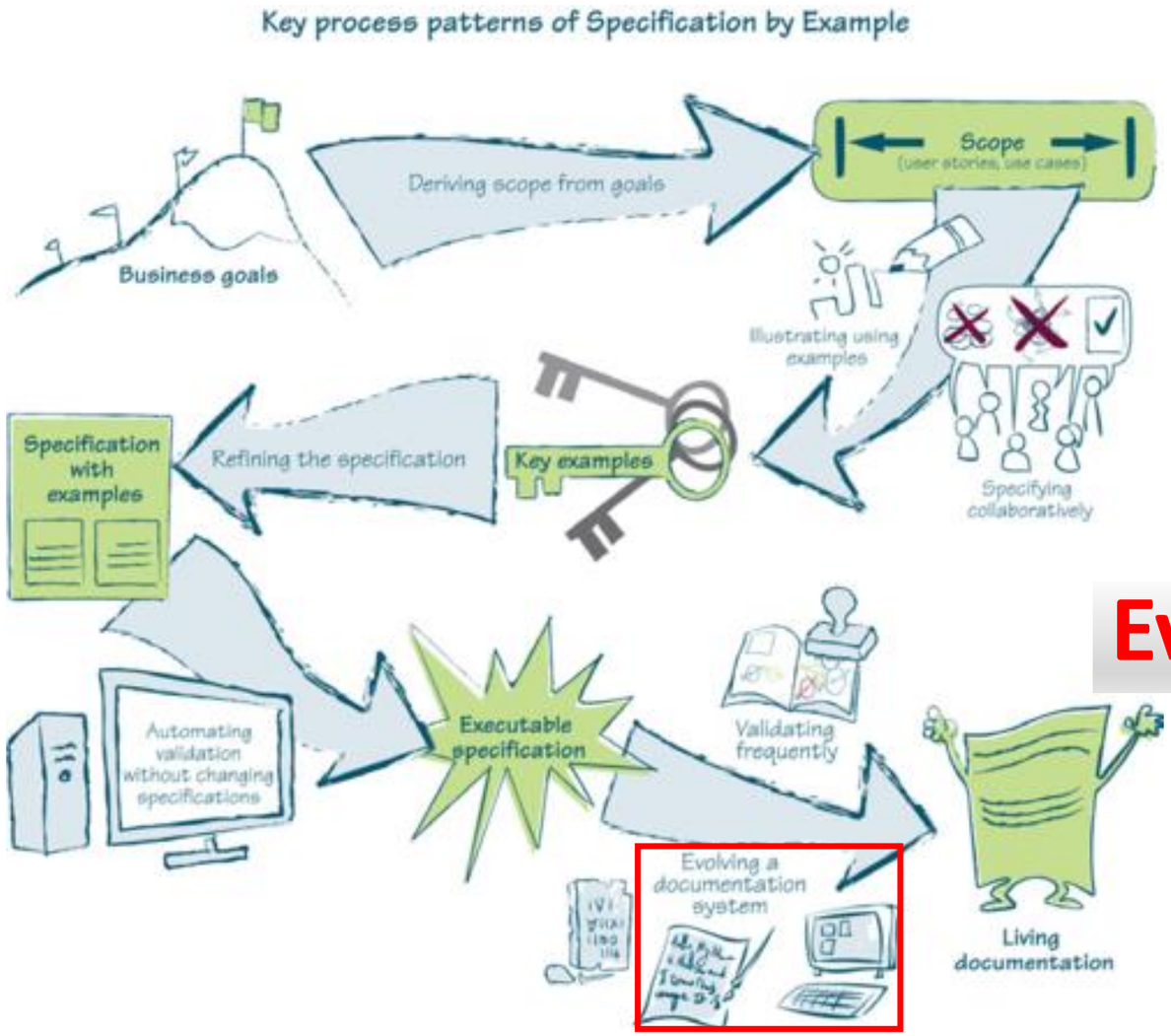
Dessin réalisé lors de l'atelier Impact Mapping, où vous étiez relativement « Speedy ».

Conclusion graphique

Pour illustrer à quel point nous formons une équipe soudée et efficace, nous avons quelques Snapchats qui vous montrent comment nous avons passé le temps lors de nos pauses.

Et enfin pour finir, la vidéo que vous attendiez depuis si longtemps : la danse de Pierre, Sébastien, et Conor, reprise et modifiée par d'autres MDI (membres du département informatique) : Cliquez ici pour voir the best conclusion ever.



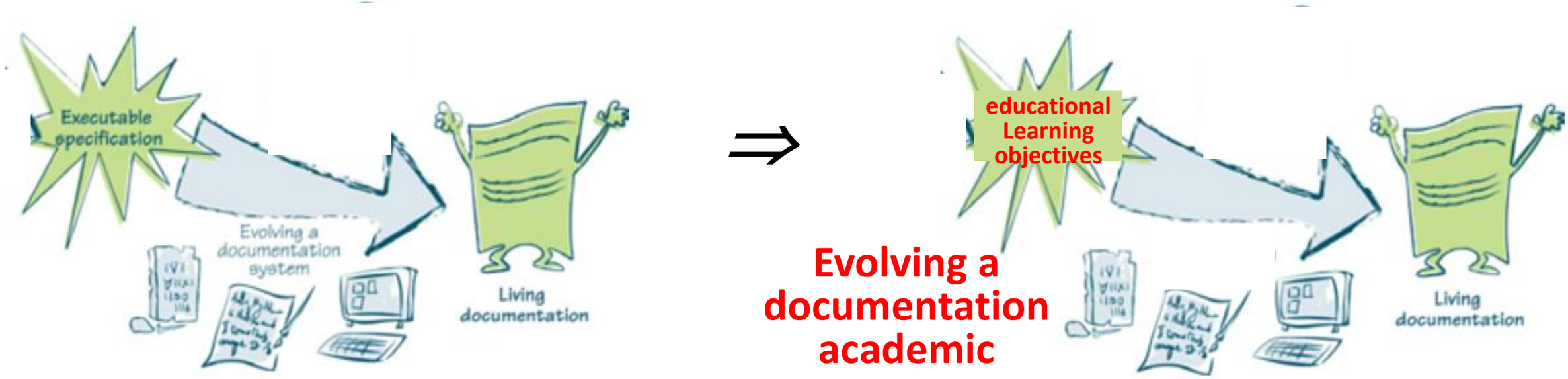


Pattern 7 :

Evolving a documentation system

Living documentation : artifact & the end-product

Overview & corresponding pattern



Living Documentation
(authoritative reliable source information on system)

→ Easy to access ⟶ repositories in a version control system

→ Easy to understand ⟶ by encouraging to share & update materials

→ Each change needs to be reflected ⟶ Be alive : notification system to alert all the skateholder when a new document is added or updated

Evolving a documentation academic Exemple

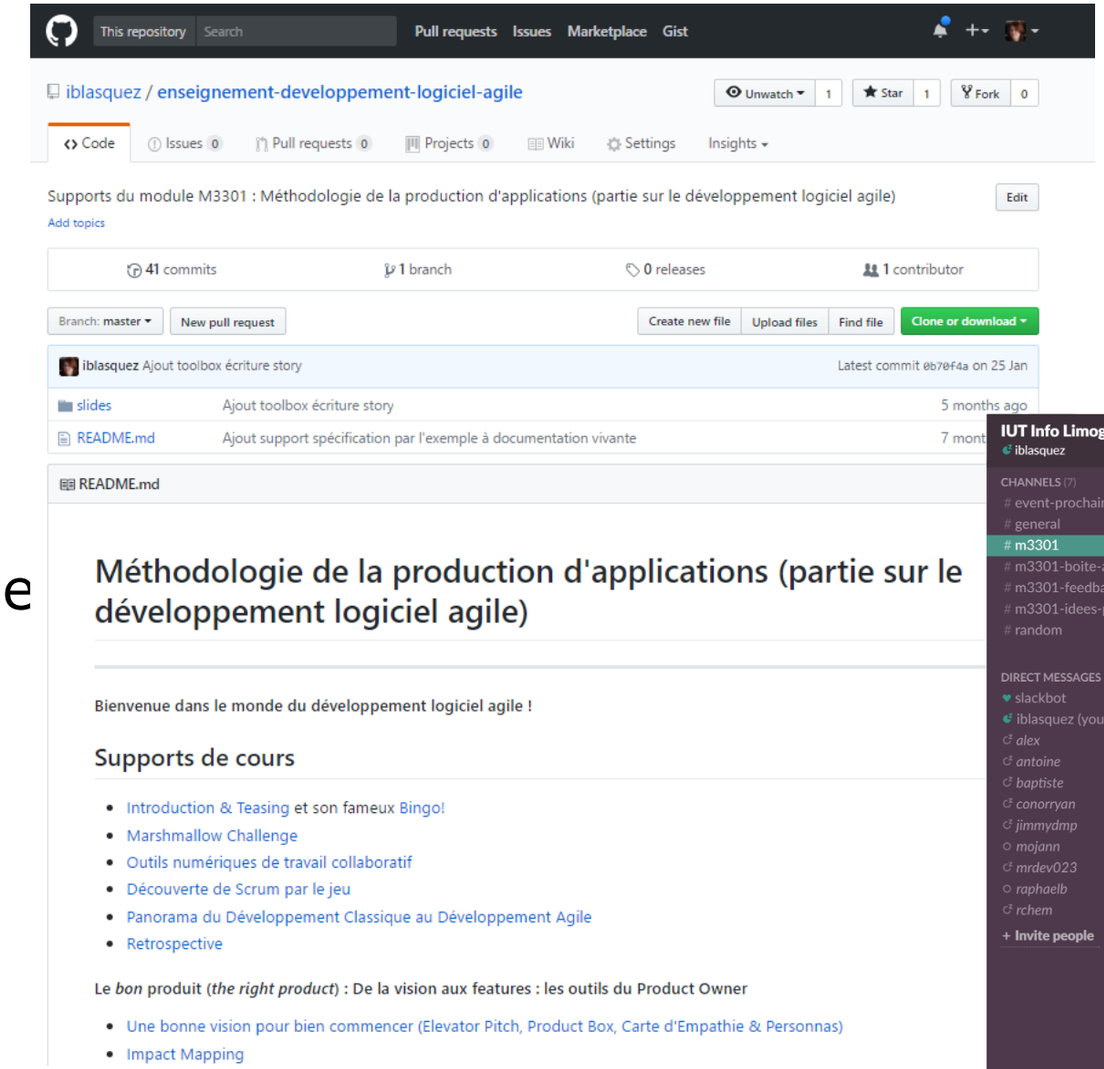
GitHub

Easily access on line public material course

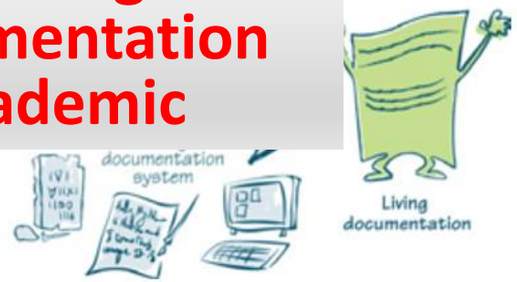
Recipe

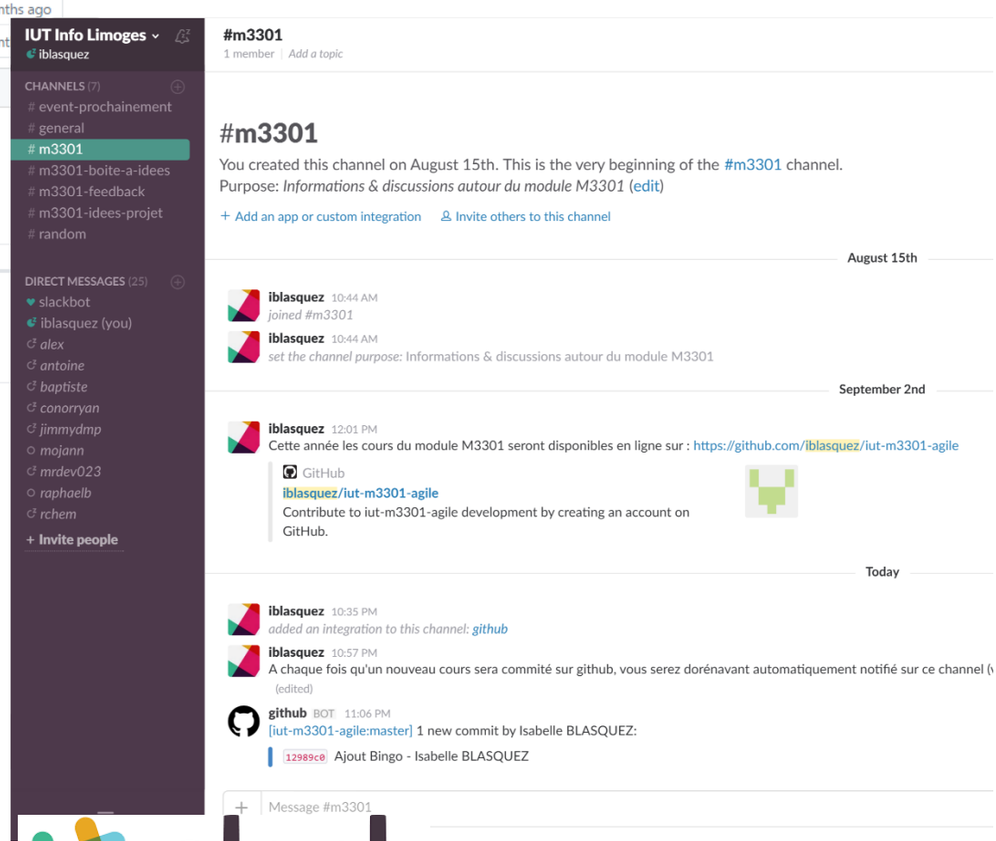
if this then that

Trigger Action



Evolving a documentation academic

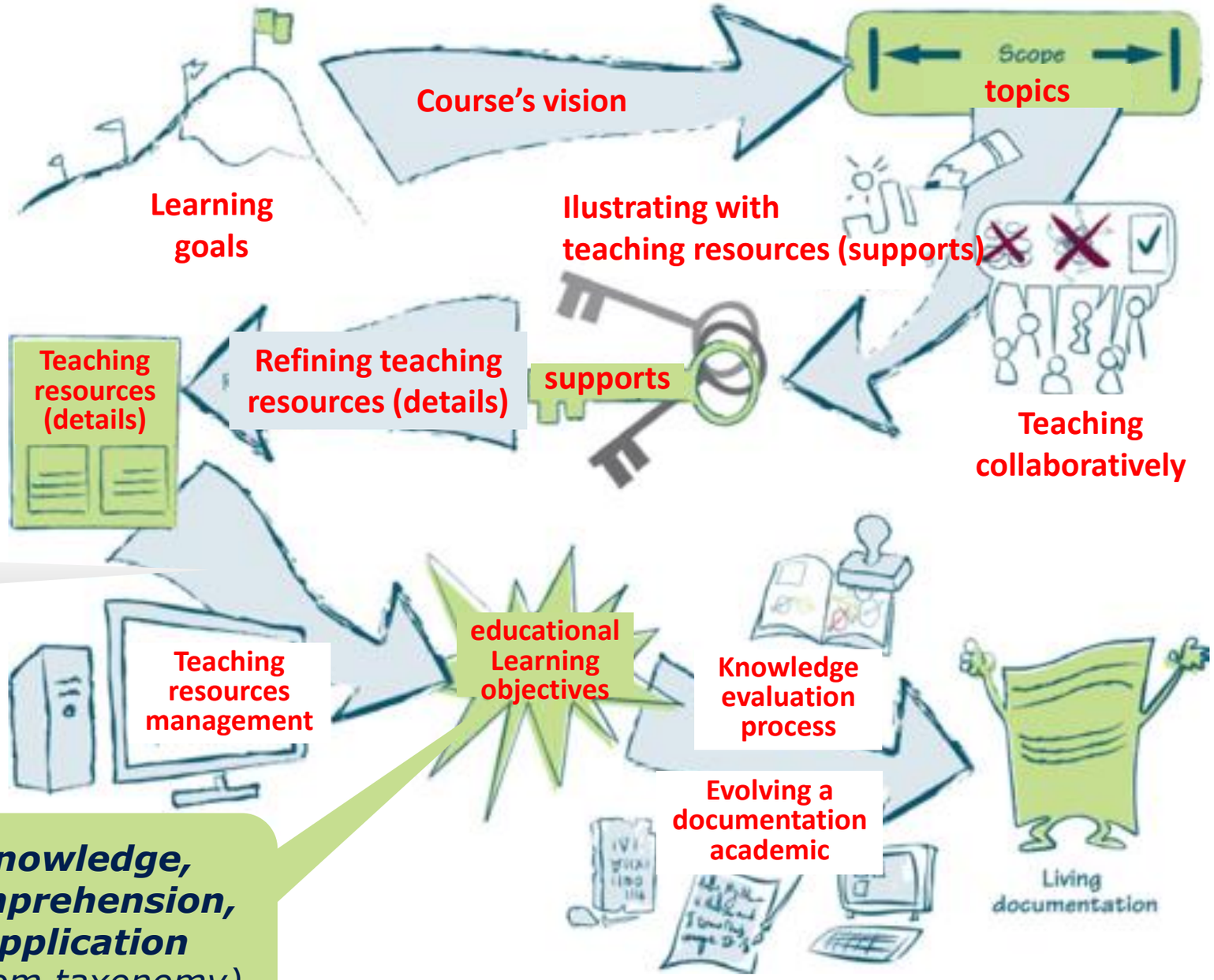




more understandable
& automatic notification system

slack

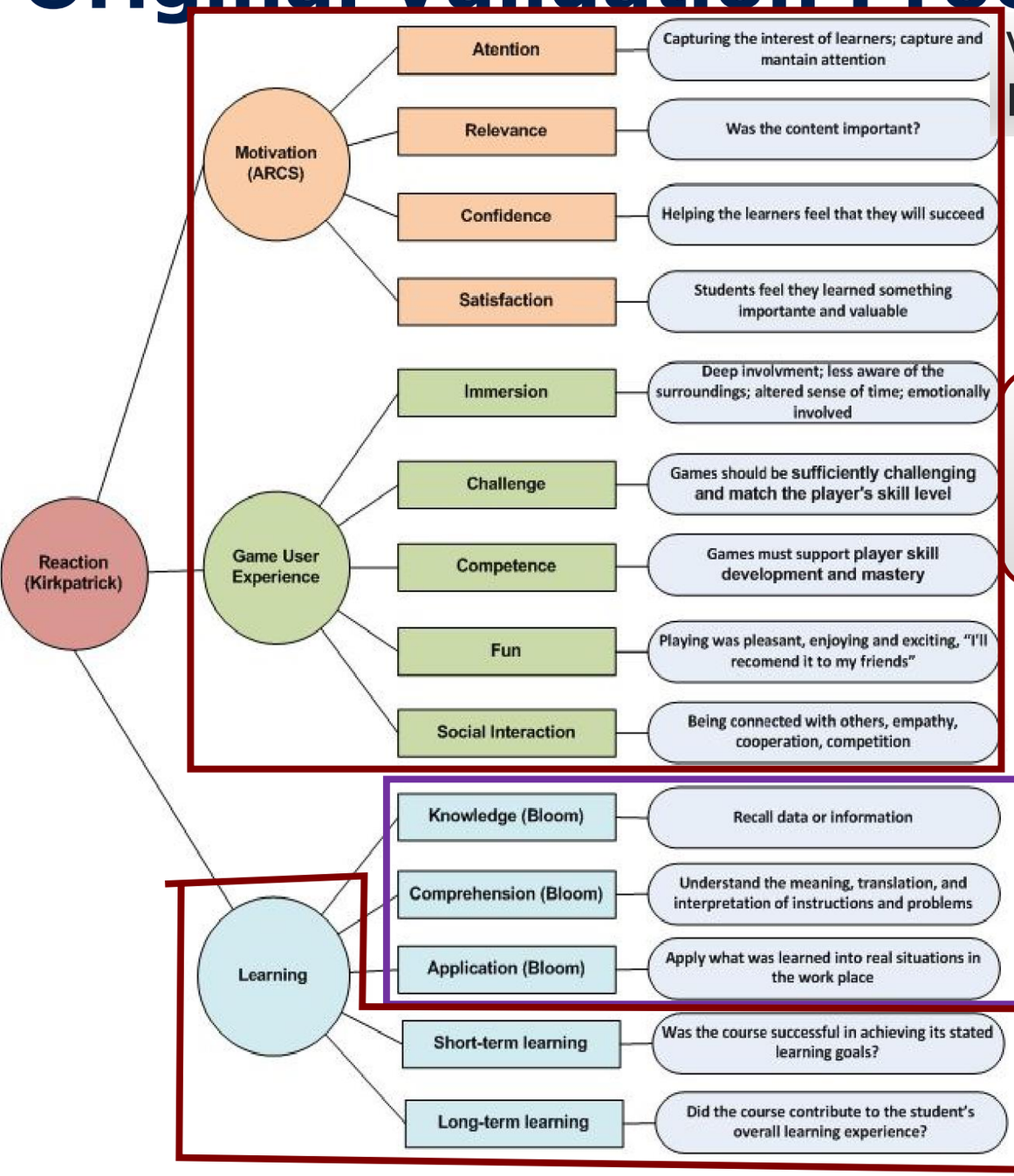
Key process patterns of Specification by Example **for Education Purpose**



Validation

... Towards a right course ...

Original Validation Process



Validation process adapted from an original model **Model for the Evaluation of Educational Games** [1]

Evaluation kit of the model available on
http://www.gqs.ufsc.br/meega-a-model-for-evaluating-educational-games/

A questionnaire based on Kirkpatrick Evaluation
27 items asking motivation, user experience, and learning through 11 dimensions (*attention, relevance, confidence,…*)

A questionnaire based on Bloom Taxonomy
Evolution of learning in the competencies taught before and after the game

[1] C. G. von Wangenheim, R. Savi, and A. F. Borgatto. Deliver! - an educational game for teaching earned value management in computing courses. *Inf. Softw. Technol.*, 54(3):286–298, 2012

Adapted validation process to our case study (1/3)

1. Revise/adapt the objective of the evaluation

→ A definition of **quality** in the context of educational game in [1]
"a game is high-quality, if it provides a positive learning effect, motivates students to study and provides a pleasant and engaging learning experience."

→ Extension of this definition to the ***right* course** whose the expectations in terms of **learning**, **collaboration**, **commitment** and **happiness** to work are similar.

[1] C. G. von Wangenheim, R. Savi, and A. F. Borgatto.
Scrumia : An educational game for teaching scrum in computing courses.
Journal of Systems and Software, 86(10):2675–2687, 2013

Adapted validation process to our case study (2/3)

2. Revise/adapt the research

→ **research strategy** : the ***quality*** of a ***right course***.

→ **Our case study** :

- ***Agile Software Project Management Course***
- ***80 two-year French undergraduates*** *(technical college specialized in Computer Technology)*
- *10 weeks with 2 * 2-hours sessions per week*

→ **Overview of Bloom Taxonomy** (knowledge-comprehension-application)

- Doing Agile & Being Agile

→ **Overview of Kirkpatrick** :

- Terminology adapted from game to course
- Only 21 items to only focus a set of teaching resources

Adapted validation process to our case study (3/3)

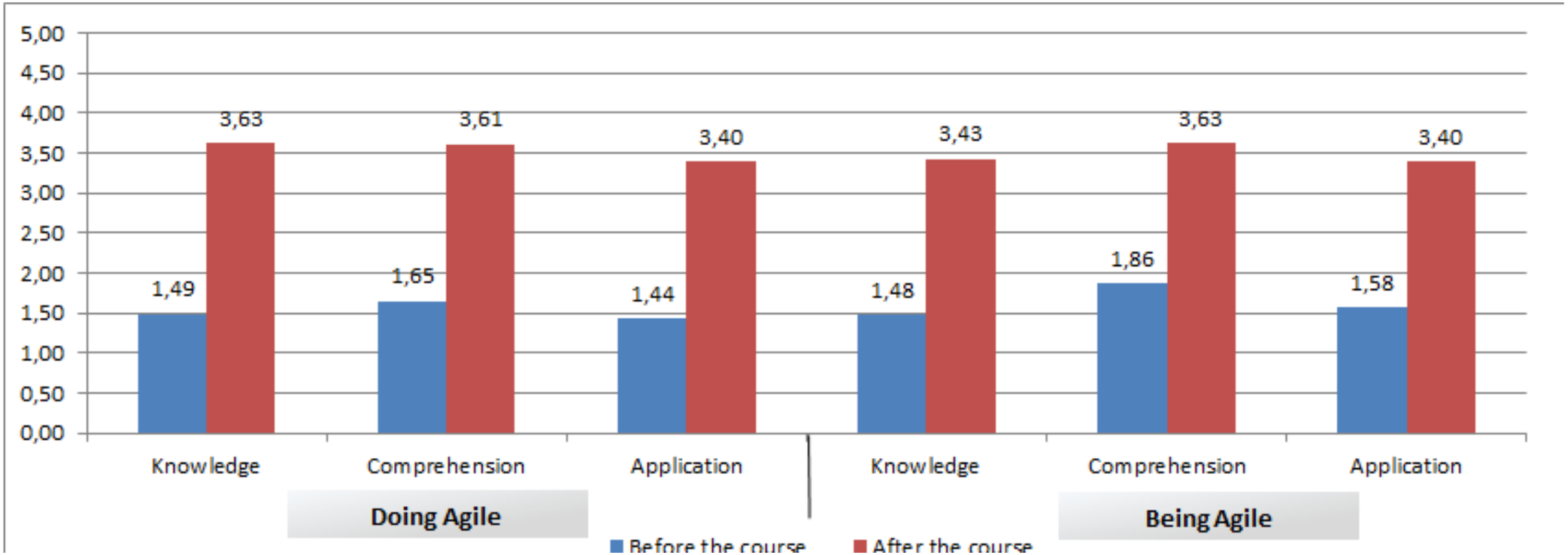
3. Plan the evaluation

→ Course designed & delivered in the fall 2015

4. Execute the evaluation collecting data via questionnaire

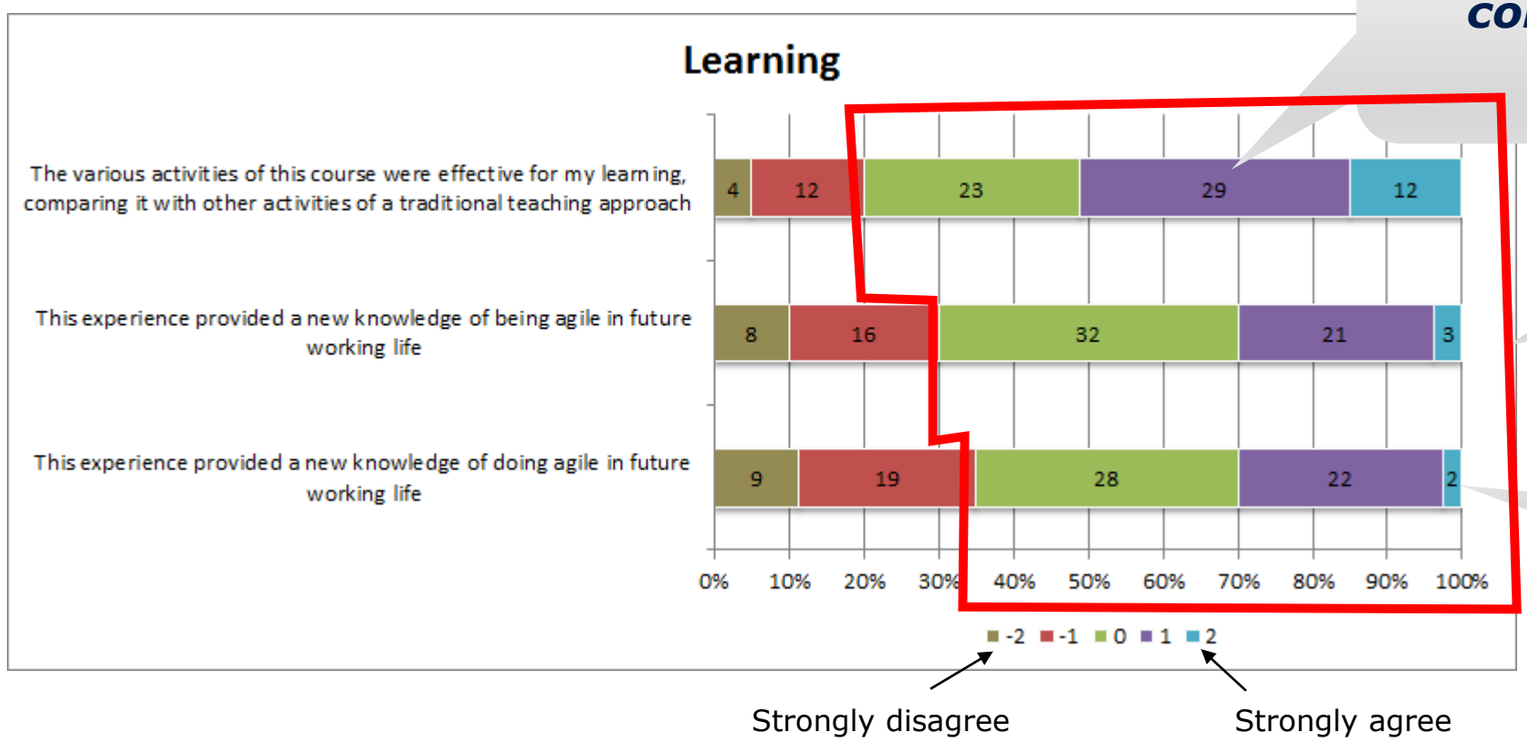
→ on line via google form (http://unil.im/sondage3301 in french)
→ each student anonymously filled out these questionnaires
→ once at the end of the course, **totalling 80 participants**.

Results : *Bloom Taxonomy*



Course has offered the opportunity to learn not only technical skills but also some values in a new mindset

Results *Kirkpatrick Evaluation*



Short-term

Effectiveness of various teaching resources comparing it with traditional teaching approach activities

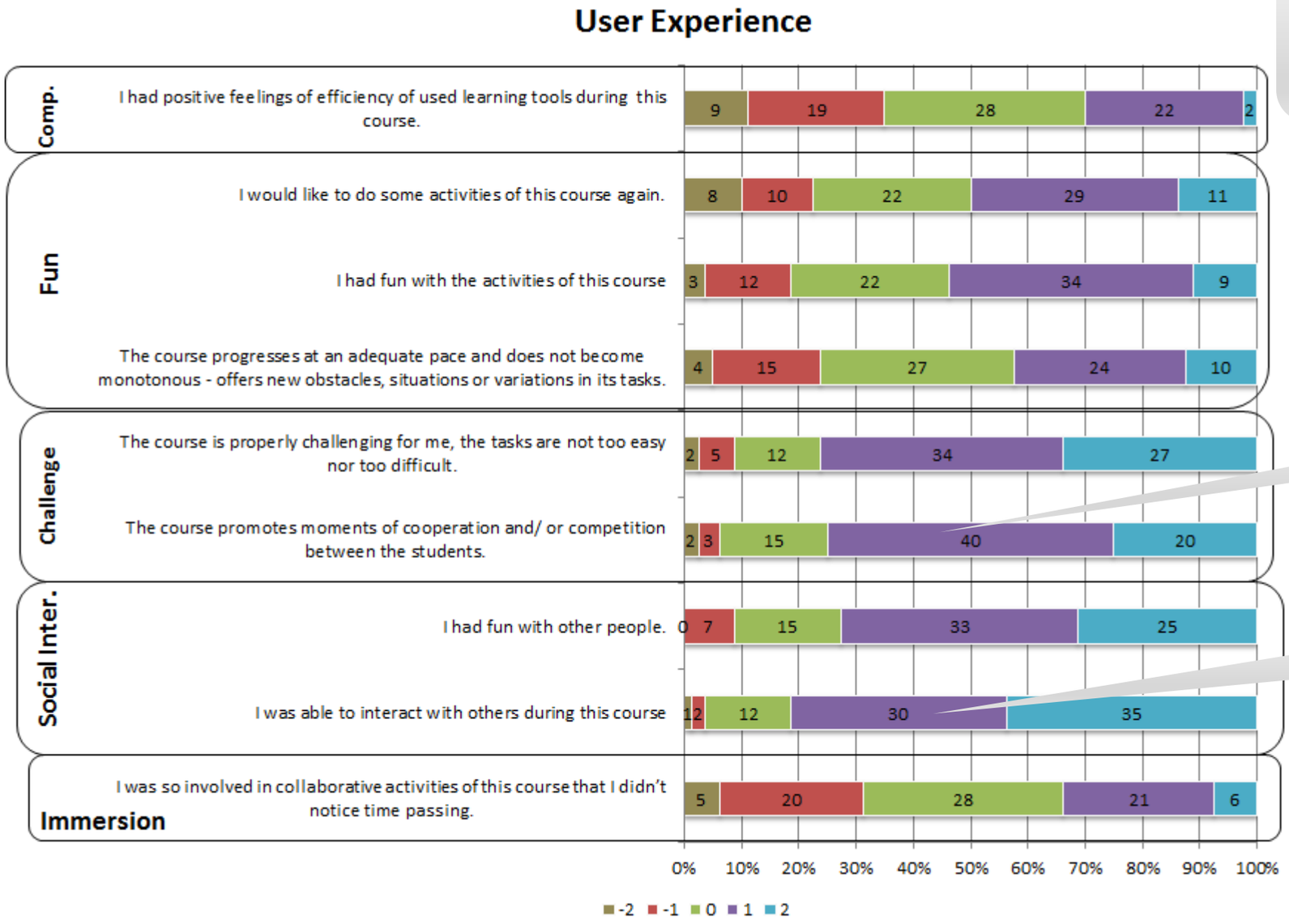
Long-term

being agile in the future

doing agile in the future

Course offers the opportunity to learn not only technical skills but also some values in a new mindset

Results *Kirkpatrick Evaluation*

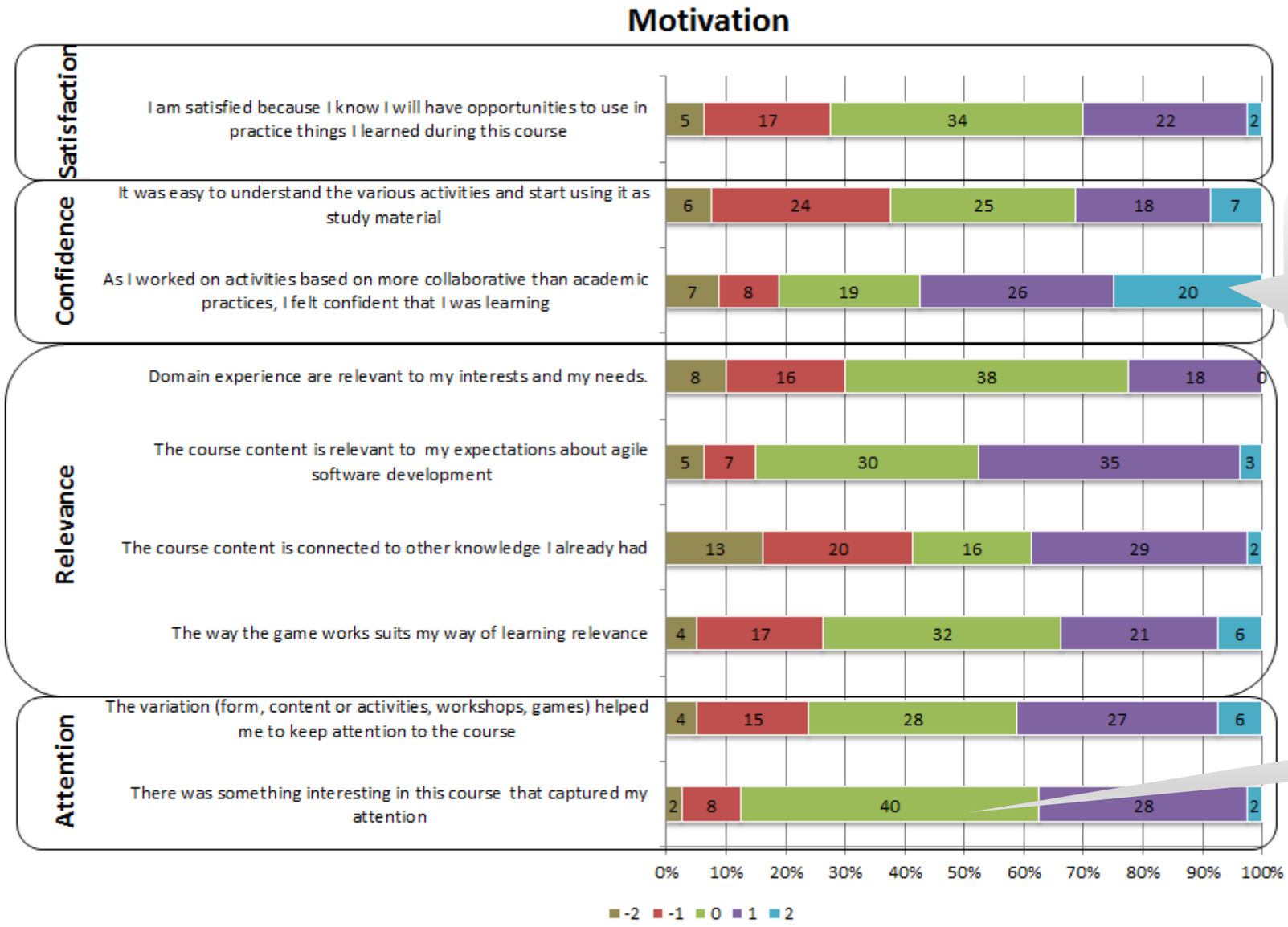


Positive results in terms of fun, challenge, social interaction

Moment of cooperation

Fun while interacting with others students

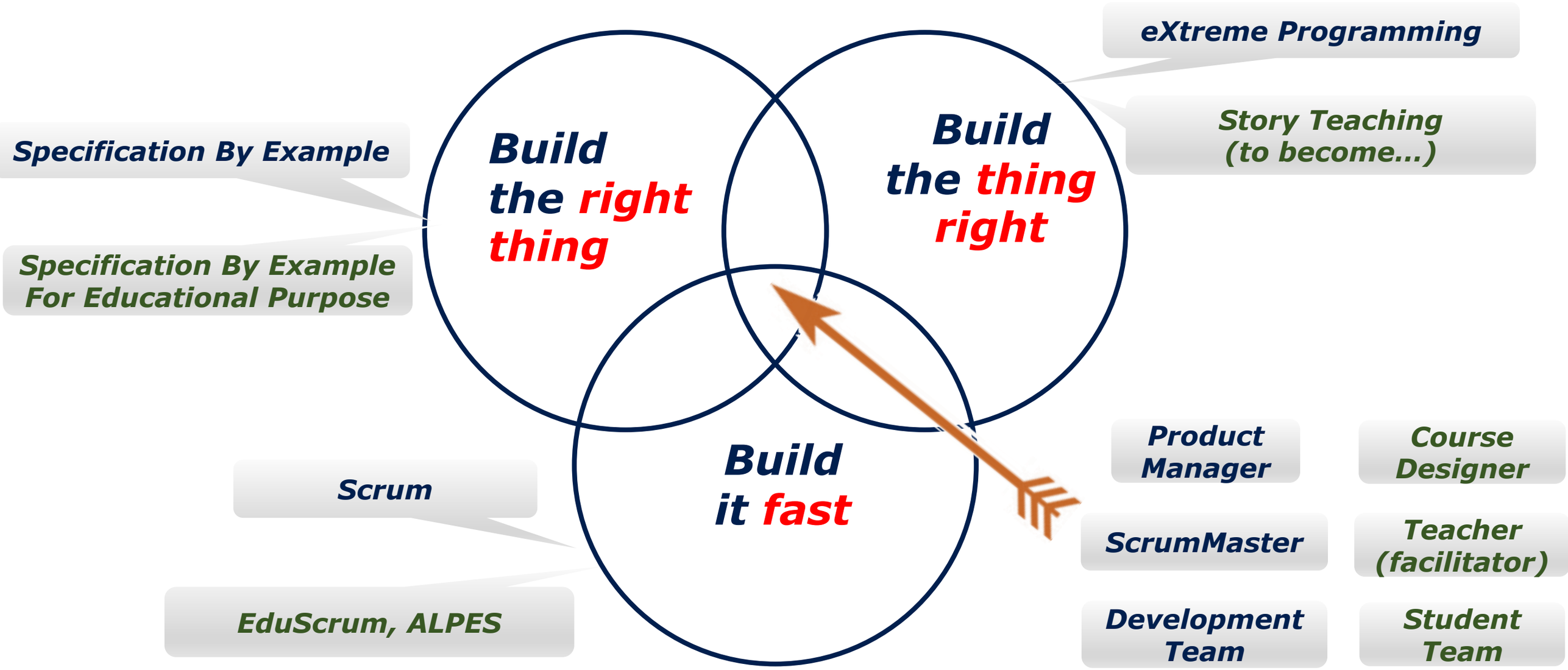
Results *Kirkpatrick Evaluation*



Feeling confident with more collaborative than academic practices

Better alignment : more attentive

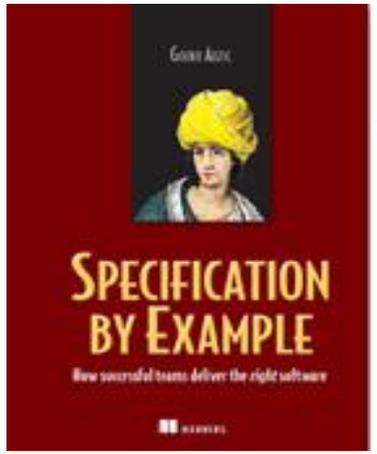
Teaching approaches in analogy to an agile software development & Future work



Three circles inspired by Henrick Kniberg

Thanks !

From 3 July 2013 to 3 July 2017



SPECIFICATION
BY EXAMPLE

Dear Isabelle
Thank you very much
for your interest in
Spec by examples
I hope you will be
able to use it to
improve your team!
Yours Aslak
3. July 2013