



Evidence Based Engineering Education: Research and Practice

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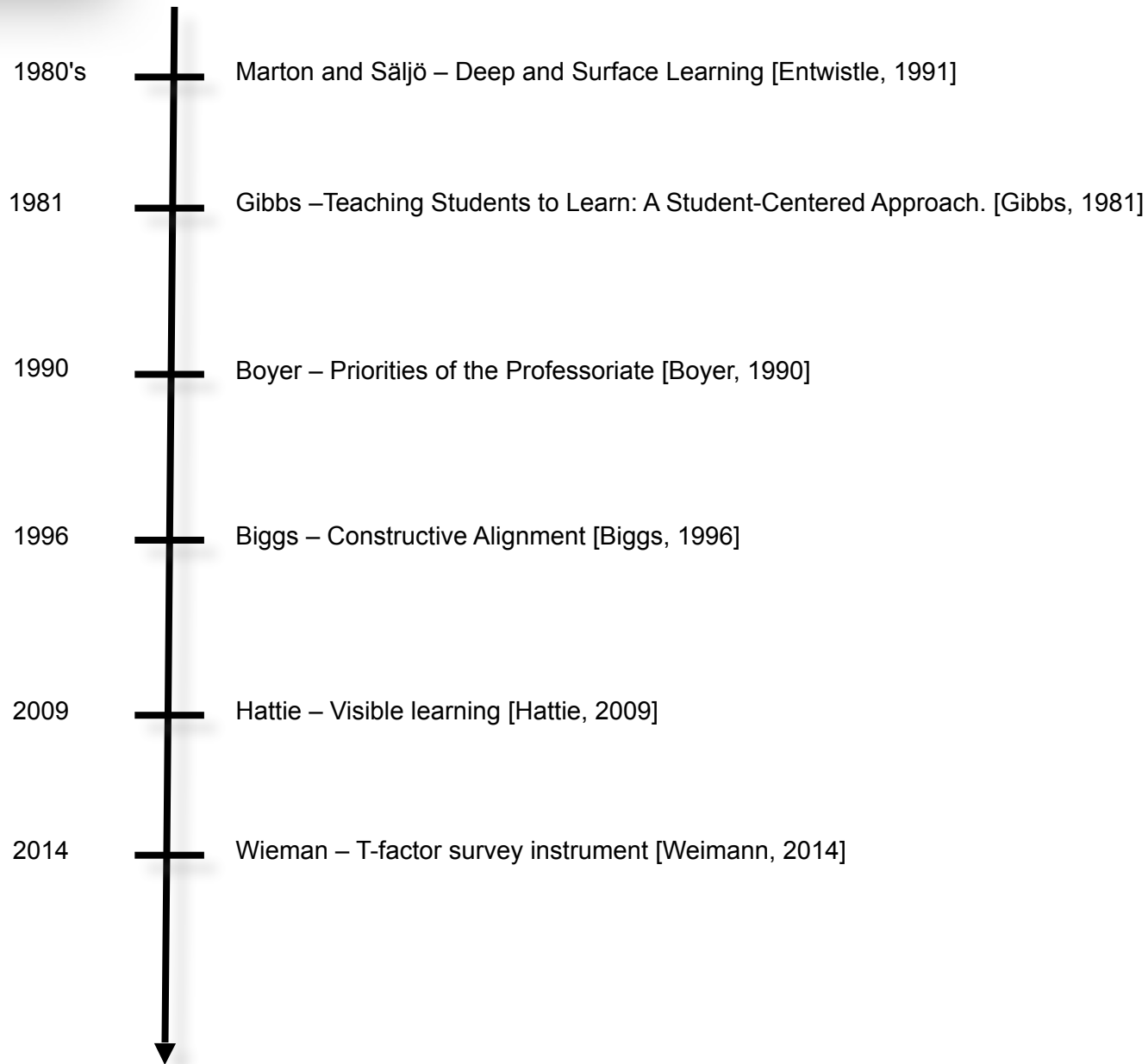
Sweden



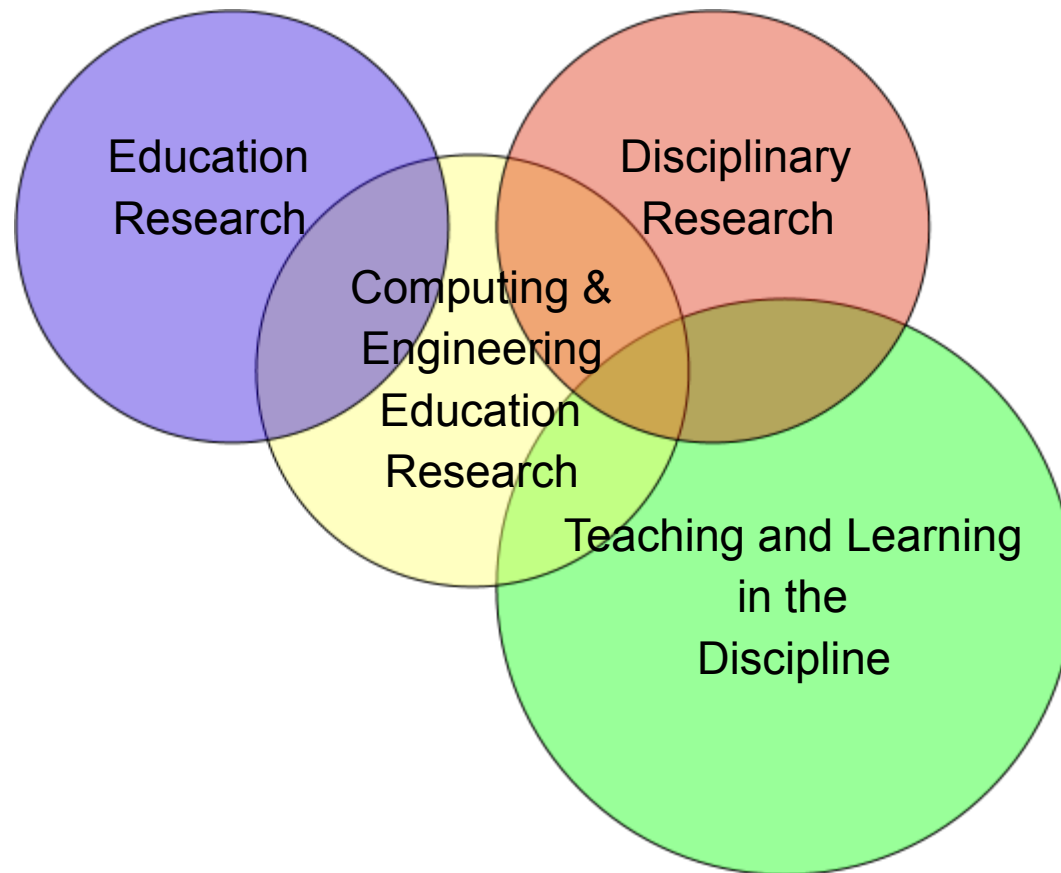
Agenda

- Research area
- Goals and systematic investigation
- Examples of my contributions.

Trends in higher education



Context of Evidence Based Education



Cognitive Shift

Introspection

Scholarly discourse

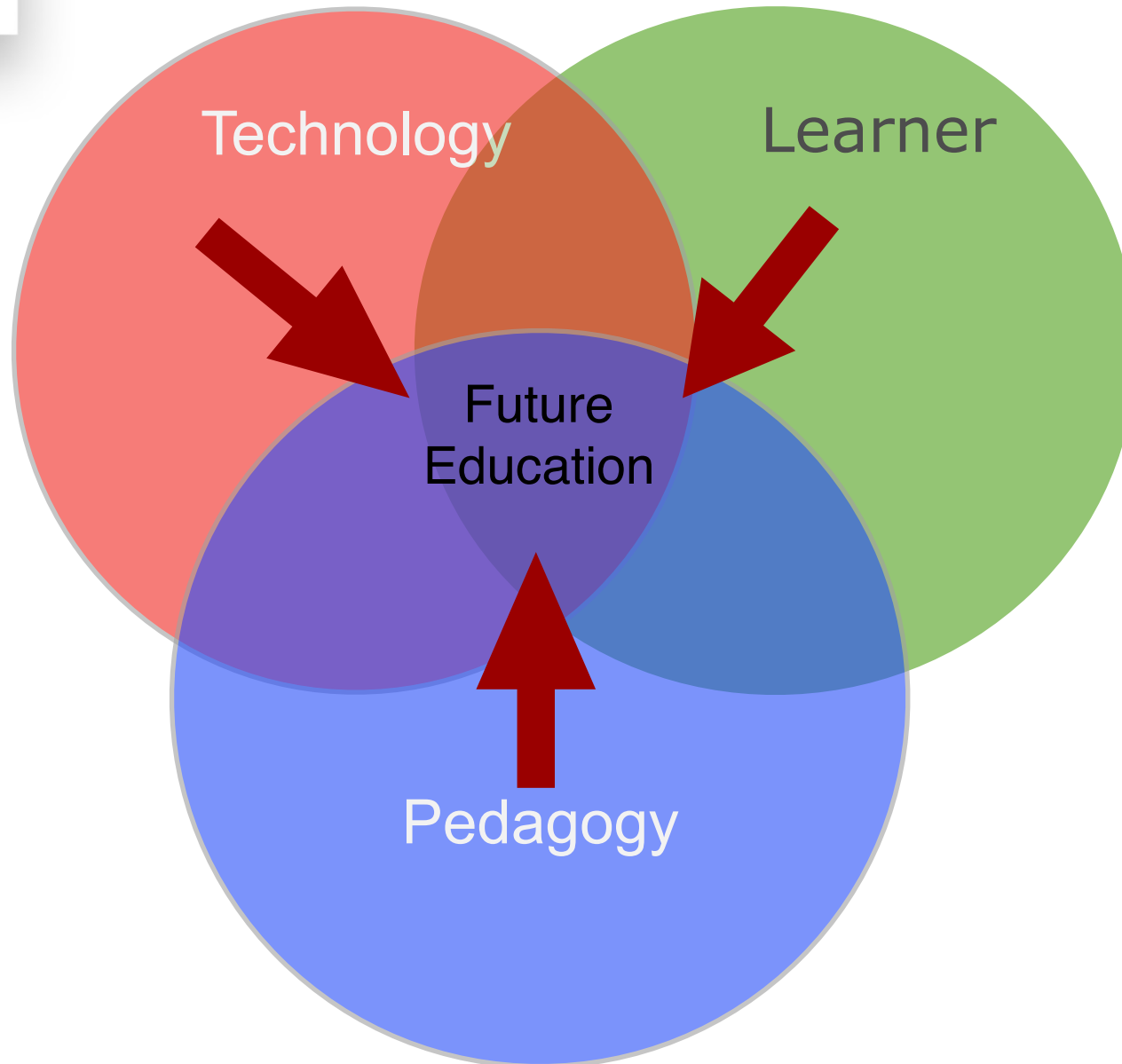


Teaching Practice in Computing and Engineering

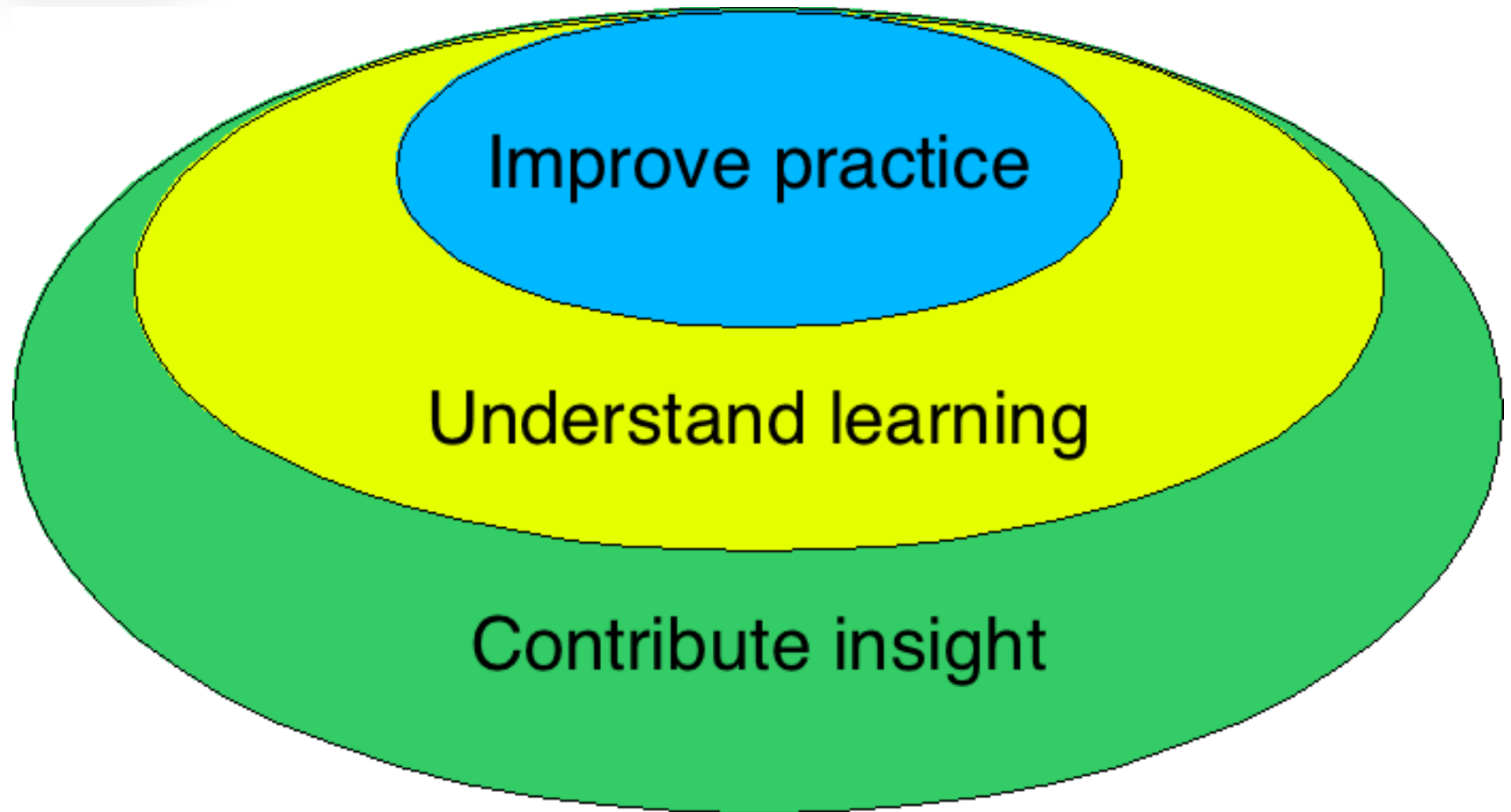
Intuition

Evidence

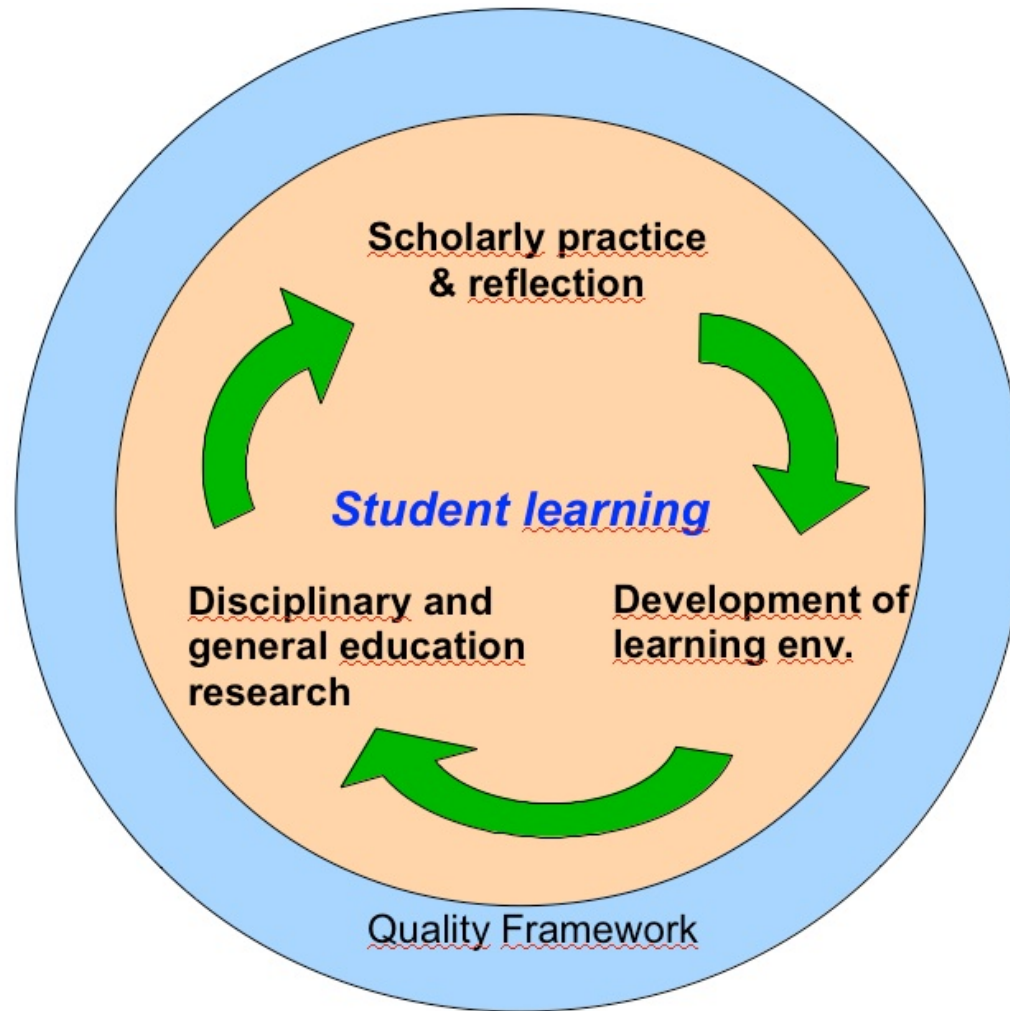
The education of the future



Research Goals



Managing Systematic Change





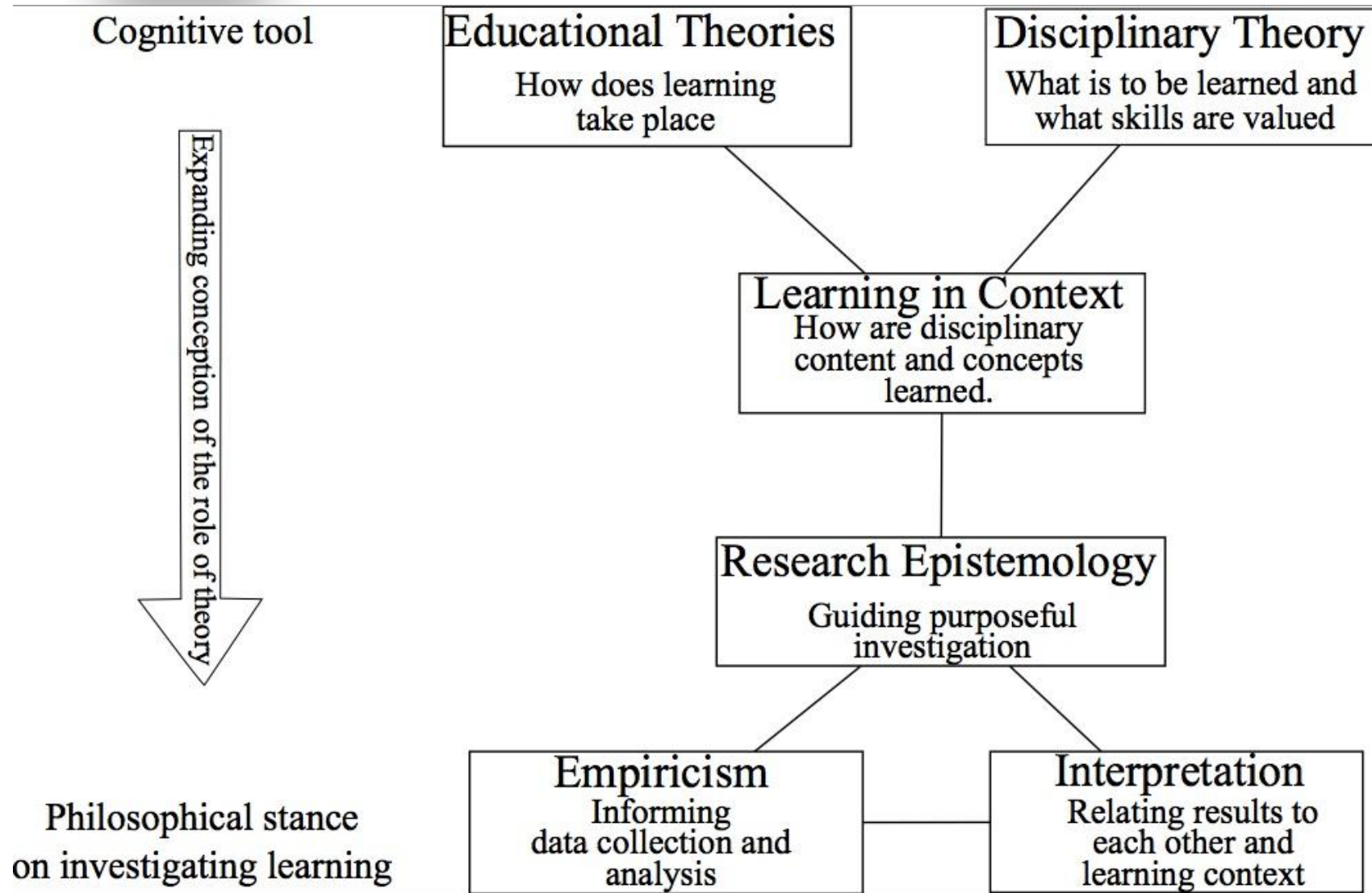
Group Discussion - systematic innovation

Aspect of System to be Changed	Individuals	<p>I. Disseminating: CURRICULUM & PEDAGOGY</p> <p>Change Agent Role: Tell/Teach individuals about new teaching conceptions and/or practices and encourage their use.</p> <p><i>Diffusion Implementation</i></p>	<p>II. Developing: REFLECTIVE TEACHERS</p> <p>Change Agent Role: Encourage/Support individuals to develop new teaching conceptions and/or practices.</p> <p><i>Scholarly Teaching Faculty Learning Communities</i></p>
	Environments and Structures	<p>III. Enacting: POLICY</p> <p>Change Agent Role: Enact new environmental features that Require/Encourage new teaching conceptions and/or practices.</p> <p><i>Quality Assurance Organizational Development</i></p>	<p>IV. Developing: SHARED VISION</p> <p>Change Agent Role: Empower/Support stakeholders to collectively develop new environmental features that encourage new teaching conceptions and/or practices.</p> <p><i>Learning Organizations Complexity Leadership</i></p>
		Prescribed	Emergent
Intended Outcome			

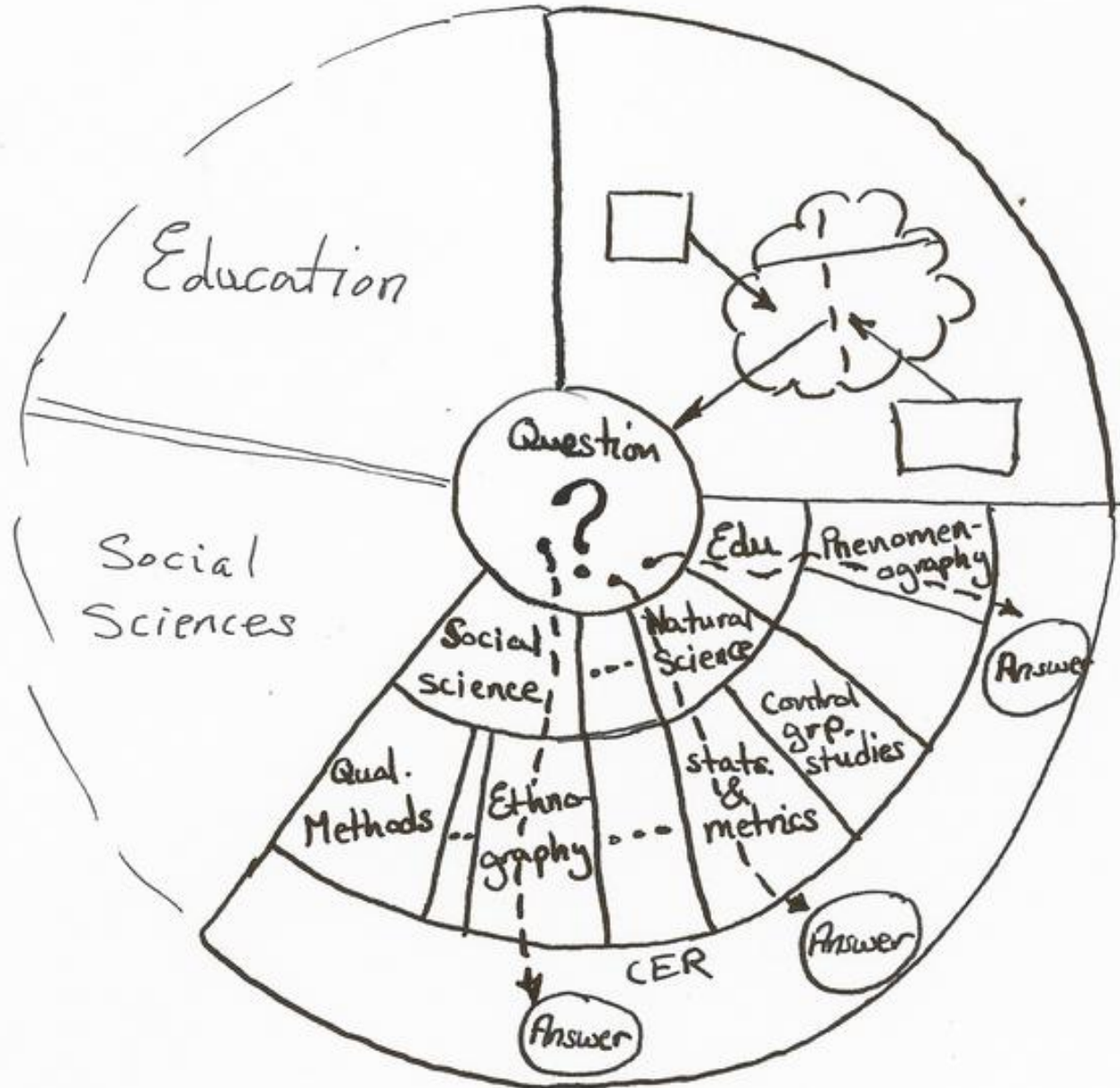


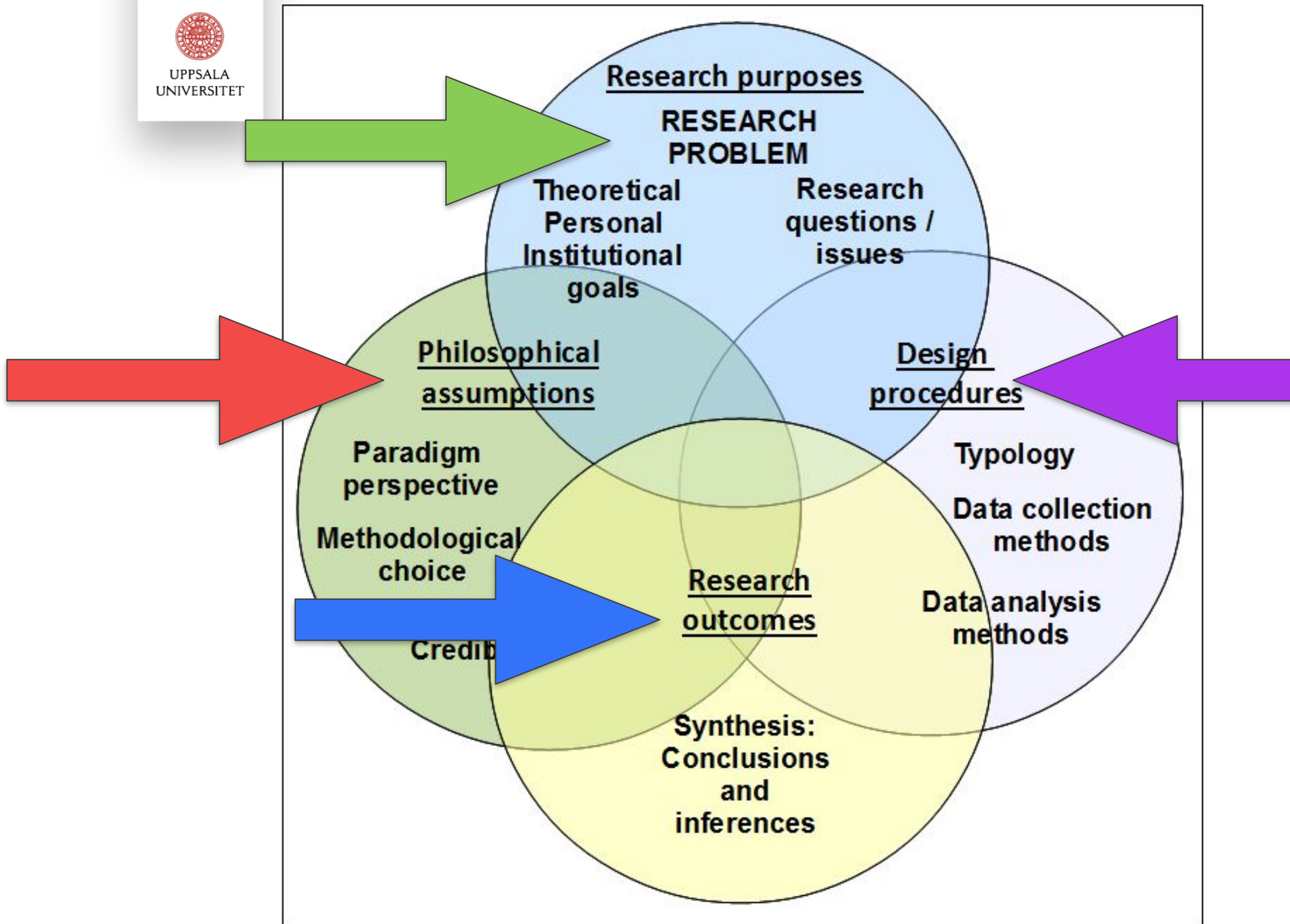
Case Study 1

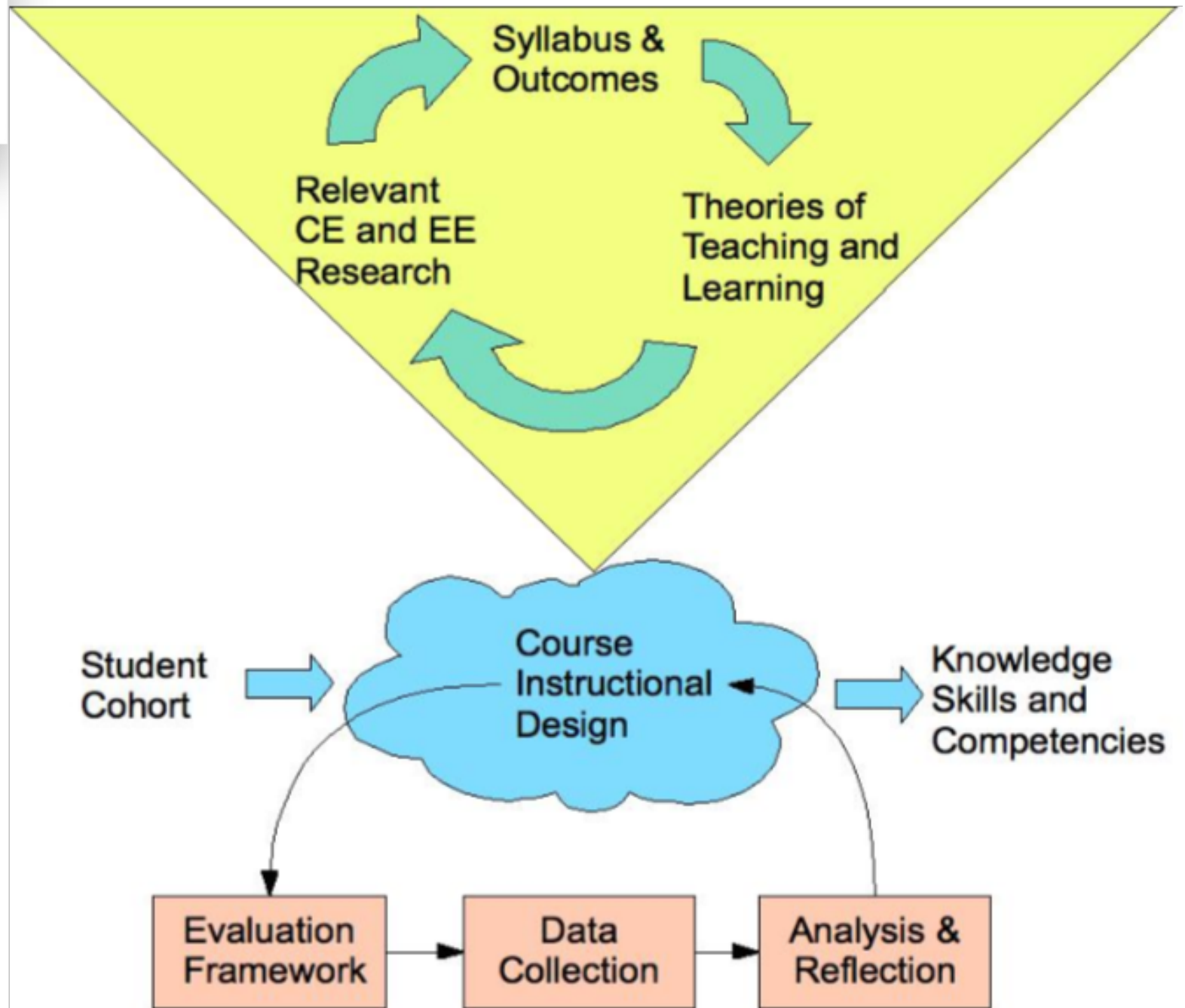
Designing high quality research



How?







Case Study 2

Improving student learning of programming

Approach

- Re-structuring programming instruction
- Focus on the role of experience, and practice in the development of professional competence.
- Utilise current research in the domain, and observations from professional practice.

Enhancing learning

- Key results from learning and teaching research
 - research on motivation and activated learners
{e.g. Dweck:1999}
 - deep vs surface learning
{Trigwell 1999, Biggs 1987}
 - threshold concepts {Meyer 2005} and conceptual change {Entwistle 2007}

Relevant CE and EE research

- Importance of helping students to appreciate tacit aspects of expert knowledge and behaviour. {Mancy: 2006}
- Self efficacy, creativity, and motivation {Williams: 2001, McDowell03, Jacobson:2008}
- Research on the learning of programming, {Soloway 1986, Palumbo 1990, Pattis 1993, Robins et. al. 2003, Howe 2004, Eckerdal 2005, Lister 2006, Pears 2007}

Enhancing learning

Revealing tacit knowledge

Interactive code development in lecture environment

Leveraging research on self efficacy and self theories

Resulting in a peer interaction approach to practical work

Motivation and engagement

Enhance opportunities for self determination and creativity.

Allow student groups to define significant aspects of their own assignments.

Assessing for learning

Final grade: Fail, Pass, Pass with credit, Pass with distinction

Grade based on:

- Pass in 10 of 13 supervised programming sessions,
- Final grade determined by a project assessment,
 - 30 minute group oral exam
 - 15 minute individual oral exam
 - Qualitative criteria used to determine, final grade.



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Questions?