

Why and how to categorize computing education research literature?

- A tool to find relevant new research topics

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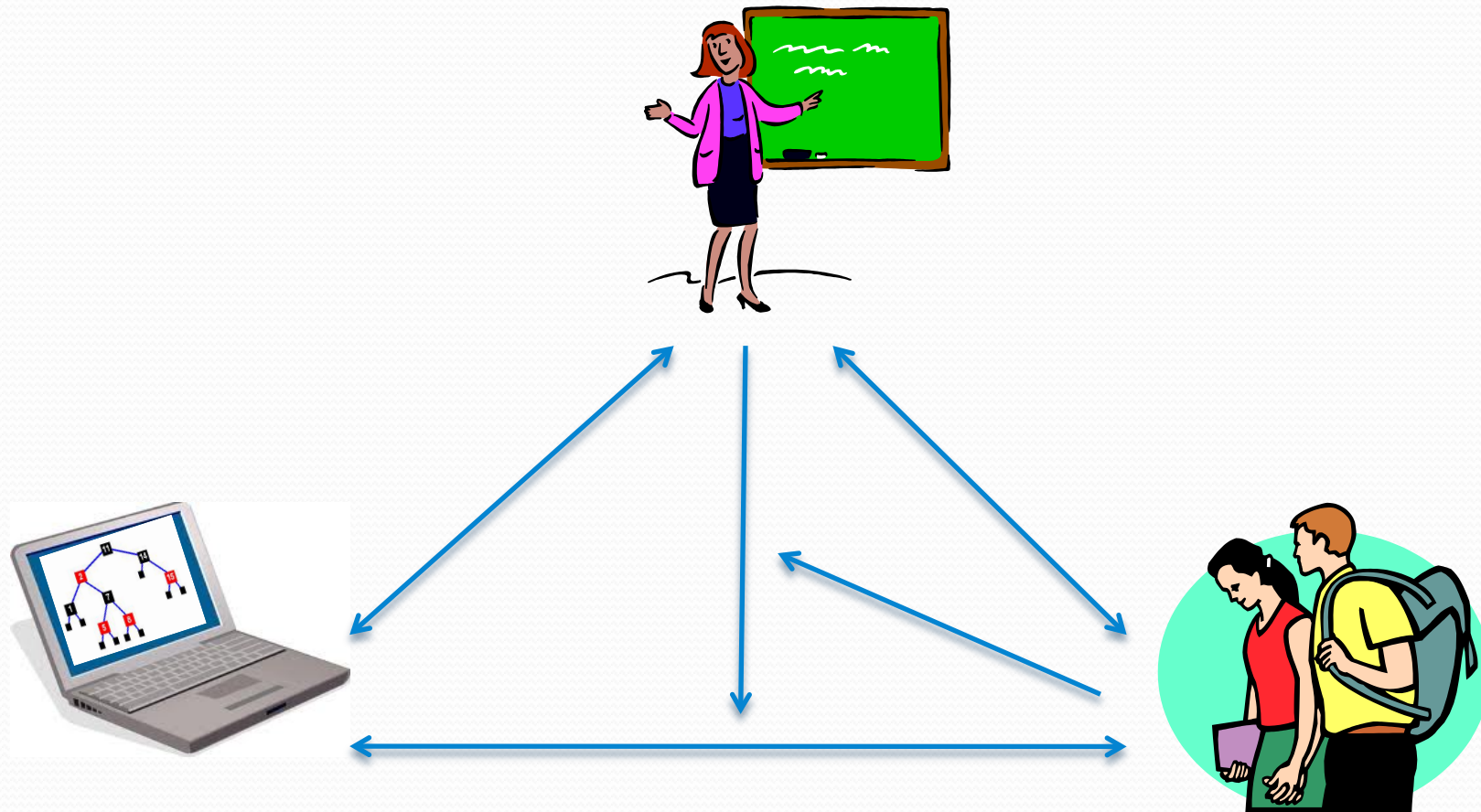
Existing categorisation systems

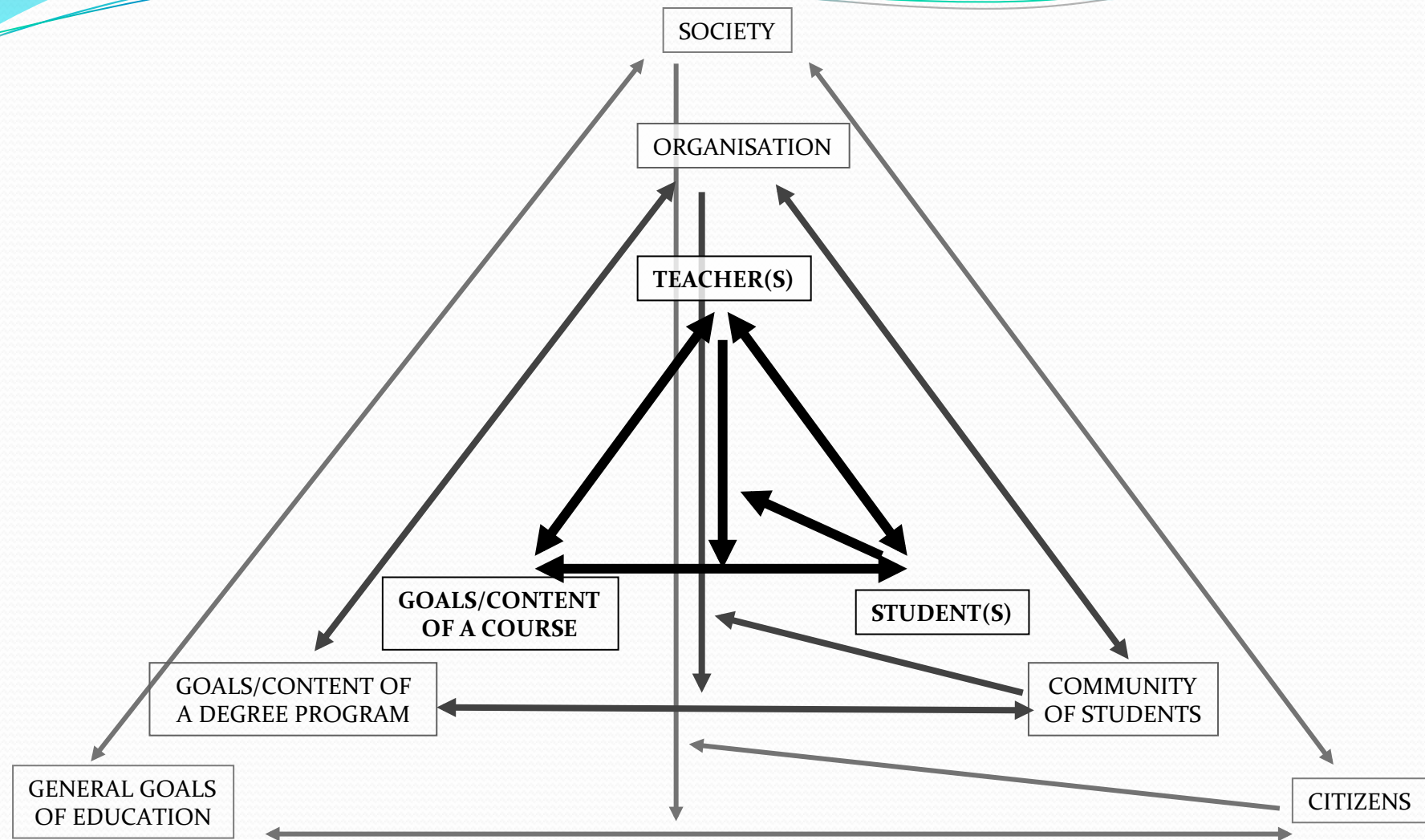
- There are several categorisation systems that are based on existing research (data driven). They focus on:
 - Topic (e.g. Fincher and Petre 2004, Simon 2007)
 - Methodology (Malmi et al. 2010; Glass et al. 2004, Randolph et al. 2008)
 - Reference discipline (Glass et al. 2004)
 - Content (Simon 2007; Valentine 2004)
 - Significance (Pears et al. 2005)

Didactic focus based categorisation system for existing computing educational research

- This categorisation system is based on **didactic focus** of the educational research. It differs from the existing systems:
 - It is theory based
 - It enables analysis not only on what has been studied but also to **discover less studied areas** → possible new research questions

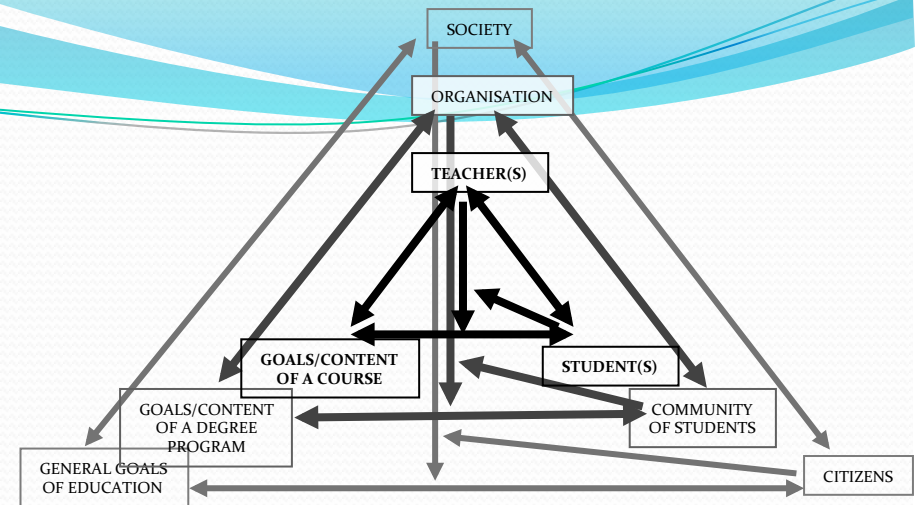
Didactic triangle (Johann Friedrich Herbart)





8 categories

1. *Goals and content*
2. *Student(s)/community of students/citizens*
3. *Teacher(s)/organisation/society*
4. *Student(s)/community of students/citizen – teacher(s)/ organisation/ society*
5. *Student(s)/community of students/citizens – goals/content*
 - 5.1 *The understanding and attitude*
 - 5.2 *The actions (e.g. studying)*
 - 5.3 *The results of the action*
6. *Teacher(s)/organisation/society – goals/content*
7. *Teacher(s)/organisation/society – studying*
 - 7.1 *The conceptions of teacher(s)/organisation/society of students' understanding/attitude on goals/content*
 - 7.2 *The conceptions of teacher(s)/organisation/society of students' actions towards achieving goals*
 - 7.3 *Pedagogical activities*
8. *Student(s)/community of students/citizens – teacher's/ organisation's/society's pedagogical means to enhance learning*



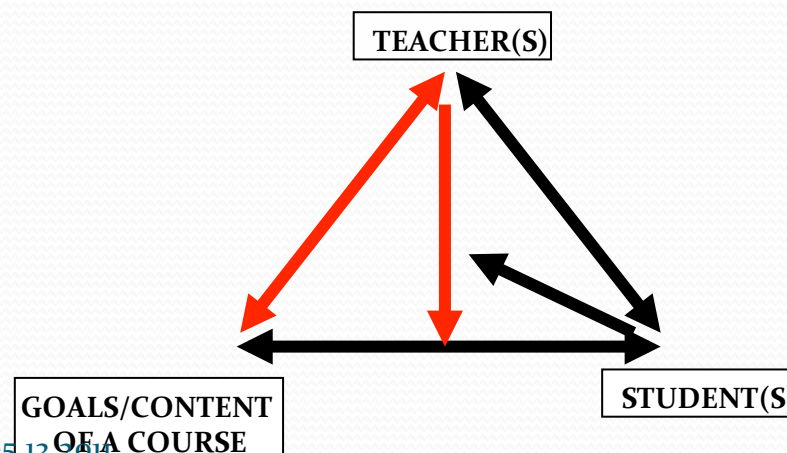


Example 1: Which aspects of the instructional process ICER community has studied/overlooked?

- Categorisation of all instructional process related research papers published in ICER during the years 2005 – 2009 (67/72)

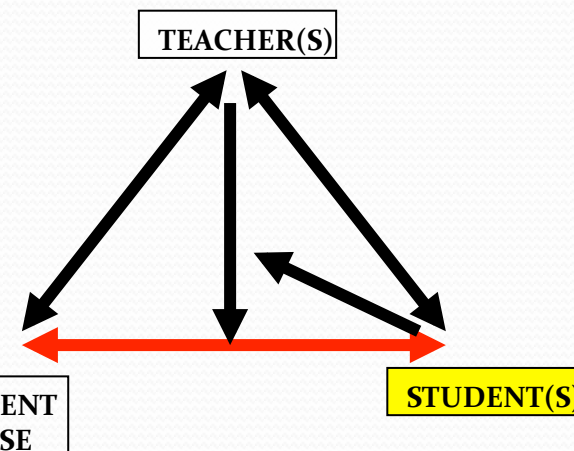
Schulte, C. & Bennedsen, J. 2006. What do Teachers Teach in Introductory Programming?

- Teachers' opinion about what should be taught in a course, what they believe is important to teach → Category 6
- What students find most difficult (according to their teachers) → Category 7.2
- What teachers teach and how/on what level → Category 7.3



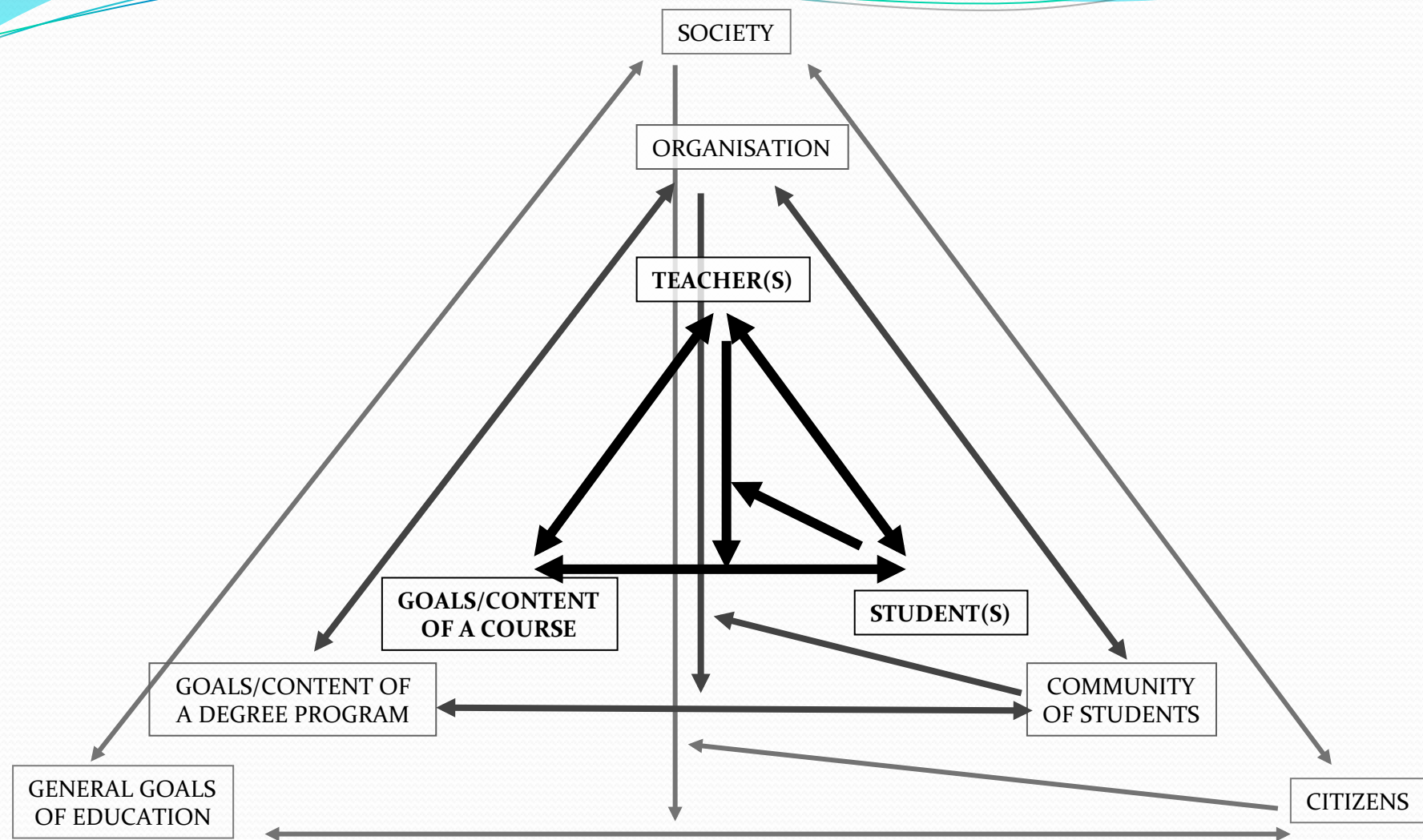
Bennedsen, J. & Caspersen, M. E. 2005. An Investigation of Potential Success Factors for an Introductory Model-Driven Programming Course.

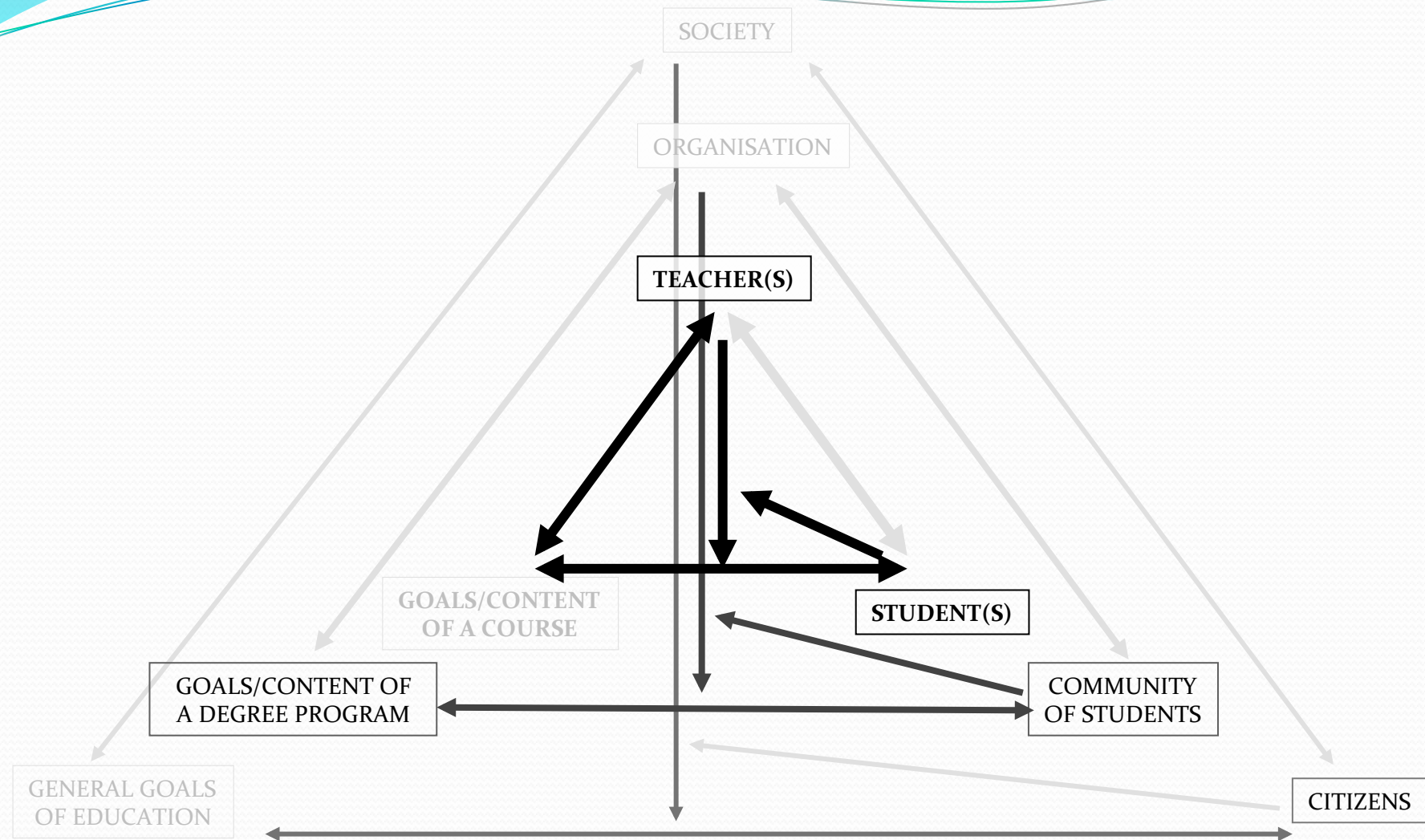
- Study focuses e.g., on students' characteristics (gender) and knowledge/ability (math ability) → Category 2
- Success in a CS1 course → Category 5.3



ICER papers categorised by all didactic foci found in the paper

Category	Course level	Organisation level	Society level
1 Goals and content	-	2	-
2 Student(s)/community of students/ citizens	7	5	1
3 Teacher(s)/organisation/society	2	-	-
4 Student(s)/community of students/ citizen – teacher(s)/ organisation/ society	-	-	-
5.1 The understanding of and attitude about goals and content	13	8	1
5.2 The actions of students	15	2	1
5.3 The results of students' action	12	2	1
6 Teacher(s)/organisation/society – goals/content	2	-	-
7.1 The conceptions of teacher(s)/ organisation/society of students' understanding/attitude on goals/ content	-	-	-
7.2 The conceptions of teacher(s)/ organisation/society of students' actions towards achieving goals	1	1	-
7.3 Pedagogical activities	18	3	2
8 Student(s)/community of students/ citizens – teacher's/ organisation's/ society's pedagogical means to enhance learning	7	1	-







Example 2: Analysis on papers on specific topic

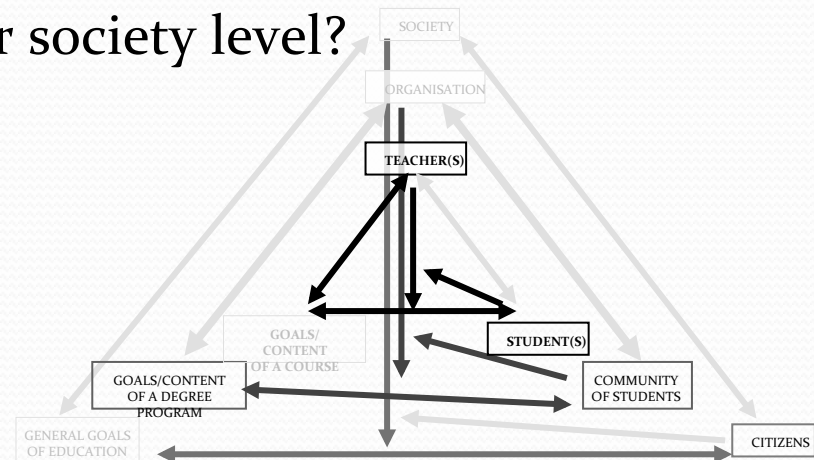
- Categorisation of papers that aimed at studying factors, which predict or explain students' success in a CS1 course.
 - Pool of 13 papers that we found from CER-related conference proceedings, working group reports, and journals. All papers were published within the last decade.

An example of the categorised studies on factors that predicted or explained students' success in a CS1 course

Ref.	Didactic foci of the paper (all studies were done at the course level)			
Bennedsen, J. and Caspersen, M. 2005	2	-	-	5.3
Byrne, P. and Lyons, G. 2001	2	-	-	5.3
Pillay, N. and Jugoo. 2005	2	-	-	5.3
Pioro, B.T. 2006	2	-	-	5.3
Mancy, R. and Reid, N. 2004	2	-	-	5.3
Ramalingam, V., D. Et al. 2004	2	5.1 (self-efficacy)	-	5.3
Rountree, N., et al. 2004	2	5.1 (perceptions of difficulty)	-	5.3
Wiedenbeck, S. 2005	2	5.1 (self-efficacy)	-	5.3
Bergin, S. and Reilly, R. 2006	2	5.1 (self-efficacy)	5.2 (game playing)	5.3
Bergin, S., Reilly, R. and Traynor, D. 2005	2	5.1 (task value)	5.2 (self-reg. learning)	5.3
Cantwell Wilson, B. 2002	2	5.1 (comfort level)	5.2 (work style)	5.3
Simon, et al. 2006	2	5.1 (attitudes to studying)	5.2 (deep and surface approach to learning)	5.3
Ventura, P.R. 2005	2	5.1 (comfort level)	5.2 (hours of work)	5.3

To conclude

- The benefit of didactic focus based categorisation system are:
 - Helps to discern different aspects and levels of the instructional process and how they have been studied
 - helps to identify overlooked research areas
 - E.g., is there a need for studies that look at the instructional process from organisation or society level?



THANK YOU ☺

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