

Benefits and Challenges of Interdisciplinary Courses in Computer Science

1. Background

- “**Interdisciplinarity** is typically characterized by integration of information, data, methods, tools, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge.” (Klein, 2015, p. 15)
- “Multidisciplinarity does not synthesize or integrate the various elements of disciplinary knowledge into a cohesive whole”. (Lattuca & Knight, 2010, p. 3)

By understanding students’ experiences, faculty staff can:

- better design courses centered around interdisciplinarity
- understand how students struggle with interdisciplinary courses and
- provide support with their challenges
- get the most out of the benefits of interdisciplinarity

Research question

What benefits and challenges do computer science students experience, when participating in interdisciplinary courses?

Benefits and Challenges of Interdisciplinarity

- Benefit → something that could improve the students’ skills or affect their future in a positive way
- Challenge → a circumstance that might cause a student to struggle or something that might test their skills

Not necessarily opposites!

Common benefits:

- Improve problem solving skills
- Innovation
- Personal growth
- Positive career impact

Common challenges (Richter and Paretto, 2009):

- Negative Relatedness → inability to connect interdisciplinary knowledge with personal background
- Negative Perspective → struggling to see a problem from different perspectives

An interdisciplinary environment in CS is also important for the development of problem solving and teamwork.

Transformative learning theory: How certain experiences in adult education shape individuals (Mezirow, 1991).

“A disorienting dilemma is an experience which does not fit with one’s existing belief system” (Feng et al., 2024, p. 3) → experienced within interdisciplinarity

Research gap

Research is lacking on interdisciplinarity in CS education → especially research on students’ experiences

Why study student experiences? → in-depth understanding of the students

2. Method

7 semi-structured interviews on CSE students

Semi-structured → flexibility

2nd and 3rd year students → most interdisciplinary courses

Avg interview time: 45 min

Data analysis with ATLAS.ti

Reflexive Thematic Analysis (Braun & Clarke, 2021)

1. Open Coding
2. Review Codes
3. Deductive Coding (relate codes to existing literature)

Axial coding → Define themes

3. Results

Broadened Perspectives as Opportunities and Struggles

- Students experienced a change of perspective within interdisciplinary courses

- Benefits for academic life and career
- Challenges were stepping outside of their comfort zone, collaborating with students from other disciplines

Student quotes

“A really important benefit is when you have the experience of thinking one thing and then speaking to another person who’s thinking something completely different.”

“It was difficult to know what things were more or less important to learn.”

Communicating Across Disciplines as Opportunities and Struggles

- How students were able to communicate and present their ideas within an interdisciplinary environment

- Communication and teamwork are important skills for their future
- Also, understanding people from different disciplines and being a good listener

- Challenges were lack of shared knowledge, poor communication

Student quotes

“The underlying skill of communication, that’s always necessary for interdisciplinary thinking, is always going to be applied, no matter what I do.”

“Anything I said, related to programming or tech, even tech related stuff, I had to tone down.”

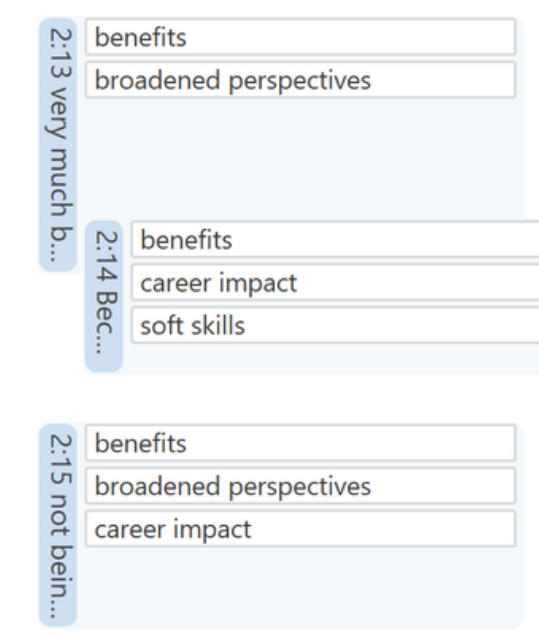


Figure 1: Example of ATLAS.ti deductive coding

	benefits 64	challenges 32
broadened perspectives: considering others' perspectives	7	2
broadened perspectives: innovative solutions	6	
broadened perspectives: learn about other disciplines	3	1
broadened perspectives: perspective shift	7	2
broadened perspectives: stepping out of comfort zone	1	6
broadened perspectives: thinking outside the box	3	3
motivation to make a real-world impact	3	

Figure 2: Co-occurrence of 'broadened perspectives' codes with 'benefits' and 'challenges'

	benefits 64	challenges 32
ability to communicate with people from different backgrounds	6	2
career impact: ability to present in future career	3	
career impact: collaboration with colleagues from different disciplines	2	
career impact: communicating with clients	7	1
career impact: communication with managers	4	
lack of shared knowledge	2	5
social skills: better listener	4	
social skills: communication	10	1
social skills: leadership	2	1
social skills: poor communication	1	1
social skills: presentation skills	6	4
social skills: teamwork	3	
social skills: understanding people better	2	2
work division based on backgrounds	4	

Figure 3: Co-occurrence of 'communicating across disciplines' codes with 'benefits' and 'challenges'

4. Discussion

- Broadened Perspectives as Struggles relates to disorienting dilemmas.
- A disorienting dilemma is a broadened perspective
- It is a struggle because it challenges the students’ core views
- Theme 1 goes in-depth of the ways the students experience disorienting dilemmas, and the benefits from such an experience

- Social skills are important for teamwork, they can be developed in an interdisciplinary environment
- Theme 2 shows further benefits and the importance of social skills, and being able to communicate.
- Through interdisciplinarity, students can become better listeners and be willing to understand other disciplines and people better.

Limitations

- Too few participants because of the time constraints
- Only interviewed students from TU Delft and one program

5. Conclusion

Through interdisciplinarity:

- Students experience broadened perspectives.
- Students reported they learned to communicate and present their ideas.

Recommendations

- Interview students from different universities.
- Interview master’s students too.
- Conduct quantitative research to generalize the findings.

6. References

- Braun, V., & Clarke, V. (2021, November). Thematic analysis. Sage Publications Limited.
- Feng, X., Sundman, J., Aarnio, H., Taka, M., Keskinen, M., & Varis, O. (2025). Towards transformative learning: students’ disorienting dilemmas and coping strategies in interdisciplinary problem-based learning. *European Journal of Engineering Education*, 50(2), 428-450.
- Klein, J. T. (2015). *Interdisciplining digital humanities*. In University of Michigan Press eBooks.
- Lattuca, L., & Knight, D. (2010, June). In the eye of the beholder: Defining and studying interdisciplinarity in engineering education. *In 2010 Annual Conference & Exposition* (pp. 15-710.3).
- Mezirow, J. (1991). *Transformative dimensions of adult learning* (Vol. 350, pp. 94104-1310). San Francisco, CA: Jossey-bass.
- Richter, D. M., & Paretto, M. C. (2009). Identifying barriers to and outcomes of interdisciplinarity in the engineering classroom. *European Journal of Engineering Education*, 34(1), 29-45.