Challenges of Requirements Engineering Education in Higher Education: Insights from an Interview Study with Educators in Switzerland*

Anthea Moravánszky

University of Szeged, Doctoral School of Education, Hungary & University of Applied Sciences of the Grisons, Pulvermühlestrasse 57, 7000 Chur, Switzerland

Abstract

This study explores the challenges of teaching Requirements Engineering (RE) in Swiss higher education, addressing whether issues identified in the literature—such as the gap between theory and practice, struggles with abstraction, and limited opportunities for hands-on learning—persist in this context. Through interviews with 25 educators responsible for 33 RE-related courses, the research highlights key challenges, including students' difficulties with abstraction, modeling, and interdisciplinary collaboration. Educators employ instructional approaches like project-based and case-based learning, role-play, and flipped classroom methods to provide practical experiences and bridge the gap between academic learning and industry needs. However, resource constraints, large class sizes, and curriculum limitations continue to hinder the implementation of innovative approaches. Emerging challenges, such as integrating AI technologies into RE curricula, highlight the need for curriculum adjustments to reflect evolving industry trends. This research provides a comprehensive view of the RE education landscape in Switzerland and lays the foundation for future studies to address these persistent and emerging challenges.

Keywords

Requirements Engineering Education (REE), Challenges, Higher Education

1. Introduction and Motivation

The evolution of Software Engineering (SE) to manage increasingly complex systems led to the emergence of Requirements Engineering (RE) as a distinct discipline [1], elevating the importance of research on RE education (REE) to prepare students for evolving industry demands [2]. REE must train students to specify requirements, resolve conflicts, and address socio-technical challenges, blending theoretical and practical skills [3]. Educators in higher education (HE) face the dual challenge of teaching theoretical knowledge while fostering practical decision-making skills [4]. Curricula must balance theory with hands-on practice to help students intuitively select appropriate techniques [2].

A key issue in REE is the overemphasis on theory at the expense of practical applications, making RE less engaging and more challenging for students to understand [5]. Traditional lecture-based methods often fail to address the hands-on aspects of RE, leaving students underprepared for professional practice [2, 6]. The extensive scope of RE curricula also requires educators and students to prioritize breadth over depth [7].

Literature highlights a persistent gap between theoretical knowledge and practical application. Students often struggle with modeling requirements and creating specification documents—essential RE skills—leading to a misalignment between industry needs and academic offerings [5, 6]. A lack of

* *In: A. Hess, A. Susi, E. C. Groen, M. Ruiz, M. Abbas, F. B. Aydemir, M. Daneva, R. Guizzardi, J. Gulden, A. Herrmann, J. Horkoff, S. Kopczyńska, P. Mennig, M. Oriol Hilari, E. Paja, A. Perini, A. Rachmann, K. Schneider, L. Semini, P. Spoletini, A. Vogelsang. Joint Proceedings of REFSQ-2025 Workshops, Doctoral Symposium, Posters \& Tools Track, and Education and Training Track. Co-located with REFSQ 2025. Barcelona, Spain, April 9, 2025*

anthea.moravanszky@fhgr.ch (A. Moravánszky)

0009-0001-3055-6689 (A. Moravánszky)

industrial project experience further impacts their readiness for real-world challenges [5]. Additionally, the rapid pace of technological change complicates the relevance of curricula as students struggle to distinguish enduring principles from transient trends [6, 7, 8]. The socio-technical nature of RE adds complexity, as students often lack organizational experience, interdisciplinary collaboration skills, and comfort with ambiguity—all critical for RE tasks [9, 10]. Helping students embrace uncertainty and develop exploratory mindsets is a notable challenge for RE educators [10].

These issues point to the need for a more practice-oriented approach in RE education, incorporating realistic examples, industrial projects, and role-play to bridge the gap between academic learning and professional practice. However, little literature exists on how an entire country approaches RE education. A preliminary study from the US [6] found that RE is often briefly covered within introductory software engineering courses rather than as a standalone subject, leaving students with limited exposure to its principles and practices. This study also noted a misalignment between academic content and industry needs, particularly in critical competencies like analytical thinking and communication skills.

Against this backdrop, our study aims (1) to explore whether educators are aware of the challenges identified in the literature and (2) how they address them in their teaching. Additionally, we seek to (3) identify new challenges that have not yet been addressed in the literature. Based on interviews with Swiss educators, we aim to examine potential differences between universities (UNIs) and universities of applied sciences (UAS), particularly given their known stronger focus on practical education. Although the limited sample size from interviews means we cannot draw statistically significant conclusions, this research provides a comprehensive view of the REE landscape in a country renowned for its strong emphasis on vocational training.

2. Interview Participants and Data Analysis Process

Interview participants were selected using purposive and snowball sampling [12], targeting educators such as lecturers, program leaders, and module coordinators responsible for RE curricula. The goal was to include at least one participant from each identified RE course (N=33). A total of 25 interviews were conducted. Some educators were responsible for more than one course. The distribution of educators and courses across UNIs and UAS is shown in Table 1.

Table 1
Identified courses and interviewed RE educators distributed by HEI type

HEI type	Interviewed Educators (N=25)	Identified RE courses (N=33)			
		Bachelor & Master Courses (N=24)		Certificate of Advanced Studies (CAS) (N=9)	
		Dedicated RE courses	Courses with RE parts	RE CAS	CAS with RE parts
UNIs	8	13	8	-	1
UAS	17	20	3	7	1

The interviews have been recorded and transcribed. A semi-automatic approach was used for transcription. First, the recordings were transcribed using the MAXQDA AI-powered transcription service, which operates on a credit-based system. All transcriptions and recordings were manually reviewed and refined in the second step. Quality control measures were implemented in the third step, with a second researcher conducting random checks of the recordings against the transcriptions. The coding was done based on a coding memo. As a first validation measure, the AI coding function of MAXQDA was used to compare the initial coder's work with the coding identified by MAXQDA's AI, checking for any discrepancies in the coding memos.

3. Identified Challenges

Six main sub-codes were identified by analyzing educators' experiences shared in the interview study (see Figure 1, code-subcode-segment model). These include the cognitive and practical struggles students face with modeling and abstraction, students' difficulties with soft skills as an important aspect of RE, the ongoing need to adapt to evolving practices in the field—particularly in the age of Artificial Intelligence—and the challenges educators encounter when teaching RE to heterogeneous student classes with diverse backgrounds and levels of experience, as well as other curricular challenges. Within modeling and abstraction, there have been code overlaps. Orange-colored segments represent statements from UAS educators, while blue-colored segments are from UNI educators. Aside from the smallest cluster, "Agility," all sub-code clusters have representations from both HEI types.

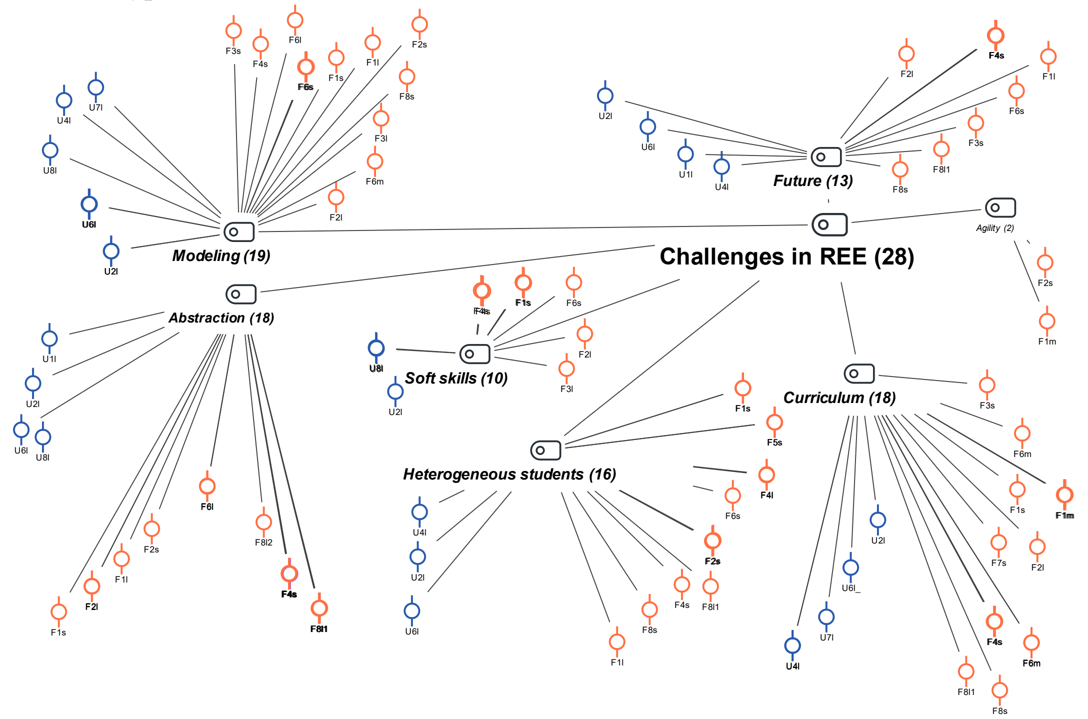

Figure 1: Code-Subcode-Segment Model of "Challenges in REE

3.1. Abstraction and Modeling

The interview study confirmed that one of the key challenges students face in RE is navigating different levels of abstraction effectively. As one lecturer noted, "It is a relatively abstract discipline" (F4s), requiring students to move beyond technical details and think conceptually. Many students struggle to step back and focus on the bigger picture, often getting "lost in detail" (F8l2). This difficulty extends to shifting between high-level customer requirements and granular specifications, with students finding it challenging to document and understand these relationships (F4s). The lack of practical experience further deepens these challenges, making the abstract nature of RE seem daunting and even "esoteric" to some (F6l). Modeling, a core aspect of RE, adds to the complexity. Students often struggle with basic tasks like constructing context diagrams or distinguishing between a class and an attribute (F6s; F3l). As concepts grow more advanced—such as include-extend relationships or data modeling—these difficulties become more pronounced (F3l; U6l; F2s). Master students have fewer issues with it than bachelor students.

Furthermore, the student's background plays a role in their aptitude for modeling. Those with a more substantial technical or computer science foundation tend to grasp the concepts more readily, while those from non-technical backgrounds often find the structured, analytical thinking required for modeling to be a considerable hurdle (Edu_F3l; Edu_U6l). One educator (Edu_F6m) assumes that the shift in student preferences and expectations, as highlighted in the interviews, further compounds the modeling challenge. Today's learners are increasingly drawn to web-based, rapid prototyping solutions, often prioritizing speed over depth of understanding. This mindset can make it challenging to instill the patience and attention to detail required for effective modeling.

Despite these difficulties, the value of modeling in requirements engineering and software development remains undisputed (Edu_F6s; F1s; F2l). Conceptual modeling, in particular, is recognized as a crucial skill, enabling the abstraction of reality and the precise specification of requirements (Edu_F3l; Edu_F2s).

3.2. Dealing with Heterogeneous Student Classes

RE educators must deal with students with varying prior experience and knowledge (F2l; F4l). Most students studying at a UAS in Switzerland come from a previous apprenticeship and not directly from a gymnasium. Therefore, primarily within RE Bachelor courses or Certificate of Advanced Studies (CAS), the students come from diverse professional backgrounds, such as healthcare, administration, or finance, and sometimes lack the necessary technical and analytical skills required for RE. This creates a situation where the instructor has to cater to students with vastly different levels of understanding, making it difficult to find the right pace and depth of instruction.

Furthermore, the interview segments highlight the issue of students' familiarity with project management and process management concepts (F8s). While some students have already been exposed to these topics positively or negatively, others may be completely new to them. This discrepancy can hinder the student's ability to grasp the fundamental principles of RE, which often rely on a solid understanding of project and process management.

Another challenge arises from the students' varying technical proficiency (F2s) levels. Some may have extensive programming experience, while others struggle with basic computer skills. This diversity can make it challenging for instructors to design and deliver course content that effectively addresses all students' needs, particularly regarding system architecture and software design. The interview segments also suggest that the heterogeneous nature of the student groups can lead to difficulties in fostering collaborative learning and group dynamics (F8s; U2l).

3.3. Keeping up with evolving practices

Artificial Intelligence (AI) has been a topic of interest in the RE community for some time, with the AI in RE workshop being organized annually since 2014. Effectively integrating AI in REE has gained increasing attention in recent RE conferences [13]. Educators recognize the transformative potential of advanced AI technologies—particularly Large Language Models (LLMs) and generative AI—in RE education. Some RE curricula have already begun integrating AI-driven tools for tasks such as writing requirements and modeling UML class diagrams. Currently, five out of 33 RE courses include these AI-assisted topics, while three additional courses plan to incorporate them in the upcoming academic year. This adaptation may involve introducing new topics, such as prompt engineering (F4s; F8l; F8s) and rethinking RE practices to leverage LLM capabilities (F3s; U6l). Educators also stress the importance of addressing ethical, reliability, and compliance concerns related to AI-generated requirements (F1l; U5l).

However, some educators express uncertainty about effectively integrating AI tools into RE programs (F2l; U6l). They also question how the role of the Requirements Engineer might evolve as AI systems become increasingly capable of generating and refining requirements, potentially shifting responsibilities to roles like Data Scientists or Prompt Engineers (F4s; F3s).

Ultimately, the future of REE will require a balanced approach that embraces AI-powered tools' transformative potential while maintaining the discipline's human aspects (F2l; U6l; F6s). Finding the right balance between AI-supported and human-centric RE practices will be a key focus for RE educators.

3.4. Curricular Challenges

Selecting the essential RE topics and fitting them into a course format is a well-known challenge for educators. This is particularly difficult when RE is not a standalone course—common in approximately 40% of the identified courses—but is integrated into broader Software Engineering curricula instead. One respondent noted, "The time that is now planned for requirements engineering is very limited" (U6l).

Twenty of the 33 courses align their curriculum with the syllabi of IREB's CPRE FL, as it is often requested in RE job ads in Switzerland [14]. However, the breadth of RE, including elicitation, validation, management, and documentation, often exceeds the allocated time. One educator explained, "I do not have time to explain in detail all the requirements specification activities" (U4l).

Especially in CAS programs, curriculum design is sometimes influenced by practical considerations, including participant interest and market demand. As a result, emerging "hot topics"—such as the growing attention around AI—can shape the inclusion of new content. With the integration of new topics, a critical question arises: What should be replaced to accommodate the integration of new topics?

Class sizes exacerbate these challenges. While CAS programs often have smaller groups, bachelor-level courses can have over 50 students, sometimes up to 300. Larger classes make implementing effective instructional approaches and ensuring team collaboration harder. As one respondent remarked, "The teams are also larger... synchronization is a big problem" (F6m). Maintaining interactivity becomes increasingly challenging as class sizes grow, with one educator stating, "With 22 students, it is already starting to move more towards a lecture" (F4s).

4. Solutional Approaches

Our interviewed Educators are well aware of the challenges in REE education highlighted in literature in the last decade. These challenges include difficulties in abstraction and modeling, the gap between theory and practice, and the need for active student engagement. Rather than being deterred by these challenges, educators have actively addressed them by developing tailored solutions to enhance RE learning.

They emphasize the importance of practical approaches to teaching RE. Strategies include real-world case studies, project-based learning, leveraging industry experience, and innovative teaching methods like the flipped classroom. These methods aim to provide students with hands-on experience, enabling them to grasp RE concepts more effectively. However, implementing such approaches often depends on institutional resources, posing challenges for some educators.

Real-world case studies and semester-long group projects are widely used to expose students to practical RE challenges. These projects often involve analyzing company needs, modeling processes, and proposing requirements specifications. Educators provide coaching, peer review, and structured feedback (F6s) to support these efforts. One educator described a business game designed to simulate workplace experiences, helping students prepare for professional environments (U8l).

Most educators can draw from their own industry experience to make RE concepts tangible. Examples from real-world scenarios help students connect theoretical concepts with practical applications (F4l). Some educators use team teaching and teaching assistants to expand coaching and feedback resources.

Several educators have adopted the flipped classroom approach to maximize in-class time for interactive activities, quizzes, and discussions. This method shifts foundational learning to self-study, enabling more active engagement during class sessions. Additionally, one educator has developed simplified modeling languages to address modeling challenges, combining elements from existing notations to lower student barriers (U8l).

Two educators use role-play to simulate realistic stakeholder interactions. These activities involve "fake" stakeholders, played by students from other faculties or even hired actors, to help students practice navigating non-technical challenges in a safe, simulated environment (U8l).

5. Discussion, Conclusions and Outlook

Despite notable progress in integrating practical activities into Switzerland's higher education RE landscape, the challenge of balancing theoretical knowledge with hands-on experiences remains, particularly in keeping education aligned with evolving trends. Regarding the reported difficulties students face in dealing with the abstract nature of RE, transitioning between different levels of abstraction, and especially modeling these concepts, educators have implemented various instructional strategies that primarily focus on allowing students to have practical experiences. The professional and industry experience that most educators bring into the classroom, enriched with real-world examples, should make RE more graspable for students. Many courses incorporate semester-long group projects with milestones accompanied by feedback, peer feedback, and/or coaching sessions, allowing students to learn through trial and error. For courses without project-based learning, educators still emphasize implementing practical exercises in the classroom. Another proposed solution, especially for making it easier for students to deal with the challenge of modeling requirements, is creating a simplified modeling language. It must be noted that some findings, particularly solutions like coaching sessions or role-play with actors, depend heavily on resource availability. These approaches may not be feasible for all institutions, especially those with fewer resources. Additionally, the success of innovative teaching strategies often depends on institutional factors, such as access to teaching assistants, team teaching, smaller class sizes, or simply the motivation of individual educators to invest additional time and effort.

While some educators have begun integrating AI into their RE curricula, uncertainty persists regarding its effective implementation and implications for the RE profession. Students require guidance on its practical and ethical use, and industry expectations are unclear. Expanding the use of AI in teaching, particularly to align with industry practices, will keep educators engaged in the coming period.

Additionally, there is a pressing need to develop scalable approaches for managing larger classes, ensuring that project-based learning remains feasible and effective, even in resource-constrained environments. Tackling these challenges will be instrumental in shaping the future of REE.

Self-reported practices also have limitations, as educators' descriptions may not fully reflect their actual methods or effectiveness, and socially desirable answers could introduce response bias. Focusing solely on educators' perspectives presents a one-sided view of RE education challenges. Therefore, a follow-up study will incorporate students' perspectives via an online survey to complement and contextualize the findings of this study. Currently, we are conducting a pilot survey. Preliminary results confirm that abstraction and modeling are the most frequently reported difficulties. However, to gain deeper insights into these issues, we will analyze the qualitative comments in the survey to better understand the specific aspects students struggle with and identify which instructional approaches have been most effective in helping them overcome these difficulties.

Acknowledgements

The author thanks Prof. Dr. Ingo Barkow for his invaluable guidance and support throughout this research. His review of the transcripts, verification of recordings, and checks of the coding enhanced the accuracy and rigor of the study. Additionally, we would like to thank all the RE educators who participated in our study, dedicating their precious time and sharing their insights with us.

Declaration on Generative AI

During the preparation of this work, the author used ChatGPT-4 and Grammarly for grammar and spelling checks, and MAXQDA's AI-powered transcription service for transcribing the interviews.

MAXQDA AI Assist was also used to recheck the coding process. After using these tools, the author reviewed and edited the content and takes full responsibility for the publication's content.

References

[1] D. Callele, K. Wnuk and B. Penzenstadler, "New Frontiers for Requirements Engineering," *2017 IEEE 25th International Requirements Engineering Conference (RE)*, Lisbon, Portugal, 2017, pp. 184-193, doi: 10.1109/RE.2017.23.

[2] M. Daun, A. M. Grubb, V. Stenkova, and B. Tenbergen, "A systematic literature review of requirements engineering education," *Requirements Engineering*, vol. 28, no. 2, pp. 145-175, 2022, doi: 10.1007/s00766-022-00381-9.

[3] M. Daun, A. M. Grubb and B. Tenbergen, "A Survey of Instructional Approaches in the Requirements Engineering Education Literature," *2021 IEEE 29th International Requirements Engineering Conference (RE)*, Notre Dame, IN, USA, 2021, pp. 257-268, doi: 10.1109/RE51729.2021.00030.

[4] D. M. Fernández, X. Franch, N. Seyff, M. Felderer, M. Glinz, M. Kalinowski, ... and K. Lauenroth, "Do we preach what we practice? Investigating the practical relevance of requirements engineering syllabi—the ireb case," *arXiv preprint arXiv:1902.01822*, 2019, doi: 10.48550/arXiv.1902.01822.

[5] R. N. Memon, R. Ahmad, and S. S. Salim, "Problems in requirements engineering education: A survey," in *Proceedings of the 8th International Conference on Frontiers of Information Technology*, Dec. 2010, pp. 1-6, doi: 10.1145/1943628.194363.

[6] K. Hertz and P. Spoletini, "Are Requirements Engineering Courses Covering what Industry Needs? A Preliminary Analysis of the United States Situation," *2018 IEEE 8th International Workshop on Requirements Engineering Education and Training (REET)*, Banff, AB, Canada, 2018, pp. 20-23, doi: 10.1109/REET.2018.00008.

[7] S. Ouhbi and N. Pombo, "Software engineering education: Challenges and perspectives," in *2020 IEEE Global Engineering Education Conference (EDUCON)*, Apr. 2020, pp. 202-209, doi: 10.1109/EDUCON45650.2020.9125286.

[8] C. Ghezzi and D. Mandrioli, "The challenges of software engineering education," in *Proceedings of the 27th International Conference on Software Engineering*, May 2005, pp. 637-638, doi: 10.1145/1062455.1062592.

[9] G. Regev, D. C. Gause, and A. Wegmann, "Experiential learning approach for requirements engineering education," *Requirements Engineering*, vol. 14, pp. 269-287, 2009, doi: 10.1007/s00766-009-0080-8.

[10] R. J. Barnes, D. C. Gause, and E. C. Way, "Teaching the unknown and the unknowable in requirements engineering education," in *2008 Requirements Engineering Education and Training*, Sep. 2008, pp. 30-37, doi: 10.1109/RE.2008.12.

[11] M. Bano, D. Zowghi, A. Ferrari, P. Spoletini, and B. Donati, "Teaching requirements elicitation interviews: An empirical study of learning from mistakes," *Requirements Engineering*, vol. 24, pp. 259-289, 2019, doi: 10.1007/s00766-019-00315-5.

[12] C. Parker, S. Scott, and A. Geddes, "Snowball sampling," *SAGE Research Methods Foundations*, 2019. [Online]. Available: https://eprints.glos.ac.uk/6781/.

[13] A. Moravánszky, "When Banning Isn't an Option: Embracing AI in Requirement Engineering Education," in *REFSQ Workshops*, 2024. [Online]. Available: https://ceur-ws.org/Vol-3672/EuT-paper2.pdf

[14] A. Moravánszky, "SwissREview - Mapping the Requirements Engineering Job Landscape," *2024 IEEE 32nd International Requirements Engineering Conference (RE)*, Reykjavik, Iceland, 2024, pp. 450-456, doi: 10.1109/RE59067.2024.00053.