

MULTIMODAL ALIGNMENT IN INTERNATIONAL ENGINEERING MOBILITY: MIXED-METHODS EVIDENCE FROM 200 EXCHANGE STUDENTS

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Abstract

International engineering mobility is increasingly expected to enhance not only intercultural learning but also pedagogical quality. In the GP_TIME consortium, (Good Practices in T.I.M.E.; four engineering institutions across Canada, Spain, Argentina, and Portugal), developed under the 2025 T.I.M.E. (Top International Managers in Engineering, <https://timeassociation.org/>) Call for Projects, exchange students were positioned as comparative evaluators of good teaching practices across partner institutions. This paper presents findings from a sequential mixed-methods design that combined questionnaire data from 200 engineering exchange students with a supplementary qualitative phase based on institutional focus-group summary reports. While the questionnaire identified the broad pattern of courses perceived as good practices, the focus-group phase was used to deepen and refine interpretation of those patterns. The results show that good-practice courses were characterized by hybrid pedagogical designs in which theoretical explanation was closely linked to application through problem solving, projects, collaborative work, and discussion-based learning. Assessment was experienced as multimodal and supportive, not only because multiple formats coexisted, but because grading was distributed across opportunities for feedback, revision, and progressive improvement. The focus-group evidence also highlighted the importance of relational and organizational conditions, including accessible faculty, mentoring, peer support, and structures that facilitated participation and academic integration. These elements help explain why students associated such courses with deeper understanding, stronger confidence, professional preparation, and greater international adaptability. The findings suggest that sustainable pedagogical innovation in international engineering mobility emerges not through the replacement of traditional structures, but through the coherent integration of active learning, diversified assessment, relational engagement, and enabling support conditions.

Keywords: International mobility, engineering education, constructive alignment, authentic assessment, transformative learning, multimodal evaluation.

1 INTRODUCTION

International mobility has become a structural component of contemporary engineering education. Beyond linguistic immersion or intercultural exposure, mobility increasingly offers an opportunity to examine how students encounter, interpret, and compare pedagogical practices across academic systems. Within this context, the GP_TIME consortium approaches exchange students not merely as recipients of mobility experiences, but as privileged observers capable of identifying courses they perceive as especially effective and pedagogically meaningful [1], [2].

Such a perspective is especially relevant in engineering education, where active learning, problem solving, and professional orientation are widely valued, yet traditional curricular structures and summative assessment formats remain strongly embedded [3], [4]. As a result, pedagogical quality cannot be understood simply in terms of isolated innovations or the adoption of one specific method. It must be examined in relation to how teaching, assessment, and student support are combined in actual learning environments.

The broader GP_TIME study used a sequential mixed-methods design to analyse questionnaire data and complementary qualitative evidence. This approach made it possible to identify a set of recurring

features in courses perceived as good practices, including hybrid active designs, multimodal assessment, strong student-faculty interaction, and multidimensional developmental impact. The present paper places particular emphasis on the focus-group phase in order to deepen the interpretation of these patterns and to clarify the pedagogical and organizational conditions that shaped students' experiences.

From this perspective, the paper contributes to international engineering education in two ways. First, it shows that students' perceptions of good practice are shaped not only by teaching methodology or assessment format, but also by wider relational and support conditions. Second, it suggests that mobility itself can function as a comparative lens through which pedagogical quality becomes more visible. This interpretation is aligned with constructive alignment, authentic assessment, and relationally grounded perspectives on undergraduate learning [5], [6], [7].

2 METHODOLOGY

This study adopted a sequential mixed-methods explanatory design. In the first phase, structured questionnaire data were analysed through descriptive and inferential procedures, while open-ended questionnaire responses were examined thematically to deepen interpretation. In the second phase, institutional focus-group summary reports were comparatively analysed as a supplementary qualitative source used to refine, validate, and extend the patterns identified in the questionnaire. In this design, the questionnaire provided the main comparative structure across the consortium, whereas the focus-group summaries offered a cross-case interpretive layer that made it possible to explore how students experienced those patterns in pedagogical terms.

The questionnaire involved 200 engineering exchange students from the GP_TIME consortium, including students linked to Polytechnique Montreal (PolyMTL, Canada), Universitat Politècnica de València (UPV, Spain), Técnico Universidade de Lisboa (IST, Portugal), and Instituto Tecnológico de Buenos Aires (ITBA, Argentina). Participants had completed at least one course at the host institution before responding. The questionnaire explored teaching methodologies, assessment methods, reasons for identifying a course as a good practice, comparative perceptions relative to the home institution, and perceived academic and personal impact.

For the qualitative phase, the available material consisted of institutional summary reports prepared from the focus groups rather than full transcripts. Accordingly, these materials were not treated as an equivalent discourse-level dataset or used for detailed frequency attribution. Instead, they were analysed as robust institutional syntheses of student perceptions concerning teaching and learning methodologies, assessment systems, relational dynamics, and other enabling learning conditions. This paper therefore uses questionnaire evidence mainly as an orienting baseline and foregrounds the explanatory value of the focus-group phase.

3 RESULTS

3.1 Hybrid pedagogical ecosystems linking theory and practice

The questionnaire findings showed that courses identified as good practices were characterized by hybrid active designs rather than by one dominant method. These courses were described as integrating structured input with applied work, with lectures appearing in 46% of nominated courses and typically coexisting with laboratory sessions and cooperative learning (24% each) and project- or problem-based learning (23%). The focus-group phase deepens this pattern by making more explicit how students experienced such environments in practice.

Across the focus-group summaries, students described good teaching practices as pedagogical ecosystems that combined theoretical explanation with immediate application through problem solving, projects, collaborative activities, and discussion-based sessions. A clear cross-institutional convergence emerged around the idea that learning was more effective when theory and practice were closely connected rather than separated into different moments or disconnected formats. This same-session articulation of conceptual input and applied work was especially visible in the reports from ITBA and UPV, while PolyMTL added detail on experiential co-construction, iterative project development, case-based work, flipped-classroom elements, and challenge-based learning.

The focus-group material also revealed contextual nuances that are difficult to capture through questionnaire categories alone. ITBA emphasized small class sizes, multilingual materials, multiple instructors, and

automated validation tools. UPV highlighted software-supported practical work, active in-class workspaces, and externally proposed challenges. PolyMTL contributed a stronger emphasis on design iteration, mentoring, and broader support structures. These differences do not undermine the common pattern; rather, they show that the pedagogical value perceived by students arose from a family of aligned practices in which application, collaboration, and professional relevance were coherently organized.

3.2 Multimodal assessment as feedback-rich progression

The questionnaire findings also indicated that courses perceived as good practices were characterized by multimodal assessment structures in which final examinations coexisted with group projects or reports, oral presentations, midterm tests, and continuous components. The results reported final exams in 70% of nominated courses, group projects or reports in 58%, oral presentations in 55%, midterms in 40%, and continuous assessment and individual assignments in 30% each. The focus-group phase strengthens this pattern and gives it a clearer pedagogical meaning.

Across the institutional summaries, students consistently valued assessment systems that distributed grading across multiple components, reduced overreliance on one final exam, and created opportunities for feedback and improvement. The point most strongly reinforced by the focus groups is that multimodality was not experienced simply as the presence of several formats, but as a logic of learning based on revision, transparency, and progressive mastery. Assessment was appreciated when it helped students understand how they were performing, improve after receiving comments, and demonstrate reasoning in different ways.

The institutional examples deepen this picture. ITBA emphasized frequent formative assessment and open-book evaluation oriented toward understanding rather than memorization. UPV highlighted balanced continuous assessment, the importance of group work, and multiple opportunities to pass or improve performance. PolyMTL provided especially rich detail on feedback-oriented assessment practices, including resubmission after comments, access to corrected copies, oral examinations focused on reasoning, flexible exam attempts, and scheduling conditions that reduced stress. Taken together, these findings suggest that the perceived quality of assessment did not depend on the elimination of summative structures, but on the extent to which those structures were embedded within feedback-rich, improvement-oriented ecosystems.

3.3 Relational and organizational conditions supporting learning

One of the most important added contributions of the focus-group phase concerns the wider conditions that sustain learning. The broader dataset identified a relational-active core, led by student-faculty contact (265 reclassified mentions), cooperation among students (156), and active learning (139). It also indicated that perceived pedagogical contrast varied significantly according to students' home institution ($\chi^2(56)=307.45$, $p<.001$; Cramer's $V=0.26$), suggesting that these practices were interpreted against different institutional baselines.

Students repeatedly referred to professor availability, horizontal and trust-based interaction, collaborative peer environments, and institutional mechanisms that facilitated participation and integration. These included mentoring systems, official forums, active peer networks, extracurricular opportunities, and practical support conditions. Such features were not treated as peripheral conveniences, but as integral elements of what made good practices work. In other words, students did not define pedagogical quality solely by what happened during class time, but also by the relational and organizational environment that made engagement viable and meaningful.

The focus groups also clarified the developmental implications of these support conditions. Beyond academic learning, students associated these environments with gains in autonomy, confidence, problem solving, critical thinking, teamwork, communication, stress management, and international adaptation. This reinforces the broader study's conclusion that the impact of good-practice courses was multidimensional, while adding explanatory depth on how such development emerged from the interaction of authentic tasks, multimodal assessment, accessible faculty support, and supportive organizational settings. The developmental value of good practice thus appears to arise not from isolated excellence in one domain, but from the mutually reinforcing combination of pedagogy, feedback, relationships, and institutional facilitation [7], [8], [9].

4 CONCLUSIONS

Taken together, the findings suggest that courses perceived as good practices in international engineering mobility were experienced less as isolated innovations than as coherent pedagogical ecosystems. Their value lies not in any single innovative technique, but in the alignment among active and applied methodologies, multimodal assessment, relational engagement, and enabling support conditions. The questionnaire was able to identify the broad architecture of this pattern, but the focus-group phase made it more intelligible by showing how students narrated these elements in concrete educational terms.

The evidence also does not support a simplistic opposition between traditional and innovative pedagogy. Final examinations remained present in many of the courses identified as good practices, yet students still experienced those courses positively when examinations were integrated with projects, presentations, revision opportunities, and feedback-oriented processes. Sustainable pedagogical innovation therefore appears to emerge not through substitution, but through integration within richer learning environments. In this sense, mobility becomes a productive context for identifying practices that may inform broader curricular and pedagogical enhancement across institutions.

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