A 3-year multidisciplinary project training in Mining Engineering to build bridges across the disciplines

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ABSTRACT: Education in Mining Engineering and Geology at the University of Mons starts in the 3rd year of the Bachelor's degree in Engineering and continues during the 2 years of the Master's degree. Throughout this period, project-based learning provides students with a multidisciplinary education built around realistic mining engineering problems. Working in teams, students address complex engineering problems, tackling different aspects over time, thus breaking down the barriers between disciplines and reinforcing the links between geology, geomechanics and mining engineering subjects in the broadest sense of the term. This paper describes 4 types of projects that are carried out over the 3 years. Such projects encourage students to take a multidisciplinary approach of problems. Not only do they gain technical knowledge in different fields, but they also gain a better understanding of the interrelationships between courses. Furthermore, these projects develop essential non-technical skills such as teamwork, autonomy, a sense of responsibility, organisation and communication.

Keywords: Project learning, Multidisciplinarity, Rock mechanics, Engineering geology, Mine planning

1 Introduction

Project-based learning is widely used in engineering education (Airey, 2008). It is one of the pillars of education at the Faculty of Engineering, Mons (Belgium) for more than 20 years. Particularly in Geology and Mining Engineering, the industry demands highly multidisciplinary profiles, capable of solving complex problems, connecting various disciplines and acting with responsibility. This cannot be achieved through ex cathedra courses only.

Throughout the curriculum, project-based learning provides students with opportunities to tackle realistic mining engineering challenges, such as mine/quarry extension, creation of underground cavities, post-mining, environmental challenges, etc. These engineering problems serve as a general framework that students have to understand first. Then they handle several aspects of the projects like the ground model and constitutive laws, stability issues, design and construction of the works, planning, with a key principle in mind: creating bridges across the disciplines.

This paper first describes the educational framework at the Faculty of Engineering, Mons. Then, it focusses on the specific projects that are proposed in Mining Engineering and draws the lessons from this experience.

2 Faculty of Engineering, Mons and the Eng'Up approach

Higher education in the Wallonia-Brussels Federation is organised in terms of a credit accumulation system. An ECTS (European Credit Transfer and Accumulation System) credit is a unit of overall working time spent by the student, corresponding to 30 hours of learning activities (courses, practical work, placement, etc.). This system focuses more on student learning. It is a central instrument of the Bologna process, which aims to make national systems more compatible.

In the Faculty of Engineering of UMONS (University of Mons), initial university education is organised in two stages: a “transitional” 1st cycle consisting of 180 credits, leading to a Bachelor’s degree in engineering, and a “professional” 2nd cycle accounting for 120 credits, leading to a Master’s degree. The first two years have a common curriculum for all Bachelors in Engineering (except Architecture). Seven different specialist areas are then proposed, among which Geology and Mining Engineering. Specialised courses are introduced in the 3rd year of the Bachelor’s degree (45 ECTS).

The Faculty of Engineering is committed to an approach known as Eng'Up. It aims to provide future engineers with a high level of technical education and encourages them to question their future career. Eng’Up leads students to take on the course best suited to their personality. One of its key components is project-based learning, which starts from the 1st year of the Bachelor’s degree (B1). Very early in the curriculum, students are led to actively discover the engineering professions and are introduced to project management through teamwork of 6 to 8 students. In B1 projects, they must produce a robot fulfilling an assigned mission identical to all teams. After 12 weeks, the robots participate in a competition that evaluates different aspects (performance, innovation, originality, weight and aesthetics). This project is based on the CDIO approach, standing for Conceive, Design, Implement, Operate (Crawley et al., 2014). This educational framework features an integrated curriculum with interwoven activities, rich design-build-test projects, and active, experiential learning. Skills like teamwork and communication are embedded.

In the 2nd year (B2), the same teams carry out a second project, this time on a subject they choose themselves, which also includes an entrepreneurial dimension. Here too, after 12 weeks, the project is evaluated on various criteria, in particular on the business plan, communication strategy, and relationship with potential customers. For both activities, a steering committee made up of teachers ensures the monitoring of the projects, as well as their final assessment. For the B2 project, members of a business incubator also attend the evaluation and select a team that is called upon to compete at the national level.

3 Mining-oriented projects in the curriculum

In Belgium, Geology and Mining engineers need to have a multidisciplinary profile that allows them to work in a variety of sectors, including mines and quarries (aggregates, building stone), cement production, metallurgy, energy sector (production, distribution), geotechnical consultancy, environmental assessment, education, etc. Besides general engineering courses, students are trained through the whole value chain of the mining industry, with courses covering fundamental geology, engineering geology, rock mechanics, mining techniques, mine planning, mineral processing, metallurgy, etc. Mining-oriented projects are introduced during the 3rd year of the Bachelor’s degree (B3) with a geomechanics project and are pursued during the 1st and 2nd year of the Master’s degree (M1, M2) with dedicated topics all linked to the same mining engineering problem (Figure 1).

Continuity of the projects through a variety of courses (geology, rock mechanics, mining, Table 1) is the core of this approach. The mining engineering problem is formulated in such a way that it will offer opportunities to be handled from various points of view, as shown in Figure 1. Continuity is also ensured by managing groups from one year to another. Groups of 3 to 4 students are created for the geomechanics project, and, as much as possible, group composition remains identical for the following projects. The implication (organisation, guidance and continuous feedback) of academics and scientists also contributes to the continuity among projects. Indeed, they are not involved in only one project type but follow at least two consecutive project stages, ensuring pedagogical coherence from one year to the next.

3.1. Geomechanics project

The geomechanics project represents the first steps of the students in this project learning in Geology and Mining Engineering. Rock mechanics and geology courses are introduced during the 3rd year of the Bachelor's degree. At this stage, students have some basic geological knowledge, and the geomechanics course has focussed on the constitutive laws of geomaterials and their characterisation both in laboratory and in situ.

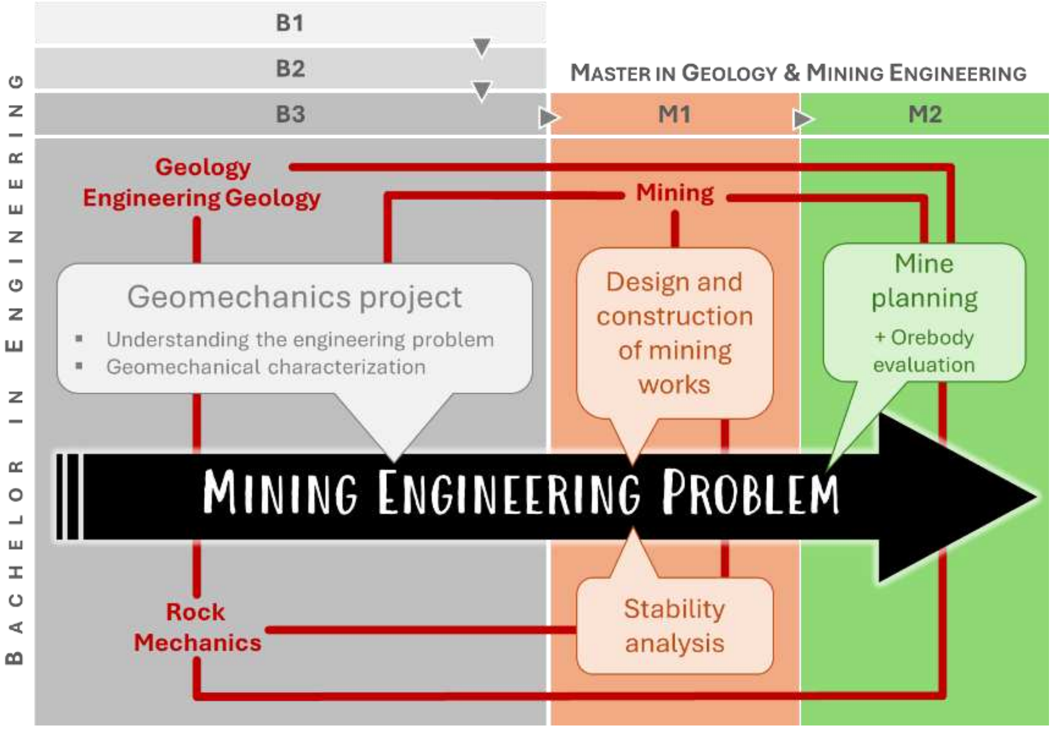

Figure 1. General organisation of mining-oriented projects during the curriculum

Table 1. Short description of teaching program in B3, M1 and M2 for Geology and Mining Engineering at UMONS. Only courses connected to the discussed projects are listed here

	Discipline	Course	ECTS	Hours Theory	Hours Exercises	Hours Practical work
B3	Geology	General geology Structural Geology Geology of Belgium Hydrogeology	17	83	121	0
	Mining	Extraction of mineral resources Principles of Mineral Processing	7	60	12	12 (visits)
	Rock Mechanics	Mechanical Behaviour of Geomaterials	3	24	12	0
		Project in Geomechanics	5	6	0	54
M1	Geology	Geology Fieldwork	5	0	60	0
	Rock Mechanics	Analytical and Numerical Modelling in Rock Mechanics	9	28	24	0
	Mining	Design and Construction of Mining-Like Structures		32	24	0
M2	Mining	Project Mine Planning and Optimisation	5	16	44	0

The objective of the project is to propose a constitutive model for the rock materials encountered in a typical mining engineering problem on a specific site. Detailed learning objectives are provided as supplementary material on https://www.mygeoworld.com, for all the projects described in this paper. During the first session, the general context of the mining engineering problem is presented: location, type of problem (see examples in Section 3.5), geological formation and possible outcrops, sources for literature review, working method and organisation.

First, students have to understand the engineering problem by identifying the relevant elements and by integrating them in a specific context (geological framework, environment, rocks involved). It develops their analytical mindset, using their current knowledge, and they complement it with additional reading, discussions with supervisors, and meetings with experts. Flipped classroom is particularly relevant for increasing their understanding of specific topics. Typically, students do not yet have skills in stability analyses, but they are encouraged to include some readings on the topic in order to identify which information will be required to feed the models.

Second, acting as junior engineers, they determine which material(s) should be characterised, which tests are required, how and where to sample the rocks. Then, they proceed to in situ rock mass characterisations (structural survey, Rock Quality Designation, Rock Mass Rating) and laboratory tests. This organisation is very different from conventional laboratory sessions and quite confusing for students because it requires a high level of involvement. They are used to follow a pre-established program but, for the geomechanics project, they are asked to propose the testing program themselves. This shift promotes stronger project ownership. The staff is aware of the difficulty and iterates with students to reach an appropriate program.

The project includes dedicated sessions for literature review and additional lessons on specific topics, if needed. One or two days are also devoted to fieldwork on outcrops or in quarries for completing geological training, for rock mass characterisation and sampling. Students are also trained to sample preparation for mechanical tests and determine a multi-week work plan, including laboratory equipment scheduling. Collaboration between teams and pooling are encouraged.

Writing a scientific report is another objective of this project. Coaching is provided in terms of report organisation and presentation of data. Proofreading by teachers is proposed, with an intermediate deadline for the geological context. The final report should be about 50 pages for each group and is part of the assessment (see section 3.4).

3.2. Modelling, design and construction of workings

During the 1st year of the Master's degree, two projects are scheduled. One is addressing the stability of workings (rock slope, tunnel, shaft, underground cavity) and the other is dedicated to the design and construction methods required. Those two projects allow students to go deeper into their engineering problem, highlighting the transversality by combining several approaches (analytical and/or numerical modelling, sometimes empirical methods) and with both computational and technological concerns. Theoretical courses are partly given in advance so that students have the appropriate tools to handle the problems: stability of rock slopes from kinematic analysis, limit equilibrium analysis, analytical solutions for stresses around underground works, numerical methods (including finite element, boundary element, distinct element), convergence-confinement method in tunnelling, as well as the different underground construction methods, the various support systems, and their design methodologies.

Projects start after a few weeks of teaching and are conducted simultaneously, as much as possible, with the same groups as for the geomechanics project. This allows to use the results of stability analyses for the design and construction method, and vice versa, to come back to some computations for testing several designs. Typically, when support is required for underground work, students have to propose technical choices and have the possibility to validate their solutions in the numerical models.

The stability analysis project aims to develop students' ability to integrate geomechanical principles into engineering design. One key is to rely on the constitutive law obtained during the geomechanics project and to use it to feed the stability analyses. Students should also refer to their previous project for the geological and hydrogeological context, rock mass quality, topography, geometry of existing works, etc. and complete missing data. Numerical simulations are performed with the RocScience suite which offers a variety of tools, particularly for slope analysis and finite element modelling (FEM). One teaching objective is to connect theoretical principles of the FEM with its practical implementation.

The design and construction project aims to enable students to apply the concepts studied in class to the practical design of an underground structure. They are required to define the most appropriate excavation method for their project and design the support system to be implemented. This second aspect necessitates close collaboration with the modelling project to ensure that the chosen support system is well adapted to ground conditions. The ultimate objective is to produce a technical specification document detailing the excavation method, the type and design of the support system, and a construction schedule.

3.3. Mine planning project

During the 2nd year of the Master's degree, students undertake a project focused on the planning and optimisation of a mining operation, either for an open-pit or underground quarry/mine. The objective is to develop a long-term exploitation plan covering multiple years up to the end of the life. Whenever possible, this project is linked to previous ones, allowing students to build upon the projects from the 3rd year of the Bachelor's degree and the 1st year of the Master's program. This enables them to use geomechanical data and stability calculations for pit slopes or underground openings in order to design the necessary infrastructures for the operation.

Throughout the project, students use geological data (maps, drill cores) to develop a 3D geological model of the studied site. By integrating recent topographic data, they refine the geological representation and, when necessary, conduct an on-site survey using a total station available in the unit. Additionally, students apply geostatistical methods to model the spatial distribution of key parameters, such as mechanical properties or ore grade, within a block model of the deposit.

Based on this model, students design the future pits and determine the total life of mine according to the current production rate. To provide them with industry-relevant experience, all tasks are carried out using Surpac, a professional mining software developed by Dassault Systèmes.

3.4. Projects assessment

For all projects, assessment is based on a group report. Its size varies depending on the project. The report is a major target for the geomechanics project and a volume of 50 pages is required with a detailed description of the engineering problem, geological context, rock mass characterisation and laboratory testing to finally propose a constitutive law. For students, a page limit makes more sense than a word limit. It also includes figures and students must find a good balance between the text and illustrations, select the most relevant content and select which material is best suited for the main document or for appendices. This report should serve as a reference for the following projects. More concise reports are expected for Master's projects (typically 20 to 25 pages).

Assessment for the geomechanics project also includes an oral presentation by each team, followed by questions from the jury (academics and scientists involved in the project). All students attend the presentations. This is intended to train them for oral communication. For other projects, only questions and answers sessions are organized, without presentation.

Evaluation is partly based on a common mark for the group but also on individual grades. These individual grades depend on the student's commitment during the project (students working in the laboratory under teachers and scientists' supervision) and on the quality of their answers during oral examination. Combining a written report with oral presentation and discussion has proven to be a good means to assess each student's global involvement, rather than only evaluating a specific task. In addition, the teaching team closely monitors each group's progress throughout the project and pays attention to individual participation.

The geomechanics project is an independent teaching unit. Other projects are associated to courses with some theoretical assessment. Projects marks represent 40% (M1) to 50% (M2) of the total mark of the associated course.

In team works, a specific attention should be paid to ensure that each student really progresses and reaches the learning outcomes. This is accomplished through continuous supervision throughout the project. Formative assessment is time consuming but indeed very important to help student evolve in the good direction. Students know that assessment is not limited to the report, nor to the oral presentation but it is also a continuous assessment, including their active behaviour during the project sessions. Another aspect is that assessment is individual (which is partly possible because of continuous evaluation). Consequently, among a same group, some students may receive excellent grades while other could fail.

3.5. Some examples

3.5.1. Extension of a quarry

Open pit quarrying operations are typical mining engineering problems. In such cases, issues like the extension of the quarry (Figure 2), or the installation of new equipment serve as a realistic context for the projects. Outcrops for rock mass characterisation and sampling are generally easy to access. Students typically will investigate the geological context and propose a constitutive model during the geomechanics project to address the stability of benches during the 1st year of the Master's degree. The learning process continues with mine planning work in 2nd year of Master. For instance, Figure 2 b to d refer to quarries in Tournai area (Belgium) where two neighbouring pits are merging. This situation raises some issues on distribution of resources for aggregates and cement production, but also stability of the slope between pits and organization of access, evolution of the pit.

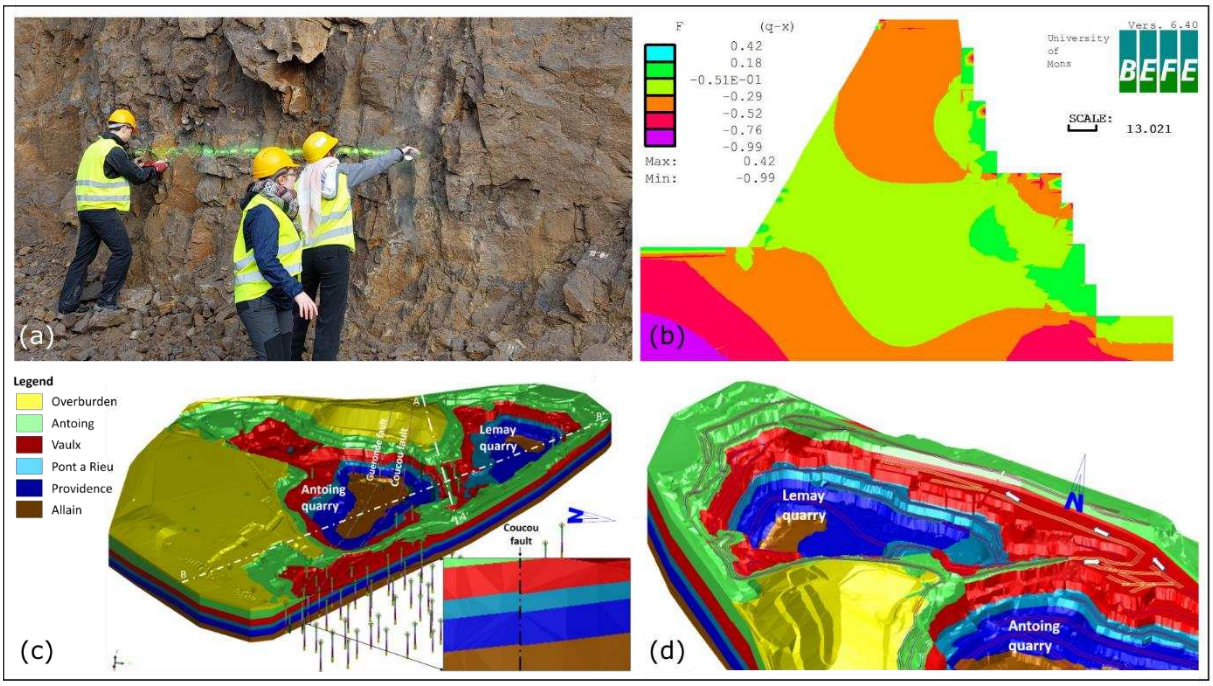

Figure 2. Example of projects dealing with quarries extension. (a) Rock mass quality assessment from a scanline and structural analysis of a quarry slope. (b) Finite element modelling of a slope between two quarries. Contour lines represent the value of the load function, positive values indicating yielding. (c) Geological model of quarries. (d) Planning of quarrying operation

3.5.2. Creation of underground works

Digging galleries, shafts, and underground cavities are typical mining-like underground works. Some recent students' projects involved such engineering problems, sometimes with quite original applications: digging new galleries in an old iron mine for water adduction, or the construction of a wine cellar in limestone formations (Figure 3). In the first example, the mining method has to be understood first, in order to identify how the new galleries could be dug. In the second case, students could benefit from the case study of a first cellar that was dug a couple of years before.

In 2025, B3 students start working on a challenging project, the Einstein Telescope, that will be Europe's most advanced observatory for gravitational waves. Their mission is to understand the purpose of such an ambitious project and particularly to focus on the 10-kilometers tunnels that will be excavated if the project is selected. For this study, students work on outcrops of the formations targeted by the current research teams in order to characterise the rocks and rock masses involved.

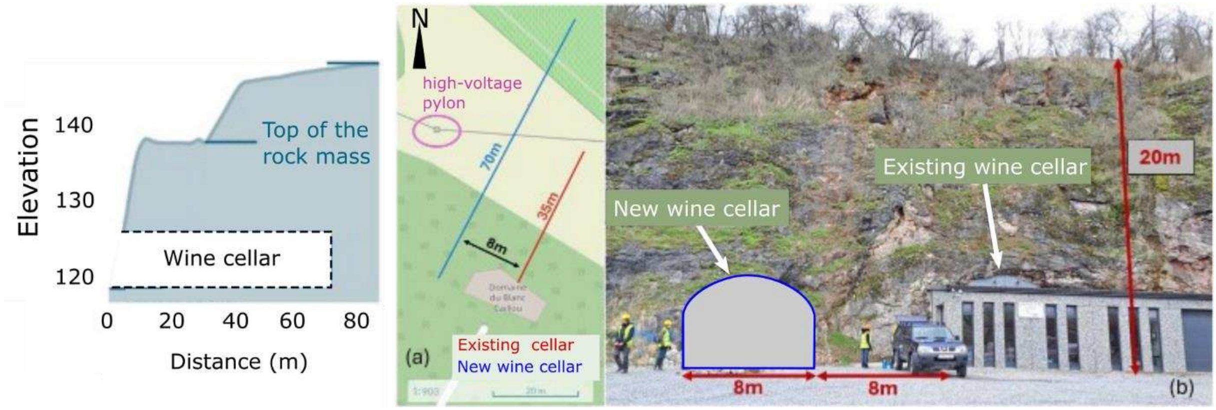

Figure 3. Example of a project dealing with the digging of a wine cellar in a rock mass. Focus on the design and construction project investigated by students. Left, profile of the cellar in the local topography. Centre, top view showing the trace of the existing cellar and the one delt during the project. Right, picture of the site with the design of the new wine cellar

3.5.3. Valorisation of underground cavities

Risks related to underground cavities are a concern in Wallonia, and improving their prevention and management was the core of the RISSC project (Georgieva et al., 2020; Kheffi et al., 2020). The valorisation of underground cavities has been highlighted as an alternative solution to mitigate such risks (Pinon, 2023). As an example, students were proposed to investigate the possibility of transforming an abandoned room-and-pillar quarry into an underground parking. During their geomechanics project, they had to rely on their mining course to understand how the room-and-pillar mining method is implemented, particularly from a stability point of view and associated geometry. They also collected documents about the abandoned quarry (history, maps, previous investigations) in order to propose a first solution for the parking. Another issue was to identify the geological formations and search for outcrops since the abandoned quarry is not accessible.

Once the rock has been characterised during the geomechanics project, the students' tasks in M1 were to address the stability of the proposed parking and also propose and test some designs for access roads and additional excavations.

4 Lessons learned

4.1. Bridges across disciplines

Building bridges across disciplines is one guiding principle of this project approach. Because skills integration and continuity between projects phases are required in professional life, our aim is to offer students a problem-oriented vision rather than illustrating courses one by one with different topics. Disciplines such as geology, engineering geology, rock mechanics and mining are introduced in B3 and are generally all connected to the geomechanics projects (Figure 1), as illustrated by the examples. Further teaching in M1 and M2 covers more specific aspects of the engineering problem and let the students understand the difficulties related to each discipline. Moreover, among those disciplines, students are provided a variety of skills, including both field and laboratory work, experimental and modelling aspects.

Such bridges across disciplines are also based on the documentation work for which students must process diverse materials (maps, drillhole data, books and scientific or technical papers, testing reports, etc.). Typically, drillhole data and geological maps need to be understood for building a suitable 3D model and description of the geological context.

The geomechanics project strongly supports the rock mechanics course in B3. This course focusses on the constitutive laws for geomaterials. Thanks to the project, students better understand the purpose of such a law and how its parameters can be obtained in laboratory. But they also highlight connections with geology, structural geology and even geotechnics.

In M1, the rock mechanics course is organized around stability analyses, either analytical or numerical. Similarly, students appreciate the project approach, in that some theoretical concepts become much clearer when applied to a practical case. The need for a constitutive model is obvious at this stage, clarifying the connection between B3 and M1 rock mechanics courses. Particularly, the project is organized before the course assessment and supports the understanding of the theory. Students consider that both projects proposed in M1 are closely related and again create bridges between (engineering) geology, rock mechanics and mining engineering courses. It helps to understand the link between the mechanical properties of the rock mass and the design of mining-type works.

Students also consider that the project approach allows to dive deeper into some topics. When specific questions arise on their project, it gives some opportunity to go beyond the course material, search for complementary data from teachers, experts or literature. Such behaviour is typical from inductive approaches to teaching and learning (Prince & Felder, 2006) and promotes intellectual growth.

4.2. Other lessons

Several strategies have been used for creating the groups and attributing the topics: random designation, team leaders who recruit their collaborators, concertation among all the students. Ensuring equity is a concern to “pull the students upward”. Even if the designation of team leaders seemed interesting, it did not show better results. Concertation among students is now the preferred method.

Good collaboration between teams is also observed. This is favoured by a real team spirit among students, and between students and academics, scientists and technicians. Each student can find his/her place in the team (field work, sample preparation, computations, writing report) and get better results when putting the group’s skills together. Values such as sharing the knowledge, collaboration, respect of the others’ work, communication are appreciated and contribute to enhancing motivation.

Project-based learning is also a good mean to promote autonomy and prepare students for their future work. Rather than a conventional laboratory session in which a list of precise tasks is prepared, here, the proposed topic is more general: propose a constitutive law for the geomaterials, investigate the stability of the work, etc. Autonomy is trained by asking the students to propose themselves how they could solve the problem. In B3 particularly, students often struggle to define their experimental program based on the engineering problem they investigate. Playing the role of a young mining engineer is confusing for them. They are more used to simply apply procedures rather than defining them. For instance, a challenge for students is to organise the laboratory work for several teams (preparing a planning for the use of equipment and staff so that everybody can work). In the Master’s degree, students are much more autonomous and do not hesitate for distributing tasks among the team. With time, students become more aware of their strengths and weaknesses and become able to rely on the team to produce more efficient work.

Projects are also organised with some contribution of the industry sector, by involving some experts for specific topics, by integrating current issues of the industry into the project topics, or simply to have access to sampling sites in quarries. Including the students in this interaction between academics and professionals is important. It prepares the young generation for becoming responsible engineers, as requested by future employers (profession advisory committee) and as promoted by the Eng’Up approach.

4.3. Students’ perceptions

To assess students' perceptions of the projects and their impact on their learning process, a survey was conducted anonymously as a Wooclap poll. Students received a QR-code and submitted their answers digitally. The survey used yes/no questions, but students could add a comment if they wished. 10 students participated, among a group of 12 Master students (M1 level), i.e. 83% of respondents. The Authors did not propose the poll to Bachelor students because they had not yet experienced the mining-oriented project approach at this time of the year, nor to M2 students because the group was too small to ensure anonymity. Students often provided additional comments, enriching the results discussion.

Figure 4 summarises the key findings of this survey, presenting the percentage of students who positively evaluated each aspect of the projects. The results highlight that students highly value the projects in terms of problem identification, work planning, and knowledge acquisition, particularly regarding geomechanics, modelling, and design and construction aspects.

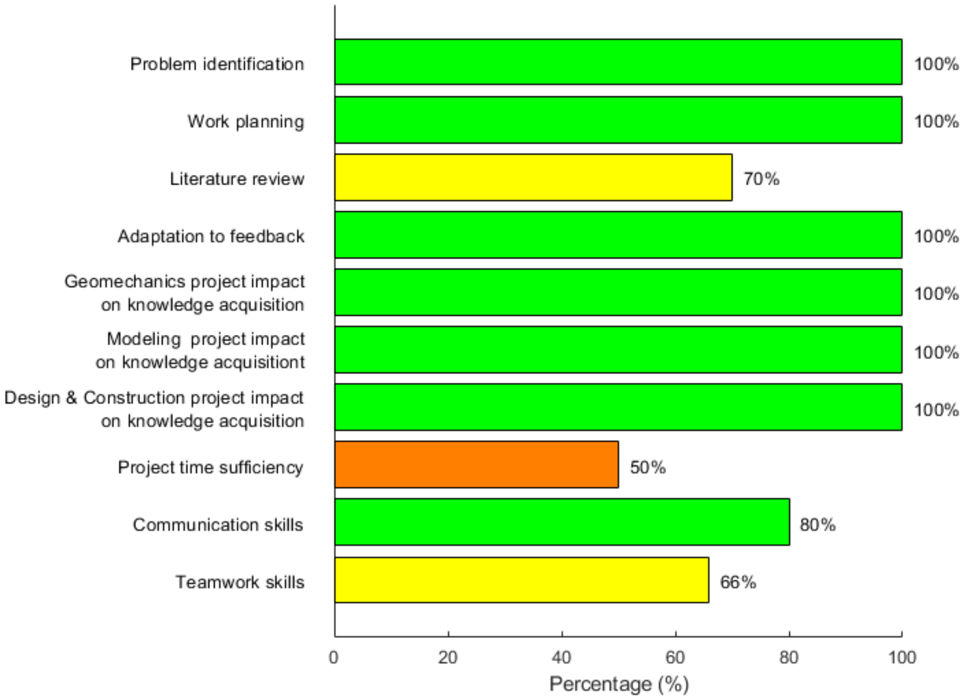

Figure 4. Summary of survey results on students' perception of the projects. Percentages indicate the relative amount of students who positively evaluated a given outcome of the projects

The projects were widely appreciated for reinforcing theoretical knowledge through practical application. Students reported that working on geomechanics, modelling, design and construction projects helped them better assimilate course content. The hands-on nature of these assignments allowed them to visualize concepts and apply them to real-world scenarios, significantly improving their understanding.

Beyond technical knowledge, students developed valuable skills in problem identification, work planning, and research methodologies. Many improved their ability to structure tasks, manage deadlines, and collaborate effectively within teams. The need to gather relevant documentation also encouraged students to explore academic and industry sources, enhancing their research competencies.

Another strength was the constructive use of feedback. Iterative reviews from professors and teaching assistants helped students refine their analyses, improve report clarity, and adopt a more structured approach to problem-solving. This process fostered precision in technical explanations and deeper engagement with engineering methodologies. Additionally, report writing and presentations strengthened students' communication skills, while teamwork encouraged critical thinking and collaboration. Most students agreed that these projects provided a valuable platform for articulating ideas, debating technical choices, and working collectively toward a common goal.

Despite these strengths, students identified several challenges. The most frequently mentioned issue was time management. While some found the project duration sufficient, others felt overwhelmed, especially when balancing project work with a demanding course schedule. Several students suggested starting projects earlier in the academic year to distribute the workload more effectively. The high time demands of projects is often reported as a disadvantage of project-based learning (not only for students but also for the staff), as well as less rigorous understanding of engineering fundamentals (Airey, 2008). These drawbacks are counterbalanced by more conventional lectures that are organised in parallel. Indeed, in our framework, projects do not substitute to lectures but complement them.

Although the projects promoted independent research and work, several students reported difficulties in navigating academic literature and in using specialized software or laboratory equipment. To address the issues related to academic literature review, a dedicated training session on academic databases was introduced in 2024-2025 for B3 students, in collaboration with university librarians. In addition, a concise writing guide is available to help students structure and present their scientific reports more professionally. Regarding mastering software and laboratory tools, students can make progress thanks to individual coaching and dedicated tutorials. Their feedback remains instrumental in identifying the areas where they face the most difficulties, thus informing and refining our pedagogical strategies.

Regarding teamwork, most students were satisfied with the current group formation method and preferred to keep it unchanged. However, some noted challenges in ensuring equal participation, as smaller teams sometimes led to workload imbalances. In some cases, one or two members carried a disproportionate share of the work.

Overall, the survey confirms that project-based learning is perceived by mining engineering students as highly beneficial, enabling them to apply theoretical knowledge, develop problem-solving skills, and improve their teamwork and communication abilities.

5 Conclusions

The Faculty of Engineering at UMONS is committed to an approach known as Eng'Up. It aims to provide future engineers with a high level of technical education and encourages them to question their future career. One of the keys to this approach is project-based learning. In Geology and Mining Engineering especially, this is developed via a multidisciplinary project approach from the 3rd year of the Bachelor's degree to the 2nd year of the Master's degree. The geomechanics project in B3, the design and construction and the stability analysis projects in M1, and finally the mine planning project in M2 form a continuous education package connecting many disciplines. It aims to prepare students to their future job by means of a typical mining engineering problem for which they investigate various aspects year after year, developing both their technical and soft skills.

Student feedback on the project-based learning approach has been largely positive. Students particularly value the opportunity to apply theoretical knowledge to practical problems, which reinforces their understanding of course material. They also recognize the development of crucial skills such as problem-solving, work planning, teamwork, and communication. While challenges related to time management and navigating academic literature have been noted, these are being addressed through pedagogical adjustments.

Acknowledgements

The authors would like to thank the students for their valuable feedback.

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Authors' bios

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Dr Ir Fanny Descamps is associate professor at the University of Mons, Belgium, and head of the Mining Engineering unit. She graduated as a Mining Engineer (M.Sc., 2002) and achieved a PhD in rock mechanics as a research fellow of the FNRS (Belgian Fund for Scientific Research). She continued as a post-doctoral researcher, specialising in the constitutive behaviour of rocks. After that, she has been involved in several projects, diversifying her research interests. Particularly, she worked on risk related to underground cavities, on the relations between geology and geomechanics in chalk and on several mine planning projects for quarries in Belgium. During her early career, she already participated to many teaching tasks, understanding the importance of multidisciplinarity for future mining engineers and the connections between academia and industry. She is now teaching rock mechanics and reservoir engineering at UMONS for students in Bachelor's and Master's degrees and continues her involvement in transversal courses. She is a member of ISRM and IAEG, and member of the WEG committee (Women in Engineering Geology).

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Dr Ir Nicolas Gonze is a lecturer and teaching assistant at the University of Mons in the Mining Engineering unit. He holds a Master's degree in Geology and Mining Engineering (2013) and earned his PhD in 2022 from UMONS. His doctoral research focused on understanding the rock cutting mechanisms under confinement. After an experience in the recycling industry, he joined the Mining Engineering unit in 2014 as a teaching assistant and PhD candidate, contributing to various mining engineering courses. Today, he teaches "Design and Construction of Mining-Like Structures" and "Mine Planning" to Master's students, guiding them through both theoretical concepts and practical applications. Passionate about education, he encourages students to move beyond compartmentalised knowledge and forge meaningful connections between their courses. His goal is to equip them with a holistic understanding of the challenges in rock mechanics and mining operations, preparing them to tackle complex real-world problems with confidence and insight.

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Dr Sara Vandycke is Research Associate of the Belgian Fund for Scientific Research (F.R.S.–FNRS). She is structural and tectonician geologist, specialised in natural fracturing, jointing and faulting in carbonated rocks. She has a strong experience in paleostresses analysis in chalk, connecting to regional geodynamics in northwest Europe. She is also teaching structural geology and cartography at the University of Mons.

Philippe Ancia, University of Mons (Belgium)

Dr Ir Philippe Ancia is an Engineering Geologist (University of Liège, 1987) and PhD since 1993 (University of Liège). Since September 2002, he has been a professor in the Mining Engineering unit of the University of Mons (UMONS), where he mainly teaches to students in Geology and Mining Engineering. His main areas of teaching and research are the processing of mineral materials and waste, environmental problems related to these activities and the treatment of polluted soils. He is also involved in the projects organised in the 1st and 2nd year of the Bachelor's degree, ensuring a better understanding of the students' background when they join their specialisation in Geology and Mining Engineering.

Tégawendé Nikiema, University of Mons (Belgium)

Ir. Tegawende Nikiema is a teaching assistant and PhD student, at the Faculty of Engineering of the University of Mons, Belgium. He holds his Master's degree in Geology and Mining Engineering since 2022, from the same faculty. He is involved in several teachings in the Mining Engineering unit, namely geomechanics, mining construction, mine planning and mineral processing. His research topic deals with the understanding of the mechanical behaviour of fractured rocks and their integration into numerical geomechanical modelling, with a particular focus on the effects of roughness.

Opéhlie Faÿ, University of Mons (Belgium)

Dr. Ophélie Faÿ is a FNRS post-doctoral researcher working at the University of Mons. She joined the Mining Engineering unit in 2023 and holds a PhD in Geology from KU Leuven. Her research focuses on chalk, studying how sedimentology and diagenesis affect its properties. Recently, she has been exploring how water saturation impacts geomechanical properties, with applications in reservoirs, hydrogeology, geothermal energy, carbon storage, and the stability of underground structures. Dr. Faÿ is also passionate about teaching, guiding students in fieldwork and practical courses. She emphasises the importance of connecting different disciplines in both her research and teaching, helping students understand the broader implications of geological processes.

Jean-Pierre Tshibangu, University of Mons (Belgium)

Dr Ir Jean-Pierre Tshibangu is emeritus professor of the University of Mons where he was head of the mining engineering unit for more than 25 years. Graduated as a mining engineer from the University of Lubumbashi, he first gained experience in the mining industry in DRC before obtaining a PhD degree from the Faculty of Engineering, Mons. Passioned about engineering sciences, he teached a wide variety of disciplines in the fields of rock mechanics and mining sciences, while contributing to cutting-edge research in those disciplines as well. Committed to the evolution of the teaching programs in the University of Mons, he introduced the project-based approach presented in this paper in the early 2000's. He is still strongly involved in the scientific activities of the mining engineering unit, and in university cooperation with DRC, while keeping strong relationships with the industry.