



The potential role of European professors in the context of Rwandan civil engineering education: Reflections after a teaching experience



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ARTICLE INFO

Keywords:

Civil engineering
Teaching skills
International cooperation
African higher education
Academic responsibility

ABSTRACT

The number of students in civil engineering in some sub-Saharan African developing countries is strongly increasing, as consequence of an increasing demand of their capabilities. However, current efforts to educate civil engineers in Africa and, specifically, in Rwandan higher education institutions are hindered by the lack of local qualified teachers. On the other hand, in some European countries, university teachers are increasingly considering the effects of globalization on both civil engineering education and profession. In this situation, the educational potential of a European teacher can gain an innovative perspective, since it would be of great use if it were beneficial to a big number of students in a country where qualified teachers are scarce. It cannot be hidden that thanks to such a change of perspective, the inner motivation to carry out academic activity would also benefit.

The Authors try answering three main questions: In which way a European teacher can contribute to civil engineering education in sub-Saharan Africa, with particular reference to the Rwandan context? What impact can a European type of teaching have in the Rwandan context, especially with regard to the methodological approach? How do Rwandan students perceive a learning experience with different characteristics from the usual ones?

Beyond writing a report of the activities done during a personal teaching experience of one of the authors in a Rwandan university, this paper aims at explaining the lesson learnt from this experience, under both human and professional viewpoint. Although the experience of a single teacher has proved to be a privileged way to build a larger project in the framework of the Erasmus Plus program, which was subsequently eligible for funding, this paper is not focused on the network construction, but only on the preceding indispensable step. In fact, the paper describes on the one hand the challenges faced by the teacher during a direct teaching experience and, on the other hand, the results obtained and the perception by the students, expressed through an evaluation questionnaire.

The paper proposes an example of successful and profitable experience of a European professor in the field of civil engineering in the context of a Rwandan higher education institution, with the awareness that it cannot become paradigmatic of a wider academic practice orientation, but at least an example of a professional way of being. This model offers opportunity of knowledge sharing, in the wider perspective of future Rwandan development, but it is also an opportunity for exchange in terms of culture and values.

1. Introduction

It is before everyone's eyes that, in the past two decades, globalization has influenced our personal and professional lives. In fact, communication, job opportunities, education and different services are globally distributed.

As stated by Langhorne (2001), results of globalization are changing not only our way of life on a personal basis but they are also changing the institutions which we collectively use to give form and predictability to our economic, social and political relationships.

According to Wright (2011), globalization is a phenomenon that requires a proper education as it involves social evolution on a global level.

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That's why collective cooperation is a necessity, and therefore the weight of education becomes most apparent (Wright, 2011).

We are all aware that globalization will lead to greater opportunities and access to world markets, but there are several challenges facing specifically the globalization of the engineering profession (Cheville, 2012). These challenges include developing international licensing procedures and international engineering standards, defining global engineering ethics and the engineer's responsibility to society, and breaking language and cultural barriers. Globalization affects also civil engineering practice and education (Downey & Beddoes, 2010). With increased globalization, the role of the professional civil engineer will change significantly and this aspect is strictly connected with higher education in civil engineering (Lucena, Schneider, & Leydens, 2010).

In fact, if on the one side civil engineers are recruited within a wider and wider global market, on the other side the education in the field of civil engineering occurs within the context of individual higher education institutions, which can differ greatly from one country to another (Alves, Kahlen, Flumerfelt, & Siriban Manalang, 2013). Recently, Alves et al. (2013) underlined how engineers are educated with varying pacing and scoping of higher education programming and with varying methods of higher education teaching. Then, expectations for engineering practice normed from the corporate side within the engineering marketplace often do not match the widely dispersed educational experiences. This gap brings challenges for all stakeholders, employers, higher education institutions and the engineering graduate (Alves et al., 2013). In the specific field of civil engineering, these differences are more pronounced if we compare higher education systems from European and African contexts.

Moreover, it should not be disregarded the contribution of current education in the field of civil engineering to the development of some sub-Saharan African countries like Rwanda. This aspect has been deeply considered by many researchers. Among others, Bloom, Canning, and Chan (2006) showed how African higher education can assist countries with technological catch-up and thus improve the potential for faster growth. On the basis of aggregate data and a scientific approach, Bloom et al. (2006) identified an agenda for potential work on some key issues, such as the balance across levels of education, cost management strategies, curricular reform, and disciplinary focus, that can be considered crucial to policy development (Bloom et al., 2006).

It's a fact that in developing countries, and especially in Rwanda, the demand for civil engineering education is constantly growing, but it is equally true that in most cases students from those countries are unable to support their studies in Europe due to economic constraints (Schendel, 2015). At least in the field of civil engineering, in the universities of the developed countries, there are many teachers with high competence in both research and education. On the other hand, universities in developing countries have a huge demand from students and an inadequate supply of teachers (Altbach, 2010). If it were just a matter of the market, it would be important to find a balance. But the question is not only about the supply-demand relationship. The problem is of a very different nature and, in our opinion, it is a cultural matter.

It is rather difficult that the didactic experience of teaching a course in a faculty of civil engineering in Rwanda for a European professor can rise directly based on considerations concerning globalization of higher education or development strategies at national level. Instead, it can grow up for different reasons: the challenge of an "unusual" experience, the intention to contribute to international cooperation activities, the research of a new sense for the academic profession, among others.

This article is based on the teaching experience of one of the authors, who currently teaches in a faculty of civil-environmental engineering in Italy. This story does not claim to become paradigmatic, but can be a virtuous example so that the positive experience can be replicated.

During a holiday journey in Rwanda, the European professor visited the Institute of Applied Sciences INES – Ruhengeri in Musanze District, Rwanda. During the visit, the Vice Chancellor of that University asked him if he was available to spend a short period at INES, to teach a module

inside the undergraduate program in civil engineering. A bilateral cooperation agreement between the European and the Rwandan institutions (University of Parma and INES-Ruhengeri, respectively) was established at first. Thereafter, a three weeks teaching activity of the module of "Soil Mechanics" to the students of the third level of civil engineering was organized. Since the first experience proved to be extremely positive, both from the teacher and from the students' point of view, a second cycle of teaching activities in the Rwandan institution was planned within the same year.

This article describes the didactic activities carried out and the results obtained in terms of profit by the students. The results of an interview and of a survey on the students' perception of this experience are also reported. The resulting reflections seemed worthy of sharing with a wider audience through this publication. In fact, this paper is not only a simple report of the activities done, but it aims at explaining the lessons learnt from this experience, under both human and professional viewpoint, with the personal conviction that other professors could give and gain benefit from similar kinds of actions.

2. The Africa-EU Strategic Partnership

Higher education plays a crucial role for economic and social development of low income countries. In particular, higher education helps catalysing sustainable development by producing high quality human resources and in disseminating the results of scientific and technical research (Taleza, 2005). This is also one of the main objectives of the Joint Africa-EU Strategy (JAES, 2006).

Starting from 2007, the Africa-EU Strategic Partnership contributes to strengthening links between the parties in the field of higher education. The Joint Africa-EU Strategy aims at building high-quality tertiary capacity through networking, increasing the mobility of students and scholars, and promoting institutional support and innovation. The dialogue includes discussing ways of supporting the mobility of students and scholars and completing the African higher education harmonisation process (JAES, 2006).

European Commission recognizes that universal access to quality education must be matched with a responsive higher education system responding to African challenges in infrastructure, financing, retention, training and retraining teachers, harmonisation of educational structures, providing appropriate and relevant skills, quality assurance, recognition of qualifications and research capacity.

Key objectives of Africa-EU cooperation in the area of higher education are the promotion of top-quality mobility of African and European students, scholars, researchers and staff as well as the support to the development of centres of excellence in Africa, particularly through the Pan-African University (JAES, 2006).

The Africa-EU cooperation in the field of higher education has been furtherly stated by the European Commission in the "State of the Union 2018", especially in terms of African students and researchers supported with Erasmus programme.

As stated by Jean-Claude Juncker, President of the European Commission from 2014 to 2019, European Government is aware that Africa will play a crucial role in the future: by 2050, Africa's population will number 2.5 billion (Juncker, 2018). One out of four people on earth will be African. European Government knows that European Countries need to invest more in relationship with African nations and that they have to stop seeing this relationship through the sole development aid viewpoint. European Government is aware that Africa does not need charity, but true and fair partnerships. And Europe needs this partnership just as much (Juncker, 2018).

For the time being, there are a lot of relationships between European and African universities, especially supported by European union in the framework of the Erasmus Plus program. Most of them are oriented to the development of higher education in African countries. If, on the one hand, many projects and funding programs have been recently oriented to strengthening partnerships between European and African

universities, on the other hand it seems that, in most cases, apparently more limited activities and one-to-one relationships can give very positive results and can represent a good starting point to develop subsequent structured projects. Moreover, it is evident that any cooperation project starts from a first simple step, which can be represented by a brief teaching experience of a European professor in an African university. This was the case of the experience described herein. The experience of a single teacher from an Italian university has proved to be a privileged way to build a larger project under the Erasmus Plus program, which was subsequently eligible for funding. The project, which will be described in a future article, involves not only the teacher's home university, but also other European higher education institutions.

It is worth noting that among African countries, Rwanda appears rather interesting to establish such a kind of relationship, because some particular aspects of this country are well suited not only to the basic objectives of this experience, but also, in a wider perspective, to a stronger cooperation with European universities. In fact, after the first visit in Rwanda by the European teacher, one the main goals was strengthening relationship in order to develop common projects. A further favourable circumstance is that tertiary education in Rwanda is at the moment in a strong developing phase that requires connection with European higher education institutions (Schendel, 2016; Schendel & Tolmie, 2017).

3. Cultural context and general objectives

Rwanda is a small landlocked country of 26,338 Km² and is the most densely populated African country; it has an estimated population of 12.2 million people that grows by 2.3% per year. About 19% of the population lives in urban areas. A big number of the Rwandan population is young. More than 60% are below 30 years while about 29% are between 16 and 30 years. A great part of Rwandans is into agriculture with the majority being poor subsistence farmers. Despite the abundance of natural resources, a huge portion of the population still lives below poverty line. Poverty is worse in the rural areas, where the majority of the population lives. Although the country is healing physically, the psychological effects of the 1994 genocide, which resulted in the deaths of over 800,000 innocent people, remain quite fresh in the minds and souls of many Rwandans today. The genocide has destroyed not only infrastructures and families, but also the human and intellectual capital of Rwanda, even in the academic field.

As the population of Rwanda grows, the demand for higher education, especially in the field of applied sciences like Civil Engineering, will continue to increase, and the mismatch between the number of students and academic staff will worsen. To ensure that supply grows to meet demand, the qualitative expansion of Rwandan higher education institutions is vitally important.

The Rwandan Ministry of Education, recently focused the following needs in Rwandan Universities (MINEDUC, 2008):

1. Higher education has a few staff with advanced academic qualifications and research experience.
2. As well as research being underdeveloped, there is an underutilization of the role that higher education institutions play as absorbers and transmitters of knowledge.
3. The academic quality of higher education provision is poor. The challenge is to implement quality systems that ensure that Rwanda meets international standards in the areas of courses, curriculum, research, knowledge transfer, teaching and learning in higher education.
4. Teaching is mainly didactic and often relies on outdated material. There is a need to develop more student centered methods of learning and teaching and ensure that students are engaging with up to date knowledge.

In this context, the University of Parma began to embark on a project aiming at improving the quality and internationalization of the

undergraduate programme in Civil Engineering and the qualification level of graduated students in a leading Rwandan higher education institution, such as the Institute of Applied Sciences INES at Ruhengeri.

The experience described herein started from an occasional personal visit of the European professor to INES Campus in Musanze, which is located in a relatively poor area in the Northern part of Rwanda. The University Campus appeared as a group of modern facilities hosting approximately 3000 students, instead the surrounding environment was made of very poor neighborhoods: among other aspects, unpaved roads, houses made with poor materials, predominantly rural activities, low presence of running water and electricity.

The first sensation was that the presence of the Institute INES-Ruhengeri in that area was a real attempt and an absolutely necessary "throwing platform" for the future development of the local population.

In fact, INES intends to strategically be a role model of University of Applied Sciences in East sub-Saharan Africa. Moreover, it appeared that the mission and vision of INES corresponded not only to a teaching strategy but also to the real existence of practical means, such as many well equipped laboratories. This means that INES, in its learning methodology, seeks to balance theories and practical experiences, in order to give students competences that they can use to provide sustainable solutions to various day-to-day problems of the society.

The educational background of Rwandan university students is very different from that of European students (Schendel, 2016). It was astonishing to observe how they were inured to study using only few and poor material means such as paper, handbooks, books, and even pencil. As regards the level of basic knowledge, it was generally satisfactory. On the other hand, especially referring to typical civil engineering disciplines, it was evident a study practice based on the solution of elementary problems more than on deep reasoning.

Engineering teachers are commonly aware that engineering students should be educated from a global perspective of their field so that they successfully master essential attributes and the problem solving skills at strong levels to meet the demands of an evolving worldly market (Benson, Becker, Cooper, Griffin, & Smith, 2010).

One of the general objective of this teaching experience was to show a different approach to the study of such a kind of disciplines. In particular, it was useful to pass from a mere pragmatic approach, to a wider vision of the theory, through an in depth analysis of problems, questions, answers, based on physical evidence and on experimental measurements. In fact, as stated by Wei (2005), education in the field of civil engineering is traditionally designed to train students for technical information in construction and building, and there is no hesitation about the importance of teaching core engineering and analytical skills to the students. Moreover, it is pertinent to educate them as creative thinkers and creative problem solvers (Wei (2005)). The didactic activity that was undertaken was based on the idea that "learning to learn, learning to transform information into new knowledge, and learning to translate new knowledge into applications become more important than memorizing specific information" (Dahms & Stentoft, 2008).

On the basis of a bilateral cooperation agreement between the University of Parma and INES-Ruhengeri, a first three weeks teaching activity in January 2018 and a second six weeks teaching activity at the end of the same year (November–December 2018) were organized. The lessons of "Soil Mechanics" were addressed to the students of the third level of Civil Engineering undergraduate program. It was just a coincidence that the invitation was made to a geotechnical teacher. Entrusting the "Soil Mechanics" module to a European teacher was not explicitly desired. However, it soon became apparent that this was a particularly favourable circumstance.

In fact, basic concepts of Soil Mechanics are of paramount importance in a Rwandan faculty of civil engineering, due to two main reasons:

- 1) the great amount of problems connected to soil mechanics affecting Rwanda, i.e. the construction of new infrastructures, the construction

of new buildings in urban areas and the frequency of different kinds of landslides throughout the country;

- 2) the high demand and lack of local experts in the field of Geotechnical Engineering.

4. Teaching methods and materials

Preparing lessons for students coming from a very different background, with respect to what the European teacher was used, represented a real challenge. But this undertaking was tackled before arriving in Rwanda, since lessons were carefully prepared in the previous period.

“Soil Mechanics” was included as a basic module of level 3 of the undergraduate program in civil engineering. The students attending the module taught in January 2018 were 64, 7 females and 57 males, corresponding to one half of the students belonging to level 3 in that academic year. The second cycle of lessons was composed by the same modules taught to two groups, and each module was taught for one class. One module took place in November 2018 and was attended by class 3A. The class was composed by 44 students, 4 females and 40 males, corresponding to one fourth of the students of level 3 in that academic year. The second teaching took place in December 2018 and was attended by class 3C. This class was composed by 43 students, 6 females and 37 males.

The teaching of each module lasted three weeks divided as follows: 26 h of theoretical lessons, 4 h of seminars, 10 h of classroom exercises and 12 h of laboratory activities. In order to concentrate the module in three weeks, teaching activities were rather intensive, since they were scheduled each day. Only three full days were devoted to students’ self-study. At the end of the second week, one half day was devoted to the mid test and at the end of the third week a further half day was devoted to the final written examination.

Theoretical lessons were taught prevalently in the morning, using both presentation slides and sketches and writing on the blackboard. Classroom exercises were proposed using only the blackboard, in the form of problem-solving, by inviting students to solve some practical problems and fostering their direct participation. Laboratory activities were carried out in the afternoon, with the help of laboratory technicians.

Each day, during the afternoon, a group composed by one half of students of each class went to the laboratory of soil mechanics. Laboratory activities were oriented to support the students’ understanding of basic concepts of soil mechanics. The specific didactic objective was allowing the students to handle laboratory devices, to touch materials, to face practical problems, to make measurements in the awareness that who sees and touches learns quicker. In particular, laboratory activities dealt with four main themes: sieving of some soil samples, determination of Atterberg limits of fine soils, direct shear test, and oedometer test. In order to facilitate the practical involvement of the students, they were divided into small groups composed of around ten people each. Groups were involved at the same time in different laboratory activities, with the help of at least four laboratory technicians and assistants. Then the groups did different parts of the same practical exercise rotationally. Each group was always composed by the same students, for all the laboratory activities. At the completion of the course, each group had to write a report dealing with the laboratory activities and the evaluation of the report was accounted for the final marks. In the time span of three weeks, each student spent a total amount of 12 h to get laboratory activities.

The teaching language was English, as usual in all education institutions in Rwanda. Since neither the teacher nor the students were native English speakers, the use of English as “vehicular” language was a real challenge. It was faced without any specific didactic preparation on the use of this language as a means of teaching.

5. Observations about the didactic activities

Some questions rose during the preliminary preparation of the presentation slides. First of all, before starting the first cycle of lessons, the

teacher didn’t know which was the students’ background and their level of knowledge of basic disciplines such as Engineering Materials, Solid Mechanics, Fluid Mechanics and Hydraulics. This issue represented an obstacle in the choice of the teaching approach to be adopted. Secondly, it was necessary to consider the students’ real and wider cultural background as they came from the local context. To facilitate their learning, it was deemed not appropriate referring to practical examples that were far away from their experience. For instance, if the teacher wanted to refer to an *embankment*, a European student knows the meaning of the word because he has his own experience of road or railway embankments. A Rwandan student has probably seen only few asphalt roads, prevalently built through excavation of existing hills, and no any railway. For these reasons, preparation of presentations required different levels of care and implied many uncertainties.

As expected, the first lesson was very hard. The teacher intended to keep a high level of teaching. After a brief introduction to the module and a rough attempt to motivate the students through the explanation of practical objectives, the first lesson was full of concepts, definitions and theoretical aspects. At the end of the first day, the prompt comment from the student, who was the representative of the whole class, helped the teacher both to understand students’ expectations and to reconsider the way of teaching. In the following days things went better.

In general, the use of English language was not an insuperable obstacle. Indeed, at the end of the module, the teacher realized that some students had encountered some difficulties in learning because of their limited understanding of English language.

A further obstacle was represented by the scarcity of books. In order to have a support for the study, the teacher recommended the use of an e-book, which was immediately available for all the students of the class. The teacher’s impression was that the students were not accustomed studying on books, whatever hard or soft copies. The students studied prevalently by using their notes taken during lessons.

As regards the laboratory activities, it was very impressive to see the young students to handle soil specimens with manual ability and practical sense, in order to determine the basic characteristics for soil classification. It was evident that laboratory activities helped the students to understand better what has had been explained during theoretical lessons.

The teacher noticed another aspect, completely new and unexpected, in the students’ way of studying. In their free time, the brightest students in the class made themselves available to provide additional explanations to the slowest students. This has helped all the students of the class to improve their learning and has also allowed members of the group most in need to raise their performance. The teacher was able to ascertain from this experience the observations of some researchers, who stated that dealing with education, one important approach to teaching and learning is the so-called “peer learning”, a greatly underutilized and highly effective method of learning, in which students teach other students (Biggs, 2003; Dahms & Stentoft, 2008). From this evidence, the teacher realized how widely the technique of “teaching each other” was adopted among INES students. In fact, a great amount of peer teaching accompanied by peer learning commonly takes place at INES, especially in the field of Civil engineering. According to many researchers in the field of education, this is one of the most effective ways of learning (Dahms & Stentoft, 2008). The European teacher has become aware that, as stated by Dahms and Stentoft (2008), peer teaching and learning enhances the quality of learning, while at the same time helps to develop in the students a sense of responsibility for their own learning, as well as for the learning and personal growth of team members.

6. Students’ interviews

Ten students belonging to the same class, who attended the first “Soil Mechanics” module, were interviewed about the main differences they noticed between the teaching methods adopted by INES lecturers and those adopted by the European teacher.

They noticed that INES teachers usually teach in a clear way, but not much emphasis is given to know how much the students have understood. No feedback is ever required from students. During the lessons by the European teacher, they noticed a more open attitude towards students, which made it easy for them to reach out, even asking questions during the break time. They also noticed the constant request to know if students had understood and do everything possible to make sure every student had understood. In the way of teaching of the European lecturer, they also noticed a certain effort in setting up a high effective feedback mechanism.

As regards laboratory activities, they noticed that during their ordinary lessons, laboratory tests were explained only by laboratory technicians. INES lecturers only showed how to apply the test results in formulas. In the module taught by the European teacher, laboratory tests and related concepts were explained by the teacher before having a laboratory session, which helped students understanding with engineering methodology the reason those tests were performed and the meaning of each procedure, in simulating the field conditions.

The language used ordinarily in the classes in this institute, as in the whole Rwandan education institutions, is English. Regarding the use of this common vehicular foreign language, the interviewed students noticed that in their ordinary lessons, when some students did not understand something, INES lecturers tried to use Kinyarwanda (the local language) to explain it. With the European teacher, they were obliged using only English, though not many but few students had a barrier in understanding some terms.

They also commented punctuality of lecturers. They compared the high level of punctuality of the European teacher with respect to the average punctuality for a large number of local teachers.

The interviewed students underlined how local teachers are usually highly motivated, but less passionate. Teaching looks much like job to them. They only make sure that the module is covered. Instead, they noticed that the European teacher was very passionate and highly motivated while teaching, really concerned that students could understand the contents and their concepts.

Obviously, not all comments pended in favour of the European teacher. As an example, the interviewed students noticed that at least one field visit was provided for each module. Instead, no any field visit was organized within the module taught by the European teacher.

Students also observed how showing field videos or simulation videos during lessons is very effective, at least for two reasons: (i) it helps students to get an idea about the concept, if it is their first time they hear about the topic, and (ii) procedures and practicability are well observed through videos than illustrations of figures and drawings. This can also help students who are not so strong with English to understand what is discussed during class. This means is commonly used by INES lecturers. Instead, the European teacher did not use any video, and it was a good suggestion for future teaching activities.

Among similarities, they noticed that all teachers provided lecture notes, slides and books to students for revising further reading. Moreover, all teachers provided exercises well related to field applications.

The interviewed students expressed their gratitude for the opportunity to have a foreign teacher. Some of them expressed their satisfaction and said that "this professor taught with authority".

7. Student survey

Among the 151 students of the three classes who attended lessons, a survey was carried out on the evaluation of the learning experience. A total of 114 students were interviewed through an anonymous questionnaire at the completion of the module. The questionnaire included 20 questions, which are reported in [Appendix 1](#).

The main topics of the questionnaire were:

- Education background (question 1), in order to understand if the module fitted the previous students' preparation;

- Use of English as vehicular language (questions 2 and 3), in order to assess the level of difficulty due to the use of a foreign language;
- Methodological approach (questions 4, 5 and 6), in order to evaluate if it was perceived similar or different with respect to other modules and if it was considered more or less difficult with respect to others;
- Different parts of the module (questions 7 to 10), in order to understand what the students considered attractive and useful for their education;
- Teaching methods (questions 11 to 14), in order to evaluate if the used techniques were more or less appreciated and effective;
- Students' involvement (questions 15 and 16), in order to compare the teacher's perspective with that of the students;
- Expectations (question 17), in order to evaluate the appreciation of the learning experience;
- Experience with a foreign teacher (questions 18, 19 and 20), to evaluate the effectiveness of the educational action carried out by a teacher with a different culture.

Results of questionnaires are reported in the following.

As regards the education background, 62% of the students said that it was suitable, for nearly 30% it was very suitable and for only a small percentage it was poorly (6%) or not suitable (1%). The remaining 1% did not answer ([Fig. 1](#)).

The use of English was considered a normal obstacle by 53% of the students; 35% of them declared that it did not represent any obstacle, while for nearly 10% it was a big obstacle; for 2% of the students it was indifferent ([Fig. 2a](#)). When students were asked how much they considered important translation in their native language, answers were almost equally divided into three parts: for 32% of the students, translation was very important, for 34% it was important, for 32% it was not important and only 2% declared that it was indifferent ([Fig. 2b](#)).

The adopted methodological approach was evaluated difficult, i.e. at too high level, by 13% of the students; 82.5% of them declared that it was appropriate, 3.5% that it was not appropriate and only 1% stated that it was at low level ([Fig. 3a](#)). Through a different question, the students were asked to judge the methodological approach for their personal growth: 59% of them judged it as very useful, 38% as useful, 2% as not useful while for 1% it was indifferent ([Fig. 3b](#)).

In order to understand to what extent the teaching method was inserted in the context of the Institute, the students were asked to compare the methodological approach adopted in this module with respect to other modules. 32% said that it was very different, 53.5% that it was different, 10.5% said that it was equivalent and 4% that it was indifferent ([Fig. 4](#)).

As regards the different parts of the didactic activity, theory was considered very useful by 61.5% of the students, useful by 33.5%, poorly useful by 4%, while 1% did not answer. No one said that it was ineffective ([Fig. 5a](#)). Exercises, which had been solved all together during class and with the help of the teacher, were judged very useful by 83% of the

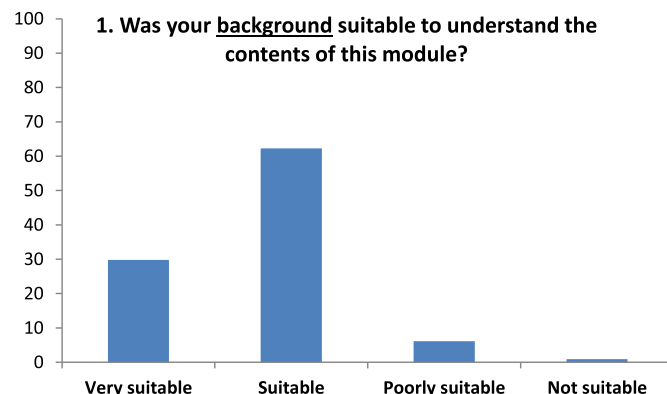


Fig. 1. Percentage of answers about education background.

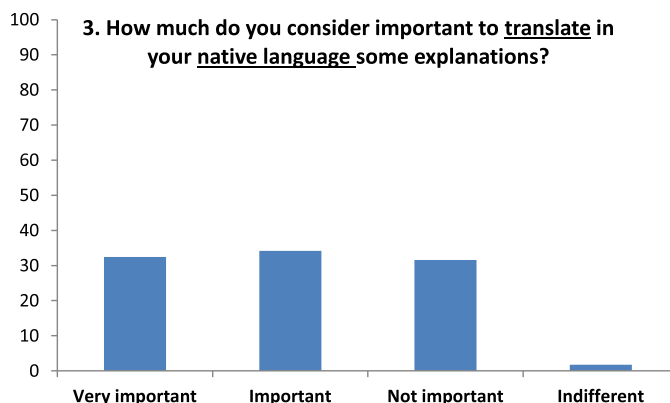
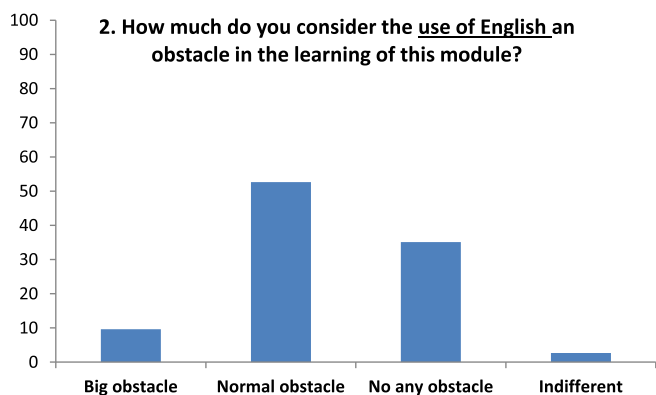


Fig. 2. Percentage of answers about the use of English (a) or native language (b).

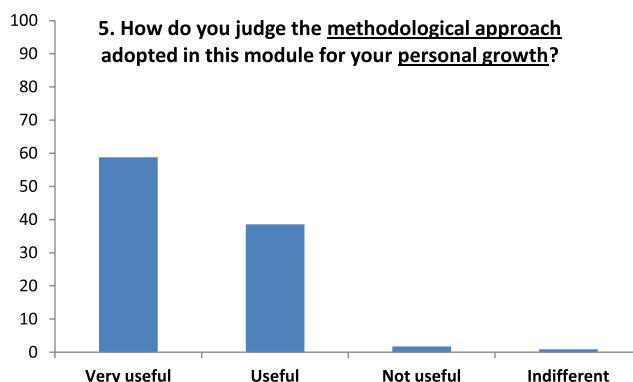
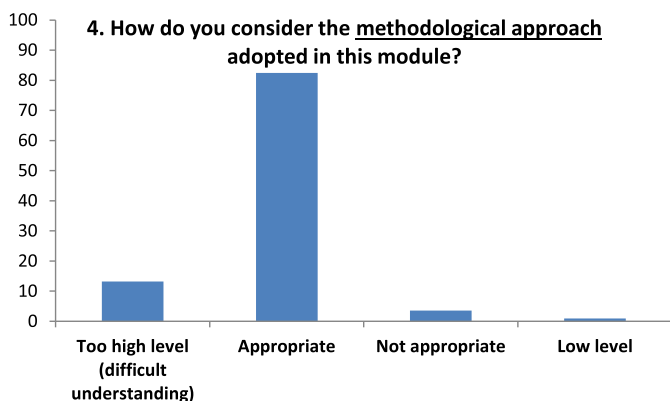


Fig. 3. Percentage of answers about the adopted methodological approach.

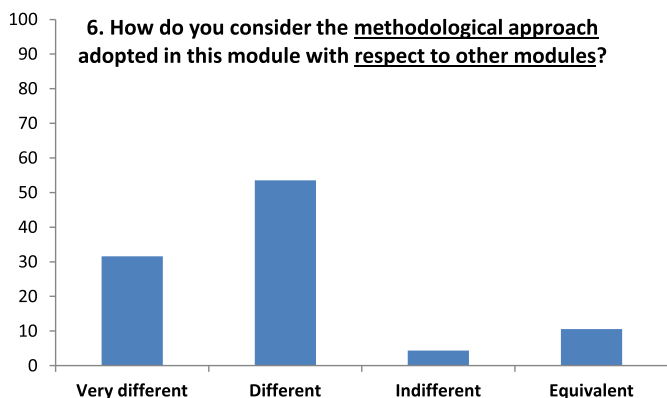


Fig. 4. Percentage of answers about comparison with other modules.

students, useful by 17%, poorly useful by 3%, while 1% did not answer and no one said that they were ineffective (Fig. 5b).

The approach of “problem solving” was considered very useful by 59.5% of the students, useful by 37%, poorly useful by 2.5%. 1% did not answer and no one answered that it was ineffective (Fig. 5c).

Laboratory activities were judged very useful by 72% of the students, useful by 24.5% and poorly useful by only 3.5%. No one answered that they were ineffective (Fig. 5d).

Almost 80% of the students judged the way of teaching as appropriate, 18% as easy and 2% as difficult (Fig. 6a).

As regards the use of different tools during teaching activities, they were judged rather well. The use of blackboard was evaluated as effective

by 92% of the students, as ineffective by 4% and indifferent by 2%. Further 2% did not answer to this question (Fig. 6b). The use of slide showing (“Power point”) was judged effective by 85% of the students, ineffective by 9%, indifferent by 5%. 1% did not answer (Fig. 6c).

The means the students had to their disposal for self-study (essentially: copies of slides and a soft book) were considered appropriate by 67.5% of the students, as usual by 30% of them. 2.5% did not answer and no one said that they were not appropriate (Fig. 6d).

During lessons, the teacher tried to involve students in discussions and explanations. The students were asked to evaluate how much their involvement had been facilitated. 44% of them declared that they had been highly facilitated, 51% normally facilitated, 4% poorly facilitated. 1% did not answer (Fig. 7a). Through a different question, students were asked to judge their “real” level of involvement: 34% declared that the involvement had been high, for 58% it was normal, for 5% it was poor. 3% did not answer (Fig. 7b).

As regards the students’ expectations, 56% declared that the module fulfilled much more than they expected, for 36% the level of fulfilment was adequate, for 4.5% it was lower than expectations. 3.5% did not answer (Fig. 8a).

The last three questions were directly devoted to evaluate the students’ perception of a foreign (in particular European) teacher. The possibility of having a foreign teacher was considered very useful by 79% of the students, useful by 16.5%, poorly useful by 3.5%. 1% did not answer (Fig. 8b). The real exchange experience with the teacher was judged high by 68% of the students, normal by 30%, poor by 1%. A further 1% did not answer (Fig. 8c). The possibility of having further European professors teaching other modules was judged highly preferred by 78% of the students, normally preferred by 20%, poorly preferred by 1%. 1% did not answer (Fig. 8d).

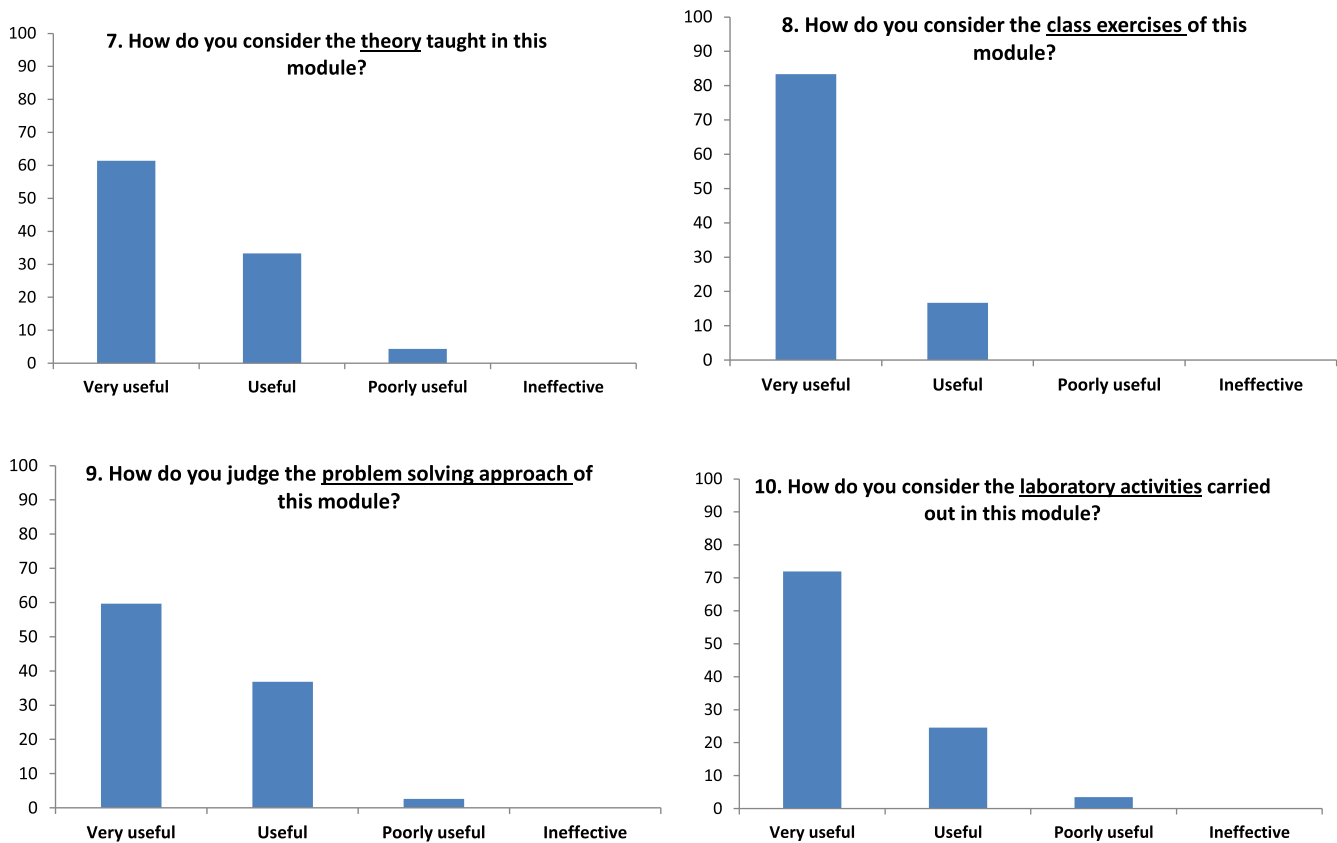


Fig. 5. Percentage of answers about different parts of the module.

8. Exams and evaluation

The evaluation of each student was made on the basis of four components: written mid test, written final exam, assignments and laboratory report. In particular, both the mid test and the final exam included multiple choice theoretical questions (14 questions in the mid test and 5 questions in the final test, respectively) and exercises with calculations (3 exercises in the mid test and 5 exercises in the final test, respectively). The assignments consisted of two exercises with calculations, the first one dealing with the classification of a soil sample and the second one dealing with the determination of soil shear strength parameters on the basis of laboratory test results. The assignments had to be solved in a written form individually from each student and delivered to the teacher during the module. The laboratory report, one for each group of students, had to describe all laboratory activities, including devices, procedures, theoretical and practical assumptions, boundary conditions, measurements and results. Different didactic activities concurred with different percentages to the final evaluation of each student. The written mid test concurred with the 35%, the final written exam with 40%, the assignments with 10%, the laboratory report with 15%.

9. Final students' profit

The profit of the students, with direct reference only to the final marks, can be considered satisfactory. The minimum marks to pass the exam was 10 out of 20. The frequency of the final marks are reported in Fig. 9.

As regards the first class (Level 3, January 2018) only two students, corresponding to 3.1%, did not pass the examination, with final marks less than 10; 40.6% of the students attained a sufficient level, with marks in the range between 10 and 12.5; 36% attained a fairly good level, with marks between 12.5 and 15; 14% were at a very good level, with marks

between 15 and 17.5; 6.3% attained an excellent level, with marks between 17.5 and 20.

In the second class (Level 3A, November 2018) 6.8% of the students did not pass the examination, with final marks less than 10. 29.5% of the students attained a sufficient level, with marks in the range between 10 and 12.5; 34.1% attained a fairly good level, with marks between 12.5 and 15; 20.5% were at a very good level, with marks between 15 and 17.5; 9.1% attained an excellent level, with marks between 17.5 and 20.

In the third class (Level 3C, December 2018) 9.3% of the students did not pass the examination, with final marks less than 10; 21% attained a sufficient level, with marks in the range between 10 and 12.5; 27.9% attained a fairly good level, with marks between 12.5 and 15; 37.2% were at a very good level, with marks between 15 and 17.5; 4.6% attained an excellent level, with marks between 17.5 and 20.

These results are not different from those that could be attained by a similar class of students in a typical Italian undergraduate program in Civil Engineering.

By comparing these data, it can be noticed how passing from results of the first class to the second one and then to the third one there is a decrease in the number of students who attained a sufficient level and a corresponding increase in the number of students who attained a very good level. It can be supposed that this global improvement in the academic performance is mainly due to the following reasons:

1. The teacher tried to improve his teaching method, adapting it more and more to the needs of the students; in particular, on the basis of the experience in previous classes, he tried to focus attention on aspects that constituted an obstacle for the students;
2. On the basis of "word of mouth" from the classmates of the previous classes, the students tried to take greater advantage of the new type of lessons, participating more and more assiduously and actively in the teaching activities.

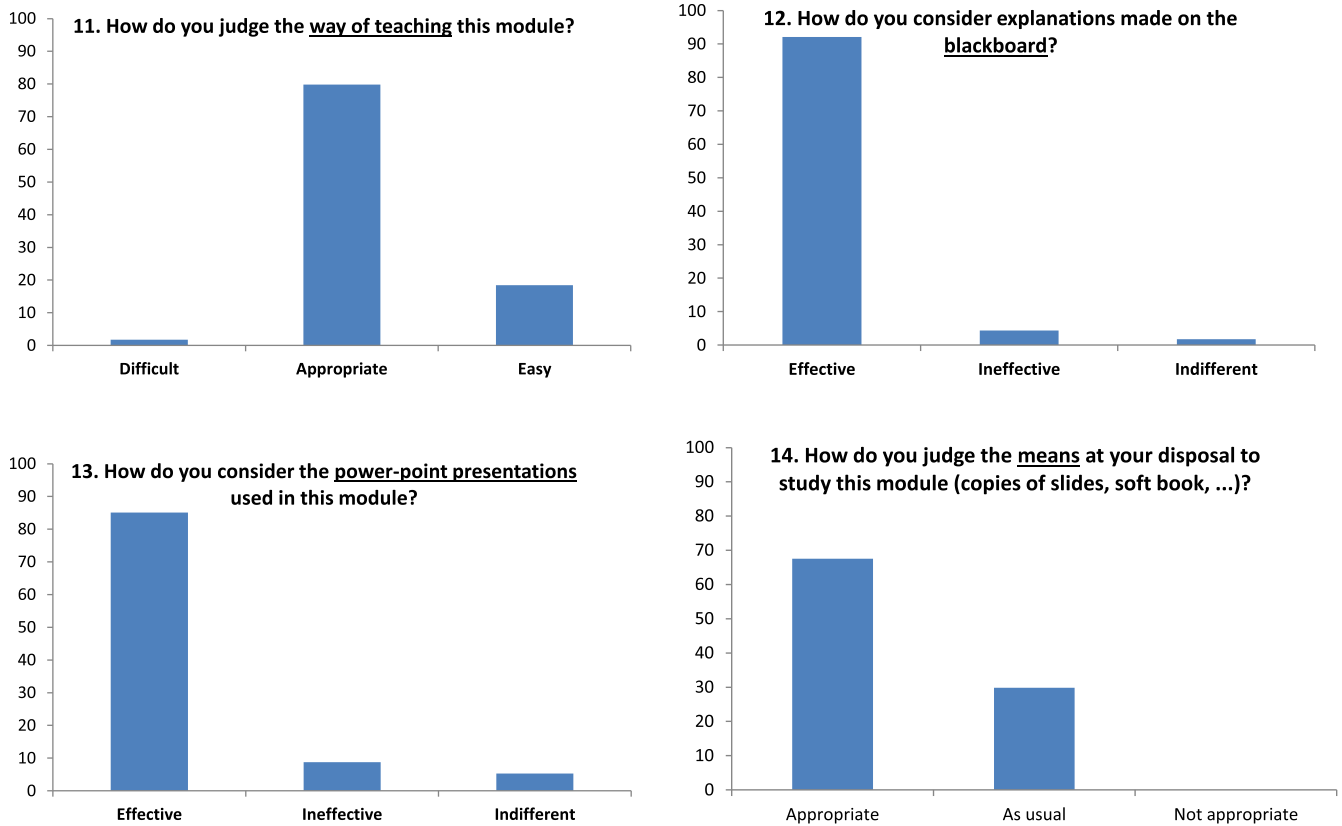


Fig. 6. Percentage of answers about teaching methods and means.

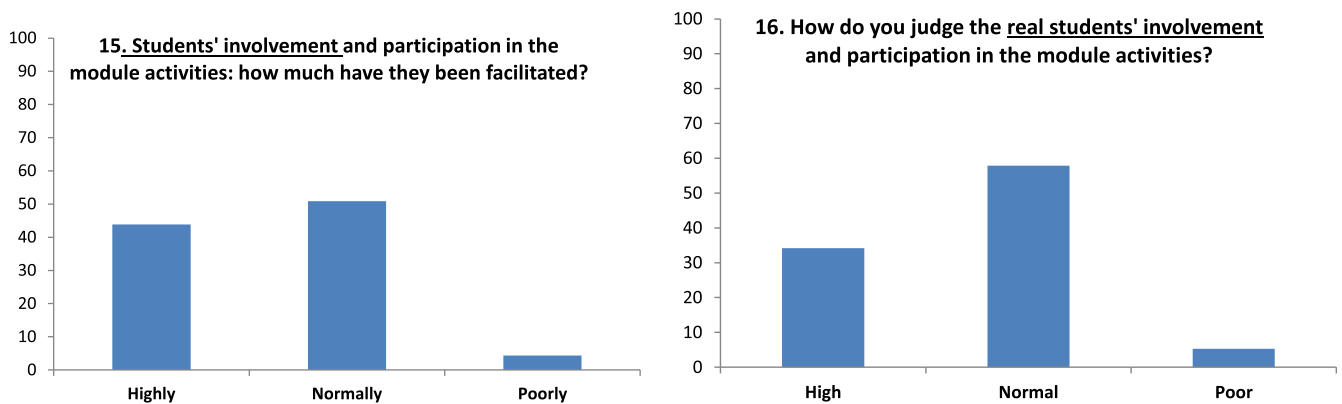


Fig. 7. Percentage of answers about students' involvement.

3. In the third class, the teacher noticed a higher use of “peer learning” than in the first two classes.

Obviously, the simple marks number does not include what each student might have acquired in terms of human experience and education in the broad sense.

10. Concluding remarks

Based on the reported students' opinion, it could appear that the conclusion is that “European teachers are better than African teachers”. This would be a misinterpretation of the message. The fact that the approach used by the European teacher has been appreciated by the students should rather be interpreted as a positive element with a view to welcoming a completely different element into one's learning activity. In fact, the initial concern of the European teacher was to be considered as a

“stranger” and as an element of “disturbance” in the usual course of learning. Instead, it is useful to underline how the intervention of the foreign teacher has been able to introduce a small improvement in the general performance of the civil engineering undergraduate program.

Moreover, the described experience has helped the teaching methods of the European professor not only in the new foreign environment, but also in his own country, among the Italian students. This appears to be in line with results of some researchers in the field of education. For example, Hayward and Morace (2009) observed that professors with research experience in an international context could enrich their teaching practice with the insight gained from their contact with other cultures (Hayward & Morace, 2010). Other researchers showed how intercultural and international training of professors could help them to adapt to the needs, learning and working methodology of foreign students and build foundations for domestic students' interaction with other

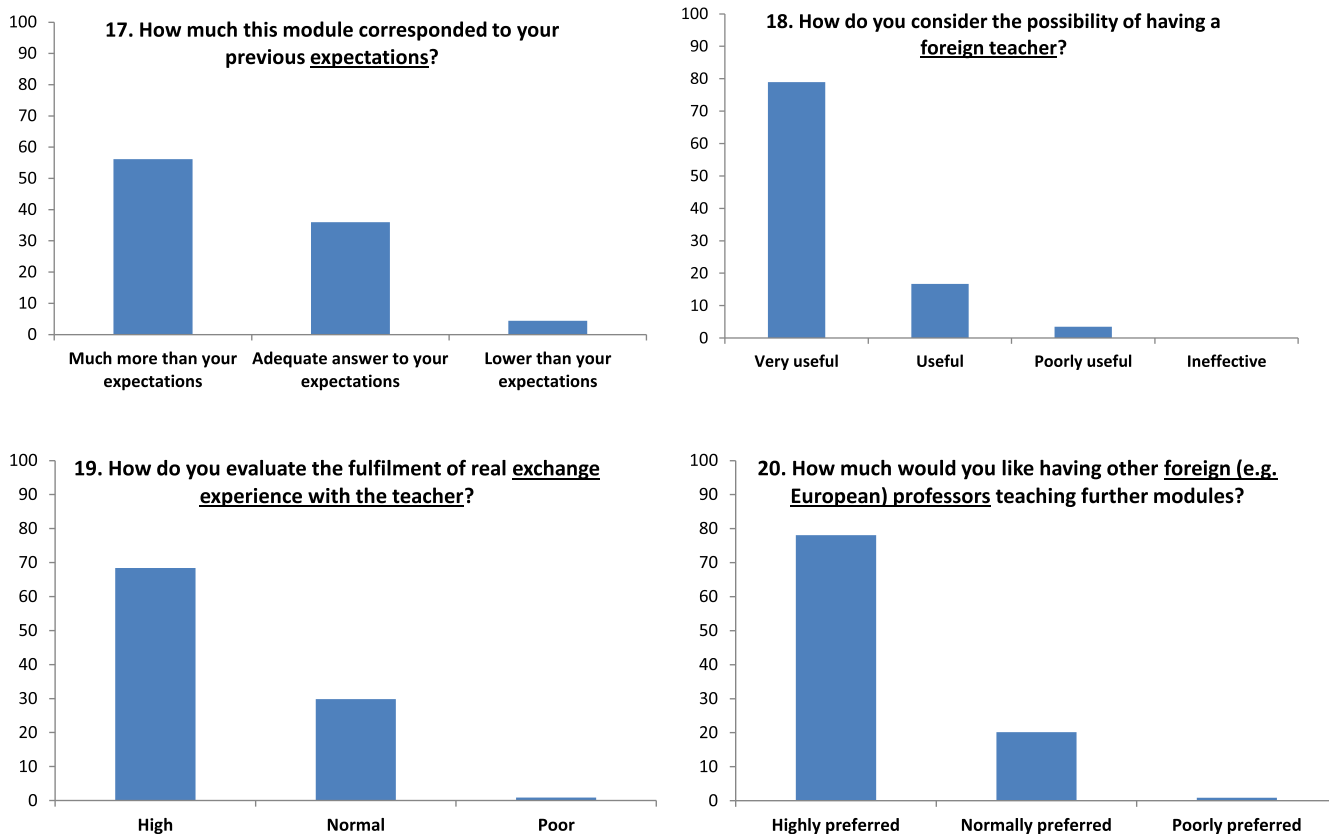


Fig. 8. Percentage of answers about students' expectations and global experience with a foreign teacher.

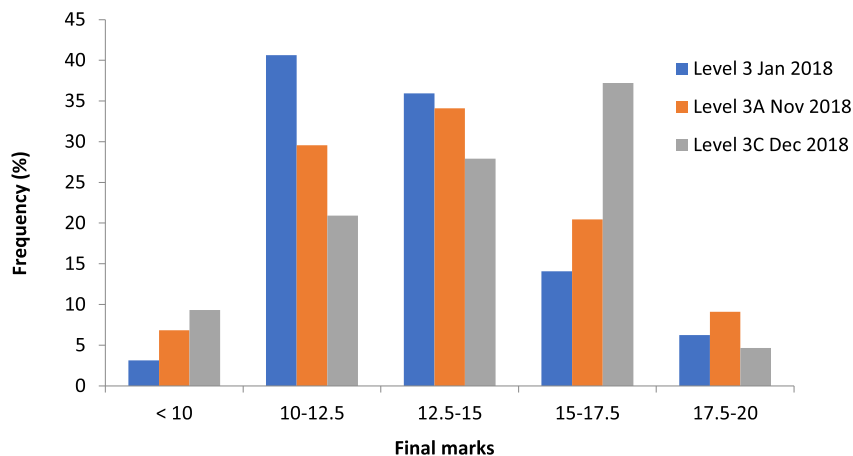


Fig. 9. Frequency of the final marks for the students of three classes.

cultures resulting in a stronger formation of intercultural synergistic teams (Cheach, Chen, & Ting, 2005; Russell, 2000).

Under a wider perspective, this experience has proved to be a privileged way to build a larger project under the Erasmus Plus program, which was subsequently eligible for funding. The described experience could be considered as a very useful step preceding the construction of the project, that involves not only the teacher's home university, but also other European higher education institutions.

If it is rather difficult quantifying the lesson learnt by the Rwandan students, and it is also rather difficult assessing the potential advantage of "domestic" students from the teacher's experience abroad. But it is much more difficult measuring what the teacher gained by this experience. The most impressive gift he received was the human relationship and a great motivation. This had the power to give a new and deeper sense to his

profession. Moreover, it was astonishing to observe how the didactic approach that can be considered "usual" for a European teacher was considered of a much higher level by the local students. We think that, in this sense, European professors can assume an important role with respect to a real improvement of higher level education in the African context, specifically in Rwanda and especially in the field of civil engineering.

Nor should we overlook the question of academic responsibility, especially of universities in developed countries, for the role they can play as a driving force for higher education institutions in developing countries. It will be difficult for this role to be automatically entrusted to the richest universities by those with the lowest economic means, if not taken up autonomously, as a moral, cultural and institutional commitment.

On the basis of this rich experience from a human and professional point of view, a question arises that perhaps should concern all university

teachers: does our task really end in a good research worthy of publication? Which is the added value of such a kind of experience in terms of collective good? Perhaps it would be useful to start a joint reflection on this issue in the academic world.

Appendix 1. Questionnaire on the evaluation of the module of “Soil Mechanics”

No.	Question	a	b	c	d
1	Was your background suitable to understand the contents of this module?	Very suitable	Suitable	Poorly suitable	Not suitable
2	How much do you consider the use of English an obstacle in the learning of this module?	Big obstacle	Normal obstacle	No any obstacle	Indifferent
3	How much do you consider important to translate in your native language (Kinyarwanda) some explanations?	Very important	Important	Not important	Indifferent
4	How do you consider the methodological approach adopted in this module?	Too high level (difficult)	Appropriate	Not appropriate	Low level
5	How do you judge the methodological approach adopted in this module for your personal growth?	Very useful	Useful	Not useful	Indifferent
6	How do you consider the methodological approach adopted in this module with respect to other modules?	Very different	Different	Indifferent	Equivalent
7	How do you consider the theory taught in this module?	Very useful	Useful	Poorly useful	Ineffective
8	How do you consider the class exercises of this module?	Very useful	Useful	Poorly useful	Ineffective
9	How do you judge the problem solving approach of this module?	Very useful	Useful	Poorly useful	Ineffective
10	How do you consider the laboratory activities carried out in this module?	Very useful	Useful	Poorly useful	Ineffective
11	How do you judge the way of teaching this module?	Difficult	Appropriate	Easy	–
12	How do you consider explanations made on the blackboard?	Effective	Ineffective	Indifferent	–
13	How do you consider the power-point presentations used in this module?	Effective	Ineffective	Indifferent	–
14	How do you judge the means at your disposal to study this module (copies of slides, soft book, ...)?	Appropriate	As usual	Not appropriate	–
15	Students' involvement and participation in the module activities: how much have they been facilitated?	Highly	Normally	Poorly	–
16	How do you judge the real students' involvement and participation in the module activities?	High	Normal	Poor	–
17	How much this module corresponded to your previous expectations?	Much more than your expectations	Adequate answer to your expectations	Lower than your expectations	–
18	How do you consider the possibility of having a foreign teacher?	Very useful	Useful	Poorly useful	Ineffective
19	How do you evaluate the fulfilment of real exchange experience with the teacher?	High	Normal	Poor	–
20	How much would you like having other foreign (e.g. European) professors teaching further modules?	Highly preferred	Normally preferred	Poorly preferred	–

References

- Altbach, P. G. (2010). Globalisation and the university: Myths and realities in an unequal world. *Tertiary Education and Management*, 10(1), 3–25. <https://doi.org/10.1080/13583883.2004.9967114>.
- Alves, A. C., Kahlen, F. J., Flumerfelt, S., & Siriban Manalang, A. B. (2013). *Comparing engineering education systems among USA, EU, Philippines and South Africa, conference: ASME 2013 international mechanical engineering congress and exposition, November 2013* (Vol. 5). San Diego, California, USA, ASME: Education and Globalization. <https://doi.org/10.1115/IMECE2013-63254>.
- Benson, L. C., Becker, K., Cooper, M. M., Griffin, O. H., & Smith, K. A. (2010). Engineering education: Departments. Degrees and directions. *International Journal of Engineering Education*, 26(5), 1042–1048.
- Biggs, J. (2003). *Teaching for quality learning at university*. Berkshire, United Kingdom: The Society for Research into Higher Education & Open University Press.
- Bloom, D., Canning, D., & Chan, K. (2006). *Higher education and economic development in Africa*. Washington DC, USA: Harvard University, Human Development Sector, The World Bank.
- Cheach, C. Y. J., Chen, P. H., & Ting, S. K. (2005). Globalization challenge, and civil engineering curriculum reform. *Journal of Professional Issues in Engineering Education and Practice ASCE*, 131(2), 105–109.
- Cheville, R. A. (2012). Global engineering education: Current challenges and opportunities. In *2012 IEEE/MTT-S international microwave symposium digest* (pp. 1–3). IEEE.
- Dahms, M.-L., & Stentoft, D. (2008). *Does Africa need problem based learning?: Educational change in engineering education*. Cape Town, South Africa: American Society of Engineering Education (ASEE) – Global Colloquium. Paper presented at.
- Downey, G., & Beddoes, K. (2010). What is global engineering education for?. In *The making of international educators*. Morgan & Claypool Publishers.
- Hayward, A. G., & Morace, C. (2010). The challenges of globalization in French engineering and management schools: A multiperspectivist model for intercultural learning. *International Journal of Intercultural Relations*, 34, 303–313, 2009.
- Jaes. (2006). *The Africa-EU strategic partnership: A joint Africa-EU strategy*, 2006 https://www.africa-eu-partnership.org/sites/default/files/documents/eas2007_joint_strategy_en.pdf.
- Junker, J. C. (2018). *State of the union 1018, the hour of European sovereignty, authorised version of the state of the union address 2018*. https://ec.europa.eu/commission/sites/beta-political/files/soteu2018-speech_en_0.pdf.
- Langhorne, R. (2001). *The coming of globalization – it's evolution and contemporary consequences*. New York: Palgrave Publishers Ltd.
- Lucena, J., Schneider, J., & Leydens, J. A. (2010). Engineering and sustainable community development. *Synthesis Lectures on Engineers, Technology, and Society*, 5(1), 1–230.
- Mineduc. (2008). *Higher education policy, republic of Rwanda*. Ministry of Education. Report http://mineduc.gov.rw/fileadmin/user_upload/Higher_Educ.pdf.
- Russell, J. (2000). Globalization: The new reality. *Journal of Management in Engineering*, 3, November/December.
- Schendel, R. (2015). Critical thinking at Rwanda's public universities: Emerging evidence of a crucial development priority. *International Journal of Educational Development*, 42, 96–105.
- Schendel, R. (2016). Adapting, not adopting: Barriers affecting teaching for critical thinking at two Rwandan universities. *Comparative Education Review*, 60(3), 549–570.

Schendel, R., & Tolmie, A. (2017). Beyond Translation: Adapting a performance-task-based assessment of critical thinking ability for use in Rwanda. *Assessment & Evaluation in Higher Education*, 42(5), 673–689.

Taleza, P. T. (2005). Transnational education and African universities. *Journal of Higher Education in Africa/Revue de l'Enseignement Supérieur en Afrique*, 3(1), 1–28.

Wei, J. (2005). Engineering education for a post-industrial world. *Technology in Society*, 27, 123–132.

Wright, H. (2011). *Construction market analysis and forecast*. <http://www.ihs.com/products/globalinsight/industry-analysis/construction/index.aspx>.