

**Grand Challenges Scholars Program - GCSP at the Engineering
School, Universidade Federal de Minas Gerais**

**Programa Acadêmico Grandes Desafios para a Engenharia, Escola de
Engenharia, Universidade Federal de Minas Gerais**

DOI:10.34117/bjdv8n6-049

Recebimento dos originais: 21/04/2022

Aceitação para publicação: 31/05/2022

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ABSTRACT

The structure of the Grand Challenges Scholars Program (GCSP) of the Universidade Federal de Minas Gerais -UFMG, School of Engineering, linked to the National Academy of Engineering (NAE) former initiative, is presented. This academic program has an aspirational vision of educating professionals for facing the challenges of engineering in the twenty-first century. The approach is based on an integrative methodology, geared toward the formation of critical competencies, with a focus on solutions to global problems. It creates opportunities for cooperation, as well as develops multicultural and multidisciplinary competencies, social ability, and commitment. Currently, the courses at the UFMG School of Engineering are adapting to meet the new national guidelines for Engineering courses in Brazil, published in January 2019, and the GCSP is a pilot program, capable of transforming the methodology, the mentality, and the educational and technological tools it uses, into an alternative for all engineering courses at UFMG. The Program started its activities in the School of Engineering in 2020, despite the challenges and limitations imposed by the Covid-19 pandemic. The operational criteria and the internal organization were defined, and the Program was introduced to the students. The first initiatives of the Program - with broad access to engineering students and open to the participation of students from other areas - included the Call No.01/2020 - Covid-19 and the I Sustainability Workshop, held in 2021.

Keywords: GCSP, academic program, Grand challenges Scholars Program, integrative methodology, competency formation.

RESUMO

Apresenta-se a estrutura do Programa Acadêmico Grandes Desafios para a Engenharia (Grand Challenge Schollars Program - GCSP) da Escola de Engenharia da UFMG, vinculado a National Academy of Engineering - NAE. Esse Programa Acadêmico tem uma visão aspiracional de formação de engenheiros preparados para os desafios da Engenharia no século XXI, e é baseado em metodologia integradora, voltada para a formação de competências críticas, com foco em soluções para problemas globais. Ele cria oportunidades para cooperar, bem como desenvolver competência multicultural e multidisciplinar, competência social e comprometimento. Atualmente, os cursos da Escola de Engenharia da UFMG estão se adaptando para atender às novas diretrizes nacionais para cursos de Engenharia no Brasil, publicadas em janeiro de 2019, e o GCSP pode ser visto como um programa piloto, capaz de transformar a metodologia, a mentalidade e as ferramentas educacionais e tecnológicas que utiliza, em alternativa para todos os cursos de engenharia da UFMG. O Programa iniciou suas atividades na Escola de Engenharia em 2020, definindo critérios para o seu funcionamento, sua organização

interna, e iniciando a apresentação do Programa aos estudantes, mesmo com os desafios e limitações impostos pela pandemia de Covid-19. Apresentam-se, também, as primeiras iniciativas do Programa, de acesso amplo aos estudantes interessados da Escola de Engenharia, aberto à participação de estudantes de outros cursos, como a Chamada No.01/2020 – Covid-19 e a I Oficina de Sustentabilidade, realizada em 2021.

Palavras-chave: GCSP, programa acadêmico, grandes desafios para a engenharia, metodologia integradora, formação de competências.

1 INTRODUCTION

The School of Engineering at UFMG- EEUFMG has developed several academic projects and programs to modernize the curricula of engineering courses. Among these initiatives is the Grand Challenges Scholars Program - GCSP of EEUFMG, created by the National Academy of Engineering – NAE (US). The participation of EEUFMG was approved and launched in 2020.

The GCSP aims to implement worldwide programs committed to an education that develops the critical skills needed for solving the Grand Challenges of Engineering in the 21st century. These challenges were selected in 2008 by a committee made up of 18 people invited, including engineers, technologists, and futurists, such as Google co-founder Larry Page, Brazilian architect and urban planner Jaime Lerner, and futurist Raymond Kurzweil. The 14 challenges address four cross-cutting themes incorporated into the GCSP program, namely sustainability, health, safety, and *joie de vivre*. These four themes point to modern society's urgent issues and require innovation in engineering solutions. It is the responsibility of engineering courses to prepare the new generations of engineers with the tools to face these challenges and create sustainable solutions, by exposing students to these Grand Challenges during their undergraduate programs. Well-prepared engineers can act locally, but think globally, producing knowledge and developing solutions that can be applied everywhere.

Morell et al. (2008) analyze the challenges of educating engineers prepared to deal with the relevant issues in a globalized world and knowledge-based economies. These include quality improvement of processes and systems, cost reduction, meeting consumer needs, and the development of innovative products. Morell (2010) discusses the role and opportunities engineering professors have in meeting the challenges facing engineering education considering those issues. In this paper, the profile and desired characteristics of the engineering professors - catalysts of these transformations - are aligned with the

results of a survey conducted by the president of the Student Platform for the Development of Engineering Education (SPEED) in 2009. The professor needs to be both an engineer and an educator: an expert and practitioner engineer, who communicates effectively and keeps up with trends in his or her discipline, an efficient educator and mentor committed to global citizenship and to developing engineering skills in the students. This understanding is consistent with the GCSP. A premise of the latter is faculty mentoring students from the time they begin until they complete their degree requirements. The mentor follows up on all the student's activities, from the selection of subjects to be taken, to the major challenge and the project to be developed, with guidance, but providing the necessary autonomy to the student.

The NAE/GCSP network currently has 71 programs in American universities, 14 in universities in Europe and Asia, 1 in Australia, and 2 in Brazil, the first of which was approved at the UFMG School of Engineering, and the second at the Mauá School of Engineering. But there are always new proposals being submitted to the proposal review committee of the GCSP network coordination and new programs being approved around the world. Several publications discuss the training of engineers based on the principles of the NAE/GCSP Program (MORELL, 2010, KATSOULEAS; MILLER; YORTSOS, 2013) and implementations of the GCSP Program in different universities (DONARER et al., 2017, Davies, 2020). In this context, Morell et al. (2018) presented the engineering leadership training program for the 21st century implemented at the Beihang University, which is also based on competency training as advocated by the GCSP.

Each university must prepare a proposal for the implementation of its GCSP Program, respecting the guidelines of the international committee. The proposal must present a vision and the academic structure of the school/faculty, the major challenges chosen as reference for the Program, the strategy for its implementation, considering the resources, culture and internal rules, forms of student selection, evaluation, and monitoring and student recognition. Students who complete the requirements defined for the Program are entitled to a certificate issued by the local coordination and a recommendation letter signed by the NAE president.

It should be noted that each GCSP Program must seek funding, either through corporate sponsorship or funding agencies. The School of Engineering's Program started, only, with resources remaining from the sponsorship obtained for the realization of the GCSP Workshop Brazil, in 2019, used for initial operational costs.

The adhesion of the School of Engineering to GCSP occurred through the collective construction of a proposal, by a team comprised of professors from the various departments, at the invitation of the Vice-Dean. Four motivations for the creation of this Program at the EEUFMG are listed:

- (i) Commitment to graduating engineers who are technically prepared, capable of thinking of new approaches, and able to turn an idea into a viable solution.
- (ii) Use of integrative and multidisciplinary methodology, focusing on solutions to global problems.
- (iii) Creating the aspirational vision of engineering for the 21st Century, committed to the continuation of life on the planet, making the world more sustainable, safe, healthy, and happy.
- (iv) International network cooperation, allows one to meet and discuss solutions to engineering-relevant problems with colleagues from other countries, cooperate on network-identified opportunities, and gain visibility on the international scene.

A successful GCSP Program will help the School of Engineering to build new approaches and methodologies for engineering courses, with an integrated vision, focused on developing solutions to problems of concern worldwide. This program creates an opportunity to cooperate, as well as develop multicultural and multidisciplinary competence, social competence, and commitment. Currently, EEUFMG courses are adapting to meet the new national guidelines for engineering courses in Brazil, published in January 2019. The GCSP experience can be seen as a pilot program, which seeks to transform the methodology, mindset, and educational and technological tools used in all 11 engineering courses at UFMG.

Section 2 presents the GCSP Program being implemented at EEUFMG, section 3 presents the internal organization and functioning, section 4 presents the first program activities open to all interested students, as well as the organization of the first selection and admission process of students to the program and, finally, section 5 presents the final considerations of the work.

2 THE GCSP PROGRAM AT EEUFMG

The GCSP Program at EEUFMG offers a formative pathway, to easily connect students in the Program to available resources. The student, with the help of his/her

mentor, must choose the subjects for his/her GCSP curriculum, in a way compatible with the pedagogical project of his/her undergraduate course (corresponding to a formative structure for the student in the Program). The GCSP curriculum is made up of five components, which aim to meet the basic principles of the critical competencies:

- 1) Talent competency: research-oriented; creative experience in GCSP topic.
- 2) Multidisciplinary competence: understanding of multidisciplinary engineering systems solutions - curriculum.
- 3) Viable business/entrepreneurship competency: understanding of viable business model for solution implementation.
- 4) Multicultural competence: planetary mindset; consideration of cultural issues to ensure acceptance of proposed engineering solutions.
- 5) Social awareness competency: understanding that Engineering should serve people and society.

The EEUFMG's flexible curriculum structure, defined for UFMG's undergraduate courses, establishes that the courses' curricula must offer students the possibility of taking a Complementary Education – CE (minor). The CE must cover topics related to the undergraduate course, but in a topic that represents a knowledge frontier of the original curriculum, as shown in Figure 1. This flexible structure allows the implementation of the multidisciplinary GCSP curriculum, as required by the Program. With eleven engineering courses, it is possible to provide many subject options, including some from other academic units.

In addition to the courses, some new academic activities have been proposed to meet the objectives of the GCSP. Students selected to participate in the Program will be instructed by their mentors to submit their specific GCSP further education plan to their course Collegiate for approval. This complementary GCSP training will allow students to develop the training skills required by the Program in an applicable way, in a given project, focused on one of the grand challenges, preferably in partnership with a company or community.

The grand challenges were chosen considering EEUFMG's understanding of the priority demands of the city of Belo Horizonte, the state of Minas Gerais, and Brazil, as well as the competencies installed at EEUFMG, capable of contributing to project development.

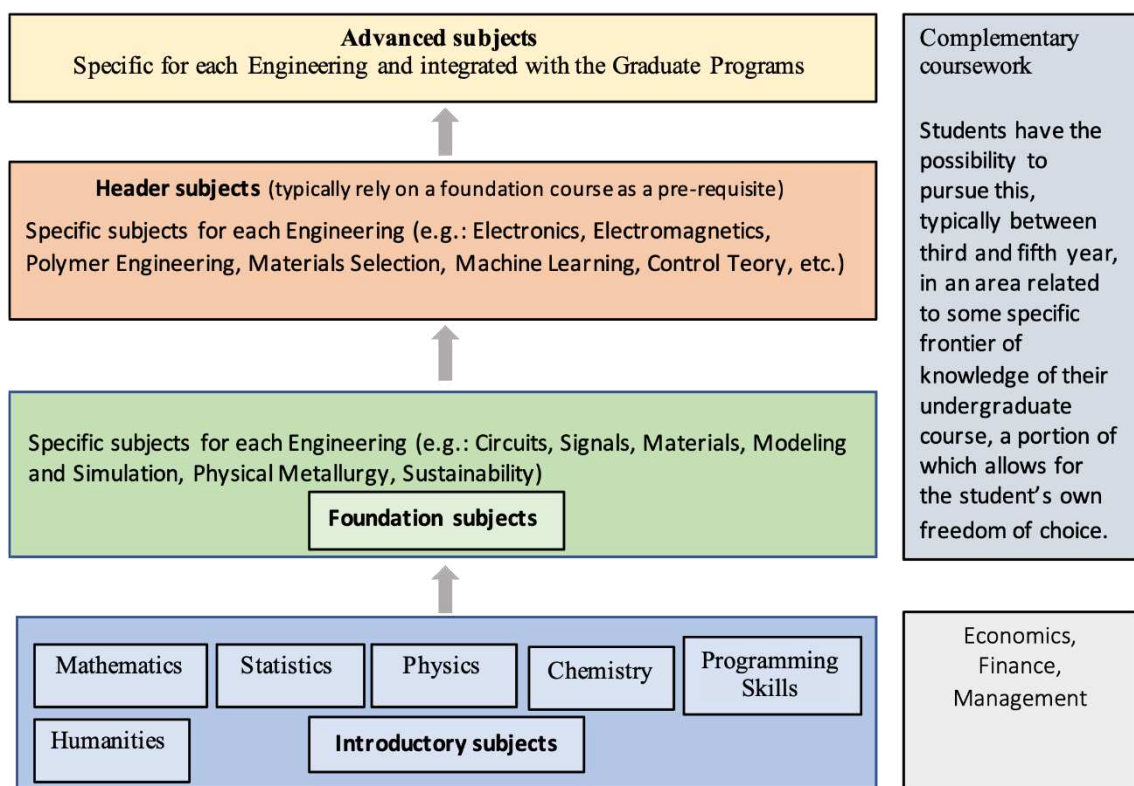
These are the challenges of the GCSP at EEUFMG:

- (i) restore and improve urban infrastructure;

- (ii) provide access to clean water and treat wastewater;
- (iii) develop clean and safe energy solutions;
- (iv) develop sustainable mindsets and solutions;
- (v) develop resources for advanced personalized learning.

The social insertion of the projects is considered a fundamental issue, to be a permanent exercise of applying the knowledge and competencies of Engineering to improve people's living conditions, especially those with fundamental unmet needs.

Figure 1: Course structure of the School of Engineering at UFMG



Source: GCSP proposal from the UFMG Engineering School, 2020.

Other important resources are the normative definitions of the EEUFMG, which establish a minimum workload of complementary academic activities that can be carried out by students in each course, if they so desire. Some of these activities are alternatives among the Program components and can be integrated by students into their course curricula and the GCSP, for example, participation in junior enterprises, participation in extension projects, and scientific initiation.

A fundamental strategy of the training process in the GCSP Program is faculty mentoring, which provides full support for each student throughout his or her time in the

Program. The mentor is the teacher responsible for following and guiding the student's training in the Program so that he or she experiences the five curricula components based on the GCSP competencies. It is considered that the mentor of a student in the GCSP program and the supervisor of his/her project may be distinct. In other words, the student's mentor in the Program may be the advisor of the project they are developing, too, but not necessarily.

2.1 COMPONENTS OF THE GCSP AT EEUFMG

The components of the Program are presented. It is shown how each one of the five critical competencies in students will be implemented, based on the resources available.

- **Multidisciplinary competence** (developed via curriculum): the flexible curricular structure of UFMG, by means of a Complementary Education plan (240h), is submitted to the student's course Collegiate. This workload was chosen to meet, also, the minimum requirement of a Complementary Education, according to UFMG's internal rules. Each student must choose one of the Grand Challenges and select the courses from Table 1 (minimum of 120 hours), in addition to the required or mandatory courses (120 hours), which are inherently multidisciplinary and designed for accomplishing the objectives of the Program. The suggested courses are listed for each Engineering Grand Challenge of this GCSP Program, but others may also be chosen, as suggested by the student's mentor, according to each specific project. The curriculum includes an activity that is also mandatory, called Academic Immersion, to be explained in the next section.

Table 1: Interdisciplinary Curriculum

Basic contents for all GCSP students (minimum course load of 60h)	
Challenges for Engineering, Innovation, and Problem-Solving (New) (30h) (Mandatory)	Sustainability and Ethics in Engineering (New) (30h) (Mandatory)
EMA083 Mechanical Drawing (60h) (Elective)	Electronics, Metrology and Instrumentation Fundamentals (New) (30h) (Optional)
Simulation and Modeling in Engineering (New) (30h) (Optional)	EPD064 - Technology and Society (60h) (Optional)
General Curricular Urban and Rural Internship (60h) (Optional)	Fundamentals of Object-Oriented Programming (New) (30h) (Optional)
Grand Challenge I: Recover and improve urban infrastructure	
ETG011 Transportation Systems Analysis (60h)	EHR007 Applied Hydrology (60h)
ETG051 Urban and Regional Transportation Planning (60h)	ESA612 Sewage Treatment (60h)
ETG036 Urban Traffic (60h)	ESA009 Environmental Control (60h)
ETG037 Public Transport (60h)	ESA014 Wastewater Treatment (60h)
EHR018 Water Resources Engineering (45h)	ESA126 Air Pollution Control (60h)

ENG - Academic Immersion I - Cities (Mandatory) (60h)	EPD048 Topics in Production Management: Environmental Management (60h)
Grand Challenge II: Provide access to water, respecting its diverse uses, and treat wastewater	
ENG090 - Water Reuse (30h)	Speciation and Reactions in Aqueous Media (new) (30h)
EHR007 - Applied Hydrology (60h)	EQM056 - Industrial Processes I (60h)
ESA014 Wastewater Treatment (60h)	EMN026 - Engineering Geology and Applied Hydrogeology (60h)
EHR018 - Water Resources Engineering (45h)	ESA125 - Groundwater and Soil Pollution Control (60h)
ESA613 - Industrial Wastewater Treatment (60h)	ESA612 Sewage Treatment (60h)
ENG - Academic Immersion II - Water (Mandatory) (60h)	
Grand Challenge III: Develop clean and safe energy solutions	
EEE024 - Fundamentals of Alternative Energy (30h)	ENG033 - Topics in Mechanical Engineering C: Solar Technology - Fundamentals and Applications (60h)
ELE045 - Electric Energy Generation (60h)	ENU002 - Energy Issues (60h)
EHR020 - Hydroelectric Power Plants (60h)	ENG091 - Recovery of Products and Energy from Environmental Sanitation (60h)
EEE934 - Electrical Energy Storage Systems (PPGEE) (60h)	Materials for Energy Generation and Accumulation (30h) (new)
ENG - Academic Immersion III - Energy - (Mandatory) (60h)	
Grand Challenge IV: Developing sustainable mindsets and solutions	
EMT074 - Materials Science (60h)	ENG090 - Climate Change and Carbon Market (30h)
ENG033 - Liquid Biofuels (45h)	EMT094 Materials and Process Selection (new) (30h)
Chemical Processes towards Sustainability (new) (45h)	Applied Processes for Solid Waste and Aqueous Effluents Treatment (for material recovery) (new) (30h)
Recuperation of Degraded Areas and Future Uses (new) (30h)	ELT071 Residential Automation (30h)
ENG - Academic Immersion IV - Sustainability (Mandatory) (60h)	EMN017- Sustainable Utilization of Mineral Resources (60h)
Grand Challenge V: Develop resources for advanced personalized learning	
DIP FAE988 - Didactics and Teaching: Teaching as an Object of Study (30h)	Engineering discipline in the desired area
DIP FAE956-Educational Technologies (30h)	Engineering discipline in the desired area
MTE 025 - Didactics (60h)	Engineering discipline in the desired area
ENG - Academic Immersion V - Learning (Mandatory) (60h)	

Source: UFMG School of Engineering GCSP Proposal, 2020.

- **Talent Competency:** all students selected for the Program must participate in an Academic Immersion Activity, related to their chosen Grand Challenge, as indicated in Table 1. The immersion activity comprises a combination of visits or internships in a company or municipality. During this period, students and their mentors will identify relevant problems or technical issues to be addressed by the GCSP projects. Students will be invited to form multidisciplinary groups to participate in this immersion, always

guided by at least one GCSP teacher/mentor. The project that each student will propose should be chosen from this immersion, trying to share the problem identified and the responsibilities involved, based on the specific skills of each student, working collaboratively to achieve a viable solution

The goal is to raise awareness, allow students to identify a problem, discuss it with the community or group, gain acceptance and trust from the group to propose a specific solution, to achieve a positive outcome for the community, even if this represents only a partial benefit.

- **Entrepreneurship Competence:** the aim is to promote the ability and competence in the process of translating ideas, inventions, and innovations into a viable solution, comprehending and applying the understanding of the local and global economy in projects. Each student in the Program must choose at least one among the activities below related to entrepreneurship:

- (i) Attend the Workshop: Entrepreneurship and Innovation.
- (ii) Participate in the administrative council of a junior company for one semester.
- (iii) Participate in a national or international competition.
- (iv) Take one course among these four: Product Development System, Process Design, Innovation for Sustainability, and Advanced Topics in Innovation.

- **Multicultural competence:** develop and broaden global awareness and multicultural experience. The student should choose at least one of these experiences:

- (i) Study abroad through some international programs.
- (ii) Internship abroad with a global focus.
- (iii) Participate in projects focused on a global program, with some experience with foreigners, even if in a virtual meeting. EWB - Engineers Without Borders can help with some opportunities for this
- (iv) Participate in some vacation courses, even at UFMG, with the participation of foreign students joining our university.
- (v) Participate in some international GCSP events, presenting personal experience in the Program.

For the option chosen, Program students must justify how the proposed program of study (Complementary Training) / internship/project/experience will: a) cultivate global awareness, b) promote sensitivity to multiple perspectives, c) improve communication skills in a foreign language, and d) facilitate community development.

- **Social Conscience:** to promote and deepen social awareness and motivation to be brings engineering knowledge to develop solutions to improve people's lives, especially those who need it most. The student should participate in at least one of the initiatives:

- (i) Engineering Academic Internship.
- (ii) Curricular Internship Program.
- (iii) Engineering Solidarity.
- (iv) Engineers without Borders – ESF.
- (v) Be an instructor in the free professional capacity building courses offered at UFMG, such as the Intensive Industrial Labor Preparation Course -CIPMOI or the pre-university entrance exam is aimed at low-income candidates who attended high school in public institutions.

2.2 ASSESSMENT, MONITORING, AND RECOGNITION

Students will meet at least twice per semester with their GCSP mentor. The mentor will document their progress and accomplishments through an online version of their GCSP portfolio. A tracking sheet will be available to assist mentors and students. Each student will publish their work in their portfolio for review by their faculty mentor, which will be accessible to the GCSP Steering Committee for periodic review twice a year. In addition, the GCSP Steering Committee will meet periodically with faculty mentors to review progress and ensure that all students continue to meet Program requirements.

Final evaluations of the individual student's program will be conducted by the faculty mentor and the Steering Committee. After each year of the Program, the Steering Committee will organize a poster presentation to showcase the students' work, recognizing their contributions to the issues presented by the challenges.

A ceremony will be conducted by the Steering Committee, the Dean, and Vice Dean of the School of Engineering to award the GCSP certificate of participation to students who satisfactorily complete the five curricular components of the Program and

to award prizes for the best projects. A commendation letter is also provided by the NAE to recognize students who have succeeded in fulfilling the requirements of the GCSP.

3 INTERNAL ORGANIZATION OF THE PROGRAM

The GCSP at EEUFMG has a board of directors, responsible for the program's supervision, and a group of professors, responsible for the systematic mentoring of the students admitted to the program.

The board is constituted of the vice-director of EEUFMG, the Program Coordinator, and senior faculty from the various engineering areas. The board is expected to dynamically lead and innovate the GCSP curriculum, keeping it updated and aligned with NAE recommendations and EEUFMG's curriculum profile and structure, with a focus on the multidisciplinary nature of the Program. The council is responsible for welcoming admitted students, orienting them regarding curriculum and skills, and helping them find a mentor and a topic for their research project, which must be aligned with the grand challenges defined above. In addition, it should develop a Program Reference Guide for the mentors and mentees (of projects), defining roles and guidelines that ensure the accomplishment of the Program's goals.

The evaluation and reports produced by the mentors for each fellow will be compiled by the board coordinator, allowing him/her to produce an overall Program report every semester and at the end of each year. In addition, the coordinator, with the support of the board, should interact with the director of the International Relations Office - DRI, looking for concrete alternatives for the participation of students in international programs, in addition to establishing partnerships with institutions and companies that can financially support the initiative.

4 PROGRAM ACTIVITIES IN THE FIRST YEAR

The Program at EEUFMG was approved by NAE/GCSP in April 2020 and, one month after approval began its process of internal organization, and conceptual and procedural discussions for the implementation of the Program in the School of Engineering. It was chosen to start the dissemination and the Program's performance with the students with a broad call for papers, motivated by the challenges presented by the pandemic caused by the coronavirus to several areas of knowledge, as well as living amid knowledge still under development and uncertain conditions.

The call GCSP EEUFMG No. 01/2020_Covid-19, from the GCSP/EEUFMG Program, was directed to students from all undergraduate courses at the School of Engineering. The call defined that the proposals should contribute, through a systemic approach, with the use of methodologies and technologies of Engineering, and an innovative mentality, to fight the contagion and the impacts resulting from the world pandemic of the new coronavirus. The proposals required multidisciplinary teams, of 3 to 5 members, with students from at least two Engineering courses. Since the work of Engineering in this context requires cooperation with other areas of knowledge, the participation of students from other courses, external to the School of Engineering, was considered welcome.

The selection process took place in two phases. Phase I, of preliminary proposal submission, where the team and the proposal might not be complete yet. Phase II, of proposal refinement, with mentoring from the GCSP group professors, helping the teams to improve the proposal, make it more feasible, helping to find other team members, if necessary. The final selection of the proposals occurred after their review by the proposing teams, considering the mentoring guidelines. Proposals chose a category of interest from the large group of engineering challenges best adapted and exemplified for the call (challenges of the coronavirus-19 pandemic) to familiarize students with the challenges:

- I. Sustainability and recovery (infrastructure in general - sanitation, housing, transportation, socioeconomic recovery, reusable materials, care in the disposal of materials, etc.)
- II. Security (technology and logistics for resource distribution, equitable information, artificial intelligence, personal, collective, and health worker protection, etc.)
- III. Health (sanitization/disinfection technologies, urban and rural sanitation, production of supplies/utensils, health monitoring apps, tools for the elderly, etc.)
- IV. Social well-being / *joie de vivre*, with the adaptation of environments and healthy self-insulation practices, mitigation of social harms, and others.

A virtual event was held to present the Program and launch the call, with the participation of the entire GCSP team, board of directors, and mentors. Five proposals were received in the first phase. After the mentoring in the second phase, only two groups submitted revised proposals, and for these, mentors were assigned and became

responsible for monitoring and guiding the teams. It is noteworthy that the period for submitting proposals coincided with the resumption of the first semester of 2020 at UFMG, which generated a lot of anxiety among students, given the uncertainties of the new way of offering courses. The whole offering in remote mode proved to be challenging for the professors, who needed to adapt their materials, strategies, classes, and assignments, and for students, who tried to maintain their motivation, even with the feeling of some loss concerning the face-to-face laboratory activities. One of these groups, composed of five students, two of them from Electrical Engineering, one from Civil Engineering, one from Medicine, and another from Pharmacy, developed the whole project, from the conceptual phase to the detailing, reaching the prototyping phase. There was a closing ceremony of the call in 2021, with a presentation of the results of this project, entitled "Low-cost and accessible UV-C light disinfection equipment", and delivery of certificates to the participating students and faculty mentors (GCSP-EEUFMG, 2022). The program's methodology based on faculty mentoring for students in project development proved to be very effective, considering their significant growth, both in problem analysis and solution development.

Continuing the broad initiatives, offered to all students from the School of Engineering and other UFMG courses, the GCSP program offered the I Sustainability Workshop, addressing one of the great challenges assumed by the program, which is to "develop sustainable mentality and solutions" (AGUILAR; PALHARES, 2022). Professors from the program's board of directors and mentor professors worked on the organization and delivery of this workshop, executed in two days, as an online activity - via the Teams Platform, with a 5h workload, and with the following topics: principles of sustainability, paths to implement sustainable development, engineering solutions, and sustainability. The first day involved a theoretical approach to the theme and examples of sustainable solutions, while the second day involved group discussions about ideas for sustainable solutions, with the 40 participating students organized in virtual rooms, followed by a plenary session with discussions and closing of the workshop. The program team evaluated the experience as successful, both for the choice of theme and the methodology adopted, since the participating students were motivated and had an active participation during the two-day workshop. The demanded volume of registrations confirmed the students' interest in this theme, and the program's team will organize new offers for this workshop and others, focused on the great challenges of engineering.

The student selection process for the first admission to the Program was set for the second semester of 2021, since the program's methodological proposal requires face-to-face activities, such as academic immersions. Therefore, the selected students will start their participation in the GCSP program in the first semester of 2022.

5 FINAL CONSIDERATIONS

The mobilization of the team, which would constitute the board of directors and the group of mentors, since the discussions that preceded the elaboration of the proposal, contributed significantly to the collective construction of a robust proposal, making the best use of the resources available at the School of Engineering and UFMG. The involvement of the team since the elaboration of the proposal, participating and contributing to the discussions and activities of the Program, made them committed to it.

The flexible curricular structure of the university and the concept of a complementary training structure made it possible to implement a curriculum that contemplates both the GCSP requirements and those of the engineering courses. In this way, students can fulfill the requirements of the Program and complete their course credits at the same time.

The global conjuncture in the year the Program was approved imposed a delay in its full implementation, but brought challenges and motivation for several activities, of a wide-character for all students, such as the first call for papers - Covid-19 and the 1st Sustainability Workshop. This allowed introducing the team and the program to the students, the team's mobilization for important discussions, such as the mentoring process, and the organization of other activities of a broad character (i.e., workshops and lectures) focused on the major challenges. These initiatives have allowed the program team to include all interested students from the School of Engineering in the discussion of the Engineering Grand Challenges.

ACKNOWLEDGMENTS

The authors would like to thank the NAE/GCSP, the School of Engineering Board, who, believing in the value of the Program, created the GCSP team by invitation, and the program mentors, who actively participated in the discussion of the proposal.

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