

SKIL

Student Kreativity & **I**nnovation Laboratory

ANNUAL REPORT 2019



FOREWORD

Over the last 18 months, the **Student Kreativitiy and Innovation Laboratory (SKIL;** <https://www.epfl.ch/labs/skil>) has become fully operational. In this short period, it has become clear that the SKIL is making a very strong impact on the teaching landscape, not only of ENAC - but indeed across the EPFL campus. The SKIL has made ENAC a pioneer in the transformation of the EPFL teaching portfolio and became a magnet for students from all corners of EPFL and beyond – the place where students interact in hands-on and highly interdisciplinary projects. The leading position and visibility created by the SKIL was clearly formulated in the recent academic evaluation of ENAC. In the following, we provide a brief status-report of the SKIL, supported by key figures and statistics.



Prof. Marilyne Andersen
Director



Prof. Anders Meibom
Academic Leader

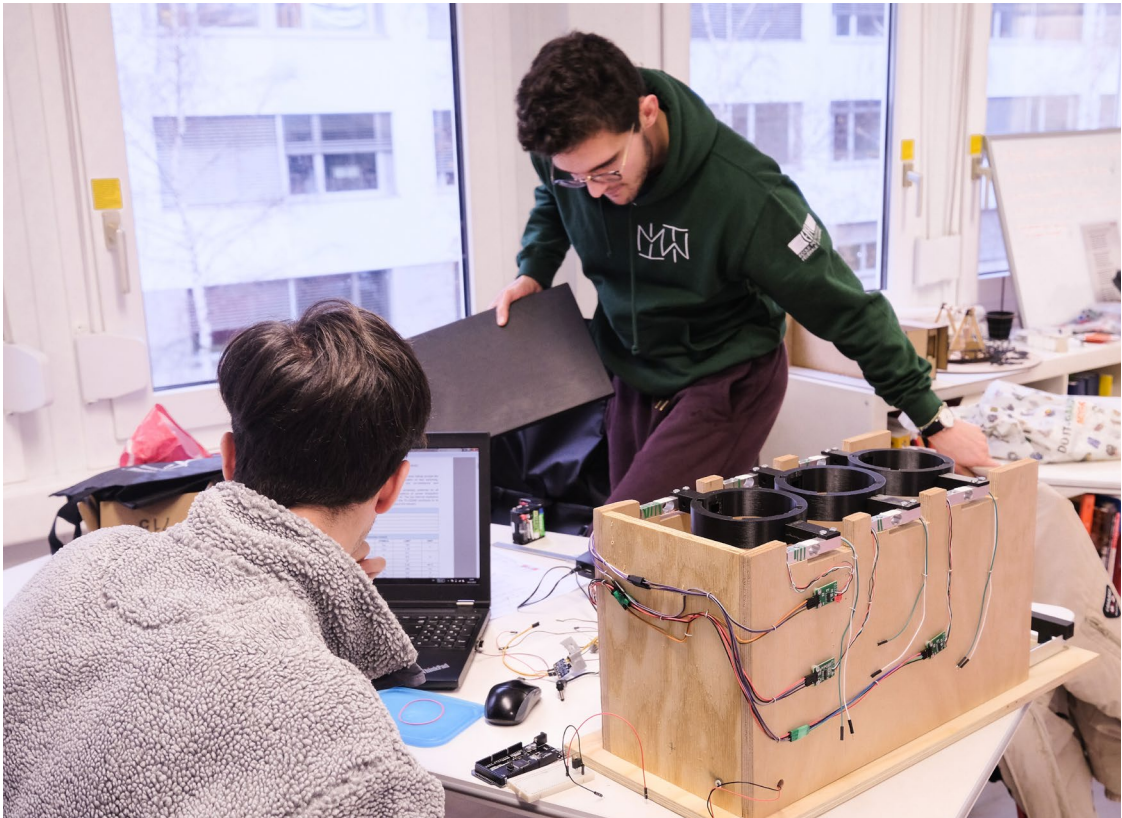


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OVERVIEW

What is the SKIL and why do we need it?

The greatest potential for improving EPFL's quality and visibility as an educational institution clearly lies in the manner with which we interact with our student body. Today, and in the foreseeable future, the best and most relevant engineers, architects, and scientists will be those that, in addition to having a strong base of technical knowledge, are also trained to structure ideas into new constellations and concepts, take initiative, innovate, work together in groups and across disciplines, and have the courage and self-confidence to lead and inspire.

For this reason, and building upon the experience gained through the ENAC-led Solar Decathlon project (and the curricular and infrastructure gaps it allowed to identify), ENAC took a concrete step to modernize its curriculum and learning infrastructures by creating the SKIL, which is a custom-made workshop space in which our students (at the moment mainly second to third year bachelor, and master students) can work on projects that they either define themselves, or have a great freedom in formulating.

In the SKIL, the students are strongly encouraged to be creative, innovate, and engage interdisciplinary group work. The SKIL thus promotes a new culture for hands-on and bottom-up projects, for which the students receive grades and credits.

The SKIL, which was launched in the spring of 2018 and officially inaugurated on September 24th, 2018, contains a broad selection of tools for working with plastic, wood, textiles, electronics, etc., as well as equipment such as 3D printers, laser cutter, CNC milling machine, computers with software for drawing, design and app-development, a sewing and embroidery machine, etc...¹ Users of the SKIL have to complete a training course² before being allowed to access these tools. Between October 9th, 2018, when training sessions opened, and January 1st, 2020, 668 students have taken this training course in order to have access to the SKIL. The SKIL exists along with other infrastructures on the EPFL campus, such as the Atelier des maquettes, the Discovery Learning Lab spaces (DLL), the professional workshops, the Robopoly association and other smaller labs. The mission of SKIL is to create an effective hands-on learning environment on the EPFL campus.

¹ Complete list of equipment: <https://www.epfl.ch/labs/skil/en/skil-as-workshop/equipment/>

² Safety in the SKIL: <https://www.epfl.ch/labs/skil/en/skil-as-workshop/security/>



ORGANIZATION & TEAM

MISSION

The core mission of the SKIL is to support:

- Bottom up projects
- Hands-on learning
- Interdisciplinary bridges

PROJECT SUPPORT

Different frameworks for project realization exist, ranging from SKIL courses (e.g. the ENAC Teaching Unit PENS-315 for 3rd year bachelor students) and other credited courses that benefit from the SKIL infrastructure, to student association activities, EPFL-wide interdisciplinary projects (such as supported by the MAKE program) or students who want to pursue their own innovative ideas. An average of 50 students per week come to the SKIL

for non credited projects during the semester. To cover consumables for such projects, a modest fund of 2'500 CHF per year is available.

Projects selection: during semesters, priority is given to credited courses (e.g. Design together), and interdisciplinary projects supported by the MAKE program or Act4Change lab.

STUDENT MENTORING

The SKIL team (academic leader, coordinator, lab managers and coaches, i.e., highly qualified technical and academic personnel) offers its expertise to guide students in their projects, to inspire them and facilitate their project-based learning experience through advice and interactions. Depending on specific needs of a given project, additional expertise is sought from ENAC, EPFL, other nearby universities, or external partners. Students benefit not only from the direct mentoring from the SKIL team and coaches, but also from getting access to its network and reach out to competences within and beyond the EPFL campus

Daily operation and interactions with the students is handled by SKIL coordinator Samuel Cotture and lab managers Stéphane Clerc and Marc Wettstein, who coordinate each project with the students, often with the help of student assistants.

The lab managers' mission is to ensure the safety in the workshop, the maintenance of the equipment and the technical support of the students. They also provide guidance on the design and realization of the prototypes. The work on projects happens in the presence of a labmanager or a competent student assistant during office hours. Equipment with special safety concerns is blocked without their presence.

SECURITY

Before being allowed to access the SKIL infrastructure, users have to complete an obligatory 1-hour theoretical training course³ given by the labmanager and unit safety coordinator (COSEC) Stéphane Clerc. This course focuses on the rules of use, including emergency measures in case of accident, information on the risks to which users are exposed and the measures to be taken to avoid them.

Regarding the machines, the security is ensured by following the recommendations from Suva, the Swiss National Accident Insurance Fund, and the Safety, Prevention and Health domain at EPFL (DSPS). Three security levels were also defined for the equipment:

A – Free use after the 1-hour course

B – Practical training required

C – Use under the supervision of the labmanager or a competent student assistant.

COORDINATION WITHIN EPFL

The SKIL coordinator ensures smooth communication and coordination of activities between the SKIL and the various units at EPFL offering fabrication facilities to students (notably DLL, professional workshops, Atelier Maquette, GIS, Popup in Fribourg, etc...). The SKIL represents an interface for Bachelor and Master students to access these spaces in situations where a specific project requires equipment and expertise not available within the SKIL itself.

Samuel Cotture represents the SKIL in the DLL coaching committee organized by Pascal Vuilliminet, which brings together all coaches and technical

personnel for prototyping at EPFL. This coordination is particularly important for projects that are supported at the school level (through the MAKE program for instance) and relying heavily on the SKIL infrastructure and staff (e.g. EPFL Racing Team, GrowbotHub for Igluna project, Hyperloop, D'izy Fruits and Verti'SKIL projects in 2019).

The SKIL also interacts with partner initiatives on the EPFL campus (and beyond), such as the MAKE program, the Act4Change lab, the entrepreneurship programs proposed by the Vice Presidency for Innovation (VPI) (e.g. XY grants) or the Service de Promotions des Sciences (SPS).

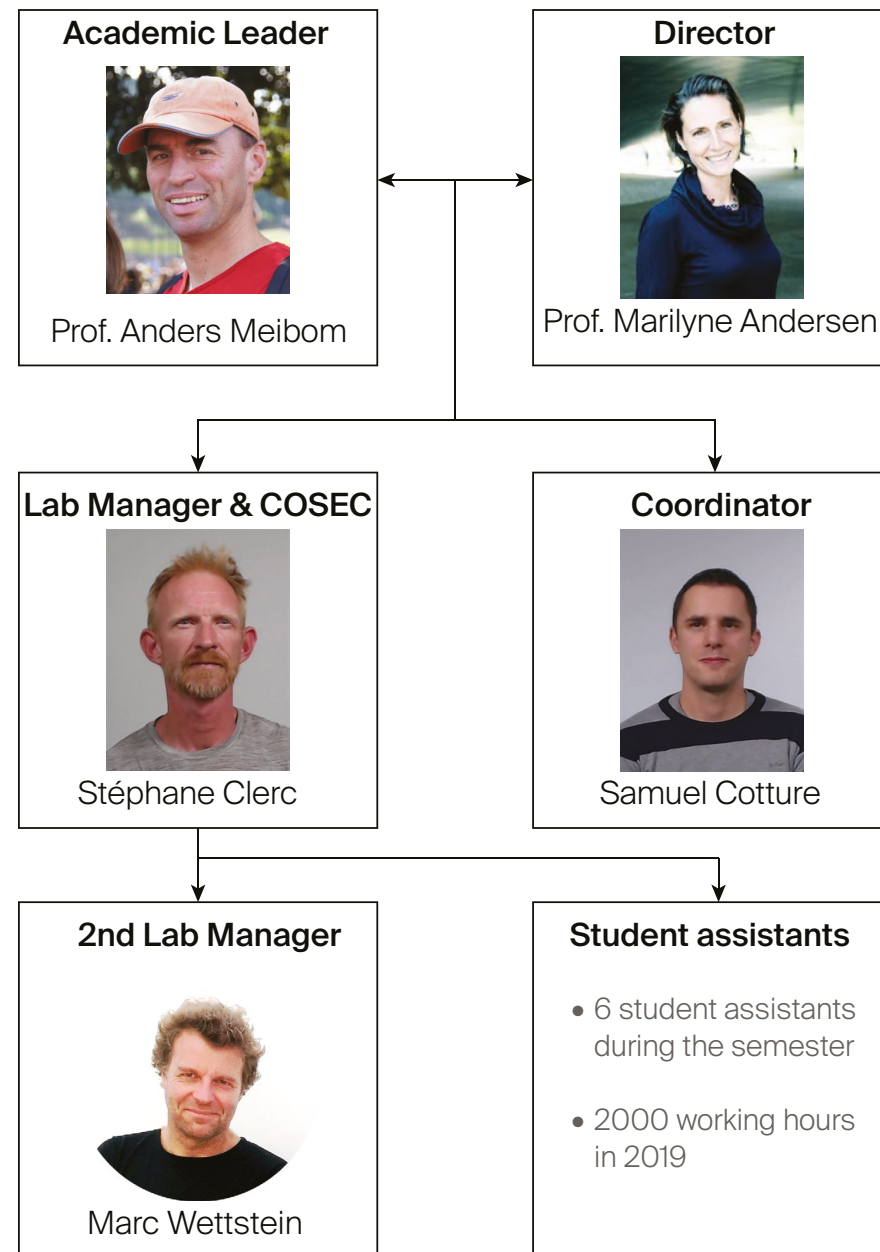
SKIL STEERING COMMITTEE

The work in SKIL is overseen and directed by Director Prof. Marilyne Andersen and Academic Leader Prof. Anders Meibom. Frequent meetings are held between

Prof. Marilyne Andersen, Prof. Anders Meibom and Samuel Cotture, during which strategic decisions are made.

³ <https://www.epfl.ch/labs/skil/en/skil-as-workshop/security/theoretical-training/>

SKIL TEAM

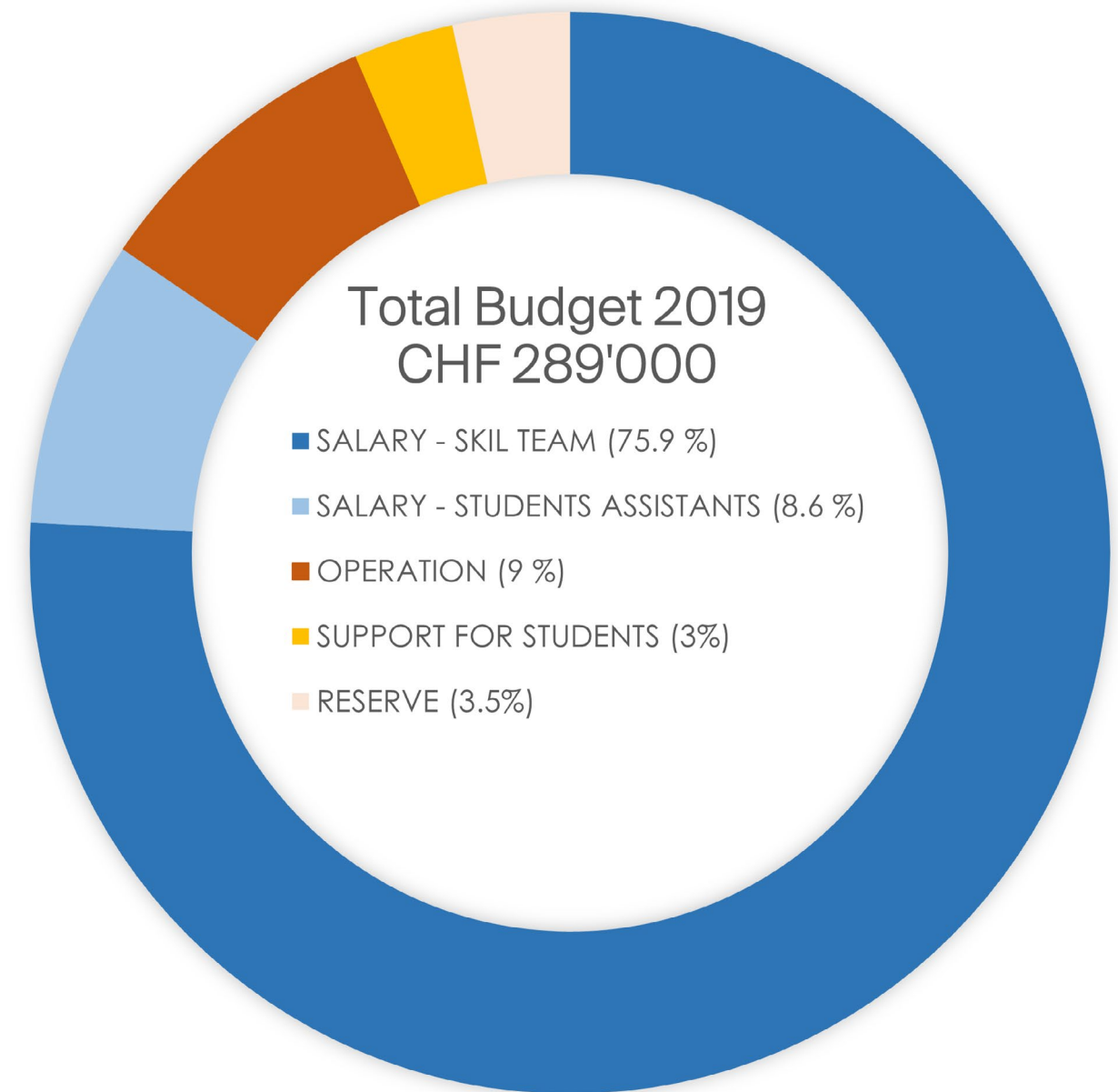


Other available coaches:

Claudio Leonardi (Scientist),
Sébastien Actis-Datta (Designer)

The role of coaches is to guide, facilitate, advice and inspire the students to work, to the highest possible degree, independently and efficiently on their own.

FINANCES



The SKIL budget is entirely supported by the School of ENAC, including salaries, operation costs and student project support.



SKIL COURSES

ENAC proposes an interdisciplinary teaching program called “Design Together”. Students from all three sections within ENAC have the opportunities to work together in multidisciplinary project teams, acquire the abilities to design innovative solutions for a more sustainable future and become aware of their social and ecological responsibilities.

The SKIL is fully integrated in this learning program and proposes two opportunities for ENAC students to receive credits in their curriculum by developing their soft skills and working on their own project.

All these projects were successful with the students giving them the “opportunity to create something”, “the freedom to develop their own ideas” and the “opportunity to step outside of the standard curriculum”.



ENAC TEACHING UNIT (PENS-315) 4ECTS, BA6

This course allows 3rd year bachelor students to engage in hands-on projects defined by themselves, in a dedicated workshop environment. Students work together in small groups on their own ideas, with access to a wide range of tools, materials, software, etc. - assisted by specialized coaches.

Teaching unit SKIL 2018

- 31 students, 7 projects
- 4 articles on the EPFL webpage
- 18 articles in external media
- 1 grant received at EPFL

Teaching unit SKIL 2019

- 30 students, 7 projects
- 1 article on the EPFL webpage
- 2 grants received at EPFL

ENAC PROJECTS (PENS-490) 4ECTS, MA1, MA2 AND MA3

The SKIL proposes “SKIL Project – Propose your project”. This framework allows student to feel free to propose their own project and experiment the project processes.

Low-cost refurbishment of a Swiss “Mazot”

- 3 students (1 GC, 2 AR)
- Fall 2018-2019
- Co-supervision: SKIL and Prof. N. Braghieri

Sorting and shredding of plastic waste to create 3D printer filaments

- 1 student (GC)
- spring 2019
- Co-supervision: SKIL and Y. Leterrier



M&A Mycelium Design & Architecture developed a mushroom-based materiel for various applications, including to reduce plastic use in transportation and construction. The project received a large success in the media (RTS La 1ère, Le Temps, La Liberté,...).



Showerloop is an open-source cyclic shower that recovers, filters and reuses water in real time. This project received a grant from the CODEV for developing the shower in Colombia.



CHEAP (Catalog of Handmade Elements Assembled from Pallets) aim to create furniture from recycled pallets and to propose them in a catalog. The project was exposed during the EPFL Open Doors and received a grant by the Act For Change Lab.



SKIL FOR OTHER CREDITED COURSES

The SKIL also supports several other courses and projects in prototyping and innovation, which bring together students from all over the EPFL campus and even the nearby University of Lausanne (UNIL) and Ecole Cantonale d'Art de Lausanne (ECAL).

The different levels of support provided by the SKIL are:

- Support of technical questions, help in the design process and/or networking with other platforms (laboratories, DLL, professional workshops or external suppliers).
- Access to the SKIL equipment and consumables.
- Use of the SKIL building as teaching classroom for some of the courses.

The students appreciate the help provided by the SKIL and give excellent feedback. They enjoy the space provided, the supporting "SKIL team" and the access to functional machines.

CREDITED COURSES SUPPORTED BY THE SKIL

- HUM-206 «Industrial Design I»
- HUM-375 «Prototyping»
- HUM-378 «Creativity and participatory design»
- HUM-441 «Collective creation: improv-arts & engineering I »
- CIVIL-443 «Advanced composites in engineering structures»
- PENS-304 «Living in Mars»
- PENS-308 «Argamassa armada»
- CS-489 «Experience Design»
- ME-302 «Mechanical Design Principles»
- MICRO-200 «Mechanism Design I»
- MICRO-406 «Product Design & Systems Engineering»
- MGT-555 «Innovation and Entrepreneurship in Engineering»



The SKIL building hosts two SHS courses: HUM-375 «Prototyping» and HUM 378 «Creativity and Participatory Design» It allows the students to follow all the steps of the course in the same building, from theoretical inputs to prototype through ideation phases, team work and presentations.

More and more prototyping courses are integrated in the curriculum of Bachelor and Master students at EPFL. Here are prototypes examples of the courses MICRO-406 «Product Design and System Engineering» and MGT-555 «Innovation and Entrepreneurship in Engineering».





EPFL proposes two project platforms in particular for Bachelor and Master students at EPFL: the MAKE fund for interdisciplinary projects and the Act for Change Lab for sustainable initiatives on campus.

The SKIL supports these projects in different ways:

- Technical support through the access to equipment, the SKIL team and the networking at EPFL.
- For some projects, coordination support at EPFL with financial and/or administrative responsibilities.
- For some projects, financial support with discount applied on consumables and possible equipment loan.
- Sometimes, academic support with the integration of the project in the SKIL credited courses.

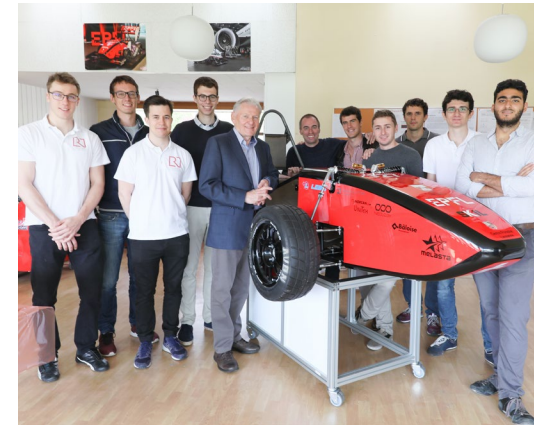
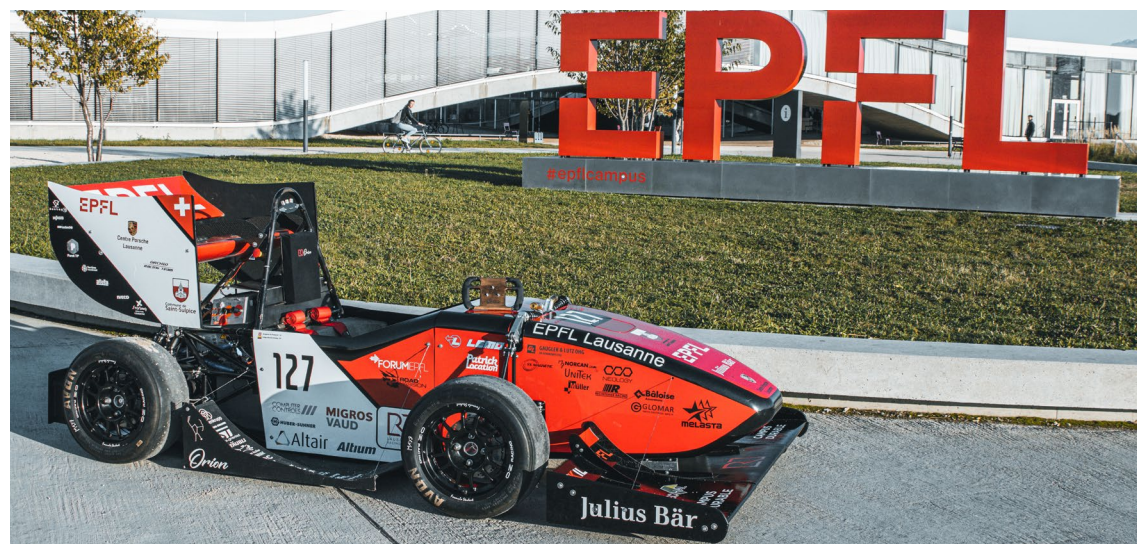
These students benefit from the diversity of equipments and the support of the SKIL team. From CNC milling machine to sewing machine or vinyl cutting, these students were the largest SKIL users outside curriculum.

MAKE / INTERDISCIPLINARY PROJECTS

- EPFL Racing Team
- GrowbotHub
- EPFloop
- EPFL Rocket Team
- Hydrocontest
- Swiss Solar Boat
- SP80
- CHIC
- SensUs
- Robot Competition
- Baleclectic
- Asclepios

ACT FOR CHANGE LAB PROJECTS

- Pigeonier du campus
- Verti'SKIL
- CHEAP
- D'izi Fruit
- La Pergola
- Sustainable Grocery
- Cargobike band



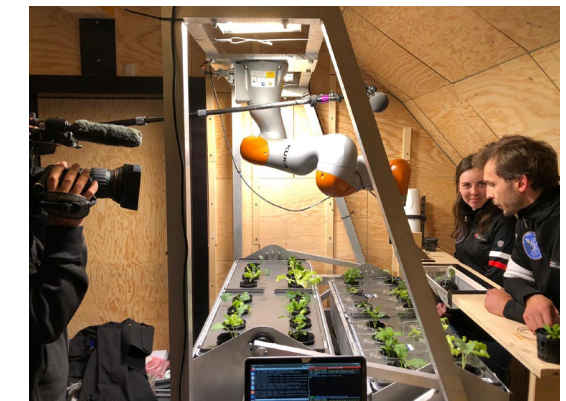
GrowbotHub, which was part of the first ESA_Lab Demonstrator Project IGLUNA, was supported by the SKIL in the development of their prototype from scratch to realization. It is also a good example of the link between student-lead initiative, support of prototyping phases and networking with professional workshops for the final prototype realization. The prototype had a good media outreach during the exhibition in Zermatt.



Verti'SKIL proposes to study the advantages of a green wall. As a prototyping building, SKIL was the ideal place for such a project. Thanks to the Act for Change lab, the SKIL is now decorated with a homemade green outdoor wall.

The development of the prototype was carried out within SKIL with an appreciated support of the labmanagers for the metal structure and of the sewing machine to make the 80 bags.

The Lausanne Racing Team (now EPFL Racing Team) represents a good example of the use of the SKIL infrastructure. The team used the full potential of the SKIL for the development of their car. Sewing machine, CNC milling machine, laser cutter, 3D printers, vinyl cutter for the sponsors logos, support for composite manufacturing... As student-led project, the SKIL also supported the team with the project coordination as well as internal and external networking.



EPFSens project won a price during the SensUs competition in 2019 in Eindhoven. While the developments of the biological and sensor parts were made in the DLL spaces, SKIL coached the students in the realization of the external structure.





As a support for creativity and innovation, SKIL offers a small seed grant to Bachelor and Master students at EPFL. In order not to compete with other EPFL grants (XGrant, YGrant, Act for Change Lab, etc...), the SKIL grant represents free access to SKIL consumables or the purchase of discounted material.

This allows students to quickly find a first support in the realization of their project, sometimes to realize a first low fidelity prototype and thus to be able to present a more mature application for the higher level student grants listed above. It also gives the opportunity to support Open Sciences projects. SKIL also offers a prototyping space for projects that have already received a grant at EPFL. Thus, several projects came to use the SKIL space in the realization of their prototype.

EARLY STAGE IN SKIL

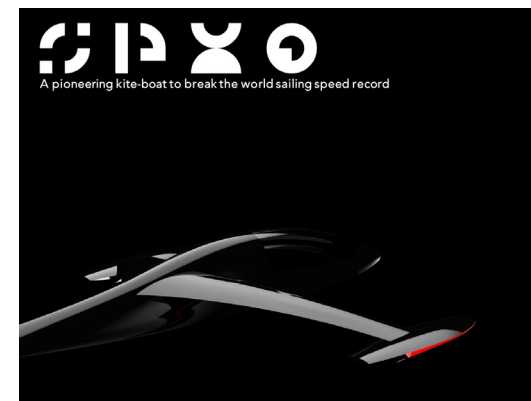
- SP80, MAKE
- NUAGE, XGrants
- GrowbotHub, XGrants & Make
- Showerloop, CODEV DI grant
- CHEAP, Act for Change Lab
- TROBAK, Impact Hub Lausanne

ONGOING SKIL SUPPORT

- DODO
- DIY CNC milling machine

GRANTED PROJECTS USING SKIL

- Ouay
- LYF
- MotionPilot
- Raclette oven



Some projects now well established at EPFL have taken their first steps in SKIL. For example, SP80 and GrowbotHub were quickly able to find support from SKIL for the realization of their first prototype. Other projects, such as CHEAP for Act for Change Lab or NUAGE for the X-Grants, have also had the opportunity to develop a first prototype to apply for and receive another grant at EPFL.



Innovation also comes through popularisation and accessibility to a wider public. For example, a student challenged himself to build a CNC milling machine made out of wood. In addition to doing it for himself, the student wants to make a free access video with guidance on the realization of this machine. The SKIL supports this project by offering supervision, equipment and a link with internal (library, etc.) and external partners (wood, bearings suppliers, etc.).



Projects that have already received a grant from the EPFL sometimes use SKIL to work on the realization of their first prototype. For example, the Ouay team was able to take advantage of SKIL's infrastructure during the summer to build their first prototype. This prototype is now in the test phase in different locations. Another example, is the LyF project which receives technical advises and support from the SKIL in their prototype development.



The student associations are numerous at EPFL. In addition with the student associations linked with the MAKE/interdisciplinary projects (p.8-9), the SKIL was involved with other student associations for various purposes:

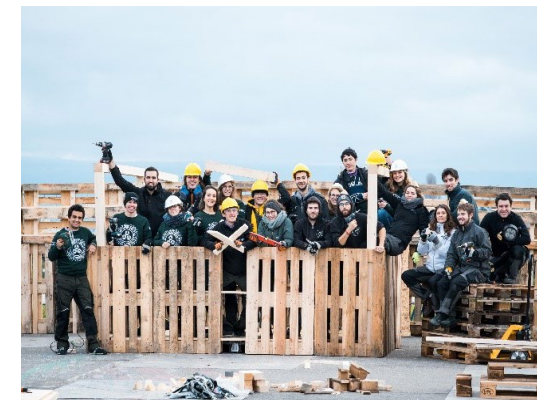
- Use of equipment for realizing prototypes or promotion goodies for most of them.
- Loan of material for a specific event for most of them.
- Sometimes, financial support for an event link with prototyping and interdisciplinarity.
- Sometimes, private access to the SKIL building for an event or access for temporary storage.
- Sometimes, participation in an event through a presentation or facilitation support.

STUDENT ASSOCIATIONS

- CIEL
- Robopoly
- AGEPOLY
- CHALLENGE
- FORUM
- STIL
- TREE
- AMAC
- Coaching
- Polybeach
- BALELEC
- Sysmic
- Satellite
- SOLAR
- UNIPOLY
- JUNIOR ENTREPRISE
- ...

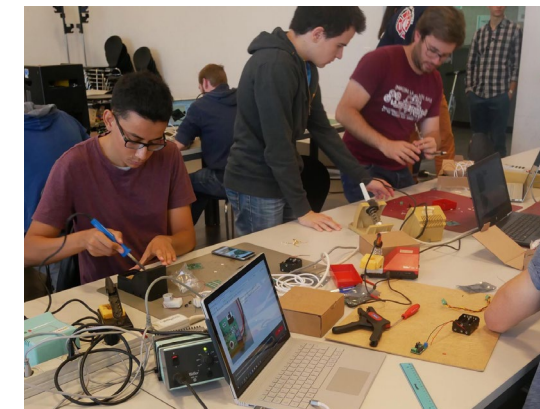


CIEL - Intedisciplinary Student Competition Lausanne - has created a student competition to imagine a sustainable Olympic village of tomorrow. SKIL offered students financial support and a loan of a multitude of tools and consumables to help with the competition organization.



The AGEPOLY uses SKIL for the realization of several of their projects. A good example is the construction of the Advent 2019 cottage. They were able to take advantage of SKIL's equipment to store their material and prepare the wood before construction. In addition, SKIL provided drills for the day of construction of the chalet on the Esplanade.

With its electronic makerspace, Robopoly is an important partner that is complementary to the SKIL. Every year, the association organizes the «Grand Concours». The SKIL thus offered its building and equipment during the final of this «Grand Concours».



SKIL is a support for associations to realize prototypes, as well as, decorative or promotional items. For example, the START Lausanne association has realized this «TEDx Ecublens» sign in the SKIL area.



SKIL FOR PERSONAL PROJECTS

The SKIL also allows the realization of personal projects. Most of these projects are carried out during the inter-season periods and at the beginning of the semester. Thus, it was possible to see the development of a connected beehive, the transformation of a bicycle into a battery-powered electric bike or the realization of creative Christmas presents.

But personal projects are not always at first glance technological. The possibility of accessing a wide range of equipment and the desire to learn how to use certain

machines often leads students to carry out less technological projects. It is therefore common to see the realization of small decorative accessories or other elements. Creativity has no limits.

Finally, for personal projects, we also take into account the repair or recycling of tools or waste found in the EPFL waste collection centers. It is common to see students trying to repair devices or accessories in order to give them a second life.



Turn your bike into an electric bike? Yes, it's possible. You can even use old batteries from power tools to power your electric motor. A student took advantage of the summer holidays to develop this personal project at SKIL and set off on the road again with his now electric bike. Several drones have also been created in the SKIL infrastructure.



The realization of gifts for Christmas or birthdays is also done at SKIL. From a simple laser cut to create a 3D puzzle, to the creation of a personalized T-shirt in flocking or embroidery, to more complex projects integrating electronics, creativity is facilitated by the access to machines.

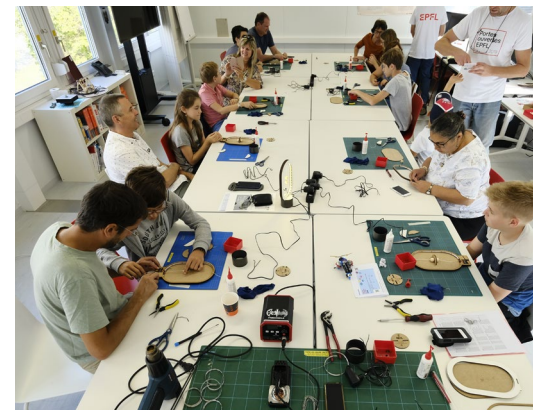


The repair or recycling of appliances found at waste collection centers are also projects that are sometimes present at SKIL. Access to SKIL's space and tools can sometimes give a second life to devices or accessories that were thought to be lost.



During the past year, SKIL participated in several events: from the Information Days to the Welcome Day and the EPFL Open Days, SKIL opened its doors to the community. The visits of new students and the larger community gives the opportunity to raise awareness about student's access to creativity, initiative and making at EPFL.

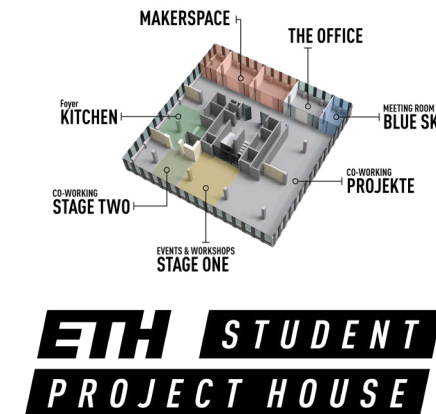
The SKIL also works with the Service des Promotions des Sciences (SPS) at EPFL. The SKIL infrastructure was therefore proposed during the semester break to be a support for the summer MINT camps. During the EPFL Open Days, the SKIL also proposed a workshop for young children to build their own Heng lamp. The SKIL is also an infrastructure for the SPS to imagine and machine new projects.



The SKIL is also a space which supports workshop in collaboration with ENAC laboratories or units. For example, the Innosseed program offers a hands-on crash course on the Design Thinking method. Thus, the SKIL offered its facilities and equipment for one day event in order to allow an optimal framework for this creative day. In 2019, the SKIL also offers its facilities to support the ECOS workshop on «how to service skis».



It is not always possible to move a class or group of people to a fablab or to create a fablab in every school. Thus, Marc Wettstein and Sébastien Actis-Datta are developing the Fabmobile alongside their involvement with the SKIL. The vehicle is parked next to the SKIL building and allows the sharing of additional equipment during peak periods. SKIL is also attracted by the message passed on through this project.



The ETHZ also has an academic makerspace called the Student Project House (SPH). This area supports numerous projects at ETHZ with a greater focus on innovation. The link with the SPH allows a point of comparison in Switzerland and an interesting collaboration to help in the development of the respective spaces.

The Higher Education Makerspace Initiatives (HEMI) organizes the International Symposium on Academic Makerspaces (ISAM) every year. This year, the SKIL coordinator travelled to Yale University after a detour to MIT to visit other academic makerspaces. In questions of making, the USA have good example. This visit helped to create international links and provided additional inspiration for the future development of SKIL.

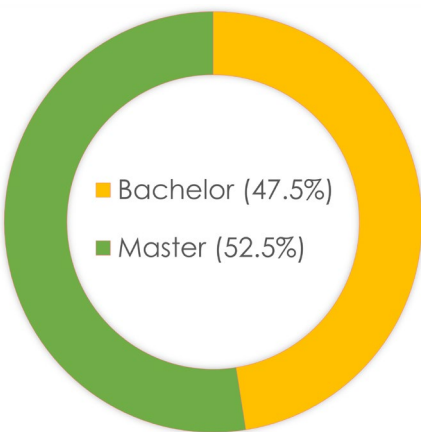
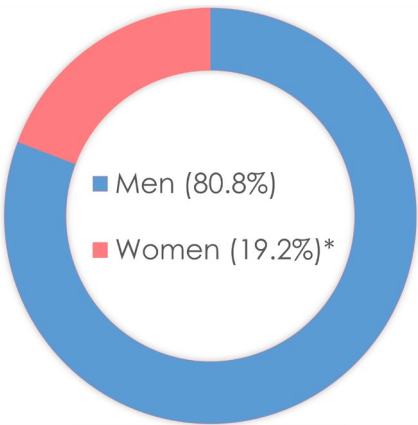
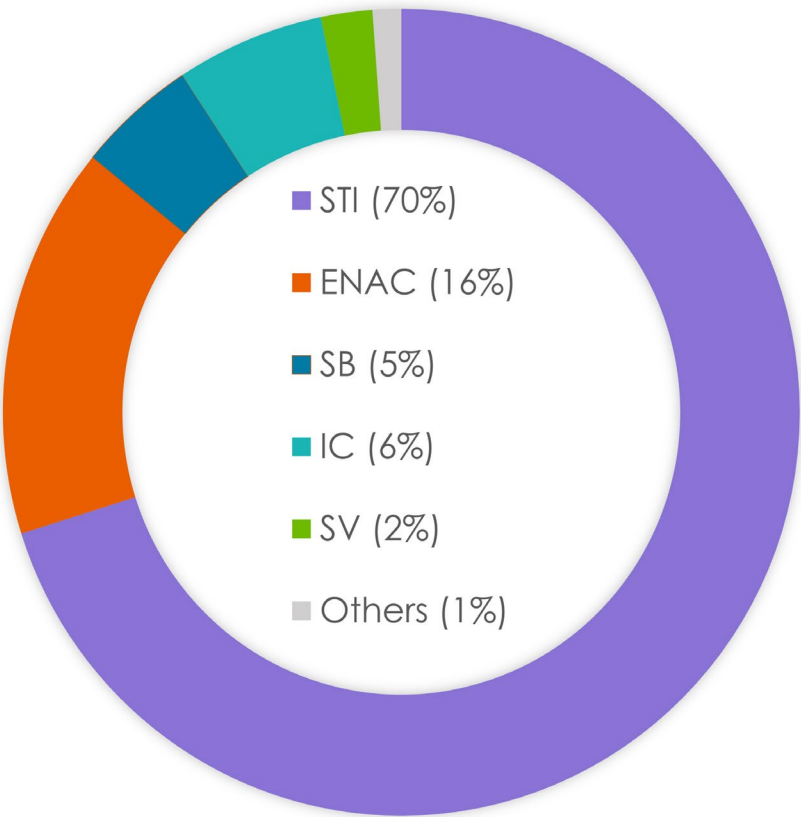


STATISTICS 2019

USERS

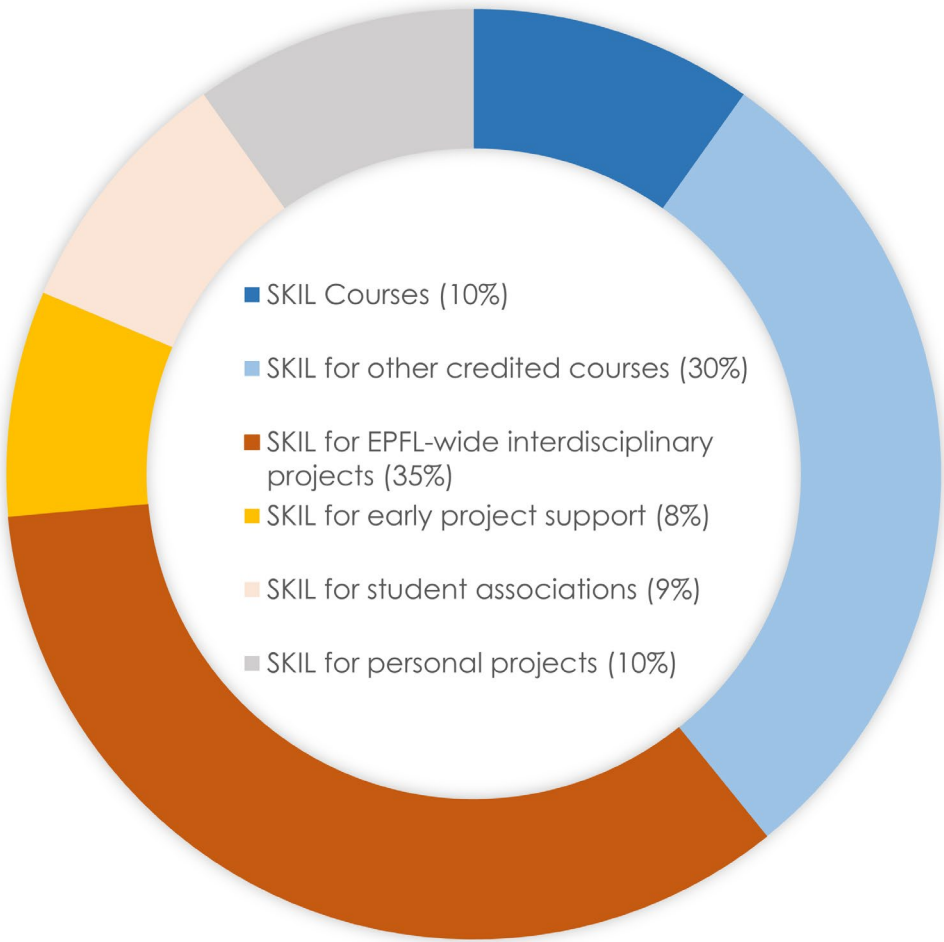
SKIL registered students (2019):

668



*slightly lower than EPFL-wide proportion (23% accounting for relative school representation in SKIL)

ACTIVITIES



MACHINE USAGE



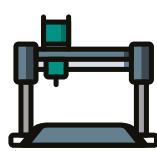
3D Printers

>5000 cumulative hours of printing
>750 files



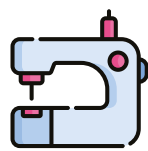
Laser Cutter

>2000 hours of cutting
>162 users



CNC milling

>800 hours of cutting



Sewing

>2500 meters of thread



Vinyl cutter

>200 meters of vinyl
>2000 stickers

CONTACT

Opening hours:

- During academic semesters:
Monday-Friday: 8AM-8PM
Saturday: 1PM-5PM
- During semester breaks:
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