

Acronyme du projet / Project acronym	REAL SU - Research-based Education for ALL
Titre du projet en français	Formation par la recherche pour tous - Alliance Sorbonne Université
Responsable du projet / Project manager	Jean Chambaz, Président de l'Alliance Sorbonne Université, Président de Sorbonne Université
Aide totale demandée au titre de la SFRI / Requested funding	47 693 464€ (non retrievable VAT included and 8% management cost included)
Etablissement coordinateur / Leading institution	Sorbonne Université
Le cas échéant : Listes des projets PIA auxquels ce projet est éventuellement lié (notamment EUR, Equipex, Labex, Institut convergence, IDEFI...) / Project links with existing PIA entities (e.g. EUR, Equipex, Labex, Institut convergence, IDEFI etc.)	<ul style="list-style-type: none">● IDEX SUPER● EUR IPSL● NCU - NLSU● 4 EU+

Liste des établissements partenaires / List of partner institutions

Nom de l'établissement d'enseignement supérieur et de recherche / Name of academic institution	Statut / Legal status
Sorbonne Université Muséum national d'histoire naturelle INSEAD Université de technologie de Compiègne Le pôle supérieur d'enseignement artistique Paris Boulogne-Billancourt (PSPBB) France Education International	EPSCP EPSCP Association EPSCP EPSCP EPSCP
Nom de l'organisme de recherche / Name of research organisation	Statut / Legal status
CNRS Inria Inserm IRD	EPST EPST EPST EPST
Autres partenaires / Other partners	Secteur(s) d'activité / Field of activity
-	-

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SUMMARY

RESUME FRANÇAIS

Dans le cadre d'une approche concertée avec les deux autres universités de recherche intensive du site parisien avec lesquelles elle partage certaines unités de recherche et écoles doctorales, Sorbonne Université, avec ses partenaires de l'Alliance, entend renforcer systématiquement et pour le bénéfice de tous l'adossement de ses formations à ses forces de recherche.

Présentes sur un très vaste spectre, ancrées dans les UFR, les départements et les facultés, ces forces sont actuellement structurées autour de grandes aires disciplinaires. Elles irriguent les formations à travers des structures transversales dédiées : un Collège des Licences avec ses majeures et mineures ; des instituts et initiatives transversales à dimension internationale mis en place sur la base de l'expérience des Labex ; un Collège doctoral structurant depuis plusieurs années déjà la formation doctorale au sein de l'Alliance SU.

Il s'agit, à travers les actions SFRI non seulement de donner une plus grande visibilité aux initiatives transversales et à leurs enjeux en lien étroit avec les départements disciplinaires, mais aussi d'organiser en collèges les niveaux masters et doctorats qui sous-tendent les initiatives transversales.

S'inscrivant dans le cadre de certains axes majeurs du projet stratégique de SU et en parfaite cohérence avec l'initiative d'excellence SUPER, 4EU+, NLSU et le projet IDÉES OPEN SU, SFRI doit nous permettre de nous tirer pleinement parti de l'atout majeur que représente l'adossement de nos formations à la recherche pour répondre aux besoins du monde contemporain, pour les étudiants en formation initiale aussi bien que continue : a) la demande d'une approche critique des pratiques de la recherche elle-même, b) la nécessité d'une approche toujours plus ouverte et internationale, c) les exigences d'ouverture et de flexibilité des programmes de formation.

Pour relever ces défis les actions de SFRI feront évoluer notre formation adossée à la recherche sur quatre principaux axes.

1. Inscrire au cœur des champs disciplinaires l'adossement des formations à la recherche : favoriser des pratiques d'enseignement et d'études créatives étayées sur les atouts des UFR et des départements ; intensifier les relations avec les organismes de recherche pour approfondir et accroître l'implication déjà significative des chercheurs dans la formation ;
2. Développer des formations adossées aux recherches menée aux interfaces des approches disciplinaires pour faire face aux défis sociétaux : transposer dans la formation l'exploration par la recherche des interfaces disciplinaires en s'appuyant sur les instituts et initiatives de l'Alliance SU ;
3. Déployer la formation adossée à la recherche pour l'acquisition de compétences transversales : soutenir l'acquisition par les étudiants, quelle que soit leur discipline, de compétences transversales, en particulier la culture des données, l'éthique de la recherche et l'intégrité scientifique, les capacités d'entreprendre et d'innover ;
4. Ouvrir la formation adossée à la recherche au contexte global : si la recherche a toujours été internationale, elle l'est désormais plus que jamais. Former par la recherche et à la recherche, c'est ouvrir les étudiants au monde. SFRI contribuera aux efforts de l'Alliance SU pour stimuler

la mobilité entrante et sortante aux niveaux master et doctoral, accroître des enseignements en langues étrangères et créer une véritable communauté universitaire internationale.

ENGLISH SUMMARY

Sorbonne Université, together with its partners in the Alliance Sorbonne Université (ASU), intends to systematically strengthen the connection between education and research for the benefit of all. This strategy relies on a concerted approach with the other two research-intensive universities on the Paris site (*Université de Paris, Université Paris Sciences et Lettres*) with which it shares research units and doctoral schools.

Present across a very broad disciplinary spectrum, anchored in the UFRs, departments and faculties, these strengths are currently structured around major disciplinary areas. They enrich and inform education through dedicated transversal structures: a Bachelor's College with its majors and minors; institutes and transversal initiatives with an international component based on Labex experience; and a Doctoral College that has been structuring doctoral training within the ASU for several years now.

Through the SFRI actions, the aim is not only to give greater visibility to transversal initiatives and their stakes in close connection with the disciplinary departments, but also to organize the Master's and Doctoral levels within colleges that underpin the transversal initiatives.

As part of certain major axes of SU's strategic project and in perfect coherence with the Idex SUPER, 4EU+, NLSU excellence initiative and the IDÉES OPEN SU project, SFRI will enable us to take full advantage of connecting our education and research to meet the needs of the contemporary world, a major asset for both initial and continuing education students: a) the demand for a critical approach to the practices of research itself, b) the need for an increasingly open and international approach, c) the requirements for openness and flexibility in education programmes.

To meet these challenges, SFRI's actions will develop our research-based education on four main areas.

1. Making research-based education at the core of disciplinary fields: encouraging creative teaching and study practices based on the strengths of the UFRs and departments; intensifying relationships with research organizations to deepen and increase the already significant involvement of researchers in education;
2. Develop degree programmes based on research carried out at the interfaces of disciplinary approaches to meet societal challenges: transform education into the exploration using research methods at the disciplinary interfaces by drawing on the institutes and initiatives of the ASU;
3. Deploying research-based education for student acquisition of transversal capabilities: supporting this acquisition by students, whatever their discipline, and in particular data literacy, research ethics and scientific integrity, and entrepreneurial and innovative capacities;
4. Opening up research-based education to the global context: while research has always been international, it is now increasingly so. Education by and for research means opening students to a larger world. SFRI will contribute to the efforts of the ASU to encourage incoming and outgoing mobility at the master's and doctoral levels, increase teaching in foreign languages and create a truly international academic community.

1. CONTEXT

1.1. CONTEXT AND SCOPE OF THE PROJECT

Preliminary note

The application of Sorbonne Université to the SFRI call is embedded in the overall development project of Sorbonne Université. This application also fits into the broader effort of coordination of the so-called Parisian “site”, organized around three world-class universities: Université de Paris, PSL and Sorbonne Université.

Our institutions differ in structuration, size and institutional project. But they share the missions of research-based universities: each of them considers the other two as privileged partners, and the three of them work in close cooperation with National Research Organisations (NROs).

They all share the willingness to cooperate wherever they have joint research units (UMRs), joint doctoral schools, doctoral programs, or any other type of projects that benefits from a cooperative approach.

Sorbonne Université today: four strategic axes for a global ambition

Sorbonne Université and Alliance Sorbonne Université (ASU). As a comprehensive research-intensive university, Sorbonne Université (SU) was formally created in 2018, building upon the long-standing strengths of its founding institutions. With 135 research units with the extensive involvement of the NROs, **SU is one of the leading research universities in France and in the world.** Its three Faculties - Science, Humanities, Medicine - offer a wide range of academic programmes, all of which benefit from a very strong and active backing from the research units.

Its partners in the ASU alliance are:

- the **National Museum of Natural History (MNHN)**;
- the **Université de Technologie de Compiègne (UTC)**, a public research university specialized in technology and engineering;
- the **Institut Européen d'Administration des Affaires (INSEAD)**, a graduate Business School;
- the **Pôle supérieur de Paris Boulogne-Billancourt (PSPBB)**, a teaching cluster in the arts (music, theater and dance);
- **France Éducation International** (formerly CIEP), national institution on cooperation in education and teaching;
- national research organisations: **CNRS, Inserm, Inria and IRD.**

All of these partners **share a commitment to excellence in research & higher education, as well as a deep societal commitment.** Based on their contribution, REAL SU is therefore supported by the whole spectrum of skills and disciplines provided by the ASU's partners and NROs.

The basis for our application: SU's strategic project. SU has formalised its institutional ambition for 2019-2023 within a strategic project that provides a single and coherent framework guiding the efforts of the institution. This strategic project is the basis for:

- the **multiyear contract with the State**, which details the institutional commitments of the university and of the Alliance;
- the **agreements with the Faculties** (*contrats d'objectifs et de moyens*), which show how each Faculty develops and supports the shared objectives in its own scope;
- the **shared projects developed within the ASU alliance**, and hence the use of the IDEX funding, which relies on a unique set of institutions embracing liberal arts, sciences, management, engineering, natural history and the performing arts;
- the applications for **competitive sources of funding** such as SFRI and IDÉES.

The applications that we submit to the SFRI and IDÉES calls for projects are embedded into this long-term effort to develop ASU as a world-class multidisciplinary university, which serves society throughout four main priority areas:

1. Acting in a globalised world - With its scientific strengths and reputation, ASU sees the development of impact and attractiveness at the European and international levels as a priority. We thus chose to develop a limited number of long-term, comprehensive and in-depth strategic partnerships with leading international universities, which embrace both research and education. We are also increasing our participation in European programmes, and strengthening incoming and outgoing mobility for students and staff.

2. Taking part in the revolutions of open science, digital tools and data - SU is fully involved in the digital revolution that fundamentally reshapes the relevance of data and multiplies their uses. SU is thus acquiring cutting-edge infrastructures, and is committed to educate, raise awareness and develop research on digital technology, digital literacy and artificial intelligence. It is also committed to develop reasoned uses of data, greater transparency and ethics, and open science.

3. Understanding, learning and innovating in a changing world - As a key player in the public debate, SU remains at the forefront of scientific knowledge and of its dissemination to its students and the general public. It wants to be a reliable, transparent, reactive source of expertise for society, able to respond to society's expectations and urgent questions. SU constantly adapts its teaching methods to the needs of new generations of students, fosters entrepreneurship and stimulates innovation. It is thus able to support and guide society through the challenges it faces, including: globalisation, mobility, the digital revolution, demographic and health changes, environmental transition.

Axis 4. Setting up Sorbonne Université and developing its identity - in some respects, SU is a typical research-intensive university; but it cherishes its values such as a commitment to being a world-class public university open to all, and to relying on strong Faculties, under a solid common leadership. Its identity is being developed on this basis, to bring together, celebrate and support a community that goes beyond students and staff to reach alumni, partners and all interested citizens.

The table below sums up how we conceive of various funding opportunities as different ways, all of which converge to support this institutional project overall.

The first column of the table presents the axes and objectives of our project. The second column represents some of the major funding lines, which complete institutional public funding, and show how they are channeled to support some specific elements of our project. It shows which axes the SFRI and IDÉES project contribute to, and how they are articulated with other actions such as the European University Project 4EU+:

Strategic axis for SU and ASU	Funding sources
Axis 1. Acting in a globalised world	
1.1. Developing outgoing student mobility	IDEX
1.2. Improving international students reception	IDEX / IDÉES
1.3. Developing international curricula	IDEX / SFRI
1.4. Promoting strategic international partnerships	IDEX / SFRI
1.5. Developing the European commitment	Project EUP 4EU+ / IDEX
Axis 2. Taking part in the revolutions of open science, digital and data	
2.1. Getting involved in the digital, data science and AI challenges	IDEX
2.2. Promoting open science	IDEX / IDÉES
2.3. Implementing the digital transformation	IDEX / IDÉES
Axis 3. Understanding, learning, and innovating in a changing world	
3.1. Developing the scientific strategy at the heart of disciplines and at the interfaces	IDEX
3.2. Strengthening education through research	IDEX / NCU - NLSU / SFRI
3.3. Developing entrepreneurship, innovation and knowledge transfer	IDEX / NCU - NLSU / IDÉES
3.4. Supporting teaching & learning innovation	IDEX / NCU - NLSU / SFRI
3.5. Supporting the dialogue sciences between sciences, culture and society	IDEX / IDÉES
Axis 4. Setting up Sorbonne Université and developing its identity	
4.1. Providing everybody with the conditions to study and thrive	IDEX
4.2. Supporting student life on campus	IDEX

4.3. Promoting inclusive campuses	IDEX
4.4. Developing the cohesion of the SU community around its values	IDEX
4.5. Becoming known and acknowledged in society	IDEX / IDéES

Structuring the graduate offer: choosing a model supporting SU and ASU

Research-intensive universities throughout the world organise graduate level training programmes through research in different ways. There is not one but a few main models in this respect:

- (a) some universities directly embed it in the structure of their disciplinary departments - the University of Chicago, Stanford University, and most European Universities are based on this model;
- (b) some universities rely on a quite light and generic “Graduate School” structure as a portal for communication and admission: the generic and transversal Graduate School is a common instrument to increase visibility and ensure overall coherence - [Princeton University](#) is an example of this type of model;
- (c) some universities have a “Graduate School of Arts & Sciences” coexisting with other Graduate Schools oriented towards professional sectors (Business School, Law School, etc.). The [Harvard University Graduate School of Arts & Sciences](#) is the prominent reference point for this model;
- (d) some universities identify a few thematic Graduate Schools as a way to provide salience to some domain of excellence - the [Graduate Schools of Science at the University of Amsterdam](#) provide an example of this organisation.

In SU, the organisation by grouping large disciplinary areas is anchored in the UFRs, departments and the three Faculties. A series of dedicated structures ensure a transdisciplinary approach : thus, the *Collège des Licences* is key for the implementation of the major-minor system at the undergraduate level. In parallel, the experience of our Labexes has given us with a strong experience of transversal and international research projects. Similarly, the *Collège Doctoral* has been providing a structured doctoral training at the level of the ASU for several years already, which will be further supported by REAL SU.

On this basis, REAL SU offers us a major opportunity to take a further step:

- **the Institutes and transversal Research Initiatives of the ASU provide strong visibility to a series of transversal priorities and topics, in addition to and in close articulation with the disciplinary departments;**
- **the organisation of colleges at the Master’s and Doctoral levels supports the coordination of the transversal initiatives at the ASU perimeter.**

The following images present this structure:

Image 1. The institutional structure of SU and the ASU today. Sorbonne Université itself is structured in three large faculties. The image below represents the members of the ASU:

The three faculties of Sorbonne Université



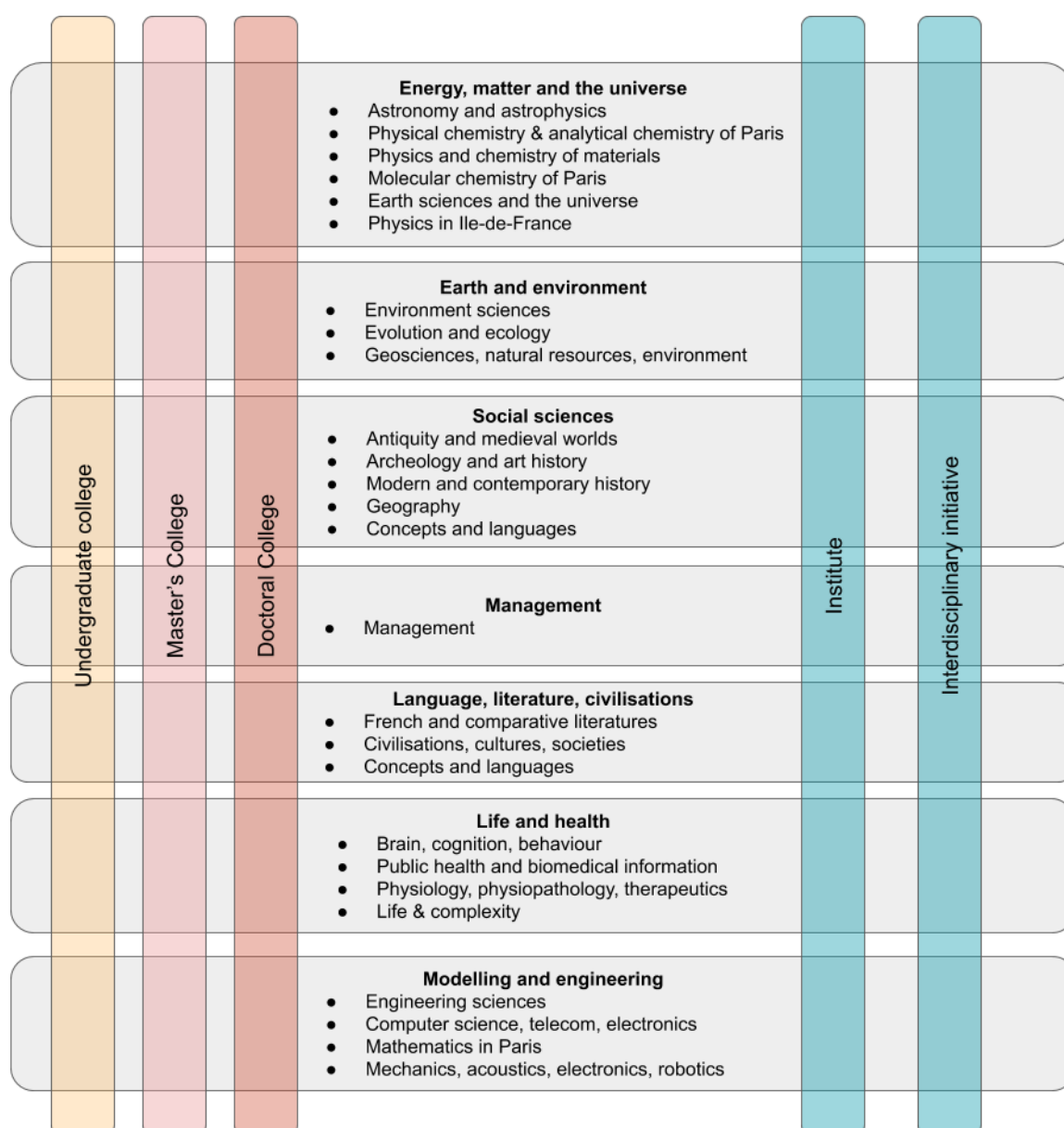
Members of ASU - higher education and research



Members of ASU - national research organisations



Image 2. The members of the ASU are already structured in major areas in research and education in sciences, engineering, life science & the environment, management, humanities & social sciences. The structure of our doctoral schools provides a good overview of this existing structuration for the graduate studies in broad thematic areas and is represented in the gray areas. The image also shows, on the right, how the Institutes and transversal Research Initiatives create a research and teaching dynamic at the interfaces of disciplinary strengths; and, on the left, how the Colleges at the undergraduate, Master’s and Doctoral levels act as a space for interaction and brainstorming on the teaching offer throughout the university:



REAL SU: scaling up research-based education

Research-based education is already at the very heart of the education offer of SU. As a research-intensive university, it is *the* major education asset which we constantly strive to endow our students with. SU has already successfully implemented research-based education approach at the undergraduate level, with its innovative *Major-Minor* system. SFRI will enable **an extension of this perimeter to graduate students**, as well as to professionals engaged into **life-long learning programmes**. The ASU has also been a pioneer in setting up a single *Collège doctoral* encompassing all doctoral schools, and coordinating the transversal teaching & learning offer.

We are convinced of the importance of this specific way of educating the public to face contemporary challenges. **Research-based education is of course about providing students with cutting-edge knowledge. But it is also a means to convey a way of thinking about the world, based on a commitment to rationality, and the openness and curiosity to question established ways of thinking and come up with innovative answers.** Rationality and innovation: these are two major qualities that contemporary societies urgently need to cultivate in their youth; and they are also two qualities that are prominently cultivated by the practice of and familiarity with research. SU and the ASU are committed to being places where these qualities are cherished and cultivated.

This means, in our case, that REAL SU is not so much about embracing a new way of educating - we are already offering research-based education as a defining feature of the student experience at SU and within the ASU – as it **is challenging us to deepen and extend this practice to respond to major contemporary needs:** (a) the request for a **critical approach to the practice of research** itself; (b) the need for an increasingly **open and international approach**; (c) the demands for **openness and flexibility of the curricula**.

REAL SU provides a place to go deeper into teaching and learning approaches that are best suited to cultivate research qualities, by encouraging students to take an active part in the concrete reality of research, and by involving them in its collective dimensions. The ASU fully endorses the role of a melting pot where people and scientific disciplines are brought together, so that from their encounter, their affinities or their confrontation, a new way of questioning the world may emerge.

To address these challenges, SFRI provides us with the opportunity to scale up and shake up our research-based education in four main directions, which are the axes of the REAL SU project described in detail in part 2:

1. **Research-based education at the heart of disciplinary fields:** REAL SU will support creative teaching and learning practices based on the assets of the UFRs and departments and promote a closer communication with the NROs to deepen the already extensive involvement of researchers in teaching. This strong disciplinary basis provides the necessary foundation for the other three directions;
2. **Research-based education at the interfaces of fields in order to face societal challenges:** relying on the assets of the ASU's Institutes and Initiatives, REAL SU will enable the transformation of research-based education into the exploration of the interfaces of knowledge which are being developed in research;

3. **Research-based education to acquire transversal skills:** all students, whatever their discipline, need to be endowed with fundamental transversal skills that REAL SU will support: in particular, data literacy, ethics of research & scientific integrity, entrepreneurship & innovation;
4. **Research-based education in a global context:** research has always been an international matter; this is increasingly the case. Educating our students through research means opening them up to the larger world. REAL SU will contribute to the ASU’s efforts in this aspect with incoming and outgoing mobility at the Master’s and PhD levels, courses taught in foreign languages and the development of an international academic community.

International attractiveness at ASU: state of affairs, diagnosis and ambitions

SU’s international strategy as described in our institutional project rests upon the following pillars:

- **Internationalizing courses and careers at the University:** Hosting students and staff from around the world, giving everyone the means to succeed in Europe and throughout the world;
- **Developing international university cooperation:** building strategic partnerships in Europe and throughout the world, setting up cooperation with countries that have university sectors in development;
- **Being active in Europe:** participating in the European debate and displaying our credentials, developing the European dimension of our activities;
- **Opening up to society in Europe and throughout the world:** taking on our role in the European knowledge triangle, playing a significant part within European ecosystems for innovation and enterprise, multiplying international socio-economic partnerships, providing international visibility to our host regions (SU sites in Île-de-France and beyond).

Currently, the percentage of international students enrolled at the Master and PhD levels at SU follows the trend indicated in the table (French average: Master 15.7%, PhD 39.5%¹):

	Master	PhD
2017-2018	22.9%	44.1%
2018-2019	22.9%	43.9%
2019-2020	24.0%	42.9%

The ASU is already involved in many initiatives aimed at increasing international visibility. INSEAD is of course international at its very core, but the international engagement is true of many other

¹ Source : https://cache.media.enseignementsup-recherche.gouv.fr/file/2020/39/6/NI_2020-03_Effectifs_universitaires_1235396.pdf

programmes within the ASU. For example, more than a decade ago the ASU (through its founding member UPMC at the time) was a key player in the creation, along with other large universities in the Paris region, of “Fondation des Sciences Mathématiques de Paris” and the “Paris School of Neuroscience” (ENP) which developed attractive packages for very selected students. Moreover, the ASU was host to 14 laboratories of excellence, most of which included policies and programmes for international education and teaching at the second-year master’s/PhD levels. These innovative “experimental” programmes were very successful and provide a background of experience on which the actions proposed in the SFRI project will be built.

1.2. MAIN EXPECTATIONS

Because of the scale of the ASU, the SFRI funding will have to be targeted on specific actions. However, the expected effect of those actions does concern ASU as a whole, and is meant to regard the whole community, whether directly or indirectly.

In coherence with its institutional project and with its identity as a comprehensive research-intensive university, **SU considers that education through research has to be a defining feature of all the education programmes it offers. This remains true whether the objective is to educate to research or not, and at both the undergraduate and the graduate level.** Any student who gets a degree from Sorbonne Université should be introduced first-hand to the practice of research, and be acquainted with the current research in their fields. This ambition also extends to life-long learning curricula, where training through research offers key solutions to answer the educational needs of professionals.

The main impacts expected from the SFRI project will therefore be seen at three scales:

Scale 1. Very concretely, REAL SU will enable innovative modules to be set up that are directly relevant to research-based teaching:

- a. **Within the Faculties** and the members of the ASU, the scaling up of successful practices and the support for innovative research-based disciplinary modules;
- b. **At the interfaces of disciplinary fields**, the creation of a series of innovative and highly relevant education programmes, which address the needs of students, employers and society;
- c. **Transversally**, by educating our students to think critically about their research practice and its conditions, their skills are more solidly anchored and therefore more concretely transferable beyond academia;
- d. **On a global scale**, by multiplying the opportunities of mobility to enrich the students’ experience.

Those various modules and practices are described in more details within section 2 of the document.

Scale 2. A second effect that we expect from SFRI concerns the entire education offer, beyond the new modules. By creating the framework to support actions in research-based education at the ASU, the effect is on the whole institution. Education through research within SU is already largely structured throughout the Faculties, but the creation of the Masters’ College with all ASU partners (and the continuing support to the Doctoral College) will complete this organisation by providing support and coherence to interdisciplinary and transversal development.

The Doctoral College and the Master's College are coordination structures, gathering representatives from the academic staff across the whole Alliance, and whose missions are:

- ensuring the sharing of information and good practices in teaching through research across the Alliance;
- promoting interfaces and flexibility in the curricula;
- identifying the needs of academic staff;
- assessing projects and promote successful ones;
- steering policies oriented towards international attractiveness of curricula.

The implementation of the Master's College through REAL SU will therefore contribute to reinforcing the emphasis placed on research-based teaching approaches throughout the institution.

Scale 3. Finally, we expect an effect from REAL SU that will go beyond specific teaching units, regarding the visibility of our education offer on a national and international scale. Indeed, we expect the actions supported by REAL SU, together with an effort of communication, recruitment and staff and student mobility, to help increase the visibility of the whole research-based education of SU: (i) through a better, clearer, more easily understandable communication of our teaching offer; (ii) through dedicated support to the internationalisation of our teaching, thus contributing to further establish the visibility of the ASU amongst the network of partner institutions.

In other words, with REAL SU, the ASU wants to be the place where its national and international students will be able to discover immense fields of knowledge, to explore new areas of expertise and to become citizens that are aware of the challenges currently facing the world.

2. PROJECT DESCRIPTION

2.1. PROGRAMME OUTLINES, VISION, AMBITION, EDUCATIONAL STRATEGY

As stated above, the activities developed within REAL SU fall within four major axes:

1. research-based education at the heart of disciplinary fields;
2. research-based education at the interfaces;
3. research-based education to acquire transversal skills;
4. research-based education in a global context.

Axis 1. Research-based education at the heart of disciplinary fields

Ambition:

Educating citizens and future professionals with a direct in-depth experience of research practice, an ingrained intellectual habit to systematically question and explore new issues, and the capacity to transpose those research-based skills into different contexts.

Approach:

Supporting our Faculties, UFRs and departments in scaling up successful research-based teaching approaches and developing innovative methods at the heart of their disciplinary fields.

Concrete actions supported by SFRI:

- Supporting academic staff in developing new training modules and/or scaling up existing ones (compensating time for academic staff, providing material and human support).
- Fostering a stronger commitment of researchers within disciplinary education.
- Encouraging the creation of communities of practice, both for academic staff and for students:
 - Creating events where academic staff can confront and enrich their teaching and learning approaches to research-based teaching.
 - Organizing encounters between students from similar disciplines within different structures of SU in order to compare and enrich approaches.

Axis 1 intends to capitalize upon SU's consolidated practices and upon the programmes and curricula developed within the Faculties and UFRs.

The first step of REAL SU will therefore consist in supporting UFRs and departments in the development or upgrading of disciplinary modules on a research-based approach.

By funding academic teams of professors and researchers and incentivising them to dedicate time to develop new approaches to research-based education, **REAL SU will create a space where academics can reflect and improve on the practices they use to teach through research.** Indeed, academic staff, whether employed by the university or by the national research organisations, usually stress that the key conditions to develop effective teaching-through-research methods are (i) time and (ii) interactions with their colleagues.

REAL SU will provide both. Indeed, on top of a support in time and resources, **REAL SU will also support community engagement** through regular events where teaching teams may meet to discuss about the methodology of teaching through research. Those internal seminars dedicated to teaching and learning practices, and focusing specifically on the challenges of teaching through research, will take specific care to address the differences between practices in the various fields of knowledge encompassed within the three Faculties of Sorbonne Université and ASU.

Once the creation of a proposed module has been validated, a teaching team of 3 to 5 people, both from the university, the ASU partners or the the NROs, who will be compensated for the time spent developing the module. Depending on the specific requirements of the module, technical tools and/or the support of a teaching & learning specialist may be provided. In order to give maximum flexibility to the students, resort to blended methods of teaching will be actively supported.

For both this practical and reflective support, REAL SU may rely on the structures to support innovative teaching practices set up at Sorbonne Université and the ASU such as:

- Capsule² - Centre d'accompagnement pour la pédagogie et support à l'expérimentation (Support center for pedagogical experimentation at SU);
- SIPR - Service Informatique pour la Pédagogie et la Recherche (IT based support service for pedagogy and research at SU, Faculté des Lettres);
- the Cellule d'Appui Pédagogique at UTC (pedagogical support service);
- the Cellule TICE - Technologies de l'Information et de la Communication au service de l'Enseignement at MNHN (support service on information and communication technologies applied to education);
- the Centre for pedagogical innovation at INSEAD.

Community engagement will not only concern academic staff only, but also **students**. In fact, many of them may receive disciplinary educational modules with a similar topic, but a very different teaching and learning approach: for instance, the history of science, which may be taught differently at UTC and at SU's Faculty of science. **We will encourage students to compare these approaches and enrich their perspective through thematic encounters that bring together the different audiences.**

This strategy of reinforcing the research-based teaching at the heart of the disciplines will be led in **close connection with the NROs**, which will contribute to a stronger involvement of research within academic programmes (see below, section 2.3).

Lastly, our commitment towards community engagement is conceived in a logic of concentric circles, that go beyond the strict perimeter of SU, and extended to a set of project-based partnerships: for instance, in the context of the **Fondation des Sciences Mathématiques de Paris (FSMP)**, that has a organising effect both internally and externally at SU. REAL SU will thus rely specifically on the programme "Paris Graduate School in Mathematics" (PGSM) supported by the FSMP, that aims to promote the visibility and attractiveness of the partners' Master's programmes to attract top international students and to the best undergraduate students through scholarships and a significant follow-up at the pedagogical and administrative level.

² <http://capsule.sorbonne-universite.fr/>

Axis 2. Research-based education at the interfaces

Ambition:

Educating future citizens and current professionals to tackle contemporary challenges, which are transversal and pluridisciplinary, by articulating the expert knowledge coming from various fields and combining it in new ways.

Approach:

Proposing flexible, cross-disciplinary courses, relevant to tackling transversal societal challenges.

Concrete actions supported by SFRI:

- Identifying, designing and certifying modules and academic curricula targeting societal and/or pluridisciplinary challenges. The Institutes and Initiatives of the ASU will contribute to this effort.
- Supporting academic staff in developing new academic modules (compensating time for academic staff, providing material and human support).
- Setting up summer schools to reinforce the international visibility on the series of themes.
- Supporting the Master's college and the Doctoral college in ensuring the steering and overall coherence of the new education offer.

Axis 2 focuses on the design, creation and development of education paths at the interfaces of disciplinary fields. It extends to teaching the approach already developed in research within the Institutes and transversal Initiatives supported by the IDEX project.

Indeed, beyond a support to excellence at the heart of disciplinary fields, SU and the ASU have ensured the creation of Research Institutes and Initiatives at the interfaces of disciplinary fields and/or focused on societal challenges. This approach started with funds coming from IDEX that supported a series of Institutes, that were already deeply rooted in the cooperation born in the Labexes.

Institutes and interdisciplinary Research Initiatives are defined by:

- the originality and relevance of a research project at the interfaces of disciplines and/or focusing on societal challenges;
- the excellence of the research teams contributing to it;
- their articulation with socio-economic partners.

Now, thanks to REAL SU, they will also be characterised by the development of **teaching-through-research modules for graduate students** but also to **current professionals engaged into life-long learning**, in a continued effort to foster diversity.

An appendix provides a description of each of the existing Institutes (topic, research unit involved, and teaching and learning projects), and the table below gives an overview of the Institutes and interdisciplinary Initiatives that will contribute to the project:

Instituts et initiatives	Status
Collegium Musicae	Institute, running since 2015
Institut de science des matériaux de l'Alliance Sorbonne Université (Institute of Materials Science at Alliance Sorbonne Université)	Institute, opening in 2020
Institut de la Mer (Institute of the Sea)	Institute, under construction
Institut des sciences du calcul et des données (ISCD) (Institute for Computational and Data Sciences)	Institute, running since 2014
Institut de la transition environnementale (SU-ITE) (Institute for Environmental Transition)	Institute, running since 2017
Institut Universitaire d'Ingénierie en Santé (IUIS) (University Institute of Health Engineering)	Institute, running since 2014
Observatoire des Patrimoines (OPUS) (Heritage Observatory)	Institute, running since 2017
Sorbonne Center for Artificial Intelligence (SCAI)	Institute, running since 2019
Quantum Information Centre in Sorbonne (QICS)	Institute, opening in 2020
Initiative Biodiversité, Évolution, Écologie, Société (IBEES) (Biodiversity, Evolution, Ecology, Society)	Initiative, under construction
Initiative CREATION (arts)	Initiative, under construction
Initiative Économie de la Santé (Health Economy)	Initiative, under construction
Initiative Genre (Gender)	Initiative, under construction
Initiative Interculturalité et Europe (Interculturality and Europe)	Initiative, under construction
Initiative Sciences des Antiquités (Classics)	Initiative, under construction
Initiative Sciences du Vivant et ses Interfaces (Life sciences and its interfaces)	Initiative, under construction

Initiative Physique des Infinis (Infinite Physics)	Initiative, under construction
Initiative Sciences et Ingénierie Moléculaires (Molecular sciences and engineering)	Initiative, under construction
Initiative Humanités Médicales (Medical Humanities)	Initiative, under construction
Initiative Maîtrise des Systèmes Technologiques Durables (Control of Sustainable Technological Systems)	Initiative, under construction

This list should evolve over time, following the development of research and the evolution of educational needs. We will describe in part 3 how the assessment and evolution of those Initiatives are an integral part of our SFRI project.

Currently, both Master’s and Doctoral students have to choose elective modules. **The aim is to build a wider offer of elective modules that will enable students to develop a strong focus, in direct contact with research, linked to the main topics of the Institutes and transversal Research Initiatives.** Thus, any ASU student will have the possibility of creating a curriculum that will familiarise them to the research being developed by the departments with the Institutes and transversal Initiatives.

In concrete terms, REAL SU will provide:

- **the support for teaching teams to develop the new offer:** see mechanisms described in Axis 1;
- **the mechanisms to ensure the overall coherence of the teaching offer:** the proposal for identifying, designing and implementing the modules will emerge from the Institutes and the transversal Initiatives. To ensure that the bottom-up proposals are consistent with the overall education offer proposed by ASU, an overall coordination will be guaranteed by the Master’s and the Doctoral Colleges.

Axis 3. Research-based education to acquire transversal skills

<p>Ambition: Educative future citizens that are able to combine a critical approach, intellectual precision and creativity cultivated by the practice of research, that includes a strong awareness of ethical concerns and social responsibility.</p>
<p>Approach: Developing transversal research skills with a focus on data literacy, the ethics of research & scientific integrity, and entrepreneurship and innovation.</p>
<p>Concrete actions supported by SFRI:</p> <ul style="list-style-type: none"> ● Developing transversal education through research modules for graduate and PhD students,

focusing on data literacy, ethics of research & scientific integrity, entrepreneurship and innovation.

- Supporting teaching and learning approaches to introduce students to partner research or project-based research.

Axis 3 aims to develop a set of transversal skills connected to research, and that have a special importance in today's social, economic and professional contexts.

In particular, REAL SU will focus on:

- **Data literacy**, that covers a set of skills goes beyond technical mastery, and includes critical analysis, argumentation, informed decision-making and management of complexity. The objective is that every student, whatever their disciplinary field, has the fundamental understanding of the stakes, tools, challenges and methods to deal with data and cooperate with data analysts and specialists;
- **Ethics of research & scientific integrity** - this aspect is included in the scope of the legal framework of PhD studies in France³. It is our mission to emphasize ethics and integrity in a world where sources of information are growing, where the notions of copyright and intellectual property are constantly challenged, where the differentiation between trusted and fake data requires rigorous methodologies. We want every SU student to be fully aware of the ethical conditions surrounding the practice of research as well as the sometimes slippery slope which might lead from a brilliant idea to a questionable practice;
- **Entrepreneurship and innovation in and from research** - the capacity to either develop an entrepreneurship project, or collaborate with partners engaged in an innovation projects, are crucial skills that can now be expected not only from experienced researchers, but also from students at an early stage of their curriculum, from the Master's level onwards, and to the benefits of all the actors of society. The ASU actively wants to support the acquisition of such skills amongst its students, and encourages strongly project-based learning that mixes research and innovation.

As in Axes 1 and 2, REAL SU will give academic teams the time and support to develop and scale up the new modules. Those transversal modules will be developed and hosted by the Master's and the Doctoral Colleges. The research-based education at the interfaces that includes entrepreneurship and innovation will rely on existing structures such as FabLab or Pépite and also benefit from the Inria Startup Studio that offers young researchers and project leaders everything they need to dive head first into the creation of their own digital deep-tech start-up.

For the continuation of the project, more relevant transversal skills may be targeted based on the evolution of relevant soft-skill requirements.

³ *Arrêté du 25 mai 2016 fixant le cadre national de la formation et les modalités conduisant à la délivrance du diplôme national de doctorat précise, article 3 que les écoles doctorales « les écoles doctorales veillent à ce que chaque doctorant reçoive une formation à l'éthique de la recherche et à l'intégrité scientifique ».*

Axis 4. Research-based education in a global context

Ambition: Open our students to the larger world.
Approach: Reinforcing the international scope of our programmes by supporting incoming and outgoing mobility for our educating-through-research programmes, in order to encourage brilliant students to pursue a PhD.
Concrete actions supported by SFRI: <ul style="list-style-type: none">● Promoting the development of academic modules in foreign languages.● Setting up international PhD fellowships targeting the development of the research-based programmes that rely on the topics of the Institutes or Initiatives.● Setting up international incoming mobility grant at the Master's level to encourage brilliant students to pursue a PhD, and therefore foster the LMD (Bachelor-Master-PhD) continuity.

Axis 4 specifically tackles the challenge of visibility and international attractiveness of our education offer. SU has many assets in this regard (a very visible brand, an internationally recognised quality of research) and, as mentioned at the end of section 1.1, is already attracting many international students. However, we are also aware that, in an extremely competitive environment, French universities have to progress to attract the best students. The preparation of the REAL SU application has helped revisit our analysis of potential weaknesses:

- **Language of the teaching programme:** many research-intensive universities in Europe, which are faced with a similar issue regarding the balance between national and global languages, have decided to maintain their specific language at the undergraduate level, whilst developing the offer in English from the Master's level onwards or to balance an English-based offer with an important offer in the national language. Currently, our offer has a mix of courses in French and English. In fact, several training modules have already successfully developed English-speaking curricula (sometimes relying on the assets of the Labexes): for instance the international Master curricula "From fundamental molecular biosciences to biotherapies"⁴ (developed with our partners of the 4EU+ Alliance and some other partners in Brazil, Germany, Portugal and Spain) or the École des Neurosciences de Paris Île-de-France⁵ (School of Neurosciences of Paris Île-de-France) that will be managed by SU's foundation, the Brain and Mind Msc in cooperation with UCL⁶, as well as several modules developed with international partner institutions. We will further develop our offer of courses either offered in a foreign language, or in French, while still suitable for international students.
- **Welcome packages for international students:** students take into consideration the quality of the university and interest of the programme, but also the material conditions that they will

⁴ <http://sciences.sorbonne-universite.fr/masters/master-biologie-moleculaire-et-cellulaire-bmc/parcours-international-fundamental-moleculaire>

⁵ <http://www.paris-neuroscience.fr/>

⁶ <https://www.ucl.ac.uk/prospective-students/graduate/taught-degrees/brain-mind-sciences-msc>

enjoy while studying. At the moment, we recognize that our capacity to welcome international students is not as structured as it could be. On one hand, such considerations go well beyond the scope of the SFRI call, since it deals with the overall quality of student life on campus. However, the priority is to make sure that the international students we attract can have good conditions. This key aspect is being supported in part by one of the axes of our IDÉES application and is therefore not funded through SFRI, but is deeply connected to the overall strategic objective;

- **International incoming Master’s and PhD fellowships.** A known issue with international fellowships is how to target and distribute them to achieve maximum effect. Sorbonne Université is awarding 680 PhD diplomas and 4,800 Master’s diplomas each year. In comparison, the number of international fellowships that REAL SU can offer to attract more international students is low. This makes it all the more important to target these fellowships correctly, in order to improve their impact on, and contribution to the strategic objectives of the ASU. We have chosen a dual approach to this question:
 - Master’s fellowships will support the research-intensive programmes to attract top international students;
 - PhD contracts will be targeted on the topics at the interfaces that are being developed in the Institutes and Initiatives.

The implementation of these actions is intended as a complement to such instruments as the IDEX or EUP funds. In particular, this aspect of our project relies heavily on the network we are currently building with our partners from the 4EU+ Alliance.

2.2. DESCRIPTION OF THE LEARNING CURRICULUM

SU departments, along with Institutes and transversal Initiatives, have been invited to identify a series of modules with content that fits their specific topics, in order to raise awareness of a graduate offer related directly to those research concerns. This consultative process will continue throughout the duration of the project but the initial set of modules is already detailed in section 2.2 of the present document.

The education offer will keep on evolving all throughout duration of the project, following the steering mechanisms described in section 3.

Axis 1. Innovative training modules at the heart of disciplinary fields (examples)

Institution / structure	Teaching module	Description / format / number of students
SU / Ancient Greek - Latin	History of scholarly traditions and technical knowledge in ancient Mediterranean societies	A transversal course focusing on the conditions, actors and instruments of knowledge transmission and scholarly practices from Antiquity to the Renaissance, in the Mediterranean and peripheral areas.

		<p>Initial partners: MNHN (UMR 7209), BnF, IRHT/CNRS</p> <p>Two courses of 2 hrs/week each</p> <p>Level: Master and PhD, in correlation with the Sciences of Antiquity Initiative</p> <p>Number of students: 20 to 25 per course</p>
SU / Geography	An introduction to “sociopoles”	<p>A course focused on the notion of “sociopoles”, as local ecosystems geographically limited and involving various actors (academia, public and private agents etc.) working on local social challenges. Students will examine the co-design of innovative solutions to territorial challenges, test different types of sociopoles and improve the connections between society at large and the world of academia.</p> <p>Level: Master</p>
SU - Langue française	An introduction to cognitive linguistics	<p>A multidisciplinary course on the cognitive constraints on linguistic structures. It will involve linguistic analyses, cognitive psychology, neuroscience, semiotics and the philosophy of cognition.</p> <p>Level: Master 2</p> <p>Language: French</p>
SU - Langues étrangères appliquées	Managing Cultures	<p>A course on the integration of cultural differences in collective work – workshops will put students in real-life situations in order to correct their initial prejudices.</p> <p>Level: Master</p> <p>Language: French and English</p>
SU - Literature	Freedom of expression and copyright	<p>A course on the legal environment of the publishing industry:</p> <ul style="list-style-type: none"> ● freedom of expression as a right (defamation, insult, privacy, hate speech, fake news, liability of digital players, etc.); ● the rules of copyright (notion of work, economic and moral rights, exceptions, neighbouring rights, contracts, counterfeiting and plagiarism, etc.). <p>The course is oriented towards the theoretical presentation of the main legal rules, complemented with a practical approach through the study of legal cases and practical ones.</p>
SU - Medical School	PréMed (Prejudice in medicine)	<p>A course focusing on the awareness of representations and judgments regarding stigmatizing pathology or the discovery of patient associations.</p> <p>Teaching modality: Moderation of discussions on</p>

		<p>preconceived ideas + debates with Patient association. Themes: Obesity, disability, COPD/tobacco, elderly/dementia, mental health, addiction alcohol/transgender, neurological functional disorder intellectual disability. Format: 32 groups of 12 students</p>
SU - Philosophy	An introduction to bioethics	<p>A course aiming to explore some major issues in contemporary bioethics: abortion, reproductive choice, post-mortem paternity and pre-implantation screening; surrogate motherhood; eugenics; stem cells; etc. The aim is to introduce the different methodological and normative options of contemporary bioethic by confronting arguments and methods of analysis based on a specialized bibliography in French and English.</p>
SU - Sciences	Shared experimental platforms	<p>Experimental platforms are an essential element of educating-through-research. The ASU offers undergraduate and graduate that students a wide sets of cutting-edge platforms which students may learn to use during dedicated teaching units (6 to 12 ECTS per year): biological platforms (imaging, electrophysiology), chemical platform (spectrometry, RMN, chromatography), engineering (electronics, mechanics, robotics, computer science), physics (lasers, nuclear physics)</p>
SU - Sciences	Data science	<p>A transdisciplinary programme which provides students, whatever their main disciplinary field, with a solid basis in data sciences, opening up the possibility to continue studying in fields directly related to data sciences or requiring interactions with data sciences.</p>
UTC	The engineer, the philosopher and the scientist / L'ingénieur, le philosophe et le scientifique	<p>An elective to understand the differences but also the strong links that connect the intellectual approaches of these three characters. Teaching material in English Level: Master Number of students: 50</p>
SU	From archives to records management – papers, books, data	<p>An elective open to students interested in the approaches, methods and tools for record keeping. It will bring together historians, IT specialists and data scientists. It will include visits of major libraries in Paris, storage and data server facilities.</p>

		<p>Level: Master's Languages: French and English Number of students: X group(s) of 20</p>
MNHN	Heritage	<p>An online teaching unit on EU Heritage including a summer school. This summer school would involve international students + Master students, or could be focused towards the Master level.</p>
SU - CELSA	Living in a media-driven world – boon or bane?	<p>An introduction to Information and Communication Sciences to understand the challenges of a world that seems increasingly driven by the media, the press or social networks. The course will introduce students to the main theoretical approaches to information and communication sciences, as well as history and sociology of the media.</p>
FSMP - "Paris Graduate School in Mathematics" (PGSM)	Master's scholarships and specific follow-up and support	<p>A global offer in mathematics, with complementary training courses at the various partner universities, as well as joint actions promoting the creation of networks and the integration and development of PGSM scholarship students. PGSM laureates receive a monthly scholarship, some support with all the administrative formalities related to studying in France, a round-trip from their home in Paris, a tutor who provides pedagogical supervision and support in finding a course director and, if necessary, a thesis director, follow-up meetings, meetings on the possibilities for further study and the various career and professional integration prospects.</p>
INSEAD	Privileged access to INSEAD's training modules and programmes in Business	<p>INSEAD will offer:</p> <ul style="list-style-type: none"> ● an opening to attend the courses of INSEAD's Master embedded in INSEAD's PhD Programme⁷; ● free participation to a course of the Business Foundations Certificate Programme for ASU's students (agreement in progress); ● privileged access to INSEAD's Open Online Programmes

⁷ With the agreement of their supervisor, of the Director of the Doctoral College and of the Director of INSEAD's PhD Programme.

Axis 2. Research-based education at the interfaces (examples)

During the previous years of SU's development, the Labexes have played a key part in the development of attractive academic curricula for national and international students. This will now be continued through the contribution of the ASU's Institutes and Initiatives to the development and/or creation of transversal education programmes focused on urgent societal and contemporary challenges. The table below presents a selection of projects to be implemented.

Institute or Initiative	Proposed module	Description and/or format
Collegium Musicae (with the PSPBB)	Master Creation, Sound Arts and Engineering/Création, arts du son et ingénierie de formation (CréASIF) Texte principal	Axes : <ul style="list-style-type: none"> ● Sound design ● Pedagogy ● Research (musicology and education sciences)
CREATION (Initiative)	Transversal Master seminar: World Theater/Théâtre du Monde	2 h/week, open to PhD students,+ workshops on theater practice, starting Feb. 2020. Seminar: 1 group, Workshops: 4 or 5 groups (max. 15 students/group). Languages : English and French for the seminar; French, English and Italian for the workshops
Institut de Science des Matériaux	Practice-based/research-based learning	The Institute will label existing training courses and develop new ones for doctoral students and new users of SU's platforms. It will include life-long learning actions, e.g. for industrials.
Institut de la Transition environnementale	Climate and climate change - Jupyter Lab (with IPSL)	SU is working with the Institut Pierre-Simon Laplace (IPSL), and the GIEC (Groupe d'experts Intergouvernemental sur l'Evolution du Climat) on the development of a climate model. IPSL seeks to make these data and models available to students and to allow them to visualize them with an adapted online platform (Jupyter Lab, ESPRI mesocomputing centre), both in Bachelor and Master programs. By providing access to cutting-edge data and programming tools, it will also use it as a support for innovative entrepreneurship initiatives in the field of the environment.

Institut Universitaire d'Ingénierie en Santé	Ingénierie-Santé/ Engineering-Health	The restructuration of Health Studies (effective Sept. 2020) will offer engineering students the opportunity to follow a path in health and vice versa.
OPUS	Archaeology and Conservation in the Far East / Archéologie et conservation en Extrême-Orient	Training in archaeology strengthening the links between the theoretical and practical teaching of archaeology, particularly in the Far East. Training units from the L3 to undergraduate will include for instance: teaching units on "Current events in archaeology and site conservation in the Far East" (40 student max.), "Presentation of excavation sites, ongoing conservation-restoration programmes, recent discoveries and archaeological practices related to excavation programmes" for M students (30 French students max, including 12 max enrolled in specialization + 8 foreign students max enrolled in partner institutions), Excavation camps open to grad students.
	Interdisciplinarity and Heritage Materials (IMAP) / Interdisciplinarité et Matériaux du Patrimoine (IMAP)	Transversal approach between chemistry and history of art/archaeology. Topics covered: "stone and soil" and "pigments and colour". <ul style="list-style-type: none"> ● video production by students; ● archaeological site visit ; ● supervision by multimedia and graphic design specialists and provision of specific equipment; ● creation of a theater play aimed at science dissemination.
Physique des infinis (Initiative)	MOOCs: Issues behind Infinite Physics, from laboratory plasmas to space plasmas, particles & Universe	Series of online courses on the Sorbonnex platform. A few thousand students/year (SU and non-SU students) in 2020-2024 Language: English
	Enrichment of the existing Master training offer: Space, Plasma, Particle Physics, Cosmology	Creation of course modules at the interface of Particle Physics/Plasma Physics/Space 30/50 students/year in 2020-202 Language: English
Quantum Information Centre in Sorbonne	Quantum Information Master	Creation of a Master's degree in quantum information, affiliated to the UFRs Engineering and Physics 2024: 20 students. 2028: 30 students Language: English
Sciences de l'Antiquité (Initiative)	Techniques at their best	Laboratoire Orient et Méditerranée (UMR 8167) Training in emerging techniques applied to research in history

		and archaeology 2h/month
	Seminar on Hellenistic and Roman Philosophy	Organized by UMR 8061 Centre Léon Robin - UR 4081 Rome et ses Renaissances - Paris 1 - Paris Nanterre
Sorbonne Center for Artificial Intelligence	Intensive Master courses on the AI and Climate axes of SCAI	5 courses per year The objective is to push the development of the AI/Climate axis through the identification of motivated students in computer science or mathematics courses in particular, starting at Masters level, in order to attract them to a thesis. Support from the internal research group: https://ai4climate.lip6.fr/
Institute of the sea	Ocean Literacy	Tackling the major challenge of sustainability for the oceans, this teaching unit relies on a wide array of disciplinary fields and on the technical research infrastructures present at ASU to provide a transversal training to the issue of ocean sustainability. The teaching unit will be developed with Ghent University, within a new International Master - <i>Master International en Ressources Biologiques Marines</i> (IMBRSea).

Axis 3. Research-based education to acquire transversal competencies (examples)

Institution / structure	Teaching unit	Description / modality / number of students
ASU - Master's college	Critical thinking	An elective to understand what it means to look at the world in a critical way – is “science” always reliable? What is a bias? Can anyone pretend to be objective? Level: Master Number of students: 50 to start with
ASU - Master's college	Data literacy	The aim is to cover the whole set of issues crucial to understand and make an optimized use of data: how to use data responsibly, avoid typical biases, create and manage meta-data, what is the value of data, data storytelling, data-informed decision making, data experimentation... Level: Master Number of students: 100-200 students /year Note: this teaching unit could be at least partly taught by PhD students, as part of their teaching responsibility (“ <i>charge de mission d’enseignement</i> ”).

ASU - Master's college/FabLab	Collaborative research projects/entrepreneurship	The FabLab has been deployed successfully within SU. Students, researchers, companies, and all stakeholders would like to see the structure developed further. This structure encourages students to learn in contact with research itself, through action and interactions, and in direct connection with societal challenges and socio-economic stakeholders. In itself it seems to us to encapsulate most of the important values underlying the wish to promote training-through-research.
ASU - Master's college	Researchers' career in and out of academia	Together with the SU Alumni, organising meetings between current Masters' students and former graduates of SU who have had a career in and out of academia, to present the diversity of careers opened to graduates who have been trained through research. The aim is to show students the diversity of application of skills and competencies learnt through the practice of research.
MNHN	Scientific mediation	The MNHN will be a key actor regarding training modules dedicated to scientific mediation, in coherence with the innovative course "EXPE - Les expéditions, une approche de la sciences" that is included within the offer of minors proposed to undergraduate students: one course of introduction to scientific mediation, followed by an immersion of students in a laboratory and by an exhibition of resulting projects. Similar projects will be developed for Master's students.
ASU - Doctoral college	Transversal summer schools	Summer schools in an international and multicultural environment on transversal and "ethical" topics, complementing the disciplinary training modules offered to PhD candidates: for instance, role of researchers within society, open science, arts & science. This action could in particular be initially developed in close interaction with the partners of the 4EU+ Alliance.
ASU - Doctoral college	Transversal teaching unit on ethics & scientific integrity	Scaling-up of existing training actions regarding scientific integrity - from a cycle of conferences to the development of workshops and case studies, involving the academic staff and directed to all SU's PhD candidates (3500-4000 PhD students, 15 to 20 trainers)

ASU - Doctoral college	Career-oriented hackathons	<p>Support to professional insertion of PhDs: Hackathons centered on encounters between PhD students and socio-economic partners, setting-up of a mentorship program based on the Alumni network.</p> <p>This aspect will be implemented in cooperation with the MNHN. The project will start as a pilot in 2020 and could be extended all or part of SU’s general Masters students in the following years. It rests upon the animation of a series of workshops (3 in the pilot phase), and on a dedicated LMS platform.</p>
UTC	Modules on entrepreneurship and innovation management	<p>Initiation to the creation and management of innovative companies - group simulation-based training: how to position a product and/or service in a competitive market environment, choose core business, make a business plan</p> <p>Technology and innovation management (in autonomy) - distance learning based on expert videos and online courses + a complete simulation of innovative project management</p> <p>Management in companies: management styles, team building and group work techniques - combining theoretical elements/managerial techniques, research, self-assessment tests, definition of one's own “managerial profile”, participation in team role plays.</p>

Axis 4. Research-based education in a global context

Several programmes within ASU are international in scope, and therefore firmly engaged into attractiveness strategies in terms of teaching offer (for instance, INSEAD). Yet, not all of our programmes have reached the same level of international attractiveness. In addition to the instruments described in section 2.1, we will set up specific instruments to reinforce the attractiveness of our programmes:

- **Supporting the development of teaching modules in English and other foreign languages:** a common barrier to internationalisation lies with the language of our teaching units. For curricula where English or other foreign languages are relevant (which is the case for part but not all of the graduate course offering at ASU), SFRI will enable us to extend the English / foreign language-based offer by providing dedicated coaching and support to the professors, so that they feel confident in teaching to an international audience in a foreign language.
- **Incoming Masters’ mobility fellowship:** as explained above in section 1.1., ASU considers that the experience of mobility is a key element in the educative experience of any student.

Attracting students in incoming mobility is also a way to internationalise the campus and provide all students on campus, whether mobile or not, with the possibility to interact with students from other countries and different origins. However, mobility is expensive and providing adequate financial support is a must if we want to make it accessible to all students whatever their social backgrounds. ASU in general is therefore relying on many different sources of support to develop the opportunity of incoming and outgoing mobility (IDEX, EUN, regional funds, etc.). We have decided to focus SFRI support on *incoming* mobility as a support to the development of our *international strategic partners*.

- **International PhDs fellowships:** the available PhD fellowships funded on SFRI will be explicitly devoted to the strengthening of international research collaborations being developed in the context of our Institutes and Initiatives. The idea is to create the “virtuous circle” whereby our laboratories can continue developing research partnerships at the highest level and train students at the best, because they have the resources to feed such partnerships.

2.3. RESEARCH-LEARNING INTERFACE

Articulation between research and teaching is omnipresent in all the activities supported by SFRI, which supposes by definition that all the teaching units rely directly on cutting-edge research being developed within the ASU labs. It is true for all four axes (see descriptions above).

Teaching staff at the ASU involve both professors (“*enseignants-chercheurs*”) and NRO researchers (“*chercheurs*”): it is very important to highlight that, **already, many NRO researchers are teaching classes at the Master’s or undergraduate level**. Today, this involvement takes various forms: some researchers are financially compensated for teaching, others do it more punctually and very often pro bono.

What matters for us is to find a way to **ensure a commitment of researchers on a mid-term basis, so that they may not only teach but also actively take part in the design and evolution of curricula**. It is also important that this involvement in teaching should be properly acknowledged.

Finding the adequate HR instruments obviously depends both on the ASU and on the NROs and we are designing together new collaboration models. We are very interested in the opportunity to create “joint positions”, whereby a NRO researcher accepts, as part of his/her regular responsibilities, to teach a definite number of hours (typically 64h) and takes this commitment for several years in a row - so as to become part of the teaching team of the relevant curriculum. In exchange, the ASU can contribute to the financial compensation of the teaching, along with the NRO. The researcher also gets the title of “Professor at ASU”. REAL SU will enable 500 such positions each year.

We are ready to start implementing this system as soon as 2020 with Inria and CNRS, and hope to be able to extend the model very soon to all NROs willing to participate.

For the 2020 recruitment campaign, Inria is offering a new type of research positions called the “Inria Starting Faculty Position” (ISFP), designed to strengthen Inria’s attractiveness. ISFPs are intended for researchers at the beginning of their careers. They are based on an unlimited-term contract (CDI) and associated with a teaching service in an Inria partner higher education institution (approximately 32 to 64 hours per year). The implementation of this new recruitment system meets a twofold ambition: (1)

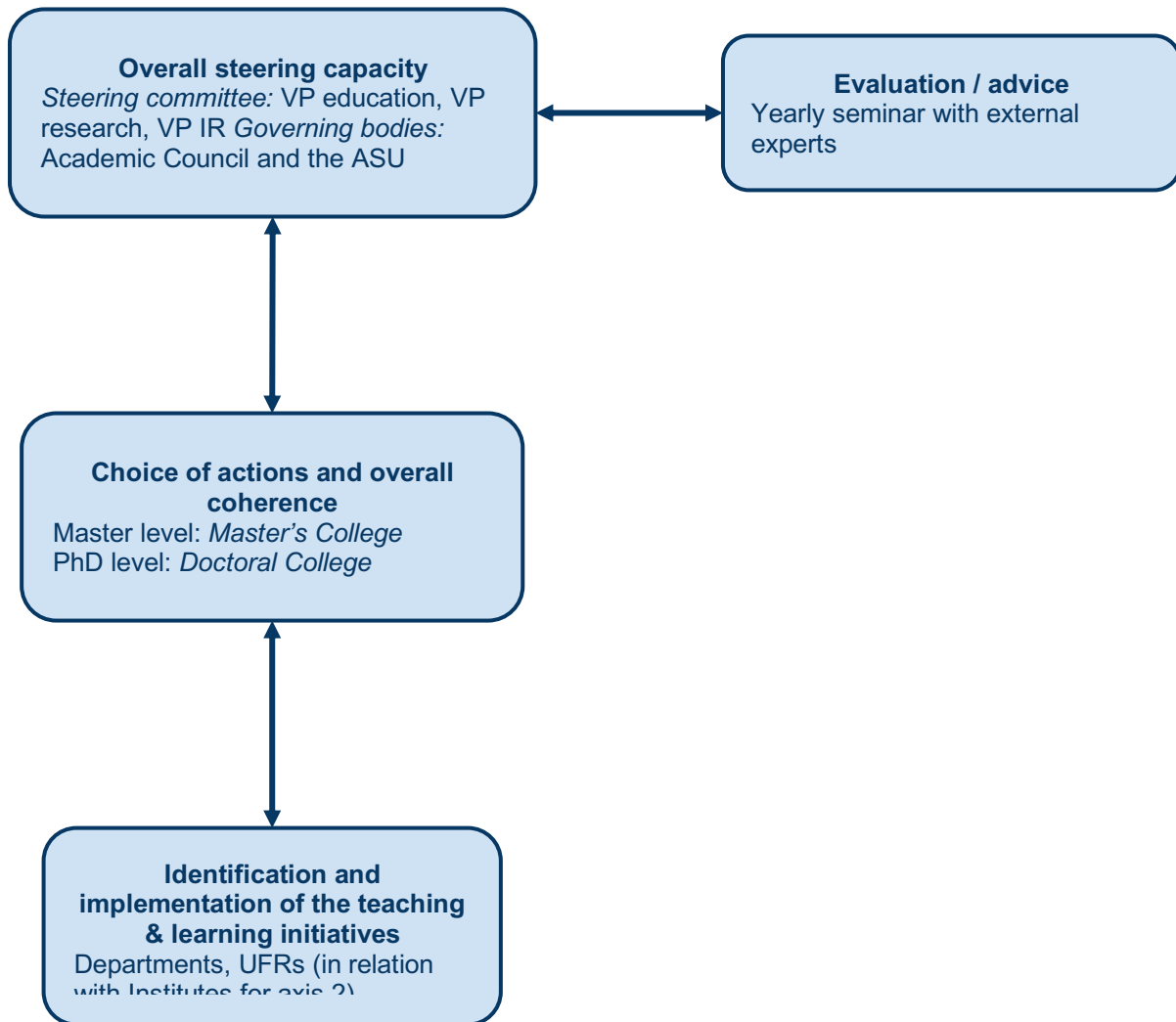
enhanced interaction with major research universities and (2) a more attractive research career right from the beginning.

3. MANAGEMENT FRAMEWORK

The REAL SU initiative relies as much as possible on the existing education structures as much as possible at the ASU. This ensures that the management framework remains as lean as possible, while including all members of the ASU and the responsibility of the academic programmes.

Thus:

- **The director of the Master's College and the director of the Doctoral College will have the responsibility of allocating the budget on the basis of the proposals emanating from the UFRs and departments of SU and the ASU.** The Doctoral College includes all the members of the ASU, and the Master's College will follow the same principle, with representatives of the teaching structures. They will work in coordination with the Institutes and Initiatives when relevant:
 - for the transversal actions (axes 2, 3 and 4), they will be in charge, with the associated council, to decide both upon the quality of the proposal and upon the funding decisions;
 - for the disciplinary actions (axis 1), the decision upon the quality of the proposal will be made by the director and council of the Faculty, and the director of the college will only take the decision of funding depending on the available budget.
- **The director of the Master's College and the director of the Doctoral College will discuss the general orientation of the REAL SU funding with a steering committee** made of: the Vice-President for Research, the Vice-President for Education and the Vice-President for International Development.
- An evaluation is organised *a posteriori*: every year, the director of the Master's College and the director of the Doctoral College will **(i) account for the actions funded and (ii) present the projected actions for the coming year to the Academic Council of SU and to the governing body of the ASU.**
- The steering committee organises **a yearly seminar with external experts** to get advice on the actions and the overall direction of the project.



4. FUNDING JUSTIFICATION

The table below presents the budget distribution for one typical year, and for the total of the nine years. Note that the total is not simply nine times the typical year, since there is a progressive ramp-up of the activities over the first three years.

The main expenses are the following:

- **incentives to foster the involvement of NROs researchers in teaching,**
- **international PhDs,** which will focus on the topics being developed within the Institutes and Initiatives
- **lab internships for our Master's students,** targeting students who work on the topics developed by the Institutes & Initiatives
- **incoming Masters' mobility fellowships**
- **development of new teaching units at the Master's and Doctoral levels,** in order to support the various projects of axes 1 to 3

We also think it important to devote funding to supporting activities such as:

- community engagement
- support to our innovative teaching and learning structures and FabLabs
- efforts to tailor our teaching offer to the needs of life-long learning students
- efforts to improve the communication, marketing and visibility of our teaching offer both within ASU and outside.

Action	Type of expense	Total 2020-2028
Project management	1 FTE	536,250€
Evaluation	Invitation of ext. experts	120,000€
Quality insurances and indicators	1 FTE	268,125€
Development of new teaching units at the Masters level - disciplinary	Time of academic staff for 10 new units each year	1,544,400€
Contribution to NROs involvement in teaching	500 teaching packages	12,800,000€
Community of practice on research-based teaching & learning (Capsule)	Functioning	536,250€
Lab internships for M1-M2 students	100 internships	2,400,000€
Support to innovative teaching & learning support units (Capsule, SIPR @SU, UTC, etc.)	1 FTE	536,250€
Support to life-long learning	Sub-contracting	200,000€
Summer schools	Functioning	1,280,000€
Conception of Masters' tracks - interfaces	Time of academic staff for 10 track design each year	858,000€
Development of new teaching units at the Masters level - interfaces	Time of academic staff for 7 new teaching units each year	1,081,080€
Development of transversal units at the PhD level	Time of academic staff for 4 new units each year	617,760€
Transversal summer schools of the Doctoral College	Functioning	480,000€
Teaching unit Ethics & scientific integrity / Data literacy	Time of academic staff	825,000€
PhD teaching services	40 PhD teaching positions	990,000€
Support to FabLab structures	1 FTE	1,072,500€
Alumni involvement in teaching	Functioning	247,500€
Incoming mobility fellowships at the Master's level	50 fellowships each year	6,000,000€
International PhDs	17 new PhDs each year	10,200,000€
Coaching to academic staff for teaching in English	Coaching	412,500€
Communication / marketing of the teaching offer	1 FTE	536,250€
International student recruitment initiatives	Missions	618,750€
Total		€44,160,615
		€47,693,464

The distribution of the funding requested from SFRI between the various axes of the project is as follows:

Project management and evaluation	924,375€	2.09%
Axis 1	18,016,900€	40.80%
Axis 2	3,836,840€	8.69%
Axis 3	3,615,000€	8.19%
Axis 4	17,767,500€	40.23%

5. KEY FIGURES

Implementation KPIs	Situation in 2018-2019	5 years projection	10 years projection
Number of Master's students per year within the institution, including component institutions or members (Specify the % of European and international students who do not hold a French Baccaauréat)	Master degrees: 4,851 4.9% non-French Europeans 18.3% international students	+3% overall +15% non French European +15% international	+5% overall +33% non French European +33% international
Number of new PhDs students per year within the institution, including component institutions or members (and including CIFRE) (Specify the % of European and international students who do not hold a French Baccaauréat)	PhD degrees: 680 14.6% non-French Europeans 36.5% international students	+5% overall +15% non French European +15% international	+7% overall +33% non French European +33% international
Number of Master's students per year within the other partner institutions of the project within the relevant fields (Specify the % of European and international students who do not hold a French Baccaauréat)	NA	NA	NA
Number of new PhDs students per year within the other partner institutions of the project within the relevant fields (and including CIFRE) (Specify the % of European and international students who do not hold a French Baccaauréat)	NA	NA	NA
Requested PIA funding	47 693 464€		
Knowledge and technology transfer of the research produced by the institution with regards to economic actors, including component institutions or members[1] : <ul style="list-style-type: none"> ● Number and volume of research contracts signed with companies ● Number of technology transfer licenses signed (patents, software, plant breeders' rights, biological material, etc.) ● Number of start-ups created between 2015 and 2019 by member institutions of the 	In 2018: 76 partener research contracts, amounting to 5M€ In 2018: 10 licences with SU Between 2015-2019: 80 spin-offs created		

Excellence Initiative			
Professional insertion and estimated job opportunities for Master's students of the institution, including component institutions or members (most recent insertion rate)	87.5% after 30 months		