3DEXPERIENCE® Edu

YOUR SKILLS, OUR FUTURE

KEY SKILLS FOR TOMORROW'S CARE

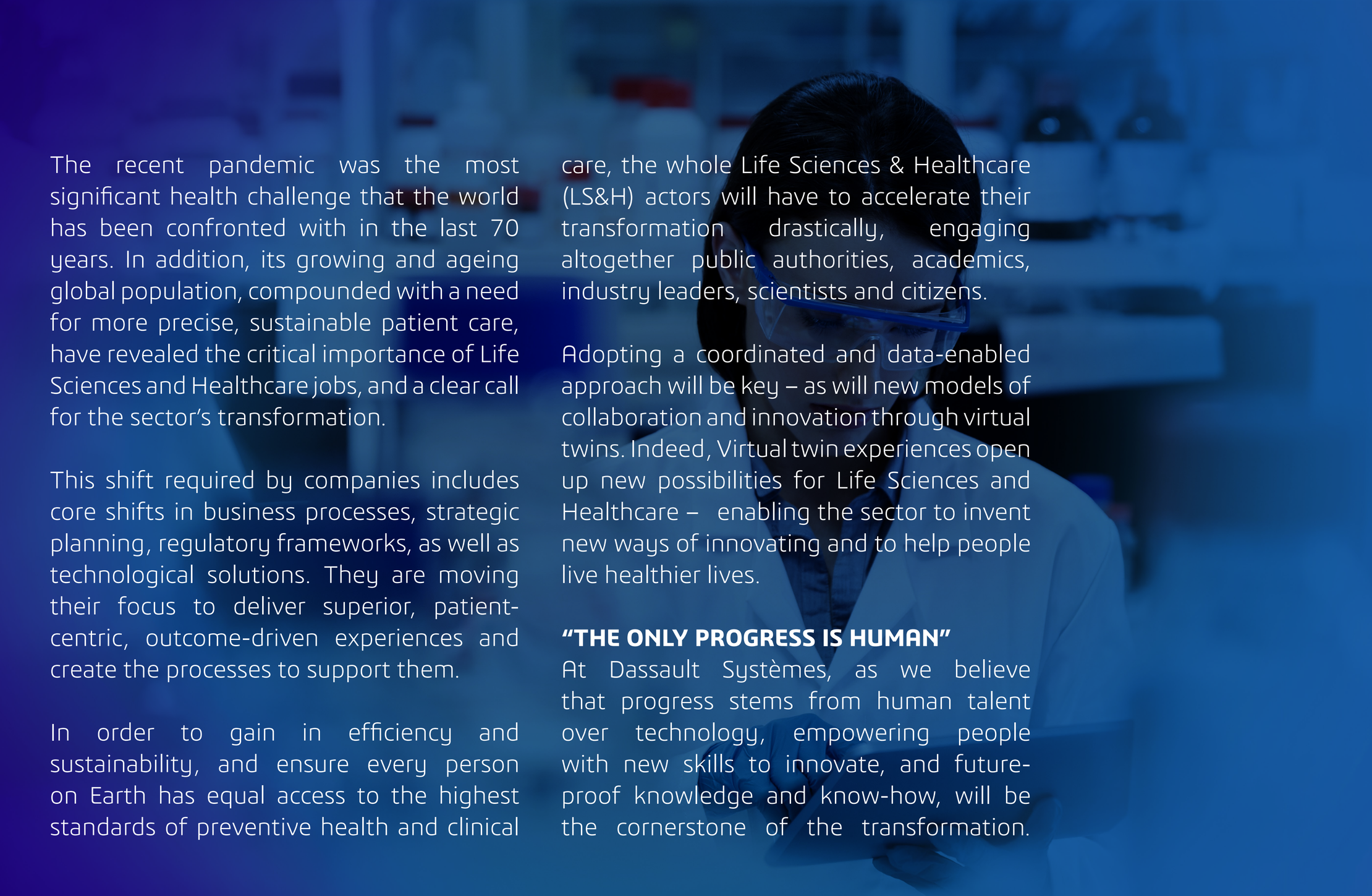
LIFE SCIENCES & HEALTHCARE

DASSAULT SYSTEMES

We’re experiencing a global Industry Renaissance today, bringing new ways – real and virtual – of seeing the world, inventing, learning, producing and trading. Tomorrow’s game-changers will not be those with the most automated production systems, but those who build a culture of knowledge and know-how to reveal and train the Workforce of the Future, able to solve the challenges of a planet lacking sustainable solutions.

BERNARD CHARLÈS
Chairman of the Board
and Chief Executive Officer

FOREWORD



The recent pandemic was the most significant health challenge that the world has been confronted with in the last 70 years. In addition, its growing and ageing global population, compounded with a need for more precise, sustainable patient care, have revealed the critical importance of Life Sciences and Healthcare jobs, and a clear call for the sector's transformation.

This shift required by companies includes core shifts in business processes, strategic planning, regulatory frameworks, as well as technological solutions. They are moving their focus to deliver superior, patient-centric, outcome-driven experiences and create the processes to support them.

In order to gain in efficiency and sustainability, and ensure every person on Earth has equal access to the highest standards of preventive health and clinical care, the whole Life Sciences & Healthcare (LS&H) actors will have to accelerate their transformation drastically, engaging altogether public authorities, academics, industry leaders, scientists and citizens.

Adopting a coordinated and data-enabled approach will be key – as will new models of collaboration and innovation through virtual twins. Indeed, Virtual twin experiences open up new possibilities for Life Sciences and Healthcare – enabling the sector to invent new ways of innovating and to help people live healthier lives.

"THE ONLY PROGRESS IS HUMAN"

At Dassault Systèmes, as we believe that progress stems from human talent over technology, empowering people with new skills to innovate, and future-proof knowledge and know-how, will be the cornerstone of the transformation.

Thanks to learning and skills development we will tackle current and future challenges in the Life Sciences & Healthcare sector.

As the strategic transformation partner for global Industrial and Academic leaders, Dassault Systèmes plays a unique role in the transformation of the sector. This is why we are very pleased to share this new publication from **3DEXPERIENCE®** Edu, whose one of our main goals is to foster collective intelligence on key emerging roles and skills. This e-book is part of a series of publications called "Skills wanted for sustainable innovations," and focuses on revealing pivotal skills to accelerate the Life Sciences & Healthcare sector's transformation and empower its stakeholder. Thanks to a social listening study, in partnership with Bloom, the publication also highlights how those skills are discussed on social media today.

Retaining Talent: the Life Sciences & Healthcare sector must prioritize talent experience and skills development!

Beyond hiring the rightly-skilled profiles, retaining them is also essential in a sector where employee turnover is at a record high of 20.6%. Companies need to differentiate themselves on what they can offer people, while adding value throughout their enterprise talent lifecycle.

Randstad 2023 Talent Trend Research* highlights that talent scarcity and turnover are indeed part of the Top 3 pains of the sector. The study focuses on four key trends to help LS&H employers attract, retain and empower their people, and create a more sustainable "future of work":

- purposeful talent experience: 77% of talent feel a company's values and purpose are important when selecting an employer.
- talent intelligence management: as of June 2022, 70.1% of pharma companies were hiring for data analytics roles, compared to 65% a year before.
- internal mobility & skilling: 88% of LS&H employers say their roles have been significantly elevated and/or expanded to include mobility, development and career pathways, and skilling.

*Source: Randstad 2023 Talent Report

LIFE SCIENCES & HEALTHCARE: PIVOTAL SKILLS TO FACE THE CHALLENGES OF THE INDUSTRY

From developing breakthrough precision health like cell or gene therapy, to ensuring the data & and digitalization imperatives, while optimizing patients' experiences, regulatory or competitive pressure, and sustainability-driven objectives at the same time: the Life Sciences and Healthcare sector has several and **complex challenges to address** across its transformation journey.

Shifting the focus to deliver **superior, patient-centric, outcome-driven experiences and creating the processes to support them** will indeed completely transform how therapies are discovered, developed, produced, commercialized and used.

Life Sciences companies that **transform their businesses** by facilitating data sharing across the entire value network, and leveraging existing know-how to deliver differentiated patient experiences will win.

This new paradigm requires massive skilling, reskilling and upskilling for all sector's players, to empower them all along the value creation and decision-making processes.

DASSAULT SYSTEMES 3DEXPERIENCE Edu CENTER OF EXCELLENCE

LIU LONG ISLAND UNIVERSITY

Dassault Systèmes recently collaborated with Long Island University (LIU) to become the first **3DEXPERIENCE** Edu Center of Excellence in Life Sciences focusing on research with high societal impact to advance the fields of pharmaceutical sciences, precision medicine and healthcare to ensure their students can thrive in the digital age. This partnership will provide cutting-edge software and the right skills to their students; this will create impact for research and the Life Sciences industry for the years to come.

Key skills & disciplines to help people live healthier lives

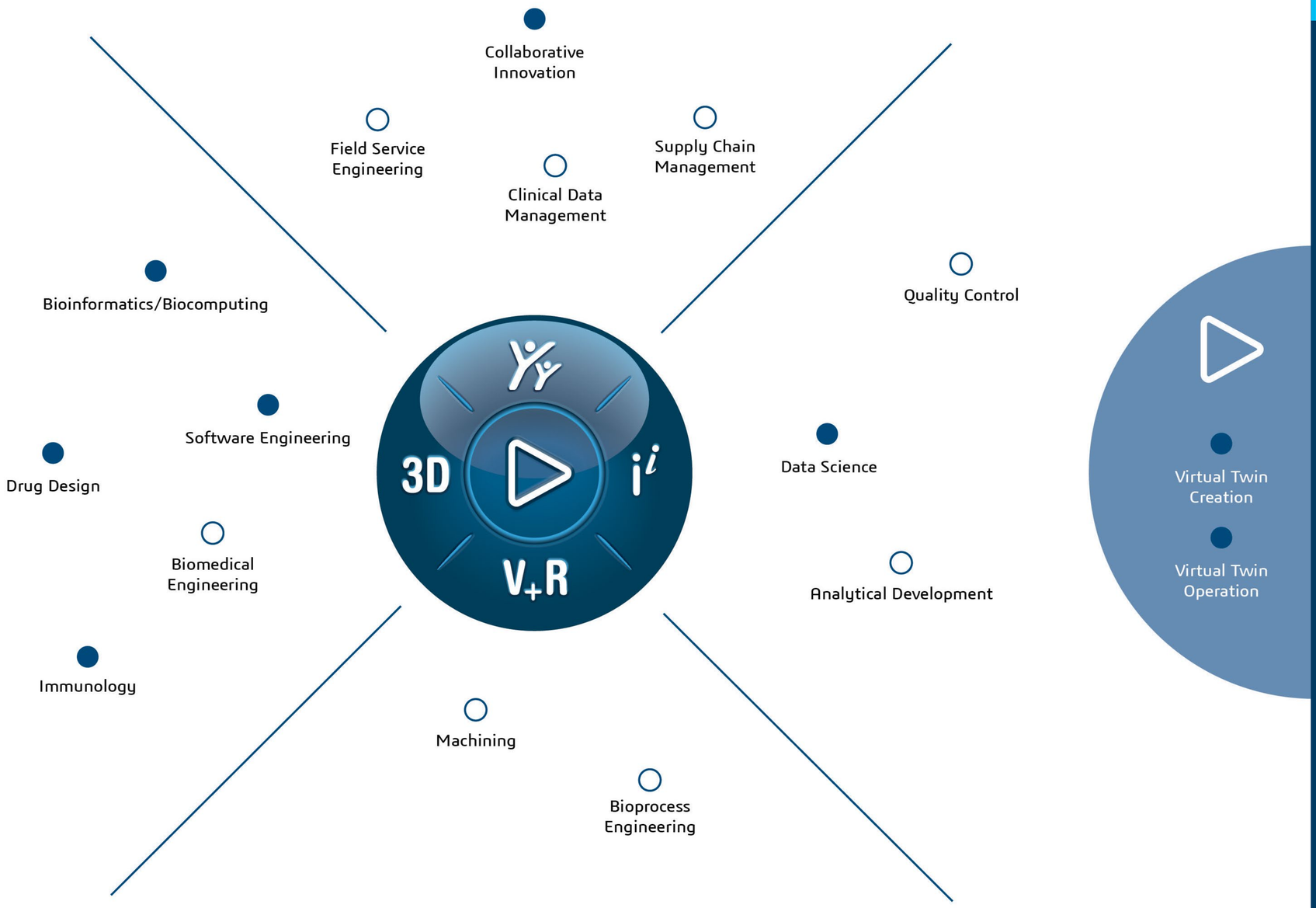
From conversations with our customers and the industry ecosystem, we have identified key skills that are necessary to addressing these challenges, and accelerating sector's transformation towards more efficient, sustainable and personalized experiences. Among them are **Biomedical Engineering, Drug Design, Bioprocess engineering, Bio-computing, Immunology, Quality Control & Assurance and Clinical Data Management.**

Underpinning all those disciplines and fostering multi-disciplinarity, the **3D**EXPERIENCE platform provides a single environment for the next generation of doctors and health innovators to collaborate in the virtual world and create the conditions to improve care in the real world.

In the graph on the next page are the skills, powered by the **3D**EXPERIENCE platform, and their identification as "foundational" or "pivotal".

Indeed, the **3D**EXPERIENCE platform accelerates collaboration and scientific innovation enabling Life Sciences professionals to better manage complexity and create better therapeutic experiences in one virtual environment.

PIVOTAL SKILLS TO ACCELERATE LIFE SCIENCES & HEALTHCARE TRANSFORMATION



SOCIAL LISTENING TO REVEAL CONVERSATIONS ABOUT LIFE SCIENCES & HEALTHCARE SKILLS

Understanding how new technologies are changing the game for Life Sciences companies and their professionals also means getting more and more engaged to further develop the new skills required by digital continuity. This starts with raising awareness and fostering conversations around them.

We worked with our partner Bloom, an artificial intelligence (AI) platform dedicated to qualitative, predictive and strategic analysis of social networks, to perform an **analysis of the different mentions of these identified skills in the Life Sciences & Healthcare sector**.

We ran a social listening study on five social media networks (Facebook, Twitter, Instagram, YouTube & TikTok) and their associated websites and blogs, in two languages (English and French) over a one-year period (January 2022 to January 2023) to discover how those disciplines and skills are discussed and by whom. The content includes a mix of text, pictures and video content, to see which topics are raised, those raising, and those which gather the strongest levels of engagement.

Bloom methodology

Social networks contain an enormous amount of information that can be mined for powerful insights. Bloom's unique approach uses semantic and social inference techniques to achieve unparalleled depth and accuracy in the analysis of digital communities. It exploits the unique characteristics of networks to study the propagation of information, to identify the opinions of actors and to measure their influence ("social inference"). Learn more at **https://bloomsocialanalytics.com/en/**

Then we could improve their noise, and keep measuring engagement and continue to work hard in this direction with our partner ecosystems: academia or industrials.

The data set gathered 13 skills and disciplines that we identified to be part of our referential. Over this 12-month period, we collected almost 32,000 documents (posts + comments) that garnered more than 136,000 engagements (likes, shares and comments) from almost 130,000 unique actors.

The English language represented 84% of all documents, and 81% of the activity (documents and engagements), even on French platforms. We observe that those topics are mostly discussed in English languages compared to the french one, representing only 16% of all documents.

almost

32,000

documents (posts and comments) collected

13

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LESSONS LEARNED FROM SOCIAL LISTENING

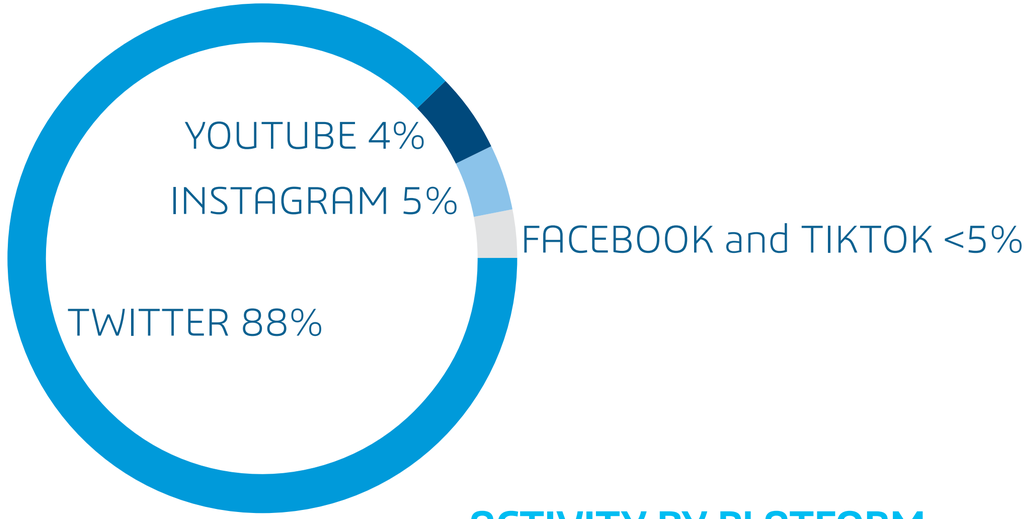
What did we learn from this study? Let's first see how Life Sciences & Healthcare skills are discussed on each platform.

- **Twitter** by far hosts the most conversations on LS&H skills, accounting for 88% of all posts and comments. However, it proportionally shows lower activity (documents + engagements), accounting for 44% of them. The most engaging publications highlight how pivotal disciplines like bio-computing and data science skills help Life Sciences & Healthcare actors remain competent in regard to Industry 4.0 and hire the best profiles. In France, the platform is mainly used to promote corporate and institutional capabilities, as well as job opportunities and research.
- **Instagram** proves to be more engaging. The network indeed generates up to 44% of the total activity while representing only 5% of all documents. Its content focuses on people-centric media like videos, testimonials or professional and personal achievements. Universities also use it to promote their programs and celebrate the success of their departments, highlighting for example the competencies of graduating classes toward future-ready jobs.
- **YouTube** however accounts for only 4% of posts and comments, and 9% of the total activity, probably due to the specificity of the discipline that is not easily shareable through videos format. It mainly stages biomedical and bioprocess engineering disciplines, which prove to have strong online communities gathering around video content such as: "day in the life of an expert", skill talks and training, conferences (sometimes too long to engage properly), career paths testimonials, or new methods promotion.

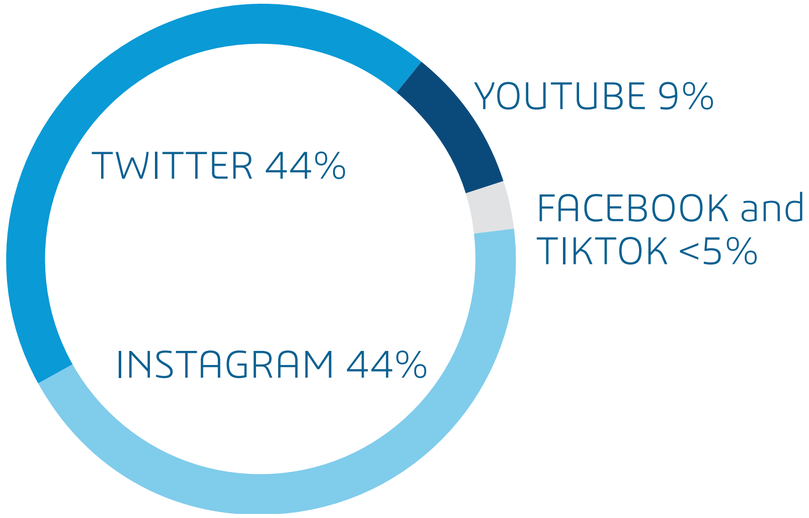
- **Facebook** and **Tiktok** account for less than 5% of both activities and documents; these networks do not also seem to be the right place to engage on such topics. With less than 30 videos and low engagement, Tiktok is exclusive to students sharing professional career and everyday insights. Facebook on its side focuses on official communication and partnerships with companies or universities promoting their methods and programs.

Influencers also are present on these scientific topics. There are composed of life sciences students or student associations, sharing testimonials or explaining some clinical best practices, or also dedicated accounts, like pharmacologist accounts, and even academic influencers that share their experiences in labs.

DOCUMENTS BY PLATFORM



ACTIVITY BY PLATFORM



KEY TAKEAWAYS: THE STATE OF CONVERSATIONS ABOUT SKILLS

We can observe from the social media analysis that foundational and technical skills of the Life Sciences & Healthcare sector like **Biomedical Engineering** and Bio Computing are being massively discussed, and can trigger strong engagement, when addressed in an engaging way. But there is still **large opportunity for emerging pivotal disciplines to be profiled as well, helping to explain how critical they are and which jobs require them, now and in the future**. Let's make a deep dive into some of these key skills, either foundational or pivotal.

Overall, **Biomedical Engineering** and **Bio-computing** are the most widely discussed skills across all platforms, and in both languages. These also show strong potential to remain very present in the future. This is mainly due to the broad scientific, professional and academic community which, more than in any other industry, is of great legitimacy, and benefits from better patient trust. These two skills gather more than 21,000 cumulated documents, for over 90,000 engagements.

Biomedical Engineering, Bio-computing, Drug Design, Immunology and **Quality Control** seem to take the forefront of discussions and be the top skills having the strongest potential in the future.

Bio-computing / Bio-informatics

Bio-computing is the most discussed skill on social media, with more than

SKILLS HAVING THE STRONGEST POTENTIAL FOR THE FUTURE:

Biomedical Engineering
Bio-computing
Drug Design
Immunology
Quality Control

12,000 documents for more than 32,000 engagements in english language and 20,000 in french language. Hashtags used in conversation also show its strong proximity to Data Science, another pivotal skill.

The topic is mainly addressed on Twitter (with 63% of the activity), and especially by the scientific community, whose experts share online resources for training and academic papers to help break into the subject.

The academic and educational community is also active on the topic, sharing conferences and content, from breakthrough sophisticated projects to more didactic, real-world application.

Companies however focus on bio-computing for recruitment and training programs exclusively, with a goal to improve their employer brand and attract new talents.
The COVID pandemic has brought multiple health topics to the forefront of social media conversations, namely related to vaccinology, including the next most discussed skills in our study: Immunology, Quality Control & Assurance, and Clinical Data Management (these last two being especially discussed in France, and identified as important skills to retain within the country so it is not too dependent on the US).

Biomedical Engineering

As a foundational and very established skill, Biomedical Engineering is also very discussed skill and the one that garnered the most engagement. With more than 9,300 documents in English and almost 60,000 engagements, it triggers strong and diverse

interactions, and even multiplies by 20 in the French language, with 20,000 engagements for over 1,000 documents! It is also the skill that garnered the most unique active actors, being academic, scientific or professional communities.

Many discussions come from the academic community, with universities or institutions highlighting award-winning profiles or programs, as well as collaboration with industry leaders, or students promoting their future-ready skills and competencies.

The scientific community, and especially "Women in STEM" in the English language, is also very active on the topic, showcasing research results and innovation whitepapers.

Finally, Life sciences companies promote their professional training services, solutions, and platforms in relation to Biomedical Engineering. Skill-Lync, for example, an Indian education startup helping engineers train on industry-relevant skills, is a big promoter of the topic, with many sponsored videos, especially on YouTube. Dassault Systèmes is actually supporting Skill-Lync since June 2022 through a partnership with the Government of India's New Education Policy (NEP).

Instagram and Twitter are the platforms where Biomedical Engineering is much discussed, with respectively 57% and 30% of all activities.

Drug Design

Drug Design is more present in the English-speaking market. More specifically, Computer-Aided Drug Design (CADD) certifications and applications are by far

the most mentioned subjects, including Artificial Intelligence topics, and calls from consumers (namely on Twitter) to explore the subject and reduce time and cost for new drug discovery.

But for now, these topics are mostly exclusive to the scientific community, which shares online resources for training and academic papers, and to companies and labs promoting their CADD services or drug discovery.

Immunology

Although Immunology is not discussed as much as other pivotal skills (garnering 245 documents only), it definitely triggers strong reactions with 4,300 engagements in total in english versus almost no engagement in french language. The renewed interest in public health topics pushes the scientific community to communicate more and more on the relevance of immunology skills in vaccinology, immunotherapy, and pharmacology.

The academic community is also sharing promotional posts on the matter, namely coming from universities showing their related programs and promoting students' testimonials or experimental progress on this discipline.

In the US, the "Women in STEM" community is also very active on the Immunology skills topic.

Quality Control & Quality Assurance

With 1,077 documents for 2,900 engagements in English, these skills are moderately discussed but trigger more and more engagement and expectations, especially since the pandemic. They are still

missing in many countries' conversational landscape (this is the case in France), although they are pivotal to improving healthcare's sustainability and efficiency in the long run. Most existing publications are from professional organizations sharing training materials on current quality standards and latest news and regulation, supported by YouTube videos to understand current methods. The video network indeed accounts for 29% of the activity – while 45% of it remains on Twitter.

The academic community is also sharing scientific content or conference recordings by professors and former students talking about real-world applications.

Clinical Data Management

Clinical Data Management is mostly addressed by associations and institutions showing how niche the subject is, even within the academic and scientific communities. This academic community, when it is present, shares specialized training or students or researchers testimonials, while scientific community highlights projects to increase skills and knowledge on the matter. Compared to other skills, Facebook takes here a more significant share of the conversations, still behind Twitter (respectively 37% and 62%), official research communication and result sharing being the main focus.

Although Clinical Data is of great strategic importance to improve precision and personalized health in the future, this topic is not much discussed in English. It is however more visible in French, with a quite high share of the studied content: it is part of the Top3 most discussed topic with the most engagements in this language. Most

probably, due to the pandemic that revealed a strong need of not being that dependent from other countries for their own healthcare system.

Bioprocessing engineering is a foundational skill, gathered in English language almost 800 documents and more than 3,000 engagements. It is also generating lots of motivation (average number of interactions per actor) and appears as the top 3 skills on Youtube in categories like “Learn from experts” videos and long explanation/ recommendations videos.

Collaborative innovation, as a pivotal skill, has not been covered in the study. However, it is crucial for allowing a more holistic collaboration across the ecosystem and within the virtual environment to optimize therapeutic efficiency and to provide stronger insights and better-informed decisions to all stakeholders.

CONCLUSION

The disruption of skills and jobs having significant impacts on business and workers worldwide, it is critical to anticipating the appropriate shifts to promote growth and make informed decisions for the whole stakeholders.

From skills development to job matching and expertise sharing, knowledge and know how are will make a difference in the way we address the current health challenges.

Leveraging social communication to maximize value network engagement for a digital transformation strategy will shape collaborative scientific innovations. They are also crucial to gaining momentum and ensuring their identification, attention and development for current workforce and future graduates. We will continue to facilitate these conversations and drive innovative ideas and approaches to generate more engagement from all our partners, either from business or academia.

But we'll need your help to accelerate: we look forward to seeing your own social media campaigns on required skills for tomorrow's care. See you online very soon!

Visit https://3ds.com/edu/skills for more information.

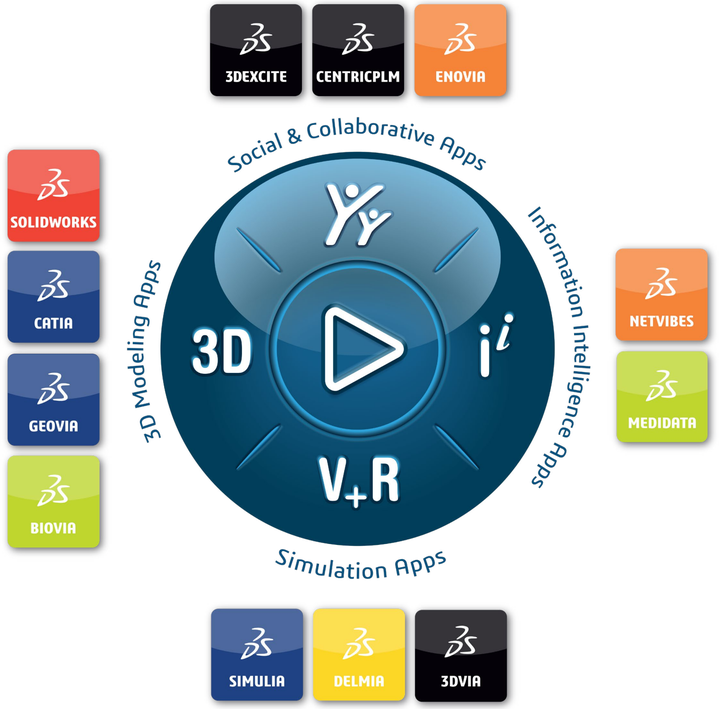
#pivotalskills #foundationalskills #virtualtwinexperience #tomorrowscare #bioinformatics/biocomputing #softwareengineering #drugdesign #immunology #biomedicalengineering #collaborativeinnovation #fieldserviceengineering #clinicaldatamanagement #supplychainmanagement #datascience #qualitycontrol #analyticaldevelopment #machining #bioprocessengineering

For more information, visit our 3DEXPERIENCE Edu Skills website

Our 3DEXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our **3D**EXPERIENCE platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all –consumers, patients and citizens.

Dassault Systèmes brings value to more than 300,000 customers of all sizes, in all industries, in more than 150 countries. For more information, visit **www.3ds.com**.



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