Overview

During the iGEM 2022 competition cycle, education has always been a priority. Our activities are divided into **two categories: synthetic-biology-related projects and skincare-related projects.**

In China, synthetic biology has infiltrated into considerable lifestyle scenarios, such as the food industry and the pharmaceutical industry. However, **"synthetic biology" is still an unfamiliar term to most of the Chinese population**, and along with that unfamiliarity comes disbelief and fear. **Avaricious companies** use the concept of synthetic biology as a fraudulent gimmick to deceive the public, damaging consumer rights and discrediting the reputation of synthetic biology. Furthermore, the **unscrupulous media** target the current limitations of synthetic biology, trumpeting its challenge to social ethics and calling for boycotts of related products, such as genetically modified foods and vaccines, which are detrimental to the progress of social attitudes and the development of social productive forces.

To better popularize synthetic biology science to the general public and **encourage people to think about and discuss the social ethics** behind synthetic biology, we designed and carried out **inclusive activities in various forms, with high public participation, targeting different audiences**. We provide **opportunities** for more people to **understand and appreciate synthetic biology's scientific principles, practical applications, and scientific ethics** and to build a **platform for communication with professionals**. Among them, the organic combination of science and art highlights our activities.

In addition, we are concerned that the lack of understanding of synthetic biology is mainly due to **the lack of universal education in China's formal education system**. Consequently, we have also developed a series of activities targeting formal education, especially the education of minors, including **lectures, science and innovation camp, educational forums, and peer mentoring programs**, reaching students of all school levels countrywide.

In China, although there is a huge market for skincare products, **the ingredients of skincare products are not particularly valued in the market education** led by major skincare brands, and there is a lack of everyday skincare ingredients known to consumers. Meanwhile, old skincare molecules dominate the market share, making it **difficult for new skincare molecules to enter the market**. As a result, consumers will have even less knowledge about new ones, which is not conducive to consumer choice and product renewal.

To better educate the public about skincare, we first needed to understand the public's attitudes toward skincare and skincare product consumption preferences, so we implemented **two rounds of investigations, analyzed the data using joint analysis(CA)** and other statistical analysis methods, and conducted **communication activities for some special groups** based on the

research results and **tips from stakeholders**. Finally, after comprehensively completing the information aggregation, we **made science popularization on skincare contrapuntally to achieve a closed loop** for the skincare part of education.

In every educational activity, our workflow always followed the iGEM cycle presented below, consisting of four steps: **discover the needs, balance the values, fulfill the plans, and ameliorate the project.** That's how we made our activities smooth and **sustainable**.

We also keep in mind our **multiple responsibilities**: our responsibility as college students, our our responsibility as iGEMers, and our responsibility as caring citizens.

Synthetic biology-related education

Centered around synthetic biology, we carry out activities in two directions. One is to **combine it with art**, focusing on **discussing the public values behind synthetic biology, encouraging public participation and dialogue** with multiple parties in a relatively gentle way; the other is to **locate synthetic biology in the context of life scenarios, carry out science education** according to the characteristics of different audiences step by step, remove the knowledge

barriers, and **promote people's understanding and recognition of the scientific meaning** behind synthetic biology.

Two-way Dialogue with MoCA Shanghai: Artist Talk & Fan Letter

Artist Talk

Discover the needs

When Museum of Art Pudong opened to the public in the summer of 2021, there was a wave of visits to the museum on social media, with people posting impressions, some of which were really insightful. This phenomenon brought to our attention the **audiences' curiosity and perception of art, and the willingness of many people to think, to express their opinions and engage in friendly exchanges with others.**

In the fall of 2021, Nobel Laureate and Professor of Fudan university Michael Levitt and artists engaged in a cross-border dialogue on the theme of "Basic Research in Science and Art", which inspired us greatly. The event cast cast light on **the possibility of the rich synthesis of science and art**, which may also become **future trend**.

We were delighted by the enthusiasm of the audience for art and the openness of scientists and artists to each other's fields, and in this context, **we also wanted to have a dialogue between science and art, between scientists, artists, and the audience.**

Balance the values

First, we **collected the students' opinions** about similar events, and our idea was supported by them. Then, we contacted the host of the cross-border dialogue event, Wenqian Sun, executive curator of MoCA Shanghai. We expressed the intention to cooperate and **ask for advice on the feasibility of our preliminary planning of the event**. Although the curator praised our idea, she reminded us that scientists might not be easy to invite. After weighing our options, we reached a consensus: **curator Sun would invite some artists to Fudan university to hold a seminar with students** about the relationship between art and life, art and technology. And **we would be responsible for making arrangements for the on-campus activities.**

Fulfill the plans

iGEM2022 team member Weiyi Li hosted the event. Curator Sun brought three artists to the event to **discuss the inspiration of technology on art creation, how science affects life, and how people should acquire new knowledge in the wave of technology** to keep a sensitive mind and clear thinking. In the Q&A session, they answered the students' questions about art creation and artwork appreciation. **They guided the students to think about the meaning of science and art respectively, and what kind of spark can be created when they are combined.**

Ameliorate the project

At the event's end, the artists and the students could not get enough.

The **artists** expressed their love for such a relaxed and open communication environment and also marveled at Fudan university students' perception of art and thinking about science.

The **students** kept asking questions around the artists even after the event was over and hoped we would hold more events like this in the future.

Our team members developed a friendship with the curator Sun during the event, which enabled us to ask her questions about art crossings and art activity curation. We also **gained experience in planning and organizing offline events**, which laid the foundation for us to organize various offline events in the future.

Figure 1. After the event, we took a group photo with artists and staff.

Fan Letter

Discover the needs

In 2021, the offline event we co-organized with MoCA Shanghai was well received by the students, and their thoughts on art and life impressed Wenqian Sun, the executive curator of MoCA , and we have kept in touch with MOCA since the event. In the spring of 2022, **when the epidemic was raging in Shanghai**, most people were trapped indoors, which made them anxious, confused, and unsure of what would happen the next day. **At this time, more than ever, people needed to connect with others, and more than ever, people needed art to heal their minds and bodies.**

Balance the values

As college students studying in Shanghai, we were also enclosed in the dormitory and felt the same way as every Shanghai resident. We were concerned about **the need for communication and artistic healing**, and contacted curator Sun, with the hope that we could **bridge the dialogue with our fellow students on an equal footing by exchanging letters.**

Fulfill the plans

The curator, who has always been committed to promoting public education in art museums, readily agreed to our proposal, and the exchange of letters with the curator was successfully carried out.

We received a number of enthusiastic letters from the students, and after screening and consolidating them, we summarized them into two long letters and sent them to curator Sun, who promptly wrote back. In the letters, **the students** elaborated their views on the relationship between the expression of artworks and the aesthetic understanding of the audience, and also shared their own art practices, while **curator Sun** answered the students' questions related to public education in art museums and hoped that the students would keep their hearts sensitive and make their life immersed in art.


LETTER 2

孙文倩老师：

您好，一直以来，我都在被各种形式的艺术吸引着，艺术也成为了我了解社会，并反过来与社会沟通的媒介。MoCA 上海当代艺术馆是我最喜欢的几座艺术馆之一，因此，得知课堂春日来信这一企划使我激动不已，也希望能够借此机会与老师您探讨一直萦绕在我心头的几个话题与疑问。

首先是中国当代艺术在西方当代艺术界的困境这一问题，我偶然看到李苏桥老师在 Ii 艺术专栏《中国藏家和艺术家共同缺席，伦敦弗里兹难忘今宵》中的一段话：

走走看看给我希里兹博览会现场的时候，走访当代艺术博览会也在热闹闹地进行中，不过感觉有些像是在平行世界里，两个市场两个圈子两个系统并不相交，如果不是有中国轮子力的一度涌出，话语权一直在西方的这盘当代艺术大菜，百分数没有和支付等式出去确的选择上现在已经不需要中国元素，中国当代艺术令人尊重和有质量地融入所谓西方的主流，越来越难；即便是那些被西方超级画廊签约的明星中国艺术家，他们作品的销售单中，中国买家还是主力，西方买家的比例也很令人生疑，中国购买力对西方话语权的建设，是中国当代艺术缺席的根本原因，最现出来的市场反应就是，"消失那们"这入亿元商乐部的精神就如隔壁的垂云今宵，不知道到底谁家双喜谁家笑想，用一出话剧的台词作为结束语，"只有一只眼含泪时，另一只眼才能含笑"。

想问老师您本人怎样看待这样的观点，以及老师您认为中国当代艺术未来将会通过怎样的方式（美术馆、公共教育？），有怎样的发展呢？那么上海当代艺术馆又计划以怎样的方式参与这一发展过程呢？未来上海当代艺术馆又是否会不断向外辐射，在当代艺术的全球语境下又会扮演怎样的角色呢？包括我们知道上海当代艺术馆一直在努力扶持中国青年艺术家，那么在未来这种扶持活动的具体形式除了举办展览、公共活动之外或许是否还会有其他的项目呢？

上海当代艺术馆在公共教育方面做出的努力有目共睹，包括开办艺术工坊、公益讲座、MoCA 校园行等多种活动，很好地承担了美术馆公共教育的责任。但是例如讲座、校园行这样的活动常常会出现受众范围小的问题，来参与的大部分都是本来就对艺术感兴趣的人，导致启发培养的还是这群人的艺术设计欣赏实践能力，就想请问老师您在上海当代艺术馆举办公共活动时有没有什么更好的方法吸引更多受众，将公共教育的范围扩大呢？复旦公共艺术课堂在举办分享会时也会存在同样的受众固定的问题，或许能否给课堂提一些小建议呢？美术馆公共教育的边界又在哪里呢？

再次感谢老师您阅读此信，我的问题可能有些冗杂，如若老师您能选取一二回复解答我便不胜感激。

真诚祝您工作顺利，生活愉快！

K

2022 年 4 月 7 日

亲爱的K:

谢谢你的来信，很高兴听闻艺术以积极的方式参与并影响着你的生活！

诚然，公共教育是艺术馆工作中的重要一环，上海当代艺术馆一直以来都秉持着"一座'没有墙'的艺术馆"的宗旨，持续让当代艺术走出艺术馆，走进学校、社区，成为一座真正的"人民的艺术馆"。同时，作为中国的艺术馆成员，过二十年来，我们皆力地向世界推广中国当代艺术，以及邀请国际知名的当代艺术家及其作品走入国内观众的视野。

作为国内前沿的当代艺术馆，我希望中国当代艺术家可以被世界更好地看到，那么如何从我们自己文化的根源特质成为一个个艺术的语言，甚至是可以影响世界艺术史的语言，其实是我们大家一直在努力的方向，未来希望看到更多的年轻艺术家，可以有这样的态气和影响力，慢慢地去影响世界对于中国当代艺术的看法。

如你在信件中提到的，过往年来中国当代艺术因艺术市场的操作，衍生出种种的乱象，然而好的艺术作品是经得起时间考验的！我们都是社会这个大齿轮里的一颗螺丝钉，一个部件，当每个人都坚守自己的责任和义务时，相信我们的当代艺术将会更好地被世界看到。皆力不断地推广中国当代艺术，带着中国当代艺术家走出艺术馆，MoCA 这些年一直在做，另外通过持续地举办讲座、研讨会和出版和相关的艺术文化活动，希望吸引更多的民众走进艺术馆，希望更多的观众和你般热爱艺术当然也欢迎对艺术文化充满兴趣和热爱的你可以在学校里向更好地去推广艺术文化，艺术馆欢迎像你一样的年轻人参与到艺术馆的志愿服务或任何形式的活动中，MoCA的大门永远为热爱艺术的人打开！

希望有朝一日，你可以加入到艺术工作中来，通过自己的实践便捷那答内心的困惑，也希望你可以继续保持对艺术的热情，保持对这个世界的探索，成为更好的自己！

深深祝福在学校的你！加油！加油！再加油！

希望MoCA上海当代艺术馆会成为你大学生岁月里一段美好的回忆，艺术和美好可以陪伴你走过海海的人生！

你的馆长姐姐，Miriam

2022.04.27

Figure 2. A letter written by students and its reply form curator Sun.

This event provided **a platform for sincere dialogue, promoted two-way understanding between college students and art museums**, and added a splash of color to life in the midst of the epidemic.

Ameliorate the project

After the letter exchange program, **the students** said that when writing letters, especially art-related letters, they could forget their worries and regain peace of mind. As for **curator Sun**, she said she was delighted to receive feedback from young people about art at a time when the epidemic was so severe and that the students' letters had given her new inspiration for the curatorial work. **We have included their correspondence, and the conversations we facilitated can be viewed [here]**(https://static.igem.wiki/teams/4162/wiki/education/moca/fan-letter.pdf). The event was not difficult to organize, but it worked well, probably because both parties delivered their sincerity in their letters, which is why they were equally moved.

The Birth of an Immersive Exhibition: Multisensory Bioart & Audio Poems

Discover the needs

As mentioned in the overview, most people feel worried and afraid when faced with the unfamiliar concept of synthetic biology. According to our analysis, these two attitudes should mainly originate from people's questioning of the ethical aspects of synthetic biology. **How to settle this ethical challenge is an urgent issue**. We need to find **a relatively gentle way to guide people to think about the public values behind synthetic biology rather than just lecturing them**, and to get out of the shadow of the established discourse and **express their own opinions freely**.

Our original plan was to hold a synthetic biology science exhibition in an urban public space, introducing its basic principles and application scenarios with display board, and dispelling people's doubts with interesting interactive devices, but the epidemic prevention and control measures in the spring of 2022 stopped us at the campus. As a result, our original plan was blocked, but we did not give up.

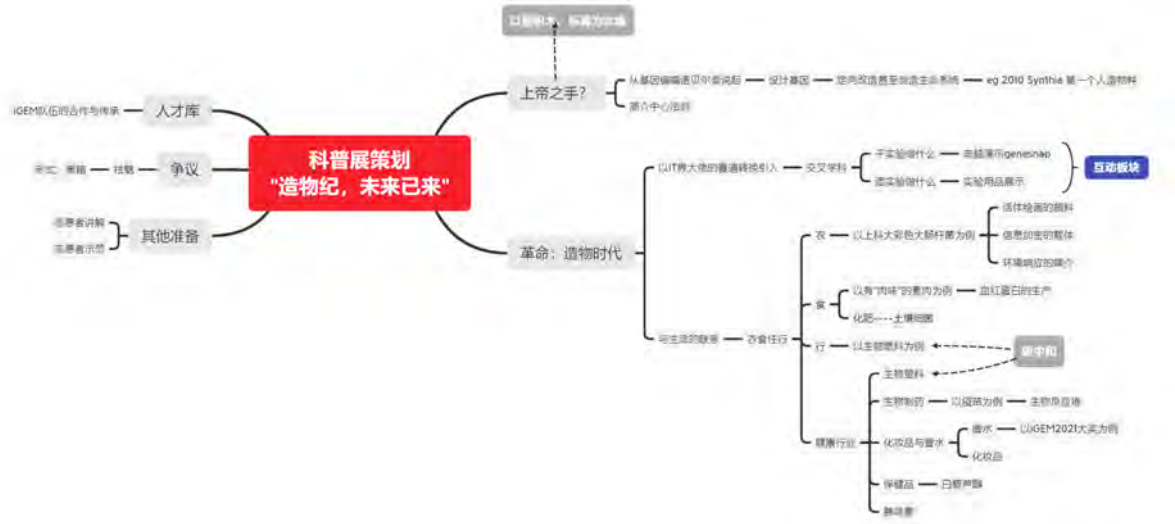


Figure 3. Our original plan of a synthetic biology science exhibition.

Balance the values

At that time, the International Museum Day was just a week away, and this special holiday gave us a new inspiration: **why not have an exhibition with exhibits as the core?** We were delighted to discover that **2022 coincided with the 25th anniversary of bioart, which is the best proof of the symbiosis between biology and art**. The artwork can also provide much more room for imagination and reflection than scientific knowledge, which may better **inspire the audience's thinking**.

In order to organize a wonderful bioart under limited conditions, we asked the curator Sun for advice, **wondering how to promote art in a more educational and participatory way**, and she believed that an **"immersive" exhibition** would allow the audience to make full use of their senses to perceive the aura of the work, while a **relatively professional tour** would allow the audience to further understand what the work was trying to convey. ideas. Only through sufficient contact with the artwork and a certain level of comprehensive effort can the audience obtain ideas and meanings from the artwork. **The results of science will be reflected in the way the artwork is presented, while the artists' reflections on the ethics of science are embedded in the main idea of the work.**

Inspired by her suggestion, we **added more sensory experiences** to the design of the art promotion activities and expanded the single exhibition **into a series of activities with bioart as the core.**, including seminar We decided to conduct the activities and results showcase separately offline and online, with the **offline activities geared toward the campus**, which is small in scope but ensures a sense of participation, and the **online results showcase geared toward the public**, which allows them to comfortably **watch and listen to the audiovisual exhibition on their mobile devices** even if they do not participate in the activities.

Fulfill the plans

The offline series of activities are divided into three sections: Micro Tour of the Exhibits, After-viewing Seminar, and Poetry Night Recitation. Each section is **interlinked** to provide the audience with a sense of mystery and exploration, leading to the climax of the event gradually and progressively.

1. **Micro Tour of the Exhibits***: We carefully **selected 10 outstanding works of bioart** worldwide since 1997. The artists come from all over the world, and the exhibits have different characteristics, including installation art, performance art and real life, such as GFP Bunny. **The team members, as guides**, simply introduced the composition of the exhibits and the artists' creative thinking to the audience. We suggested the audience watch the exhibition quietly and experience for themselves what the exhibits are trying to say, and we believed that there were a thousand Hamlets for a thousand audiences.
2. **After-viewing Seminar**: After the guided tour, we asked the audience to **express their understanding of the exhibits**. The discussion was spectacular, as if everyone had been touched by one or more of the exhibits. One student asked, "The GFP Bunny looks like the product of a transgenic experiment, so why is it a work of art?" Another student replied, "If GFP Bunny had been in the lab without being regarded as a family member of anyone, it would have been the most ordinary experimental animal, but the artist was treating it in a very warm way by taking it out of the lab and adopting it as a pet. Perhaps this is the artist's question towards biological experiments: **how should one choose between the coldness of technology and the warmth of humanity.**" This was a fascinating question-and-answer session that went on and on.
3. **Poetry Night Recitation**: Inspired by the audience's discussion at theseminar, we **created a poem for each of the ten works**, and **invited all students interested in biology, art and recitation to recite these poems together** and experience the rhythm of poetry. It was an unforgettable romantic experience to recite the poems of life and share the mystery of art with young friends under the starry sky.

Fighure 4. Poetry Night Recitation

Online presentation of results: We summarized the pictures of ten exhibits and their introductions, plus ten original short poems, inscribed with a introduction and a conclusion like a real exhibition. To **immerse the audience in the atmosphere** created by the works and the poems together, we also invited members of **the Lecture and Eloquence Association to record poetry readings to music for us.** Surrounding the audience with sound and images together on mobile, we brought them deep into the biological arts. This WeChat tweet reaped **2000+ reads**, which is enough to show how much the audience loved it.

Ameliorate the project

The offline series and the online bioart audio exhibition receiveed positive feedback from **participants and viewers.** They found the planning of such an event very **innovative and interesting,** and were as happy to see their ideas being processed into beautiful poems as they were to complete a piece of work by DIY.

Our team members practiced the organizational method of an immersive exhibition in this event and **learned the advantages of using multi-sensory media in conveying artistic ideas**.

Both the audience and we **developed a unique understanding of synthetic biology** during the event, and they expressed that they would no longer blindly believe in media propaganda, but rather trust and monitor the scale of science, so that synthetic biology and other disciplines can "do something and not do something".

After the event, we recorded **QR codes** for each exhibit and poem and made them into **exhibit cards**, so that visitors could view the exhibition and listen to the poems by scanning the QR codes, which greatly facilitated the **dissemination in different social media**. If you are interested in our poems, click here to get the Chinese and English script.

Figure 5. Carousel of our exhibit cards.

Complementing formal education: tailoring education to the needs of the individual

Discover the needs

In the formal education system of China, only high school students from some prestigious schools and university students from some majors receive a relatively systematic and formal education related to synthetic biology. With only 17% of China's population having higher education, **the majority of Chinese citizens have no access to synthetic biology.** As technology becomes more integrated into our lives, those without basic knowledge of biology will likely encounter more and more challenges.

In addition, the level of education in different regions of China is uneven, with many children in less developed regions receiving a vastly different education than those in developed areas. Therefore, **to raise the awareness of synthetic biology, we need to start with the children.** Institutions and organizations supplementing students' scientific knowledge from different regions and levels of schooling can be a solution.

For some **physically or mentally challenged children** in special schools, teaching synthetic biology to them requires the use of various media, and more attention must be paid to special groups' acceptance of different types of knowledge. It is important to **tailor education to the needs of the individual** so that they can better understand the knowledge and the world.

Balance the values

At first, we aimed our **target audience at primary and secondary schools and special education schools** in economically underdeveloped areas. However, after estimating their basic education level, we found it challenging to teach synthetic biology to these groups because these students didn't have much basic knowledge of biology, so it would be like a fantasy to teach synthetic biology directly.

Therefore, we **expanded our target audience to include high school and college students** in addition to the above-mentioned elementary and middle school students. We developed several formal education supplemental activities that are **suitable for different levels of students in different regions** according to their educational level and knowledge comprehension.

Fulfill the plans

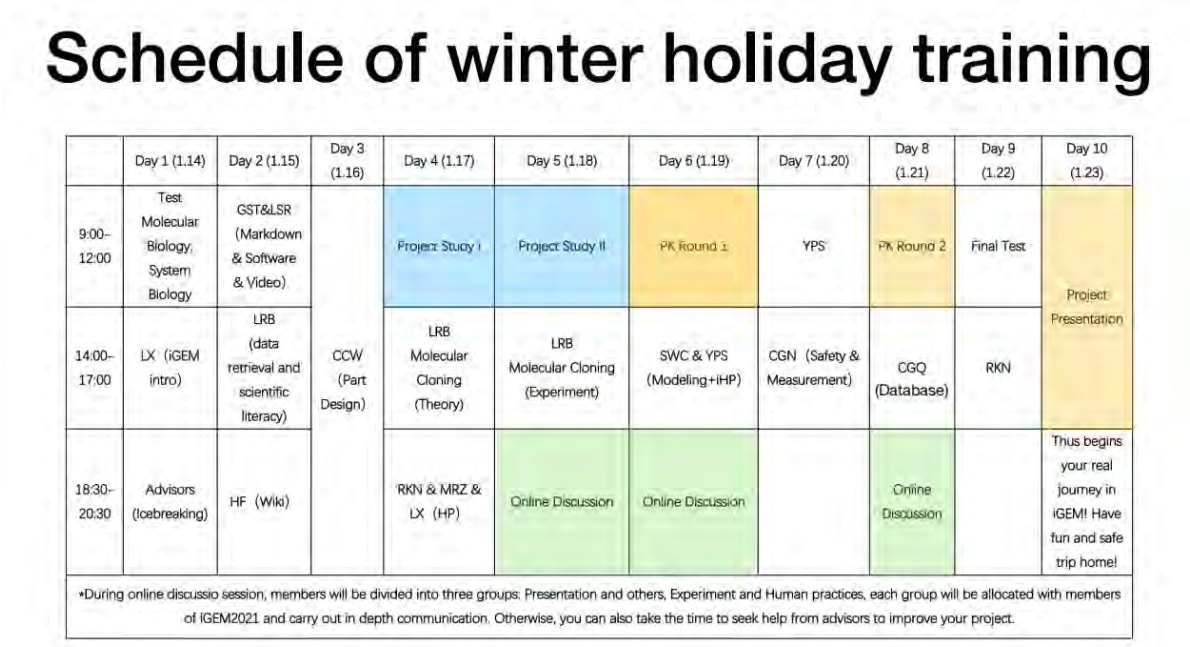
We identified primary and secondary schools and iGEM teams who had intention to cooperate and conducted **a series of online and offline science education activities**, as well as an **on-campus iGEM promotion and recruitment campaign** at Fudan university.

Ameliorate the project

Before each lecture, we **tried out the lecture** in advance and **adjusted the slides** a couple of times to ensure our professionalism. After completing each activity, we randomly asked 2-3 students to **give us suggestions** for the course and **added or deleted the course content** according to their advice.

When interacting with elementary and middle school students, we marveled at **their imagination of synthetic biology**, and I see a vision of the future in their eyes. When we held events with high school and college students, they were able to comprehend by analogy, and the events ran smoothly as a result.

Lecture and training for Fudan university students: transmission and promotion



Schedule of winter holiday training

	Day 1 (1.14)	Day 2 (1.15)	Day 3 (1.16)	Day 4 (1.17)	Day 5 (1.18)	Day 6 (1.19)	Day 7 (1.20)	Day 8 (1.21)	Day 9 (1.22)	Day 10 (1.23)
9:00-12:00	Test Molecular Biology, System Biology	GST&LSR (Markdown & Software & Video)		Project Study I	Project Study II	PK Round 1	YPS	PK Round 2	Final Test	Project Presentation
14:00-17:00	LX (iGEM intro)	LRB (data retrieval and scientific literacy)	CCW (Part Design)	LRB Molecular Cloning (Theory)	LRB Molecular Cloning (Experiment)	SWC & YPS (Modeling+iHP)	CGN (Safety & Measurement)	CGQ (Database)	RKN	
18:30-20:30	Advisors (Icebreaking)	HF (Wiki)		RKN & MRZ & LX (HP)	Online Discussion	Online Discussion		Online Discussion		Thus begins your real journey in iGEM! Have fun and safe trip home!
*During online discussio session, members will be divided into three groups: Presentation and others, Experiment and Human practices, each group will be allocated with members of IGEM2021 and carry out in depth communication. Otherwise, you can also take the time to seek help from advisors to improve your project.										

Figure 6. Schedule of a 10-day training

In late 2021, after the initial establishment of the Fudan iGEM2022 team, we received 10-day training. The training was divided into four parts.

① Past team members **analyzed** for us the required content of each page in the wiki and the details of the judging form one by one.

②We were trained to equipped oursevles with **the necessary skills**, including markdown writing, the use of snapgene, data retrieval, and scientific literacy.

③We studied **experimental theories** related to synthetic biology, such as the theory of molecular cloning, the design of biological circuits, the use of kill switch and so on.

④We **learned** the best projects from the previous years, **brainstormed** our own projects, and then had PKs among the project teams to select the projects for this year's competition.

This was **a fairly systematic training system** that allowed us to have a comprehensive understanding of iGEM in a short time and equipped us with the capability for an iGEMer. We not only learned knowledge and skills but also received experience and lessons from the previous year.

Figure 7. A group photo at the end of the training

In March 2022, we started the **recruitment of the second batch of 2022 team members**, this time, the junior team members became mentors, and we **optimized the curriculum** of the winter holiday training while promoting the training of new team members. At this time, we have put together **a complete set of iGEM training manuals**. This was how we practiced our legacy responsibility as iGEMers. We hope that this training manual will **help Fudan team** in the next team member training and **inspire other teams.**

In September 2022, when freshmen enrolled and the College of Life Sciences came with the newly shunted students, we made some cultural and creative products and delivered it to each new student, along with the college gift bags. This is **our promotion of iGEM and preparation for recruiting** the following year's team members.

Figure 8. What we provided for freshmen

Online science for Tibetan elementary school students

The education level in Tibet is low compared to economically developed areas. In order to make the curriculum more easily understood by primary school students, we prepared a more story-based science popularization for them, starting from the life of Haeckel, telling the development of biogenetic law and tracing the origin and wonder of life. Click here to view our PPT examples.

Science and Technology Camp for Tibetan High School Students: Root Science in Children's Hearts

Our team member Zihan Wang served as a teaching assistant for the Seed Science Camp for Tibetan secondary school students to **promote synthetic biology and guide them on scientific technical innovation**. In addition, we assisted professors from Fudan university and Tongji university in helping Tibetan high school students with their science experiments and helped them achieve outstanding results. Please check out the details on the inclusivity page.

As a student in Fudan university, we carried forward Professor Zhong Yang's "spirit of a seed" and tried to plant science in the hearts of children from the Qinghai-Tibet Plateau through our educational activities to **encourage them to pursue science and change their fate with knowledge bravely.**

Offline Communication for Ningxia Middle School Students: a Collide of Synthetic Biology and Gastronomy

Shizuishan, Ningxia, backed by the Helan Mountains, is a quiet little northwestern town. We worked with the Astronomy Association of Fudan university to reach out to the Shizuishan Experimental Middle School, whose principal wanted us to conduct a camp for the 7th and 8th graders. After the initial mapping of the students' interests, team member Weiyi Li changed the original, slightly boring lecture on pure synthetic biology into a **quality development class that was closely integrated with Chinese food culture.**

Figure 9-10. A lecture combined with synthetic biology and Chinese food culture.

The course introduced Chinese food culture, focusing on the changes of staple food. Further, it extended to one of the main nutrients in staple food, starch, which is vivid and exciting, and **introduced the application prospects of synthetic biology in food manufacturing**. This way, it can keep the students' interest in the course at all times. The feedback of the course was mostly nice, but some students suggested that the switch from food culture to synthetic biology was a bit stiff, so we **reworked the slides and added some more nutrients in the transition part, and called back the related food** at the end to make the course structure more reasonable. Click here to see the revised slides.

Online science popularization and communication for a wide range of high school students: collaborative lectures with other teams iGEMer

- PINGHE*

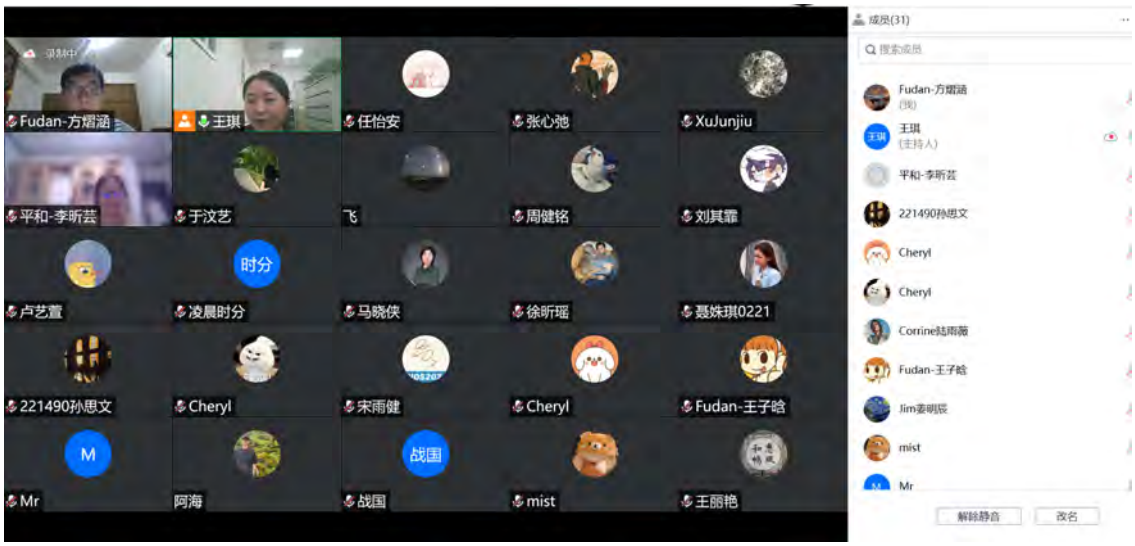


Figure 11. Online synthetic biology lecture with team PINGHE

PINGHE and our team co-organized two online sharing sessions. Two teams prepared an educational lecture for the public together. During the process, we exchanged our idea about synthetic biology and made slides. Team PINGHE introduced synthetic biology from the origin, the development process to the latest papers and prospects While we introduced synthetic biology in the eyes of college students.

The event was well received by the audience, with 80+ high school audiences watching our lecture in the online seminar room. We were also honored by the feedback from some of the audience who commented on the value of the work we were doing. We will continue to add new content to expand the boundaries of synthetic biology and the boundaries of our popularization.

- into China, into iGEM*

This summer, we took part in ICII (Into China Into iGEM), an annual educational event.

Our team brought **the science of the industrial view of the skincare economy** to the audience. The main content we shared covered: the definition of skincare products, the composition of skincare products, the production model of skincare ingredients, the survival of celebrity skincare products, and how we The main content we shared covered: the definition of skincare products, the composition of skincare products, the production model of skincare ingredients, the survival of celebrity skincare products, and how we The main content we shared covered: the definition of

skincare products, the composition of skincare products, the production model of skincare ingredients, the survival of celebrity skincare products, and how we choose skincare products.

- Shanghai Tech

This summer, we also participated in a **6-session synthetic biology science-popularization event** co-organized by 8 universities.

Team Fudan, as the leading lecture team of the engineering session, contributed a full-of-real-stuff lecture on the **science of synthetic biology industry** in this lecture, we shared: the underlying technology of synthetic biology, the design-build-test-learn cycle of synthetic biology, the synthetic biology industry chain and its development landscape.

Click here to view slides of our lecture. Hopefully we can provide a new view.

The Voice Of Biology: An Audio Science Recording and Companion Program for Blind Children

Our team's Bio Art Talking Exhibition, launching in May 2022, has received the attention of many organizations, including TECC (Technology & Education: Connecting Cultures), an international non-profit organization founded by Chinese and American university students, whose mission is to rely on socially responsible young students and The mission of TECC is to **promote the development of science, technology, education, and culture in the backward regions of central and western China through socially responsible young students and international cooperation**. This coincides with **the mission of iGEM**.

After being contacted by the TECC community at Fudan, we partnered with LINB (Love Is Not Blind), a public welfare program that provides quality education and companionship services for **blind children**, to help us connect with special education schools in Shanghai and Wuhan. While we were responsible for providing the blind children with **audio works** that meet their needs.

The voice of biology is a free online audio course we produced about basic biology knowledge. Previously, the Fudan iGEM2020 team released several audiobooks. Based on this, we summarized the work of our predecessors and completed the recording of their unfinished audiobooks on science. After several retouching and adjusting of the material, we released a set of audio science books in the WeChat community, introducing the basic knowledge of biology with vivid and easy-to-understand phrases, which were **listened to more than 2000 times**.

Figure 12. Team member Weiyi Li were recording audio contents for LINB.

Since it is difficult for children in blind schools to have the opportunity to receive science knowledge systematically, we joined LINB to bring an element of science to them, and **"The Voice of Biology" made up for the shortcomings** of LINB's relatively homogeneous output. Although it was challenging for the blind children to understand the content of the science audio at once, we and the LINB volunteers were happy to slowly describe to them what the tiny things looked like and compare them with the things they could touch and feel, so that they could have a relatively intuitive understanding of the science content.

Rethinking and improving formal education: childhood education forum & cross-age peer mentoring program

childhood education forum

Discover the needs

In China's formal education system, school-age children's education spans a large period and is relatively simple in terms of intellectual content, but it actually requires a lot of guidance in terms of quality education, and social education is needed to fill in the areas that are difficult to reach with school education and family education. As an important provider of social education services, **college students' public welfare associations** have made considerable achievements in the field of children's public welfare, but various problems inevitably arise when conducting activities in voluntary activities. As a promoter of synthetic biology, we also wanted to **make synthetic biology education a part of children's quality education and let children**

experience the fun of synthetic biology and scientific knowledge. Therefore, we cooperated with the Expedition Society, the biggest public welfare associations in Fudan university, and invited several children's project leaders of university student public welfare associations , leaders of social welfare organizations and sociology professors to discuss with us **how university students can play a bigger role in children's education.**

Balance the values

When combing through the children's projects of university public welfare associations, we found that children's projects can be divided into three main categories: **quality education, homework tutoring, and companionship education**. Among them, the quality education category accounts for the highest percentage, but the level of volunteer projects of each association varies, whether it is science popularization or aesthetic education, there is no clear standard. Many people in charge of children's projects said that how to effectively carry out quality education activities is a problem they have been exploring. So, we decided to collect project information and conduct research before opening an offline forum to discuss the issues concluded from the research.

Fulfill the plans

We have collected front-line practice information from nearly 30 children programs, categorized and summarized them, and convened the childhood education forum. For details, please see the inclusivity page.

Ameliorate the project

Participants believed our forum format to be innovative and **discussion-focused, with professional public service professionals guiding each discussion group**, and the atmosphere was cordial, with no awkward and cold situations. After the event, we **summarized the discussions and research** of the forum and produced a research report on childhood welfare projects of university student associations. We **shared the report with everyone who participated** in the forum, and it was their enthusiastic participation and sincere discussion that made this document possible.

cross-age peer mentoring program

Discover the needs

The formal education system in China is relatively **lacks in career planning** for students, and students know very little about their college majors before they enter college. Moreover, after the college entrance examination, students have to use less than a week to fill in the application form to Moreover, after the college entrance exam, students have to use less than a week to fill in the application form to decide which major they want to devote to for the next four years or even their whole life, which is very unreasonable. As a result, it is common for students to be dissatisfied with their majors and feel confused about their future after entering university.

In China, some fundamental subjects are considered by the public as majors with no job prospects, and the most typical ones are biology and chemistry. Therefore, **candidates deliberately avoid these majors** in favor of more popular majors such as finance and economics when filling out their volunteer applications.

But the actual situation of these majors is not the same as the public imagines. The background of basic disciplines in undergraduate studies has a significant advantage in China. Under the trend of disciplinary integration, many majors are willing to accept undergraduates from these basic disciplines across majors, after which comprehensive talents with multi-disciplinary perspectives are The background of basic disciplines in undergraduate studies has a significant advantage in China. For example, **synthetic biology is a branch of biology and an emerging interdisciplinary field with multiple applications and a bright future.**

Balance the values

Our **cross-age peer mentoring program** helps high school students enhance their career development awareness and ability by organizing college student volunteers to serve as peer mentors and online group activities that focus on high school students' career exploration goals. We recruit college student volunteers from the university and high school students in Shanghai to participate in our program.

Fulfill the plans

During the event, we introduced the **basic information, application scenarios and future trends of synthetic biology** to the high school students. We hope that through this program, high school students can choose their intended majors independently instead of filling out their volunteer applications according to their scores. We hope that through this program, high school students can choose their intended majors independently instead of filling out their volunteer applications according to their scores. that in the communication between high school and college students, college students can experience the responsibility of being a senior and pass on this responsibility. We also hope that in the communication between high school and college students, college students can experience the responsibility of being a senior and pass on this responsibility.

Ameliorate the project

Through this activity, both college and high school students benefited immensely. **First of all, for high school students,** the peer mentoring program helps them master a series of career development skills, including personal statement writing, college major selection, etc. More importantly, it allows high school students to understand themselves better and explore themselves more deeply, especially at the values level. In this process, we inspire high school students to seek meaning and value in life and can stimulate interest in exploring college majors

on their own. **Second, for college students,** the peer mentoring program also positively impacts them: it enhances their servant leadership, exercises Second, for college students, the peer mentoring program also positively impacts them: it enhances their servant leadership, exercises their organizational and communication skills, and strengthens their career goals, interests, and aspirations. The relationship-based education is facilitated through a two-way mutual support model. This relationship and bond allow college student mentors and high school student mentees to benefit from each other and promote peer-to-peer learning. This relationship and bond allow **college student mentors and high school student mentees to benefit from each other and to promote peer-to-peer learning and growth in group activities.**

Click here to review our report.

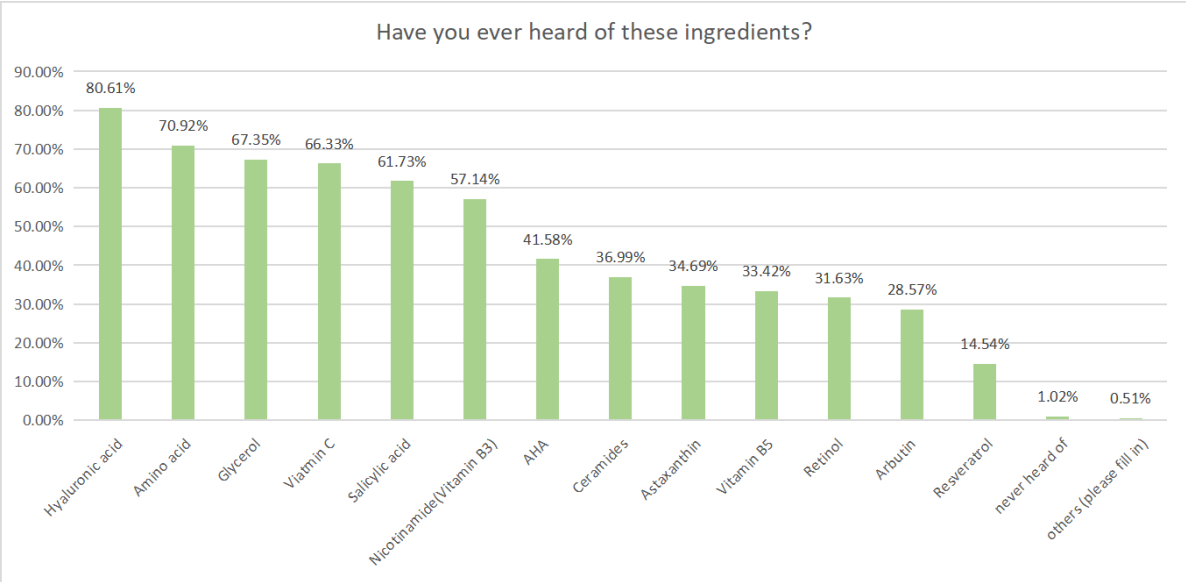
Skincare education

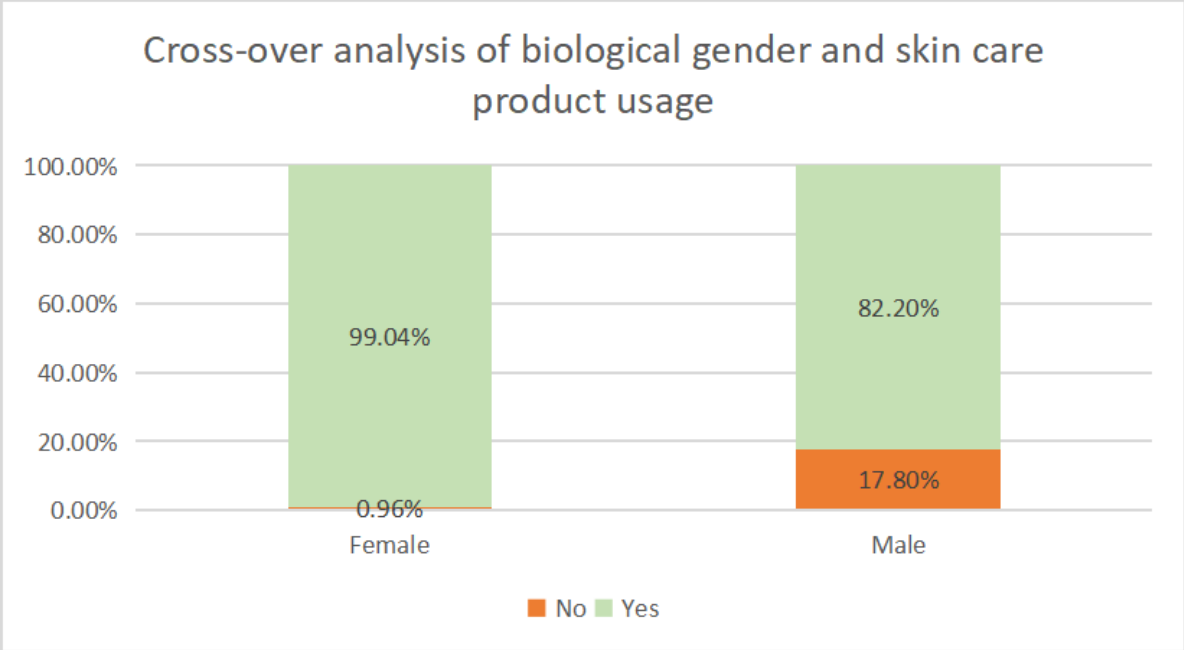
Each activity of skincare education is part of the iGEM cycle, and this series of activities constitutes a complete workflow.

Discover the needs：The two surveys allowed us to understand people's attitudes towards skincare and their demands for skincare products.

In July and October, we conducted two surveys on attitudes towards skincare and skincare product usage.

In our **first survey (408 qualified voters)**, we focused on sex differences in skincare and recognition of skincare molecules. Through chi-square analysis, we found that there is a significant difference between men and women in the use of skin care products, but interestingly, through univariate analysis, we found that there was no significant difference between men and women in terms of self-assessed understanding of skin care products. Sexual differences, at the beginning, we speculated that the reason for this phenomenon may be that women are influenced by social gender, thus, they will pay more attention to their skin condition, while men care less about skin management. However, in subsequent interviews, we asked women and men the same questions about skin care precautions and the efficacy of ingredients in skin care products, and the answers of female respondents were significantly better than those of male respondents. In terms of the **recognition of skincare molecules**, retinol's is only 31.63%, indicating that consumer education on this molecule remains unfinished.



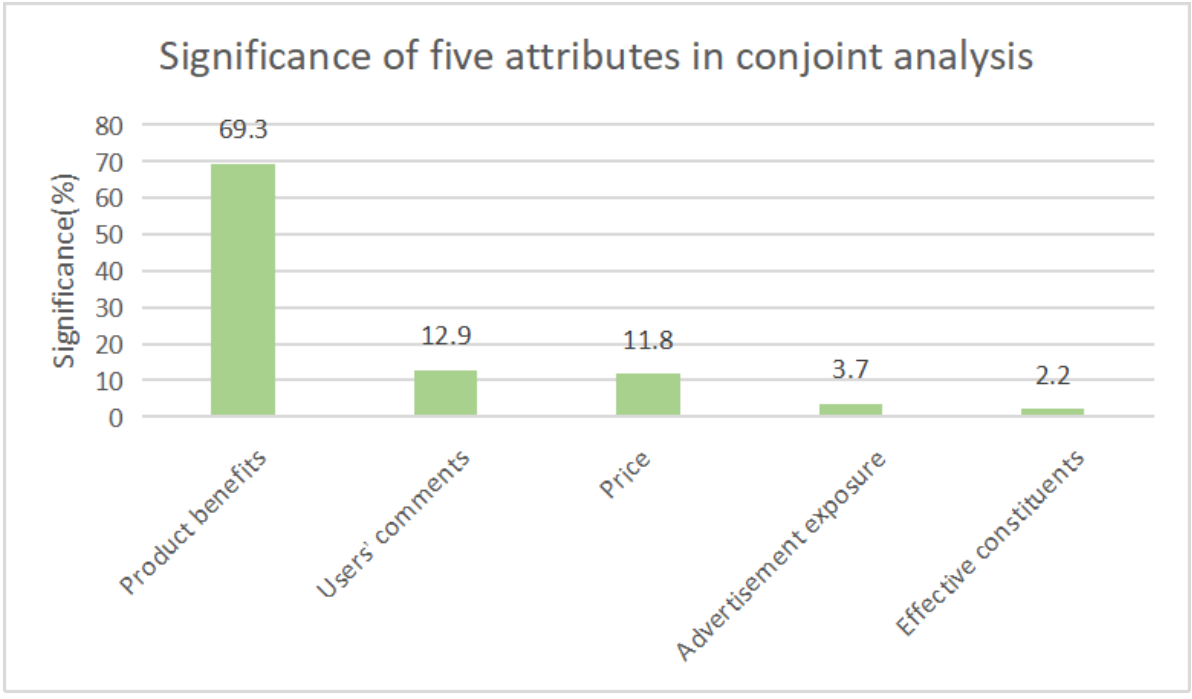


In the **second survey (217 qualified voters)**, we wanted to find out what people buy skincare products for and which attributes they value more when buying. **Conjiont analysis(CA)** is a type of multivariate analysis that has gained popularity in marketing research (e.g., Gustafsson, Herrmann, & Huber, 2007; Lohrke, Holloway, & Woolley, 2010). An orthogonal array of 16 profiles was generated using IBM SPSS 25.0, with each profile possessing a unique combination of the five variables. For example, a potential commodity might be “poor product benefits, high price, low users’ comments, ordinary effective constituent, low advertising intensity.”

An orthogonal array of 16 profiles					
No.	product benefits	price	users' comments	effective constituent	advertising intensity
1	significant	high	high	ordinary	low
2	poor	high	low	ordinary	high
3	ordinary	low	medium	ordinary	low
4	poor	low	high	premium	high
5	significant	medium	high	ordinary	high
6	significant	high	medium	premium	high
7	ordinary	high	high	premium	low
8	ordinary	medium	low	ordinary	high
9	significant	medium	medium	premium	high
10	significant	low	high	ordinary	high
11	significant	medium	low	premium	low
12	poor	medium	medium	ordinary	low
13	poor	medium	high	premium	low
14	significant	low	low	premium	low
15	ordinary	medium	high	premium	high
16	significant	medium	high	ordinary	low

Participants were instructed to score the 16 commodity relative to one another according to their preference to buy each product, using a 5-point scale (anchors: 1 = unwilling , 5 = very willing).Participants Participants were also given a separate task in which they had to indicate how important the same five attributes would be for a skincare product using a 5-point scale (anchors: 1 = unimportant, 5 = very important).

After using the SPSSPRO website to conduct a joint analysis of the results of the questionnaire, we obtained the following results:



It can be seen that the **primary demand of consumers for skin care products is product benefit**, and the quality of ingredients does not affect the choice of most people. Because everyone's skin type is different, even good ingredients may not be suitable for everyone.

Balance the values：Communicating with different groups allows us to understand the ideas of skincare companies and consumers

KOL in beauty industry :

Informaton Source (multiple choice)								
	first	second	third	fourth	fifth	total	ratio	total rank
independent search	80	37	14	10	5	146	67.28%	1.79
KOL's recommendation	68	47	16	5	1	137	63.13%	1.72
Medical advice	19	29	34	8	6	96	44.24%	2.51
Brand advertisement	10	26	24	14	5	79	36.41%	2.72
Friend's recommendation	36	32	27	9	9	113	52.07%	2.32
other	0	0	0	0	0	0	0	/
number of qualified voters							217	

In the second survey, we analyzed the questionnaire and concluded that the channels for people to learn about skin care products are mainly blogger recommendations, we interviewed Miss Lin (bilibili id: mengdesijiu) who has 220,000 fans of the beauty industry KOL, in the conversation with her, we learned that the **skincare mentality of young people** is now changing from "for their lover" to "for their own happiness ", skin care for people now is more and more of a daily thing, everyone has the right to pursue beauty.

At the same time, Miss Lin, as an intern in the beauty and skincare industry, also talks about **how brands promote their products**. In view of the difference in purchasing power of different users from different promotion platforms, the company will choose bloggers with different styles and fan group portraits to promote products. For example, some bloggers take the celebrity route, then most of their fan groups may have exquisite requirements for life, so relatively speaking, the purchasing power of these fans will be higher, and the acceptable products will be more expensive. Different products have different positioning and benchmarking consumers, and there are different promotion routes.

As for the promotion of products, she pointed out that the company's publicity department is divided into two parts: product group and marketing group. The product group is responsible for mining the "highlight" characteristics of the product, and the marketing group is responsible for comparing the advantages and disadvantages of the product with other products of the same type. Secondly, the brand will focus on the three aspects of product composition, ease of use and comparison with competitors. For some similar big brand products, the new brand will focus on publicity to achieve the purpose of close to the existing market of big brands.

We also had a talk with **dermatologist doctor Mrs.Yu**. Dr. Yu pointed out that because retinol is used as a prescription drug to play a therapeutic role, consumers have difficulty accessing prescription drugs, and prescription drugs are relatively high in alcohol content compared to products in the skin care market, and they need to be used in accordance with medical advice, otherwise they will face the risk of face rot. In addition, the use of alcohol skincare products is more demanding, such as avoiding light, not suitable for use during the day.

In addition, patients with skin issues are a potential large market for skin care products, and a considerable number of patients with skin issues have a great demand for skin care, but there is no one to guide them to carry out proper skin care.

1. **The skin barrier of skin disease patients is more sensitive and fragile than that of ordinary people**, and different types of skin diseases are different reactivity to complex skin

care products, and the current market-oriented skin care products cannot achieve personalized skin care programs.

2. **Skin disease patients have a lower tolerance for skin care risks than the average person**, because their skin condition is poor, they are unwilling to accept that after using skin care products, the skin condition is worse than the original, even if this bad is only temporary.
3. **Skin disease patients are willing to pay a higher price than the average person** for maintaining the state of the skin, as long as the skin care products are really effective, they are willing to spend more money and time on the use of skin care products, that is, the tolerance for the convenience and price of skin care products is higher.

Fulfill the plans：Skincare ingredient science and KOL interview publicity allow us to answer the public's questions in a targeted manner

For retinol, the lack of market education is the biggest problem at the moment. And when it comes to skin care, the one that suits you is the best. Just as consumers pay more attention to product efficacy than product ingredients. Our responsibility is to promote retinol, an excellent skin care molecule, to more people, and to promote the correct skin care concept.

As for the molecular science of skin care products, we have launched an article with pictures and texts on the WeChat public platform, giving the audience a comprehensive introduction to the past and present of vitamin A, focusing on analyzing its efficacy. As for promoting the concept of skin care, Miss Lin, as a KOL, must have a much stronger drainage effect than our public account. Therefore, we directly launched an exclusive interview with Miss Lin, and integrated the transmission of the correct skin care concept into the conversation with her. among. The two articles **received a good response, with 3750+ hits**.

Click here to read more results of data analysis.

Conclusion

Everything we did for education lasted almost an entire year. We built ourselves on synthetic biology and our projects, **formed various connections to the outside world.** We dedicated our time, energy and creativity to a variety of different audiences, during which time **we were occasionally teachers, sometimes volunteers, but always a student.** We were eager to absorb all the knowledge we can reach, including how to plan a fun event, how to integrate our ideas into the event, and how to bring everyone to enjoy our projects and outputs. We would like to believe that as long as you are willing to dedicate your enthusiasm, you will be able to grow and be touched in Education.