

BAMBOO BICYCLES BEIJING

How can we empower youth to shape their own mobility culture?



Our project aims to **combat motorization** in China by **empowering youth to design and build** their own community mobility solutions using **bamboo**.



Thank you to our current supporters!



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Executive Summary

The Problem: As communities in emerging countries get richer, they are buying more cars. This rapid motorization is the cause of a host of urban problems including miserable living conditions, dire health issues, and catastrophic environmental challenges. Our three years of research has revealed the startling finding that a critical driver behind motorization is the cultural significance of car ownership.

Our Approach: While there are number of economic, political, and technological measures being designed to slow motorization, we at Bamboo Bicycles Beijing have an ambitious-yet-demonstrated solution to empower Chinese youth to actively consider and reshape their culture of mobility. We do this in a simple but powerful way:

- Teach young, community change-makers to make their own bamboo bicycle to generate pride in a non-car mode of transport;
- Challenge these young leaders to identify and co-design community mobility solutions using the techniques learned from bike making;
- And, provide the resources and mentorship for these young people to co-implement their solutions with their communities.

Our Impact: During the summer of 2016, we aim to train 20 Chinese high school and college students. We will spend 6 weeks in the summer to address 3 community mobility challenges. In 2017, we aim to work with and support our young leaders to disseminate these community solutions to 4-5 lower-tier cities by setting up workshops in these cities and addressing community mobility challenges specific to these locations.

Our Vision: Ultimately, we aim to engage all Chinese young people to begin thinking actively about urban mobility and using creative techniques to engage their communities in envisioning a more sustainable and liveable mobility culture.

An aerial, top-down view of a busy street in an urban area. The street is filled with a variety of vehicles, including white vans, silver sedans, a dark blue van, and a yellow taxi. A person is riding a bicycle in the middle of the street. The overall scene depicts a dense and active traffic environment.

The Problem

EMERGING ECONOMICS CRAVE THE CONVENIENCE, SAFETY,
AND PRIDE OF CAR OWNERSHIP.

YET, CAR OWNERSHIP LEADS TO A HOST OF SOCIAL AND
ENVIRONMENTAL PROBLEMS.

Despite excellent cycling infrastructure, Beijing and other Chinese cities are quickly falling victim to the harms of motorization.

Beijing is an ideal place for urban cycling: completely flat, with cordoned-off bike lanes, regular service stations, and dedicated signage. In the 1980's bicycles made up 62.7% of all non-walking trips in Beijing. By 2010, that number fell to 16.4%, and it has continued to drop rapidly.¹ The bicycles from the 1980's now lie in rusting heaps.

The reason: motorization.

Motorization in Beijing (and many other emerging market cities) is not only untenable for the city's future, it has already begun to damage the quality of life for its residents across a spectrum of problems:

- At the most basic level, motorization is an inconvenience that makes the average Beijinger sit in traffic an additional 32 minutes each day.²
- More critically, Beijing's motorization causes 22.2% of Beijing's infamous air pollution³ problem, which has raised the incidence of asthma, lung cancer, and heart disease in the city.
- In the long-run, Beijing's conservative estimate of 6 million vehicles by 2017⁴ will not be sustainable given the city's current road system and will require massive investment into new car-focused infrastructure which will further exacerbates challenges of equity and pollution.



1 Yang, Zhao, Wang, Zacharias, *The Rise and Decline of the Bicycle in Beijing* (2014)

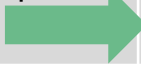
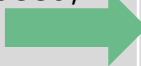
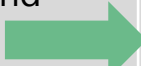
2 AutoNavi Software, *2015 Yearly Analysis Report on Major Chinese Cities' Transportation* (2015)

3 Beijing Municipal Environmental Protection Bureau, *2012 Beijing City Environment Report* (2013)

4 Based on data from World Bank's "Motor Vehicles (per 1000 people) 2009-2013"

Demand for cars has risen as incomes have grown. And, technological, policy, and educational measures attempt to reduce car demand and usage. But...

We spent three years researching why China's urban residents are buying more cars and what could be done about it. This research confirmed many expected factors and solutions:

Personal Auto Purchase Factors	Mitigating Measures
Economic Factors: growing consumption power, growing road network 	Policy Response: car quotas, driving restrictions, taxes, subsidized mass transit
Convenience Factors: perceived speed, increased autonomy, expanded range 	Technology Response: car-hailing apps, subway expansion to periphery
Safety Factors: protection for self and family, environmental safety 	Education Response: public transit rules and awareness, enforcement of traffic laws

Our research revealed an important factor that has been largely ignored...



CULTURE

Cultural values and expectations drive young people to prioritize car ownership to assert social status and stability.

In 2012 and 2013, we conducted ethnographic research on 32 young people in China's 1st- and 2nd-tier cities. The results indicated that car ownership is a social prerequisite for almost all aspiring young people:



“My best friend told me I had to drive to his wedding in an Audi or BMW, so I rented one.”

“My girlfriend’s parents won’t let us get married until I own a house and a car.”

“I would never consider biking to work [at a venture capital firm] because they would look down on me.”

We have since substantiated this finding with quantitative research on “car pride” conducted at MIT.¹ The auto industry has perfected the recipe for creating the cultural imperative to own a car, thus showing that influence the evolution of mobility culture is possible.

How might we shift urban China's mobility culture to value alternatives to cars?

A young man with short dark hair, wearing a grey face mask and green gloves, is focused on working on a mechanical device. He is positioned on the right side of the frame, looking towards the left. The device is a complex assembly of yellow cylindrical components mounted on a metal frame. The background shows a workshop environment with various tools and equipment. The lighting is somewhat dim, creating a focused and industrious atmosphere.

The Innovation

WE BELIEVE THE CULTURAL SOLUTION STARTS WITH
EMPOWERING CHINESE YOUTH TO BE THE CREATORS OF
THEIR FUTURES.

By leveraging three existing opportunities specific to China, we will begin to affect mobility culture.

Opportunity 1: Chinese cities have already constructed some of the world's best cycling infrastructure.¹



Since the 1950's, China has been had 10'-wide, cordoned off bike lanes, bike-specific signage, and mobile bike repairman sit at almost every corner. Yet, as car culture begins to dominate public discourse, this advanced cycling infrastructure is being forgotten.

Opportunity 2: Chinese youth are searching for the skills and tools to become social *changemakers*.



Our community partner, China Youthology, published this seminal paper on China's Post-90's millennials. Read it [here](#).

The Chinese education system is renowned for its rigid, exam-centric education system that struggles to cultivate leadership, innovation, and civic engagement. Yet, the new generation of "Post-90's" youth are different from previous generations as they are actively taking their education into their own hands to gain these skills

Opportunity 3: A Chinese material that is carbon-negative, renewable, cheap, and local.²



Bamboo sequesters as much carbon from the atmosphere as timber forests. But unlike timber bamboo, it matures after 4-6 years when it stops sequestering carbon and should be harvested to make room for new culms. The mature culms are as strong as steel. Most importantly, high quality bamboo is widely available across China.

¹ The New Yorker's [entertaining account](#) of Beijing's bike lanes and the need to protect them from cars.

² A quick read on the benefits of bamboo: <http://nyti.ms/1cVVq90>



Teaching Chinese youth to make bamboo bicycles:

empowers

its maker to feel confident leading, creating, and contributing to the community.

rejuvenates

cycling infrastructure as its makers feel proud to regularly ride their bikes as a symbol of their individuality and values.

reduces CO₂

as a bamboo frame's lifecycle carbon emissions is -524kg CO₂/m³ whereas the production of steel increases +32,423kg CO₂/m³.¹

¹ Based on estimate from Environmental Assessment of Industrial Bamboo Products- Life Cycle Assessment; P. van der Lugt, Vogtlander, van der Vegte, Brezet

Our innovation is an actionable framework that uses bamboo bicycles to develop youth leaders to improve their community.

1. Recruit young and eager students.
2. Teach them to build their own bamboo bicycle.
3. Challenge students to identify and design solutions to community challenges.
4. Provide students with resources and guidance to implement and share solutions.
5. Prepare students leaders for expansion.

Results from our 2015 trial:

We have been envisioning working with a cohort of youth leaders in China for a long time. We tested a model in the summer of 2015 with 5 students. The experience was extremely rewarding and helped us further develop the model for full and continued implementation with your support. Realizing that our idea is not the easiest to communicate without examples, we hope that the example help illustrate our action framework.

Action Framework:

1. Recruit young and eager students.

- Students must apply and commit to 6 week experience.
- Students must demonstrate the desire to make a difference.

2. Teach them to build their own bamboo bicycle.

- Instills a sense of self-identity and pride around a non-car mobility option.
- Builds confidence in the group's ability to create useful objects.
- Teaches a variety of empowering skills, including woodworking and basic electronics that can be used to tackle other design problems (see Appendix A for more details)



Jackie, 17

Yuyuan, 17

Jiahua, 18



Geena, 21



Coco, 17

Action Framework:

3. Challenge students to identify and design solutions to community challenges.

- Encourages active observation and interaction with local community.
- Exercises students co-creative design abilities to define challenges.
- Begins a grassroots discourse on urban mobility through social media.



With their bikes the students spent time exploring Beijing and connecting with communities to develop their core questions:

- **Jackie:** *How can we include the disabled community in our bamboo mobility?*
- **Yuyuan:** *How can we use leftover bamboo to encourage dialogue between community elderly and youth?*
- **Jiahui:** *How can I make a documentary to communicate what we think about mobility?*
- **Geena:** *How can we get the students at the next door elementary school to enjoy bikes?*
- **Coco:** *How can we refurbish all the thrown out bikes from the 1980s to ride again?*

Action Framework:

- 4. Provide students with resources and guidance to implement and share solutions.**
 - Gain proficiency in prototyping and design (see Appendix A)
 - Experiencing communicating both with the community and potential stakeholders.



Coco refurbished a discarded bicycle for a community neighbor and became an excellent bike mechanic.



Yuyuan organized a bamboo crafts workshop with the Neighborhood Committee for over 30 grandparents and grandchildren.



In addition to designing BBB's illustrated bamboo bike manual, Geena worked with 4 5th graders to build their own bamboo bicycle.

Action Framework:

5. Prepare students leaders for expansion.

- Following the summer, our Community Managers will work with student leaders to continue their community projects throughout the school year by mentoring them to form their own student groups.
- Continue social media sharing to garner community and mass support.



At the end of the summer BBB's community leaders came to gather to discuss future plans. The students' 4-week summer experience ended with these accomplishments, but there was a desire to use their newfound leadership skills and expand. This is where your support comes in. We hope to secure the resources so that youth leaders like these five students will be able to follow through with the community challenge projects to create lasting impact.

OUR IMPACT

We measure our success by tracking student abilities, public discourse, and financial sustainability.



Individual Development

- **Design and Prototyping**
 - Are students proficient in foundational skills?¹
 - Are students confident effectively implementing ideas?
 - Do students demonstrate appropriate safety measures?
- **Leadership**
 - Can students articulate their observations and ideas to others?
 - Can students lead peers to build their own bamboo bicycles?
- **Community Engagement**
 - Do students demonstrate capacity to empathize with differences?
 - Can students work with community members to identify and create solutions?



Public Discourse

- **Community Collaboration**
 - ~15 of school presentations, workshops, and forums
 - ~10 of partnerships with local organizations and businesses
 - 20+ of workshop volunteers
 - 50+ of converted cyclist commuters
- **Social Media**
 - ~50 student postings/wk
 - ~10,000 online share/wk
- **Mass Media**
 - Featured in 2-5 major magazines, TV, website with *accurate* portrayal of BBB mission.



Financial Sustainability

- **Steady Revenue Stream**
 - On-going sales for corporate trainings (~25,000RMB/mo)
- **Growth in Social Impact Areas**
 - Partnerships with schools by establishing workshops as part of school curriculum through the graduates of our summer program.
 - Dialogue with government to train Chinese civil servants in cycling communities of Beijing.
 - Spread to model new cities through efforts of entrepreneurial youth leaders.

¹ For BBB, the skills used in producing our bamboo bicycles are our foundational skills to realize many ideas. They include: woodworking, composites, bike mechanics, electronics, CAD, visual arts, and programming

The background of the slide is a photograph of numerous yellow, cylindrical objects, likely prototypes or components, scattered on a light-colored surface. The objects are of varying lengths and some have circular openings at their ends. The lighting is soft, and the overall tone is muted, with a dark overlay on the left side where the text is placed.

Feasibility

OUR TEAM HAS DEMONSTRATED THE FEASIBILITY OF THIS INNOVATION AND PLANS FULLY IMPLEMENT IT WITH YOUR CHALLENGE'S SUPPORT.

Progress Thus Far: We have demonstrated the ability to run a bamboo bicycle workshop in China and are ready to begin make lasting social impact throughout China.

2013-2015	<ul style="list-style-type: none">• Bamboo Bicycles Beijing started as project and ended up teaching over 400 people to make over 250 bamboo bicycles; our students have then started workshops in Shanghai, Hong Kong, Sanya, Laos, Ethiopia, and Denver.
Summer 2015	<ul style="list-style-type: none">• BBB worked with 5 students to test our model and ended up with some excellent results and this year's community mobility challenges (see appendix).
Winter 2016	<ul style="list-style-type: none">• Over IAP, we held 2 bamboo bike workshops at MIT in the International Design Center with the goal exposing the MIT community to the concept and asking for help and new ideas.• BBB team has grown with new MIT and Boston members (see "Team")
Spring 2016	<ul style="list-style-type: none">• Apply to Global Ideas Challenge• Development grant: develop streamlined teaching methods for youth to master skills in workshop and test at local high school.• Recruit 20 students for summer program with help of community partners.

Implementation Plan: Over the next 18 months we will develop 20 Chinese youth leaders to train

Summer 2016	<ul style="list-style-type: none">• Send 4 team members to Beijing to train 20 Chinese students.• Team members train students to become future leaders to work community challenges. The community challenges include developing handcycles for the disabled community, developing mini-workshops for schools, developing bamboo bicycle accessory solutions, and organizing community events.• Production of 20 bamboo bicycles, 4-5 student led community projects, and regular students reflections and stories shared on social media and mass media to begin a discussion on mobility culture.
Fall 2016	<ul style="list-style-type: none">• Hand-off to on-the-ground BBB employees to monitor students' progress with their projects in their respective schools and communities.• Boston team leverages results to partner with government educators, planners, and decision makers to begin community mobility workshops.
Winter, Spring 2017	<ul style="list-style-type: none">• Prepare to expand model to 4-5 lower tier cities in Southwest China (or other emerging markets), including funding.
Summer 2017	<ul style="list-style-type: none">• Class of 2016 student leaders lead teams to lower-tier cities to establish community workshops and address community challenges.

Our Team: We represent a diverse group of talents and backgrounds that have come together at MIT because of the bamboo bicycle.

David Wang, *Team Lead*

David is a graduate student at MIT's Department of Urban Students and founder of Bamboo Bicycles Beijing (BBB). Before BBB, David worked in market research on Chinese youth for brands like Apple, Nike, and Mercedes. Before that, David was an anthropologist specializing in youth subcultures in China. David is a graduate of Pomona College, a Fulbright Scholar, fluent in Chinese, and grew up in Boston.

Caroline Jaffe- *Fabrication Optimization*

Caroline works in the Social Computing group at the MIT Media Lab where she uses sensor technology and data visualization to study urban commuting habits and public space. After graduating from Yale in 2013 with an EECS degree, Caroline spent a year in the Netherlands as a Fulbright Fellow, conducting independent research on cycling behavior. Her current research interests include bicycles, urban mobility, and geographical data visualization.

Julian Leland- *Fabrication Optimization*

Julian is a Master's candidate in the Mechanical Engineering Department at MIT. He is fascinated by the concept of bringing tools to people - exploring new ways of designing and creating, while seeking to make those tools and techniques available to the widest possible audience. Previously, he developed cable driven robotic arms, manipulators and rehabilitation systems and researched self-scaling manufacturing systems and public policy for global development engineering.

Siyuan Wei- *Business Development*

Siyuan is pursuing an MBA in entrepreneurship. He is a Visiting Fellow at MIT Sloan. He is also a MBA and MIM dual degree candidate of ESCP Europe and Lingnan College. Previously, he worked at Uber (China) as a marketing analyst, the Agricultural Bank of China for 3 years as Senior Business Consultant, Finance Manager. He is an Associate Financial Planner certificate holder. He has a deep understanding of Chinese market and business operation.

Marshall Cao- *Master Builder and Media*

An undergraduate at Hampshire College, Marshall has been with BBB since the beginning and is one of the best workshop leaders at BBB. He is currently enrolled at Hampshire College and manage the documentation of our progress and share it with the broader community.

Max Feldstein-Nixon- *Logistics and High School Liaison*

As the youngest of the Boston team, Max joined the BBB team with the goal of helping to develop the bamboo bike curriculum for American youth. He will act as a liaison to test our design at Brookline High School (where he will be a senior) before leaving for China.

Candy Yang- *Community Manager and PR*

Candy joined BBB at the very beginning. She is a partner at China Youthology where she runs their social impact platform, OpenYouthology. She is responsible for developing relationships and recruiting students for the summer program.

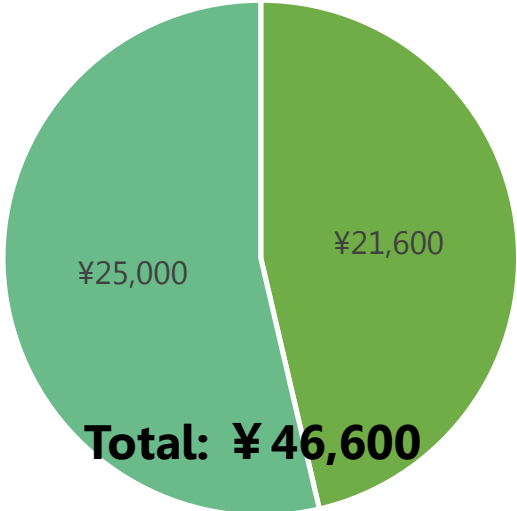
Year 1 Budget

Items	Cost
Flights (4 people) Based on roundtrip estimates between Boston and Beijing.	\$6,000
Housing (2 months) Based on housing averages in Andingmen area in Beijing.	\$3,000
Meals (4 people, 6 weeks) 150RMB/day/person	\$4,000
Teaching materials, supplies, tools Based on existing purchase list from the Beijing workshop.	\$2000
Workshop Space (2 months) 4300RMB/month	\$1,433
Media Production and Management Documentation of summer for sharing on website and social media which will be used to grow program.	\$550
Petty cash Emergency cash, meetings with officials and partners, etc.	\$500
TOTAL	\$17,483*

*Any additional funding needed will be secured through either other grants and/or financial support from our community partners.

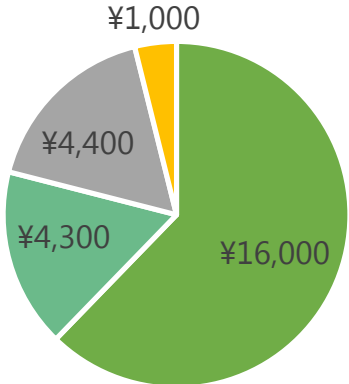
In achieving our mission to empower youth, our past data shows immediate financial viability. Global Ideas will allow us to dedicate time and resources to kickstart this mission in Year 1.

Monthly Revenue Stream



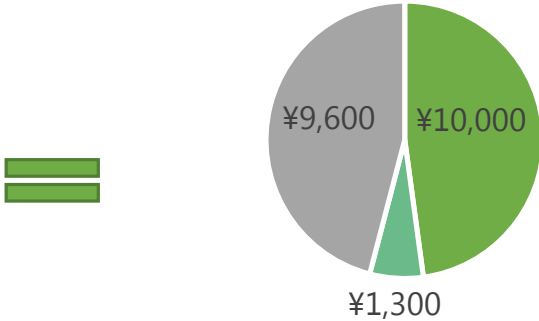
- Average Income From DIY Workshops
- Average Income From Corporate Trainings

Monthly Cost Structure



- Total: ¥25,700**
- Salaries Cost
 - Rent Cost
 - Average Material Cost
 - Other Costs

Monthly Profits Distribution



- Total: ¥20,900**
- Fund for Future Young Leader Challenge Program
 - Fund for Opening New Workshops in Other Cities
 - Profits Saving

Our focus on achieving our social goal is and will continue to be supported by revenue from larger organizations.

Target Organizational Customers

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Corporate Trainings and Sales
Previous clients have included Mercedes, SAP, Otis Elevators, Conifer Hotels, Swire Properties, and more.
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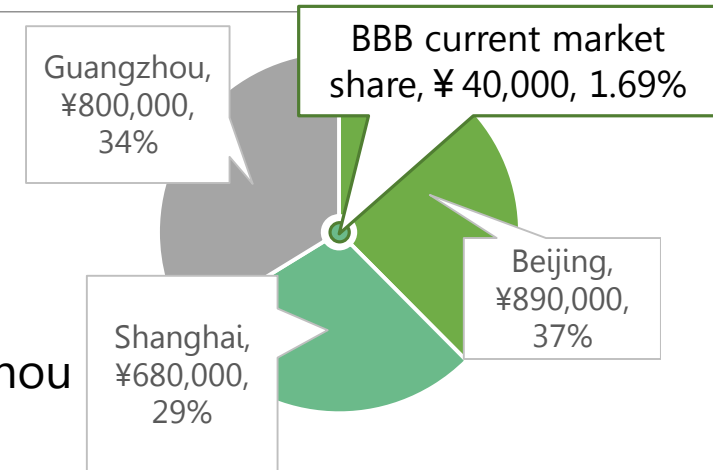
School Collaboration
Previous collaborations with International School of Beijing, Hang Seng Management College, and Associated Colleges in China.
- 

Key Criteria
First-tier cities; interest in sustainability, innovation, and/or teambuilding; need for positive brand image and CSR

Market Sizes

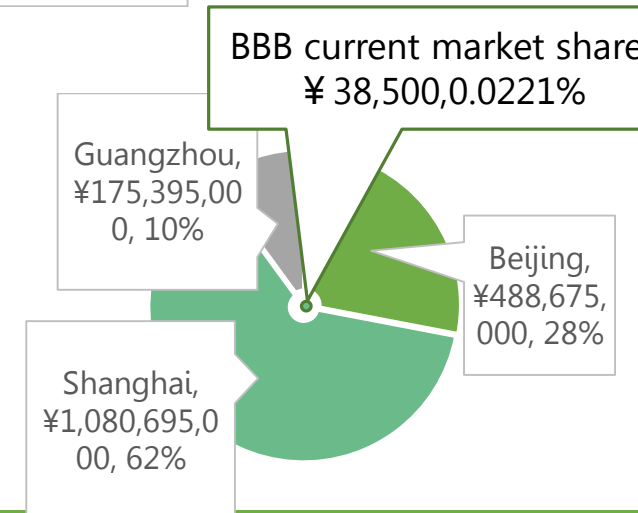
Schools Market

- 237 Colleges and Universities in Beijing, Shanghai, and Guangzhou
- ¥ 2,370,000 market



Corporate Trainings

- 31723 corporations who would consider bamboo bicycle trainings in Beijing, Shanghai, and Guangzhou
- ¥1,744,765,000 market



Source : 2014 National Bureau of Statistics of China

A large group of people, mostly young adults, are gathered in front of a modern building. They are holding up numerous bicycles made of bamboo frames. The bicycles are in various colors, including natural wood, blue, and white. The people are smiling and looking towards the camera. The background shows a building with large windows and a paved area. The overall scene is bright and positive.

Now we just need a boost to allow us to turn this idea into reality.

Thank you for taking the time to review this introduction.
We look forward to hearing from you!

- The Bamboo Bicycles Beijing Team
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Appendix: Skill-Building Kits

WE HAVE DESIGNED OUR WORKSHOPS TO INTRODUCE STUDENTS TO SEVERAL SKILLSETS WHICH WILL SERVE AS A FOUNDATION FOR YOUTH LEADERS TO ADDRESS COMMUNITY CHALLENGES.

Prototyping and Design: Woodworking Kit

Tools: hacksaws, measuring devices, sandpapers, carving knife, rotary dremels, hole saws, drills, CAD software, Japanese bamboo crafts tools, jiggling

Activity: Students will design bamboo bicycles using a simple CAD software, design a fixture, measure and shape bamboo, and produce the form of a bicycle.

Safety: Students required to wear dust masks, protective eyewear, appropriate clothing and footwear, and inform workspace partners of their actions.



Prototyping and Design: Composites

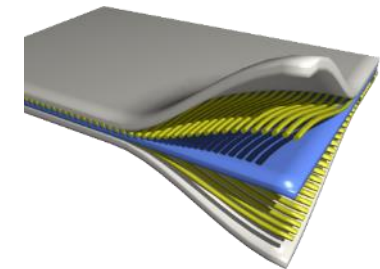
Tools: hemp fiber, fiberglass, casting tape, epoxy resin, compression tools.

Activity: Students learn how and why composites can be advantageous while reinforcing their bamboo bicycle's joints. The experience leads to new applications for composites for further projects. Students will be introduced to a variety of fibers and resins.

Safety: All work with epoxy is monitored by trained staff. All workshop participants must use full-face organic vapor masks and full-body suit to prevent exposure to epoxy.



Hemp composite reinforcing the bamboo frame.



Prototyping and Design: Cycling Mechanics

Tools: All bike tools and components.

Activity: Students assemble their bamboo frames with components to learn about gear ratios, bearing loads, chain efficiency, etc. The process of learning about how a bike works builds students foundation for further ideation.

Safety: Appropriate clothing and eye protection.



Prototyping and Design: Electronics and Programming

Tools: Computer, Arduino, breadboard, simple output components (LEDs, screens, speakers, etc), soldering iron, solder.

Activity: Student integrate electronics into their bike frame to control safety lights. In the process students will be introduced to basic electronics and embedded programming.

Safety: Fans while soldering, guided electronics introduction.



Leadership: Community Connections

Learning Goals:

- Empathy and respect for others
- Confidence to approach others
- Problem identification and exploration WITH community.

Activity:

Students explore Beijing's *hutong* community on a scavenger hunt in which they must build relationships with our neighbors (residents, local businesses, and government). Students are prepared with ethnographic research methods and asked to create a map of their findings and maintain relationships throughout the summer.



One of many maps produced from a BBB community scavenger hunt which resulted in many on-going relationships.

Leadership: Project Design and Implementation

Learning Goals:

- Confidence to take actions in their passion without certainty in results
- Ability to clearly and persuasively communicate ideas and goals to peers
- Ability to adjust project in response to changes in goals and situation.

Activity: Students are asked to propose project based on what they are interested in. They are then asked to quickly try their proposed project and compare the results compared to their original expectations. Based on the results, students are asked to improve their project according to both their personal goals and the impact their project had on others.



Yuyuan took ownership of her bamboo crafts project in 2015. Often going down the street with load of bamboo to work with the neighborhood committee.

Leadership: Social Entrepreneurship

Learning Goals:

- Understand how a socially-minded institution works and how to communicate stakeholders involved with it.
- Craft a proposal both addresses an institution's internal with abilities that the student has.
- Work in a team with peers and the institution to run an initiative and promote its progress.

Activity: Near the end of the summer, students will work with the community to address specific challenges. In doing so, they must develop a proposal for a decision maker in a social-minded institution (schools, neighborhood committee, local business, etc.). BBB's leaders work with the students to identify stakeholders and facilitate conversations to for trial collaborations. The end goal is for students to have ownership over a project that leads into their school year. (For example, after her 2015 experience, Coco wanted to work with local apartment complexes to salvage and restore discarded bicycles.)



Former BBB student, Elton Lau, went on to start his own community bamboo bike workshop in Hong Kong after interning with BBB for 4 months.