Embrace

Matthew Selnick
mselnick03@gmail.com

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about me.

When I was 10 years old I got my first skateboard, and since then it has been an integral part of my personality and lifestyle. The history, the videos, the fashion, and the inclusive culture have always fascinated me, and continue to shape my perspective and outlook on the world every day.

In middle school and high school, I began filming my friends skateboarding, and would transfer miniDV tape after miniDV tape of footage to our home computer, where I would spend hours editing video in what would become my first true creative outlet.

Skateboarding led me to explore my creativity, which led to exploring design as a career field, which led me to Philadelphia University. And from here I’m presenting my next creative outlet in skateboarding – my capstone project.

While I started with a very wide scoping base of inspiration and ideas to explore for capstone, I realized that this was not only the perfect opportunity to design for skateboarders, but that it is the opportunity that I’ve been waiting for; to connect my skillset to my passion. If you follow what you love you’ll never work a day on this project.

Capstone is the most intense design journey that you’ll go through at this point in your career, but only if you make it one. And trust me, you’re probably going to feel lost until the day that it’s done. That’s why you just have to just do it. Make it until you make it. This is your chance to prove that you can do what other people can’t, with the skills they can’t teach you in a class or in a textbook.

I want to dedicate this book to Dylan Reider, as well as the countless skateboarders, designers, and friends who inspire me every day to keep doing what I love, and to keep pushing, falling, and getting back up.
rest easy, dylan.
Skateboarders have some problems.

- Loss of confidence when trying new tricks and obstacles
- Loss of time that could be spent skateboarding
- Loss of ability to perform at best level
- Resistance to wearing protective gear because of cultural stigmas
- More money spent on physical therapy, gear, and doctors visits.
Every skateboarder's feet get injured.

The Nike Embrace System is a 4-part modular skate shoe system focused on preventing injuries using socks, insoles, a removable brace, and skate shoes to customize your setup as needed, just like your skateboard.
Skateboarding isn’t like other sports. There aren’t any rules or guidelines to follow. **No stop and start.** Every surface is your playground. It’s a lifestyle; a different way of perceiving the world.

They’re different from the NFL.
Their Mindset.

It's a constant battle between your mind, your body, and the obstacle. Every trick is a challenge that has a creative way of being solved and perfected, through constant, torturous repetition, followed by an instant rush of intense adrenaline, accomplishment, and drive.

It's an addiction.
This is who they are.

In 2006, 71% of skaters were in the 12-17 age demographic. Today only 45% are 12-17.

Female skaters are the larger growing demographic, and adults are skating longer than ever, but industry companies have yet to address these growing parts of the consumer base.
Most people assume the average skater...

doesn’t follow rules.
is a 13 year old boy.
is not considerate of their purchases.

But actually, they...

are incredibly creative.
are increasingly diverse in age and gender.
have significant product knowledge and know what their needs are.
They get injured. A lot.

Skateboarding is growing faster than any other sport or recreational activity – Along with it come increased rates of injury.

It’s the expected cost of playing the game. A constant risk that you take going towards every trick. They’re signs of battle, failure, endurance, and of non-quitting spirit.

Most skaters hate being called “athletes,” but when a pro breaks his kneecap or has to film for a major video at age 50 with a torn MCL, he’ll head to doctors who specialize in athletic rehab.”

– Dr. David Sales, Next Level Rehab

125,145
people were treated in U.S. emergency rooms for skateboard-related injuries in 2015.

42%
of these injuries treated were to the lower extremities.

Born from rebellious counter-cultural roots of surf and urban street cultures, skateboarding doesn’t fit any categories or comparisons. It’s fundamental non-compliance has driven it to become a huge inspiration for fashion and inclusive modern culture.

Skateboarders want to embody the style and freedom that defines our culture, which often means disregarding protective gear, and creating a stigma that looks down upon it.

“When I think that skateboard rehab will be replaced by injury prevention. And with skateboarding progressing at this level, there’s no doubt that everybody’s going to continue getting hurt. Unless we prevent the injury. That’s the goal.”

“Always either get tweaked, bumped or bruised every time I skate. Let’s say 100 [injuries] if you need a number.”

When you boil it down – skateboarders think that protective gear makes them look weak.
Skateboarders don’t just “break in” shoes. They break shoes.

Back foot shoe remains almost new while dominant foot shoe receives most of the wear. This destruction will also happen on the back foot shoe if the skater also skates switch stance often.

Most pairs of skate shoes are thrown away because of the damage to the worst of the pair, which is generally mostly on the dominant (or forward-placed) foot. This contributes significantly to the amount of waste created from skate shoes, and means that as the shoe is being destroyed, you lose the structure and stability that the shoe provided initially. The quick rate at which this wear happens, which can be different for every skater, creates the short lifespan of skate shoes, and shoes that lack quality material and detail placement will last even shorter lives.

“Shoe-Goo” epoxy required to extend the life of the toecap, but it is still worn through quickly.

Shoelaces have been replaced with spare laces due to being ripped through.

Laces ripped from flip trips and ollies, reducing lockdown and tight fit in vamp area.

Ripped sidewall and logo stitching from ollies and cruising.

Nike SB Koston Hypervulc: 20-30 sessions (1-2 months)
Supportive products exist, but are generalized for many sports, and don’t cater to a skater’s performance specifically.

In addition, all shoes are shaped differently. And people’s feet. And ankle braces, socks, and insoles. In some cases, more damage can be done than good.

“the problem with off-the-shelf products is that they’re based on everyone’s foot being the same - the problem is that everyone’s foot isn’t.” – Dr. Pedowitz, The Rothman Institute

Why doesn’t everything work together?
They just want to keep skating.

So why do they let themselves get injured so easily?
if every skater’s feet are different...

then why can’t you customize your shoes like your skateboard?
A modular skate shoe system, for personalized protection and style.
The Dream Team

Textile and Product Development

Mark Sunderland

R.J. Rechlin High-Performance Apparel Term Chair
Senior Fellow-IEHP
Textile Engineer + Strategist
Director-M.S. Global Fashion Enterprise
+ B.S. Textile Material Technology

Mark Sunderland is a performance apparel expert, textile engineer and the Robert J. Rechlin High-Performance Apparel Chair at Philadelphia University. With many years of industry experience consulting with and developing yarns and products with companies like Nike, Under Armour, the U.S. military, the U.S. Olympic Women’s Rowing team, and many more, Mark became an invaluable source of information, guidance, and sponsorship to the project.

I reached out to Mark to not only learn more about the capabilities for textile innovation within the footwear space, but to see what we could do to address the problems that I had identified. We jumped right in.

Rodney Sigmon

Manufacturing Solutions Center
Textile R+D Specialist

Jason Wilkins

Innovaknits, LLC
Managing Partner

Regan Marriner, a Textile Design graduate student at Jefferson University, has focused her undergraduate degree in Textile Design around performance, and designing fabrics and prints for sport. Regan had experience working with Brooklyn Shoelace and developing die-sublimated fabrics in the past, which would become a very helpful resource for my project’s development.

Michael Bielawa

Junior Industrial Design student

Mikey, a life-long skateboarder and avid skate-shoe addict, assisted me in the design process and model-making, helping to bring the project to reality.

Project Development

On campus, I connected with and gained project insight from my resources and professors, which allowed me to fully realize and flesh-out my concepts into the design development stage.

Regan Marriner
B.S. Textile Design, Current M.S. Textile Design student

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Medical and Health Mentors

Dr. Pedowitz, MD
Rothman Institute
Associate Professor of Orthopaedic Surgery
Thomas Jefferson Medical College

Monique Chabot, OTD, MS, OTR/L
Assistant Professor
Occupational Therapy
Jefferson University

Mikael Avery, MSOT, MArch, BSLA
Adjunct Professor
Industrial Design
Jefferson University

Jeroen Stam
Skateboarding Physiotherapist
@Skateboardingphysio

Matt Beare
The Daily Push - UK Physiotherapy Student

To impact skateboarders’ health positively, I needed to gain a strong understanding of the issues at hand, and validation that I was on the right track. These contacts provided a significant amount of perspective and guidance with their expertise.

Footwear Design

Nathan VanHook
Sr. Creative Director
Nike

Alan Lugo
Bill of Materials Manager
Merrell (Wolverine Worldwide)

Ronnie Irani
Former Prof. Cricket Player - Essex County Cricket Club
Founder of OrthoSole

Ian Cooke
Footwear Designer
Footprint Footwear

Carter Agvent
Footwear Designer
Cole Haan

In order to expand my knowledge on industry methods of design and manufacturing, as well as project mentorship and advice, I connected with many professionals all across the footwear and design industry.

Material and Industry

Matthew Hennessy
Sales Manager
OrthoLite

Derek Wilson
Business Dev. Manager
MatPlush Inc.

Nathan Norley
Sales Manager
Hologenix LLC (Celliant)

Matthew Bodoff
Sales + Account Manager
Ultralon Foam USA

Throughout the project, I reached out to many companies and brands to not only gain insight on my project and what I was developing, but also to sample their materials. I was able to meet some of these contacts during my trip to The Materials Show in Massachusetts as well. These contacts served as a great resource throughout the project, and provided integral insight into the design of each product.
Consumer Research
In order to gain a wider scope of opinions from skateboarders and to back up my initial surveying, I conducted additional survey questions online and in person in order to gain insight into the problems that the culture actually faces.

Only 33% of skaters polled warmed up, while 3% did anything to cool their bodies down after skating. Unlike other athletes, few skateboarders care to warm up before or cool down after skating. This can lead to repetitive stress and strain injuries that could otherwise be prevented.

Less than 10% of skaters polled purchased protective gear for their lower body, such as insoles, braces, or socks. Due to their rebellious attitude, most skaters prefer not to seek treatment, or to continue skateboarding through their injuries, making them worse.

Consumer Research
Key Insights – Supportive Gear

After surveying online, I wanted to talk to skaters in person, and hear more about what they had to say about the supportive gear they've tried.

Ankle Braces
“The [braces] add more weight so it’s harder to maneuver. I don’t want to wear them even though I might get injured…”

Social Stigma and Pressures
“I’d want the ability to hide the safety or make it less uncomfortable. Easier accessibility.”

Shoe Insoles
“The insoles I bought fit awkwardly into my new skate shoes, so I feel like they won’t help.”

I used these insights to address specifically the problems that skateboarders had with their footwear, and the protective gear that they’d tried to use in the past. From here I pulled together my survey responses and conclusions from interviewing skaters to define the best way to create a solution.

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Consumer Research 39
I also had to keep in mind the skateboarder – what would they actually want to carry around with them? In order to better understand this, I listed out the common items that skateboarders will typically carry with them and their respective locations, such as water, a skate tool, wax, headphones, and more.

If I was to design products that could help the skater customize their session and comfort, what would I be asking them to add to this list?
I then asked over 100 skaters to tell me the three factors of choosing a skate shoe that were most important to them. Ultimately, it came down to three main factors that they cared about the most – quality, comfort, and price. While many of them mentioned sustainability and protection as secondary factors, but not things they would actively look for, other factors like appearance, style, and the brand that they wanted to support took precedent when it came time to buy.

I then took it upon myself to decide which factors I would use to improve skate shoes while holding true to which factors that skaters cared about, even if they didn’t choose them specifically. This is shown in blue. The areas of overlap are shown in dark red.

**Takeaways from skaters:**

- Skateboarders are very knowledgeable about their preferences, and will shop around until they find what they like.
- Socioeconomic issues like animal-cruelty and poor labor conditions have a strong influence on some skateboarder’s decisions.
- Protection is not seen as a commonly important factor in a skater’s purchasing decisions.

**Conclusions for my direction:**

- Protection is the element in skate shoes that needs improvement and attention.
- Customization need to be offered to cater to the diverse preferences and changing tastes of skaters.
- Provide hidden protection to work around the stigma of wearing protective gear.
- Skate footwear products need to address the waste created and the impact on the environment.
3 Medical and Health Research
Defining Performance

What does performance mean for a healthy lifestyle and skateboarding?

Sports Therapy
Performance in sports therapy means being able to:

- Notice when your body is warning you of injury
- Skate at your highest level without tiring early
- Having control and balance
- Properly warming up and cooling down

Skateboarding Mentality
Performance in skating means being able to:

- Feel your board when you flick and push
- Not be in pain at the end of the day
- Shoes last long enough to make them worth it
- Being able to skate past the age of 35

Skateboarders need to find the balance between skateboarding the way that they want to and taking care of their bodies. My initial thought was to see how I could integrate this into my design to effectively help this in this process more smoothly, which led me to my further research.

*Have you ever invested in braces or other supportive gear?*

“
Nope. If I die then I don’t have to pay rent.”

*Quote from survey*
Skateboarding and the Body

Over years of skating, even small injuries can build up to larger issues, or can lead to a significant reduction in muscle strength, while potentially also causing other bone and muscle issues.

The average pro skateboarder’s career is 3-8 years, and many are cut short or end because of serious injury rather than being replaced by new riders. While these injuries can span from concussions, to broken back bones or arm injuries, most of them involve the feet or legs, such as ACL, ankle, or knee injuries.

The foot has 26 bones, 33 joints and hundreds of muscles and ligaments, which means a lot of opportunities to become injured.

Injury or severe foot pain can be devastating to one’s quality of life, and some breaks and infections can lead to long-term damage or disability if it not treated. Sprains are stretched or torn ligaments that can result from pivoting or having a foot caught while trying to move in another direction, and are the most common type of injury when skateboarding. Other typical skate-related foot injuries are heel bruises, hot pockets (hot pain in the front of the instep), or blisters which result from shoes not fitting properly and rubbing against the skin of the foot.

Dynamic training leads to an increase in isometric force, which has a direct correlation to peak jump height.

The height of the ollie is result of upward acceleration that occurs at the start of the jump, meaning that increasing the ability to accelerate results in a higher ollie, along with being able to move the front leg accordingly.

Performance of the ollie maneuver depends on muscle power and timing. This can mean that excessive muscle strain and force, especially combined with impact to similar muscles, can reduce the ability of the skater over time.

Graphics: medicalnewstoday.com
After meeting with Monique, we established that it would be best to tackle the two main typical injuries that skateboarders face. She also gave me the insight to experiment with kinesio-taping, a method of assisting in muscle movements which might be beneficial for my later designs.

I then met with Mikael Avery, a professor in the Industrial Design program and a practicing occupation therapist to discuss braces and supports that are typically recommended for performance activities. We concluded that offering support for developing injuries or after injuries was best rather than before injuries, as reliance on braces could cause additional problems. This would come to influence my design direction and how I addressed injuries.

I started creating my network by contacting some of the resources on campus that are experts not only in general healthcare, but have an extensive knowledge in Occupational Therapy, and have experience diagnosing foot injuries and solutions.

Monique Chabot – OTD, MS, OTR
Occupational Therapy Professor
Jefferson University

Mikael Avery – MSOT MArch, BSLA
Adjunct Industrial Design Professor
Jefferson University

While I was meeting with them, I was doing my own performance testing – figuring out what the products both recommended/designed for skateboarding and for general sports performed like, and so that I could present these to skaters and have them skate in them to give me feedback.

These insights carried into my design considerations moving forward.
Kinesio-taping

Kinesio tape and the Kinesio® Taping Method is a therapeutic taping technique that is intended to offer support to muscles around the body, as well as assisting in rehabilitation for injuries and conditions. The tape causes no compression on the skin, and can be intended to be worn for up to 3-5 days. The premise is that the patient's lymph and blood circulation become more focused in those areas, which can help in rehab and in relieving pain.

Using the tape, I experimented with different patterns and tensions to see if there was any potential benefit from using it.

“It was designed to run with the contours of the skin... It allows free movement of lymphatic fluid, reducing friction between the tissues and the skin.”
- Gavin Daglish, Mike Varney Physiotherapy, Essex U.K. Source: Sports Medicine

Over pronation in the feet can be an effect of one’s natural gait, or a result of incorrectly-developed muscle memory for an activity, or as the body’s instinctive response to work around pain from another injury.

In practice, kinesio-tape allows the user to relieve and influence this by creating directional tension, which can assist in correcting any issues.

Based on my conclusions, I found that the amount of pressure given from these specific patterns provided a comfortable support while not preventing the typical muscle movements when skating. These patterns of resisting and assisting in muscle movements directly informed my placement of materials within the products I began designing, for areas of stretch, padding, flexibility, structure, and compression.
In order to get a better understanding of the impacts of gait on the foot while skating, I documented the pushing process from multiple views to see if any inherent pronation or supination occurred. With skateboarding footwear having such a strong inspiration in the past from basketball footwear and the protective considerations of those shoes, I wanted to see what I saw, there was not a significant amount of evidence that the skater would push with any angular distortion, however I was able to get a better understanding of where in the foot the most stress during the pushing process comes from, as well as at which points any pronation or inversion might be occurring when injured.

What I realized was that skateboarding had a similar push as other sports when looking at the foot from the side. What can be different though, is the way that skateboarders push next to their board. Because your forward foot is offset from the ground by the board’s height, your pushing foot’s gait is now forced to be lowered than if running. While this typically does not directly create any issues, it was something I took into account with the way that forces while skating around may influence pressures and support on the feet.

The height of the board is offset from the ground, creating an offset in a skater’s typical gait.
Interview with The Daily Push

Skateboarders typically don’t refer to themselves as athletes, and because of this, the development of medical and health professionals specific to their sport and needs does not yet exist.

However, that has been recently changing. A small group of physiotherapists that specialize and emphasize health and recovery tips for skateboarding have started to gain traction, through not only social media platforms like Instagram and Facebook, but through their local communities and professional skateboarder clients as well.

I talked to a few of these physiotherapists to get their pointed, direct insight and expertise of how to develop supportive and protective gear for a skateboarder's feet, and to get their insight on my concepts later on. These are some of the main takeaways I gained.

Jeroen Stam – Skateboarding Physiotherapist – Netherlands @Skateboardingphysio

M: What are some of the things that you recommend for skaters for warming up, as well as cooling down after a session?

J: I recommend the RAMP principle for warming up – Raise your heart rate, blood pressure, and blood flow. Activate and Mobilize muscles and joints concerning the activity, and Potential – preparing your muscles to do their absolute best. In general, I suggest dynamic stretching for warming up, and to leave static stretching – like holding stretches and foam rolling – for cooling down and recovery.

M: Do you feel that skaters can be made more informed and incentivized to be more considerate and take better care of their bodies through a product?

J: I do really believe in education, teaching skaters how to treat their bodies in a good and reasonable way. So I think if something could assist the skateboarder in that way, it would be great. But beside foam rollers and that kind of stuff I don't see anything to make it easier or quicker. The warming up has a goal and to me it feels like cheating if you take the easy way out. My experience is that everyth.shareed that makes something easier or quicker has a negative effect somewhere down the line. You want to let your body know what you’re doing before you skate the sh$t out of it.

M: What are some typical problems that skaters have with ankle braces when it comes to treatment of their injuries?

J: The restriction in motion. But that's the whole idea of a brace, to limit motion so you feel less pain. Also, pressure points under the foot where the brace stops. They can hurt really bad after a day of skating.

M: What percentage of injuries and recovery do you feel could be influenced or prevented by a product like a brace or insole?

J: Ankle injury would be more like 90% regimen based, but heel bruises or front foot bruises would be like 50% equipment based. But generally speaking I would say that 80% is regimen and 20% is gear based.

I only recommend braces when returning to skating. They're not that good in preventing ankle injury, but they are good in helping you do kickflips without pain after an ankle injury. It's important to know that for preventing injuries like an ankle injury, the brace or shoe or whatever tool you use, has to withstand bodyweight and added forces created by gravity and momentum. This adds up to multiple times your bodyweight. So a shoe or brace has to become real sturdy or bulky and not feel being sturdy, rigid or bulky. So if that middle ground can be found that would be awesome, but until then training your body is the best way. At least in my eyes.

M: What are your thoughts on ankle braces, and the problems skateboarders typically have with them?

J: Considering the amount of mobility required in the ankle, it might be difficult to offer support whilst maintaining the necessary freedom of movement in the ankle, and not feeling too restrictive. However, maybe it would be beneficial if the brace allowed freedom of movement within the normal range of motion of a skater’s ankle (e.g. between neutral and the point of maximal inversion when doing a kickflip), but then stiffens up at the end point of normal range of motion.

M: Based on the insoles out there in the market, such as Footprint or Etcetera, what do you think could be improved?

J: I would also focus on having some protection under the ball of the foot on the insole, like Footprint do. I remember reading a paper where they had skaters do different tricks on and off of a force plate, and they showed most of the force would go through the ball of the foot.

The question of how to convince skaters to adopt healthier practices is one that I’ve struggled with a lot during the creation of my site. I still can’t tell you exactly what works but my theory is pretty much that we have to sell it to them, like any product. Explain to them why they want it, e.g. to improve how they skate. Also all skaters want to skate as long as possible and the idea that one day they won’t be able to be scary so showing that considering a healthier lifestyle will help them skate for longer can be a good route as well.

“Let your body know what you’re doing before you scare the s$h*t out of it.”

Matt Beare– The Daily Push – UK @the.daily.push

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M: As someone promoting the wellness and fitness of skaters, what is your approach to trying to help inform skaters on your content?

J: In general skaters can be pretty insecure around these kinds of things and it definitely isn’t considered “cool” yet. For this problem I’ve tried to keep the presentation of the info light-hearted and as durable as the most insecure skater. For example in the warm up the cardio option is just skating, and the dynamic stretches don’t necessarily call much attention. It seems a little stupid but that’s how it is.

M: Are there any products out there right now that you see as helpful in making skaters want to warm up or cool down more?

J: I’ve thought about recommending equipment in the past, and I mean it could be helpful for a normal athlete, but I think tools to bring on the session aren’t that necessary and could just make some skaters feel uncomfortable.

M: What other thoughts do you have for me to consider?

J: Make sure not to forget about breathability - current braces get super sweaty quickly and really uncomfortable. The sweatiest the braces get, the more they start slipping out of place.

The material used plays a large role in the comfort and performance.

Focus on supporting the skater when they are skating and afterwards through the benefits of the material.

Provide supportive tension but allow for the needed range of motion.
I started by creating my performance analysis, which started with the core element – the foot. I needed to get a better sense of how the anatomy of the foot can be affected by footwear and injuries.

I then analyzed the bloodflow within the foot, and where the path of the main muscles fall. This would be important to keep in mind for addressing better performance and material placement.

Based on what I learned, I developed patterns for the basic needs of a sock for skateboarding, as well as for a higher performance product, utilizing compression.
As a skateboarder and backed up by my research, I developed benchmarks for the different needs of the insole and outsole of the shoe in different areas, and how those areas performed in terms of factors like support and wear.
I extended those considerations into the upper of the shoe, so that when it came time to design, I would have a foundation of performance knowledge to guide me through the material placement and construction.

Takeaways from health professionals:

Kinesio-taping can be used to test the effect of manipulating muscles in the ankle and foot with tension, and inspire performance patterns.

Trying to cheat or make it easier to warm-up/cool-down can do more harm than good.

Skaters will be more accepting to the benefits when presented not as health benefits, but skating benefits.

Conclusions for my direction:

Support around the foot has to match the injury and skating scenario, and not interfere with comfortable muscle motions.

Focus on supporting the skater when they are skating and afterwards through the benefits of the material.

Proper exercise needs to be advocated for, but not integrated into the design.
3 Market Research
Skateboarding footwear really took off as being differentiated from other sports footwear in the 1980’s and 90’s – iconic shoes like the eS Koston line brought in a wave of basketball-inspired skateshoes to the industry, and many even preferred to skate in Nike’s Jordan 1. These bulkier, tank-like shoes provided not only significant cushioning, but used a lot of layered suedes and leathers to create the most durable shoes possible. Only available at skate shops or by mail order, many of these shoes would wear down or break apart in the construction far before you’d wear through the material, but it came at the added cost of bulk, loss of boardfeel, and use of lots of material.

Due to changes in fashion, the demand for more board feel and slimmer looks, many modern skate shoe brands have cut out the rugged materiality and protective designs for simpler, more clean-cut silhouettes. Many of these tout significantly better board feel, but with that comes less protection from the impact of the ground, fueling the cycle of foot injuries. While there are brands that still carry some of their more padded models as legacy products, there is no superior option or construction that has outlasted the shifts in style and fashion.
Market Analysis

By 2020, skateboarding footwear will be a $1.6 billion industry. Here's what's selling.

I did a thorough market analysis of the skate shoe portfolios that many of the current top brands sell, and I took away a few main things.

rising price range.

With the addition of more technical materials and more performance-based technologies built into the shoes and insoles, the market has seen a climb in the higher-end skate shoe price point. Many larger brands like Nike, Adidas, and New Balance bring in their fashion product "drop" style into skate footwear, often releasing special run shoes or offering the ultimate tech shoe in addition to more traditional silhouettes.

authentically technical.

In order to compete and to stand out from the growing crowd of skate shoe brands, products with more technical features, materials, and technologies are being pushed to the consumer. In order to appeal to skaters, brands continue to mesh these new features into the classic styling of their product lines to innovate.

very few women's shoes.

While many brands are finally adding female riders and giving them their own colorways of classic shoes, very few if any are actually providing them with their own pro models. In fact, many brands still don't even have a women's skate shoe section of their website or product line. And of those that do, they mostly offer women's colorways of the Men's teams' pro shoes.
On the Rise

Slimmer silhouettes and low-cut shoes are losing their appeal, and bulky tank-shoes of the past aren’t coming back.

Many skaters are willing to pay a higher price point for better performance and longer lasting shoes. Many technology and material innovations of basketball and running footwear, such as air bags, lacing strategies, and more have trickled into skate shoes, but much of it isn’t proven to actually help, especially as the shoe becomes more worn through.

None attempt to innovate the method of preventing injuries.
Innovations in running and casual footwear have potential in skateboarding footwear, in the same way that basketball shoes influenced skate shoes for so long as well.

Under Armour Architech
Trainer Shoe – 2017

Under Armour’s new Architech line has promoted not only that they mean business in performance footwear, but that 3D printing does too. Using an algorithmically-generated lattice structure in the midsole, and a neoprene zippered ankle wrap, the Architech sits at a $300 price point, but shows that innovations in cushioning using these production methods are coming, although significant development is still needed before they become largely commercial.

The design of footwear has changed significantly over time, but the art of fitting and making footwear is ancient, and is often presented as more of an artform than a health-focused product.

Small variations in shoes have been known to cause ankle pain, back pain, and even headaches. Depending on the shape of your foot and the forces that you subject it to, the requirements that the shoe has to provide can be very specific. Podiatry and biomechanics go hand in hand, and it is required to understand those factors in order to find the most versatile specifications to cover a broad spectrum of users with a high performance product.

Nike Considered Line
Casual – 2005-2008

What started as a goal to create product with a reduced environmental impact turned into a line that eventually brought those principles into the goal of all of Nike’s products. The Considered shoes reduced solvent use by 80%, and used leather from tanneries that used recycled wastewater. The outsoles used Nike Grind material, a recycled composite of reject sole rubber. Hemp, veg-tan leather, and other natural materials were used in place of typical price-point alternatives. This line did not last very long, but it proved that the industry could do a lot to improve, and it’s powerful “What if?” approach presents a shift in the footwear industry that is just now beginning to shift the industry.

KI Ecobe – Red Dot Award Winner
Casual Shoe – 2016

Frustrated with fast fashion and the use of toxic adhesives in manufacturing, an independent brand called KI Oriental in Korea developed this incredible simple, innovative footwear design, using only 6 parts, no glue, and a vast range of possible combinations. And it only takes 5 minutes to assemble with only a small amount of machinery, eliminating toxic factory environments and reducing waste. The KI Ecobe is a great example of the innovative power coming out of many independent brands and kickstarter campaigns, and the potential to fight the industry Goliath’s with a simple idea.

While this product is a great modular design, functioning as a great indoor bootie shoe and a casual walking shoe, it unfortunately doesn’t cater to performance. With expanded development into different areas of footwear, such as skateboarding, this concept could explode the entire industry and how we think about supporting our feet.
Unsustainable Footwear

Many of the more sustainable shoes lack any significant performance, limiting their market and usefulness.

Typical shoe construction provides great performance, but does not allow for deconstruction or recycling.

There are very few shoes that reach even close to full sustainability, especially in the performance and sport divisions. Based on the materials most commonly used, manufacturing methods and locations, there is clearly a lot of room to grow. While some of what is ineffective about typical footwear construction comes from materials, transportation, inventory, dyeing, and processing are crucial factors as well.
Weartested.com Product Analysis

In order to get a better understanding of the materials inside of skate shoes besides my initial shoe breakdown, I used an online resource called Weartested.com to not only understanding materiality but also how the performance was impacted by the construction.
Most affordable braces are meant for any sport.

With the addition of more technical materials and more performance-based technologies built into the shoes and insoles, the market has seen a climb in the higher-end skate shoe price point. Many larger brands like Nike, Adidas, and New Balance bring in their fashion product “drop” style into skate footwear, often releasing special run shoes or offering the ultimate tech shoe in addition to more traditional silhouettes.

Support sleeves provide compression, and braces provide stiff support. Few provide both.

Typically there are two different areas of supportive gear for ankle injuries that are bought over the counter – braces, which often have laces or webbing and stiffer materials, or supports, which are often compressive knit sleeves that can be uncomfortable under the foot, not breathable, and hard to fit overtop of socks or inside of some skate shoes.

All black everything.

Most braces keep it pretty simple and stick to black with accent colors highlighting the branding or straps. Because of this, it makes it very easy to identify that someone is wearing a brace or support. While this may not be an issue for other sports, this can be a large factor in skateboarding, as the stigma of wearing protective gear or letting supports influence your appearance can be a large factor in their use among injured skateboarders.
By 2022, the global footwear insole market will be a $1.7 billion industry. Here's what's selling.

Many insoles tout their placement of cushioning pods and stiffer materials as the advantages to their products. Many skate shoes even just use a giant chunk of foam, and get similar feedback from skateboarders. What's come into the market over the past 10 years is customizable insoles, like Z-Coil, OrthoSole, and versions made for hockey skates. These customized versions rise into the $40-60 range, but this is expensive for the skateboarding consumer.
“Performance Yarns Drive Innovation Explosion in Athletic Socks”

Consumers are searching more for advanced technology in their socks, especially because of the number of performance fibers available that are innovating qualities such as breathability, moisture-wicking, cushioning, coloration, and more. Stance socks, the largest extreme-sport (mostly skateboarding) focused company, has been debated as to their performance, but what they do offer is complex and attractive patterns that appeal heavily to skateboarders.

Many current solutions address general performance needs, but lack the engineered design specific to a skateboarder’s needs. SmartWool manufactures almost entirely in the U.S. and is the leading outdoor sock brand in the U.S., indicating that domestic manufacturing is very viable. Skate socks currently lack the complex design that other athletic sports have, and do not have many considerations specific to a skater’s needs, such as compression and ankle/shin padding.

“Socks aren’t meant to take a beating like shoes, but if I gotta hole in my skate shoe then I usually get one in my sock.”
Once I had established my benchmarks, I was ready to move into the design process. I knew to keep my insights, research, and resources in mind as I developed the project further, and communicated often with my mentors and network to make sure I was addressing everything I needed to create successful products.

- Authentically technical.
- Design for women and men
- Provide compression and proper, stiff support.
- Customization
- Balance quality and comfort with longer lasting materials
- Affordability
- Provide hidden protection to work around the stigma of wearing protective gear.

From here I was ready to begin designing.
there was a system where everything worked together?

Instead of buying these products separately...

Each components of the system will be offered in different variations for different needs and levels of support. This allows for customization of your kit and being able to replace only what's necessary.

Sock
Provides compression, resists/assists in movements of muscles, and the support is hidden by graphic prints and patterns.

Insole
Sits inside of sockliner / brace. Has swappable support pieces which vary in density and thickness to customize for comfort and support. Kit would come with alternate pieces to swap out at any time.

Sockliner / Brace
Insole is placed inside of the sockliner, which can be swapped out for upgraded versions such as ankle or heel braces. It sits on top of the strobel board of the shoe. This way you could replace the shoe and keep the sockliner. Stiffer structures are integrated using knit technology to offer zoned support and protection. The brace look and aesthetic is hidden by graphic patterns and prints.

Shoe
Durable materials, hidden asymmetrical safety features, a full length midsole, and rubber outsole.
Design Criteria

360° Hidden Protection
Protecting every part of the lower leg without it being obvious.

Customize
Providing customization in fit, protection, and style.

Longer-Lasting
Using high performance materials to elevate the lifecycle of the products.

Inclusive
Creating products for all skaters, not just young men.

Eco-friendly
Address ways to create a smaller, cleaner impact on the environment.

Educate
Helping skaters understand when they are hurting themselves, and how to prevent it.
As I felt the need to gain some industry perspective and advice, I got in contact with Nathan VanHook, a Senior Design Director at Nike. Throughout the project, I provided him with project updates and used these as a tool for gaining insight from other industry professionals as well in addition to his comments back.

I began taking my wide-scoping concepts and pinpointing ideas that could help not only alter the construction and assembly of the footwear, but cater to the performance needs of skate shoes.

Nate VanHook
Senior Creative Director at Nike Football

As I felt the need to gain some industry perspective and advice, I got in contact with Nathan VanHook, a Senior Design Director at Nike. Throughout the project, I provided him with project updates and used these as a tool for gaining insight from other industry professionals as well in addition to his comments back.

I began taking my wide-scoping concepts and pinpointing ideas that could help not only alter the construction and assembly of the footwear, but cater to the performance needs of skate shoes.
Before I could further develop my initial concepts, I needed to talk to health professionals, who would help me better understand how and where I could influence the skater's feet, and in which ways were best for the types of injuries I was trying to prevent. They helped me establish criteria and pinpoint areas, which I then used to develop the performance analysis for the considered components, some of which is shown down below (see pages 58-62 for larger images).
I started out by presenting some initial concepts to skaters, and working through initial rounds of thinking of how the system might break apart. Initially I proposed concepts that featured a removable outsole, but I found that through talking to skaters and professionals, it seemed that the best methods of preventing injuries was less about innovating the construction of the shoe, and more about the material placement.

"The injuries you mentioned are common injuries for runners and basketball players – I think if you look at ways those sports have attempted to solve those injuries it will give you a direction of how to engineer the midsole/outsole/insole tooling for your shoe."

– Alan Lugo, Bill of Materials Manager at Merrell

By integrating graphic prints into the brace/sock, it hides the safety intent and makes it more fun to wear.
How It Might Work

At that point, I had to think of how a modular “system” of a skate shoe might exist – there’s not really anything in the market currently in footwear that works this way. I considered different factors of how to influence a skater’s health, as well as how skaters go about purchasing their gear. This exercise helped me raise some questions and considerations that I could bring forward as I developed the system.

1. **Buy kit or individual products at local skateshop or online**
2. **Open up box, read exercise pamphlet and set up insole**
3. **Warm up for skate session**
4. **Slide foot into sock and adjust to comfort**
5. **Go home, take shoes off**
6. **Cool down afterwards**
7. **Socks help with muscle recovery**
8. **Skate!**

Design Development

- **should the sockliner go into the shoe first, or onto the foot first?**
- **how does the sockliner latch into the shoe, and stay there?**
- **how much can this be influenced?**
Design Development – Performance Socks

- **Stylish Patterns**
- **Protect the ankles and shins**
- **Supportive materials and fibers**
- **Design for women and men**
- **Provide compression and proper, stiff support.**
- **Provide hidden protection to work around the stigma of wearing protective gear.**
Shin padding

Heel cushioning

Celliant performance yarn

Compression patterns

Heel cushioning
I think you need to think about durability of the sock so maybe having zoned sections of protection as well as maintain durability.

Cool down afterwards socks help with muscle recovery.
Kinesio-taping and Drawing Patterns

These kinesio-taping patterns that I was testing and learning from helped me identify how it might be best to support the ankle, heel, and arch. It became apparent that using an elongated stretch area along the side of the ankle and shin would help support ankle movement, but making sure that the compression and stretch went around the bone itself. Also avoiding too stiff of a pattern in the direct instep pocket was crucial, but having tension that wrapped over and around the front and back of the arch/instep felt supportive as well.

I then started mapping out these patterns onto socks, which helped me transfer them into more accurate and usable patterns off of a foot, and to get proportions correct. These translated into some of the early patterns that I used to communicate with the textile mill I was working with, Manufacturing Solutions Center in Hickory, North Carolina.
First Round of Performance Sock Prototypes

The first prototypes we developed featured a very soft yarn, and had a lower-placed front padding than we needed it to be. The sock needed to be extended farther up the leg as well. Overall though, the padding under the foot and the tight support pattern around the ankle was noticeable, and testing with skateboarders provided insight into how they felt.

“They keep falling down but they feel pretty good.”
– Erica Blair

“You can definitely feel the cushioning under the heel and toes.”
– Michael Bielawa
The second round of prototypes were elongated along the collar, and used a more specialized performance yarn from Unifi. The compression in the arch and around the ankle were amplified slightly for this round, and used color to highlight the different zones in line with one of the colorways that I designed inspired by Guangzhou (see page 192).
Moving forward, I proposed working with the Celliant team to integrate their performance yarn into the sock. Celliant fiber features infrared-emitting particles, which helps to increase bloodflow, which can help to not only benefit the wearer’s performance, but also in the recovery process for their muscles as well. This would be very beneficial to skateboarders, who often do not warm up or cool down when they skate.
Design Development – Modular Insole

Design for women and men

Stylish Patterns

Supportive materials and fibers

Balance quality and comfort with longer lasting materials

Customization

Provide hidden protection to work around the stigma of wearing protective gear.
Design Development – Modular Insole

- Heel Cushioning
- Odor resistance
- Arch support
- Customized fit
- Trim-to-fit
- Breathability
Modular Insole – Initial Concepts

For the modular insole component of the system, I knew I needed to develop an insole that was not flat, and contoured better to the foot than traditional skate insoles. I knew I wanted it to support the main areas of the foot – the arch, heel, and forefoot. Based on some of my early ideation, I knew I would need to reach out to some experts in orthopedic products, as well as to begin doing my own tests for the shapes and contours I was thinking of.
In my market research for performance insoles, I came across OrthoSole, a customizable insole product intended for elevating the comfort inside of shoes for the average person. Ronnie Irani, founder of OrthoSole and former professional Cricket player, was excited to talk to me about my project and how I wanted to do something similar for skateboarders.

We discussed manufacturing, development material selection, and how to market the product to skateboarders, who are much more picky and counter-culture in their approach to these types of products.

I also kept in mind other insoles that functioned similarly; ones that had removable pieces, and ones that did not.

“Your feet are your eyes.”
– Ronnie Irani, founder of OrthoSole

I gained hands-on experience with many types of insoles to see which felt and performed the best, and which held up to their claims.
Modular Insole Prototyping and Testing

I took some of my initial concepts and did early mockups of layers of foams and other materials to feel how they compressed.

I then began using Rhino to develop contoured forms, and testing with users to see which felt proper and the most supportive to their arch and heel. I began sharing these concepts with Derek Wilson of MatPlus, an orthotics supply company. He gave me insight not only in the material I would use, but how to develop the modular system.

“You’re going to be able to influence the arch and the heel the most I think. The toebox and forefoot are typically more guided by your last’s shape, and you don’t want to interfere with the flex of the shoe and the front of your arch. Those areas are where you can make the most impact.”

– Derek Wilson, MatPlus

“The feel of a different insole can take a while to get used to, and I think swapping out different parts of the insole depending on what you want to skate might be seen as too much of a hassle to actually do mid-session, but could be helpful if they don’t have to change it out often.”

– Matt Beare, The Daily Push
Design Details – Modular Insole

“I don’t see anything wrong with your insole design at all – material placement, the concept, it makes sense.”
– Dr. Pedowitz, The Rothman Institute

Agion anti-microbial coating

Velcro holds removable pieces in place

2 densities of pieces to provide many options

grooves help insole stay in place inside of brace
How the Modular Insole Kit Works

Purchase the insole kit from your local skateshop

Open the insole kit packaging

Remove the insole base pieces (2) and the modular arch and heel pieces (4 + 4)

Choose the piece density that matches your type of skating and comfort needs and snap onto the velcro zones of the insole bases

Insert the assembled insoles into the removable brace piece.

Insert the brace into the skate shoe and lace it up.
Design Development – Removable Brace

Stylish Patterns

Protect the ankles and shins

Supportive materials and fibers

Design for women and men

Provide compression and proper, stiff support.

Provide hidden protection to work around the stigma of wearing protective gear.

Customization

Balance quality and comfort with longer lasting materials

Innovative textile construction

Design Development
Ankle Support

Celliant performance yarn

Snug internal fit

Customization per foot

Heel support

Breathability

Lateral / medial arch support

Brace versions

Machine washable
For my initial concepts of the removable brace “sockliner” component of the system, I referenced back to my performance analysis for the sock to make sure I would not be interfering with the structures of the sock in the next external layer from the foot.

I knew that the removable brace would need different versions - a “standard” version for when you are not injured, a version for when you’ve got an ankle injury, as well as a version for when your heel is injured, whether it be from heel bruises or a need for additional heel cushioning and support.

I took these sketches back to OT professionals as well as shared them with skateboarders to get their thoughts on how this would insert into the shoe, what became too complex, and what appearances they would want to see it in.
From my insights discussing with professionals, I began taking a similar approach to the removable brace as I did with the performance socks. I used normal socks and inserted pieces of foam into them, underneath them, in order to see how the removable brace should interact and be connected within the shoe system.

“It’s not about the material thickness - it’s about the support.”
- Monique Chabot

“Super hyped to see the sockliner in there for skating. I have trainers with that and it’s a game changer.”
One feature I needed to figure out was how to keep the removable brace in place within the shoe. I began testing different 3M GM series grip patterns to see which patterns provided the proper amount of resistance and ease of going in and out of the shoes. I came to the conclusion that I would actually not need the material at all, as it was more important to allow the removable brace to contour and move with the foot itself, and instead to be locked-down to the shoe in the lace area and along the heel tab rather than underneath of the foot.

Some of my first mockups were intended to just figure out a form that would slide and fit inside of a skate shoe, and that I could insert my foot into while it was inside of the shoe. This became the better way to put the system onto the foot, rather than the brace onto the foot, then into the shoe. From these prototypes, I also tested different wrap patterns that would be used in accordance with the ankle and heel brace versions of the brace.
Iterating the Removable Brace

“What you need is a hugging, compressive fit, and many braces use materials that are more forced to be tight. It seems like the sockliners and the knit material will do just that, but without the awkward force.”

– Dr. Pedowitz, The Rothman Institute

I made many prototypes to test what structure would fit best inside of the shoe, as well as whether or not I needed a base that functioned as a secondary strobel material. Since the insole was going to sit on top of this, having a stiff, flat structure worked great, except it made the brace fit much tighter and didn’t exactly contour to the user’s foot. Additionally, heel and front tabs were added to help pull the brace up and to lace into the shoe.
Final Removable Brace Prototypes

Brace can be easily folded up and washed like a normal sock

Celliant performance yarn promotes bloodflow leading to more energy, increased performance and faster recovery.

Agion anti-microbial coating

Grilon low-melt base yarn for added stiffness

Ankle support structure

Light stretch pattern for breathability

“What you need is comfortable support. Highlight the areas of support and assistance – let them [skaters] know they are there to help.”

– Dr. Pedowitz, The Rothman Institute
Design Development – Skate Shoe

Design Development

Design for women and men

Stylish Patterns

Supportive materials and fibers

Balance quality and comfort with longer lasting materials

Address the impact on the environment

Provide hidden protection to work around the stigma of wearing protective gear.
Insole Development

Design Development – Skate Shoe

- Emboss pattern for lace and vamp protection
- Asymmetrical lacing
- Culturally inspired patterns
- Internal lace loops
- Breathability
- Abrasion-resistant upper materials
- Eco-friendly foams, synthetic suede + leather
For the development of the skate shoes, I made sure to keep in mind the other elements of the system that I would need to accommodate for, which also helped to drive the material placement within the shoe. Before I could move much further into the detail of the upper design, I needed to begin mocking-up and prototyping different constructions.
Skate Shoe Development – Round 1

My initial upper patterns were focused on working with proper materials like suede and sandwich mesh. I was also beginning to test new patterns using lasercutting, and some initial samples of warp-knit composites to achieve different structures and appearances.

Because of the insertion of the removable brace, I had to make adjustments to my patterns to prevent wearing and ripping from that process. Each of these prototypes was also being mocked-up with my early midsole tests as shown in red and white 3D printed plastic.
Skate Shoe Development – Round 2

My second round of prototypes was based on narrowing down pattern, lacing, and outsole variations. I then brought these prototypes to skaters and took note of where they worn down, how they felt, and which details became frivolous and which were crucial.
After identifying the type and style of upper construction that I was going to use, I went back to the drawing board and iterated many designs for the upper, combining my performance analysis and my new takeaways.

It was at this time that I began using Nike SB for the branding of the project – see page 216 for more on that topic.
My third round of prototypes was the first physical models of the final design that I had come to. I developed the physical patterns and cut out the materials that I would also use for the final models to simulate the construction as best as possible.

I used the second generation of the jacquard pattern (see page 198) that we developed, as well as foams for the emboss features, TPU hot-melt for the toecap, and a synthetic suede for the main exterior patterns.
Once I had made adjustments to the initial final pattern prototypes, I made my first full pair – these would be the skate test models. I had designed an informed and realistic upper, but I needed to validate that it would work, especially out of the materials that I was suggesting. From this pair, I knew what I needed to improve on for the final models, and that my design was working.
These photos show some of the process I went through when preparing my patterns. I used a laser-cutter to pre-cut all of my pattern pieces, then used die-sublimation and warp-knit fabrics to build the upper with the intended patterns. Once I had all of the pieces layered, I would begin assembling the upper, which only needed a few seams, mostly attaching the exterior leather/suede in the needed abrasion areas.

I then repeated this process for the final models, where I used different patterns that Regan and I had developed, and brought them up to Brooklyn ShoeSpace in Brooklyn, New York to get a more traditional and professional experience building the final pairs.
Brooklyn ShoeSpace Trip

During my trip to Brooklyn ShoeSpace, I had the opportunity to share my project and designs with the BKSS team. Throughout the 3-day intensive workshop, we worked through layering the materials, sewing the pattern pieces, and helping me optimize the construction method from what I was doing previously in order to have a better fitting and performing shoe. By the end of the weekend, I had sewn, lasted, and soled both pairs of my concept shoes.

Thank you to Keiko, Yuji, Rebecca, and Bonnie of BKSS for making this experience an enjoyable and fruitful one, and for helping me push my project farther.
Design Development – Sole

Design for women and men

Stylish Patterns

Supportive materials and fibers

Balance quality and comfort with longer lasting materials

Address the impact on the environment

Provide hidden protection to work around the stigma of wearing protective gear
My initial development for the outsole was inspired by a mixture of reference skate shoes and the performance criteria that I had developed. I wanted to integrate subtle but assistive details that would help the outsole and midsole become more stable without adding significant cost. Some of these features were the flex grooves in the forefoot, the interior ridging that changed from the forefoot to the heel for zonal stability and midsole adhesion, and the full-depth midsole coming through to the ground surface in the arch area and in the heel. These were key features that based on my footwear experience and researching skate shoes, would work to help add support and stability. However I did have a new feature that I wanted to integrate – an elastomeric shank that would be integrated into the arch area of the outsole, covered by the midsole, and hidden from the skater’s foot. My thought was that this would help add stability and support under the arch of the foot, especially protecting it from landing “primo” or on top of the side of the skateboard which can be very painful. This type of feature is more common to mountain biking and hiking shoes. However, I needed to test this before I could be certain to integrate it into the design.
When it came to designing the tread for the bottom and sidewalls of the sole, I had a large number of reference skate shoes to learn from. Much of what dictates the pattern on the bottom itself is not as important as is the placement of the general style of pattern in the right place – having more diagonal grooves in the forefoot would wear and behave better than in the heel. Regardless, I decided to create many flexible small models of patterns I was considering in order to test their flexibility, tolerance, and scale. These patterns were not only intended for the bottom of the shoe, as some were designed for the internal ribbing structure on the inside of the outsole where it meets the midsole.

Most skaters “shimmy” their foot before a trick, as a method to quickly find their ideal foot position and to set their balance. This consistent motion creates heavily worn zones on the outsole, and requires a harder rubber and a smoother but still grippy pattern.

I wanted to use an external heel cup that was the same piece as the midsole, allowing for a more indirect but supportive cupping that eliminated pieces. I was also testing to see what type of midsole contour would work. I did a combination of flexible and stiff 3D-prints to test how the contours of the potential midsole impacted not only the visual aesthetic of the shoe, but also how difficult it was to put on and take off. Most skate shoes have an internal heel cup, which is made from a stiff board and is glued into the layers. This creates a solid heel cup, but can often wear through and cause blistering, and adds more glue to the shoe construction.
Shank Testing

For the shank testing, I had come up with some initial designs to test a variety of shapes that could help me isolate which might work the best. I then cut out a strong but flexible plastic to these shapes, and inserted them into skate shoes and testing with skaters to see which were more noticeable, assistive, or awkward. I moved forward with a simple shape, which did not interfere with the flex of the forefoot of the sides of the foot, but still provided enough stability.

Based on feedback from Nathan VanHook of Nike, I wanted to figure out a way to celebrate the design of the shank, let skaters know that it was there, but to also have it be subtle. I integrated low-relief cutouts in the outsole to expose the shank through the outsole, as shown above.

“The you have a really nice design lines but that is a result of ergonomics and flex points. The other key would be to celebrate those things.”
– Nate VanHook, Nike

The difference between a shoe without the shank (top), and a shoe with the shank held inside of the shoe (bottom).
Finalizing Design and Initial Prototypes

After isolating an ideal shank form, I then brought my research and insights together to develop many iterations of the top and bottom patterns for the outsole. I took sticky-notes and highlighted details that worked for each, and brought these into further iterations.

From these designs, I then began developing mockups and prototypes of the outsole and midsole, starting with clay on a last, moving into 3D printed models, and eventually into an SLS printed model of the final design to confirm the flexibility of the sole in the right places, and to get the detail resolution needed.
I created a complete techpack in order to communicate with the CAD engineers I worked with, and to define scale and proportion for the details I was including. These can be seen in more detail in the appendix of the book.
By having the midsole and outsole as two separate density materials, it allows for the ability to colorize them in line with the intended upper material colors. The large full-length midsole becomes a large opportunity for color blocking, while the lower outsole provides for a solid base color, highlighting the grip areas along the bottom of the sidewall.

These final prototypes helped me to validate and confirm the CAD I had developed, and to help identify adjustments that would need to be made for further iterations. Some of these adjustments would be deeper arch walls, adjusted flex grooves on the sidewall, and thickening the walls of the midsole in the forefoot.

Flex grooves for lateral and medial Medial arch cup for stability Grip along front sidewall for forefoot impact

Grip along front sidewall for flicking and lateral stability
Details – Skate Shoe Outsole

- Full-depth midsole in heel and arch
- Shimmy-zone smoother texture
- Gum rubber grip along medial side
- External heel cup
Design Development – Outsole

**Midsole**
- Full heel cup support
- Thick arch and heel pods for impact support
- Ultralon Ultrastop 260 Speciality Foam

**Arch Shank**
- Stiffer arch support for stability
- TPU elastomer

**Outsole**
- Flex-grooves
- Custom tread pattern for grip
- Deep cup for midsole
- Structure grooves for added midsole adherence
- NSB-400 Gum Rubber
Outsole is poured

Arch shanks are inserted into central cavity

Asymmetrical heel cup provides higher support to the lateral side

Gum rubber along heel adds grip and resistance when using foot to slow down

Midsole is poured on top, binding the sole together

Arch shank becomes a visual detail on the bottom of the sole
I researched into the layouts and displays in skateshops to get a better sense of where this product system might live. I decided that ultimately it would be best to display the components on a custom Nike SB fixture, with prepackaged kits at the base and individual components displayed up top.

I took my prototypes to Nocturnal skateshop on South St., Philadelphia to hear what they had to say about my project and the concept business model I was proposing.
Secondary Surveying and Feedback

As I developed my product concepts, I reached back out to skateboarders and skate-shops to gain further insight and feedback on what I was proposing not only as features, but how the system would work and be sold as well.

I feel that hotter places such as Florida, skateboarders may have a hard time skating these. Our feet get very hot while skating down here, having a sock liner may make your feet get hotter quicker.

"I think you need to think about durability of the sock so maybe having zoned sections of protection as well as maintain durability."

"Every shoe and insole fit is different; the user can’t expect to know how it fits before they buy it. Not too many people buy insoles because of this reason."

"The insole system needs to be simple and easy to figure out how to make it personalized."

"My concern would be designing the sockliner to be durable enough to make replacing the outer shoe worth it. Specific concern with that is how tall the shoe is to prevent the sockliner from ripping on heel flips and etc."

"Many people at skateshops aren’t skaters, but can be a large part of the revenue, especially here in the city. Could they want this too?" - Nocturnal Skateshop, Philadelphia

"Super hyped to see the sock liner. I have trainers with that and it’s a game changer."

"The pamphlet for suggested wearing and stretching is a nice touch. I’m a huge fan of socks as well so combining all these aspects into one shoe is really cool to me. I’m excited to see where this goes."

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"Many people at skateshops aren’t skaters, but can be a large part of the revenue, especially here in the city. Could they want this too?" - Nocturnal Skateshop, Philadelphia

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"Many people at skateshops aren’t skaters, but can be a large part of the revenue, especially here in the city. Could they want this too?" - Nocturnal Skateshop, Philadelphia
Because I was going to be using an experimental layering construction method (warp knit composites, see pages 212-213) for the upper of the shoe, I took the opportunity to design a set of prints inspired by different cities globally, some being iconic to skateboarding’s growth and development, and some that are up-and-coming. These prints would be used across the skate shoes, insoles, and removable brace sockliners, as well as the packaging of the kits.
East coast skateboarding is iconic for its grittiness – the rough, torn up street spots and legendary plaza skating at Love Park, Freedom Plaza in D.C., and Nashua Street Park in Boston have produced some of the best skaters of the past generations. Often challenged by frozen winters and scorching summers, east coast skateboarders create an interesting blend of style and flow despite the terrain they push over.

San Francisco

Well-known for its incredible hills, seaside spots and great climate, San Francisco has always been a west coast landmark for skateboarding. Public spots like Embarcadero, 3rd and Army, China Banks have become legendary, and the cities growth through skateparks, companies, and youthful gentrification have made it into what it is today.
Not only is it close to the water, good weathered, and welcoming to skaters in most areas, but Barcelona also hosts some of the most beautiful (and skateable) architecture in Europe. Back in the 1990s Barcelona was a skateboarding Mecca, and still is today with spots such as MACBA, Port Forum, and many others around the city, it has become a landmark travel destination for skaters around the world.

Due to a sudden boom in building projects in the past decade, new spots and skateparks are constantly popping up around the Danish city. In relation with the city's rather small size and easy means of transportation, the city continues to make its mark in skate media with spots like Jarmers Plads and Fælledparken and the beautiful city in between. While winters are harsh in Denmark, summers are temperate and with the large acceptance of skateboarding, Copenhagen's growth continues.
Despite the political and social views of its state, Guangzhou skateboarding has been growing over the past few years. While it's online access to skate media is limited, touring skate teams, promotion of skateboarding in the Olympics, and an adapting skate culture have put this city on the map. Its incredible architecture in parks like Yuexu Park, leisurely tolerance of skateboarding, and growing community are showing a positive adoption of skateboarding in China.

Even though the city is small, Mar Del Plata in Argentina has a long skate history, great spots and nightlife, which have made Mar del Plata a haven for Argentine skaters. The popularity of spots like Alicante, Pompeya and La Rambla have led to the development of concrete skateparks and visiting skate teams on tour. A great summer climate and cold but desolate winter are leveraged by skaters to help put their city on the map.
In order to take the sock development to the next level, we took a trip down to North Carolina, to the Manufacturing Solutions Center, a textile manufacturing center connected with Catawba Valley Community College.

Here we worked with a team of textile engineers to translate my initial patterns into real prototypes. Seeing their facilities and the process first-hand, as well as walking through the design with textile professionals really helped to carry the design further and into a tangible, producable product.

After receiving the first samples, I gathered some skaters for initial testing to see what we could improve.
Jacquard Development

Working with Textile Design Masters student Regan Marriner, we developed a jacquard pattern layer that would go in-between the surface and lining layers of the upper fabric. The different structures within the layer, each having different amounts of stretch and stiffness, would provide asymmetrical performance within the shoe.

Using a low-melt Grilon yarn, just as the removable brace sockliner component does, a simple heating process would be used once the layers are constructed to add stiffness along the lateral toebox and near the arch areas along either side of the foot. To see a more detailed breakdown of the layers, see pages 246-249.
Sampling Materials

Throughout the course of the project, I contacted many material suppliers to not only test and feel their products, but to gain their insight on the use of their material for my applications. Many of them sent sample books, while others sent out large pieces of material for me to do further testing on. While I was sampling these materials, I was making sure to keep in mind the textile research that I had conducted previously, and to attempt to focus on materials and processes that would reduce the amount of impact on the environment.

The textile industry is incredibly large and encompassing, but with that comes a lot of waste. The statistics below indicate some of the shocking results that we are dealing with because of how global our effort is to deliver standardized and affordable textiles without having good environmental considerations.

- **80%** of water used by humans goes to livestock production
- **7 pairs** U.S. consumers buy on average 7 pairs of shoes every year – some of those (~1 pair) are impulse purchases
- **50%** Only 50% of hides make a successful transition to leather – the rest go to waste

Suede is the most common exterior material used in skate shoes – it's durability, consistent texture, affordability, and large number of offerings make it superior to other materials. However, leather and suede are both typically treated and processed in methods that are harmful to the environment, and a significant amount of waste is produced from the bovine and pig suede process.

- **18%** of global greenhouse gas emissions come from livestock (55% of anthropogenic nitrous oxide)

statistics from: leatherpanel.org
During my visit to The Materials Show in Wilmington, Massachusetts in January, I had the opportunity to meet and explain my project to many companies and industry professionals from companies like Ortholite, Vibram, Faytex, Clarino, and more. I was able to acquire some samples of materials and gain a better understanding hands-on whether or not certain materials would work for my application, validated by the professionals I was discussing with.
Ortholite – Insole

Ortholite’s EcoPlush material is a blend of performance foam, and rebleded foam offcuts, to create a much more eco-friendly foam material. I decided to propose this material for the insole base because of its great compression, density, and lessened impact.

Ultralon – Midsole / Upper

Ultralon Foams were a great resource to sample materials from for the outsole and midsole. Their wide range of EVA, PE, and EVA/PE Speciality Foam blends were high performing. I proposed using their Ultralon Ultrastop 260 foam for the midsole of the shoe’s sole.

MatPlus – Upper

Derek Wilson of MatPlus provided me with material samples to test with of their materials, including their synthetic suedes and leathers. Through getting to test their materials, I learned that their synthetic leather material held up better to abrasion resistance testing than any other material I tested.

Cosmo Fabrics – Strobel

Cosmo Fabrics is one of the largest global footwear material suppliers, and provided me with many samples of sandwich mesh, knit fabrics, and other materials such as foam composites, fusibles, and strobel materials, all intended for footwear. They sell a 40% recycled strobel material which I proposed instead of a conventional strobel.
As I was developing the socks and removable braces for my system, I wanted to integrate a higher performance yarn into the knit material so that it would have additional benefits beyond the integrated structure. I got in contact with Nathan Norley at Hologenix, LLC., who gave me his thoughts on my concept system and suggested using their material in a 40% blend. He provided sample materials and information for me to use to better understand the product and what it could do for skateboarders.

Celliant Performance Yarn

HOW It Works

1. Celliant’s proprietary mix of 13 thermo-reactive minerals is embedded into the core of polyester fibers during the extrusion process.

2. These embedded minerals give any product developed with Celliant the ability to absorb and re-emit the visible and infrared electromagnetic light energy emitted by the body.

3. These minerals then alter the wavelengths of this energy and reflect them back to the body, even through multiple layers of fabrics, making it possible for the tissue to absorb it.

4. The energy that Celliant recycles back to the body triggers vasodilation in the capillary bed and makes more oxygen available to your cells. This results in more fuel for your body.

5. The natural biological process improves circulation resulting in an average increase in tissue oxygenation of 7%. The result: your body uses oxygen more efficiently.

BENEFITS

- Celliant technology is clinically proven to enhance tissue oxygen levels, improve athletic performance, increase sleep quality, and enhance your overall quality of life.

- The FDA has determined that Celliant products are medical devices as defined in section 201(h) of the Federal Food, Drug and Cosmetic Act and are general wellness products.

Material Research 209
## Material Testing – Upper Fabrics

### Material Testing – Taber H18

<table>
<thead>
<tr>
<th>Material</th>
<th>Original</th>
<th>1300 cycles</th>
<th>2150 cycles</th>
<th>2250 cycles</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig Suede 1.4mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SuperFabric 905/138/902 8mm</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SuperFabric 905/136/902 8mm</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SuperFabric 600-100-960 1mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metflus Synthetic Suede 4mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metflus Synthetic Leather 1mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarino Synthetic Suede 1.2mm</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

I conducted material testing on a Taber machine using H-18 discs to compare against Taber test results I had received from material suppliers. I worked with Janet Brady and our other resources in the Grundy Lab to run the material testing, which helped me conclude that a synthetic leather had a great combination of abrasion-resistance, consistent texture, and more eco-friendly manufacturing.

I did the most real test of materials for skateboarding footwear possible – rubbing them on griptape. This gave me a more real sense of not only how much the texture of the material would change, but also how the material would rub and fray.

Because I wanted to use an emboss in the upper material to help reduce the chance of wear along the eyestay, I tested how well each material would press using 3D-printed molds and different glue combinations.

I sourced TPU film and began testing how well and with what techniques it would adhere to the list of materials that I was considering.
Woven fabrics are made from threads running vertically and horizontally, which leaves little room for variation in porosity and almost no room for stretch. This means that they lack the ability to fit and move with the foot.

“Warp knitting is the linking of stitches and loops and frees designers to vary the fabric’s architecture in ways that affect elasticity, porosity, durability, coarseness or smoothness. Warp knitting allows for the production of much wider sheets of fabric than circular knitting or weaving. It creates fabrics much less likely to sag, shrink or ravel. And, warp knitting allows for the creation of three different kinds of fabric: solid knit, mesh/netting and 3D spacer fabrics.”
- Apex Mills

Composite Warp-knits

“Die sublimation fosters a blend in process from traditional to experimental.”
- Mark Sunderland, Textile Engineer

“Warp-knits offer a whole new way of looking at the textile composition of a product – most footwear fabrics are selected out of a foreign sample book and call it a day. How often are you able to customize the stretch, durability, print, and breathability of a fabric throughout the pattern? The amount of influence that can have on the end product is huge, especially in the industry today. Typically used for aerospace, automotive, furniture, medical, filters, or other products, warp-knits bring a new element to typical footwear construction. The scraps and waste from these industries can be taken and used for footwear, allowing for the material to find a secondary purpose, just like in the typical leather industry.

“It’s artisinally automated – you can do it at the office or in the factory.”
- Mark Sunderland

Material Research
Final Proposal
Nike is a large industry player that needs to expand its influence in skateboarding beyond its classic silhouettes and addition of great skaters onto its team.

Nike has always been known for pushing the boundaries of performance, through not only material and technology innovation, but as a company through initiatives.

Nike already sells and endorses a high level of protective products and accessories for other sports, but has yet to do so for skateboarding.

Why?

visit your local skateshop

skateboarder receives items

skateshop gets new releases and products to set out on display and for trying on

Benefits for the skateshop:

NikeSB provided floor display
Skateshop gets the same cut that they would get from shelf inventory
Saves from sunk cost on otherwise unsold inventory

Benefits for the skater:

Promotes coming into the skateshop to get new or replacement pieces
Collaborations and new releases can be promoted through in-store display

Skateboarders have always questioned the authenticity of large corporations like Nike, and the Embrace System would prove that Nike is trying to do more for the shops, skaters, and culture. Nike currently offers NikeID as a method of customization, but a modular footwear concept is the next step that needs to be taken to push customization farther.

As a company that has pushed the boundaries in the past, skateboarders will need to see this same impact in their efforts to positively grow skateboarding in order to feel respected and inspired.
Business Model

The overall offerings for the Embrace system and their retail price points.

The system would be accessible to purchase and customize your kit from online.
### Kit Options

#### Embrace Yourself.

**Embrace System Retail Options**

<table>
<thead>
<tr>
<th>Components Included</th>
<th>Softy's Box</th>
<th>Standard Kit</th>
<th>Christmas Complete Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Scuffin - Low</td>
<td>All-Black Scuffin</td>
<td>High/Top Scuffin</td>
<td>High/Top Scuffin</td>
</tr>
<tr>
<td>Basic Scuffin - Standard</td>
<td>All-Black Scuffin (2x)</td>
<td>High/Top Scuffin</td>
<td>Customizable Inside Pack</td>
</tr>
<tr>
<td>Performance Scuffin - Basic Scuffin</td>
<td>All-Black Scuffin (2x)</td>
<td>High/Top Scuffin</td>
<td>High/Top Scuffin</td>
</tr>
<tr>
<td>Performance Scuffin - High/Top Scuffin</td>
<td>All-Black Scuffin (2x)</td>
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<td>Performance Scuffin</td>
</tr>
<tr>
<td></td>
<td>All-Black Scuffin (2x)</td>
<td>Customizable Inside Pack</td>
<td>Performance Scuffin</td>
</tr>
</tbody>
</table>

#### Benefits

- **Customization**: Needs for exercise and cold weather
- **Flexibility**: Cheaper way to get a new appearance
- **Protection**: Ankle protection
- **Support**: Mid-cushioned support
- **Pain Relief**: Pain relief

#### Suggested User

- *Everyday*: Casual skater, teenager, Young Adult
- *Teenagers*: Older adults (22-34), Older Adults (35+)
- *Young Adults*: Older adults (22-34), Older Adults (35+)

#### MSRP Price

- **Basic Scuffin - Low**: $30
- **Basic Scuffin - Standard**: $50
- **Performance Scuffin - Basic Scuffin**: $50
- **Performance Scuffin - High/Top Scuffin**: $60
- **All-Black Scuffin - Basic Scuffin**: $60
- **All-Black Scuffin - High/Top Scuffin**: $60
- **Customizable Inside Pack**: $65-70
- **All-Black Scuffin (2x)**: $120
- **All-Black Scuffin (2x)**: $125
- **Performance Scuffin**: $145
- **Customizable Inside Pack**: $195
- **High/Top Scuffin**: $210

#### Individual Pricing

- $10
- $20
- $15
- $5
- $20
- $15
- $20
- $15
- $10
- $20
- $15
- $15
- $20
- $15

---

**Final Proposal** 221
Sock designed to compete with typical performance socks, designed specifically for skateboarders.

Men's/Women's Colorway: N/A
Sock 5/5/18 Scale N/A

- 2x5544 R44
- G85
- B68
- fb6a46 R251
- G106
- B70
- f5ae25 R245
- G174
- B37

2x1 collar knit structure

fitted pattern knit structure

light terry cushioning shin padding

dense terry cushioning heel and arch padding

1x1 body pattern knit structure

light terry cushioning toebox protection

Forefoot
Medial
Hindfoot
Compression sock intended to provide additional support to skateboarders during and after the session.

- **2x1 collar knit structure**
- **Dense padding to support heel knit structure**
- **Breathability knit structure**
- **Fitted pattern knit structure**
- **Stiffer arch support knit structure**
- **Grip pattern along arch sidewalks knit structure**
- **Dense terry cushioning heel and arch padding**
- **Helix compression pattern knit structure**

**High Performance Sock**

- **Men's/Women's Colorway:** N/A
- **Sock Scale:** N/A
- **Date:** 5/5/18

---

EMBRACE system
EMBRACE system

Antimicrobial Yarns for Odor Control by UniFi

**A.M.Y.**

- **Product Benefits**
  - Inhibits the growth of odor-causing bacteria, mold, mildew, & algae on fabrics
  - Permanent odor control technology
  - Non-migratory
  - Extends garment life, less discoloration & degradation
  - Environmentally safe
  - Design flexibility, can be engineered into garments

Yarns used to produce the sock with moisture-wicking and other performance properties.

**Performance Sock Yarn Info.**

- **Men's/Women's Colorway:** N/A
- **Sock:** 5/5/18
- **Scale:** N/A

**Visual Indicator of Odor Control**

- With A.M.Y.: Inhibited bacteria growth, best odor control, log 4+ reduction
- Without A.M.Y.: Bacterial growth, poor odor control, no log reduction

**Odor Control Comparison**

- **Inorganic Yarns**
  - Standard Polyester
  - A.M.Y.
  - Log 4+ reduction

**Textile Tests**

- **TMC Agar Plate Test Method**
  - Uses control; negative control; inhibited growth, no odor, no smell
  - Microbial count between samples and odor in products validated

*Made of recycled paper*
EMBRACE system

When you get going, Sorbtek goes to work. An incredibly efficient catch, move, release system keeps you cool, dry and comfortable. It’s a permanent part of the fabric. So go ahead, get going. You’ve got Sorbtek.

Yarns used to produce the sock with moisture-wicking and other performance properties.

Performance Sock Yarn Info.

Yarns used to produce the sock with moisture-wicking and other performance properties.

Men/Women’s Colorway: N/A
Sock 5/5/18 Scale N/A

UNIFI
www.unifi.com

Sorbtek

Apparel Fabric Wicking Comparison

Soil Release Properties

Moisture Absorbency Comparison
Insole designed to allow skaters to customize their heel cushioning and arch support.

Men/Women’s Colorway: N/A

Insole: 5/5/18 Scale: N/A
How do you prefer to skate?

Swap the pieces to maximize your comfort.

Inside the package, you'll find 8 support pieces:
1. Left heel support
2. Left arch supports
3. Right heel support
4. Right arch supports

Test out the combinations, see what feels best, and enjoy!

Standard Setup
Feel the tread, but not sore feet.

Additional Arch Support
No pinched bunions or arch pain here.

Additional Heel Support
For jumping down stairsets, gaps, you name it.

Maximum Cushioning and Support
Tackle any obstacle with confidence.

Insole Directions
Directions placed inside of insole kit package, used to indicate how to use the insole system.

Men/Women's Colorway: N/A
Insole
5/5/18
Scale: N/A

Everyone’s feet are different, and your own two feet may be different too.

The Nike Embrace Insole Kit allows you to customize your preference and maximize your comfort for each foot.

Once you’ve fit the pieces to your preference, simply insert the correct side inside into the matching sockliner, and make sure it sits flush against the bottom foam.

Then, attach the sockliner into the shoe as normal. Lace the shoe through the loops of the sockliner, then tie the shoe to the fit you want.

If you want to change the insole setup, simply slide the insole out of the sockliner, swap the pieces, and insert it back in.
EMBRACE system

Used for 3D printing full scale insole base, heel, and arch support pieces.

Men/Women's  Colorway: N/A

Insole  5/5/18  Scale N/A

Insole CAD Techpack

235
EMBRACE system

Knit piece used to provide additional support to the foot, with variations for injury assistance.

Removable Brace – Standard

Men's/Women's  Colorway: N/A
Sockliner  5/5/18  Scale N/A

**Low profile**
Ideal for hot summers and warmer climates, for when you're wearing low-cut socks, or for skaters who prefer a more free ankle.

**Standard profile**

- **breathable instep**
- **terry padding**

- **GRILON base**
- **stiffer arch support**
- **breathable pointelles**
EMBRACE system

Removable Brace – Heel Brace
Knit piece used to provide additional support to the foot, with variations for injury assistance.

Men's/Women's: N/A
Sockliner: 5/5/18
Scale: N/A

heel pull
webbing

pull-over strap
elastic

compression in central instep
knit structure

terry instep padding
knit structure

breathable instep
knit structure

hook and loop lockdown
sewn down

GRILON base
knit structure

stiffer arch support
knit structure

heel support
closed-cell foam

shoe connection snap
metal snap

heel support
closed-cell foam

Lateral View

Medial View

Back View

Front View
EMBRACE system

Removable Brace – Ankle Brace
Knit piece used to provide additional support to the foot, with variations for injury assistance.

Men's/Women's Colorway: N/A
Sockliner 5/5/18 Scale N/A

241240
Skate Shoe Techpack – Mid
Detailed techpack for the mid-top version of the skate shoe.

- Synthetic leather
- TPU Nike logo
- Inside lace loops
- Vamp emboss
- TPU mudguard
- Vamp perforation
- Eyestay emboss
- Jacquard warp-knit composite

Size 9D / 43
Colorway: Black/Barcelona
Skate Shoe: 5/5/18
Scale: N/A
Skate Shoe Techpack – High
Detailed techpack for the high-top version of the skate shoe.

Size 9D / 43
Colorway: Black/Copenhagen
Skate Shoe: 5/5/18
Scale: N/A
EMBRACE system

Layers detailing the construction of the upper of the skate shoe.

Size 9D / 43  Colorway: N/A
Skate Shoe 5/5/18  Scale N/A

Warp-Knit Composite Techpack

EMS, QUI ICE tech's Thermoplastic Specialty Yarns are made from bicomponent fibers and abrasion-resistant polyamide fibers. When treated, the fibers in the added areas fuse together with their cross-fibers, creating a stiffer, more abrasion-resistant structure.
Layers detailing the structure placement within the jacquard upper layer of the skate shoe.
Shoe Last Techpack

Used for 3D printing full scale lasts used in pattern making, fit, construction.

Size 9D / 43  Colorway: N/A
Skate Shoe  5/5/18  Scale N/A

EMBRACE system

251
EMBRACE system

Outsole Techpack

Communicating exact design details and construction for the outsole, midsole, and shank.

Size 9D / 43
Colorway: N/A
Skate Shoe 5/5/18
Scale N/A
EMBRACE system

Mockups of how the kit would be purchased online, proposing three potential kit variations.

**Purchasing Options**

<table>
<thead>
<tr>
<th>Size</th>
<th>Colorway</th>
<th>System</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>5/5/18</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Softy's Box**

$50

- Standard Insole
- Standard Sockliners
- High Performance Compensation socks

**Standard Kit**

$120

- Standard Insole
- Standard Sockliners
- Low or High Skate Shoe

**Christmas Complete Box**

$135

- Customizable Insole Kit
- Standard Sockliners
- High Performance Compensation Socks
- Low or High Skate Shoe

- Included: Standard Insole
- Colour Shown: Green/Brown
- Style: 30C151 019
- Read More

ADD TO BAG
Performance Layering

Detailing the effect of wearing the kit, indicating feature callouts of the system components.

- High Performance Compression Sock
  - Light compression
  - Breathable structure
  - Breathable pointees
  - Tight compression
  - Stiffer arch and heel structure

- Modular Insole
  - Ortholite EVA-Flash base
  - Swappable heel cushioning
  - Swappable arch support
EMBRACE system

High Performance Compression Sock

Modular Insole

Performance Layering
Detailing the effect of wearing the kit, indicating feature callouts of the system components.

Size: N/A
Colorway: N/A
System: 5/5/18
Scale: N/A
EMBRACE system

Detailing the effect of wearing the kit, indicating feature callouts of the system components.

Performance Layering

Skate Shoe

Entire system layered together
Location Inspired Skate Shoe Colorways

**Guangzhou, China**

Despite the political and social views of its state, Guangzhou skateboarding has been growing over the past few years. While it’s online access to skate media is limited, touring skate teams, promotion of skateboarding in the Olympics, and an adapting skate culture have put this city on the map. It’s incredible architecture in parks like Yuexiu Park, leisurely tolerance of skateboarding, and growing community are showing a positive adoption of skateboarding in China.

**Barcelona, Spain**

Not only is it close to the water, good weathered, and welcoming to skaters in most areas, but Barcelona also hosts some of the most beautiful (and skateable) architecture in Europe. Back in the 1990s Barcelona was a skateboarding Mecca, and still is today with spots such as MACBA, Port Forum, and many others around the city, it has become a landmark travel destination for skaters around the world.
U.S. East Coast: Philadelphia, D.C. and Boston

East coast skateboarding is iconic for its grittiness – the rough, torn up street spots and legendary plaza skating at Love Park, Freedom Plaza in D.C., and Nashua Street Park in Boston have produced some of the best skaters of the past generations. Often challenged by frozen winters and scorching summers, east coast skateboarders create an interesting blend of style and flow despite the terrain they push over.

San Francisco

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Copenhagen, Denmark

Due to a sudden boom in building projects in the past decade, new spots and skateparks are constantly popping up around the Danish city. In relation with the city’s rather small size and easy means of transportation, the city continues to make its mark in skate media with spots like Jarmers Plads and Fælledparken and the beautiful city in between. While winters are harsh in Denmark, summers are temperate and with the large acceptance of skateboarding, Copenhagen’s growth continues.

Because of the versality and customization of the die-sublimation process onto warp-knit fabrics, creating collaborations with skateshops, pro-skaters, and other brands would be much more possible and affordable for Nike.
Packaging Development

Initial mockups of the packaging.

The model I used for the video.
Packaging Techpack

Shoe box packaging die.

Removable Brace/Sockliner and Sock packaging dies.
Insole Kit packaging die.
Packaging In Use
SKATE, YOUR WAY.

To learn more, visit Nike.com/skateboarding/embrace.
Moving Forward
Lessons Learned

Developing this project helped me grow in many different areas, not only in communicating and working with professionals in textiles, materials supply, doctors and physiotherapists, and footwear designers, but in learning how to self-drive and push forward a project by myself. Developing a system of products was a task that I had no idea how it would come to life, and the experience gained from that process has helped me grow as a designer much more than becoming slightly more of an expert in the areas needed to develop them. There’s a lot more to be done to bring this concept to life, but the capstone process has facilitated the foundational development and growth to help me understand how to take my initial insight from a thought in my head to what could be a product on the shelf.

Project Takeaways

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Broader Impact

Change the way that skateboarders invest in their footwear so that they are more aware of their health, and prepared so they get injured less from skating.

Through brand adoption or through self-launch, my goal is to eventually bring this concept (or parts of it) to market, and to develop further innovations towards this cause, so that hopefully all skateboarders can continue to do what they love and feel confident in doing so.
Skaters in the latter-half of their twenties often are shifting in the type and amount of skating that they do, typically less than they did even in their early twenties. They are often gaining more responsibilities and have less available time or energy to skate the way that they used to. Many stop skating around this age, but those that do keep in mind how they’ll feel the next morning and begin making efforts to reduce the soreness and stiffness they feel between sessions.

Young skateboarders skate much more often and for longer sessions, and are the most prone to injuries because of their lack of experience and willingness to try new and larger things. They often lack regard for stretching and health because of their younger physiques, but are usually subject to their parents judgment and concerns. They will typically start with small ramps and drops, and increase in size as they become comfortable, skating all types of street, transition, and flatground terrain.

Typically, many skateboarders begin to skateboard less often once they’ve grown out of their teenage years, most often because of work or additional schooling. They often are trying to find time to skate between being busy and will typically be between obligations or errands when they have a session, rather than spending a full day like they did when they were younger. They are beginning to feel the effects of age taking their toll after sessions, especially if they push themselves harder than they have in a while. Many are reaching their prime years during this time however, and will skate anything and everything as they grow their trick arsenal, typically still pretty resistant to serious injuries. Coming of an age of social awareness, they often decide whether or not they care about the ethics behind their products, often the environmental impact of their skate shoes or which brands are socially responsible.

Appended is a table with the following information:

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<thead>
<tr>
<th>Brand</th>
<th>Features</th>
<th>Protection</th>
<th>Design/Style</th>
<th>Comfort</th>
<th>Price</th>
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*Appendix*
Skateboarding is different all over the world. The style, trick selection, and spots are totally different in the center of Hong Kong from those in the steep hills of San Francisco.

The world of skateboarding has exploded through the internet, websites like YouTube and Vimeo. The growth of eCommerce has influenced the retailing of skateboarding as well. Skateshops around the world have gone out of business, shifted to partially online retail, or formed distributions in order to compete with larger brands and chains like Zumiez.

When I asked skaters where they shop for their goods, the breakdown was fairly split between those who strictly purchased their shoes, accessories, boards, and more at skateshops as there were online. A significant portion do both evenly as well. Based on this feedback, I concluded that the purchasing decisions of many skateboarders are very hesitant, as they are torn between convenience and selection, and staying true and supporting the core shops in their local communities.

Some larger companies have tried to introduce support for this problem by selling product exclusively through skateshops, but these are often only temporary or in addition to their larger online retail revenues.
Footwear Industry Overview

Over 300 million pairs of shoes are thrown away each year, and can take 30-40 years to decompose.

More than $20 billion in pairs of shoes are manufactured each year.

Tens of thousands of pounds of new and unused parts and raw textiles are thrown out by factories each year.

Every person needs shoes. The footwear industry is one of the largest in the world, and with that insane amount of supply and demand comes many compromises and impacts to the people and the world around us. Many of us lack the knowledge of what happens to our footwear once we’ve thrown it out or donated it.

Leather/Suede
When it comes to materials, the footwear industry can be incredibly wasteful. Many brands hide behind the mentality that leather is technically a leftover material from the meat industry, yet it still requires significant processing, transportation, and waste to bring leather or suede into a product.

Knit Takeover
At this point, almost every major footwear brand produces some type of knit shoe or shoe component, with Nike and Flyknit leading the pack. The reason for this is incredibly innovative and simple –

Made in America
Making footwear in America is finding a new path as a resurgence in domestic manufacturing is not only trending, but becoming an increasingly important purchase consideration. In fact, the value of shipments for U.S. textiles and apparel was $74.4 billion in 2016, a nearly 11 percent increase since 2009, according to the National Council of Textile Organizations. Investments in fibers, yarns, fabrics and other non-apparel textile product manufacturing climbed 75% to $1.7 billion in 2015 from $960 million in 2009.

Currently, however, there are very few companies that manufacture footwear within the U.S., for not only labor cost reasons, but material supply reasons. Even fewer of them are performance footwear brands, the main one being New Balance, which sill does If a brand is looking to make an all-suede skate shoe, manufacturing in the U.S. is next to impossible, as most of the affordable tanneries and leather supply companies are overseas.

An upper being automatically stitched in a U.S. New Balance facility. This suede upper is a combination of classic footwear materials with a simplified construction, requiring less hands, pieces, and different materials.
In footwear, there is a now infamous term of, “the last comes first.” In order to develop accurately formed, intentional footwear prototypes and designs, I needed to gain access to shoe lasts. As the project developed, I not only created a last that was based off of the dimensionality that I wanted for an optimal skateboard shoe fit and performance, but I also created ankle height lasts to be able to simulate where the bones and muscles would be coming up the ankle when patterning the sockliner components, as well as higher top-line shoe prototypes.
August 2017
Establishing initial project concepts

October 2017
Project research, initial concepts, development of system

Early September 2017
Narrowing project into skateboarding

January 2018
Techpacking for MSC trip, location inspiration and further piece development

February 2018
Insole, upper and outsole development

March 2018
Textile development, finalizing designs and models, CAD techpacking and development

April 2018
Producing final models, creating presentation materials and preparing for BKSS trip.
To the professors, industry professionals, peers, friends, and family who helped me learn, grow, and develop this project and my skills as a designer – I could not have done it without you.

Eileen Martinson and the Martinson Fund – Project Sponsorship

Faculty
Mark Sunderland – Project sponsorship and mentor
Todd Kramer – Industrial Design mentor
Tod Corlett – Industrial Design mentor
Marcia Weiss – Textile Mentor
Mark Havens – Industrial Design mentor
Mike Leonard – Project and Industrial Design mentor
Janet Brady – Material Testing mentor
Mikael Avery – ID and OT
Monique Chabot – Occupation Therapy

Manufacturing Solutions Center – Hickory, North Carolina
Rodney Sigmon – Manufacturing Solutions Center
Jason Wilkins – Manufacturing Solutions Center / Innovaknits
Tony Whitener – Manufacturing Solutions Center

Brooklyn ShoeSpace – Brooklyn, New York
Keiko, Yuji, Bonnie, Rebecca

Project Development
Regan Marriner – Masters in Textile Design, B.S. Textile Design
Michael Bielawa – Junior Industrial Design

Material Suppliers and Resources
Derek Wilson – MatPlus
Ronnie Irani – OrthoSole
Matthew Teperow – Vibram
Matt Hennessy – Ortholite
Josh VanDernoot – Cosmo Fabrics

Dr. Pedowitz – Rothman Institute

Skateshops
Woodward Skate Camp
Westside Skateshop – Florida
Nocturnal Skateshop – Philadelphia
Pharmacy Skateshop – California
Union Skate Supplies – Pittsburgh

Footwear Design
Nathan VanHook – Nike
Neil Kwiatkowski – Smart Design
Carter Agvent – Cole Haan
Ian Cooke – Footprint Footwear
Matt Flail – Footprint Footwear

Matt Pennington – Clarino Leather
Matthew Burdoff – Ultraloon
Matt Beare – The Daily Push
Jeroen Starn – Skateboarding Physio
Nathan Norley – Hologenix, LLC
David O’Keefe – Adv Mat’l Technologies

Gabi Stahley + Paige Graff + Liza Marino
The entire ID Studio Family and program