Problem

Between 2011 and 2021, the STEM workforce grew by 5.9 million, from 29.0 million to 34.9 million, representing a 20% increase.

However, many students reported that the lack of lab work and "Hands-on lab experience" as their primary deterrent from online and remote education (Colman, 2020). This factor is even more significant for the practically dense fields of study. For example, engineering, medicine, and science.

Millions of students lacking access to labs means millions of brilliant minds have not fulfilled their potential, millions of groundbreaking projects have remained unrealized, and millions of life-changing discoveries have been missed. With lab access, they could have developed more efficient solar panel technologies, designed innovative wind turbine models, discovered new drugs, advanced surgical techniques, found cures for diseases like cancer and Alzheimer's, created cutting-edge artificial intelligence algorithms, optimized Internet of Things applications, and devised eco-friendly solutions to combat pollution and address climate change challenges!

What are the reasons?

Cost, pandemic effects, accessibility, excessive demand, limited resources and equipment, infrastructure and financial constraints, integration problems, safety concerns, and limited support for students from underprivileged backgrounds.

Any current solutions?

Fully virtual simulations provide online environments that access masses, but they lack access to real hardware and require specialized backgrounds. **Online lectures** prove to be ineffective as they promote passive learning and lack experimentation and feedback which is particularly crucial for STEM fields.

DID YOU KNOW?

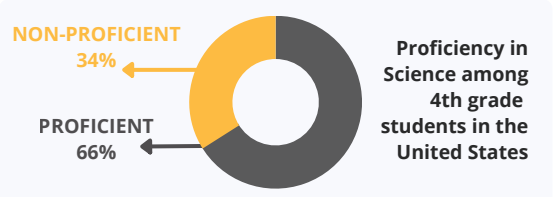
35 Million is 2021 STEM workforce

41 Million Americans lack access to a physical university

1/20 scientists are Black women or Latinas

+20% STEM workforce INCREASE

71 % of engineers are white



42% parents report that they do not have Hands-on STEM programs available for their kids

Our Solution

Hands-on Labs is a set of **collaborative remote laboratories** that allows **'any' student from 'anywhere'** to execute their commands on an industrial level robotic arm and observe their actions in real time.

Functional: Upon logging into the website, students gain access to a six-degrees of freedom robotic arm, enabling them to upload their code/input and manipulate the angles of the robot's joints. They can then observe in real-time as the robotic arm executes their commands.

Cost-friendly: Our labs, establishing and running it, is a fraction of the cost of running a physical lab while it accommodates a lot more people at once. This feature significantly reduces overall expenses while maintaining high-quality functionality.

Innovative: The robotic arm's motion controllers are seamlessly connected to an Arduino that houses the firmware. Additionally, the camera is integrated into a Raspberry Pi 4 cluster, constantly fetching data from the Azure web application.

Accessible: Our platform grants users unprecedented control over various aspects, including lighting levels, camera angles, audio controls, and various control modes to enhance the learning experience of students just with a computer and internet connection on their end!

Laboratories have become an unreachable luxury while it is, in fact, a necessity. Therefore;

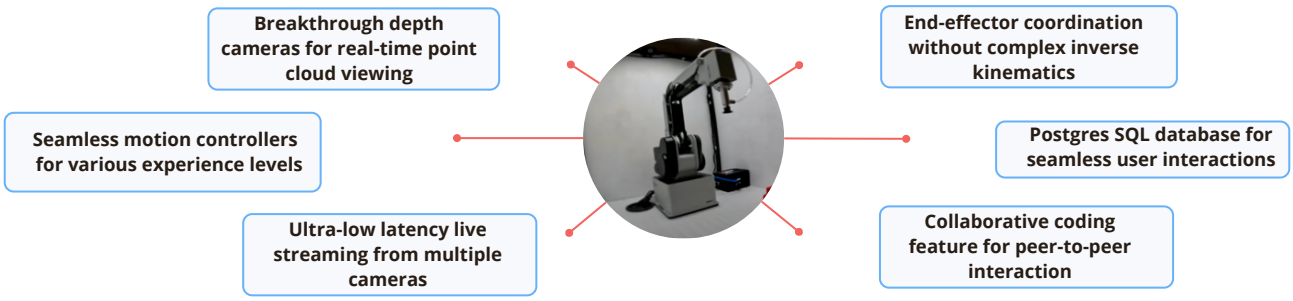
- **We break physical barriers:** Any student can access the lab and experiment with STEM from anywhere through the internet.
- **Provide experiential learning:** Students can observe and control real hardware in real-time and get visual feedback immediately.
- **Foster peer-to-peer interaction:** Students can find solutions to real-life problems by collaborating and putting their work to the test.
- **Create exciting hands-on experiences:** Students have an active learning experience to cultivate their interest through practical applications of STEM.

Current Impact

Unique value proposition

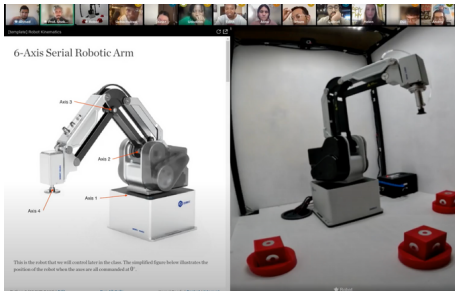
At Hands-on-Labs, our unparalleled competitive advantage lies in cutting-edge high-tech hardware - **a uniquely created, tested, and patented** technology that students can remotely access and fully control a robotic arm.

As pioneers in active learning, our platform bridges the gap between theory and practice, empowering students to engage in hands-on experimentation and develop critical STEM skills. Within our first, up & running robotics lab, **undergraduate and k-12 students can explore fields such as robotics, kinematics, physics, computer sciences (coding), and AI.**

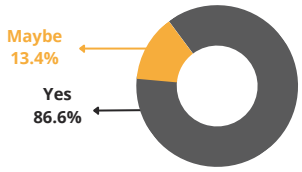


Hands-on Labs has a robotics lab that consists of a 6-degrees of freedom robotic arm, which was used in '**Harnessing Artificial Intelligence' course at Minerva University**. The students were grouped to calculate inverse kinematics for a 'pick & place' task and observed how their measures translated into movement, saw their mistakes, and re-iterate.

100% of the students indicated that this experience improved their understanding of kinematics and artificial intelligence!



Snapshot from the actual class at Minerva University while students are carrying out a pick & place task, implementing kinematics calculations during t session using our platform available at robotarm.net



*When students were asked 'would you want to experiment with Hands-on Labs while learning about robotics?', **86.6%** of the students said **"yes"** and **13.4%** of the students said **"maybe".***

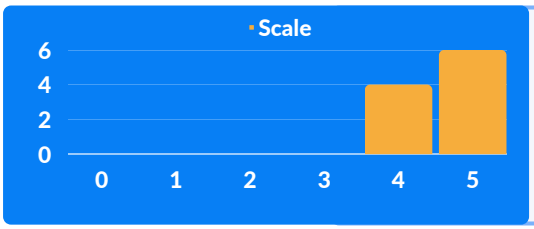
Feedback from CS152 course at Minerva University

Students

"It **helped me to understand** how everything we have learnt about forward kinematics tie together."

"It is **hard to learn robotics without an actual robot.** It helped me to see how **manipulation of joint angles translates to actual robotic movements** (the simulation also somewhat achieved this) and how coordinated movements can be used to achieve the task."

"I loved getting real-time responses as **it helped me understand real-time relationships** between angle input and the movement of the arm."



On a scale of 1 to 5, how did interacting with a real robotic arm through Hands-on Labs contributed to your online learning experience today?

Minerva University is Ranked #1 Most Innovative University in the World 2022 & 2023 by World's Universities with Real Impact (WURI)

Faculty

Rohan Shekhar, Assistant Professor at Minerva University
Until now we were only able to explore robotics theoretically, but Hands-on-Labs made it possible for students to interact with the robot in real time

Trisha Stan, NS Professor at Minerva University
This project is a good example of how projects can be utilized to help students learning remotely

Alexandra Terana, Assistant Professor at Minerva University
Working with you is a very valuable experience as long as I do business. You are the best.

Katie McKalister, Dean of Social Sciences at Minerva University
This project can be used to explore nervous systems though active learning.

Since mid-2021, with a total of $30,000 USD in micro-grants and awards, we proudly:

- **Established** our first 24/7 running remote robotics lab that students can practice a variety of subjects from computer sciences to kinematics
- **Patented** our technology
- **Served** over 300 students with diverse backgrounds for an average of 3 hours of access per student per semester at Minerva University
- **Established** all the necessary technological infrastructure, ready to serve hundreds of students

Imagine Cup

Did you know?
This revolutionary hardware has earned us recognition on a global scale, including winning the prestigious **Imagine Cup** award by **Microsoft** among competing projects from 2 million students from 160 countries!

Future Impact

Over the next two years, we are on a mission to make a difference in the lives of **2000 students** from **diverse demographics, grades, and skill levels,** through our lab.

Our vision is to offer each student a rewarding experiential learning experience with a **minimum of two hours** in our cutting-edge remote robotics lab. Through our thorough financial analysis, we estimated the **cost per student per hour to be just $200.**

Together, let's unlock the potential of these young minds and pave the way for a brighter, tech-driven future!"

Student Potential

You can catalyze global progress and extend impact to more than four student categories that have traditionally been underserved, despite a significant market need:

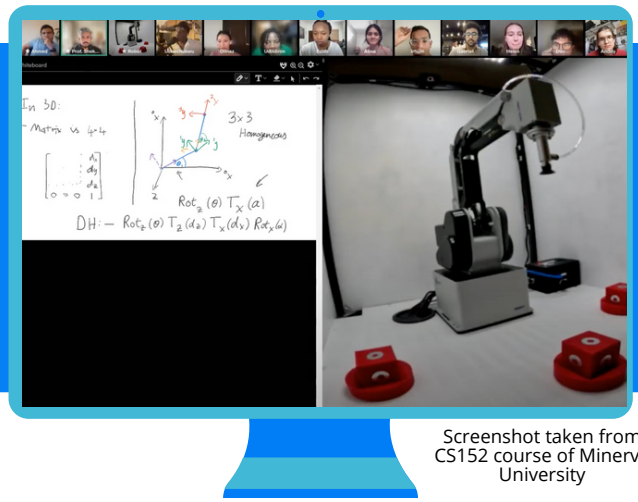
- Hands-on-Labs offers an opportunity for 662 million children deemed multidimensionally poor in 104 primary low and middle-income countries to pursue their STEM dreams with reduced lab costs. Millions **underprivileged students** facing logistical or financial constraints can also benefit from the platform's accessibility.
- Up to 1.3 billion people globally, who experience **physical disabilities** and may not be able to physically visit real labs, could access hardware from their computers through Hands-on-Labs
- The **K-12 e-learning** market is projected to grow to $12.93 billion by 2028, with Hands-on-Labs poised to capture a substantial share from developed curriculums, including robotics, mechanics (physics, computer science, coding), and STEM courses.

Institutional Potential

You can transform thousands of institutional stakeholders around the world:

- **Schools and Educational Institutions** will enhance their STEM offerings, attract more students, and position themselves as innovative leaders in education.
- **Governments and Education Ministries** will strengthen STEM and education initiatives and bridge the educational equity gap, leading to a more skilled and competitive workforce.
- **Research organizations and think tanks** will conduct groundbreaking experiments and drive innovation in various scientific disciplines with lower costs.
- **Educational nonprofits** will use collaborative efforts to expand outreach to underprivileged communities, empowering disadvantaged students with practical STEM experiences and enabling greater social mobility

Help Hands-on-Labs to become a global leader changing the entire edtech industry.



Screenshot taken from CS152 course of Minerva University

Hands-on-Labs currently can offer students to practice developed curriculums within **Robotics, Coding, Machine Learning, Internet of Things, Artificial Intelligence, and Hardware Development.** As we continue to grow, our vision is to expand our course and skill services to include diverse disciplines such as electrical, mechanical, aerospace, and biomedical engineering (covering electrical circuit design, power systems, bioinstrumentation, process control, flight dynamics, and reaction kinetics).

Additionally, our patented robotic arm lab will be able to remotely control labs in **cybersecurity, renewable energy feasibility (including solar, wind, and hydroelectric power), data science, digital electronics (FPGA programming, logic gates), forensic and crime scene investigation, archaeology and anthropology**. Furthermore, Hands-on-Labs envisions a future where even **medicine and surgery** can be explored through remote experimentation!

What is Possible Through Your Support

Gamification & Rewards

Introduce a gamified learning environment that rewards students with badges and incentives for completing challenges and mastering skills. By tapping into intrinsic motivation, we will foster a deeper commitment to lifelong learning.

Enhance UX/UI

Invest in user-friendly design prioritizing accessibility features, intuitive navigation, and seamless integration, and inclusivity for students with disabilities.

Impact Assessment

By quantifying the academic progress and skill development of students, we will continually optimize our offerings and demonstrate the real-world value of Hands-on-Labs.

Improve Technology

Secure and enhance the functionality and performance of our already impressive robotic arm technology, ensuring greater precision, responsiveness, and user interaction

Personalized Learning

Leverage AI and data analytics to create personalized learning pathways. By tailoring the curriculum to individual preferences, learning styles, and proficiency levels, we will optimize engagement and empower students to achieve their full potential.

Enhanced Learning Potential

Establish a series of webinars, blogs, and podcasts with renowned experts and educators. By sharing best practices, research findings, and emerging trends, we will inspire a culture of continuous learning and valuable insights beyond our labs.

Global Collaborations and Virtual Exchanges

Forge partnerships with international institutions, fostering cross-border collaborations and joint projects. By facilitating virtual exchanges, students from diverse backgrounds will gain exposure to different perspectives.

Faculty Training

Develop comprehensive training programs for faculty to effectively utilize our platform in their teaching methodologies to ensure seamless integration of hands-on learning into the curriculum.

Advanced Controls and Capabilities of Current Lab

While our lab excels at accommodating a variety of levels in robotics and coding, the sky is the limit. If we increase the capabilities of our lab, we can also provide room for the faculty and students to do research!

Troubleshooting Capabilities

By minimizing downtime and providing instant support, we will ensure that students can fully immerse themselves in hands-on learning without interruptions.

Curriculum Adaptability

Collaborate with educational institutions worldwide to adapt our labs to diverse curriculums and subject areas. Expand our technology into labs like 3D printing, advanced robotics, remotely controlling a microscope and even more!

Diverse Course Offerings:

By diversifying our tutorial offerings, we cater to a broader audience and enable students to explore various scientific fields. We can provide them with special and personalized ways to engage with the lab that matches their specific academic purpose.