



StudentRND

□ ■ ■ Inspire. Create. Learn.
Annual Report
2011

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Letter from the Edward Jiang, CEO

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Dear Reader,

Thanks for taking the time to take a look at StudentRND’s Annual Report! We’ve had an amazing year in 2011, and look forward to 2012!

With our program at the StudentRND workspace, we’ve provided hands-on, lifechanging experiences for hundreds of high school and college students in the Greater Seattle area. Through our projects and events, we’ve built a community of students who love science and technology and aren’t afraid to learn more about it by building cool and interesting things.

This is the first year we’ve ran the StudentRND workspace year-round, and it’s all thanks to your support. Over the next year, we plan to expand on our successful events, continue building community partnerships, and inspiring more students to learn more about science and technology.

Thanks for taking this time to read our annual report. Rock on!

Sincerely,

Edward Jiang, CEO
StudentRND

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“StudentRND is like a library,
except you can talk loudly
and bang hammers.”

Adam Ryman



Program Overview

StudentRND’s primary focus is the Workspace program, where we allow students to drop in during scheduled hours (centered on the times most students are free) and use our equipment and materials. The workspace program reaches an audience of high school and college students mostly focused on the Bellevue and Redmond areas, but with students attending from as far away as Auburn.

In the workspace, StudentRND provides students with woodworking tools, including circular saws, a miter saw, a drill press, and drills, as well as a full electronics lab with the components students are likely to need for most projects, fabrication tools including three 3D printers, a 3-axis CNC milling machine, and a laser cutter. StudentRND also has relationships with Microsoft, Adobe, and Apple, allowing us to offer access to the leading development and design software on its four loaner-laptops and multitude of desktop PCs and Mac.

StudentRND also runs a project program, where we provide interested teams of students with these resources, as well as funding and mentors, to help them complete a project. This is one of the most successful educational opportunities.

The workspace program is promoted in two ways. First, by bringing past projects to high school classes to speak and through events. Most of our members come from the latter group. Online and word-of-mouth marketing are also critical pieces of the marketing strategy.

The workspace program reaches roughly 65% of students with an established background in science and technology fields, and 35% of those who are new. The students are a multi-ethnic group in the 16-to-21 age range. StudentRND also maintains a partnership with the Cascade Science Center Foundation, which uses the workspace once to twice a month during off hours to teach science activities to the elementary and middle school age range.

At the end of the 2011 year, all of the members we spoke with from the 9 project teams felt the program was useful, and that they had learned new skills as a direct result of the program. All said they would highly recommend StudentRND to their friends.

From our evaluations and feedback from teens, parents, and the educational community, it’s clear that the StudentRND program continues to meet both our objectives, and the needs of the science and tech community in the greater Seattle area.

History

In 2009, we were a group of high school students in the Seattle Eastside, and we wanted to build a community of students who loved science and technology. As a result, we formed StudentRND, a student-run nonprofit organization that inspires students to learn more about science and technology.

During our first summer, we started working on basic electronics and robotics projects, including the Squarebot, Symet, and our 501(c)(3) paperwork. During the meantime, we started building our vision for the StudentRND workspace.

We realized: as a society, we have libraries for people who love books and sports fields for those who love sports, but there isn’t a public community center for students who love science and technology. We decided to change that.

The next year, we rallied around Chase's Community Giving’s Facebook campaign to fund-raise for StudentRND. We managed to rally an incredible amount of support, and placed in the top 100 small and local nonprofits in the USA. As a result, we rented a small but decent space in an office park in Bellevue, and began our work.

Tyler, Adam, David, Eric, and many more people got involved that year, and we purchased a Makerbot 3D printer, as well as some other tools and equipment. We set up shop, advertising StudentRND as an open workspace for students to hang out and build cool stuff – and drew students from different high schools in the area showed up to participate!

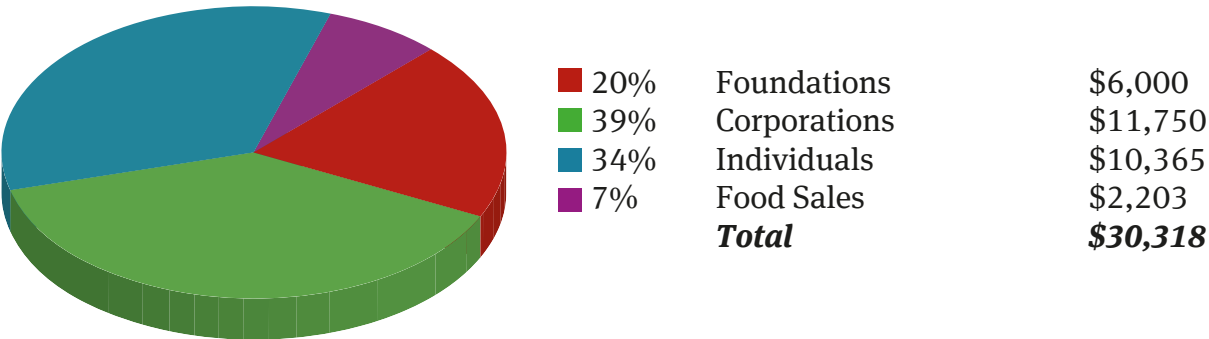
After our first summer running a workspace, we evaluated our progress. Our workspace was completely open – we allowed students to use the workspace to do anything, but at the same time, not every student was adventurous enough to jump in and start or work on a project at the StudentRND workspace.

During the summer of 2011, we started what we referred internally to as the “internship program”, where we recruited more knowledgeable students to lead projects. This allowed less knowledgeable students to jump into the StudentRND workspace and join teams of students who wanted to learn more by building interesting and unique things. As a result of this more focused effort, our projects became more advanced than ever before.

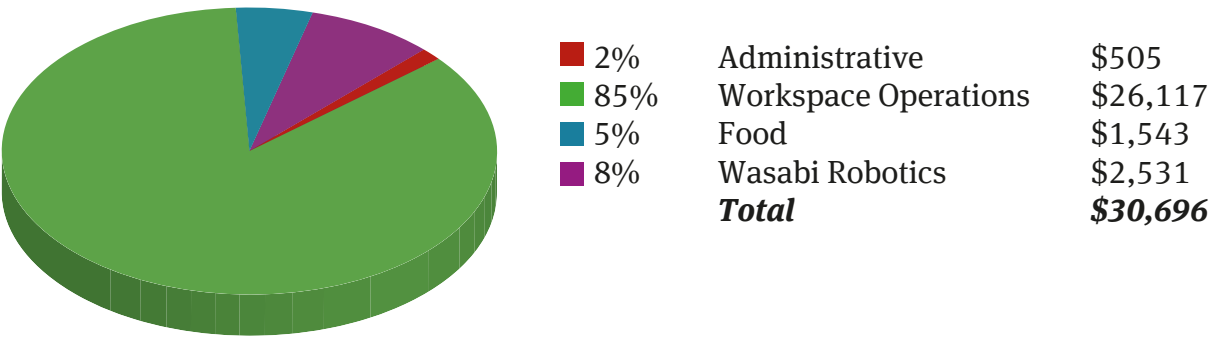
The 2011-2012 school year is the first year that we opened our workspace year-round, and we look forward to building a community of students who love science and technology to inspire students in the Greater Seattle area to learn more about science and technology.

Finances

Income



Expenses



Projects

The projects program at StudentRND is at the intersection of learning and fun; most of our students led or worked on a project, and 100% enjoyed and learned from the experience.

StudentRND puts an emphasis on student-driven learning. Today's students, having grown up with access to the internet, are well equipped to handle the research necessary for independent studies and self-directed education. These skills are critical in the world after graduation, and so we put a large emphasis on fostering them.

Further, students learn best when they have fun. Most programmers of the current generation learned to code at their own initiative, by picking up a tutorial on BASIC programming for a graphing calculator, rather than by taking a year-long computer science course.

Students who gain knowledge by practical, hands-on, and self-driven methods seem unrivalled in their ability to recall this information, and those who do this on a regular basis develop an unmatched ability to correlate previous knowledge and apply it effectively to new situations.

This knowledge in mind, StudentRND developed the projects program over its first year in 2009. We believe the projects program is one of the best examples of the application of hands-on learning.

Students are often artificially limited by money and connections in what they can achieve. We aim to remove those limitations: students who start a project are provided with the resources they need to accomplish it, including equipment, space, and, of course, money. A majority of our funds go to supporting the projects program.

StudentRND also maintains relations with local businesses and helps to connect students with mentors who can help accomplish the projects.

Our projects program is both one of the most important, and one of the most successful programs at StudentRND. Some of the projects from this year are featured in the following pages.

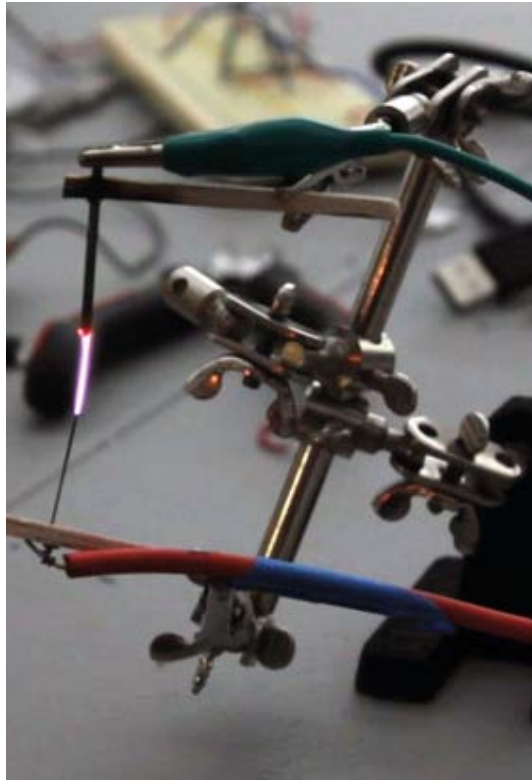
Projects -> Learning

“Going into StudentRND I knew nothing more than how to connect a light bulb to a circuit. I now know at least eight times the amount of electrical engineering I knew before. Finally, circuits are within my reach.”

Adam Ryman,
Vending Machine Project

Plasma Speaker

Marshall Meng
Matt Chapman



Inspire.

“About 2 years ago, during the summer of 2009 (in Ed's basement, where StudentRND was being held), we watched a lot of videos on YouTube. Looking for ideas. One of our favorite cool things to look at but didn't think about really making it ourselves at the time was the arc speakers. They came in all sorts of shapes and sizes, from huge Tesla coils to two small nails hammered into a piece of wood. The latter was known specifically as a plasma speaker, and some enterprising members of the organization decided they wanted to build one. After ordering the parts and trying to work out the schematic, they ended up giving up. I tried as well, and failed -- almost setting something on fire with no other interesting results.

“Fast-forward 2 years, and we suddenly remembered about the plasma speaker project. It was up to me, Marshall Meng, and Matt Chapman, now, to build it. With the experience I had gathered over the previous couple of years messing around at StudentRND, I no longer felt intimidated by the project. Indeed, I was excited and couldn't wait to get started. Not only did we get started, we managed to churn out a working product.”

Create.

“The plasma speaker is a device that creates an electric arc of about 20,000 volts using a MOSFET switching power through a transformer with a 40 kHz square wave. Sound from an input source is amplified and added on top of the carrier wave, making the arc play sounds that we can hear.

“In other words, it's a miniature lightning bolt generator that plays music by controlling the lightning's "hotness" and thereby changing the volume of the thunder. It doesn't produce the highest quality sound but the result looks very cool (the plasma is a very hot purple stream of pure electricity!).

“With this project we also tried a new fundraising platform, trying to sell our creation as kits on the internet to fund future products and infrastructure.”

Learn.

“I probably haven't ever had more to do with circuits than this year at StudentRND. It was the whole experience from the very beginning, from inception to schematic design to circuit design, testing, and beyond. Not only did I familiarize myself more with engineering problems, I also learned about more practical things like sourcing components, dealing with coworkers, and managing large scale product delivery. It was the whole package, and it couldn't have happened in a classroom. I feel like I learned more during a month in the summer at StudentRND than everything I learned the previous year of high school.”

CNC Router

Nolan Miller et al

Inspire.

“Hi! My name is Nolan Miller and I was the project leader for the CNC project. From an early age I would tinker with things in my garage. My inventions were entertaining to me but never that impressive because I didn't have the resources to build anything really cool. A couple years ago I designed a CNC router but I wasn't able to make it because I didn't have the money, space or tools necessary. I had mostly given up on my goal to make a CNC router when I learned about StudentRND. At the end of my junior year of high school they brought a surface computer they had made into my physics class and talked about what StudentRND was. It sounded like a fantastic organization and I immediately wanted to become involved any way I could.

“My project was accepted and over the summer I worked on it at StudentRND. Besides funding the project, StudentRND provided a space to work and a community of students who were willing and able to help out on the project.”

Create.

“A CNC wood router is a Numerical control tool that creates objects from wood. Parts of a project can be designed in the computer with a CAD/CAM program, and then cut automatically using a router to produce a finished part.

“The CNC router works like a printer. Work is composed on a computer and then the design or drawing is sent to the CNC router for the hard copy. This outputs a 3-dimensional copy of the work. The CNC router uses a cutting tool instead of an ink jet. The cutting tool is generally a router but other cutters can be used as well.

“The CNC works on the Cartesian coordinate system for 3D motion control. CNC stands for computer numerical control. This gives the computer a printer-like ability to drive a CNC machine to make parts.

“The CNC Router is great for prototyping, product development, art, and production work.”



Learn.

“Over the course of the four months it took to complete the project, I gained the technical knowledge to run the CNC as well as the general knowledge to run a project. I learned how to trouble shoot complicated machinery, but more importantly, I learned how to motivate and manage a team.

“StudentRND gave me amazing experience working in a real work environment. I look forward to working and hopefully running more projects at StudentRND and I am extremely grateful for the opportunities StudentRND has offered me.”

Electronic Door Lock

Adam Ryman
Tyler Menezes

Inspire.

“Normal doors are boring, entirely mechanical with no electronics at all. At StudentRND we love to add that little extra spark and learn something along the way.

“The StudentRND staff felt very limited by what a standard office door offered us. Anyone who needed access to our space either had to have someone unlock it for them or needed a key, which could be copied.”

Learn.

“We learned about the involved process of purchasing parts for a very important piece of infrastructure. As our door is our most important piece of security, each piece has to be triple checked for compatibility and security. Mounting our door lock and related equipment was a learned experience as well. Every piece has to be mounted in near perfect condition in order to achieve the maximum security. And finally the electronics, our COO, Tyler Menezes, learned basic electrical engineering for this project. The circuit created took over eight hours of researching and testing. Every student that touched this door lock project gained something, from learning about basic door/door lock mechanics, circuit design, and the importance of research to a important project.”



Create.

“StudentRND's front door now has an Adam's Rite electronic strike installed, which is connected to an Arduino to process all of our commands. The functions of the door includes, ability to be open via Twitter, switch to control if the door is forced open or closed, automatically unlocking if the open sign is on, and a key backup.”

David Tyler et al

PVC Robotic Pipe Organ



Inspire.

“Hey my name is David Tyler and I am computer science student at Bellevue College. I am among the founding members of Exothermic Robotics Club at Redmond High School and I have had a long had an interest in robotics and music. The inspiration for the robotic pipe organ was a natural extension of those interests.”

Create.

“Made from cheap PVC instead of expensive rolled steel tubes, StudentRND's robotic pipe organ was built on a budget of less than \$1500. The organ was begun in late summer of 2011, and mechanically complete by early winter. Fine tuning of the organ is ongoing.

Learn.

“In the course of the project, those involved learned about frequency, the physics of music, pipe organ construction, computer aided design and many other things. Soon, anyone will be able to go to studentrnd.org and upload songs for the organ to play.”

“Over the summer of 2011 a robotic pipe organ was created. The organ is played with 25 servos opening and closing valves. They are controlled with a Propeller microprocessor which will interpret input MIDI files. Files can be uploaded via a companion website that will also live-stream the organ playing music so the instrument and is truly accessible to all.

“A Kickstarter for the project raised \$1105 for project funding in addition to what StudentRND provided.”

Vending Machine

Adam Ryman et al

Inspire.

“Vending machines are one of the coolest inventions ever, displacing tasty snakes with no human interaction at all. Maybe you are thinking, "Hey Adam, vending machines are not the coolest things ever, there are plenty of cooler things!" Well you are probably correct, but I wanted to build StudentRND an awesome vending machine that would rival some of the coolest things in the universe.”

Create.

“Our idea was to create a touch screen / button pad controlled vending machine, that can accept both cash and StudentRND account funds.

“This involves building motor controlling circuitry that can be better controlled with modern computing technology, rather than interfacing with technology that is decades old. It also involves writing a front end for our touch screen and setting up the infrastructure for a StudentRND account system that can handle financial transactions.”

Learn.

“Going into StudentRND I knew nothing more than how to connect a light bulb to a circuit or how to control an 8 segment display. But after only getting twenty five percent of the way though this project, I now know at least eight times the amount of electrical engineering I previously knew. Finally, circuits are within my reach.”



Adam Stephenson Statspad Baller

Inspire.

“Basketball plays a big role in my life. Throughout my high school basketball career, my coach always had someone recording some basic statistics every game: where people were shooting from, who was shooting what percentage, etc.. Basically, I saw a need. Professional teams have highly specialized software that enables statisticians to record all the statistics of a game. Lower level teams do not utilize this software for numerous reasons including price and the need to use a laptop/computer. As a basketball player I felt I had great insight into how to bring a similar, simpler, product that everyone can use and afford. This product would be centered around the smartphone, a mostly untapped market for the basketball statistics recording market.”

Create.

“After developing a few previous projects for the Iphone and Palm, I wanted to switch up platforms and develop a project for Windows Phone 7. I began the project by creating a few mock up slides for the different views. Coming in to StudentRND for the first day of the project I had no code, but I had a plan and a Powerpoint.

“I began by developing the key entities. Now having the barebones for most of the basic entities, I moved on to creating screens. One of the largest issues I struggled with is letting a Team and Player adjust their own statistics mid-way through a game. After sufficiently working on these screens, I moved on to displaying all the information I was recording. This was the most enjoyable experience because all of the work that you did prior developing good entities and easy to use/understand screens pays off when you want to absorb all that information and spit it back out in a formatted way. The app was really starting to shine.”

Learn.

“From this project I learned the importance of coming into a job of this magnitude with a plan. If I didn't have an idea of what I wanted, things would not have turned out as positively as they have. Instead of having the ability to take the time and perfect the processes which I had already thought of, I would have spent the majority of time just trying to come up with some good ideas. I also learned the importance of a good day's work. The process which I described in Create certainly did not happen over night. It took multiple months, of being committed every day to put a little work into the project and seeing marginal improvement. Day to day work was not characterized by shocking moments of everything coming together perfectly. Sometimes I would work on a specific part for a day, getting nowhere and have to leave that area for a day or two only to come back later and see the solution.”



Events

StudentRND's events program is one of the most effective ways to both spread interest in science and technology, and gain more members.

Beyond simply providing a workspace for those already interested, one of StudentRND's main goals is to foster interest in STEM for those who had perhaps not previously considered it.

However, many people who are newer to science and technology may be intimidated when faced with the opportunities StudentRND provides. Because the projects program is so self-driven, the feeling that one may not be capable of finishing a project is inevitable.

StudentRND solves this problem with events. Our activities help to promote science for those who are newer, as well as encouraging those who are already interested in an aspect of STEM to expand their knowledge, and find new areas of interest they wouldn't otherwise know they had.

Our events range from the highly informative, to the highly fun, to attract a wide range of students. The events program has a high rate of conversion: 90% of people who attended an event returned to our workshop during regular hours, and most of our projects were started by people

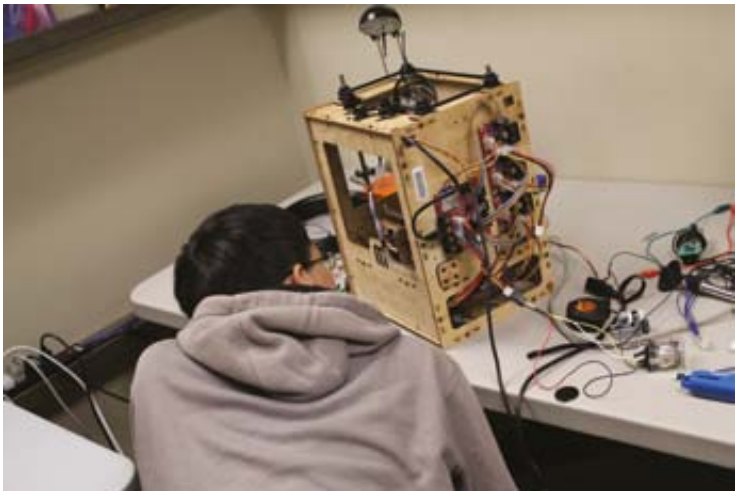
who were first introduced to StudentRND at an event.

The events program allows us to have a well-balanced mix of students at the workspace - we serve those with a developing science curiosity equally as well as those with an established background. It also allows us to push the latter group of students to go outside the area in which they are comfortable, and learn something totally new.

“Event days have been some of the most useful days for me at StudentRND. I learned how to 3D model, 3D print, how to safely handle liquid nitrogen, and how to make and use ferrofluid. Even with things I thought I was good at, like game development, I learned more at events.”

Tyler Menezes

Fabrication Day



StudentRND hosted its first Fabrication Day, a day for learning to create computer models and bring them to life.

As part of the improvements made for the summer workshop program, StudentRND added two new 3D printers, a RepRap Mendel and a newer Makerbot, in addition to the original Makerbot from the 2009 workspace.

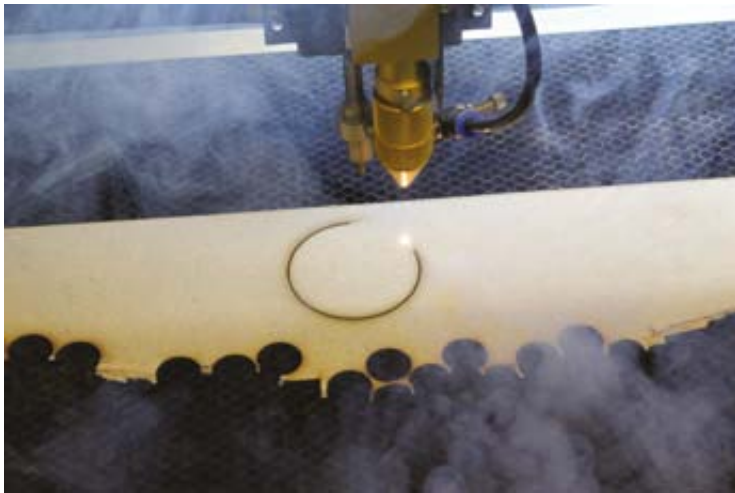
The 3D printers, which use an additive process whereby layers of hot ABS plastic are gradually built up by the automated machine

to produce the desired part, are able to produce parts up to roughly 4” x 3” x 3”.

The 3D printers are complemented by the CNC mill, built during the summer projects program, which allows the removal of wood or metal up to several feet in size.



Also available is the Laser Cutter, added in November, which uses a 80W CO₂ laser to cut or etch wood or metal up to roughly 2’ x 3’. StudentRND is home to one of the largest and most powerful laser cutters of any hackerspace in North America.



HACK/Code Day



This past winter, StudentRND hosted its first ever hack-athon! Students pitched ideas, formed teams, and then built games in a 24-hour marathon.

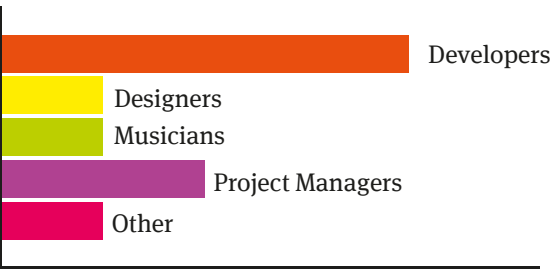
Teams were provided with a space to work, a network connection, and access to mentors; everything else was up to them. Through a series of optional workshops taught by industry professionals, tudents learned everything from the basics of game logic, to game mechanic design, to how to design sprite sheets.

In the end, the event was one of the most successful StudentRND has hosted, with many students requesting a monthly recurrence.

Students were 55% high school, and 45% college. 91% of these students stayed for the entire event, forming 8 teams which produced 9 games. 91% said they would recom-mend the event to their friends, and 100% said they would return for the next event.

StudentRND is continuing these events throughout the 2012 year under the CodeDay name.

Team Composition



Donors

To keep the space running, we rely on donations from individuals and businesses like these.

To those listed: thank you so much for your support; there is nothing we can say to convey what a truly tremendous impact you have made, and continue to make, on StudentRND.

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