

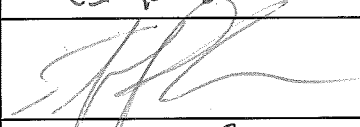
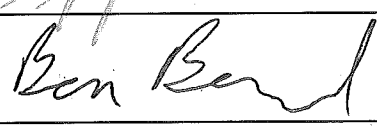
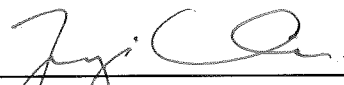
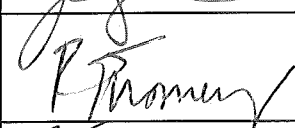


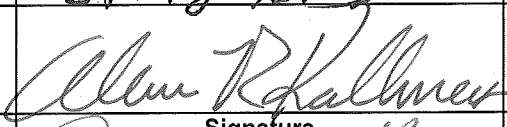
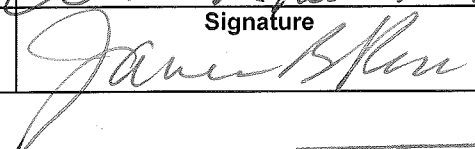
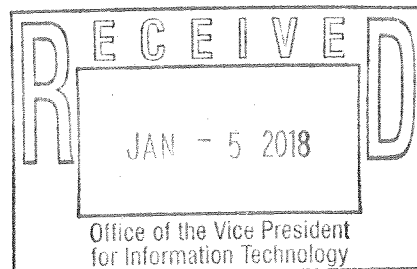


NDSU Student Technology Fee Action Plan Request

I. Action Plan Introduction and Authorizations

#1801

NDSU ORGANIZATION OR UNIT NDSU Libraries		
TITLE OF PROJECT Campus Makerspace – Phase 1		
Project Duration (3 years maximum)	From: Spring 2018	To: Fall 2018
Type of Project (Check one)	New <input checked="" type="checkbox"/>	Previously Submitted <input type="checkbox"/>
Renewal <input type="checkbox"/>		
Total Technology Fee Request \$13,578.84		
Project Director (Must be NDSU faculty or staff) Jake Clark – Emerging Technologies Services Coordinator	Campus Address: Department 2080 1201 Albrecht Boulevard Fargo, ND, 58102 Phone: 701-231-5565 Fax: 701-231-6128 E-mail: jacob.a.clark@ndsu.edu	
Name (Type or Print)	Signature	Date
Project Director Jake Clark - Library		1-4-18
Unit Head Rob Sailer – Mechanical Engineering		1/5/18
Unit Head Steve Beckermann – Technology Learning & Media Center		1/5/18
Unit Head Ben Bernard – Architecture & Landscape Architecture		1/4/18
Unit Head Joe Mocnik – Dean of Libraries		1-4-2018
Unit Head Beth Twomey – Head of Research & Instruction		1/5/18
Unit Head Theodore Zipoy – Industrial Eng. Student Timothy Straus – Mfg. Eng. Student	 	1/5/18 1/5/18
Unit Head Alan Kallmeyer – Chair Mechanical Engineering		1/4/2018
IT Division Consultant JAMES B. ROSS	Signature 	Date 1/4/2018



Executive Summary (maximum of 175 words)

This action plan will create a basic campus makerspace in the Library open to all students, faculty, and staff, creating opportunities for cross-discipline creation and innovation. Makerspaces provide tools, space, knowledge, and community to research, design, prototype, and create. Currently, there are pockets of makerspace technology isolated in a few departments and typically reserved for graduate student use. The Library can provide a neutral hub for maker technologies on campus, supervised by the new Emerging Technologies Services Coordinator. The basic makerspace equipment purchased with this grant will constitute the first steps towards the development of a more advanced makerspace on campus and will provide invaluable data about campus interests and needs. Workshops and orientation-week demos will get students and faculty engaged right away; continual programming will keep them making throughout the year. A phased and multi-locational consortium will allow for maximum collaboration across departments, as well as reach a wider spectrum of students.

The Technology Fee Advisory Committee will only accept for consideration Student Technology Fee Action Plan Request forms which are fully completed and signed, and whose Project Directors have no past due reports on previously awarded projects as of the current submission deadline date, according to the guidelines listed in the Instructions, pages 1 and 2.

Technology Action Plan Request forms will be opened and reviewed after the submission deadline.

NDSU Student Technology Fee Action Plan Request

II. Project Overview

1. How does this project meet student needs?

The NDSU Libraries mission is to energize and advance research, teaching, and learning in an evolving information environment. Providing access to maker technologies—currently only available to a limited amount of people on campus in select departments—is one important way the Libraries can fulfill its mission and strategic plans of cultivating inquiry and curiosity. The Library currently offers a 3D printing service, and the demand for services has led to the purchase of five new printers and a 3D scanner, and to the hiring of an Emerging Technologies Coordinator in the Library.

Anecdotal reports from departmental pockets of maker technologies indicate that there are regular requests from across campus for use of their equipment. For example, in the Department of Architecture and Landscape Architecture (ALA) there are approximately 10 requests per month (unsolicited) by campus members outside ALA who wish to use their maker technology. This project would be the first phase in a plan to answer those student needs for maker technology. As a facility open to all campus members, the Library can provide low cost access to students, faculty, and staff, and serve as a hub connecting people to other maker pockets around campus.

Additionally, makerspaces have the potential to promote student engagement and retention by creating meaningful opportunities and experiences through technology. Doing hands-on projects develops critical thinking skills, increases resilience in the face of setbacks, and supports the development of an innovative and engaged mindset. The Library makerspace and staff can support the development of innovative curricula by making new technologies available to faculty who do not have access in their departments.

2. What audience does this project directly serve? What audience is indirectly served? How many students are affected?

A campus makerspace housed in the Library will directly serve all students, faculty, and staff. It will allow them to have access to makerspace equipment and workspace at a reasonable cost - regardless of their academic major. Staff of campus units housed in the library will additionally benefit from increased traffic and opportunities to collaborate with students and faculty on projects.

The NDSU Libraries exist to serve all members of the campus community which makes them an ideal location to launch the first phase of a new makerspace. The Libraries had 388,351 visitors in the 2016-2017 school year, ensuring that the new makerspace would be highly visible and accessible. Cross-promotion with other members of the consortium would further increase awareness of the new space.

3. For projects that target a subset of NDSU's students, please describe the possibility for broader application in the future.

Workshops, outreach programs, and open houses will engage students who would not normally encounter makerspace equipment in their major. The ability to showcase what can be made and skills learned with this type of space to new students, faculty, and staff will bolster its use. In addition, the space provides opportunities for student workers to gain valuable experience in marketing, peer-to-peer instruction, and management of the space.

Examples of the types of workshops that could be offered include: 3D Design & Modeling, Introduction to Machining, 3D Printing Basics, Short-Run Manufacturing, Electronic Basics, Starting with Arduinos, etc. Examples of outreach programs which the Library has already been involved in and expect to continue include: Expanding your Horizons, K-12 classroom visits, campus tours, entrepreneurial events, etc.

Additionally, many high schools are now equipped with makerspaces. Having a campus makerspace will be increasingly important for student recruitment and retention.

4. Describe both the immediate and long term impact of this project.

Immediate Impact: Funding this project will allow students to have access to basic makerspace technologies regardless of major or class level. A campus makerspace will provide some student worker positions, internships (both paid and unpaid), and volunteer opportunities. It will also allow for independent initiatives across campus and will have marketing value for the university as being a part of a campus-wide makerspace consortium.

Long Term Impact: Case studies of research universities that have launched campus makerspaces reveal that once the demand and campus impact have been demonstrated, they rapidly expand to meet the needs of campus. Data on the usage and impact of the phase 1 makerspace could be used to inform the development of a larger and more advanced phase 2 space. Funding phase 2 will be done through external donors, company partnerships, local economic development groups, NDSU Incubator, etc.

5. Who will pay for ongoing expenses following the technology fee funded portion of this project (e.g., who will replace hardware or software after it has reached its end of life)?

Phase 1 of this project would use a similar model to the one used by the billiards and bowling alley in the Memorial Union: cost per hour for accessing the space. This would A) provide a cost structure that students are already used to; B) give students and faculty a cost effective way to use the space. Any other support funding would come from department funds or donors.

As for end of life of the equipment, most everything that is being considered would last well into a Phase 2 of a makerspace. These makerspace components can last 4-10 years under NDSU staff supervision.

6. Describe how this project will follow NDSU's best practices in information technology. (Please make sure the NDSU IT Division staff you consulted signs in Part I of this form.)

Computers will follow NDUS and NDSU policies for use.

Installation will be done by Library IT staff.

7. What service on campus is most similar to the one proposed here? How does this project differ?

The proposed service is not similar to anything currently available on campus. While similar equipment exists, it is reserved for particular users and not to the entire campus community.

NDSU Student Technology Fee Action Plan Request

III. Project Description (5 pages maximum)

Include information on the background of this project: how did it come to fruition?

Interest in a campus makerspace at NDSU has been building over the last few years, and a consortium of NDSU faculty, staff, administrators, and students have been exploring ways and means of making it happen. Some of the reasons for the interest include demand for wider access to the technologies across campus; faculty interest in the opportunities for engaged learning through hands-on innovations; the interest of faculty, staff and administrators in developing systems or policies to guide access to departmental equipment in demand by other campus members; the evolving roles of research libraries to provide access to and training in emerging technologies; and recruitment and retention of students who are used to having access to 3D printers, laser engravers, machining centers, electronics, and coding tools in their K-12 education. Maker technology is increasingly common in K-12 schools nationally, and EduTech is supporting Maker Education in North Dakota schools. When students are already accustomed to using and accessing these types of tools at the high-school and sometimes even middle-school and elementary school level, it creates an expectation that their colleges will have them as well. Makerspaces are growing and expanding in universities and libraries across the country. In order for NDSU to remain competitive at attracting new students and retaining enrolled students, developing a campus makerspace is vital.

The NDSU Libraries engagement with providing these types of tools began in 2014 with a successful Impact Grant application to the NDSU Alumni Foundation. The grant provided funds for three years to purchase, market and provide access to 3D printing technology at the Libraries, including hiring student workers to run the lab. Over the course of those three years, adjustments were successfully made in order to transition from a grant-funded to a self-sustaining model. The departure of the staff member who had been most involved with the project in the summer of 2017 created room for the Libraries to reimagine the position, and firmly commit to hiring a person with the skills and knowledge to drive the 3D printing project forward. To that end, the Emerging Technologies Services Coordinator position was created, and Jake Clark, owner of Fargo 3D Printing, was hired for the position. Having a skilled and dedicated staff member, space, and the support of the Dean of Libraries has laid the necessary groundwork for growing the Libraries capacity to provide access and training to makerspace technologies.

Through discussions with a large number of campus partners including faculty, students, and staff across a range of academic departments, a vision for a three-phase plan of developing increasingly advanced makerspaces on the NDSU campus has emerged. Phase 1, for which this grant proposal has been submitted, will be an initial phase that builds off of the Libraries' existing 3D printing technology and work space. In this phase, basic maker equipment that is inexpensive, easy to operate, and easy to maintain, would be purchased, set up, and ready to use in Fall 2018. This would provide students with makerspace bare essentials and position us to advance to the next phase. Phase 2 would establish a more centralized space that could handle equipment that was not appropriate in the library for noise and/or safety reasons; Phase 3 would feature a dedicated, fully-equipped makerspace.

Several departments and programs on campus have interest in creating a campus makerspace, including Art, Architecture & Landscape Architecture, Mechanical Engineering, and Interior Design.

Campus labs committed to partnering with the Libraries on this proposal include:

The Mechanical Engineering Department currently maintains several 3D printers, metal-working equipment (mills, lathes, etc.), and material testing facilities that are available for use by students for completing both academic and personal projects. The department houses this equipment in two laboratories in Dolve Hall (125 and 126) that are accessible for use by students, faculty, and staff. These facilities, which often operate at maximum capacity, provide students and faculty a venue to prototype and test project ideas. By partnering with the Library on an expanded makerspace with additional equipment, students will be afforded greater options and access to both rapid-prototyping equipment as well as more complex manufacturing and material testing equipment that is necessary to fully conceptualize, manufacture, and test their products.

Technology Learning & Media Center (TLMC). The TLMC caters to the portion of the makerspace that is geared around creating digital media content. The TLMC has a dedicated recording lab, which is more advanced than the secondary option of One-Button Studio or the Barry Hall recording studio.

The Library is neutral territory in the eyes of departments and students which makes it a great place to locate a makerspace that will be available to everyone on campus. The NDSU Library is also known as a reference point for students or faculty when they have questions – locating the makerspace in the library insures that expert help will be available for research needs. The Library is already a high-traffic building housing a number of supportive departments making it an ideal space for Phase 1 of the makerspace where it will be very visible and accessible.

NDSU Student Technology Fee Action Plan Request

IV. Milestones

List the date for each project milestone. These milestones should represent the *significant* accomplishments that will be associated with the action plan. For each milestone, please indicate its expected outcome and the means for assessing that outcome. (The table may be extended as needed.)

	<u>Date</u>	<u>Milestone</u>	<u>Expected Outcomes</u>	<u>Means of Assessment</u>
1.	March 1 st , 2018	Initiation of Project	Equipment & Materials Ordered	Completed purchases
2.	April 1 st , 2018	Progressive Collaboration Meeting	Move forward with campus marketing strategy	Meeting minutes and goals ascertained
2.	June 1 st , 2018	Install Equipment	All equipment has home and hooked up	Install Complete
3.a.	July 1 st , 2018	Equipment available for outreach/documentation	Demo pieces per equipment generated	Demo pieces complete, documentation binder
3.b.	July 1 st , 2018	Marketing	Marketing materials created	Completed website revamp, flyers generated, workshop schedule finalized
4.	August 1 st , 2018	Opening	Space is open	Doors are unlocked & staffed
5.	Mid-August	Ribbon Cutting/Open House	FMWF Chamber Ribbon Cutting	
5.	December 31 st , 2018	Analytics Review	Sense of initial usage	Analytical Data

NDSU Student Technology Fee Action Plan Request

V. Supporting Documentation


Please see following letter of recommendation(s).

The Libraries
NDSU Dept. 2080
P.O. Box 6050
Fargo, ND 58108-6050

701.231.8753
Fax 701.231.6128
Ariel 134.129.115.34
ILL Fax 701.231.7138

To: NDSU Student Technology Fee Advisory Committee

From: Joe Mocnik, Ph.D., Dean of Libraries



Date: January 2, 2018

Re: Support for Campus Makerspace request

Please accept this letter in support of the Campus Makerspace – Phase 1 funding request that will foster collaboration, partnerships, and create innovative opportunities for learning across the curriculum.

The NDSU Libraries are committed to “energize and advance research, teaching, and learning in an evolving information environment.” Building on the successes of the 3D printing technology that was supported by the 2014 Impact Grant, a makerspace will allow the Libraries to bring advanced tools and technologies into a central and universally available hub for innovation. There are several examples of successful library makerspaces, including the North Carolina State University, University of North Carolina, and University of Georgia. I know discussions are in progress with the Mechanical Engineering Department, the Technology Learning and Media Center, and others to develop sustainable partnership models.

There are many potential positive outcomes of the makerspace implementation that would strengthen and further develop a unique niche for the NDSU. For instance, student engagement and retention will increase by offering access to rapid prototyping equipment and conceptual design in neutral spaces that can be transformative for the users. The development of innovative curriculum will be strengthened by making new technologies available to faculty that is currently reserved only for few select units. There is also a potential to provide makerspace services for extension offices and build stronger ties with the local community, including the Tri-College students.

Please feel free to contact me directly with any inquiries at josp.mocnik@ndsu.edu or 231.8887.

NORTH DAKOTA STATE UNIVERSITY

Ben Bernard
Computer Services Specialist | ben.bernard@ndsu.edu

1/5/18

Honorable Members of the Technology Fee Advisory Committee:

I am pleased to offer my support, experience, and skills to the innovative proposal of launching a campus makerspace in the Library.

My first exposure to makerspace technology came shortly after I was brought aboard the Architecture & Landscape Architecture (ALA) department; I was tasked with integrating a laser cutter into the curriculum. Once I saw firsthand how prototyping technologies could powerfully shape curriculum and cross multiple disciplines while empowering students with new skills and opportunities, I quickly looked for opportunities to spread and share the makerspace gospel.

One such opportunity came about in the Fall of 2014 when I demonstrated ALA's new desktop 3D printers to faculty and staff. Two subject librarians, Margaret Browndorf and Carolyn Mead Harvey, were eager to offer 3D printing to the entire campus by hosting the service in the Library. Two days later, we had a grant proposal submitted to the Alumni Foundation. Six months later, the Library's 3D printing lab opened and has been serving the campus since.

This fall, I attended the 2nd annual International Symposium on Academic Makerspaces (ISAM) in Cleveland. There, I was thrilled to learn of many other research universities across the country that housed academic makerspaces within their libraries – and have been sharing the word to anyone willing to listen since I've returned!

I am thankful that our Library was able to recruit such a talent as Jake Clark to head up this effort as the new Emerging Technologies Services Coordinator. Jake has quickly collaborated with students, faculty, and staff across campus; this campus makerspace action plan is the fruit of such diligent efforts.

Renaissance Hall, 650 NP Ave. Fargo, ND 58102

Cell: 701-793-9528 | www.ndsu.edu/ala

At ISAM, many universities shared the same story; after demonstrating the impact a modest makerspace has, strong student demand quickly opens funding doors from internal and external sources to expand the scale and scope of a campus makerspace. I am confident that funding this action plan addresses a critical student need and has the same opportunity to rapidly grow with the student body and research faculty.

I will be happy to contribute my time, skills, and experience to ensure this action plan is a success – and have done so on four prior successful TFAC projects.

Please do not hesitate to call me at 701-793-9528 if you have any questions regarding this action plan, any other makerspace technologies, or how these technologies have been implemented within ALA.

Sincerely,

Ben Bernard
Computer Services Specialist
Department of Architecture & Landscape Architecture
North Dakota State University

Rohwedder, CeCe

From: Rohwedder, CeCe
Sent: Monday, January 8, 2018 9:13 AM
To: Clark, Jake
Cc: Wallman, Marc
Subject: FW: TFAC - Library Submission 2018
Attachments: TFAC_LetterofRec_Tim-Ted.pdf

Good morning, Jake,

I've included this additional letter of recommendation to your action plan that will be reviewed by the TFAC.

Thank you, and safe travels,
CeCe

CeCe Rohwedder
Assistant to the Vice President / Information Technology
NORTH DAKOTA STATE UNIVERSITY

Quentin Burdick Building 206B
NDSU Dept 4500, PO Box 6050
Fargo ND 58108-6050
USA
phone: 701.231.5646
fax: 701.231.8541
cece.rohwedder@ndsu.edu
www.ndsu.edu



From: Clark, Jake
Sent: Sunday, January 7, 2018 10:48 AM
To: Wallman, Marc <marc.wallman@ndsu.edu>
Subject: TFAC - Library Submission 2018

Hi Marc,

My name is Jake Clark and I'm the new Emerging Technology Services Coordinator for the Library.

I submitted a TFAC grant into your mailbox Friday a little after 4pm. I had another letter of rec I'd like to attach with that submittal as well (document is attached here). I would have dropped the TFAC and this letter of Rec off in person Monday, however I'm headed to CES to scope out new tech and won't be in Fargo.

I hope you can accept this additional letter of rec and include it with my TFAC submission. Also, for whatever reason, if you have difficulty locating the physical copy of the TFAC please let me know and I can send over the scanned copy remotely.

Thanks and I hope you had a good weekend!

Jake Clark

Emerging Technologies Services Coordinator | Libraries
North Dakota State University

Main Library – Room #121

Dept 2080, PO Box 6050

Fargo, ND, 58108

P (701) 231-5565 | F (701) 231-6128

Project



To: Technology Fee Advisory Committee (TFAC)

From: Theodore Zipoy, Project P President

Timothy Straus, Project P Treasurer

Date: January 6, 2018

Re: Support for Campus Makerspace – Phase I

We are writing this letter in support for Phase I of the Campus Makerspace project. Students on campus will benefit in many ways from the implementation of a makerspace on the NDSU campus.

As students we understand the significance of being well versed in many different technologies, especially STEAM related fields. That's why we started Project P: to go beyond the traditional classroom environment by providing an extracurricular means for students to hone new skills through more hands-on projects and experiences. The membership of Project P believes Makerspaces can revolutionize the current educational system by offering access to rapid prototyping equipment and conceptual design spaces coupled with a unique culture that can be transformative to its users.

Implementing a makerspace on the NDSU campus will provide a place for inspiration, exploration, and education. Some of the skills that are learned in a makerspace pertain to electronics, 3D printing, 2D and 3D modeling, coding, robotics, and even woodworking. Makerspaces promote innovation and entrepreneurship and are being utilized as technology incubators and accelerators for student-founded business startups. These spaces appeal to the fast-growing DIY culture prevalent amongst modern students, and will be a huge draw for incoming students evaluating their educational opportunities with NDSU.

Phase I of the project brings the various tools and technology available on the NDSU campus into one central hub. We at Project P believe this is valuable because it will bring together students and staff from many different disciplines.

We are committed to supporting the creation of the NDSU Makerspace and excited to see it change the educational landscape of NDSU. Please feel free to contact either of us with any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read 'Theodore Zipoy'.

Theodore Zipoy
theodore.zipoy@ndsu.edu
(320) 223-5140

A handwritten signature in black ink, appearing to read 'Timothy Straus'.

Timothy Straus
timothy.straus@ndsu.edu
(701) 368-1788

NDSU Student Technology Fee Action Plan Request VI. Budget

(double-click on the form to begin entering data)

1.	NDSU ORGANIZATION OR UNIT Library
2.	PROJECT DIRECTOR(S) (Must be NDSU faculty or staff) Jacob Clark - Emerging Tech Svs. Coordinator

3.	SALARIES AND WAGES		
	Personnel description	Number employed	Number of months
	A. Staff		
	B. Graduate students		
	C. Undergraduate students		
4.	TOTAL SALARIES AND WAGES		\$0.00
5.	FRINGE BENEFITS		\$0.00
6.	TOTAL SALARY, WAGES AND BENEFITS		\$0.00

7.	EQUIPMENT			\$7,712.50
Cat.	Item	Qty	Cost/ea	Ext. Cost
1	Radial Drill Press	1	\$ 384.00	\$384.00
	Lathe w/ DRO	1	\$ 1,684.00	\$1,684.00
	Lathe Stand	1	\$ 384.00	\$384.00
	Mill/Drill DRO	1	\$ 1,959.00	\$1,959.00
2	Brother Sewing Machine	1	\$ 100.00	\$100.00
	Brother 1034D	1	\$ 175.97	\$175.97
	Brother Embroidery	1	\$ 570.00	\$570.00
	Cricut Maker	2	\$ 450.00	\$900.00
3	Soldering Iron	3	\$ 28.88	\$86.64
	Filter/Fan	3	\$ 30.95	\$92.85
	Helping Hand	3	\$ 20.00	\$60.00
	Breadboard	2	\$ 11.86	\$23.72
	Breadboard Kit	2	\$ 18.27	\$36.54
	Arduino Starter Kit	2	\$ 87.90	\$175.80
	AVexEDR	2	\$ 539.99	\$1,079.98
4	Computers	2	\$ -	\$0.00
5	3D Printers	11	\$ -	\$0.00
6	3D Scanning	2	\$ -	\$0.00
7	3D Pen	4	\$ -	\$0.00

8.	MATERIALS AND SUPPLIES			\$5,866.34
Cat.	Item	Qty	Cost/ea	Ext. Cost
1	R-8 Collet Set	1	\$ 83.95	\$ 83.95
	Clamp Kit - 7/16 Slot	1	\$ 48.95	48.95
	Quick Vise	1	\$ 68.95	68.95

	End Mills	1	\$	52.95	\$	52.95
	Oil - Cutting	3	\$	26.80	\$	80.40
	Carbide Tool Bit	1	\$	51.95	\$	51.95
	Oil - Machine Lube	2	\$	14.95	\$	29.90
	Drill bit 115pc Set	1	\$	68.50	\$	68.50
	Tool Chest	1	\$	248.00	\$	248.00
	Rubber Mallet	1	\$	2.99	\$	2.99
	Claw Hammer	1	\$	3.98	\$	3.98
	Reg Mallet	1	\$	5.49	\$	5.49
	Vise Grip Set	1	\$	12.99	\$	12.99
	Plyer Set - 3pc	1	\$	9.99	\$	9.99
	Channel Locks	1	\$	10.99	\$	10.99
	Wrench Set - Standard	1	\$	14.99	\$	14.99
	Wrench Set - Metric	1	\$	14.99	\$	14.99
	Crescent Wrench Set 3pc	1	\$	24.99	\$	24.99
	Center Punch	5	\$	4.99	\$	24.95
	Metal Punch Set	1	\$	29.96	\$	29.96
	FatMax Screwdriver Set	1	\$	34.99	\$	34.99
	Hex Key Set 3pc	1	\$	18.00	\$	18.00
	Tape Measure	3	\$	4.82	\$	14.46
	Socket Set	1	\$	84.99	\$	84.99
	Eyewash Station	1	\$	345.00	\$	345.00
	Turning/Bore Holder	1	\$	29.95	\$	29.95
	Turning Holder	1	\$	25.95	\$	25.95
	Parting Tool	1	\$	64.95	\$	64.95
	Carbidede Insert	2	\$	15.95	\$	31.90
	Quick Change Tool	1	\$	295.00	\$	295.00
	Insert Boring Bar	1	\$	94.95	\$	94.95
	Carbide Inserts	1	\$	43.95	\$	43.95
	Indexable Carbide Set	1	\$	91.95	\$	91.95
	Inserts	1	\$	45.95	\$	45.95
2	Scissors	2	\$	9.99	\$	19.98
	Tape Measure	1	\$	7.99	\$	7.99
	Acrylic Ruler	3	\$	14.49	\$	43.47
	Seam Ripper	3	\$	4.64	\$	13.92
	Seam Roller	1	\$	18.99	\$	18.99
	Rotary cutter	2	\$	10.99	\$	21.98
3	Arduino Aecessories	1	\$	200.00	\$	200.00
	Voltmeter	1	\$	23.18	\$	23.18
	Breadboard Jumpers	2	\$	9.99	\$	19.98
4	Keyboards	2	\$	-	\$	-
	Monitors	5	\$	-	\$	-
	Earplugs	2	\$	23.00	\$	46.00
	Safety Glasses - 1	12	\$	-	\$	-
	Safety Glasses - 2	12	\$	-	\$	-
	First Aid Kit	1	\$	-	\$	-
	Calipers	2	\$	-	\$	-

Sound Proofing Mats	1	\$	2,000.00	\$	2,000.00
Shop Vacuum	1	\$	139.00	\$	139.00
Floor Mats	1	\$	200.00	\$	200.00
Marketing Pieces	1	\$	1,000.00	\$	1,000.00
3D Printer Materials	80	\$	-	\$	-

9.	TOTAL TECHNOLOGY FEE REQUEST				\$13,578.84
10.	MATCH (Describe in Match Section)			\$	21,496.83
11.	TOTAL PROJECT EXPENDITURE				\$35,075.67

NDSU Student Technology Fee Action Plan Request

VII. Budget Justification

Describe how you arrived at the budget totals in Section VI, Budget.

You are expected to follow all applicable university policies and procedures regarding salary expenditures.

You are expected to follow the state-approved purchasing guidelines when purchasing materials and supplies.

- **Equipment:** List name, estimated cost and quantity of each item and explain why it is important to the project. Include installation and maintenance costs in your estimates.
 - (a) Radial Drill – x1 - \$384.00/ea: The radial drill is important to the makerspace as it provides basic drilling needs for metal, wood, plastics, and other materials. This specific model has 5-speeds and variable swing up to 34" with a pivoting head. Allowing for tough angles to be drilled while safely using a clamped work piece.
 - i) Install: 120v outlet already present
 - ii) Maintenance: Lube included in request, daily maintenance and care procedures would be made/followed
 - (b) Metal Lathe w/ DRO – x1 - \$1684/ea: The metal lathe will be a primary piece of equipment for the machining aspect of the makerspace. This will allow for complex tubular products to be created with ease.
 - i) Install: 120v outlet already present
 - ii) Maintenance: Lube included in request, daily maintenance and care procedures would be made/followed
 - (c) Lathe Stand – x1 - \$384/ea: The lathe stand will allow for the lathe to sit upon. Drawers and cabinets allow for tool storage right within the piece of equipment
 - i) Install: none
 - ii) Maintenance: none
 - (d) Metal Mill w/ DRO – x1 - \$1959/ea: The metal mill will be a primary piece of equipment for the machining aspect of the makerspace. This will allow for items to be created out of basic materials at high-precision. The DRO (Digital Readout) will allow the user to digitally see what the movements are on the piece of equipment instead of manually calculating the movements
 - i) Install: 120v outlet already present
 - ii) Maintenance: Lube included in request, daily maintenance and care procedures will be made/followed
 - (e) Brother Sewing Machine – x2 - \$100/ea: The Brother sewing machine will allow for basic sewing needs.
 - i) Install: 120v outlet already present
 - ii) Maintenance: Minimal
 - (f) Brother 1034D – x1 - \$175.97/ea: The Brother thread serger allows edge finishing on fabrics, knits, linens, and other mediums. This will allow students/faculty to create finishing touches on their textile projects.
 - i) Install: 120v outlet already present
 - ii) Maintenance: minimal.
 - (g) Brother Embroidery – x1 - \$570/ea: The Brother embroidery machine allows for custom designs to be brought in and stitched onto a textile medium. This will allow students/faculty to add marketing features or visual presence to their projects.
 - i) Install: 120v outlet already present
 - ii) Maintenance: minimal
 - (h) Cricut Maker – x2 - \$450/ea: The cricut maker is a smart cutting machine that can cut a multitude of different materials. This is a good alternative to a laser engraver. Students/faculty will be able to cut custom patterns out on many materials for the use of their projects.
 - i) Install: 120v outlet already present
 - ii) Maintenance = minimal

- (i) Soldering Iron – x3 - \$28.88/ea: Soldering irons are a staple to any makerspace as it allows the ability to create basic circuits. This will allow students/faculty to utilize basic electronics equipment to complete their electronic projects.
 - i) Install: 120v outlet already present
 - ii) Maintenance: none
- (j) Filter/Fan – x3 - \$30.95/ea: For soldering fumes, this filter/fan will take the fumes and pull it into a carbon filter. This will allow students to utilize the soldering irons safely.
 - i) Install: 120v outlet already present
 - ii) Maintenance: Replacement filters will be purchased by supply budget
- (k) Helping Hand – x3 - \$20/ea: The helping hand allows for wires and PCB's to be held in place safely so the student/faculty member can work on them.
 - i) Install: none
 - ii) Maintenance: none
- (l) Breadboard – x2 - \$11.86/ea: Breadboards help create mock-circuits. This will allow students/faculty to test out circuit needs before generating a real PCB.
 - i) Install: none
 - ii) Maintenance: none
- (m) Breadboard Kit – x2 - \$18.27/ea: This breadboard starter kit includes a lot of basic pieces needed to utilize the breadboards themselves. This will allow students/faculty to test out circuit needs before generating a real PCB.
 - i) Install: none
 - ii) Maintenance: none
- (n) Arduino Starter Kit – x2 - \$87.90/ea: The Arduino starter kit will allow for students/faculty to understand the basics of using such a device. It will also pair well with the breadboards from above.
 - i) Install: none
 - ii) Maintenance: none
- (o) VEXEDR – x2 - \$539.99/ea: The VEXEDR will allow students/faculty to have the basic components to generate a robot. This kit is widely used within high school robotics competitions so incoming students may already be familiar with it.
 - i) Install: none
 - ii) Maintenance: none

• **Materials and Supplies: List name, estimated cost and quantity for each non-equipment items and explain why it is important to the project.**

- a) Note: Install and Maintenance has been omitted in this section. If any special installation or maintenance is needed it will be noted under the line item in this section.
- b) R-8 Collet Set – x1 - \$83.95/ea: This allows for mounting endmills into the machining mill
- c) Clamp Kit – 7/16 Slot – x1 - \$48.95/ea: This allows for clamping the project or jig/fixture onto a piece of equipment. 7/16 slot is specific to the model being purchased.
- d) Quick Vise – x1 - \$68.95/ea: This allows for small projects to be clamped safely where the clamp kit, from above, would not be sufficient.
- e) Endmills – x2 - \$52.95/ea: These are the actual cutting bits used for the mill.
- f) Oil-Cutting – x1 - \$26.80/ea: This allows lubrication for the endmills while cutting. It also ensures longevity of the bits
- g) Carbide Tool Bit – x1 - \$51.95/ea: These are the actual cutting bits used for the lathe.
- h) Oil – Machining Lube - \$14.95/ea: This allows lubrication for the machine itself so it can operate correctly
- i) Drill bit 115pc Set – x1 - \$68.50/ea: These are regular drill press bits of different sizes for the use in many different project applications.
- j) Tool chest – x1 - \$248/ea: Will house all the normal tools and supplies for the makerspace.
- k) Rubber Mallet – x1 - \$2.99/ea: A rubber mallet for use on materials you don't want to mark/dent with a normal mallet
- l) Claw Hammer – x1 – 3.98/ea: A regular hammer which can also remove nails.
- m) Mallet – x1 - \$5.49/ea: This mallet has two surfaces which are non-marring

- n) Vise Grip Set – x1 - \$12.99/ea: Vise grips will be used to hold pieces in place if sanding or other basic operations are needed.
- o) Plyer Set 3pc – x1 - \$9.99/ea: Pliers will be used to help hold and handle projects
- p) Channel Locks – x1 - \$10.99/ea: Channel locks will be used to hold large objects
- q) Wrench Set Standard – x1 - \$14.99/ea: Wrench set will be used to fasten bolts to/from projects that have a standard head size
- r) Wrench Set Metric – x1 - \$14.99/ea: Wrench set will be used to fasten bolts to/from projects that have a metric head size.
- s) Crescent Wrench 3pc – x1 - \$24.99/ea: Adjustable wrench set that can be used on both metric and standard bolts
- t) Center Punch – x5 - \$4.99/ea: Mechanical center punch is used to mark materials so a location can be achieved and/or a starting point for a screw or bit.
- u) Metal Punch Set – x1 - \$29.96/ea: Manual punches used for different types of surfaces
- v) FatMax Screwdriver Set – x1 - \$34.99/ea: Screwdrivers for fastening screws.
- w) Hex Key Set 3pc – x1 - \$18.00/ea: A 3 piece hex key set, standard, metric, and torque, which allows the ability to fasten those types of fasteners
- x) Tape Measure – x3 - \$4.82/ea: Tape measures will be used to measure pieces and special layouts.
- y) Socket Set – x1 - \$84.99/ea: Socket set will be used to fasten bolts when the other wrenches are not safe to do so.
- z) Eyewash Station – x1 - \$345/ea: Eyewash station will be used in the event that any debris gets into someone's eye.
 - 1) Install: Mounting brackets placed onto wall
- aa) Turning/Bore Holder – x1 - \$29.95/ea: This will be used to hold the cutting components to the lathe for turning and boring
- bb) Turning Holder – x1 – \$25.95/ea: This will be used to hold the cutting components to the lathe for turning
- cc) Parting Tool – x1 - \$64.95/ea: This will be used to cut off the part from the feed stock
- dd) Carbide Insert – x2 - \$15.95/ea: This is the bit used in the parting tool
- ee) Quick Change Tool – x1 - \$295/ea: This will be used to easily change tools in/out
- ff) Insert Boring Bar – x1 - \$94.95/ea: This will be used to bore out parts from the inside
- gg) Carbide Inserts – x1 - \$43.95/ea: This is the bits used with the boring bars
- hh) Indexable Carbide Set – x1 - \$91.95/ea: This will be used to cut parts
- ii) Inserts – x1 - \$45.95/ea: This is the bits used with the carbide set for cutting parts
- jj) Scissors – x2 - \$9.99/ea: Scissors will be used to cut textiles.
- kk) Tape Measure – x1 - \$7.99/ea: This is a fabric-specific tape measure.
- ll) Acrylic Ruler – x3 - \$14.99/ea: Acrylic ruler will be used as a cutting edge for textiles.
- mm) Seam Ripper – x3 - \$4.64/ea: Seam ripper will be used when a stitch is not the way the user intends.
- nn) Seam Roller – x1 - \$18.99/ea: Seam roller will be used to roll seams
- oo) Rotary Cutter – x2 - \$10.99/ea: Rotary cutter will be used to trim fabric to size
- pp) Arduino Accessories – x1 - \$200/ea: Arduino accessories will be used to identify what accessories are needed for the Arduino Uno.
- qq) Voltmeter – x1 – 23.18/ea: Voltmeter will be used to test electrical circuits and troubleshoot any project errors.
- rr) Breadboard Jumpers – x2 - \$9.99/ea: Breadboard jumpers will be used to assist the breadboard kits in case wires become damaged or are not long enough.
- ss) Keyboard – x2 - \$0/ea: These will be matched from Library/IT
- tt) Monitors – x5 - \$0/ea: This will allow for dual monitors on the computers as well as an additional monitor for a pre-existing computer to convert it to dual monitor workstation.
- uu) Earplugs – x2 - \$23/ea: Earplugs will be used to avoid damage from loud noises
- vv) Safety Glasses 1 & 2 – x12 - \$0/ea: Safety glasses prevent debris in the eyes. These will be matched by the Library supply for both regular and over the glasses.
- ww) First Aid Kit – x1 - \$0/ea: This will be matched by the Library supply.
- xx) Calipers – x2 - \$0/ea: This will be matched by the Library supply

- yy) Sound Proofing Mats – x1 - \$2000/ea: Sound proofing mats will be used to ensure that noise levels outside the space maintain a tolerable level.
 - i) Install: Will be hung on walls
- zz) Shop Vacuum – x1 - \$139/ea: Shop vacuum will be used to clean up around the makerspace.
- aaa) Floor Mats – x1 - \$200/ea: Floor mats will be used to lay in front of or underneath the equipment.
- bbb) Marketing Pieces – x1 - \$1000/ea: This is a baseline marketing budget that would allow for the makerspace to be showcased across campus through flyers, brochures, tours, etc.
- ccc) 3D Printer Materials – x80 - ~\$25/ea: This will be matched by the Library supply.

NDSU Student Technology Fee Action Plan Request

VIII. Budget Match

1. Attempted Budget Matches:

- Computer Monitors
- Computer Keyboard
- Computer Towers
- Computer Mice
- Room 119
- First Aid Kit
- Safety Glasses
- Calipers

2. Actual Budget Matches: \$21,496.83

7.	EQUIPMENT			\$ 21,496.83
Cat.	Item	Qty	Cost/ea	Ext. Cost
4	Monitors	5	\$ 154.00	\$ 770.00
	Keyboard	2	\$ 30.00	\$ 60.00
	Computers	2	\$ 675.00	\$ 1,350.00
	Room 119		\$ -	\$ -
	First Aid Kit	1	\$ 27.95	\$ 27.95
	Safety Glasses - 1	12	\$ 1.00	\$ 11.95
	Safety Glasses - 2	12	\$ 1.41	\$ 16.95
	Calipers	2	\$ 11.99	\$ 23.98
	3D Printer Materials	80	\$ 25.00	\$ 2,000.00
5	Prusa MK2	2	\$ 999.00	\$ 1,998.00
	TAZ6	2	\$ 2,500.00	\$ 5,000.00
	TAZ6 - Dual Extruder	2	\$ 495.00	\$ 990.00
	Replicator 2	4	\$ 2,000.00	\$ 8,000.00
	Makerselect Mini	1	\$ 250.00	\$ 250.00
6	Matterform	1	\$ 599.00	\$ 599.00
	3D Sense	1	\$ 399.00	\$ 399.00

3. Additional Budget Match information:

- Computer equipment was obtained through Library/IT.
- Room was allocated by Library