

Exploring the Possibility of Alternative Desks in Fondren Study Spaces

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Executive Summary

As new research shows that traditional desks may do more harm than good to students, alternative solutions to the typical table and chair have entered many university libraries. Fondren Library is interested in discovering if substitute options—such as bike desks, standing desk, or under desk elliptical stations—will be useful options at Rice University. This study contains a literature review analyzing the three options, interviews with leading experts in the field of alternative desks, and a survey of all undergraduate students. Finally, a cost-benefit analysis was used to find that Fondren Library should implement both under desk elliptical stations and standing desks to improve student well-being and academic success.

Background

When asked to describe a study space, students will instantly recall the traditional chair and table that they have sat in for hours trying to write essays or study for an upcoming exam. However, recent research suggests that this traditional model may do more harm than good to students. Prolonged periods of sitting or limited activity have been linked to adverse health problems, such as obesity and heart conditions (Levine, para. 1). Furthermore, inactivity when studying can harm cognitive ability and injure a student's classroom performance (Schmidt-Kassow 20). Several companies have begun offering active desk alternatives, such as bike desks and under desk elliptical stations, or mobility friendly options, such as the standing desk. These companies assert that their products can combat the negative side effects of prolonged sitting, such as decreased wellness and decreased cognitive ability (FitDesk Benefits). Research into these new options is limited and leading experts are split. While some research

shows the aforementioned benefits of alternative desks, some educators and health professionals believe that moving while studying can distract students and thus hinder learning (Kamenetz, para. 3). Furthermore, experts have claimed that incorporating movement in studying can result in high injury rates and therefore may not be the best way to counter the harmful effects of sitting (Dachis, para. 5).

In light of these developments, Fondren Library is evaluating bike desks, under desk elliptical stations, and standing desks for possible implementation at Rice University. The purpose of this report is to summarize the results of a literature review on the aforementioned three options, provide information from a survey of all undergraduate students, and conduct a cost-benefit analysis to determine which options should be incorporated into the library.

Literature Review

These three options were chosen due to similar changes at other universities. Recently, many college libraries have adopted bike desk seating arrangements and these schools have done extensive research on the impact of these desks on student learning (Logue, para. 2). For example, Clemson University's Psychology Department tested the relationship between exercise and cognitive ability after purchasing six desks for the library (Pilcher 21). Thus, bike desks were an option in this study due to success at other universities.

Next, we considered standing desks as an option for the study. Fondren Library currently has a few standing desks on the first floor and in the basement, and students were familiar with the concept. Thus, this study would decide if standing desks should be implemented across the library.

Finally, we considered under desk elliptical stations. These machines have been used by

Fondren staff and could be expanded to Fondren study spaces. Under desk elliptical stations are similar to bike desks in that they combine movement into studying but they are different in that they are more discreet and would not disrupt the learning environment (Hubbard, para. 2).

Furthermore, this option can be used in conjunction with existing desks.

After these three options were chosen, it was important to meet with the Rice University Risk Management team to determine if these products could realistically be implemented into Fondren Library. I met with Renee Block, the Director of Risk Management, who went through the risks of the three options. She had familiarity with alternative seating desks as many departments at the university have implemented similar products. Through our meeting, we determined that none of these three options would pose a significant risk to students and could potentially be introduced into the library. We also discussed any legal barrier to these options. She stated that the legal team has worked with the Risk Management office when allowing university staff members to use these devices and there should be no legal barriers when implementing these devices in Fondren for all students. It will be important in any implementation phase to stay in contact with the Risk Management and Legal Office.

This literature review is broken down into three sections for each of the three options. Each section will provide a brief description of the products as well as the costs and benefits. Finally, there will be a short conclusion that will aid in the later cost-benefit analysis.

Bike Desk

Description

The bike desk is a modified stationary bike with a table top desk (Appendix 1). The desk includes a drawer for pencils and a strap to secure a laptop to the desk. Furthermore, there is an

arm rest and a dial to change the resistance of the bike. The bike is sold for 300 dollars through the FitDesk company (FitDesk Bike Desk).

Benefits

Two key scientific studies provide information on the benefits of bike desks. First, in a study published in the Public Library of Science, researchers studied how physical exercise during studying affects learning. There were three groups that studied a vocabulary list for thirty minutes: one studies without exercise, one exercises before studying, and one exercises during studying. The groups were then tested on what they learned at the end of the session. The third group that exercised during the study session was able to recall information better than the other groups, however the difference was not statistically significant (Schmidt-Kassow 20). These data suggest that combining studying and exercise does not negatively impact learning and may provide a slight benefit.

Another study analyzed the long-term benefits of studying and exercise. Dr. June Pilcher of the Clemson University Psychology Department purchased six bike desks for the library to study the relationship between exercise and cognitive ability (Pilcher 21). These researchers measured how long students studied on the machine and how their grades changed. With these quantitative tests, she also used subjective measures to study happiness and stress levels of users. After analyzing the data, she found that while there was no statistically significant difference in grades, there was a slight benefit: students who exercised while they studied reported lower levels of stress and more motivation in school (Pilcher 21).

Both of these research reports suggest that students who study while using a bike desk are not negatively impacted and may positively benefits from slight benefits in stress and slight

increases in class performance.

Harms

While there may be some benefits, some health professionals believe that the harms of using a bike desk while studying outweigh the benefits. Dr. Cecilia Valdes of Baylor College of Medicine purchased a bike desk for the medical students at the college after reading about the adverse effects of prolonged sitting (Valdes Interview 27). She then studied student productivity to determine if these models should be implemented across the college. In an interview conducted on October 27th, she discussed her research and her conclusions. She found that while there were benefits in getting students to move, the desk was not a productive tool. She equated the lack of productivity to a phenomenon called “screen shake” where the attached desk rocks with the pedaling motion of the bike. When the desk moves, the study material moves as well and the brain is not able to focus on the shaking material. The inability to interpret the moving material can cause nausea in some people and ineffective studying. Dr. Valdes found that another reason for the lack of productivity, albeit a small reason, could be due to the uncomfortable seat. In her studies, students complained about the seat after only 45 minutes of use and were unwilling to use the bike again. I then discussed a possible plan to purchase bike desks for mass use at the library. Dr. Valdes told me she discovered that the FitDesk model is not built to be used by many different people constantly when her machine quickly broke down after only a few weeks. Fondren Library is not equipped to constantly repair these machines, and this is a significant drawback. She did mention that the bike desk can be modified to work with a traditional desk, this would void the warranty and not solve the issue of high maintenance.

Conclusion

Bike desks can improve mood, decrease stress, and improve school performance slightly when used while studying. However, bike desks may lead to unproductive studying due to “screen shake” and uncomfortable seat. Furthermore, the bike desks are not meant for mass use and would require constant maintenance from the library. Thus, bike desks may not be the best option for the library.

Under Desk Elliptical Station

Description

This product features the pedals of a traditional elliptical where users can slowly pedal while they study and costs 169 dollars (Appendix 2). The machine is meant to be used underneath a traditional desk and is very quiet to avoid distracting others (FitDesk Under Desk Elliptical). This model has not been implemented in other universities, so there is very little scientific research on the topic. The benefits and costs come from blogs and articles written by people who use the product in the workplace.

Benefits

Because the under desk elliptical station does not come with an attached desk, the harms of “screen shake” outlined by Dr. Valdes would not hinder productivity. In fact, in a site visit with Dr. Valdes on November 9th, she modified the bike desk to be used with a free standing desk (Valdes Interview 9). She found that this eliminated screen shake and students were able to effectively study. The under desk elliptical station would essentially follow this principle as the station would be used with an existing Fondren desk. Thus, under desk elliptical stations would not have the drawback of “screen shake.” This device also combines movement in studying so

many of the subjective benefits experienced with bike desks can translate to under desk elliptical stations. For example, the Schmidt-Kassow studied students' ability to recall words when using a moving desk. This study showed that there may be a slight increase in cognitive ability, but this result is not statistically significant. Also, research conducted at Clemson University showed that students who used a moving desk reported lower levels of stress and elevated levels of happiness, however these results were also not statistically significant.

Thus, the under desk elliptical station eliminates distractions from screen shake and uncomfortable seats while allowing for slight increases in cognitive ability and subjective measures of well being.

Harms

While there may be some benefits in productivity and subjective well-being for users, there are many ergonomic concerns. In one testing experiment in a workplace, users were unable to properly use the device because they couldn't pedal without hitting the bottom of the desk. One reviewer stated "to my disappointment, my desk isn't high enough to use the elliptical underneath it...I had to position it so that my knees weren't hitting the [bottom] of the desk, which made getting work done slightly uncomfortable" (FoxNews, para. 4). This machine could potentially be used by many students with different heights, so it is important to consider how different people could use this device. Also, this machine, like the bike desk, may not be durable enough for mass use in the library and Fondren is not equipped to handle excessive repairs. However, like the bike desk, it may be possible to obtain a warranty contract with the purchasing company. These ergonomic and durability concerns must be considered in the analysis of this device.

Conclusion

Under desk elliptical stations are not attached to a desk, so they can allow for productive studying and provide many subjective well-being benefits to the user. However, there are many ergonomic concerns such as height of the user and the machine moving during use. To address the height issue, the machines could be placed under tall desks to ensure that users could maintain proper posture. Also, Fondren Library could make educational materials to tell students how to properly use the machine to avoid injury and maximize studying. To address the sanitation issue, Fondren Library can provide sanitation wipes or encourage students to use the machine for short intervals to reduce cleanup. Because many of the harms can be fixed, Fondren Library should heavily consider the use of under desk elliptical stations in study spaces.

Standing Desks

Description

This option could include an elevated stand to be used with existing desks, a free standing tall desk, or a convertible desk to move from sitting to standing (Appendix 3). Both the elevated stand and the convertible desk could be height adjustable to fit a variety of students. The elevated stand is sold for 100 dollars, the free standing tall desk is sold for 200 dollars, and the convertible desk is sold for 400 dollars. All of the following harms and benefits can apply to all three options.

Benefits

Many of the benefits of standing desks have been summarized in a research article conducted by Dr. Ranjana Mehta, assistant professor at Texas A&M School of Public Health. She studied the relationship between standing desks and cognitive function and used brain

scanning technology to study the effects of standing when completing tasks. She found that “continued use of standing desks was associated with significant improvement in executive function and working memory capabilities” (Mehta 22). Not only are there positive benefits to work performance, standing desks can also improve mood and energy as found in research conducted by Dr. MacEwen of the Department of Applied Human Sciences at the University of Prince Edward Island (MacEwen 8). Furthermore, standing desks can provide a variety of health benefits. In a study conducted by Dr. Buckley of the Department of Clinical Sciences and Nutrition, standing while working can reduce risk of cardiovascular disorders such as heart disease (Buckley 109). Standing desks can provide benefits in productivity, subjective well-being, and health.

Harms

While there are many benefits to standing desks, there are important drawbacks to consider. In one review of a standing desk, Mikael Cho, founder of a popular startup, says “it’s really hard to [work] when you’re thinking about the pain in your leg, when you’re trying to force yourself to stand, when your shoulders are starting to cave in” (Miller, para. 3). Cho did not have the proper training on how to use his standing desk and probably used poor posture that led to these pains. In fact, users that stand all day and do not pay close attention to posture can experience lower back problems, cardiovascular problems, and varicose veins (Miller, para. 7). These concerns about improper usage are very important when considering the implementation of more standing desks in Fondren Library study spaces.

Conclusion

Standing desks can provide many benefits in terms of productive, subjective well-being,

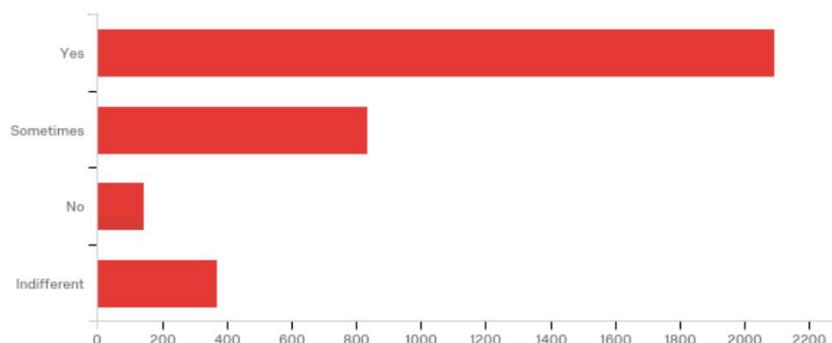
and overall health. However, improper usage can cause serious health concerns. These issues can be addressed with educational training and information about the desks. Thus, because the harms can be addressed by Fondren Library, standing desks should be implemented into Fondren study spaces.

After completing this literature review, it is clear that under desk elliptical stations and standing desks can provide many benefits to students and should be implemented into Fondren study spaces. However, bike desks show many drawbacks that could not be easily addressed by staff. Thus, bike desks should not be considered for implementation in Fondren study spaces.

Survey Results

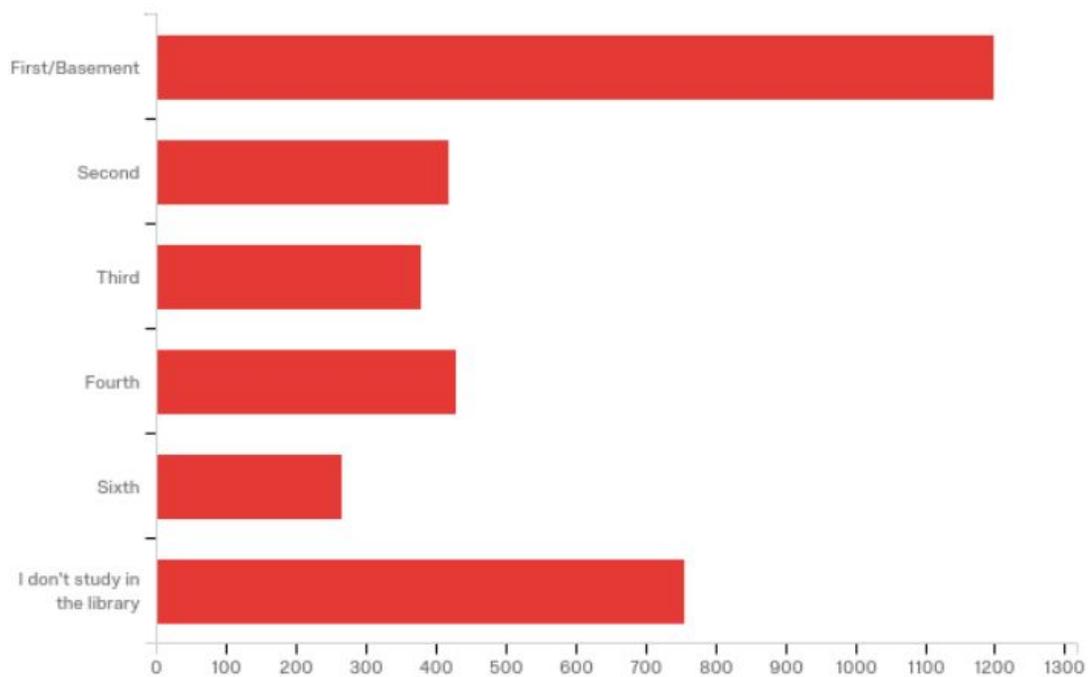
Questions gauging student interest on these three options were incorporated in a larger survey conducted by Rice University. More than 3000 students across campus participated in the survey and the results are below. At the beginning of the survey, there were pictures of each of the three options and a brief description of the benefits and harms to users. These descriptions were meant to be impartial to allow students to determine if they would use the product or not. The survey question and results will be introduced and then analyzed in the context of this study.

Are you satisfied with current Fondren Library furniture and equipment?



Students showed that they were mostly satisfied with the current Fondren Library furniture. This is significant because it suggests that students would not want to see drastic changes in the current state of the library. One way this could be achieved would be to slowly introduce new equipment and educate students about the costs and benefits associated with active workstations. It is possible that students responded positively because they were unaware of alternatives. Thus, it will be important to increase educational outreach surrounding these products. Furthermore, the high response rate of “sometimes” shows that students would be open to changes in the library, but it may require increased education.

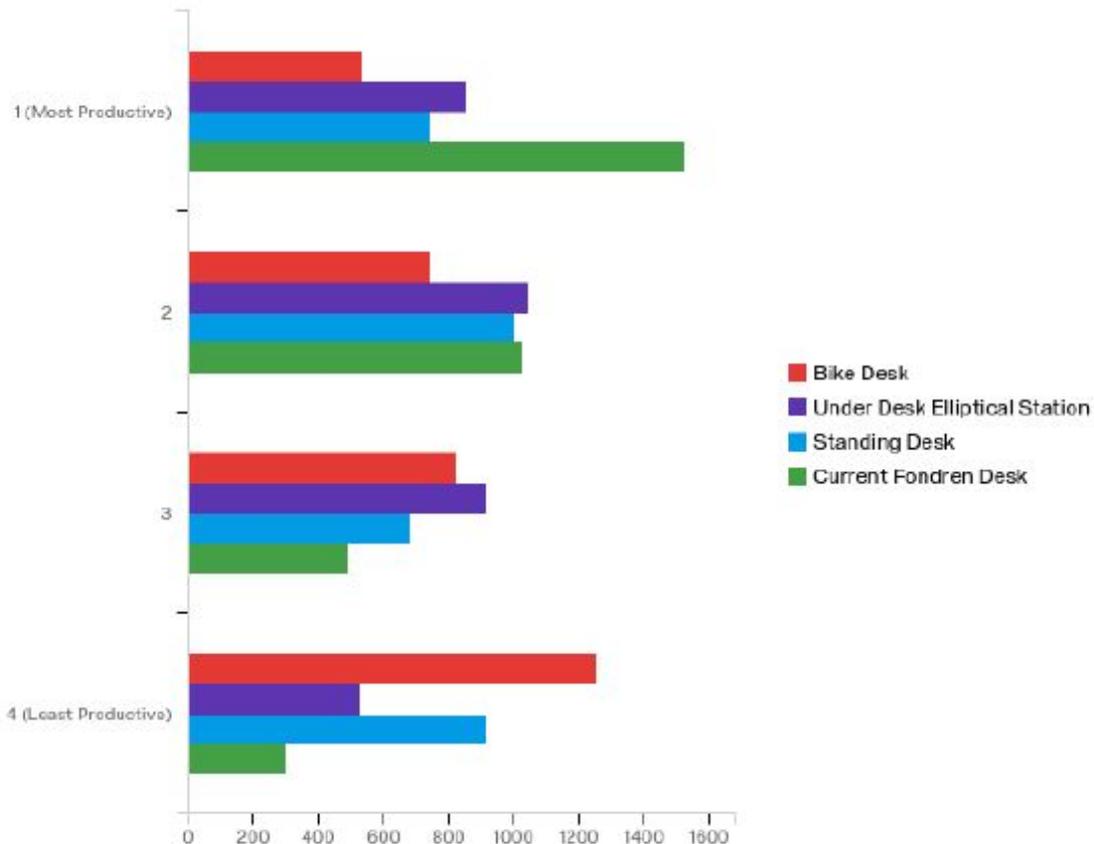
On which floor of Fondren do you prefer to study? If you study on multiple floors, please choose the one you use the most.



This question will be used to decide where to place any new equipment. It is significant to note that most students study on the main floor. This would be the easiest floor to implement

bike desks or under desk elliptical stations. Further research must be done to decide the best location on the floor for maximum use. Furthermore, it is interesting that a high percentage of people said

Please rank your perceived PRODUCTIVITY at these three seating arrangements and conventional desks in Fondren.



they do not study in the library. It is possible to adjust the education and advertising of the new products to encourage students to utilize Fondren more. Finally, there is a spread of use across floors 2-6. Therefore, it may be necessary to have a mobile unit that students could use on any floor to maximize student use.

This question asked students to rate their perceived productivity at each of the four options in order to gauge student usage. It found that students believed that the current Fondren desk would be most productive, followed by the under desk elliptical station, the standing desk, and the bike desk would be the least productive. These results were consistent with the hypotheses presented in the literature review. This information is significant because it shows Fondren staff where education efforts need to be directed in order to increase student usage. Furthermore, this information can recommend the first piece of new equipment that could be successfully added: the under desk elliptical station.

In summary, the results of the survey show that students would not want to see drastic changes in the current state of the library as most are satisfied with current equipment. Furthermore, while most students study on the first floor, there is a spread of students across the other floors and it will be important to have a mobile option for all students. Finally, students are most interested in the under desk elliptical station and the standing desk for possible use in Fondren.

Cost-Benefit Analysis

All data from extensive research into bike desks, under desk elliptical stations, and standing desks must be analyzed to provide the best recommendations to Fondren Library. Below is an analysis of the benefits and harms of each option.

Bike Desk

Bike desks allows students to incorporate movement into studying. Two key research articles showed that while there is no significant increase in school performance, there is a slight

upward trend in grade (Schmidt-Kassow 20). Furthermore, Dr. June Pilcher demonstrated that students report higher energy levels and feel more motivated to tackle school work (Pilcher 21). While these subjective measures are important, there are many harms to bike desks that cannot be ignored. For example, in an interview with Dr. Cecilia Valdes, who has implemented bike desks into Baylor College of Medicine study spaces, she found that bike desks can hinder productivity due to screen shake. Furthermore, the machine can quickly break down with many users and require much maintenance (Valdes Interview 27). In the survey, students showed an unwillingness to use the device due to a perceived lack of productivity. Thus, it seems clear that the harms of bike desks outweigh the benefits and bike desks should not be implemented into Fondren Library.

Under Desk Elliptical Stations

Under desk elliptical stations also allow students to incorporate movement into studying, but are more discreet than bike desks as they can be hidden under an existing desk. Also, because the machine does not come with an attached desk, “screen shake” would not be a hindrance to the user. This machine also allows for slight subjective benefits, such as increased happiness and decreased stress, but these results are not statistically significant (Pilcher 2). Furthermore, students may experience slight increases in cognitive ability and grades as demonstrated in published scientific articles (Schmidt-Kassow 2). Finally, the survey results showed that students were interested in using this product in Fondren study spaces.

However, there are drawbacks to this options as well. For example, many models are not height adjustable and may not be usable by taller people. In many testimonials, taller users had to sit uncomfortably in order to use the machine and do work, an overall detriment to health and

productivity (FoxNews, para. 4). Also, this machine may not be very durable for constant use. These issues can be addressed via proper education on how best to use the machine. The harms of this machine do not disqualify it from use in Fondren study spaces, but the benefits may not be significant enough for widespread implementation. A pilot run of these machines should be conducted in Fondren library to study student reactions before further implementation.

Standing Desk

The standing desk is the only option that does not clearly involve movement, but it can still provide many benefits over sitting. Research has shown that standing while studying can improve function and memory and lead to cognitive benefits in the student (Mehta 22). Many of the cognitive benefits seen in under desk elliptical stations and bike desks were also observed in under desk elliptical station users, such as improved mood and increased energy (MacEwen 8). Finally, there are many health benefits to users of standing desks such as lowered risk of cardiovascular diseases (Buckley 109). Additionally, the survey results showed that students were interested in using a standing desk in Fondren study spaces and they could be a mobile option for students studying on any floor of the library.

However, reviews on standing desks showed significant drawbacks. For example, improper posture when using a standing desk can lead to cardiovascular problems and varicose veins (Miller, para. 7). While these are significant drawbacks, they can be addressed with comprehensive training and education on how to properly use a standing desk and limiting students to only a few hours at the desk. Because these harms can be addressed with proper educational material, the standing desk can still be considered for implementation. However, the benefits are not statistically significant and cannot justify widespread implementation in the

library. Thus, like the under desk elliptical station, a pilot run of standing desks should be conducted to gather more data on any benefits or harms to students.

Conclusion and Future Work

Fondren Library should conduct a pilot study of both under desk elliptical stations and standing desks to study student reactions and gather data on any harms or benefits. Students who use these devices can potentially benefit from slight reductions in stress, increases in mood, increases in productivity and increases in grades.

This pilot study can begin with three under desk elliptical stations and five standing desks for a total cost of 1000 dollars (Appendix 4). Through discussions with Fondren Ordering Staff, the standing desks would be placed on the first floor or be available for checkout at circulation. The under desk elliptical stations would be placed under desks on the first floor and stuck with “tattle tape” to ensure that the machines stay in the library.

The success of the pilot program is largely dependent on developing a research model to collect data. The User Experience Office has done some qualitative research on the standing desks currently in the library, and future researchers can work more with this office to create an appropriate research survey. In a preliminary study, the User Experience Office suggested a pre-use and post-use survey to be given to students who check out a machine. The details of this program would have to be determined by future researchers.

The sustainability of these devices is largely dependent on advertising their benefits for students. If students are aware of the harms of sitting and the benefits of incorporating movement into study sessions, they will be interested in using these alternative options, as illustrated in the survey. Thus, it will be very important to have informational material on the new desks, training

for proper usage, and examples of students using the new devices throughout the library.

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Appendices

Appendix 1: Bike Desk



Appendix 2: Under Desk Elliptical Station



Appendix 3: Standing Desk



Elevated Stand Desk or Height Adjustable Desk



Free Standing Desk with Outlets

Convertible Sit-Stand Desk (The desk can flatten to lay flat on the table)

Appendix 4: Budget

Name of Machine	Number of Units	Price
Under Desk Elliptical	3	507
Standing Desk	5	500
TOTAL:	8	1007

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