Recommendations for the Classroom Technology and Layout at WPI

An Interactive Qualifying Project

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By:

Mimoon Alwash

Jacob Grills

Richard Hinrichs

Brittany Wasserman

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Project Advisor: Dr. Chrysanthe Demetry, WPI Professor

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Abstract

The Academic Technology Center (ATC) at WPI replaces the technology in each classroom every five years. The goal of this project, sponsored by the ATC, was to determine how current classroom technology could be improved to enhance the teaching and learning experience. Using interviews and surveys we gathered both qualitative and quantitative information from more than 140 faculty members and 550 students. Based on those findings, we formulated recommendations that include increasing the size of the podium tops and moving the projector screen to maximize board space.

Executive Summary

Technology is incorporated in every classroom at Worcester Polytechnic Institute (WPI), and the Academic Technology Center (ATC) is responsible for the installation and maintenance of that technology. The ATC renovates the classrooms every five years to keep up with new trends and to ensure reliability of the technology. During renovations the ATC replaces all technology in each classroom and tries to make improvements based on any feedback they've received. The goal of this project was to make suggestions to the ATC for improving the implementation of classroom technology and improving the design of the podiums at WPI based on feedback from a large sample of professors and students. Our ambition was to suggest a technology layout and podium design for each room up for renovation in the summer of 2014 and 2015 that would be considered beneficial by the majority of professors and students.

Methodology

In order to gather the data needed to accomplish this goal we established the following research objectives:

1. *Gathering feedback from professors about the podium design and placement, the projector screen location(s), and the desire for new technology.*
2. *Gathering feedback from students about the classroom layout, the podium design, the desire for new technology.*
3. *Analyzing feedback and formulating recommendations for the ATC to use for future classroom renovations.*

In order to gain both the qualitative and quantitative data we needed to make well-informed conclusions to our research questions, we used a combination of interviews and surveys. We were able to conduct 21 interviews with faculty members from 10 different departments. These interviews allowed us learn how professors use the podiums and gather their thoughts about how the technology in classrooms can be improved. Their responses, along with background research, helped us develop online surveys for both faculty and students to complete. We received just over 560 responses, a 10% response rate, from the student classroom technology survey, resulting in a 95% confidence that the sampling error is ± 3.9%. We received 130 responses, a 52% response rate, from faculty members which gave us a 95% confidence that the sampling error is ± 5.9%. The quantitative data from the surveys along with the

recommendations from faculty that we received from the interviews helped us make recommendations to the ATC.

Findings

After analyzing the survey and interview results we developed the following findings regarding the classrooms at WPI:

1. **Professors want podiums to have larger surfaces.** Overall, podium size was the number one concern among faculty for both interviews and survey results. More than 95% of faculty members indicated that they use the podium while teaching. Of those professors, only 6% are opposed to having a larger podium desktop. Many of the professors indicated that the podium top needs to be larger or have a more optimized design that will allow for more mobility of the components. According to the ATC, components are anchored to the tops to prevent them from falling off of the edges. Many professors also commented that they would like to be able to have more room on top for notes and a laptop or textbook. More than 10 professors commented specifically that the keyboards are in a bad location and that there is no other comfortable spot for it.
2. **Professors want the podium controls to be the same in every room.** Professors also had some strong opinions about the controls for the podium components in the classrooms. Many professors said during interviews that the controls were either hard to use in general or that there was too much variation between rooms. That led us to ask both of those questions on the faculty survey to determine if other professors agreed. Over 52% of professors said that the podium controls were easy to use with only 19% saying they were difficult. In the comments professors mentioned that having different controls in certain rooms made teaching more difficult. Although they figured out how to use them, they don't like having to spend time at the beginning of the class trying to Figure them out.
3. **Professors would like to be able to use the boards and projector screen simultaneously.** The majority of faculty said that they do or would like to use both the boards and the projector at the same time while teaching class. Over 42% of faculty said that the current layout in the classroom they are teaching in allows them to use both the

board and the projector at the same time. Another 42% said they would like to use both but there is not enough room for both.

4. **Students and faculty are in favor of new screen sharing technology.** The ATC showed us some new screen sharing technology that they were evaluating, so we decided to see what students and faculty thought about it. Over 87% of students expressed interest in being able to mirror the projector screen onto their laptop during class. The majority of students are also interested in being able share their screen with the projector and class. Faculty agreed that this would be useful for some classes. The majority of faculty also expressed interest in being able to use the projector from a wireless device.
5. **Students and faculty showed interest in studio classrooms.** One way universities are incorporating technology into classrooms is by building studio or flipped classrooms. These student-centered learning spaces are designed to support active learning and teaching strategies, collaborative learning, and peer instruction. During the interviews and surveys, we showed participants a picture of one of these rooms in addition to a brief explanation; then we asked them if they thought these rooms would be beneficial at WPI. 82% of students are interested in having some of these rooms at WPI and 63% of faculty members feel the same way. Many students had comments similar to: "…I would really like to see that at WPI…" and "…I think the learning process would greatly benefit."
6. **Students and faculty said that other classroom elements like seating, lighting, HVAC, and power outlets are also important to learning.** Although the ATC only manages the technology, we found that other classroom elements are important to students and are in need of improvements. The element that ranked lowest in quality, according to students, is power outlet accessibility. Many students want to be able to bring their laptop to class and charge it at their seat/desk. Students and faculty commented that the HVAC systems in some of the buildings like Kaven, Washburn, and Higgins are noisy and fail to provide a consistent temperature. Students also mentioned that seats are broken in some rooms like SL 115 and squeaky in others. The last element that came up as needing improvements was lighting controls. Faculty members especially think that the lighting in many rooms is hard to adjust to the desired lighting levels.

Although we have gathered a lot of feedback about the classrooms at WPI, there were still limitations to our data gathering methods. To gather data about specific classrooms, we asked faculty to consider a classroom they recently taught in when answering questions. Therefore some of the rooms only have a couple reviews, so we grouped similar classrooms together for analysis. Some of our questions we determined were not as clear as they could have been. This potentially limited our useful responses from the questions about projector screen placement.

Recommendations

Based on our findings, we have identified four areas for improvement in classrooms at WPI. These include podium design, board and screen placement, new technology, and additional classroom elements. We have developed recommendations for these areas to improve the learning experience for everyone. These recommendations can be used as a guide for future classroom renovations at WPI.

1. **We recommend increasing the surface area of the podiums and allowing components to move more freely on top.** We determined that many professors want more space on top of the podium to place their teaching materials. However, the anchored components like the screen and control box make it hard to arrange the top to have more space. Increasing the space does not necessarily need to be with a larger top. Allowing the components on top to move would make more space if professors move it to the back or side. Fold up shelves would also add more space that the professors want when teaching at the podiums. Being able to move the keyboard to a better position like the sliding drawer would also help add space to the podium top. The ideal podium design is shown in Figure 1.

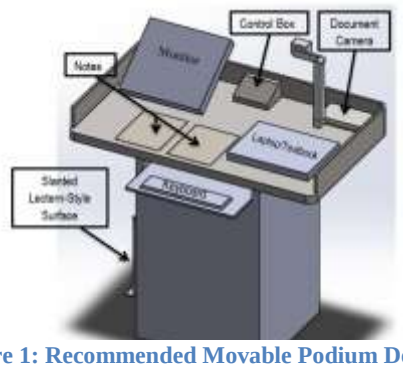

Figure 1: Recommended Movable Podium Design

2. **We recommend maximizing the board space when placing the projector screen.** It isn't possible to make a sweeping recommendation about the ideal placement of the projector screen since every room is different. However, based on our findings every room that is renovated should be evaluated to find the best position for the screen. We recommend placing screen toward the side of the boards to maximize the usable board space. We evaluated how ten other schools design their classrooms and all of them suggest a layout with the podium on one side of the board and the projector screen on the other. This allows the instructor to easily move between the podium and the board. A combination of larger boards or smaller screens would also allow professors to use both for their teaching.
3. **We recommend adding screen sharing software to renovated rooms and converting some rooms to studio classrooms.** Students are very interested in this software and adding it in classrooms on campus would add to the learning experience. Students want to be able to view the projected content on their laptop and also share their screen with the class. Some professors are also interested in students being able to share what they are looking at with the class. This could help professors answer questions better. Studio classrooms would also be a great addition to campus. Students and faculty think they would be great for GPS classes and other group intensive classes. They also note that they would require more training for the instructors and would not work for every type of class.
4. **We recommend involving the Facilities Department in the renovations to address some of the classroom elements that are of low quality.** The biggest areas for improvement are seating and power outlets. When renovating, Facilities should add outlets at some of the seats wherever possible. They should also address the seats in SL 115 because many students commented about broken seats in that room. HVAC is more complicated to address, but can have a huge impact on learning when classes are interrupted by noisy systems or extreme temperatures.

These suggestions, if implemented, could potentially improve the teaching experience and therefore have a positive impact on the student learning experience here

at WPI. We also hope that new technologies and classroom designs will be implemented to keep WPI at the cutting edge of technology and learning.

Authorship

Section	Author	Editor(s)
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1.0 Introduction

The design of a classroom contributes to the teaching and learning environment. Commonly, classrooms are designed to support a certain teaching style (Sommer, 1977). For example, rooms with podiums placed in front of rows of desks are well suited for lecture style teaching, while rooms with chairs situated around tables are better for teaching that encourages group work. Any single college classroom is used by many professors, creating the challenge of designing a versatile classroom that can adequately accommodate various teaching strategies. Many universities have tried to meet this challenge by designing flexible classrooms that can be easily adapted to support the needs of different situations. To improve upon the method of designing a classroom tailored to a specific teaching style, one must also design based on an understanding of the learning process (Yousef & Sepulveda, 2006). Numerous studies have determined that one of the greatest predictors of whether students will learn and retain information taught is whether they were engaged with the material while it was being taught (Terrion & Aceti, 2012). The classroom environment should help students understand, observe, and participate in active and engaged learning (Yousef & Sepulveda, 2006).

The use of educational technologies in the classroom has played a part in shifting the educational model from being teacher-centered to a model in which the student is the center of attention and discussion (Yousef & Sepulveda, 2006). For the purposes of this project, "educational technologies" refers to electrical components that assist in the presentation of educational materials (i.e. projectors and document cameras) as well as hardware that provides access to software, online resources, and digital content. Based on research conducted by the Semel Institute for Neuroscience and Human Behavior at the University of California Los Angeles, today's students, who have grown up with a saturation of technology in their everyday lives, will be more engaged with material presented through technology over reading about the material in a book (Diamond Hicks, 2011). Author Stephanie Diamond Hicks argues that incorporating technology into the classroom design is a necessity for enhancing the learning experience of the students.

Although there are many benefits of using educational technology, there are also numerous challenges presented. Educators must learn to use the technology as a teaching aid and organizational tool effectively, in order for it to help them present material in different ways, plan their lessons more efficiently, and distribute their notes more easily. If teachers plan lessons around the educational technologies they wish to use, the lessons become more focused on the technologies being used rather than on the students' learning experience (Harris and Hofer, 2009). To avoid the ineffective integration of technology into a lesson plan educators need to choose the educational technologies that best support the learning activity that will be used in the lesson (Harris and Hofer, 2009). Even when teachers do use technology effectively there could be other drawbacks such as uncontrollable technical difficulties that could impact the lesson plan. Also, certain technologies, like computers and tablets can create distractions for students and force the educator to compete for the students' attention (Chowdhury, 2006). Managing the challenges of classroom technology and realizing its full benefits requires both good decisions by instructors and effective integration of technology into the classroom design.

Technology is incorporated in every classroom at Worcester Polytechnic Institute (WPI). The Academic Technology Center (ATC) at WPI is responsible for the installation and maintenance of the technology, including the instructor podium, in each classroom and they renovate the technology in a number of these classrooms every summer. During renovations the ATC replaces all technology in each classroom and tries to make improvements based on any feedback they've received. According to Kate Beverage, the assistant director of the ATC, every time the ATC has tried to get professors' opinions on what could be improved they only hear back from the same few professors. The ATC wanted to use the renovations in the summers of 2014 and 2015 as an opportunity to really implement the technology in a way that is pleasing to the majority of professors and students who use the rooms. In order to get a better idea of what changes the majority of professors and students would like to see the ATC needed feedback from a larger sample of professors and students.

The goal of this project was to make suggestions to the ATC for improving the implementation of classroom technology and improving the design of the podiums at WPI based on feedback from a large sample of professors and students. Our ambition was to suggest a

technology layout and podium design for each room up for renovation in the summer of 2014 and 2015 that would be considered beneficial by the majority of professors and students. We decided the best way to do this would be to establish how the professors and students regard the current technology set-up. Identifying the two main populations of interest to our study allowed us to focus our attention on each population individually, making our task of data gathering more manageable. By gathering ample amounts of feedback and information on the current set up of the classrooms to fuel our ideas for improvement, we hoped to suggest a technology layout and podium design that would be satisfactory to both the professors and students who use the rooms.

2.0 Background and Literature Review

This chapter will explain how the design of a classroom and the integration of technology impacts both students and professors throughout the learning process. We will reference the Principles of Good Practice in Undergraduate Education to explain this impact. As a result of these principles being used in classroom design, there are new types of studio or flipped classrooms being built at leading schools across the country. The next section addresses the current technology in and layout of classrooms at Worcester Polytechnic Institute (WPI). We then highlight how some other colleges design their classrooms and what technologies they include. This section is concluded with information about new technology that should be considered in the renovation of classrooms on campus.

2.1 Influence of Classroom Layout and Technology on Learning

This section will introduce the well-known Principles of Good Practice in Undergraduate Education, which provide a good foundation for instruction. By incorporating these principles into the technology, design and layout of the room in a well-planned manner, the learning environment will be enhanced. In order for technology to be effective it has to be student-centered, designed efficiently, and cost-effective (Hopper & Hendricks, 2008). The layout of a classroom and the technology within it can have a huge impact on the overall learning environment.

2.1.1 Principles of Good Practice in Undergraduate Education

In order to assess and improve the educational experience, researchers have spent years coming up with guidelines for better education. The most commonly recognized principles by most researchers and educators were summarized in the article by Chickering and Gamson in 1987. They are called Principles of Good Practice in Undergraduate Education. Those principles are:

1) **Encourages contact between faculty and students**: Student and faculty contact in and out of class has a huge impact on student motivation.

2) **Encourages reciprocity and cooperation among students**: Group work increases student involvement in learning. Also, sharing thoughts and responding to other ideas improves thinking and understanding.
3) **Encourages active learning**: According to Barr & Tagg (1995) active learning creates experiences in which students discover and construct knowledge and solve problems. Active learning is very important in enhancing students' skills in understanding the class materials and improving the learning experience.
4) **Gives prompt feedback**: Providing students with feedback in class helps them to assess and improve their learning experience.
5) **Emphasizes time on task**: Recommending the amount of time required by the student to spend on tasks related to class helps students to map out their work and improves their time management skills.
6) **Communicates high expectations**: High expectations push students to their best performance.
7) **Respects diverse talents and ways of learning**: College attracts different types of talent. Some students prefer hands-on learning compared to standard lectures. Classrooms should be suitable to accommodate all types of talent.

Most of the seven principles can be directly affected by the layout of the classroom and the technology in it (McCabe& Meuter, 2011).

To apply the principles above, we need to take into consideration the classroom design and how it can influence the learning experience. In general, the lecture hall layout can have a significant effect on the learning outcome (Strayer, 2012). This layout includes both furniture and technology. The location and type of furniture play big roles in producing better educational experiences because some layouts can prevent cooperation among students. The room layout also can determine functionality of the classroom as either an instructor-centered teaching environment or a student-centered learning environment where the professor facilitates the learning process (Gislason, 2010). For example, the use of turning chairs with suitable sized tables for students to place their laptop and other resources helps facilitate group discussions (Emmons & Wilkinson, 2001). Moreover, the podium location and design help professors to

reach their students clearly. If the podium is located in a place that blocks the view of some students that will obviously impact their experience.

The technology that is integrated into the classroom is an important aid in achieving these principles. A student response system does an effective job of encouraging active learning and providing prompt feedback, especially in a lecture type setting (Hopper & Hendricks, 2008). Technologies that allow students to share their screen on the projector also encourage contact between faculty and students and encourage an active learning environment. Lecture capture systems incorporate diverse talents and ways of learning since it allows students to review the lectures for studying or note taking purposes (Kirby, 2009). The use of technology can be redirected and reused in different ways. For instance, the lecture capture can serve as a tool to record the lecture for distance teaching where listeners can skip or repeat some of the lecture materials (Clark & Feldon, 2005).

2.1.2 Effective Use of Technology

Experts in instructional technology agree that the use of technology in the classroom can either benefit or hinder the students and their learning experience. In order to assess the benefit of the technology used in the education process, three criterion points were proposed by Hopper & Hendricks who are pioneers in the field of Information Design and Communication from the Southern Polytechnic State University. The three points are: 1) the setting must be student centered, 2) must capitalize on the strength of technology-mediated instruction like efficiency and scalability, and 3) must be cost-effective (Hopper & Hendricks, 2008). The purpose of using technology in higher education is to "learn with it, not from it" (Hopper & Hendricks, 2008). This means that it should be used as an accessory to the lesson, not as the only method of presenting information to the class (Jonassen & Reeves, 1996).

For better use of technology, a thirteen point strategy has been created by Hopper & Hendricks as a guideline to lead the integration of technology. Some of the relevant ones are listed below:

1) **Abandon the search for technology magic, and use technology at hand**: Make use of the available technology rather than waiting for superior technology that doesn't exist yet.

2) **Model judicious technology use**: Use technology to support the classroom and teaching process rather than substituting teaching techniques.
3) **Use online technology to support the classroom-learning environment**: Videos and online resources can help engage students through a different style of learning.
4) **Use technology to increase the value of feedback in promoting quality work**: Online quizzes and assignments are one way to provide students with immediate feedback.
5) **Strategize technology adoption with a focus on long-term goals**: Technology does not aid learning without a cohesive strategy that provides opportunities for this to occur.
6) **Prepare for a mix of technology experience levels**: Since students come to school with different technology experiences, new technological tools should be explained to the students.
7) **"Don't panic"**: Introducing technology into a lesson plan can cause apprehension for some teachers. However if the instructor lets their apprehension prevent them from utilizing technology they and their students will miss out on all of the benefits it has to offer.

Not all of the thirteen points apply to our research project, so we mentioned the ones that are most likely to be applied. Also, those principles will help us to understand the point of view of the instructors regarding their use of the technology and what obstacles they are facing while using it.

2.2 Classroom Design Trends

One way universities are incorporating technology into classrooms in a way that emphasizes the Principles of Good Practice is by building studio or flipped classrooms. These student-centered learning spaces are designed to support active learning and teaching strategies, collaborative learning, and peer instruction. The increasing popularity of these studio classrooms is important to note for future classrooms at WPI.

2.2.1 New Classroom Designs

While the purpose and elements of these rooms are similar amongst most universities, each university creates a new name for them. For example, Massachusetts Institute of Technology calls them TEAL (Technology Enabled Active Learning) rooms and the University of Iowa calls them TILE (spaces to Transform, Interact, Learn, and Engage). All of these names are some form of an abbreviation of terms related to active learning and they all follow the same basic design guidelines (University of New Mexico, 2012). A studio classroom at the University of Iowa is shown in Figure 2. The most important aspect of these classrooms is that they incorporate all seven of the principles previously discussed. In order to create more contact between the students and faculty, the room is designed with tables that seat 7-9 students placed around the room and the professor's station is located in the middle. These rooms can be designed for almost any size class. Some schools have built these classrooms with as few as 27 seats while other schools have a capacity of over 150 students. Not only does this design allow the professor to easily communicate with all of the students, but also encourages the students to work in groups and share thoughts amongst themselves. Each table has a large screen display associated with it so the group can share information with each other as well as the whole class. In addition to the displays, the perimeter of the room is usually lined with whiteboards for students to work out problems and present ideas. These classrooms allow the professor to introduce new material to the students via traditional lecturing, but follow that with group

Figure 2: Studio Classroom (Van Horne, Muriatic, Gaffney & Jesse, 2012)

collaborations and practice problems. The professors can then walk around to all of the groups and provide feedback on their work. This new design style is becoming more popular because it incorporates all of the principles of good practice and is showing improved student performance (Leiboff, 2010).

2.2.2 Successful Implementations of Studio Classrooms

The University of Iowa recently created a number of these rooms on campus to improve student engagement in learning. They are designed with round tables for groups of seven students to sit, work, and learn together. Each table has a projector or big screen TV associated with it to share amongst the group. All of the groups are also connected together so that screens can be shared for the whole class to view. The classrooms built at the University of Iowa have capacities of 27-81 students each. The study conducted after they were used showed that students averaged higher grades than students who took the same course with the same instructor in standard classrooms. This is consistent with many other studies of the impacts of studio classrooms (Van Horne, Murniati, Gaffney, & Jesse, 2012).

North Carolina State University was the first to implement this type of classroom, and they call them Student Centered Active Learning Environments for Undergraduate Programs (SCALE-UP) learning spaces. Most of their rooms have a capacity of 100 or more students so this concept is useful for both large and small classes. The design concept is the same as Iowa and many other schools. Since NC State has built a number of these rooms on campus they have been able to conduct studies on the effectiveness of these rooms. All of their studies show that the students who take classes in these rooms have improved problem solving ability, increased conceptual understanding, and improved attitudes and attendance. Compared to normal lecture/lab classes, the SCALE-UP classes achieved a 16% increase in attendance. Students who take classes in these rooms are also 2.8 times less likely to fail the class. This ratio increases to 4.7 times for female students (North Carolina State University, 2007). Not only does this type of classroom encourage collaborative learning but also has a proven positive impact on the students' education experience.

2.3 Classroom Layout & Technology at WPI and Other Schools

As previously discussed, the layout of the classroom is critical to providing an exceptional learning experience for students and a functional teaching experience for professors. There are some specific technologies that are available in some classrooms like interactive pen displays for annotating documents and lecture capture systems to record lectures for future viewing. We follow this section with descriptions of the classrooms at WPI. Some schools publish design standards for their classrooms and we describe how they design their classrooms to create the best possible learning environment. We conclude with some new technologies that should be evaluated when looking for ways to improve the learning experience in the classrooms.

2.3.1 Existing Classroom Technology for Instructors at WPI

There are many useful technologies available in the classrooms at WPI. In this section we describe interactive pen displays, document cameras, and lecture capture hardware, all of which are available in many WPI classrooms.

Most of WPI's classrooms with podiums include an interactive pen display that serves as a monitor and a note-taking device. These displays allow professors to annotate PowerPoint presentations as they are presenting or just write notes for viewing on the projector screen. There are many advantages to these presenters. One is that a professor can write in any ink color or size and easily erase. Another benefit is that the "marker" is always there and will never run out of ink. Since the projectors are placed so that all seats can easily view them, all of the students will be able to see these notes compared to the chalkboards that are harder to see in certain parts of the room. Another important feature is that these notes and annotations can be saved for the professors and students to view later. These displays offer a lot more flexibility than a standard computer monitor.

The document camera is simply a camera elevated above the desk and it captures whatever is placed underneath it. WPI has two types of document cameras on the podiums. The wooden podiums have a large camera with lighting to facilitate the use of overhead projection slides. The movable podiums have a smaller, more compact camera that does not have any lighting. Both cameras are effective for professors who choose the pen and paper approach over the digital pen.

Technology like lecture capture makes distance learning possible and also allows students to review lectures while studying. There are 16 classrooms on campus that are equipped with the Echo360 lecture capture system. These systems allow the professor to record themselves and what is shown on the computer for students to review after class. The professors can record notes using the interactive pen displays that are in every technology-enabled classroom. For professors who choose a pen and paper approach, the lecture capture system also captures anything under the document camera too. Each lecture capture enabled room has a camera to show the professor at the front of the room and possibly any demonstrations. The camera does not move, so the professor has to write all notes on the display or under the document camera for them to be captured. The professor is also responsible for making sure that the microphone is working and recording at an appropriate volume for playback. Any professor who teaches in the lecture capture classrooms can sign up to have their class captured. The ATC will set up all recording schedules and the recordings will automatically link to Blackboard

2.3.2 Current Classroom Designs at WPI

Although the classrooms at WPI vary in size and seating capacity, the technology design and implementation in the majority of these rooms fall into two categories. The first are the lecture halls with dual projection screens and fixed wooden podiums, Figure 3, centered in the front of the room. The projector screens are then centered on each side of the podium. In these rooms, the screens either mostly or completely block the chalkboards. The podiums are approximately twice the size of those in other rooms and feature an interactive pen display for annotating presentations and digital writing. The podiums also feature a document camera on a slide-out side shelf that is visible in Figure 3. This shelf is about 12 inches below the top of the podium top. A small touchscreen panel located on top of the podium controls all of the technology in these rooms. In addition to operating the projectors and choosing the display source, it also has preprogrammed lighting controls designed for projector use, chalkboard use, exam taking, etc. This makes adjusting the lighting easy for the professors who use these

classrooms. There are only a few classrooms on the WPI campus with this type of technology setup.

Figure 3: WPI Wooden Podium (WPI ATC)

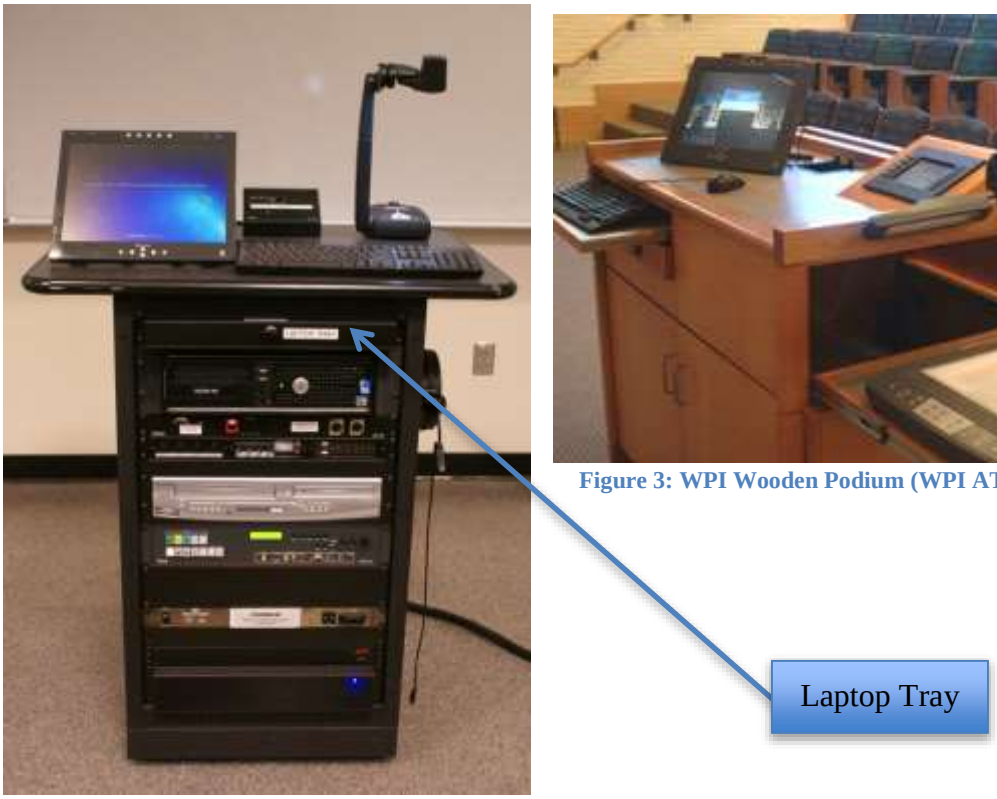

Figure 4: Movable Podium (WPI ATC)

Most other classrooms at WPI have one projector and a movable podium, as shown in Figure 4. The podium comprises a data cabinet to hold the electronics and a tabletop to hold the interactive pen display. The mouse, keyboard and document camera (some classrooms) are also placed on top of the podium. Since the podiums are movable, the professor can move it out of the way of any chalkboards. In most of these rooms the projector screen is centered on the front wall so when it is in use it blocks most of the chalkboard. There is usually some space on either side of the screen. The interactive pen displays are useful for annotating documents and presentations, but there is not much space on the display to write out notes when compared to the size of the chalkboards. All technology enabled classrooms feature VCR/DVD players and ceiling mounted speakers to play the audio from any of the sources. Some of these podiums do feature a slide out laptop tray, but it is 6+ inches lower that the podium surface which could be inconvenient for some professors to type on. The lighting controls vary in all of the rooms at WPI. Some rooms

have 5+ light switches on the wall and some have scene lighting modes for different room uses. Some switches are not labeled as to what lights they control.

2.3.3 Classroom Technology Layout at Other Schools

A number of other colleges and universities set guidelines for the design of classrooms on campus. These guidelines usually cover every aspect from seating layout to projector screen size to paint color. Many of these guides provide similar information about seating, lighting, and viewing angles. However, there is some variation when it comes to technology and its placement in the room. These schools created these design guidelines after consulting with faculty, students, technology companies, and industry experts. A table of all ten schools we reviewed is in Appendix L.

Emory College takes a different approach to the positioning of the technology than some of the other schools. The school's Classroom Design Committee requires that all projection screens be angled in the front right corner of the room and the podium be in the front left corner of the room when the room size allows it. Figure 5 shows this suggested layout. This allows almost full use of the chalkboard at the same time as the projector. Emory also has all of the podiums or lecterns custom made for their classrooms. They found that "off-the-shelf" products did not meet their needs. Since the podiums are custom made, there appears to be more space available to use a laptop and to organize notes (Emory University, 2012, p. 29)

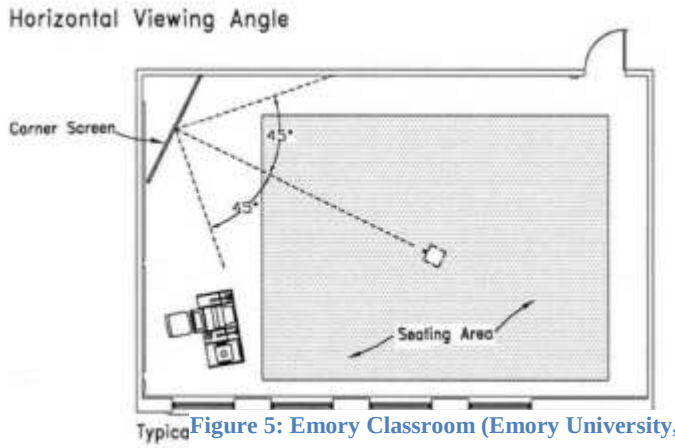

Figure 5: Emory Classroom (Emory University, 2012)

Penn State University also sets specific guidelines for their classroom designs. Their podiums appear to be slightly larger than the movable ones at WPI, with the controls and screen mounted vertically on the rear edge of the surface as shown in Figure 7. This keeps the podium compact while still providing room for a laptop and notes. These podiums are very similar to the ones in Fuller Upper and Lower at WPI, except for the placement of the computer monitor. Many of the other design specifications are similar to those of Emory College with regards to the screen and podium placement, shown in Figure 8. They also recommend a design where the screen does not cover the whiteboard while in use. With regards to lighting, they require that all of the controls be simple and well labeled like in Figure 6. They also suggest that the switches be located behind or next to the podium for easy access (Penn State University, 2013).

Figure 7: Penn State Light Switches (Penn State University, 2013)

Figure 8: Penn State Podium (Penn State University, 2013)

Figure 6: Penn State Classroom (Penn State University, 2013)

George Washington University has a slightly different approach to classroom technology. Although they still have projectors and podiums, they locate most of the hardware for the projection system outside of the podium. All of the switching equipment is located in a closet

adjacent to the room and only the PC, DVD player, and source controls are actually located in the podium. This allows them to locate the keyboard and mouse in a pull out drawer. One major difference is that they use ceiling mounted document cameras in all of their 50+ seat classrooms. Although more expensive than desktop models, these are less prone to damage and do not take up any space when not in use. However, most of the classrooms at GWU do not have an interactive pen display to annotate presentations (The George Washington University, 2013).

2.3.4 New Technology to Consider

Companies are constantly developing new technology for classrooms. One product category that really stands out is the ability to use screen sharing in classrooms, which enables teachers to broadcast their computer screen so it can be seen on other capable devices. In some cases it also allows students to share their screens on the projector in the classroom. NEC manufactures most of the projectors that are in the classrooms on the WPI campus. NEC is a company that specializes in displays such as the already mentioned projectors, video walls, large screen displays, and desktop monitors. Furthermore NEC has just partnered with DisplayNote to come out with a screen sharing software that would integrate into already existing systems at WPI. With the NEC edition of the DisplayNote software students would be able to connect to the display being shown by the projector and capture the display and take personal notes right on top of it. Another advantage of the software is that it is compatible with nearly all devices such as Windows, Mac, Android, and iOS allowing more students to readily use the software. Another beneficial feature of DisplayNote is that it will allow student-to-student sharing of notes so group interaction is a possibility (NEC, 2013). This new technology can further enhance the learning experience and incorporate the previously discussed Principles of Good Practice.

There are also other document cameras available with enhanced features. These newer document cameras are able to share their display directly with students' screens, (a feature not available with the current document cameras at WPI.) A company called eInstruction has just recently come out with a new document camera called the ShareView 2 and ShareView 5, the numbers corresponding to the pixels of the camera on the device. The cameras are compatible with software known as WorkSpace, which will allow users to connect to the ShareView camera via computer, tablet, or smart phone and make the display interactive (Nagel, 2013). This allows

the professor to annotate the documents digitally from any device anywhere in the room. New technologies for education are focused on the collaboration and interaction between the information, the professor, and now the students. This can provide some of the benefits of the studio classrooms by enabling the students to participate more while still keeping the same design and layout of the current classrooms at WPI.

3.0 Methodology

The goal of this project was to make suggestions to the ATC for improving the implementation of classroom technology and improving the design of the podiums at WPI. Our ambition was to suggest a technology layout and podium design for each type of room up for renovation in the summer of 2014 and 2015 that would be considered beneficial by the majority of professors and students. We decided the best way to do this would be to establish how the professors and students regard the current technology set-up. A table of the rooms up for renovation with some of their descriptive details can be found in Appendix B. The two main populations of interest to our study were focused on separately to make data gathering more manageable and compare opinions. In order to gather the data needed to accomplish this goal we established the following research objectives:

1. *Gathering feedback from professors about the classroom layout, the podium design, and the desire for new technology.*
2. *Gathering feedback from students about the classroom layout, the podium design, the desire for new technology.*
3. *Analyzing feedback and formulating recommendations for classroom renovations.*

In this chapter, we describe the process we took to obtain, understand, and apply the professors' and students' assessments of the classroom technology layout and podium design. Before we could start to gather data we had to submit an application to the WPI Institutional Review Board to ensure our methods would be within regulation and ethical requirements. The application is included in Appendix A.

3.1 Gathering Feedback from Professors

As author and researcher Joseph A. Maxwell suggests in his book, "Qualitative Research Design," we determined the appropriate data gathering method based on the type of data we were seeking. In order to answer the following research questions, we pursued the professors' assessment of the classroom technology layout and the podium design.

- *What do professors view as advantages and disadvantages of the overall layout of the classroom, including the location of the projector screens, the white/black boards, and the podium?*
- *In what ways do professors utilize the podiums during class and what do professors view as advantages and disadvantages of the design?*
- *Could the integration of different technologies into the classroom design be beneficial? If so, which technologies should be considered for integration and why?*

In order to gain both the qualitative and quantitative data we needed to make well-informed conclusions to our research questions, we used a combination of interviews and surveys. As explained by leading professionals and authors, Priscilla Salant and Don Dillman in their book, "How to Conduct your own Survey," some of the benefits of interviewing are that it would allow us to explain the importance of our study, ask follow up questions to the professors' responses to our questions, and allow the professors to ask us to clarify questions as necessary. Being able to explain the importance of our study to the interviewees will encourage them to provide well thought-out responses. One of the greatest advantages of an interview is being able to ask follow up questions to responses, since it allows in depth qualitative information gathering that is hard to get via other data gathering methods. In depth qualitative information is important for ensuring our complete understanding of the professors' assessments; however this type of data is not as easy to analyze as the quantitative information a survey would provide. Surveys are also the better choice for gathering information from a large sample size.

To determine which data gathering method we would use first we contemplated the benefits of each of the orders of methods. Sending a survey out to a larger sample first would allow us to see which respondents seemed to have strong opinions about the current set-up and who might be good to sample for our interview. Also, if there are any surprising results of the surveys we can ask different types of questions during the interview to see if we can get a better understanding of why we got the results we did. For surveys it's best to use short, easy to read, close–ended questions to increase the response rate (Salant and Dillman, 1994). Unfortunately, in order to write close-ended questions one must have an idea of the types of responses to expect. Conducting the interview first would allow us to get a better idea of what types of responses to

expect so that we could more easily create the close-ended survey questions. Also, by noting which questions need clarification during the interview we could rewrite the corresponding survey questions to make them more understandable before sending them out to a large sample of professors. In addition, we considered the possibility of discovering an aspect of the podium design or technology layout during the interviews that had not previously occurred to us. In this event, interviewing first would allow us to add extra questions to the survey concerning these factors we hadn't considered, which could make a huge impact on the findings we would obtain. Based on the benefits of each order of methods, ideally we would have conducted a preliminary survey, then interview, and follow up with another survey. However, doing so would have taken more time than our study had. So we decided to conduct the interviews first then survey since we concluded this would be the more advantageous data gathering sequence.

3.1.1 Professor Interviews

Using *purposeful sampling* as described in "Qualitative Research Design," by Joseph Maxwell (1996) we deliberately chose to interview professors with different pedagogical preferences who Kate Beverage recommended as most likely to provide feedback. Included in our interviews were professors who ranged from not using technology while teaching at all, to basically using technology exclusively for their lessons. This way a more accurate representation of the total professor population was provided. To ensure the experiences with the technology integration and podium design in the classrooms up for renovation were fresh in the professors' minds, we exported a list from Bannerweb of all the professors who were currently teaching in the rooms up for renovation. We chose to request to interview professors who were on both the Bannerweb list and the list of professors who Kate Beverage, the assistant director of the ATC recommended. We made sure we had at least one professor from each of the rooms up for renovation in the summers of 2014 and 2015 on our list of professors to ask to interview.

We sent personalized emails, with name and the classroom he/she was currently teaching in, to request the interviews. We got 25 responses, for a 56% response rate, from professors willing to be interviewed. Based on availability we were able to conduct 21 interviews, most of which were conducted in the professor's office. Two members of our team were present to conduct

each interview; one asked the interview questions while the other took notes. To allow the professors to better explain their thoughts we brought pictures of the classroom of interest and the podium in that room to each interview for the professor to reference. Four of the interviews were able to be conducted in the classroom of interest allowing the professor to demonstrate what they were explaining.

The questions asked during the interviews were based on the faculty-centered research questions mentioned at the beginning of this section. The complete interview protocol can be found in Appendix C. We started out asking the professor to tell us what teaching methods they typically use and which technologies they utilize. Once we had an idea of how a class period usually goes, we asked relevant questions about different aspects of the podium design. Then we inquired about how the professor felt the overall layout of the classroom--including the location of the projector screen and boards--affected their teaching. Next we asked questions aimed at discovering the professor's knowledge of and interest in new classroom technology. After all our questions were asked we allowed the professor to add any additional feedback they had about any classroom he or she had taught in. Before leaving we made sure to ask the professor for permission to quote them in our report.

After conducting all the interviews we looked through the notes and created a table of responses made about each room, and by each professor. This allowed us to compare the responses of professors from different departments and with different teaching methods. Analyzing the interview tables with our research questions in mind enabled us to draw initial conclusions about professors' opinions of classroom technology layout and the design of the podium. The summary of interview findings is available in Appendix F. Anytime a question needed clarification we highlighted it and made sure that similar questions in our survey were worded in an understandable way. We added questions to the survey about aspects of the classroom or podium that were brought up during the interviews that we had not previously taken into account.

3.1.2 Faculty Survey

The interviews provided some great qualitative feedback about the classrooms and more importantly how the professors use them. To collect more quantitative data about specific technologies, classrooms, and layouts, we created a survey. The survey also allowed us to reach a larger population than the interviews in the timeframe we had available.

When creating the survey we had to determine not only what we wanted to ask about the classrooms, but also what information to include about the faculty. When the professors took the survey their responses were recorded along with their name and department, which we imported into Qualtrics. Since we want to provide classroom specific information to the ATC, we asked the professors to complete the survey based on a specific classroom. When we sent the invitation, it said (for professors teaching in AK 116) "complete the survey based on your experiences teaching in AK 116 this term." Since we asked about a specific room, we could see if ratings for a technology in one room were higher than in another room and suggest using the higher rated technology in the lower rated one. If we had just asked about how a certain technology or layout worked for professors in general we would not be able to do that type of analysis.

Using a Qualtrics survey allowed us to deliver the survey in a fast and convenient way, while also enabling us to keep track of who had filled out the survey. In our survey (attached in Appendix D), we included close-ended questions with ordered responses, close-ended questions with unordered responses, close-ended responses in which multiple responses can be selected, and open-ended questions based on the research questions stated at the beginning of this section. We worked on wording our questions in a clear and unbiased way, and provided pictures and diagrams to assist the respondent in understanding the questions. Our survey was divided into five sections and the first three are related specifically to a classroom that he/she is teaching in this term or last term. The first section allowed us to understand what technology the professor uses to teach and their experience using it. After that we asked about the podium design then the classroom layout. The fourth section gave examples of possible future technology and layout and asked the professor to evaluate them. The final survey questions not only aimed to assess the

impact new technology would have on the teaching experience, but also to investigate whether professors would be open-minded to learning to integrate new technologies into the classroom.

After creating the survey we made sure to have some faculty and members of the ATC review it. The few professors that responded that they were willing to be interviewed but couldn't find time were asked to test our faculty survey and provide feedback on that instead. The survey was adapted to reflect the feedback given by the test surveyors before sending it to all professors who had taught in the rooms up for renovation during A or B term of academic year 2013. Pilot testing the survey allowed us to revise questions that referenced technology that we knew, but may not have been known by the professors. For example, we added "digital pen" to places where we referenced "interactive pen display" because not everyone referred to it by the same name. While we were working on the survey we also built our distribution list.

Compiling the survey distribution list was more complicated than expected. To start, we exported the list of classes in A and B terms from Bannerweb to create our sample population. We started with all of the professors teaching in B term. To increase the sample size we also included the professors who did not teach in B term, but did in A term and asked about the room they taught in that term. For professors teaching in multiple rooms, we selected either the first occurrence on the list or the room that is on our list of rooms to be renovated (if they taught there). In the event that a professor wanted to complete the survey about a room that they were more familiar with, we added an option to select a different room on the first page of the survey. We then took the list of professors and classrooms and added their email address and department from the Global Address List. The population size was 245 professors and we imported that into a Qualtrics Panel.

The purpose of going to the effort to create this list was also to be able to personalize the survey invitation. Authors Salant and Dillman (1994) suggest personalizing the survey invitation because recipients will be more likely to read it and potentially complete the survey if is addressed to them specifically. We sent the invitation to the faculty members on December 3. Our invitations were personalized with the professor's name and classroom that they were teaching in. Personalizing the emails also allowed us to keep track of who had not yet completed

the survey and then send reminder emails to them. Five days after sending out our survey, we sent out reminders about completing the survey to those professors who hadn't yet. We sent out final reminders about taking the survey to those who hadn't yet 4 days after our first reminder. The email invitation and reminders are in Appendix G. After these reminders 130 professors completed the survey, resulting in a response rate of 52%. This response rate and sample size corresponds to a sampling error of 5.9% at a confidence level of 95%. Qualtrics provides some resources for calculating the sampling error at different confidence levels.

3.2 Gathering Feedback from Students

The following research questions guided the process of gathering feedback from our second population of interest:

- *What do students view as advantages and disadvantages of the overall layout of the classroom, including the location of the projector screens with respect to the white/black boards and podium and what would they like to see changed?*
- *Could the integration of different technologies into the classroom design be beneficial? If so, which technologies should be considered for integration and why?*

We chose to use a Qualtrics web based survey for the same reasons we chose to use it for our first population of interest: it's a fast, convenient delivery method, and it allowed us to keep track of who had taken the survey and who hadn't. We included close-ended questions with ordered responses, close-ended questions with unordered responses, and open-ended questions based on the research questions stated at the beginning of this section. The first questions in the survey are aimed to discover the students' perspective on integrating new classroom technology. Next we asked about how the layout of technology has affected their learning experience, and had students choose a specific classroom to answer these questions for. We chose to include as many applicable questions from the faculty survey in this one so that we could compare the responses. These included questions about display sharing, screen placement, studio classrooms, and classroom quality. We sent our survey to some students we knew and asked them to provide

feedback on it. We then revised it based on the feedback from the pilot testers and the ATC. The survey sent to the students is included in Appendix E.

In October 2013, the Student Government Association changed the email use policy to prevent groups from sending surveys to students via undergraduates@wpi.edu. We evaluated multiple alternative ways to distribute our survey to the students. One option was to send it to professors and ask them to distribute the survey to their students. We decided against this because students could potentially get multiple emails and depending on which professors forwarded the survey the results could be skewed. Another option was to ask some student groups to send it to their members, but that also has some of the same limitations. We decided to export the Global Address List of all WPI email addresses and remove all non-students. This allowed us to send it to every student and also personalize the email. We chose to personalize the email for the same reasons as we discussed for the faculty email. The student survey invitation is also available in Appendix We sent it to 6022 students and received 570 responses, resulting in a response rate of 10%. This response rate and sample size corresponds to a sampling error of 3.9% at a confidence level of 95%. We did not send a reminder because we were nearing the end of the term when students are busier and we would not have enough time to analyze the results before presenting them to the ATC.

When reviewing the results of the survey we realized its limitations. One major limitation was that we don't know any information about a student's major or class year. This could have been used to group results to see possible trends. We also could have been clearer when asking about screen placement in classrooms with one screen. Another limitation was the inability to probe the reasons behind why the surveyors selected the response they did. Also, it didn't allow the respondents to be able to ask us to clarify any questions. Hopefully, the effects of this limitation were minimized by pre-testing our surveys.

3.3 Formulating Recommendations

In order to transform the survey results into findings from which we could make recommendations we first used Qualtrics reports to review descriptive statistics for each survey question. Then we categorized the faculty responses by type of podium and department. We

presented some of our finding to the ATC and listened to feedback they had about paste experiences with certain technologies. They also made suggestions about grouping responses based on demographics like department and room type. We also used cross-tabulations to compare certain questions and categories. Then we read through the responses to each open-ended question and used content analysis to identify themes from both faculty and students. Our thorough analysis helped us make more specific recommendations.

4.0 Findings

In this chapter we describe what WPI professors and students think about the classrooms and how they think they could be improved. We focus most of our findings on classroom technology and its placement in the classroom. We begin discussing how frequently professors use different technologies, then describe the advantages and disadvantages of the current podium design. Since the greatest need for improvement of the podium design was the amount of usable desktop space we present some in depth analysis of the items professors want to place on the podium versus the amount of current podium top space available. The black/white board and the projector were amongst the most commonly used classroom technologies so we discuss the layout preferred by the majority of students and professors. We then provide results that show support for implementing devices and software that would enable wireless control of the projector content and screen sharing between professors' and students' screens. We also reveal the substantial amount of interest students and professors showed in building studio classrooms at WPI. Finally, we address non-technical classroom elements that we found have an impact on the learning experience. These findings will provide insight to how the current classroom technology is being used and how to improve it in the future.

4.1 Faculty use of classroom technology

Determining what elements are used the most helps us prioritize our findings to help the ATC to make the biggest impact. Figure 9 shows the frequency with which faculty survey respondents reported using various classroom technologies. It is important to note that the white/black boards are one of the most commonly used resources despite being surrounded by new technology. Lecture capture was among the least commonly used, with only 20 % of professors indicating they use it at least some of the time. This supports the conclusions drawn from the responses of the professors during the interviews. Following are some additional findings and observations that we have made.

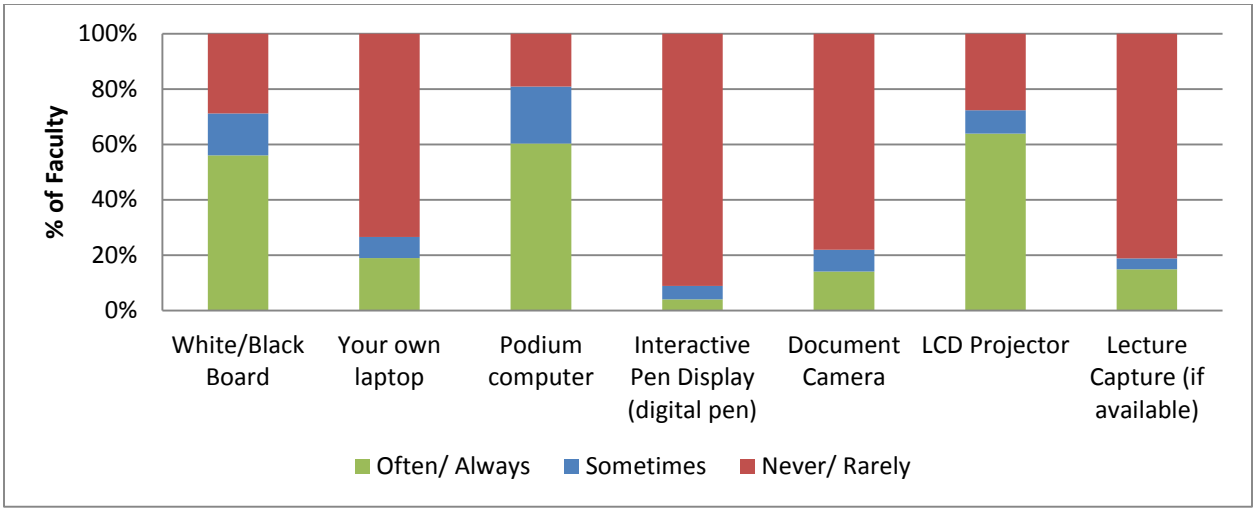

Figure 9: Faculty Use of Classroom Technology

Almost all professors utilize the podium in some way. One question, which provided insight to this claim, asked professors what items they would like to place on the podium desktop space while teaching. Only five out of the 98 professors who responded to that question stated that they do not use the podium at all. Over 80% of professors use the podium computer as seen in Figure 9. Around 25-30% of professors use the podium as a place to put their personal laptop during class. From the interviews and survey comments, some of the professors who mentioned that they mainly use the white/black board mentioned that they still utilize the podium as a place to store papers or notes. In fact, almost 70% of the professors commented that they use the podium as a place to put their notes and about 17% place their textbook on it.

The interactive pen display is the least commonly used classroom technology. Only 8% of professors responded that they use the interactive pen display at least some of the time, as seen in Figure 9. This could be because out of the 29 professors that use the interactive pen, 68% of the respondents who had experience with the display also indicated experiencing difficulties with it at one point or another. Almost half of this 68% said they no longer use the interactive pen display, as seen in Table 1. The responses to these questions broken down by room and interactive display model are in appendix K.

Table 1: Problems with Interactive Pen Display

		Have you ever experienced difficulties while using the interactive pen display?				
		Never	Rarely	Sometimes	Always	Total
Do you continue to use the interactive pen display?	Yes	0	3	7	0	10
	No	0	2	4	2	8
	N/A	9	0	1	1	12
	Total	9	5	12	3	29

Document cameras are not widely used. Only 19% of professors said they use the document camera at least some of the time, as shown in Figure 9. Results from the interviews may provide additional information explaining why some of the professors only rarely use the document camera or never use it at all. In the wooden podium rooms, the document camera is stored in a drawer that pulls out to the side. Many of the professors expressed that they did not use the document camera because they felt this set up made it too awkward to comfortably use. Additionally, during the interviews many professors were surprised to discover that there was a document camera in the wooden podium rooms. However, a clear conclusion as to whether professors are aware of the document cameras in the wooden podium rooms or not cannot been drawn since the survey results showed that only one out of 23 professors answering about a wooden podium room was unaware it was available. As for the document cameras on the portable podiums many professors during the interviews and open-ended responses mentioned that the smaller document cameras did not work well. They felt the students could not see what was being displayed clearly because of glare or improper functioning of autofocus.

4.2 Faculty Feedback on Podium Design

After finding out how the podiums are used, we then looked at what professors said could be improved and what should stay the same. We found that faculty want the height and controls to remain the same. However they want the space on top to increase, so we compared some different options for increasing the usable space.

4.2.1 Advantages & Disadvantages of Current Podiums

The two main advantages of the current podium design are the controls on top of the podium and the height of the podium. When professors were asked what they would like to remain the same in the podium design, the controls on the top of the podium were mentioned the most. Almost half of these comments were accompanied with explanations similar to this professor's response, "I have finally figured out the control panel...don't change it." Another popular response for this question was the height of the podium. Which makes sense, since nearly 90% of the professors indicated that they feel the podium is at a height that is comfortable for everyday use. However, some professors did express the desire for a stool to sit on while at the podium. In addition, six out of the 32 professors who responded to this question would like the podium design to maintain its current amount of portability as illustrated in Figure 10.

An overarching area of desired improvement was that the controls be consistently labeled and arranged throughout the different classrooms. Despite only about 19% of professors responding that the controls are at all difficult to understand and use, the open-ended and interview responses indicate that professors feel this way only after getting use to the controls. Many professors expressed frustration with getting used to the controls in one room then having to relearn how to do things using different controls in another room. The fact that many rooms have controls with unclear labels makes learning how to use the controls that much more difficult. Professors find that having some controls on the top of the podium while others are underneath inconvenient and also contributes to the difficulty of learning the different controls. Another issue with having some controls underneath was brought up during the interviews. A handful of professors mentioned that their knees would accidently press buttons while they're teaching a class. It is clear how pressing buttons accidentally during a class can hinder the learning and teaching experience. However, the professors whom mentioned having this issue emphasized that it was a rare occurrence and that they felt addressing it was a lower priority than other improvements they'd like to see.

Professors show interest in having part of the podium top sloped. Even though having a sloped part of the podium top was a popular suggestion during the interviews, only 20% of the 130 professors who responded to the survey supported this opinion. This could be because many of the professors who agreed to be interviewed happen to be from the humanities department. The humanities professors advocating for sloped, lectern-style podium tops explained that the current, flat podium tops force them to look down to read their notes and hinders the interaction with their students. The sloped podium top allows them to glance at their notes while engaging the students, which enhances the student-professor interaction. Since professors from other disciplines usually require more than discussion based teaching, they may not see the need for a sloped surface top.

Maintaining the portability of the moveable podiums is of high importance to the faculty. Portability of the podiums was considered equally important or more important than having a large desktop space by around 60% of the professors, as shown in figure 10. In fact, making the podium lighter or easier to move was the second most common response to what the professors would like to see changed in the podium design.

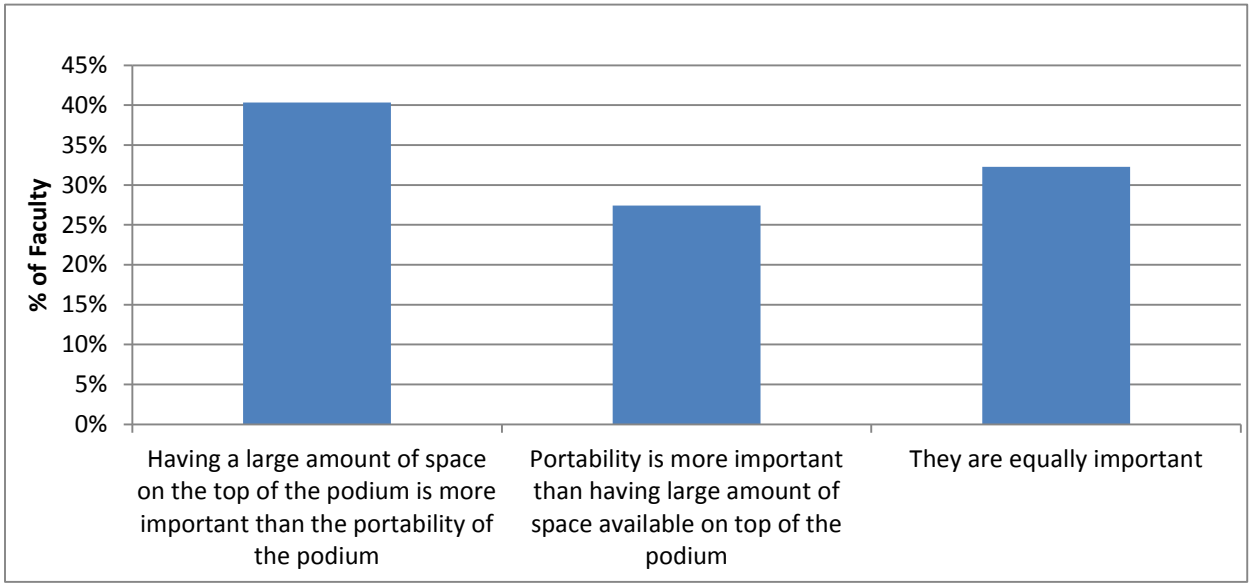

Figure 10: Podium Size vs. Portability

An improvement to the current podium design could be to add some sort of cup holders. A little over 12 % of the 98 professors who responded to the items question said they like to put a drink on the podium. In one of the responses of a different question a professor commented that sometimes the podium top is wet when he or she arrives. This professor suggested added some sort of cup holder to protect the equipment from all the professors who like having drinks during class. Even though this isn't a vast amount of professors, we feel the ease of installing a cup holder versus the potential damage that can occur from spilled drinks could be worth considering. Figure 11 shows the percentage of faculty comments that related to each item.

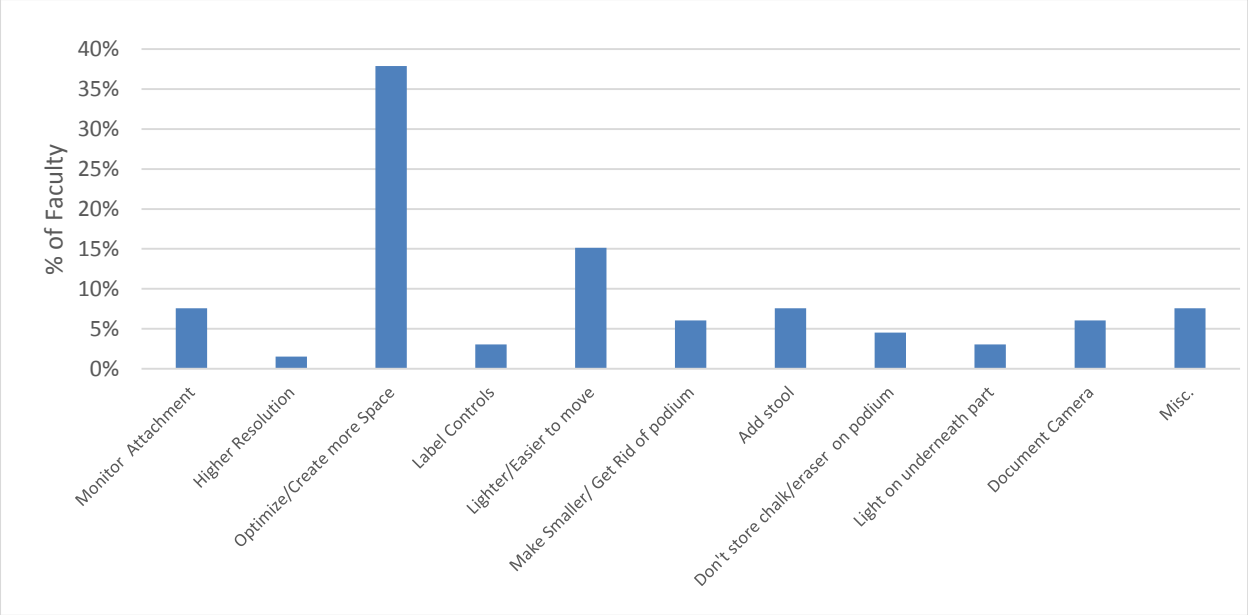

Figure 11: Desired Changes to Podium Design

The aspect of the podium design with the greatest need for improvement is the available desktop space. Figure 11 shows the percent of professors who mentioned in the comments sections of the survey that they want those changes. Out of the 73 responses to the open-ended question asking the professors what changes they would like to see made to the podium design, 30 indicated they would want a larger or optimized desktop space. Many professors expressed frustration with how the monitor, keyboard, and mouse are attached to the podium. The majority of professors feel the podium tops are overcrowded and organized in a way that limits its usefulness. Only 6 % of faculty indicated that they felt enlarging the desk top space on the podium would be a drawback to the overall design. This 6 % were all professors who were answering about a portable podium room. As seen in Figure 12, professors using both wooden and portable podiums indicated they would like more or better organized desktop space.

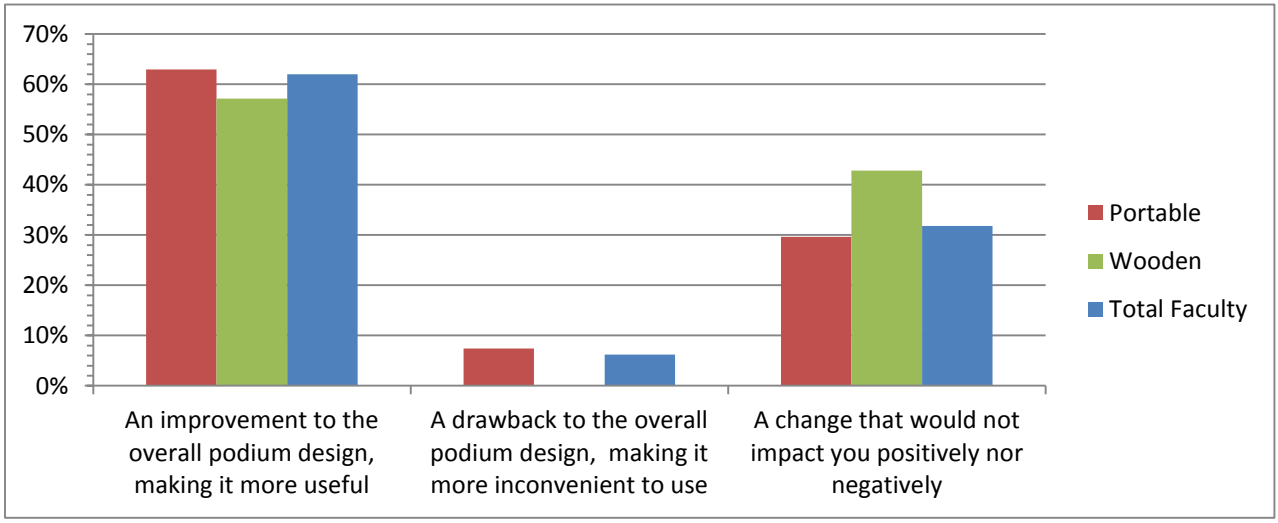

Figure 12: Would Enlarging the Podium Desktop be an Improvement?

4.2.2 Analysis of Podium Desktop Space

The podium desktop space needs to be enlarged to accommodate all the items professors would like to place on it. The responses to the question about what items professors would like to place on the podium provides more insight into the need for a larger or better organized desktop space. Figure 13 shows the percentage of professors who would like to place the corresponding item on the podium.

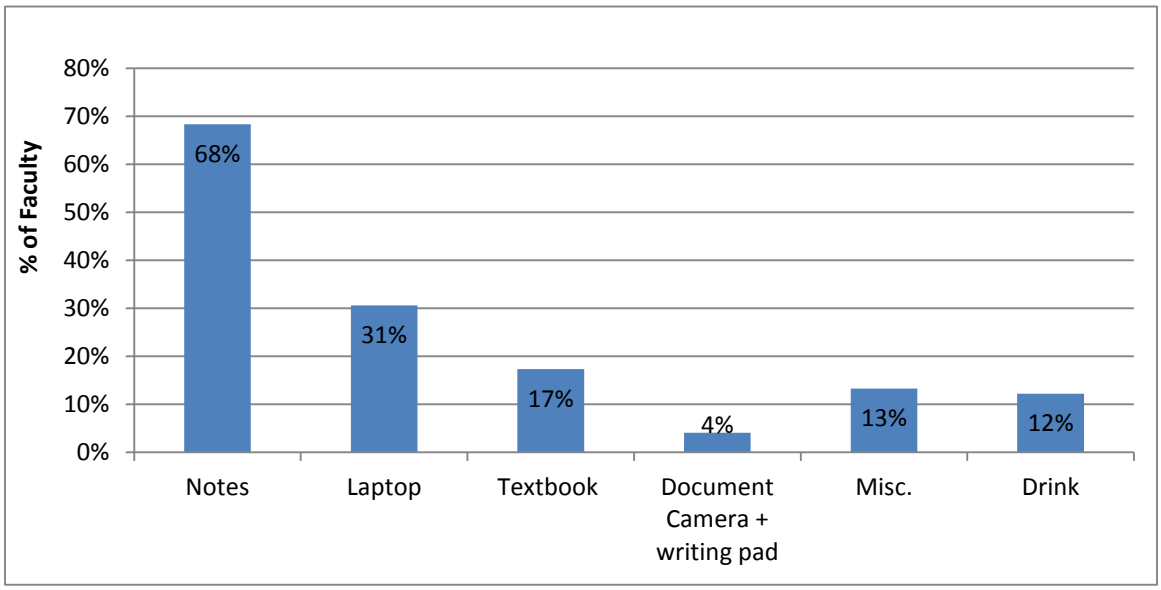

Figure 13: Desired Items to Place on Podium While Teaching

Currently the portable podiums, which are in the majority of classrooms at WPI, have tops that are 34.5 inches wide by 27 inches deep. All these podiums have a monitor, keyboard, mouse and a control box on them. Many also have small document cameras stored on them which occupy six and a half inches by eight and half inches of space. The monitors are usually one of two sizes depending on if they are wide screen or standard. The control box is typically somewhat centered toward the back of the podium top. Figure 14 shows a diagram of what the current portable podium tops generally look like when the (wide-screen) monitor is lying flat taking up the most amount of space.

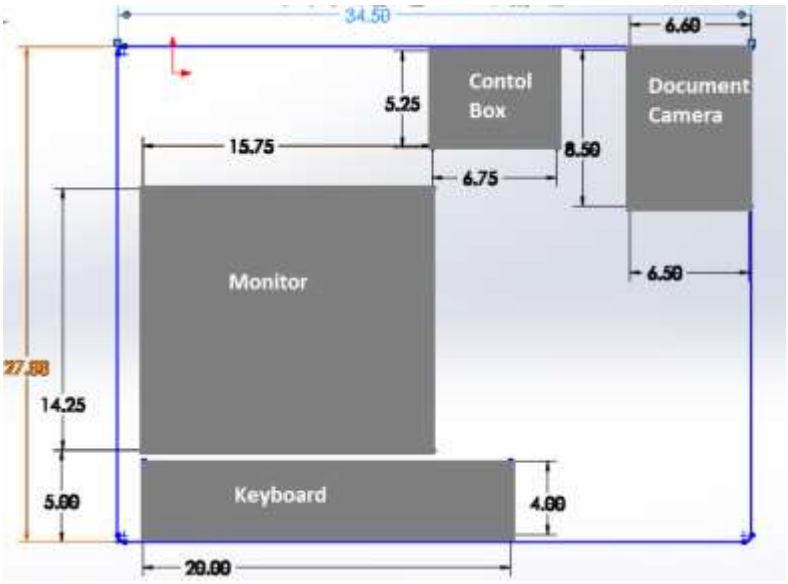

Figure 14: Movable Podium Space Usage

We calculated how much space all the items that each professor would like to place on the podium top plus the monitor, keyboard and control box would take up. Once calculations were made for each respondent, we were able to determine that the maximum amount of space a professor required the podium to be was 818 in^2 and the mean was 531 in^2. The current dimensions of the podium provide an area of 931.5 in^2 which is more space than the maximum. However, it is clear from the diagram and responses of the professors that the space provided does not suffice. Therefore we decided looking at square inches of area was not the best way to analyze the podium desktop space requirement.

Instead we considered how the professors most likely layout their items on the podium. We made SolidWorks (software that facilitates the creation of 3 dimensional models) models of the different items professors wanted on the podium with the dimensions we used in our calculations. Then we determined the most common combinations of items professors said they would like to place on the podium, as seen in figure 15. There were 19 professors who wanted both their notes and their laptops on the podium and 12 professors who wanted both their notes and the text book on the podium. Considering this and the fact that a textbook has roughly the same size footprint as a laptop we modeled an object that had dimensions that were the average of the textbook's and laptop's widths and depths. Then we tried to arrange this object and notes

on a model of the current podium top to visualize the space available versus the amount of items professors want to place on the podium.

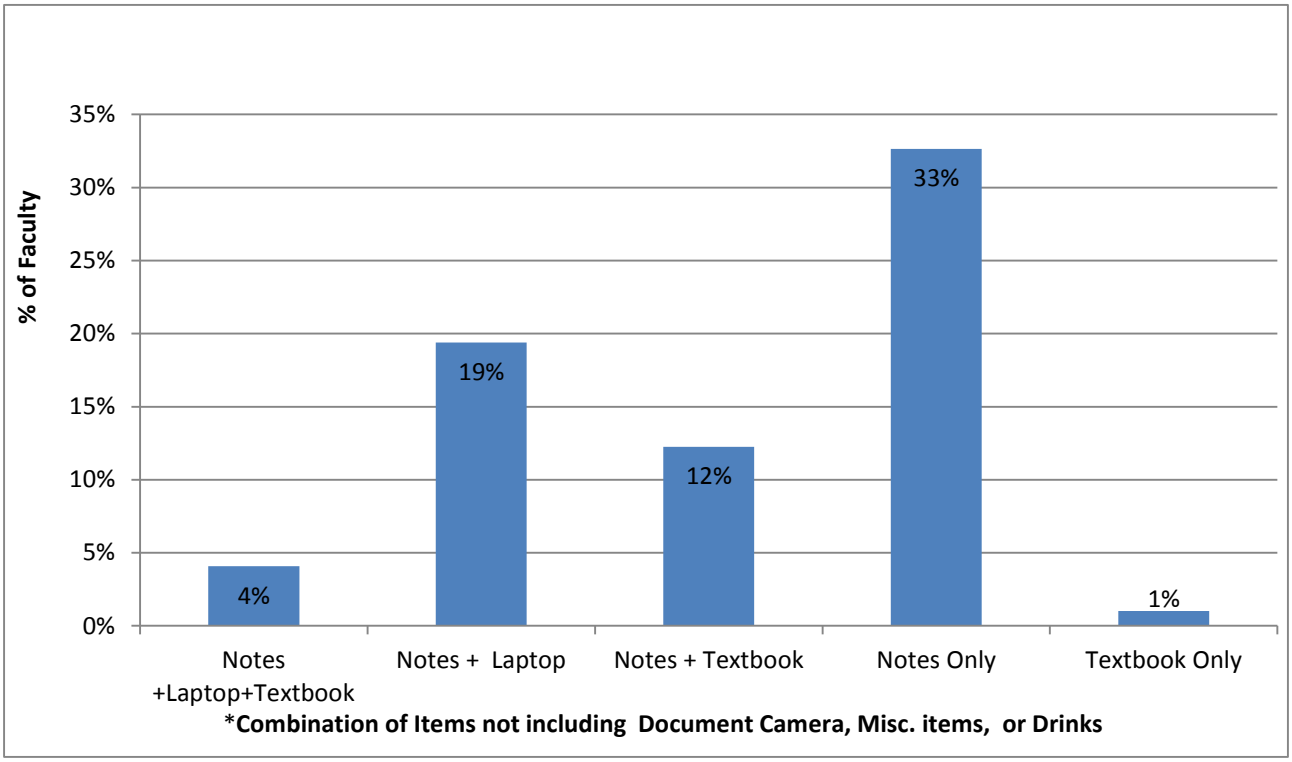

Figure 15: Combined Items Placed on Podium While Teaching

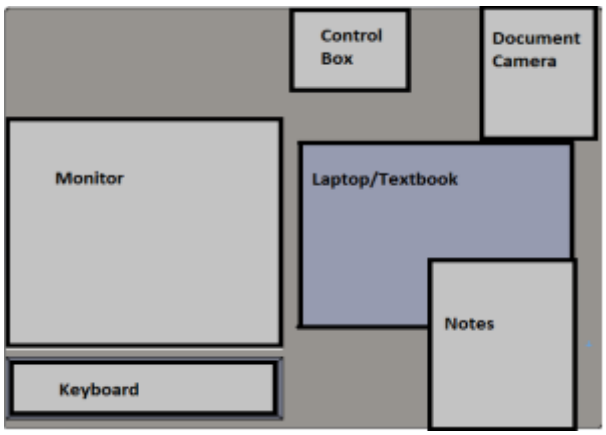

Figure 16: Current Podium Top with Notes + Laptop

We were unable to fit all the items without overlap as illustrated by Figure 16. So then we tried relocating the standard items (monitor, keyboard, and control box) to see if a different arrangement could accommodate the extra items on that space like in Figure 17.

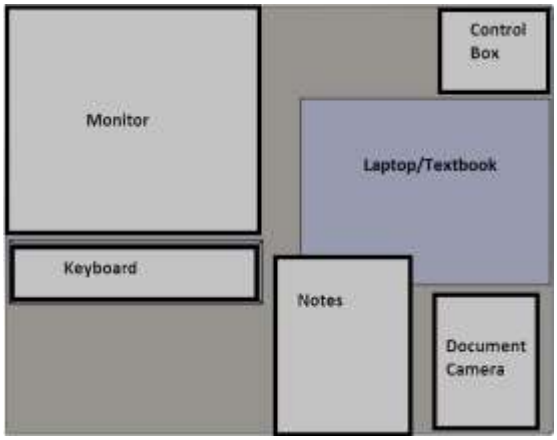

Figure 17: Podium Top with Notes + Laptop after Moving Components

This way we were able to arrange the items so that less overlap occurred but we weren't able to eliminate overlap all together. Then we tried angling the monitor up since most professors don't use the monitor while it is lying flat, and so that its footprint isn't as large. We also decided to try arrangements that didn't include the keyboard with the reasoning that the keyboard could be placed on the pull out laptop shelf.

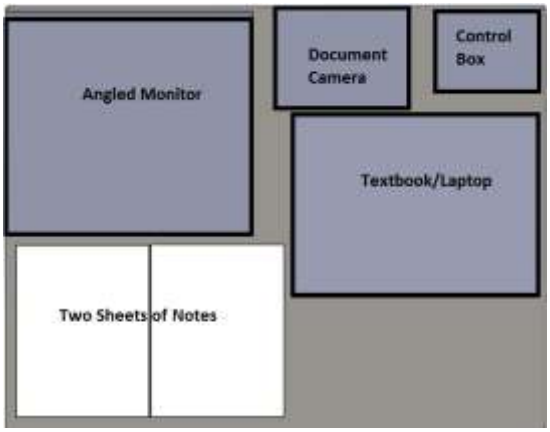

Figure 18: Notes + Laptop Placement after Moving Keyboard to Tray

Only then were we able to achieve a layout without any overlap. However, as seen in Figure 18, it is still a bit cramped. The professor would have to slide the mouse down in front of the textbook/ laptop in order to use it. If the professor was using a laptop he or she wouldn't be able to access the control box very easily. Another issue with this set up is if the professor wants to use the interactive pen display he has to reach across the podium top over his notes to reach the monitor. It is clear that changes should be made to how the current podium tops are set up.

During the interviews it was suggested by multiple professors to move the laptop tray to the side of the podium instead of in front where it blocks the podium monitor. Many professors also suggested adding flip-up shelves to the podium to increase the desktop space without detracting much from the podiums' portability.

4.3 Classroom Layout

Since the classroom layout has influence on the learning that takes place, it is important to evaluate the layout of the projector screens, white/black board, and podiums to determine their ideal placement for each type of classroom. We grouped the rooms by their characteristics like room size, board size and the number of screens to perform our analysis.

The Professors feel the fixed podiums should be centered in the front of the room. We feel the location of the podium has more of an effect on the professors than on the students, so we considered the faculty's preference with higher importance. The majority of the faculty (57%) think that the fixed podiums like the one in AK 116 should be centered in the front of the classroom.

The only solid conclusion we can draw on the layout of the white/black board and projector screen, is that professors would like to have access to the board while the screen is down. As seen in Figure 19, 73 % of faculty do or wish to use both the white/black board and projector screen simultaneously.

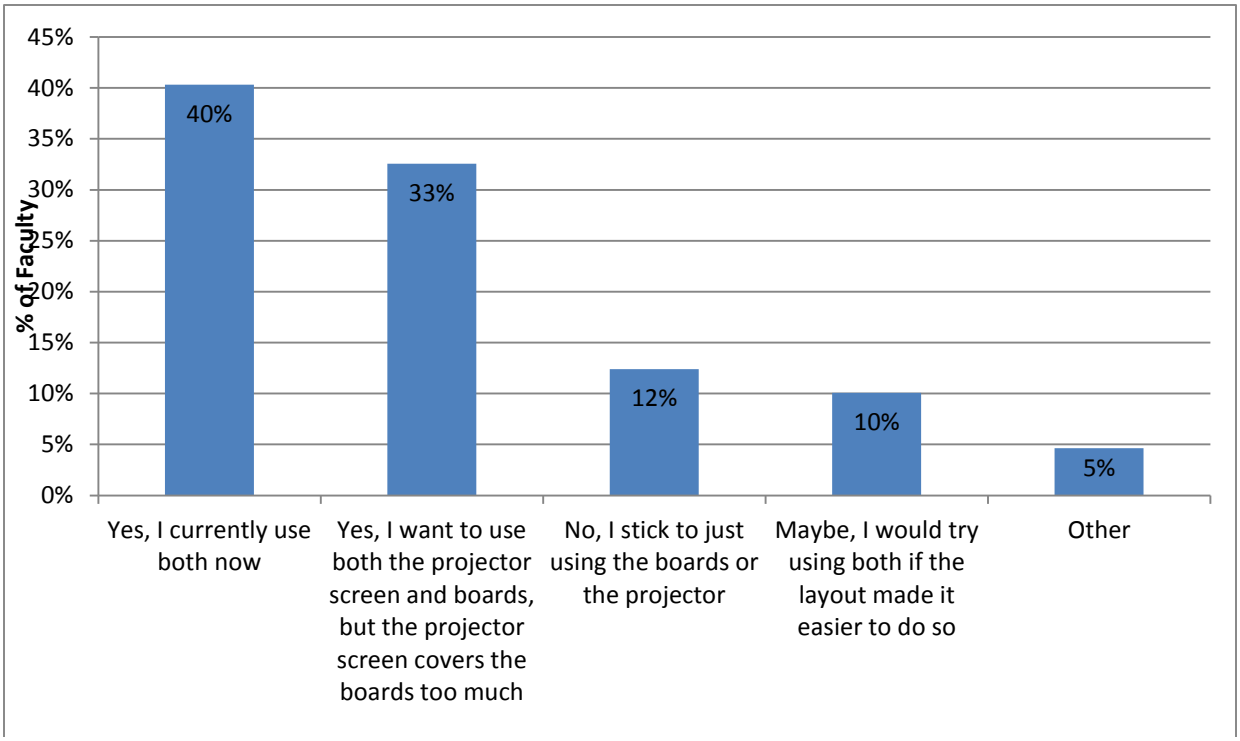

Figure 19: Using both the Boards and the Projector at the Same Time

When professors were asked if they felt there needs to be more available board space while the projector screen is down the majority of professors who use both simultaneously felt there did need to be more board space available. Even though 40% of faculty use both at the same time, 58% still think there needs to be more space as shown in Figure 20. We tried to figure out which rooms professors felt had enough board space available and which didn't by cross tabulating the responses to this question by the room the professor was answering about (This cross tabulation is available in appendix.) However, since there are so many rooms, the amount of professors answering for each room was too low to be able to draw any conclusions from it.

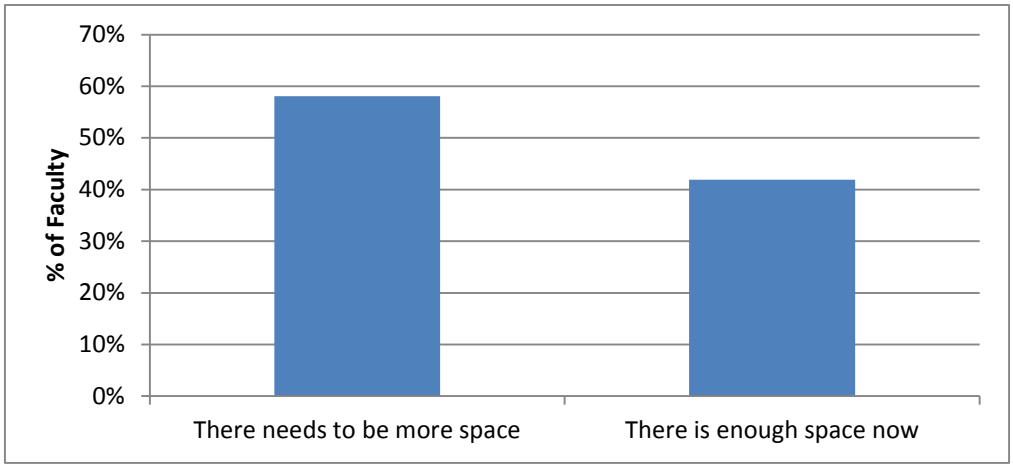

Figure 20: More Board Space with Screen Down

When students and professors were directly asked where they felt the projector screen should be located the distribution of faculty and student responses were similar. Only about 50 % of both students and faculty preferred the projector screen to be centered as seen in figure 21. These results could be explained by the fact that the ideal location of the projector screen depends on whether the professor uses just the projector screen, just the white/black board, or both simultaneously. We feel the results of this question may not reflect the reality of the professors' preferences as well as we would have hoped. This question was accompanied by pictures in the survey, and the picture portraying the centered projector screen showed the screen down with plenty of board space on both sides. This only portrays one possible scenario of a centered projector screen; we should have had another option for a centered projector screen that had a picture that showed the screen down with no usable board space available. This way we would be able to tell if professors preferred the centered projector screen based on its location or based on the available board space.

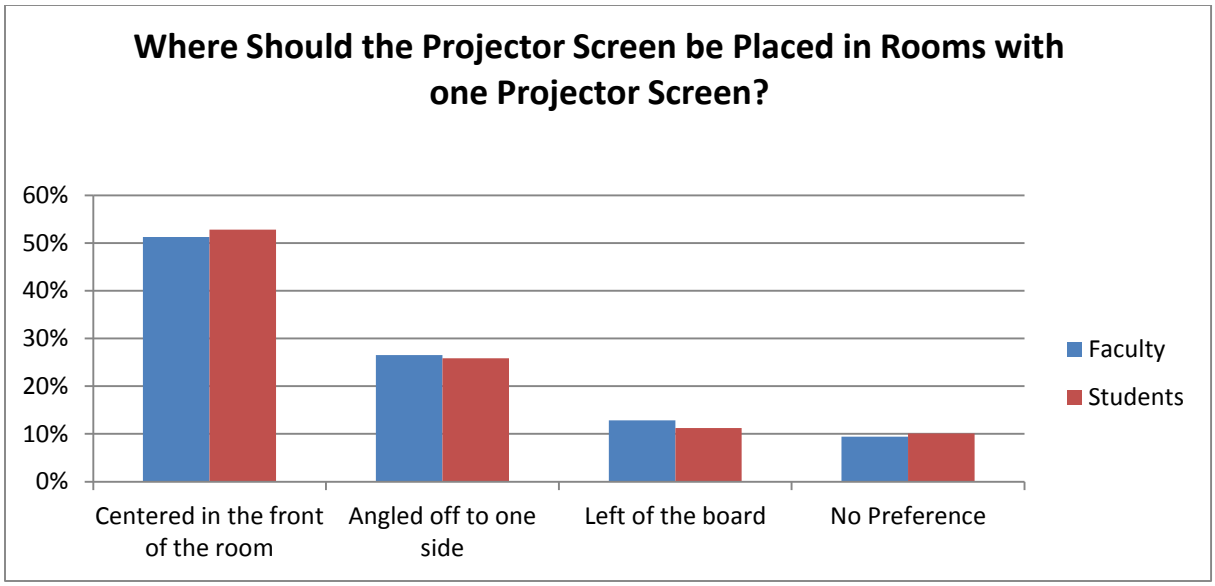

Figure 21: Student & Faculty Preference for Single Screen Placement

The majority of WPI students prefer placing two projector screens in the big lecture halls. More than 75% of the student thinks that the placement of two projector screens in the lecture hall ranges from moderately important to essential factor to improve their learning experience. We asked the faculty the same question and, while still a majority, only 57% agree that there should be two screens in large rooms.

4.4 New Technology & Classroom Designs

New technologies like screen sharing software have been released and based on the survey results, the majority of faculty and students would like to use some form of screen sharing in the classroom. Schools are also starting to implement new studio style classrooms that are designed for group collaboration. WPI students and faculty showed strong interest in having these rooms at WPI.

Professors believe having the ability to control the contents of the projector screen wirelessly would be useful. Figure 22 shows the responses for the four questions asked about

screen sharing. Having the ability to control the content of the projector screen from a wireless device was considered at least somewhat useful by 70% of the 127 respondents.

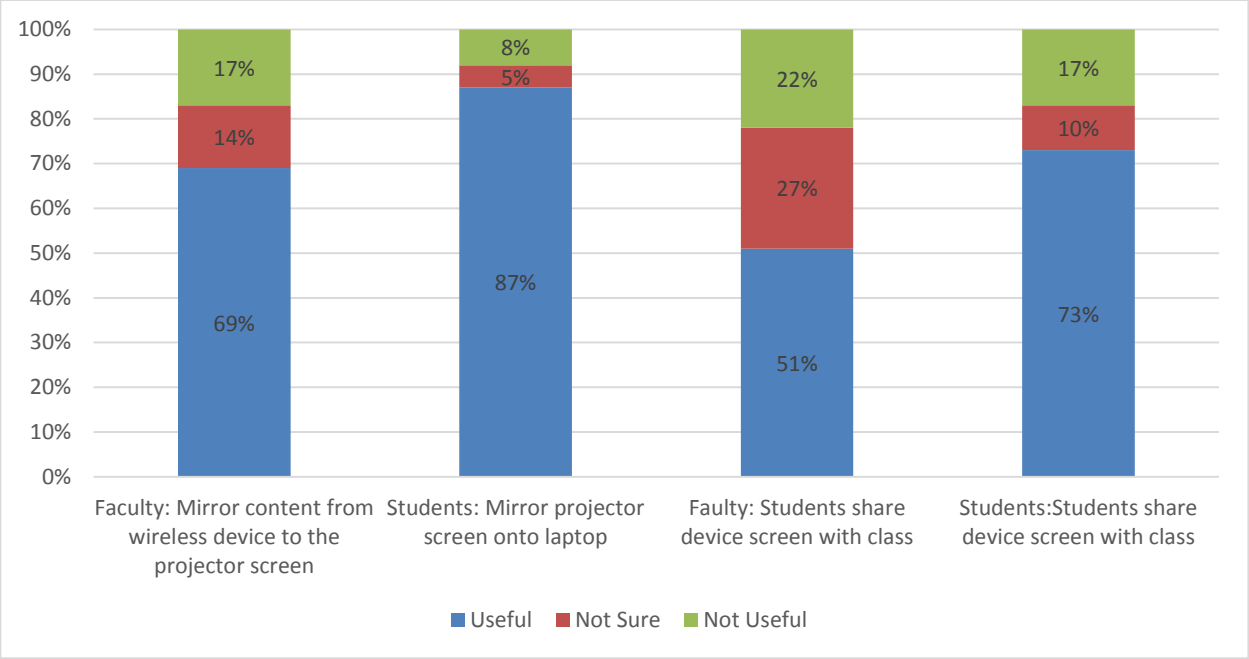

Figure 22: Faulty & Student Interest in Screen Sharing Technology

Students and faculty believed screen sharing software would be a beneficial addition to WPI classrooms. We asked both students and faculty about how useful they thought being able to have a student's screen shared with the class would be. Seventy-three percent of students said this feature would be useful, but only 50% of faculty agreed. We compared the percentage of not useful to useful responses, (ignoring the 'not sure' responses,) from various departments. This revealed the science departments were the only departments to not have a strong majority of professors who felt sharing students' screens would be useful. The Science departments still had a slight majority of 57% of professors believing this ability would be at all useful, while the other departments have a range of 74 -88% of professors believing it'd be useful. Professors' sharing the content of their screen and the projector screen with student's laptops and tablets was considered at least somewhat useful by about 87 % of the students.

The majority of students and professors are at least somewhat interested in implementing studio classrooms at WPI. As seen in Figure 23, while 64% of the total faculty

were somewhat to very interested in studio classrooms, certain departments had an even larger majority of professors interested.

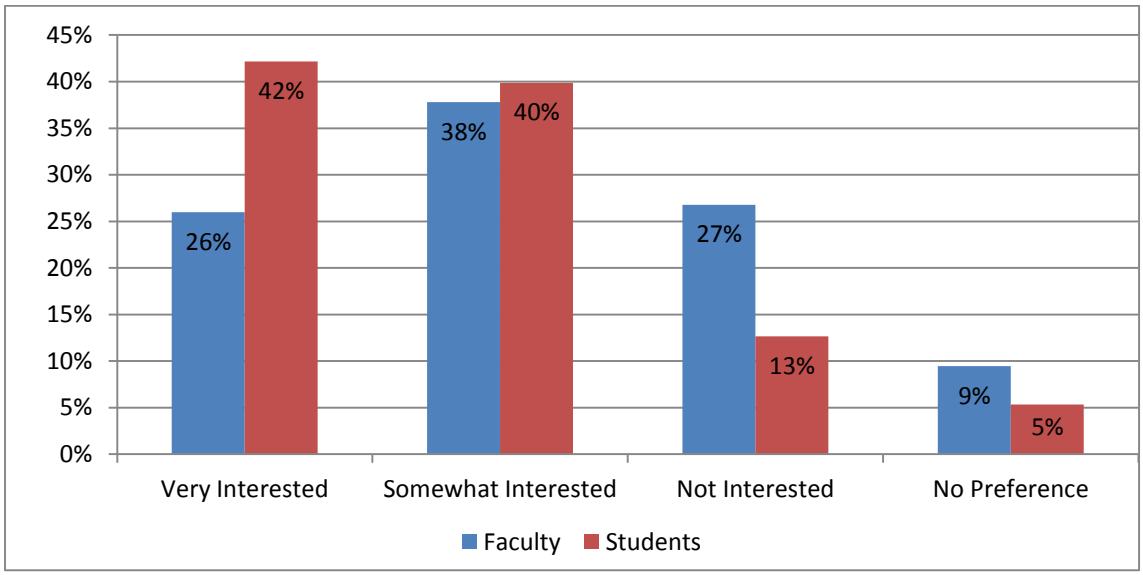

Figure 23: Studio Classroom Interest by Students and Faculty

The Business and Social Science departments showed most interest both with 82% at least somewhat interested, as shown in Figure 24. The Engineering and Humanities departments had the lowest interest with 57% and 66%, respectively. There were some comments made doubting the idea and stating that effective teaching could not be done because of lack of eye contact with students during traditional lecture periods. Also, there were questions regarding this type of classroom's ability to accommodate large class sizes and different class types. Along with the 64% of faculty finding the studio classroom useful, 82% of students thought that it would be somewhat to very useful. The students' comments were along the same lines as the professors, that is that traditional lecture style teaching would be lost in this type of classroom. The purpose of the studio classroom is to support collaborative work and increase student engagement in class. So the students and faculty who mentioned lecture-style teaching would be lost were right, but maybe they didn't understand that these classrooms aren't intended for lecture style teaching. Perhaps the students' high interest in these classrooms stems from their desire to have more interactive based classes at WPI.

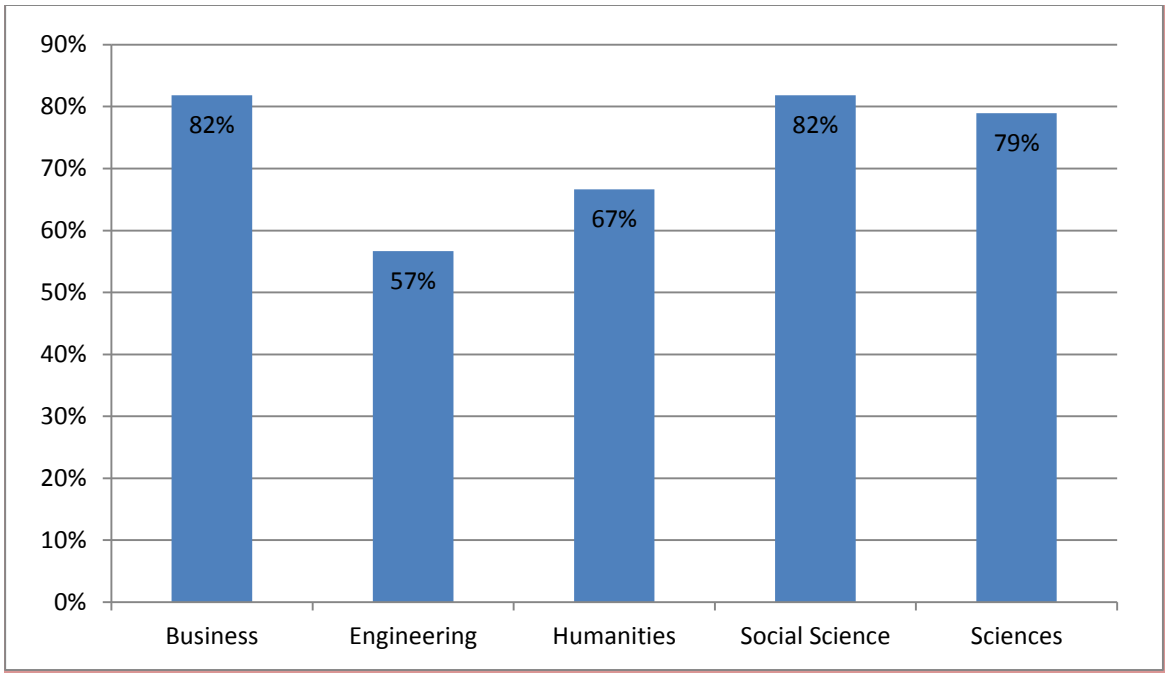

Figure 24: Faculty Interested in Studio Classrooms, by Department

4.5 Additional Classroom Elements that Impact the Learning Experience

Although our focus is on classroom technology that the ATC controls, certain classroom elements were found to have an impact on student learning and functionality of the technology implemented in the rooms. We will evaluate what other elements like HVAC, lighting, seating, power outlets, etc. fall below expectations according to students and faculty. We compare the ratings of importance of elements to the rated quality of those elements in the same types of rooms

Students and faculty rated the importance of all classroom elements more highly than the quality of those elements in WPI classrooms. As indicated in the first two rows of table 2, every element that we researched was found to be of lower quality than desired. Students rated wireless access as their most important classroom element and the quality of the wireless internet ranked second highest. Students rated power outlet accessibility as the lowest quality classroom element. Faculty on the other hand felt that the lighting controls were of low quality. Students and faculty rated HVAC low as a whole, but certain rooms ranked in the fair-poor range. To analyze these results, we grouped the answers by building. One interesting result is that according to the students, all elements in Atwater-Kent lecture halls (116 & 219) ranked

higher than the average of all of the buildings. Although not managed by the ATC, these elements can have an impact on the learning experience.

Classroom Element Importance & Quality Ratings

	Classroom Technology	Lighting Quality	Lighting Controls (Faculty Only)	Acoustics	Seating	HVAC	Power Outlet Accessability (Students Only)	Wireless Internet (Students Only)
Importance	3.69	3.87	3.65	3.87	3.76	3.81	3.29	3.93
Quality*	3.30	3.35	2.91	3.24	3.02	2.96	2.14	3.33
AK Lecture Halls	3.25	3.80	3.13	3.54	3.36	3.40	2.23	3.40
FL UPR/LWR	3.22	3.40	3.44	3.15	2.89	3.06	1.48	2.86
HL Lecture Halls	3.33	3.36	2.70	3.00	2.94	2.48	2.07	3.60
HL Classrooms	3.20	3.33	1.80	3.45	3.42	3.00	3.60	3.50
OH 107	3.80	3.41	3.00	3.47	3.53	3.53	2.15	2.74
SH Classrooms	3.75	3.44	2.50	3.07	2.78	2.72	2.81	3.33
SL 115	3.00	2.70	2.67	2.68	1.80	2.55	1.49	3.29
SL 104/5	3.54	3.33	2.77	3.33	3.00	3.00	2.08	3.92
SL Classrooms	4.00	3.40	3.04	3.03	3.09	2.97	2.26	3.58
WB 229	3.33	2.84	2.83	3.13	3.04	2.52	2.04	3.52
Worst for Element		Below Average		Above Average		Best for Element		
*Quality values in white cells are inside the margins of error of 3.9% for students and 5.9% for faculty								

Scale Conversions	1	2	3	4	5
Importance	Not	Low	Moderate	High	Essential
Quality	Poor	Fair	Good	Very Good	Excellent

Table 2: Classroom Element Importance and Quality Ratings

Lighting quality and acoustics both ranked highest in importance second only to wireless internet access. The lecture halls in Atwater Kent ranked highest for both of these elements, while SL 115 ranked lowest for both. Faculty also rated the lighting controls and they say that the smaller classrooms in Higgins have the worst controls, while Fuller Upper and Lower have the best lighting controls. Some faculty commented that the switches are not labeled clearly and it takes multiple tries to find the right lighting. Lighting was a concern for some students too because of glare on the boards.

Power outlet accessibility ranked lowest in actual quality among all elements. Looking at the student survey comments suggests that the medium sized rooms with fixed tables and movable chairs should have more outlets because students can easily use laptops on the desks. However when looking at the quantitative data, large lecture halls with the fold-up arm tables ranked lowest in power outlet accessibility. Fuller Upper/Lower and SL 115 ranked between poor – fair. Stratton Hall ranked highest because many of those rooms have dozens of outlets around the perimeter of the room. Of the 276 student survey comments, 35 included requests for more outlets in the classrooms so that laptops could be plugged in for longer classes. Most of the classrooms at WPI only have outlets around the perimeter of the room, which requires students to sit at the ends of rows and stretch their cord across the aisle. Two students commented that they have seen students trip over these cords.

Students and faculty consider seating important to the learning experience and the average ranking was 3.02 or "good" for the current seating in WPI classrooms. Although it ranked in the middle, **there were more comments about seating than any other element**. 46 of the 276 students' comments were related to classroom seating. Most were related to old, broken, or noisy chairs. Some students also said that they dislike the individual desks with the folding table. Students complained about broken chairs in SL 115 specifically in 16 of the comments. Other students commented about the squeaky chairs in other Salisbury rooms like 305, 405, and 411. This helps explain why Salisbury ranked lowest in seating quality of all buildings on campus. The seating in Atwater Kent ranked highest among students.

Heating, ventilation, and air conditioning (HVAC) had average rankings compared to other elements, but it had a lot of variation when broken out by building. As one professor put it "If I don't notice it, I guess it's working." There were 31 student comments about rooms needing better HVAC systems and controls. The majority of the comments were related to temperature of the room being too hot or too cold, but some also said that the systems were too noisy and they could not hear the professor.

5.0 Recommendations

We present our recommendations for improving the classrooms at WPI along with key findings that support them. We focus most of our recommendations on classroom technology and its placement in the classroom. We begin with the design of the podiums and the technology housed inside and on top of them. We then evaluate the placement of projector screens in relation to the boards and podium. We follow that with recommendations for new technologies and room designs that should benefit the students and faculty at WPI. Finally, we make recommendations about non-technical classroom elements that we found have an impact the learning experience. These recommendations will help improve the learning experience in the classrooms at WPI.

5.1 Podium Design Guidelines for WPI

This study has shown that the current podium design at WPI has clear advantages as well as opportunities for improvement. Our recommendations can be broken down into three major categories: enlarging and optimizing the podium desktop space, incorporating a slanted desktop space, and location and labeling of controls. Making improvements in these areas will make it easier for professors to teach and improve the learning experience for students.

5.1.1 Podium Size & Shape

Enlarge portable podium desktop space. The greatest need for improvement in both the portable and stationary podium designs was discovered to be the amount of usable desktop space. The first way to achieve a more favorable desktop is to increase the current amount of space. Since the portability of the podium was of high importance to the majority of professors we considered adding fold up shelves on both sides of the podium similar to the ones in Figure 25. That podium is available from DWI Enterprises, but other manufacturers like Marshall Furniture manufacture lecterns with heavy duty folding shelves and a ten year warranty. A ten year warranty would be sufficient given the planned five year cycle of classroom renovations.

Figure 25: Possible Podium 1 (Source: DWI Enterprises)

Figure 26: Current Podium Top Overhang

The shelves would provide additional space for professors to utilize when desired but will also fold down to maintain the podium's current portability and the amount of space it takes up. Adding the shelves on the sides of the podium enables professors to use their laptops and textbooks without interference with the monitor or anything else on the main desktop space. However, using fold-up shelves also has downsides which in the end we decided outweighed the benefits. For example, fold-up shelves may lack durability since they have to withstand the wear and tear of repetitively being put up and down. More maintenance would be required to keep the shelves in working order, even with a warranty. Also, as seen in Figure 26, the current portable podium tops extend a few inches past the ends of the base. So if fold up shelves were to be added like the ones in Figure 26 a portion of their space would be covered by the main podium top and be wasted. We tried coming up with a way in which fold-up shelves could be added to the current podium design without the main desktop overlapping but we couldn't generate a feasible idea that would be stable enough to support the necessary weight.

Instead we considered replacing the current podium top with a larger one. We determined that if the base of the podium remains the same, simply increasing the size of the podium desktop wouldn't significantly hinder its portability. We recommend replacing the current podium tops with ones that are 48 inches wide by 28 inches deep, as seen in Figure 27. Figure 28 shows our recommended design of the movable podium tops.

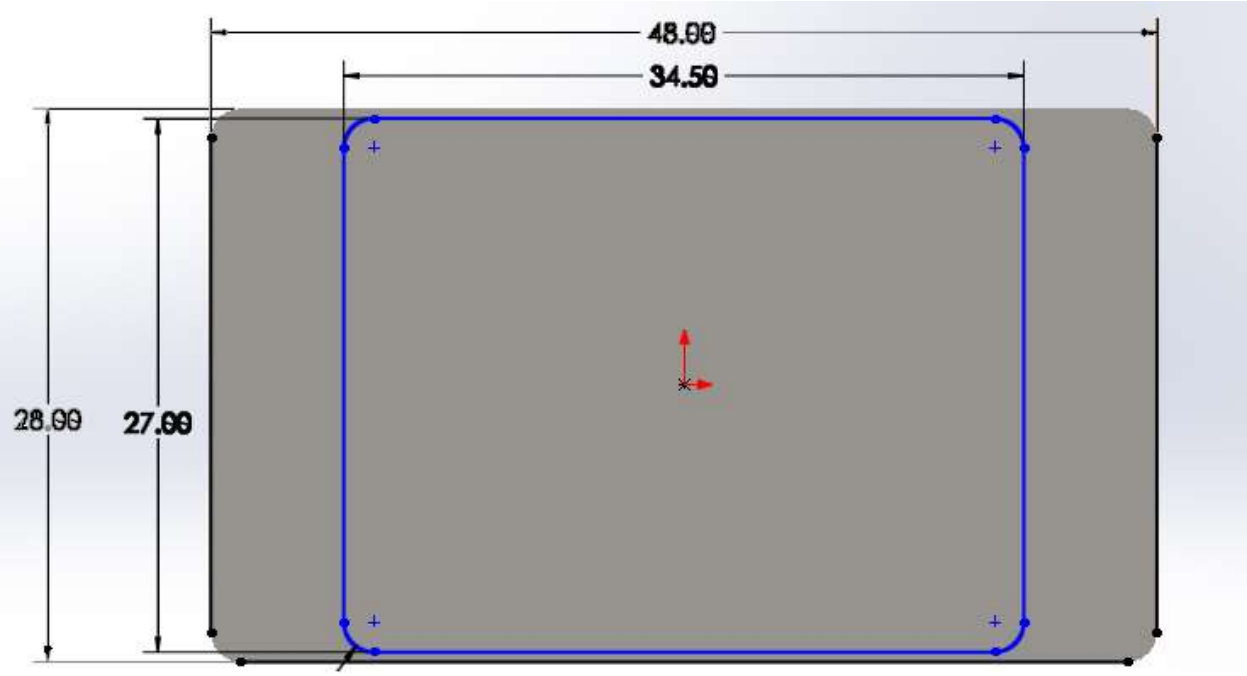

Figure 27: Recommended Podium Size vs. Current Size (blue line)

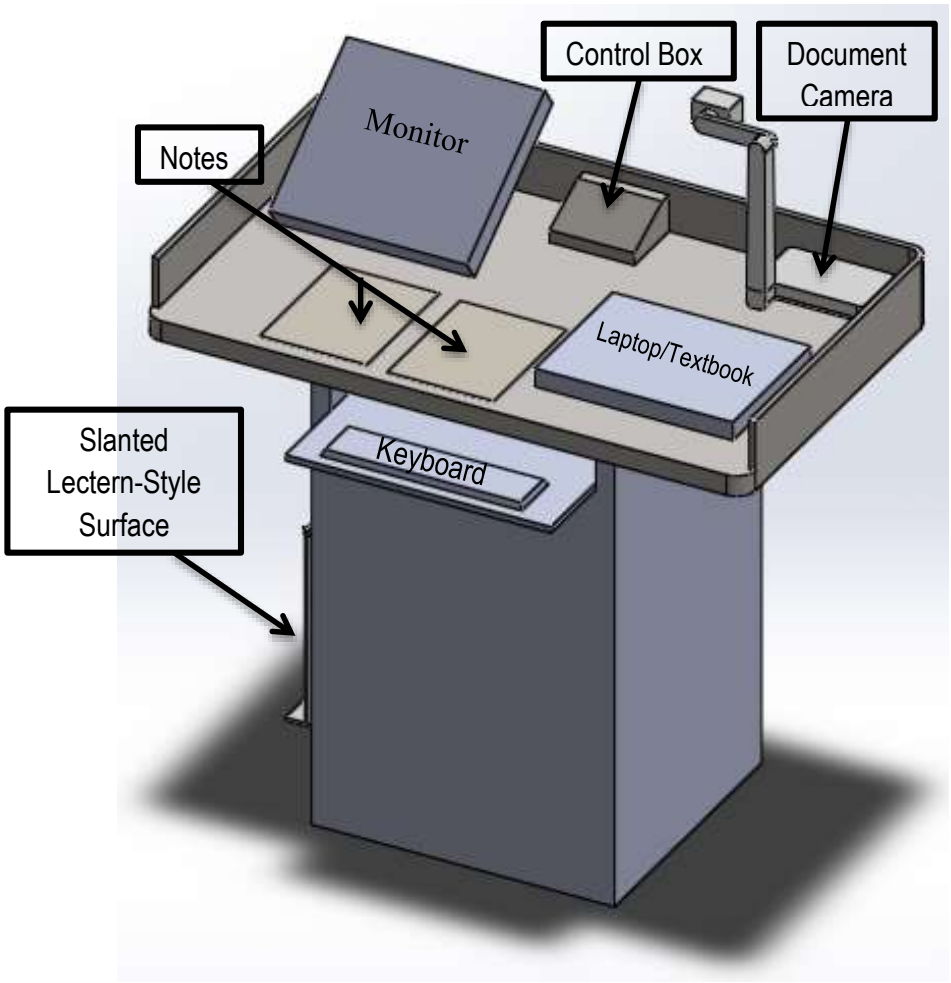

Figure 28: Recommended Design for Movable Podiums

5.1.2 Component Organization

Reduce the size of the control box on the stationary wooden podiums to increase the amount of useable space. For the stationary wooden podium tops we recommend leaving the actual size of the podium top the same and optimizing the layout of the items on the podium. The first way to do this is by making the control box smaller since, as seen in Figure 29 the control box is the main item taking up a large amount of space. Another way to create more space is by making a policy or having a sign that asks professors not to place chalk, markers, or erasers on the podium. This would not only create more space, but prevent the chalk dust from ruining the equipment, as many professors cautioned it does. Although these seem like small suggestions we

believe implementing these changes will make a significant impact on the amount of usable space available on the stationary wooden podium tops.

On the portable podiums make the layout of the monitor and mouse more flexible,

Figure 29: Wood Podium - Controls

add a lip around the edge of the podium, and move the keyboard to a pull out shelf. There were many comments from both the survey and interview that expressed frustration with the monitor, keyboard, and mouse set up on the portable podiums. Professors feel when the monitor is stuck to the podium without the ability to move it along the desktop it limits the usability of the overall space. It was mentioned several times that in multiple rooms the monitor is placed so close to the front edge of the podium that there is no space for the keyboard to go in front of it. We recommend allowing the monitor with its adjustable angle mount to be able to be moved freely. This would allow each professor to arrange the podium top in a way that works best for him or her. Making the monitor moveable also accommodates left-handed professors who would like to put the monitor on the right and use the mouse on the left. We understand that having the monitor just sitting on top of the podium may make it more vulnerable to being knocked off so we also recommend adding a lip around the edges of the podium similar to those on the wooden podium in Atwater Kent room 116, as seen in Figure 29. To optimize the space even more we suggest placing the keyboard in a slide out shelf right below the top of the podium so that it can

be comfortably used without taking up space on the podium top. This would also allow professors who use the interactive pen display or the document camera to have the keyboard out of the way entirely.

5.1.3 Recommendations for Additional Podium Components

Create the ability to use a slanted lectern-style desktop when desired. Since 20 % of the professors preferred a slanted lectern-style podium top we recommend having the option of using a slanted top but not making a permanent part of the podium desktop slanted. We recommend storing a thin, light-weight lectern on hooks on the side of the podium. This lectern could have a thickness, shape and material similar to those of a music stand. On the back of the lectern would be a thin metal bar that folds out to prop the lectern up at a 20 degree angle, as seen in Figure 30. This way the professors who want to use it could easily just take it off the hook, flip out the metal bar and place it on the podium desktop space. Since the professors who commented about wanting a lectern-style top indicated they would use it for notes or a textbook, the material of the lectern doesn't have to be very strong. The lightweight aluminum alloy commonly used in music stands would suffice. We recommend the lectern be 20 inches wide and 16 inches deep so that it can hold an open textbook while still fit on the podium top without blocking the monitor.

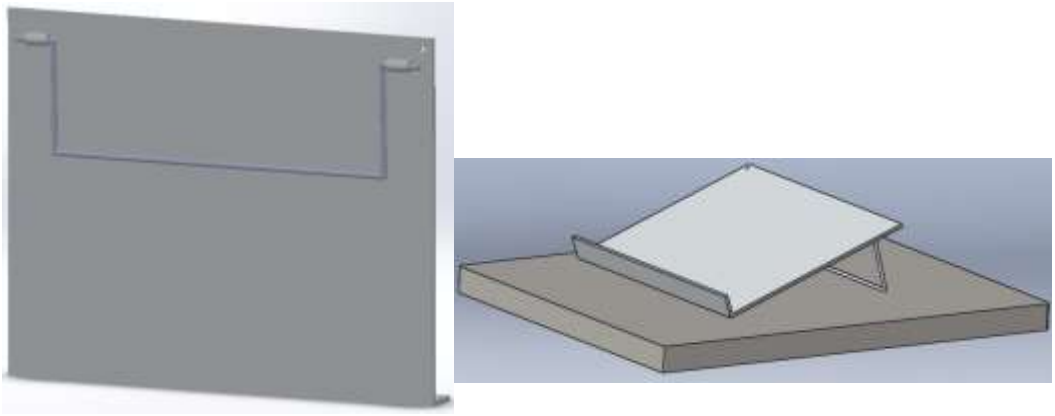

Figure 30: Sloped Lectern Style Stand for Podiums

Place as many controls as possible on the top of the podium with labels. Professors expressed the desire to have all the controls in one place on the top of the podium. So when possible place controls in the control box on the top of the podium. One of the reasons professors

don’t like having controls under the podium top is that their knees sometimes press buttons accidently. In addition to making most of the controls accessible on the podium top, putting some kind of door over the bottom part of the podium would limit the amount of accidental button presses. To make it easier for professors when they teach in different rooms, we recommend adding clear labels to all controls in every room. Professors would like uniformity across the different rooms. So we recommend determining a standard control layout with labels that works well, and as different rooms are renovated convert the controls to this standard.

5.2 Classroom Layout

Based on the feedback from the professors and students we found that some improvements can be made to the layout of the projector screen and the black/white board. In order to meet some of the needs of WPI faculty, we recommend making some changes to the current layout of the lecture halls that are up for renovation.

Increase the amount of usable white/black board space available when the projector screen is down. Over 70% of professors use or wish to use the board and projector screen simultaneously. Rooms, like SL 402 shown in Figure 31, that have at least a width of 5 feet of white/black board available when the projector screen is down enable professors to use both simultaneously. Therefore, we recommend the layout of the projector screen and boards in these rooms, like SL 402 can remain the same. However, moving them to the side of the board would allow professors to use the board space without having to move to the other side of the room. Many professors had comments similar to “What I truly need is the ability to use the white board while the screen is down. Switching between the two is such a hassle that I am forced to use one or the other at any one time.” The screen and board layout for rooms with two projector screens could also remain the same since, when the screens are down, it leaves an entire middle board to use.

Figure 31: Center Screen Placement in Rooms with Ample Board Space

For rooms that have little to no board showing when the screen is down, like Higgins 114 shown in Figure 32, we recommend enlarging the board when possible, and moving the screen off to the side so that the board space remaining isn't divided into two small sections. When it is

Figure 32: Center Screen Placement with Not Enough Usable Board Space

not possible to increase the size of the board we recommend decreasing the size of the screen and moving it to one side. Based on guidelines commonly used at other schools as long as the height of the projector screen isn't less than 1/6 the distance from the screen to the last row of seats the students should still be able to see the contents of the projector screen fine. A table showing the guidelines commonly used at other schools is available in Appendix L. We believe the board and screen layout in Fuller 311, seen in Figure 33 does an exemplary job of optimizing the amount of usable board space while the screen is down.

Figure 33: Ideal Screen Placement to Optimize Board Space

For Fuller Upper and Fuller Lower we recommend decreasing the screen size and putting it to the side to increase the access to the board while the screen is down. Finding the ideal board and screen layout for Fuller Upper and Lower is a challenge since they are such large lecture halls where students have to be able to see the screen from the back of the room. We suggest farther research to determine the optimal screen size that will create access to the board without it being too small for students to see the contents of the screen from the back of the room. Another option could be to bring portable white/black boards in the room for use when the screen is down.

5.3 Recommendations for New Classroom Design & Technology

New technologies like screen sharing software have been released and would have a positive impact on the learning experience at WPI. Some schools are starting to implement new studio

style classrooms designed to facilitate group collaboration. WPI students and faculty showed strong interest in having these rooms at WPI.

Provide devices to wirelessly control the projected content.

Of all new technologies the faculty was surveyed about, being able to use a wireless device to control projected content while teaching had the highest amount of interest across all departments. So we recommend looking into integrating this technology across all classrooms on campus. More research should be done to find such devices that can seamlessly be integrated into systems already in place. Then focus groups could be made to test the different devices so that the best devices and software would be implemented.

Screen sharing software should be further researched and implemented.

Students found the screen sharing software that allows professors to extend their screen directly to student devices to be highly desirable. Most departments also showed moderate levels of interest. We recommend incorporating DisplayNote or products like it in a few rooms at WPI then use focus groups assembled of students and faculty that tested the products to gather feedback. Since the faculty in the social science department showed the most interest, we suggest to start integrating this technology in the classrooms most used by that department. As discussed in the background section, screen sharing software would easily integrate into systems already in place on the WPI campus.

Studio Classrooms should be built at WPI.

The background research done on studio classrooms revealed this type of classroom improves student attendance and grades. Students surveyed felt very strong about having this type of classroom built on campus. Many students had comments similar to "The image from the U of Iowa, I think is a really excellent design that would be especially useful in larger humanities class where you must use small group discussions along with lectures." When the faculty was broken down by department the data showed that the Business and Social Science department wish to use these classrooms the most. It is known that the studio classroom is not ideal for all classes so it is recommended that it be built in the buildings that those departments teach in most or have one built in the Alumni building when renovations take place. Studio classrooms should

be built on campus for teachers whose classes could benefit strongly from a group based classroom setting.

5.4 Additional Classroom Elements that Impact the Learning Experience

Although our focus is on classroom technology that the ATC controls, certain classroom elements were found to have an impact on student learning and functionality of the technology implemented in the rooms. We recommend that Facilities look into making some changes to improve the classroom experience. Many of the students commented that there need to be more power outlets in the rooms for charging laptops. There are also some rooms that need seating upgrades as well as quieter and more efficient HVAC systems. We also suggest that the lighting and lighting controls be upgraded when possible.

Add power outlets at seats when renovating classrooms. Students ranked the quality of power outlet accessibility lowest of all classroom elements. The rooms with fixed rows of tables should be looked at first because those rooms scored 2.04 out of five for power outlet accessibility. These rooms should also be the easiest to add outlets to because the tables are fixed and on different levels so running electrical lines is more feasible. There isn't one room that ranked higher than 'good' for power outlet accessibility, so most rooms could use additional outlets. Facilities should try to add outlets whenever they perform renovations that would facilitate easy addition of outlets on or under the tables. Many schools design their rooms to have floor and desk mounted outlets built in for students to charge devices.

Facilities should repair or replace broken seating. Although students ranked seating quality only third highest in importance, seating was the most common topic of student comments, with 46 comments about poor seating quality. Faculty also commented about broken and noisy seats, but students had strong comments about some rooms in particular. SL 115 received over 15 comments from students about broken seats and tables. Some of the rooms on the third and fourth floors of Salisbury also received feedback about the squeaky chairs that are in most of the

rooms up there. OH 107 and AK 116 ranked higher than average, so the seating in those rooms could be used as an example for SL 115.

HVAC systems need to be quieter and maintain a better temperature balance. Faculty and students ranked HVAC as very important. The heating systems in Kaven, Washburn, and Higgins ranked the lowest and received the most comments about both the noisiness of the system and the inconsistency of the temperatures. One student commented that the temperature in WB229 was 81 degrees one day in December. Temperatures that high can certainly prevent students from focusing in class. Students also said that they had to open windows during class because the rooms were too hot. Improving the HVAC systems would prevent this and save money in heating costs. Many other schools require noise levels be at certain levels and that temperatures maintain between 68-72 degrees year round (Appendix L).

Add better labels to lighting controls. Many faculty members commented that the lighting controls are not clear and adding labels would be a simple solution to that problem. When looking at design standards for other schools across the county, they all require that lighting controls be clearly labeled for their specific zone/use. Some schools even engrave the wall plates to ensure durability of the labels. Faculty have issues with lack of labels for both standard wall switches and on the low voltage wall controllers that just say 'scene 1' instead of something descriptive like 'Whiteboard' or 'projector screen'. One professor commented "The different types of lighting are not clear, I never seem to get it absolutely right. The lights to use for doc cam, laptop and other purposes and not easy to make out and take experimentation on the part of the user." The ATC can work with Facilities to ensure all switches are labeled properly.

This project was designed to help the ATC determine how the classroom technology can be improved when they renovate rooms in the future. We gathered lots of data about how professors and students use the room and what aspects work well or could be improved. We were able to make recommendations to the ATC based on this feedback and it has the potential to improve the learning experience at WPI. The ATC has already used some of our findings to redesign the movable podiums. They increased the size and added a lip around the edge to allow

components to move freely on the top. This should satisfy many of the comments about the current podiums. We have also provided the ATC with a list of professors who are interested in looking at the new design and trying it out. However, the classroom consists of much more than the technology and we found those other elements can have a huge impact on the learning process as well. Our recommendations extend to other departments like facilities and there are huge areas for improvement as well as additional research into ways to improve the classrooms at WPI. Hopefully our project can serve as a foundation for continued improvements to the learning and teaching experience for WPI students and faculty.

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Appendix A: Institutional Review Board Application & Approval

WORCESTER POLYTECHNIC INSTITUTE
Institutional Review Board
Application for Exemption from IRB Review for
Survey or Interview Research Involving Minimal or No Risk

WPI IRB use only
IRB #
Date:

This application is specifically intended for projects in which students are expected to conduct interviews, surveys or focus groups. *Use of this application is recommended for most student project research involving minimal risk. Proposed research meets the definition of "minimal risk" when the risks to research subjects are not greater than those ordinarily encountered in daily life.*

RESET FORM

Project Faculty Advisor(s):

Name:	Chrysanthe Demetry	Tel No:	508-831-5195	E-Mail Address:	cdemetry@wpi.edu
Department:	Mechanical Engineering/ Morgan Center				
Name:		Tel No:		E-Mail Address:	
Department:					

Project Faculty Instructor:

Name:		Tel No:		E-Mail Address:	
Department:					

Student Investigator(s): *ALL student investigators must be listed.*

Name:	Mimoon Alwash	Tel No:	5083356384	E-Mail Address:	mgalwash@wpi.edu
Name:	Jacob Grills	Tel No:	8602870078	E-Mail Address:	jtgrills@wpi.edu
Name:	Richard Hinrichs	Tel No:	7745719856	E-Mail Address:	rhinrichs@wpi.edu
Name:	Brittany Wasserman	Tel No:	8476916606	E-Mail Address:	bmw@wpi.edu
Name:		Tel No:		E-Mail Address:	

Project Title: Recommendations for the Classroom Technology and Layout at WPI

Project Location and Time Frame:
This project is taking place on campus at WPI during A, B, and C terms. The data gathering will be taking place during B term.

WPI IRB Application for Exemption from IRB Review for Survey or Interview Research Involving Minimal or No Risk

Expected Research Subjects: (e.g. museum visitors under the age of 12)
WPI Students and Faculty

Project Mission Statement and Objectives
The goal of this project is to make suggestions to the ATC for improving the implementation of classroom technology and improving the design of the podiums at WPI. Our ambition is to suggest a technology layout and podium design for each room up for renovation in the summer of 2014 and 2015 that would be considered beneficial by the majority of professors and students. Our objectives: 1)

Brief Methods Listing: (e.g. "Survey of public to ascertain knowledge and opinions about climate change" or "Interviews of professionals working on climate change regarding effective city climate change program")
Interviews of faculty members and surveys of students and faculty members to determine how technology is used in the classroom.

Appendix 1: Attach the draft methodology chapter or statement of research methods.

Appendix 2: Attach a draft of surveys and/or a list of questions to be used for interviews or focus groups. If sample questions are included in Appendix 1, Methodology Chapter, indicate page numbers here. 11-16

1. Is the proposed research sponsored or supported by a US federal agency or by US government funding? If so, identify sources. No ◉ Yes ○
2. Is the proposed research funded by a corporation or foundation? If so, identify sources. No ◉ Yes ○
3. Does the proposed research involve vulnerable research subjects? (e.g. children, prisoners, students, persons with mental or physical disabilities, pregnant women) No ○ Yes ◉
4. Does the research involve human subjects in ways <u>other than</u> as participants in interviews, focus groups, or surveys? (e.g. observation of public behavior, use of archived data or experimental procedures) If yes, explain. No ◉ Yes ○
5. Will the researchers collect information that can be used to identify the subjects? No ○ Yes ◉
6. Could the disclosure of a human subject's identity and responses place the subject at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability or reputation? No ◉ Yes ○
7. Will the researchers disclose the identity <u>or</u> the individual responses of any human subjects? (e.g. by quoting an individual, whether or not identified by name or title) No ○ Yes ◉

WPI IRB Application for Exemption from IRB Review for Survey or Interview Research Involving Minimal or No Risk

IF you answered yes to question 6 or 7, answer these questions:

A. What is the potential risk to human subjects?
This subject matter is not sensitive and thus there is very little foreseeable risk.

B. How will you eliminate or reduce said risk to an acceptable level?
We will ask people whether or not we have permission to quote them, and whether or not we can identify their name or title.

Please Print Form Before Signing Below

By signing below, all participants in this research project are agreeing to abide by the following instructions:

1. You agree to inform subjects orally or in writing that:
   - Participation in the research is voluntary.
   - Participants may end their participation at any time.
   - Participants need not answer every question in an interview or survey.

2. If your research is **anonymous**, you also inform subjects that you are not collecting names or any identifying information from them.

3. If your research is **confidential**, you inform subjects that no identifying information will be disclosed with individual responses.

4. If your research is **NOT** completely anonymous and confidential, you must obtain each subject's permission to publicly disclose his or her identity and/or responses. All requests for anonymity and confidentiality must be honored. The subject must be offered the opportunity to pre-approve the publication of any quoted material

Signature of Faculty Advisor: Chrysanthe Demetry Digitally signed by Chrysanthe Demetry DN: cn=Chrysanthe Demetry, o=Worcester Polytechnic Institute, ou=Mechanical Engineering Dept, email=cdemetry@wpi.edu, c=US Date: 2013.10.22 08:27:06 -04'00' Date: 10/22/2013

Print Full Name and Title: Chrysanthe Demetry, Associate Professor of Mechanical Engineering

Please return a signed hard or electronic copy of this application to the WPI IRB c/o Ruth McKeogh, 2nd floor Project Center or irb@wpi.edu.
If you have any questions, please call (508) 831-6699.

WORCESTER POLYTECHNIC INSTITUTE

Worcester Polytechnic Institute IRB# 1
HHS IRB # 00007374

24 October 2013
File:13-203

Re: IRB Application for Exemption #13-203 "Recommendations for the Classroom Technology and Layout at WPI"

Dear Prof. Demetry,

The WPI Institutional Review Committee (IRB) has reviewed the materials submitted in regards to the above mentioned study and has determined that this research is exempt from further IRB review and supervision under 45 CFR 46.101(b)(2): "Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation."

This exemption covers any research and data collected under your protocol from 24 October 2013 until 23 October 2014, unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific exemption must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue.

Please contact the undersigned if you have any questions about the terms of this exemption.

Thank you for your cooperation with the WPI IRB.

Sincerely,

Kent Rissmiller
WPI IRB Chair

Appendix B: Details of Classrooms to be renovated in 2014 & 2015

Room	Summer of renovation	# of Seats	# of Boards/locations	# of projector screens/locations	Type of podium	Podium Desktop Size Width	Depth	Height of podium	Document Camera?	Height of document camera	Monitor: Flip or movable?	Other?
HL116	2015	90	1 big white board wall, front	1 screen, center front	portable	34.5in	27in	40 in	yes	on top	flip monitor	laptop tray 35in high
HL114	2015	35	1 white board, front	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
HL154	2015	35	3 black boards, front, side, back	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
HL202	2015	35	3 black boards, front, side, back	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
HL218	2015	90	3 white board, front center	1 screen, center front	portable	34.5in	27in	40in	yes	on top	flip monitor	laptop tray 35in high
WB229	2015	85	3 white boards, front in line at angles	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
FL Upper	2014	196	2 white boards front next to eachother	1 screen, center front	movable wooden	4ft	23in	41in	yes drawer on side	27in above ground	moveable moniter	Slideout keyboard drawer
FL Lower	2014	100	2 white boards front next to eachother	1 screen, center front	movable wooden	4ft	23in	41in	yes drawer on side	27in above ground	moveable moniter	Slideout keyboard drawer
SL 104	2014	76	3 black boards, front in line at angles	1 screen, center front, 2nd screen mystery	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
SL 105	2014		4 black boards, front in line at angles	1 screen, front center	fixed wooden				?		flip monitor	laptop tray 35in high
SL 411	2015	60 seats	1 long blackboard in front, 1 side white board	1 screen, center front	portable	34.5in	27in	40in	yes	on top	flip monitor	laptop tray 35in high
SL 402	2014	60	1 long blackboard in front, 1 side white board	1 screen, center front	portable	34.5in	27in	40in	?		flip monitor	laptop tray 35in high
OH 107	2014	205	3 chalk boards in front	2 projector screens covering outside boards,	fixed wooden							
OH 223	2014	42	3 black boards, front, side, back	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
AK 116	2014	206	3 black boards, front in line at angles	2 screens, over right and left boards	stationary wooden	4ft	30in	40in	yes drawer on side	29in above ground	moveable monitor	Slideout keyboard, 3ft .25in high
AK 219	2014		3 black boards, front in line at angles	2 screens, over right and left boards	stationary wooden	4ft	30in	40in	yes drawer on side	29in above ground	moveable monitor	Slideout keyboard, 3ft .25in high
AK 233	2014	70	3 black boards, front in line at angles	2 screens, over right and left boards	stationary wooden	4ft	30in	40in	yes drawer on side	29in above ground	moveable monitor	Slideout keyboard, 3ft .25in high
KH 115	2015	26	1 white board	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
KH 116	2015	70	1 long black board	1 screen, center front	portable	34.5in	27in	40in	no	N/A	flip monitor	laptop tray 35in high
GH 227	2015	80			portable				no	N/A		
SH 308	2014											

Appendix C: Faculty Interview Questions

Podium Design:

1. When teaching a class how do you utilize the podium?
2. What would you like to see changed in the podium design and why?
3. Do you do that for all of the classes you teach? If not how else do you use it? What determines how you will use the podium?
4. If the podium was redesigned to have a bigger desktop space for notes or a laptop, would you consider this an improvement or a fault to the overall design of the podium?
5. What do you consider to be the ideal size of the podium desktop?
6. Do you find the portability of the podium or the desktop space available on the podium more important?
7. In your opinion how comfortable is the height of the podium desktop?
8. Do you prefer to stand or sit while you teach?
9. How often, if ever, do you use the document camera while teaching?
10. Do you use the one attached to the podium or get a separate one?
11. Is the attached podium at a height that you find comfortable or not?
12. Are there aspects of the podium that we haven't asked you about, that you feel we should consider when redesigning it?

Classroom Layout:

13. If you could change the location of the fixed podium would you? If so, to where and why?
14. While teaching what do you utilize most: boards, projector screen, or a combination of both?
15. Would you use both the projector screen and the white/black board simultaneously if their layout, allowed you to do so? Why or why not?
16. If you could change the location of the projector screens would you? If so, to where and why?
17. Is there any aspect of the overall layout of the classroom you'd like to see changed? If so, what is it, how would you like it to be changed and why?

New Technology:

18. Do you think the ability to move around the classroom while controlling the projector screen wirelessly would be beneficial to your teaching techniques? How so?
19. Are you aware of any new technology that you would like to be able to integrate into your teaching?

Appendix D: Faculty Survey

Faculty Classroom Technology Survey

Faculty Survey on Classroom Technology & Layout

Our IQP team is gathering feedback on how the layout of classroom technology and the design of the podiums at WPI could be changed in order to become more satisfactory to the professors. By filling out the following survey your preferences for classroom technology layout and podium design will be included when we make our recommendations to the Academic Technology Center (ATC). The ATC will consider these recommendations when they renovate these classrooms in the coming years
This survey is divided into five parts:
1. How you teach in ${m://ExternalDataReference}.
2. Podium design in ${m://ExternalDataReference}.
3. Layout & Design of ${m://ExternalDataReference}.
4. Future classroom technology and layout.
5. Feedback about any other classrooms at WPI.

If you would like to complete this survey about a classroom other than ${m://ExternalDataReference}, please change it below: Classroom to review:

- ${m://ExternalDataReference}

Confidentiality Note:
Your participation in the survey is completely voluntary and you may withdraw from the survey at any time. All of your responses will be kept confidential and no personally identifiable information will be associated with any responses that we include in our report.

Use of Classroom Technology

While teaching in ${q://QID36/ChoiceGroup/SelectedChoices}, how often do you use the following:

	Unaware it is available	Never	Rarely	Sometimes	Often	Always
White/Black Board	❍	❍	❍	❍	❍	❍
Your own laptop	❍	❍	❍	❍	❍	❍
Podium computer	❍	❍	❍	❍	❍	❍
Interactive Pen Display (digital pen)	❍	❍	❍	❍	❍	❍
Document Camera	❍	❍	❍	❍	❍	❍
LCD Projector	❍	❍	❍	❍	❍	❍
Lecture Capture (if available)	❍	❍	❍	❍	❍	❍

Have you ever experienced difficulties while using the interactive pen display?

- ❍ Never
- ❍ Rarely
- ❍ Always
- ❍ Sometimes

Do you continue to use the interactive pen display?

- ❍ Yes
- ❍ No

When you use the document camera do you prefer to stand or sit?

- ❍ I prefer to stand
- ❍ I prefer to sit
- ❍ No preference
- ❍ Both sit and stand

When you use lecture capture, does it change how you teach the class?

- ❍ I use the same teaching method and technology regardless of whether I am using lecture capture or not.
- ❍ I teach differently when using lecture capture. Please explain: _____

Podium Design

If the podium were redesigned to have a bigger desktop space for notes or a laptop, would you consider this

- ❍ An improvement to the overall podium design, making it more useful
- ❍ A drawback to the overall podium design, making it more inconvenient to use
- ❍ A change that would not impact you positively nor negatively

What items would you like to place on the podium while you teach?

In your opinion, which is more important: the space (size) available on top of the podium or the portability of the podium?

- ❍ Having a large amount of space on the top of the podium is more important than the portability of the podium
- ❍ Portability is more important than having large amount of space available on top of the podium
- ❍ They are equally important

In your opinion, is the height of the podium top currently

- ❍ Too tall for comfortable use
- ❍ Too short for comfortable use
- ❍ Good for comfortable use

Would you prefer a section of the podium to have a sloped surface for notes or books (lectern style)?

- ❍ Yes
- ❍ No
- ❍ No Preference

Do you prefer to stand or sit while using the podium?

- I prefer to stand
- I prefer to sit
- I do both

Are the podium controls in ${q://QID36/ChoiceGroup/SelectedChoices} easy to understand and use?

- Very Difficult
- Somewhat Difficult
- Neutral
- Somewhat Easy
- Very Easy

Comments about the podium controls:

If the podium were to be redesigned, what aspects of the podium, if any, would you like to see changed in the new design?

If the podium were to be redesigned, what aspects of the podium, if any, would you like to remain the same in the new design?

Classroom Layout & Design

If the location of the fixed podium were to be moved where, in your opinion, where would be the ideal position of the podium?

- Off to the side angled 45 degrees between projector screen and students' seats (left picture)
- Centered across from and facing the students' seats (right picture)
- Other, please specify _____

In classrooms with one projector screen, where should the screen be placed?

- ❍ Centered in the front of the room
- ❍ Angled off to one side
- ❍ Left of the board
- ❍ No Preference

Would you use a combination of both the projector screen and the white/black boards if their layout allowed you to use both at the same time?

- ❍ Yes, I currently use both now
- ❍ Yes, I want to use both the projector screen and boards, but the projector screen covers the boards too much
- ❍ No, I stick to just using the boards or the projector
- ❍ Maybe, I would try using both if the layout made it easier to do so
- ❍ Other; please specify _____

Do you think there needs to be more usable board space with the projector screen down?

- ❍ There needs to be more space
- ❍ There is space enough now
- ❍ I don't use the board while the screen is down

How would you rate the following elements in ${q://QID36/ChoiceGroup/SelectedChoices}?

	Poor	Fair	Good	Very Good	Excellent	Not Sure
Overall Classroom Technology	❍	❍	❍	❍	❍	❍
Lighting Quality	❍	❍	❍	❍	❍	❍
Lighting Controls	❍	❍	❍	❍	❍	❍
Acoustics	❍	❍	❍	❍	❍	❍
Seating	❍	❍	❍	❍	❍	❍
Heating & Cooling / Ventilation	❍	❍	❍	❍	❍	❍

In general how important are the following classroom elements to your teaching?

	Not Important	Low Importance	Moderate Importance	High Importance	Essential	Not Sure
Overall Classroom Technology	❍	❍	❍	❍	❍	❍
Lighting Quality	❍	❍	❍	❍	❍	❍
Lighting Controls	❍	❍	❍	❍	❍	❍
Acoustics	❍	❍	❍	❍	❍	❍
Flexible Seating	❍	❍	❍	❍	❍	❍
Heating & Cooling / Ventilation	❍	❍	❍	❍	❍	❍
Two Projection Screens (large rooms)	❍	❍	❍	❍	❍	❍

Additional Comments:

Future Classroom Technology & Layout

The ATC is evaluating both software and hardware that would allow professors and students to share the screen of their device (laptop or tablet) wirelessly with the projector in the classroom.

Do you think it would be useful to be able to control the content on the projector screen from a wireless device?

- Very Useful
- Somewhat Useful
- Not Useful
- Not Sure

Do you think students being able to share the content of their screen with you and with the classroom projector would be useful?

- Very Useful
- Somewhat Useful
- Not Useful
- Not Sure

Are there any other technologies that you think should be incorporated into the classrooms?

Below is a picture of a studio classroom at the University of Iowa. These student-centered learning spaces are designed to support active learning and teaching strategies, collaborative learning, and peer instruction. These classrooms allow the professor to introduce new material to the students via traditional lecturing, but follow that with group collaboration and practice problems.

How interested would you be in having this type of classroom at WPI?

- ❍ Very Interested
- ❍ Somewhat Interested
- ❍ Not Interested
- ❍ No Preference

Additional Feedback

Please provide feedback you have about the technology and layout of any classrooms at WPI.

Appendix E: Student Survey

In classrooms with one projector screen, where should the screen be placed?

- ❍ Centered in the front of the room
- ❍ Angled off to one side
- ❍ Left of the board
- ❍ No Preference

The ATC is evaluating both software and hardware that would allow professors and students to share the screen of their device (laptop or tablet) wirelessly with the projector in the classroom.

Would screen sharing software that mirrors the projector screen on to your device (laptop or tablet) be useful?

- ❍ Very Useful
- ❍ Somewhat Useful
- ❍ Not Useful
- ❍ Not Sure

Do you think being able to share the content of your computer screen with the professor and/or with the classroom projector would be useful?

- ❍ Very Useful
- ❍ Somewhat Useful
- ❍ Not Useful
- ❍ Not Sure

Below is a picture of a studio classroom at the University of Iowa. These student-centered learning spaces are designed to support active learning and teaching strategies, collaborative learning, and peer instruction. These classrooms allow the professor to introduce new material to

the students via traditional lecturing, but follow that with group collaboration and practice problems.

How interested would you be in having this type of classroom at WPI?

- ❍ Very Interested
- ❍ Somewhat Interested
- ❍ Not Interested
- ❍ No Preference

Now we would like your feedback about a specific classroom.
Please choose a classroom that you are familiar with:

❍ List of all classrooms…

How would you rate the following elements in this classroom?

	Poor	Fair	Good	Very Good	Excellent	Not Sure
Overall Classroom Technology	❍	❍	❍	❍	❍	❍
Lighting Quality	❍	❍	❍	❍	❍	❍
Power Outlet Accessibility	❍	❍	❍	❍	❍	❍
Acoustics	❍	❍	❍	❍	❍	❍
Seating Quality	❍	❍	❍	❍	❍	❍
Heating & Cooling / Ventilation	❍	❍	❍	❍	❍	❍
Projector Screen Visibility	❍	❍	❍	❍	❍	❍
Wireless Internet Access	❍	❍	❍	❍	❍	❍

In general how important are the following classroom elements to your learning experience?

	Not Important	Low Importance	Moderate Importance	High Importance	Essential	Not Sure
Overall Classroom Technology	❍	❍	❍	❍	❍	❍
Lighting Quality	❍	❍	❍	❍	❍	❍
Power Outlet Accessibility	❍	❍	❍	❍	❍	❍
Acoustics	❍	❍	❍	❍	❍	❍
Seating Quality	❍	❍	❍	❍	❍	❍
Heating & Cooling / Ventilation	❍	❍	❍	❍	❍	❍
Two Projection Screens (large rooms)	❍	❍	❍	❍	❍	❍
Wireless Internet Access	❍	❍	❍	❍	❍	❍

How easy is it to take notes when the professor uses the

	Very Difficult	Difficult	Neutral	Easy	Very Easy	Not Sure/No Preference
Dry Erase Board	❍	❍	❍	❍	❍	❍
Chalk Board	❍	❍	❍	❍	❍	❍
Interactive Pen Display (Digital Pen)	❍	❍	❍	❍	❍	❍
Document Camera	❍	❍	❍	❍	❍	❍

Please provide any comments about the following:
Improving classroom layout
Technologies that should be added to classrooms
Technologies that hindered your learning experience

Any other feedback about classrooms at WPI

Appendix F: Conclusions from Interviews

What do professors view as advantages and disadvantages of the overall layout of the classroom, including the location of the projector screens, the white/black boards, and the podium?

It seems, except for humanities department, the majority of professors like when they are able to use both the projector screen and boards simultaneously.

> Humanities seem to use guided discussions and use PowerPoint just to show pictures, videos, and examples.

In the rooms with two projector screens some professors said they would like to be able to control each screen independently (like have power point on one and a writing space for the interactive pen on the other)

> It seems the location/size of the screen in Fuller Upper and Lower is disliked by almost all professors.

Many professors favor the sliding boards like the ones in AK 116.

All the professors in Stratton Hall 106 felt it had too many large desks overcrowding it.

Although many professors understand need for lecture hall style seating, almost all of them preferred teaching in smaller classrooms with flexible seating.

In what ways do professors utilize the podiums during class and what do they view as advantages and disadvantages of its design?

Almost all of the professors said they utilize the podium in one way or another (other than to move it out of the way)

All professors who use the portable podiums felt having a larger better organized desktop space would be extremely beneficial.

Even some of the professors using the wooden podiums felt the desktop space could be utilized better to create more usable space.

Whether portability or size of podium is more important was split pretty evenly amongst the professors interviewed.

> Many of the professors who said size was more important stipulated that the fixed podium would be ok if it was in a place they liked.
>
> Almost all of the professors who said portability was more important also expressed the need or want for a larger desktop space.

Many professors expressed discontent with the location of the keyboard and fixed monitor set up. –they would like the keyboard to be able to be moved out of the way.

Many professors (mostly humanities department) would like the podium to offer a space that is slanted lectern style for their notes.

Many professors felt the laptop tray should be on the side-not in front.

Many professors suggested adding fold up shelves to create more space.

Although controls did not seem like a main issue, some professors mentioned that they could be labeled better and easier to use and would prefer uniformity throughout rooms.

> There were a few professors who said the mute button doesn't always work. (Kaven Hall 115, Fuller Lower)
>
> Multiple professors would like the light controls to be on the podium.
>
> A few professors mentioned that their knees would hit the buttons that are on the front of the portable podiums.
>
> Many of the professors who said controls were good also said that it was because they were used to them and had taught in that room for a long time.

Notes on Document Camera

It seems the majority of humanities professors never or rarely use it.

There were a few instances of professors who had tried using document cameras and felt that either its setup was too inconvenient or that it didn't work well (glare, autofocus bad) so they stopped using it.

Notes on Lecture Capture

Only one professor commented on how when she has to use lecture capture she is forced to teach differently than she normally does. (Had to use doc camera with projector screen instead of writing on board.)

Notes on Interactive pen display

Many of the professors who said they do or have used it said that they have experienced some issues with it occasionally.

> Some professors said they found issues with the interactive pen display so interruptive to their teaching that they stopped using it.

Could the integration of different technologies into the classroom design be beneficial? If so, which technologies should be considered for integration and why?
Some professors said they would like automatic shades/blinds that they can control from the podium.

The majority of the professors liked the idea of a tablet or similar device that would allow them to control the contents of the projector screen wirelessly.

A few professors expressed it would be nice if students didn't have to rent clickers (and using phones is unreliable according to many of the professors who use clickers); one suggested installing/integrating clicker system into seating.

Additional Comments
Multiple professors said the internet access was not great (especially in Goddard Hall)

Multiple Professors said they had experienced issues with sound/audio when playing video clips, or DVDs.

Comments were made about a buzzing sound that occurs when people receive smartphone notifications and that it's distracting.

Some professors mentioned that the heating makes loud distracting noises (especially in Higgins Labs.)

One professor was frustrated that he was not notified when updates were done to the classroom computer software.

Important comment:
Olin Hall 223 and Higgins Labs 202 comments were made that having the podium on the other side of room would be better because currently when the professor moves it out of the way of the boards it ends up blocking the door (probably a fire hazard?) This comment could pertain to a lot of the smaller rooms that have portable podiums on the side where the door is.

Appendix G: Survey Invitation and Reminder Emails

Faculty Invitation email sent on December 3, 2013:

Subject: Help Improve the Classrooms at WPI

Dear Professor ${m://LastName},

Our IQP team is gathering feedback on how the layout of classroom technology and the design of the podiums at WPI could be changed in order to become more satisfactory to the professors who use them.

We would appreciate your participation in our short 15 minute survey about your experience teaching in ${m://Classroom}. Please follow the link below to complete the survey so that your preferences for classroom technology, layout, and podium design can be included when we make our recommendations to the Academic Technology Center (ATC).

Thank you,
Mimoon Alwash
Jacob Grills
Richard Hinrichs
Brittany Wasserman

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Faculty reminder email sent to professors who had not completed the survey on December 6, 2013:

Dear Professor ${m://LastName},

We would really appreciate 15 minutes of your time to find out how the classroom technology at WPI could be improved.

We would appreciate your participation in our short 15 survey about your experience teaching in ${m://FirstName}. Please follow the link below to complete the survey so that your preferences for classroom technology, layout, and podium design can be included when we make our recommendations to the Academic Technology Center (ATC).

Thank you,

Mimoon Alwash
Jacob Grills
Richard Hinrichs
Brittany Wasserman

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Faculty second reminder email sent on December 11, 2013:

Dear Professor ${m://LastName},

We are still looking for your feedback about how classroom technology could be improved. The survey should take less than 15 minutes to complete.

We would appreciate your participation in our survey about your experience teaching in ${m://FirstName}. Please follow the link below to complete the survey so that your preferences for classroom technology, layout, and podium design can be included when we make our recommendations to the Academic Technology Center (ATC).

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Thank you,
Mimoon Alwash
Jacob Grills
Richard Hinrichs
Brittany Wasserman

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Student invitation sent on December 11, 2013:

Subject: Improve the Classrooms at WPI

Hi ${m://FirstName},

We are working with the Academic Technology Center (ATC) to improve the technology in

classrooms on campus. Please take our short survey to help make the WPI learning experience better for everyone.

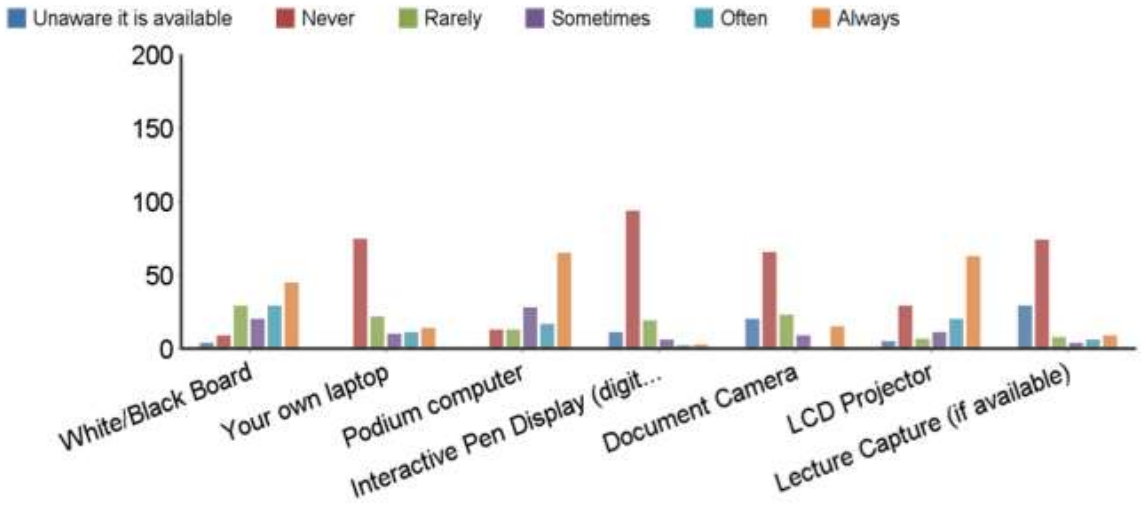
Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Thanks,
Mimoon Alwash
Jacob Grills
Richard Hinrichs
Brittany Wasserman

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

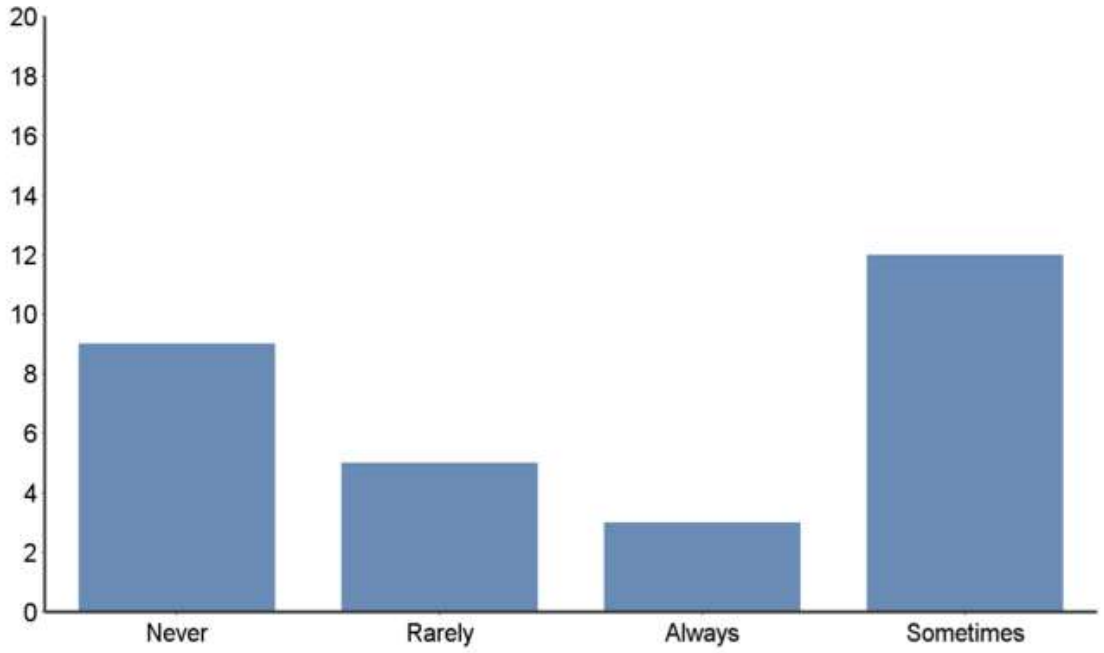
Appendix H: Faculty Survey Responses

While teaching in ${q://QID36/ChoiceGroup/SelectedChoices}, how often do you use the following:



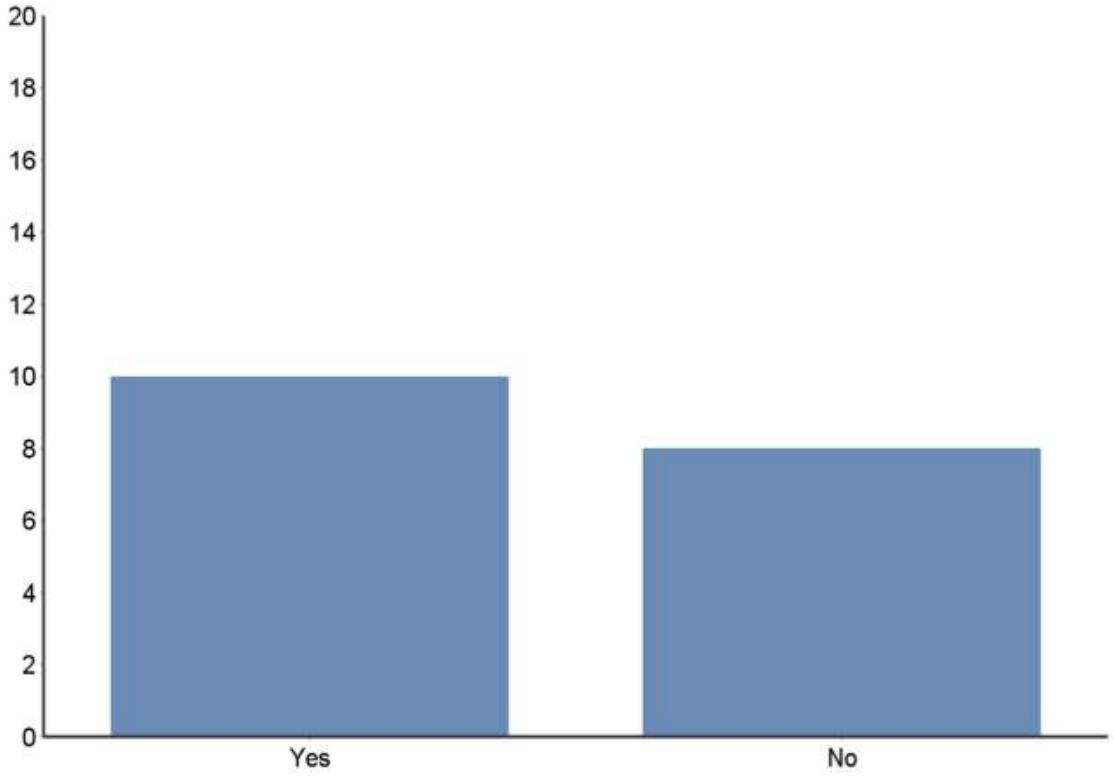
#	Question	Unaware it is available	Never	Rarely	Sometimes	Often	Always	Response	Average Value
70	White/Black Board	4	9	29	20	29	45	136	26.44
71	Your own laptop	-	75	22	10	11	14	132	24.99
72	Podium computer	-	13	13	28	17	65	136	26.79
73	Interactive Pen Display (digital pen)	11	94	19	6	2	3	135	24.28
74	Document Camera	20	66	23	9	1	15	134	24.63
75	LCD Projector	5	29	7	11	20	63	135	26.49
76	Lecture Capture (if available)	29	74	8	4	6	9	130	24.32

Have you ever experienced difficulties while using the interactive pen display?



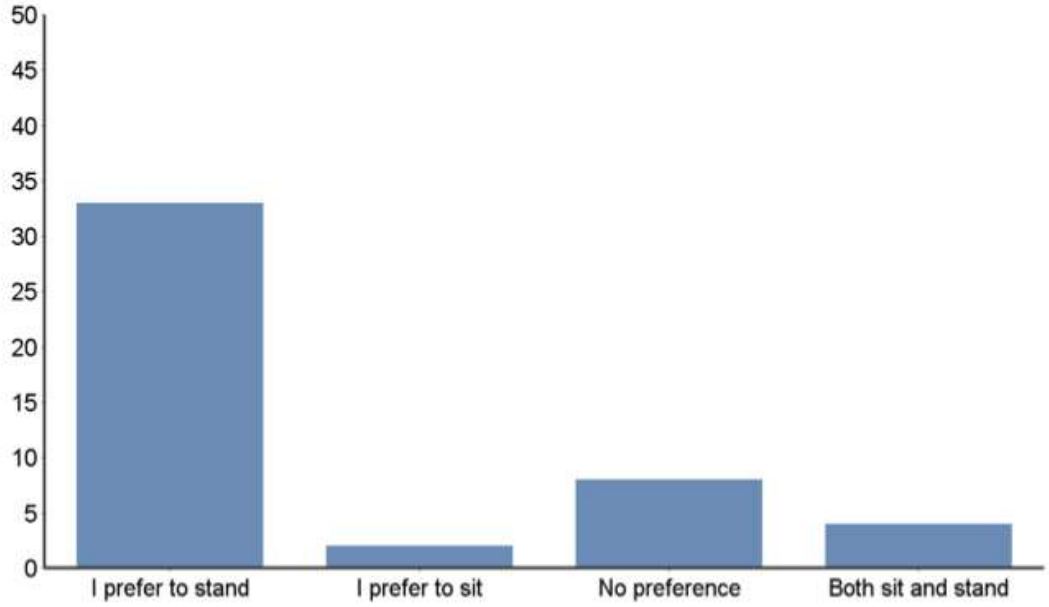
#	Answer	Bar	Response	%
1	Never		9	31.03%
2	Rarely		5	17.24%
3	Always		3	10.34%
6	Sometimes		12	41.38%
	Total		29	100.00%

Do you continue to use the interactive pen display?



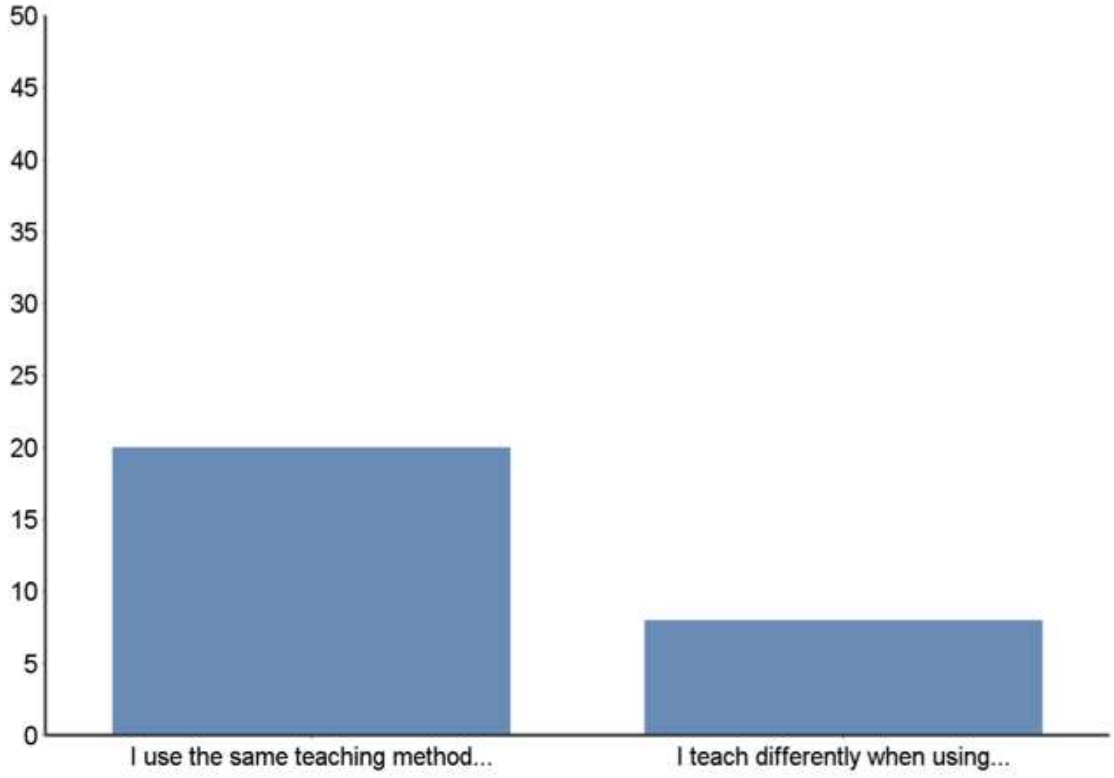
#	Answer	Bar	Response	%
1	Yes		10	55.56%
2	No		8	44.44%
	Total		18	100.00%

When you use the document camera do you prefer to stand or sit?



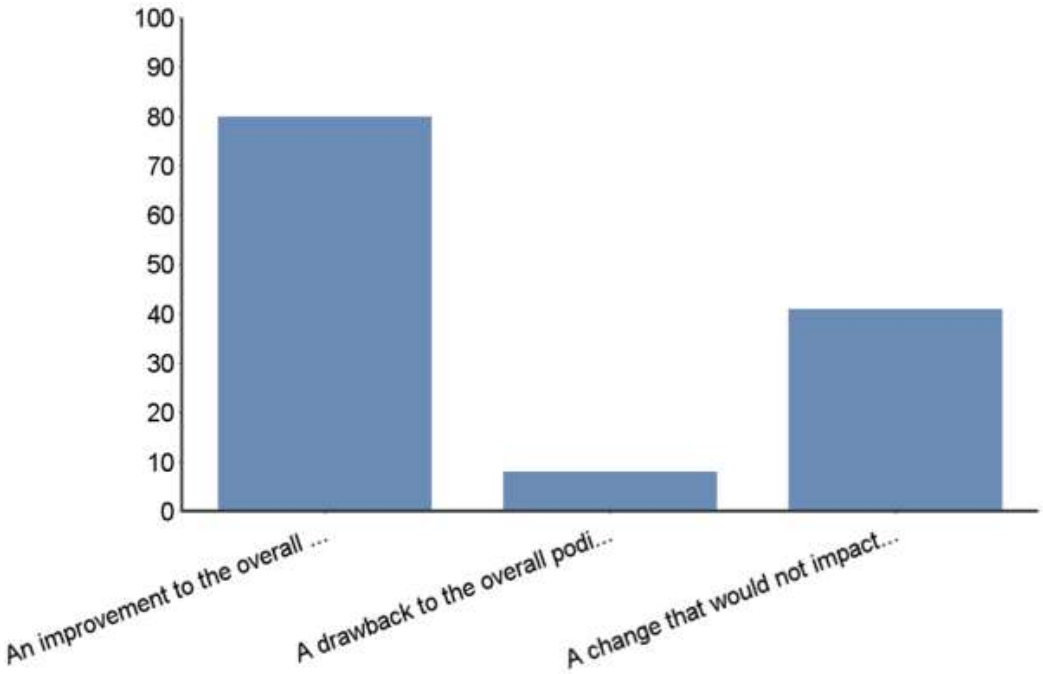
#	Answer	Bar	Response	%
1	I prefer to stand		33	70.21%
2	I prefer to sit		2	4.26%
3	No preference		8	17.02%
4	Both sit and stand		4	8.51%
	Total		47	100.00%

When you use lecture capture, does it change how you teach the class?



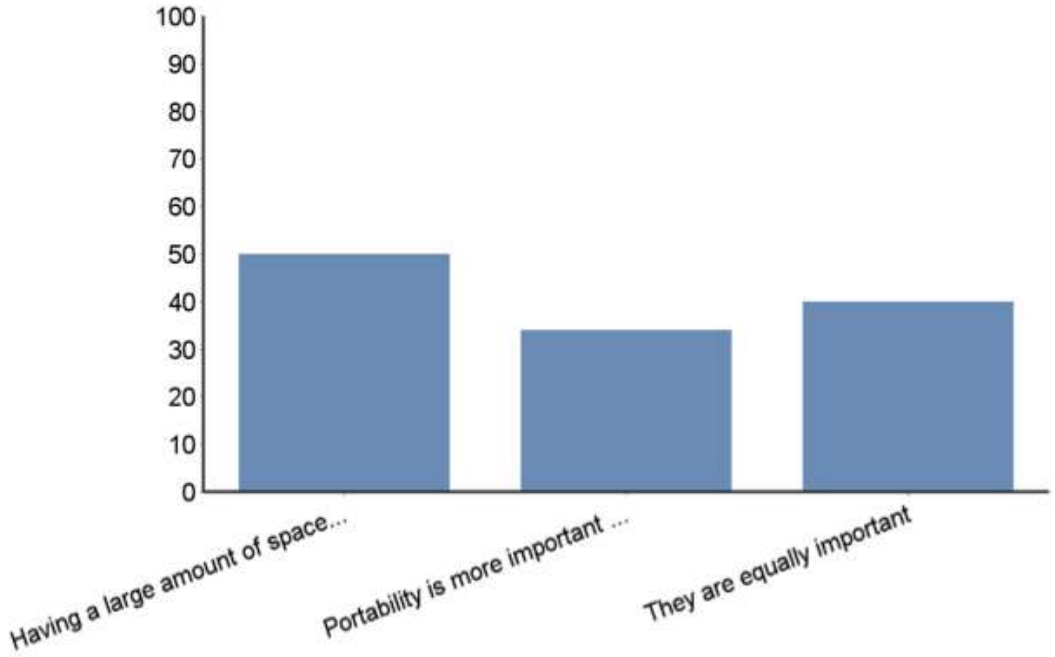
#	Answer	Bar	Response	%
1	I use the same teaching method and technology regardless of whether I am using lecture capture or not.		20	71.43%
2	I teach differently when using lecture capture. Please explain:		8	28.57%
	Total		28	100.00%

If the podium were redesigned to have a bigger desktop space for notes or a laptop, would you consider this



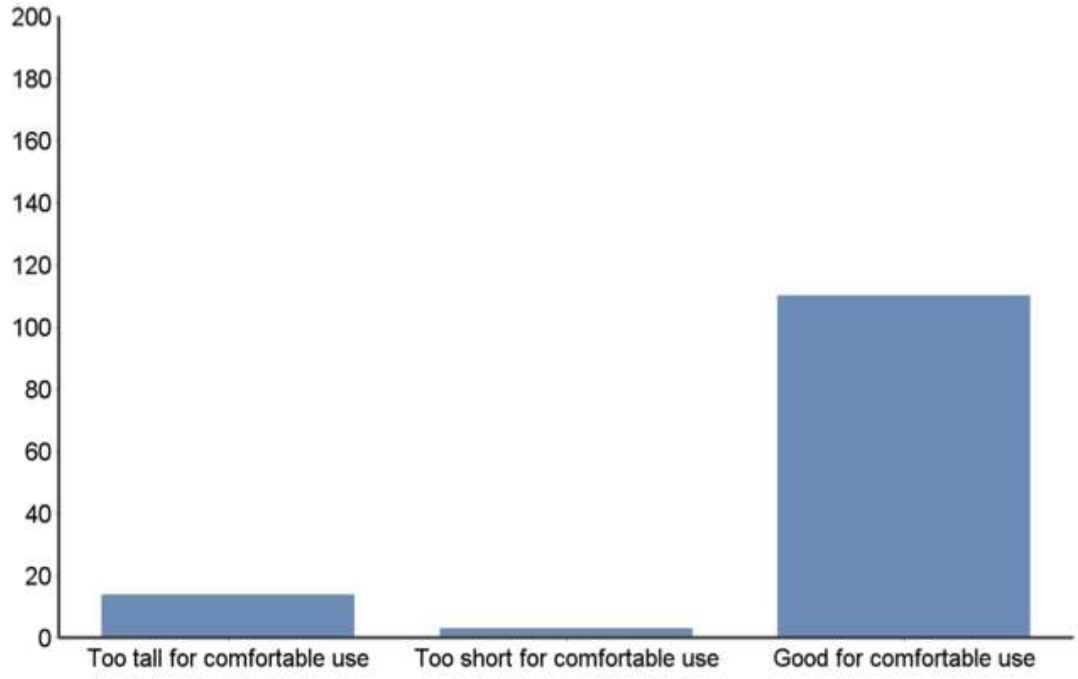
#	Answer	Bar	Response	%
1	An improvement to the overall podium design, making it more useful		80	62.02%
2	A drawback to the overall podium design, making it more inconvenient to use		8	6.20%
3	A change that would not impact you positively nor negatively		41	31.78%
	Total		129	100.00%

In your opinion, which is more important: the space (size) available on top of the podium or the portability of the podium?



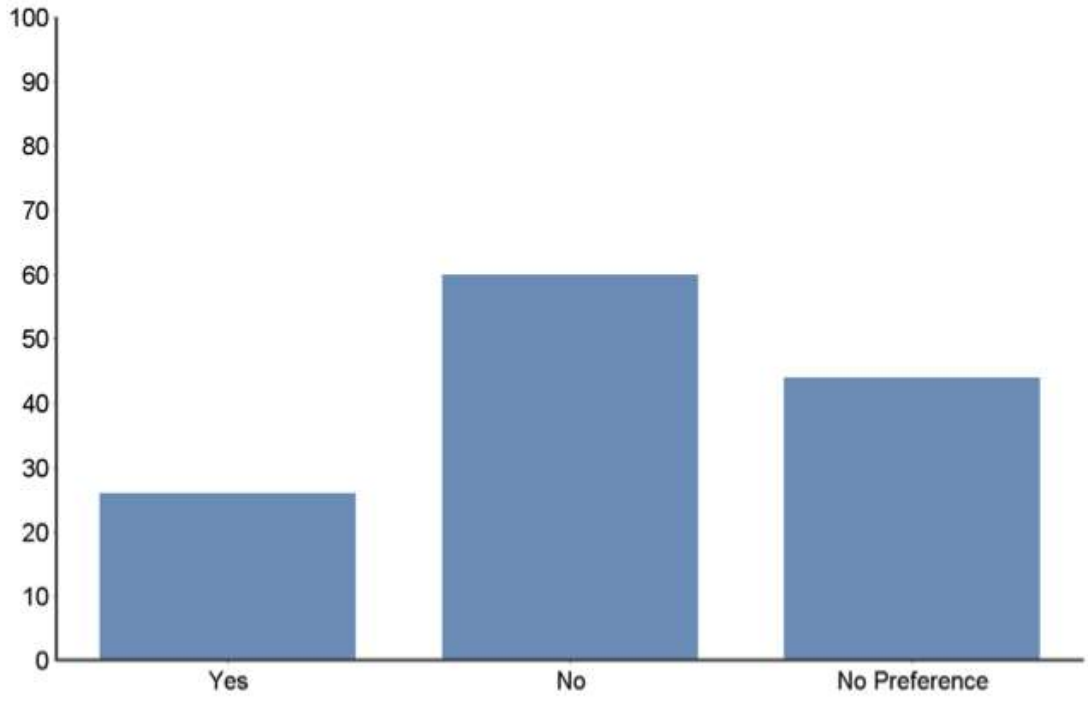
#	Answer	Bar	Response	%
1	Having a large amount of space on the top of the podium is more important than the portability of the podium		50	40.32%
2	Portability is more important than having large amount of space available on top of the podium		34	27.42%
3	They are equally important		40	32.26%
	Total		124	100.00%

In your opinion, is the height of the podium top currently



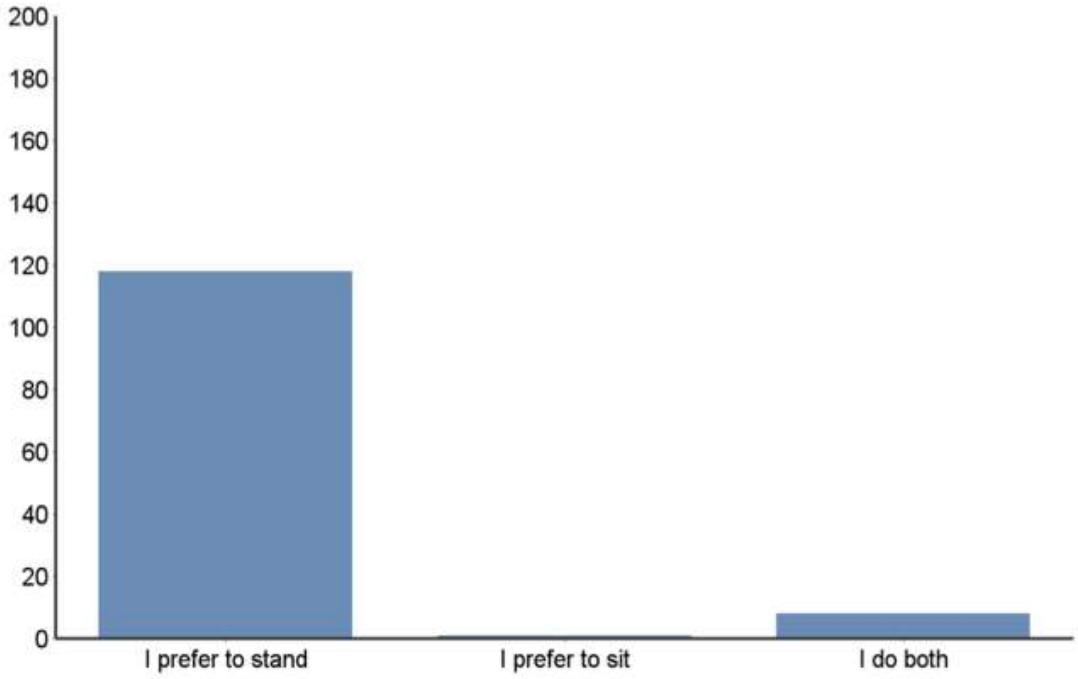
#	Answer	Bar	Response	%
1	Too tall for comfortable use		14	11.02%
2	Too short for comfortable use		3	2.36%
3	Good for comfortable use		110	86.61%
	Total		127	100.00%

Would you prefer a section of the podium to have a sloped surface for notes or books (lectern style)?



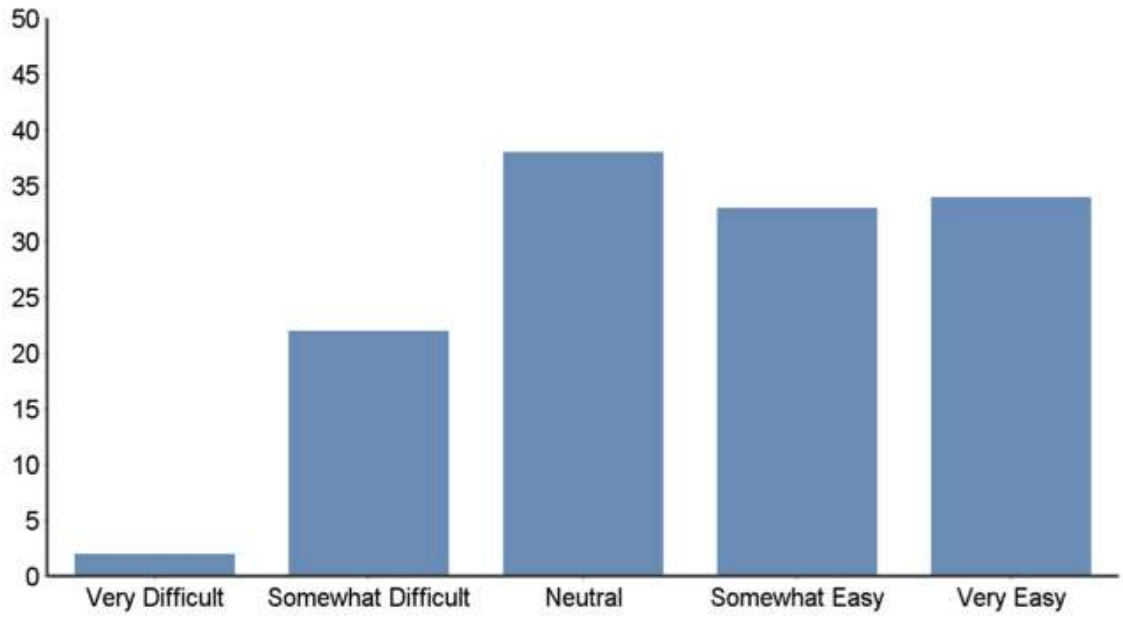
#	Answer	Bar	Response	%
1	Yes		26	20.00%
2	No		60	46.15%
3	No Preference		44	33.85%
	Total		130	100.00%

Do you prefer to stand or sit while using the podium?



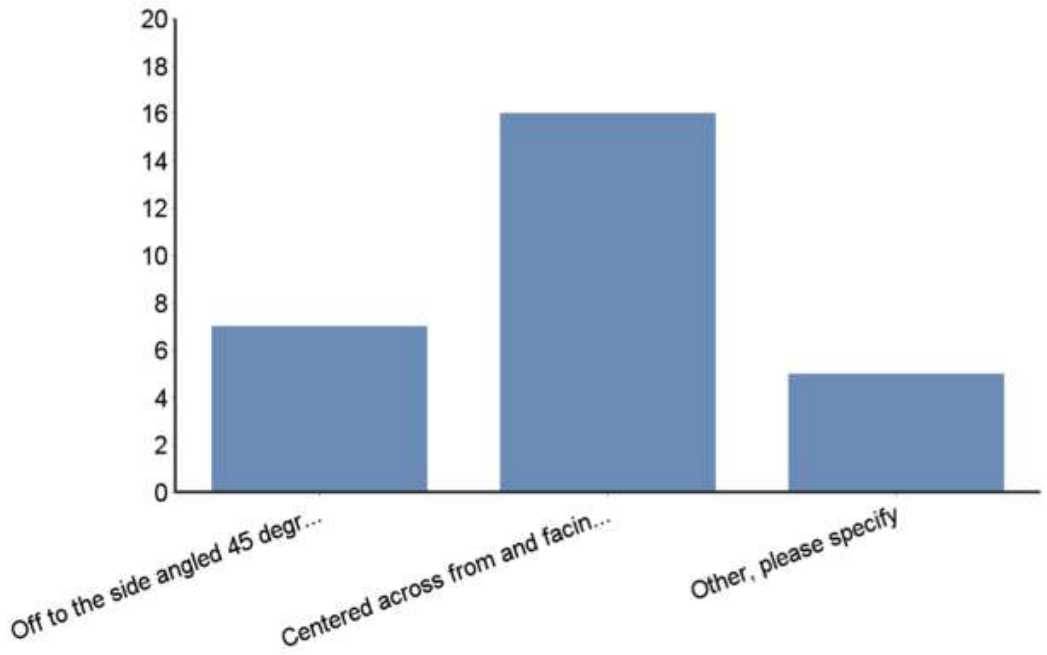
#	Answer	Bar	Response	%
1	I prefer to stand		118	92.91%
2	I prefer to sit		1	0.79%
3	I do both		8	6.30%
	Total		127	100.00%

Are the podium controls in ${q://QID36/ChoiceGroup/SelectedChoices} easy to understand and use?



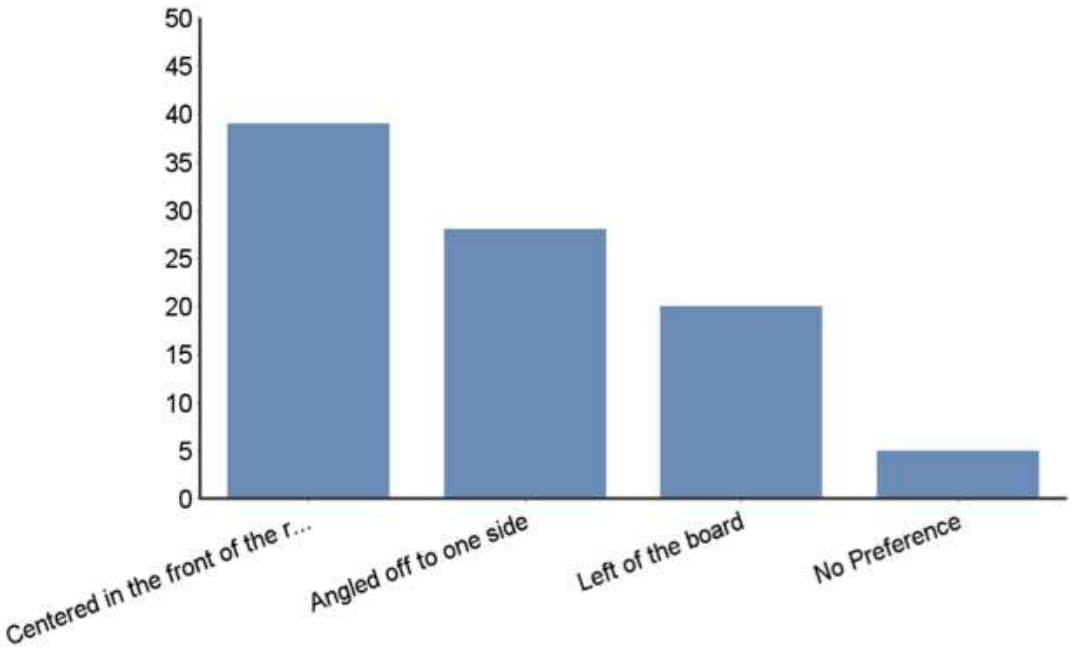
#	Answer	Bar	Response	%
1	Very Difficult		2	1.55%
2	Somewhat Difficult		22	17.05%
3	Neutral		38	29.46%
4	Somewhat Easy		33	25.58%
5	Very Easy		34	26.36%
	Total		129	100.00%

If the location of the fixed podium were to be moved where, in your opinion, where would be the ideal position of the podium?



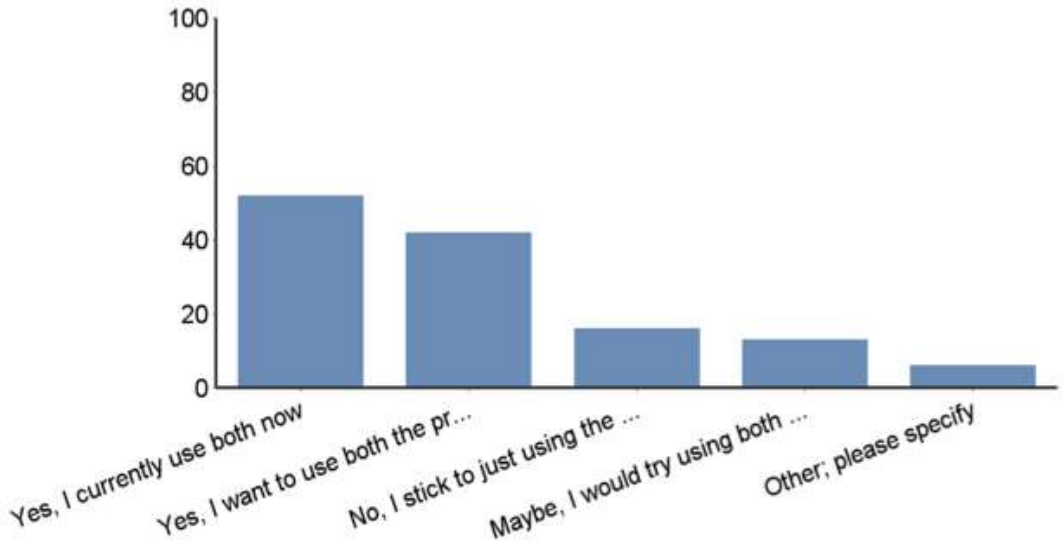
#	Answer	Bar	Response	%
2	Off to the side angled 45 degrees between projector screen and students' seats (left picture)		7	25.00%
3	Centered across from and facing the students' seats (right picture)		16	57.14%
4	Other, please specify		5	17.86%
	Total		28	100.00%

In classrooms with one projector screen, where should the screen be placed?



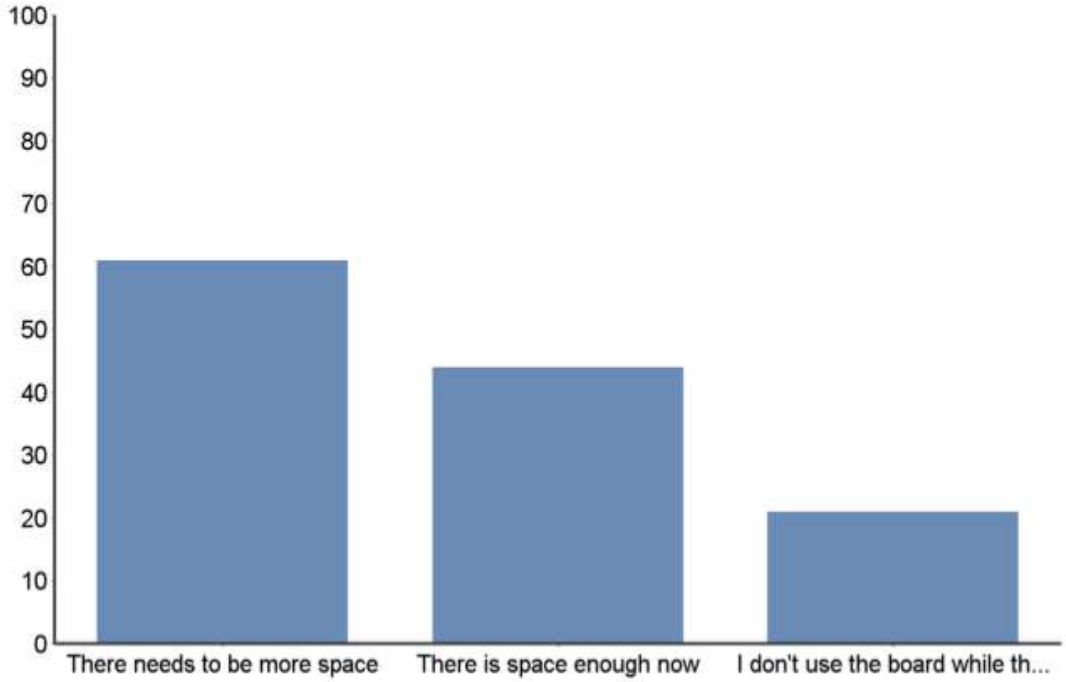
#	Answer	Bar	Response	%
1	Centered in the front of the room		39	42.39%
2	Angled off to one side		28	30.43%
3	Left of the board		20	21.74%
4	No Preference		5	5.43%
	Total		92	100.00%

Would you use a combination of both the projector screen and the white/black boards if their layout allowed you to use both at the same time?



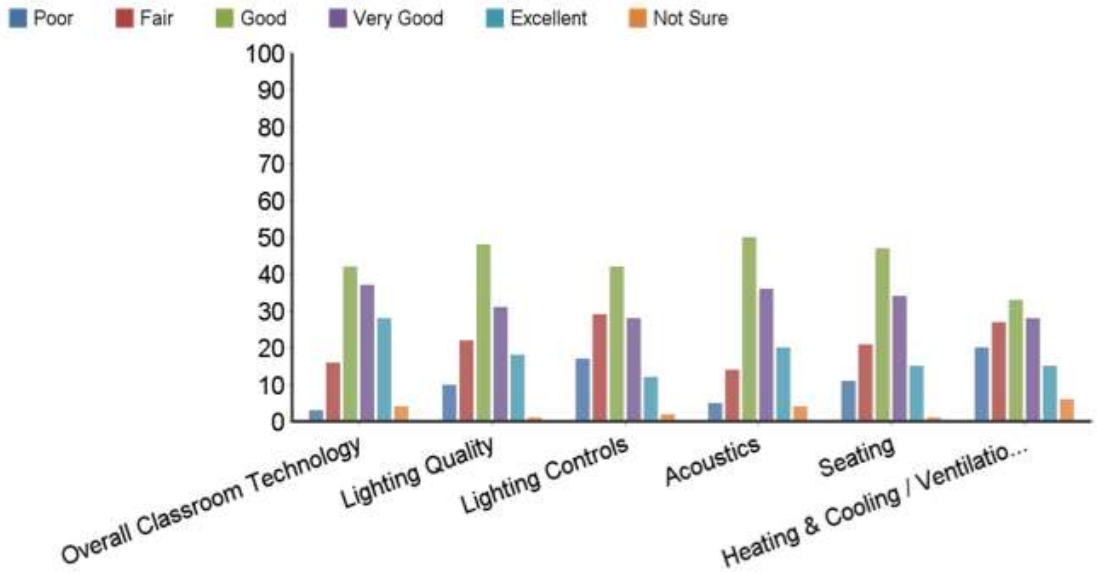
#	Answer	Bar	Response	%
1	Yes, I currently use both now		52	40.31%
2	Yes, I want to use both the projector screen and boards, but the projector screen covers the boards too much		42	32.56%
3	No, I stick to just using the boards or the projector		16	12.40%
4	Maybe, I would try using both if the layout made it easier to do so		13	10.08%
5	Other; please specify		6	4.65%
	Total		129	100.00%

Do you think there needs to be more usable board space with the projector screen down?



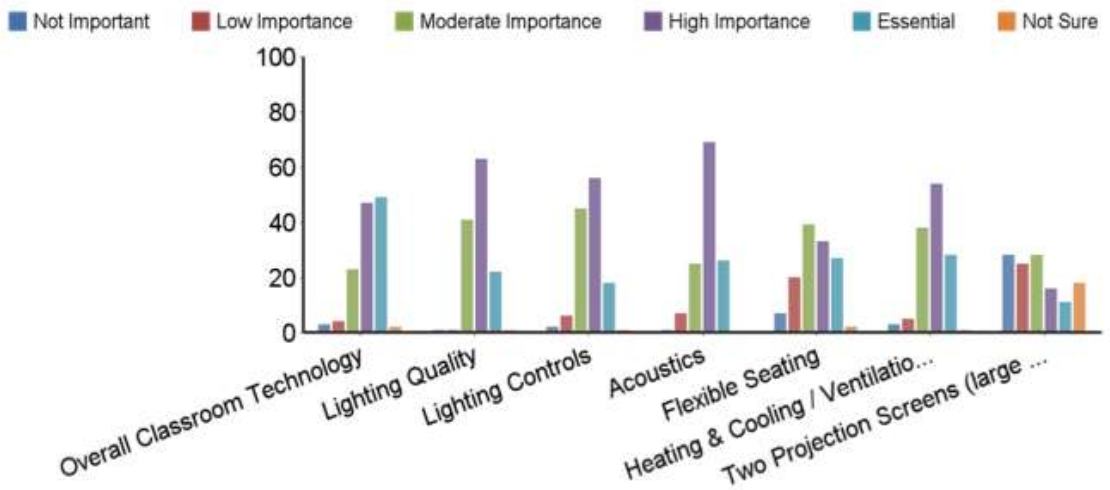
#	Answer	Bar	Response	%
1	There needs to be more space		61	48.41%
2	There is space enough now		44	34.92%
3	I don't use the board while the screen is down		21	16.67%
	Total		126	100.00%

How would you rate the following elements in ${q://QID36/ChoiceGroup/SelectedChoices}?



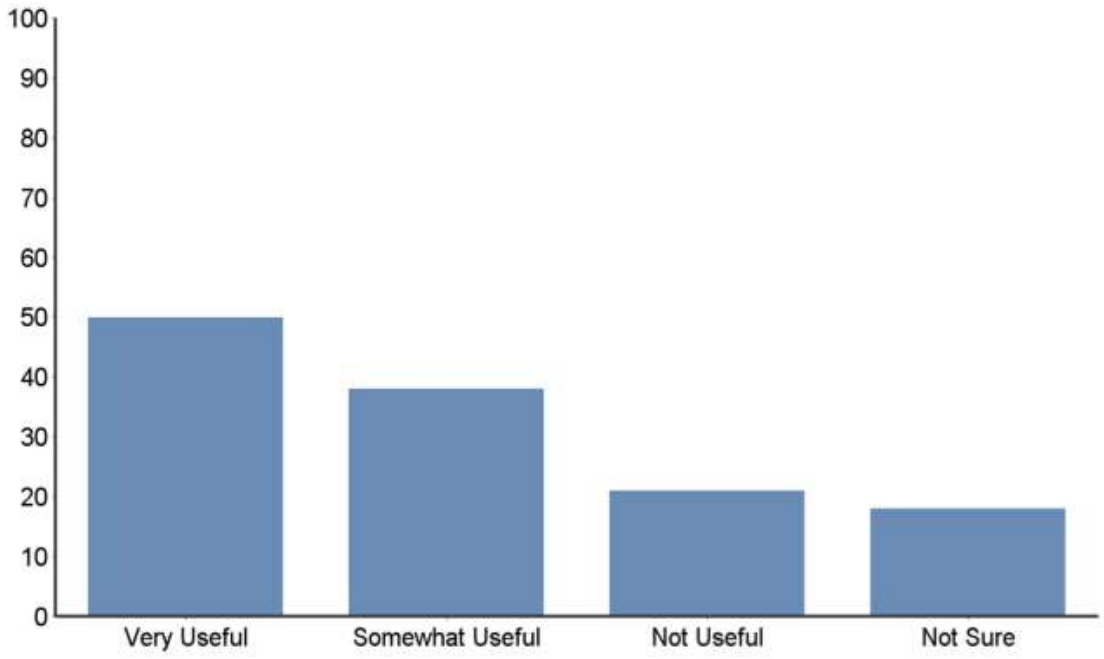
#	Question	Poor	Fair	Good	Very Good	Excellent	Not Sure	Response	Average Value
1	Overall Classroom Technology	3	16	42	37	28	4	130	3.64
2	Lighting Quality	10	22	48	31	18	1	130	3.22
3	Lighting Controls	17	29	42	28	12	2	130	2.96
4	Acoustics	5	14	50	36	20	4	129	3.50
5	Seating	11	21	47	34	15	1	129	3.19
6	Heating & Cooling / Ventilation	20	27	33	28	15	6	129	3.07

In general how important are the following classroom elements to your teaching?



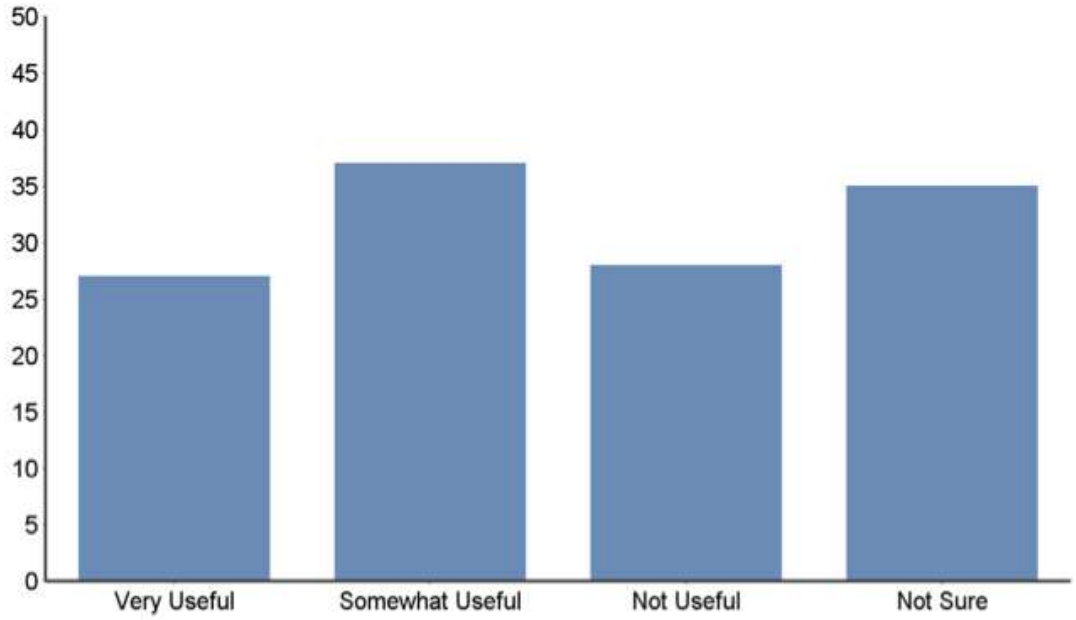
#	Question	Not Important	Low Importance	Moderate Importance	High Importance	Essential	Not Sure	Response	Average Value
1	Overall Classroom Technology	3	4	23	47	49	2	128	4.10
2	Lighting Quality	1	1	41	63	22	1	129	3.83
3	Lighting Controls	2	6	45	56	18	1	128	3.66
4	Acoustics	1	7	25	69	26	-	128	3.88
5	Flexible Seating	7	20	39	33	27	2	128	3.46
6	Heating & Cooling / Ventilation	3	5	38	54	28	1	129	3.79
7	Two Projection Screens (large rooms)	28	25	28	16	11	18	126	3.09

Do you think it would be useful to be able to control the content on the projector screen from a wireless device?



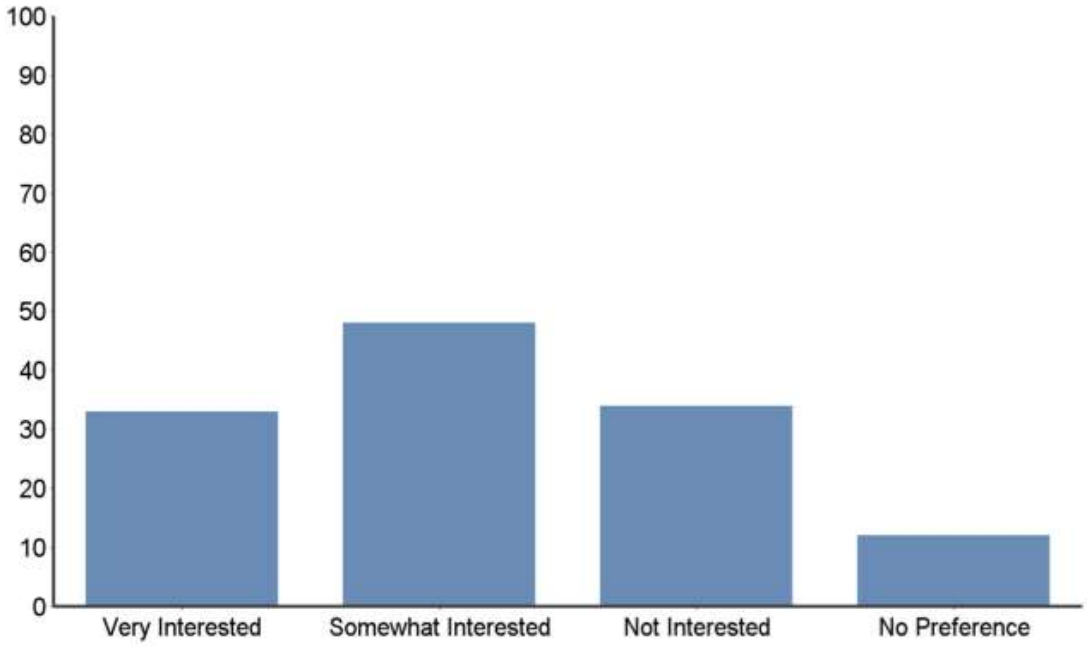
#	Answer	Bar	Response	%
1	Very Useful		50	39.37%
2	Somewhat Useful		38	29.92%
3	Not Useful		21	16.54%
4	Not Sure		18	14.17%
	Total		127	100.00%

Do you think students being able to share the content of their screen with you and with the classroom projector would be useful?



#	Answer	Bar	Response	%
1	Very Useful		27	21.26%
2	Somewhat Useful		37	29.13%
3	Not Useful		28	22.05%
4	Not Sure		35	27.56%
	Total		127	100.00%

How interested would you be in having this type of classroom at WPI?



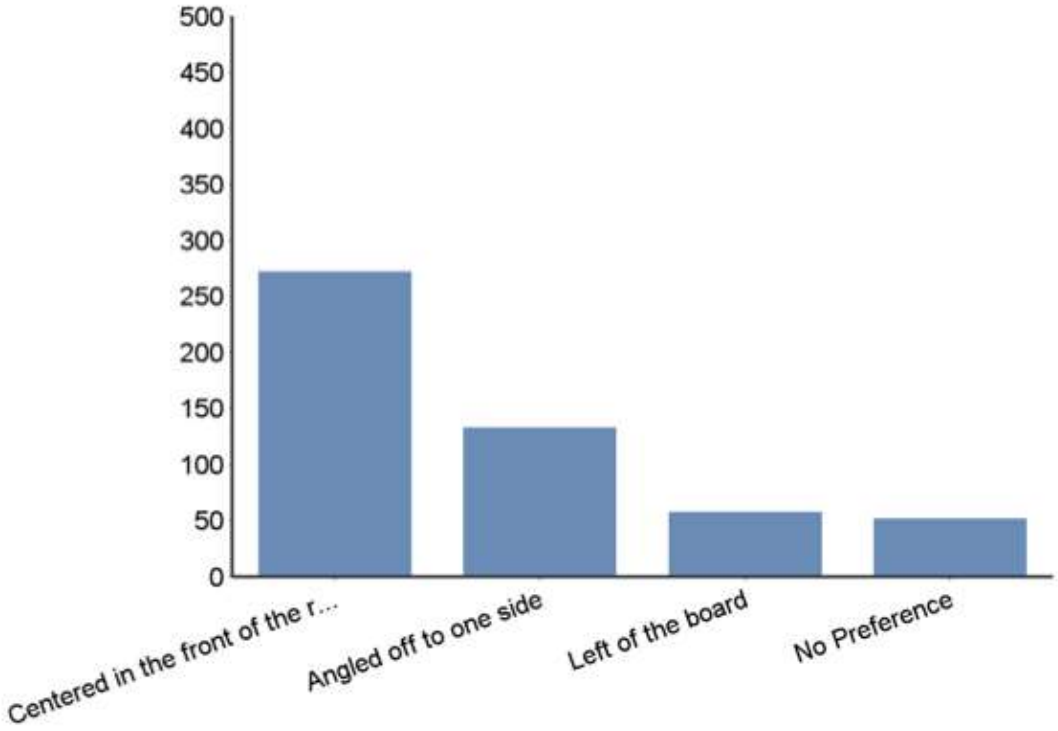
#	Answer	Bar	Response	%
1	Very Interested		33	25.98%
2	Somewhat Interested		48	37.80%
3	Not Interested		34	26.77%
4	No Preference		12	9.45%
	Total		127	100.00%

Responses by Room:

Value	Total
SL 406	9
SL 104	8
KH 116	7
AK 233	6
FL 320	6
AK 116	6
WB 229	6
SL 105	6
SL 305	6
HL 218	6
FL PH-LWR	5
FL PH-UPR	5
SL 402	5
OH 107	5
OH 223	4
HL 116	4
GH 227	4
SL 407	4
SL 115	3
SH 202	3
SL 411	3
HL 202	2
HL 154	2
KH 115	2
HL 114	2
SH 308	2
GH 012	2
AK 219	2
SL 011	2
FL 222	2
GH 212	1
OH 126	1
AK 232	1
SL 124	1
SH 309	1
SH 306	1
FL 311	1
SH 203	1

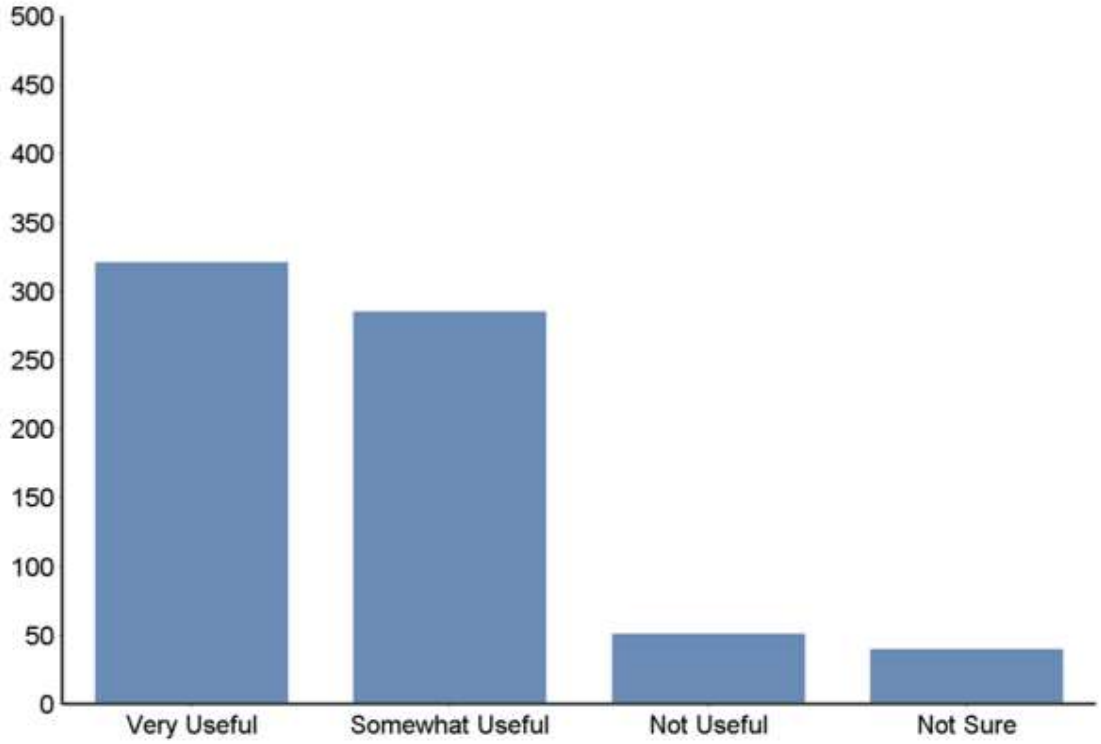
Appendix I: Student Survey Responses

In classrooms with one projector screen, where should the screen be placed?



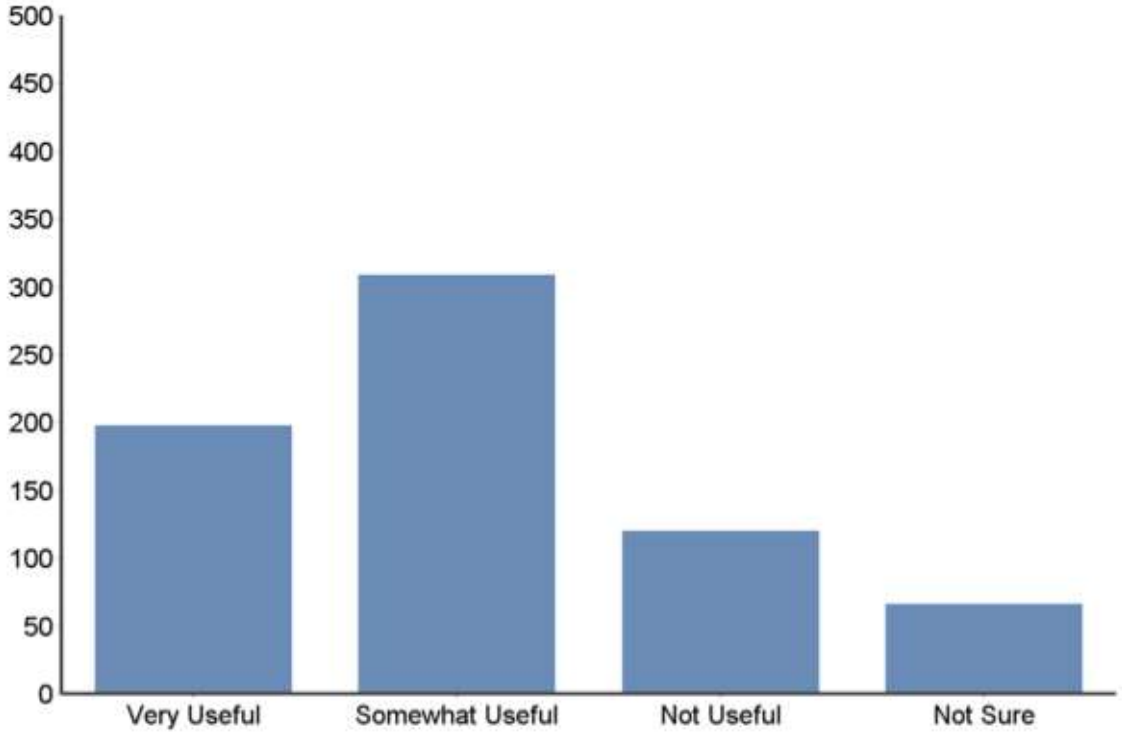
#	Answer	Bar	Response	%
1	Centered in the front of the room		272	52.82%
2	Angled off to one side		133	25.83%
3	Left of the board		58	11.26%
4	No Preference		52	10.10%
	Total		515	100.00%

Would screen sharing software that mirrors the projector screen on to your device (laptop or tablet) be useful?



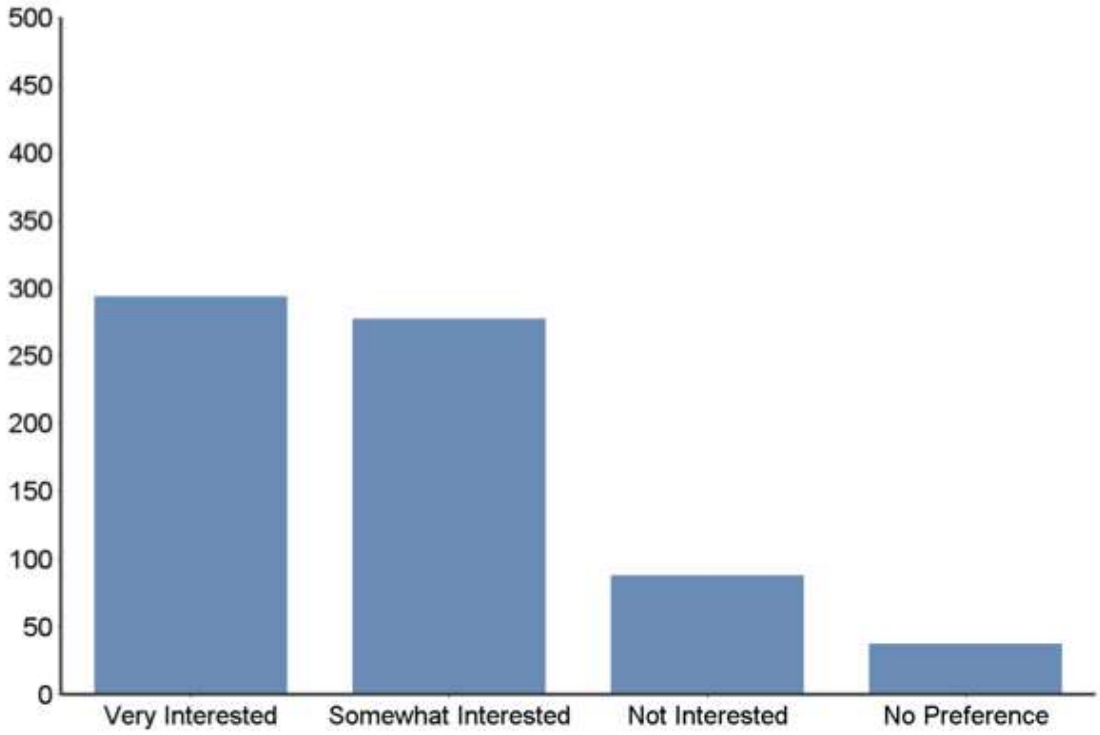
#	Answer	Bar	Response	%
1	Very Useful		321	46.05%
2	Somewhat Useful		285	40.89%
3	Not Useful		51	7.32%
4	Not Sure		40	5.74%
	Total		697	100.00%

Do you think being able to share the content of your computer screen with the professor and/or with the classroom projector would be useful?



#	Answer	Bar	Response	%
1	Very Useful		198	28.57%
2	Somewhat Useful		309	44.59%
3	Not Useful		120	17.32%
4	Not Sure		66	9.52%
	Total		693	100.00%

How interested would you be in having this type of classroom at WPI?

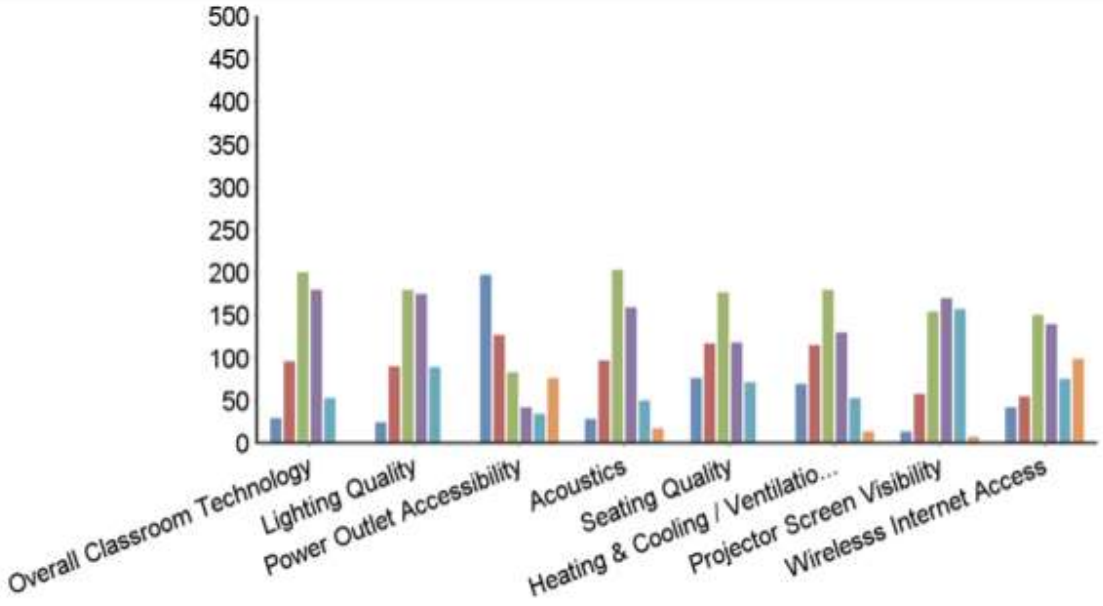


#	Answer	Bar	Response	%
1	Very Interested		294	42.24%
2	Somewhat Interested		277	39.80%
3	Not Interested		88	12.64%
4	No Preference		37	5.32%
	Total		696	100.00%

Now we would like your feedback about a specific classroom.
Please choose a classroom that you are familiar with:

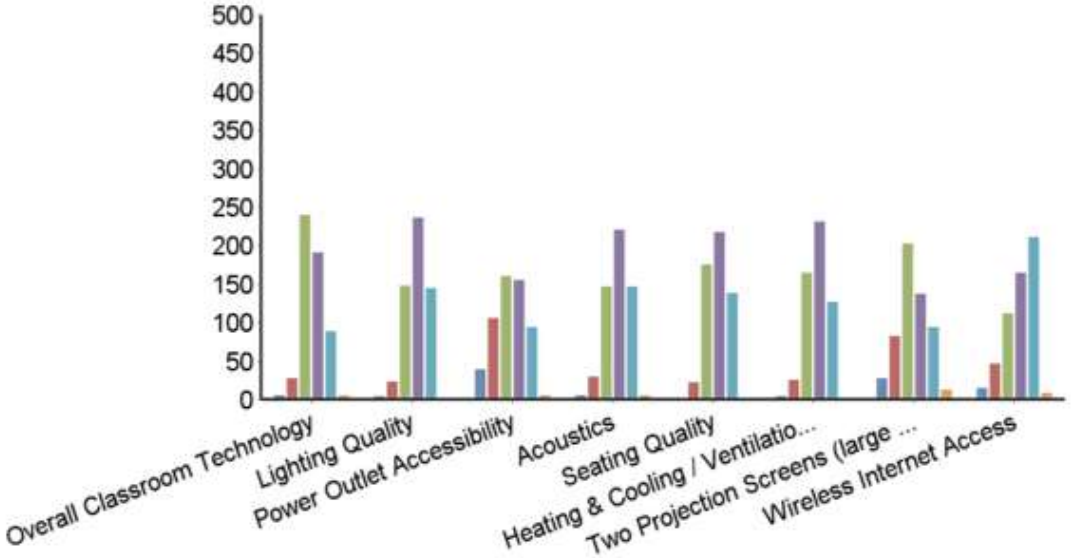
#	Answer	Bar	Response	%
3	AK 116		102	18.38%
4	AK 219		30	5.41%
5	AK 232		8	1.44%
6	AK 233		14	2.52%
8	FL 222		9	1.62%
9	FL 311		3	0.54%
10	FL 320		15	2.70%
11	FL PH-LWR		23	4.14%
12	FL PH-UPR		52	9.37%
13	GH 012		2	0.36%
14	GH 205		1	0.18%
17	GH 227		12	2.16%
22	HL 114		2	0.36%
23	HL 116		26	4.68%
24	HL 154		1	0.18%
25	HL 202		1	0.18%
26	HL 218		21	3.78%
27	HL 230		7	1.26%
28	HL 234		2	0.36%
29	KH 115		1	0.18%
30	KH 116		20	3.60%
31	KH 204		2	0.36%
32	OH 107		32	5.77%
33	OH 109		5	0.90%
35	OH 117		3	0.54%
36	OH 126		3	0.54%
40	OH 223		5	0.90%
41	SH 106		2	0.36%
42	SH 202		7	1.26%
43	SH 203		4	0.72%
45	SH 306		2	0.36%
46	SH 308		3	0.54%
47	SH 309		1	0.18%
48	SL 011		1	0.18%
49	SL 104		10	1.80%
50	SL 105		5	0.90%
51	SL 115		44	7.93%
53	SL 305		7	1.26%
54	SL 402		13	2.34%
55	SL 406		6	1.08%
56	SL 407		3	0.54%
57	SL 411		7	1.26%
59	WB 229		25	4.50%
60	WB 323		4	0.72%
61	Other		9	1.62%
	Total		555	100.00%

How would you rate the following elements in this classroom?



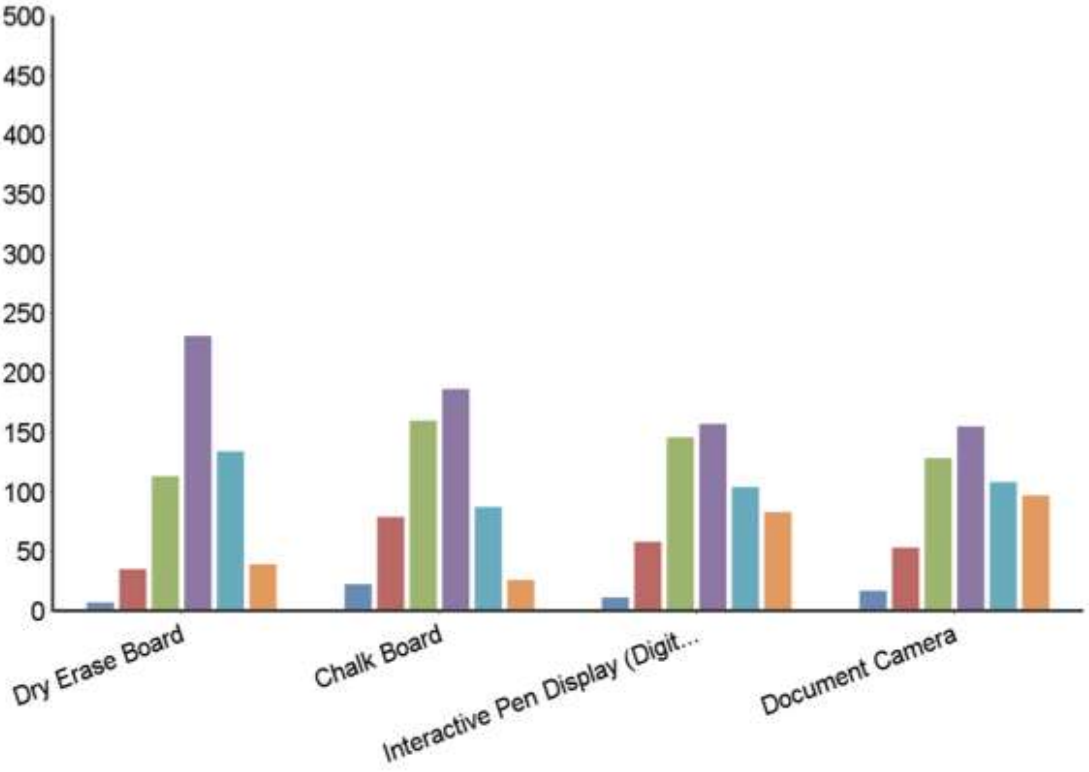
#	Question	Poor	Fair	Good	Very Good	Excellent	Not Sure	Response	Average Value
1	Overall Classroom Technology	29	96	200	180	53	1	559	3.24
2	Lighting Quality	24	90	180	175	89	1	559	3.39
3	Power Outlet Accessibility	197	127	83	42	34	76	559	2.67
4	Acoustics	28	97	203	159	50	18	555	3.29
5	Seating Quality	76	117	177	118	71	2	561	2.99
6	Heating & Cooling / Ventilation	69	115	180	130	53	14	561	3.04
7	Projector Screen Visibility	14	58	154	170	157	8	561	3.75
8	Wirelesss Internet Access	42	55	150	140	75	99	561	3.80

In general how important are the following classroom elements to your learning experience?



#	Question	Not Important	Low Importance	Moderate Importance	High Importance	Essential	Not Sure	Response	Average Value
1	Overall Classroom Technology	5	27	239	191	89	5	556	3.62
2	Lighting Quality	4	23	148	236	145	1	557	3.89
3	Power Outlet Accessibility	39	105	160	155	94	5	558	3.31
4	Acoustics	5	30	147	220	147	5	554	3.88
5	Seating Quality	2	22	175	217	138	2	556	3.85
6	Heating & Cooling / Ventilation	4	25	165	231	127	2	554	3.83
7	Two Projection Screens (large rooms)	27	82	203	137	94	13	556	3.41
8	Wireless Internet Access	15	46	112	165	211	8	557	3.96

How easy is it to take notes when the professor uses the



#	Question	Very Difficult	Difficult	Neutral	Easy	Very Easy	Not Sure/No Preference	Response	Average Value
1	Dry Erase Board	7	35	113	231	134	39	559	4.01
2	Chalk Board	22	79	160	186	87	26	560	3.56
3	Interactive Pen Display (Digital Pen)	11	58	146	157	104	83	559	3.96
4	Document Camera	17	53	128	155	108	97	558	4.03

Appendix J: Text Responses – Faculty & Student Surveys

Faculty: What items would you like to place on the podium while you teach?

Lecture notes
lecture notes
Notes
My laptop computer and mouse. Sometimes a paper notebook
My textbook, my notes, my laptop, and a bottle of water (for my voice).
Cell phone A clock
Notes without interfering with the mouse.
notes, my laptop
Teaching notes.
In relation to podium design. The class I taught last term was a design class. As you may be aware a design class requires a lot of interaction with students and furthermore to display/solve a problem using a step-by-step approach. I found the white board to be much more effective in this direction. I tried the pen but unfortunately it was not synchronized/calibrated well and was very difficult to write, especially when placing lots of equations. When I used the podium while running a power point of trying to write on the screen I placed my notes and/or the text book.
Usually I use the podium computer. When I use my own laptop, I use the pull-out drawer in the podium and the AC outlet on the podium. The only thing I sometimes put on top of the podium is a drink. Of course, SL104 has a table. So if I need to sit, either because I am tired or while I am proctoring an exam, there is a place to sit and use my laptop.
-- a large folder of lecture notes. -- handouts or exams (Note: the answers below are for SL 105 only, where the podium is fixed)
Laptop, notes, lab development board
I need to place my laptop, my wireless mouse, my clicker, a note pad, my water bottle, and other papers for class on the podium. The podium in SL105 is okay size-wise, sometimes I don't have space for the extra class materials I need (I always have things with me for demonstrations and sometimes handouts). In other rooms with smaller podiums (like SL 305 or SL 411) I use the table for these materials.
no more -- I like to interact with the students and don't want more stuff to manage.
Place for white board markers
I often spread out notes, books, student papers, etc. across the front row table. Actually I'd rather stand there instead of behind the podium. Then I move behind the podium to use the computer, internet... and I move to use the board. I also move around the room. I also sit in one or another empty chair here and there.
I don't see a need for a podium - since most of our classes are project based - I fear that a podium would encourage lecturing and faculty "hiding" behind the podium rather than lead a discussion or work students through a project. If anything, getting rid of a podium and having a true project class would be welcome. Students come to WPI for a project-based curriculum not lectures, they can get lectures anywhere.

I rarely put anything on the podium. I put notes on a table near the podium, and I walk around the room a lot. I try NOT to lecture a lot.
The podium is already large, and I move it around, as other faculty do. While the space on top is large, there are many things on the top of the podium. For this reason, the podium space is almost useless now. It is not a crisis, it is just a fact. If I have things to demo, I use a table in the center of the lecture area. But sometimes I have things that that I would show and use if the camera were working, if I knew how to use it, and if there were space.
My lecture notes, and maybe my textbook.
My notes.
Perhaps an independent screen to view the class rosteri and student pictures or I could use this screen to search for items outside of my powerpoint materials.
My notes.
Cannot think of anything right now.
Laptop, projector cable, sound hookup, power supply
The current design does not provide sufficient space for the instructor to use it for class materials etc.
notes
Laptop, lecture notes and possibly demo props for my class.
Sometimes, a textbook and some notes.
none
Laptop
There is no place to put my laptop and I cannot move the monitor and keyboard.
Laptop
My clas s no tes I plan to co ver in lecture.
My notes, pad for use with doc camera, book or other sources for use with doc camera, pen(s) for writing under doc camera, ...
My 3-ring binder. Currently it hits the keyboard.
My laptop and my notebook with class notes.
My paper notes (sized big enough for 2-3 piles!) My laptop My water bottle Space for whiteboard markers
Something to drink! Any design would need to not have drinks sliding off during class.
ideally only a touch screen monitor. it's currently very cluttered with keyboard, mouse, etc.
notes, laptop, demonstration equipment
notebook PC
books and notes
I use and old fashioned standing podium available in the room in whihc I place my written notes and it works very well for me. The only porblem is that other instructors keep moving it away from the position I need it and I have to put it back in place for my lecture
laptop, notes, handouts
laptop, mouse, coffee cup
it's fine EXCEPT, the screen and the keyboard are right at the edge

The podium is typically in the way and I roll it to the side before I teach. I use the tables at the front of the room to lay out my notes at the beginning of class and some times sit on it... So a low podium that does not block the black board and a camera focused on the board or a smart white board would help...
Notes and handouts, viewgraphs.
Laptop, when I use it. Occationally some notes for use when using the computer.
My iPad, the text or article under discussion, a hard copy of the class list, other notes
Lecture notes, pens and tech props (microphone etc). Also my keys and personal items.
the podium is already big. making it bigger has negative aspects as well
notes on a stand. laser pointer
I would like to place my notes and a bottle with water.
I try not to use the podium that much, but to walk around. I've flipped my course and so spend more time in-class working with groups of students on scenarios. A redesign might be better for guest speakers who would prefer to use their laptops for presentations.
Glass of water, Notes
I never use thew podium except for IT access, which is fine.
Textbook, chalk, jacket
I use the in-room PC and occasionally my laptop. Both fit on the podium as-is. I do NOT like all the chalk dust that gets on the podium from placing chalk there, though. I have found no need for a portable ppodium
notes, glasses, watch, water, pen
I would also like a lecturn component
My notes and an area to write; a laptop sometimes;
The overall size of the podium is probably ok, but the placement of the monitor is too close to the front edge and does not leave enough room to rest one's hands when using the keyboard. I prefer to have the keyboard in front of the monitor, not to the side. The current podium is heavy, but once in place, I don't usually move it. A sloped lectern style surface would obstruct visual contact with students in the class, so I would not use it.
Notes
book, notes and markes
Room for a laptop and an 8.5x11 pad, with a document camera ability. The doc camera under the side of the podium is poor.
I don't use the podium except to log into the computer and start the PowerPoint. After that, I use my personal clicker, and I tend to walk around the room, walk to the screen and point, etc. The one disadvantage of the clicker is that the Lecture Capture audience cannot see what I am pointing to. However, I feel that standing behind a podium is rude and does not engage the class. Therefore, I have to walk around.
Textbook, notes
My notes and folders.
laptop and notes
lecture notes
Nothing in particular, but I think the podium could stand to be wider or multi-tiered. Right now the keyboard gets in the way of successfully using the pen display

laptop, book, papers
My Notes, Laptop computer.
I do not use the podium. I push it out of the way.
My own laptop, as I may need to switch between the desktop and my own laptop. I may also place my notes binder on the podium.
I would put additional handouts, the attendance sheet, and any additional materials.
my books, pens, handouts, students' laptops there is usually very little space for those things in addition to the keyboard and mouse
All the gadgets and control on the podium, where I can stand in one place to work with every gadget. Right now, the overhead projector/projection camera is so inconvenient to use if I want to write on the paper or transparency.
Laptop computer and stacks of papers (quizzes to be handed out and those to be graded)
Lecture notes Text book Maybe personal laptop
Huh?
More room for my own lecture notes
my notes. There is not enough room for my laptop and notes with the monitor there.
Papers and notes
Pens, my own notes, a water bottle
My notes folder, textbook, my tablet, a coffee mug.
Textbook, papers.
I have to sit while using the document camera, but I would prefer to stand.
Textbook, lecture notes, microphone case, hardware examples.
lecture notes - but having a table next to the pdioum is OK too. In fact having the table next to the document camera is actually easier.
I'd like room for my lecture notes, but with the projector AND the computer, there's not much room.
First, the actual gadgets on the podium block the view of the students. I am pleased with what we have now. I would appreciate if some competent folks will do every term some maintenance work.
My lecture notes. I move around the class a lot though, so I don't stay at the podium. I also use the table that's at the front of the room to keep additional papers (handouts, attendance sheet, textbook, etc.).
Document camera, space for paper, space for notes.
Remove the podium completely. It blocks the view of the lower half of the central board to the front half of the audience in the room

Faculty: Comments about the podium controls.

Ok
Once you've used them a couple of times they are straightforward. Using new functions requires a little thought

Do not always respond well to your touch.
The podium controls are not easy to understand. My graduate assistants, my students, and I have wasted precious classroom time trying to Figure out what the buttons control. Plus the podium is dusty (that is a polite way of putting it). The podium needs to be cleaned.
Note: there is no podium in SL124. I've answered the questions as if there were, based on the usual design.
I use the equipment in every class, thereofre I am very familiar with the current equipment controls
fine
They are an adventure in every classroom as there is no reason to believe they are the same as one you know how to use. I like adventure but not when there is a time limit...
it is hard to see the controls. the computer is extremely slow, has only IE, I need Chrome for some of the website i am using in class.
The problem is when students are presenting and they hit OFF instead of MUTE, then we have to wait for the projector to reboot.
The different types of lighting are not clear, I never seem to get it absolutely right. The lights to use for doc cam, laptop and other purposes and not easy to make out and take experimentation on the part of the user.
Once I figured out the controls, they are east to use. The only problem is adjusting to the controls being different in different rooms. It is very nice that I can raise and lower the shades remotely; when the sun is bright the screen is hard to see with the shades open. However, I wish the room lighting had a greater range of values. In particular, if the blackboard lights are off so you can see the screen, the rest of the room is a little dark. This is actually a room problem, not a podium problem.
The most difficult control is the overhead projector one. I think it is just finiky and takes a while responding.
A couple of controls are easy to mix up, causing more button pushes than needed.
Pretty easy to sue but I'[m not sure how to get different sections/chapters in a DVD so i never tried. Classrooms with remotes make this fairly easy.
Unreliable. I often find one feature or another not working. The ones breaking most often, and also having the greatest impact are the overhead projectors.
The combination of touch screen buttons and side buttons sometimes makes me forget where certain options are, but it's quick trial and error to find them.
They are fine.
The more confusing controls are the ones for the window shades and lights
playing a DVD is often impossible to Figure out
They take getting used to. Everyone seems to puzzle over them - other professors and students who might want to show something.
again, put them on the wall and get rid of it.
I don't use that many features on the podium, so for my purposes, things are easy to use.
I wish I had some instruction in the operation of the podium controls and the camera
the volume seems to have problems

Confusion about what is controlled form the controls on top of it versus underneath...
sometimes hard to wake it up
Slow turn-around time once you select an option.
See my comments above. I don't stand at the podium AT ALL except to open a new file or start a new slide show.
The room lighting controls are non-intuitive and frankly wrong. There should not be 3 individual volume controls for audio.
The first time I used that classroom and podium, I had to guess what the switches are for but the information sheet attached to the podium recently has been somewhat helpful.
I often have the students help me.
Responds a little slow
Sometimes when I showed video material we didn't have sound and it wasn't evident how to access the sound. It took about 5 minutes before we figured out what to do.
Could be broken equipment causing difficulties. One of the projectors did not work as well as the sound input.
The special pen for the display only exists at the podium so I don't have the chance to really learn how to use it. I don't think it would be useful. My laser pointer works fine.
none
I have never had a problem with the podium controls.
I don't use the podium.
They are good to use but could be more intuitive. I go between my powerpoint and the blackboard. The lighting becomes an issue and I have to search for the buttons on the podium to rechange it.
Sometimes I have to use the controls both on the bottom and on top of the podium
There are controls on top and below. Just put them in one place. They are not intuitive, either.
No ability to control the volume of microphone.
I think it takes a lot of practice to get to a relaxed point with the podium. I originally used pre-written notes - but at some point just felt comfortable enough to use it and haven't looked back since. I was thinking too much on how to use the software during class when I first used the podium; but now I am extremely relaxed. I hate using a marketboard/chalkboard now and prefer the podium greatly.
The doc camera controls are difficult if someone has changed settings.
Control to mute the projector is often broken, requiring me to turn it off to use the blackboard.
I am OK with them
Not friendly enough.
I frequently can't get the projector to connect to the overhead document scanner.
Training is probably more important than design. I've accidentally done clever things with the electronic pen, but have no idea how to replicate that behavior.
i like the video mute feature that allows me to easily put the lcd projector on sleep mode.
If this could be done wirelessly without a podium to start (e.g.chromecast) this would be ideal.

Faculty: If the podium were to be redesigned, what aspects should be changed?

Ease of altering pc screen angle .
The podium computer screen display should be much higher resolution.so I can display my circuit simulation software appropriately. Presently only part of the circuits I use daily can be displayed and used for live simulations in class. I use National Instruments Multisim. Also the software should be installed on that PC. Presently I need to remote desktop to an ECE server to use it and the communication between the PC and server adds delay and effects appropriate operation of the software.
More space for laptop computer and mouse.
The top is to be enlarged by double the space. The screen needs to be matte (not shiny) so the glare is reduced. The controls need to be clearly labeled (NOT a text book or a confusing laminated sheet with instructions written by a geek). The height has to be one that I can comfortably sit it or stand at. The current height is off a bit. The keyboard does not need to be huge since I do not create documents when I stand at the podium. The podium needs to be moved so students can comfortably walk in front and behind the podium. I have 60+ students in a class so it gets crowded when they leave the room. The podium needs to be lighter so I can move it. (Really, do I need all the stuff in the podium right now?)
I do not need the podium to be redesigned, but if you do i would like to get the features that I currently use from the portable, old fashioned, podium vailable at KH 116. By the way this podium is not available in other rooms like KH 115 or KH 202 or KH 203. On those classrooms I use the instructor's table or desk
This is assuming that the podium is the problem. The class layout is the problem. The black board is on a different wall than the projector. There are too many seats in the room, so we cannot move around and access the teaching tools
faster computer. provide better lighting in the cabinet
just keep them mobile so it won't block the black, white boards. Add smart white / blackboards
keyboard not at the very edge
Bigger workspace
There is no document projector in this room and I would have likes one.
Lower and wider, with more efficiency space for the computer keyboard
More space for my notes. Ability to position the screen display so I can see over it; I'm 5'3" and when I'm using the computer, the screen is always blocking part of the classroom.
The large size of the podium seems to separate the instructor from the students. So, a smaller overall profile would be desired, to make it easier to go to the other side and contact the students. Also, would prefer if the chalk and erasers were NOT stored on the podium. They take up space and make a mess.
Have a larger flat area to place one's materials.

the desktop space. it can be extended using, for example, an hinged extension to increase the space when needed. make it lighter and easy to maneuver. on carpeted floors the wheels get stuck sometimes. I am not sure if there is any at the moment, but a USB port on the monitor would be nice..
I like being able to stand and easily move, but would then like to be able to sit also. The height is good for standing; the room just needs a podium stool for sitting as chairs don't work. I would also like it to be slightly easier to move, and with a slightly larger top.
A minor point -- greater commonality between rooms. The height of the podium is right for standing, but not for sitting. There should be a high stool in every room, as there are in Perreault.
Easy to move out of the way. Clicker, so you don't have to bring your own and guest speakers and students could use it.
None
-- better control of cables for video slide projector and the mouse/keyboard. They're both too tight. -- computer higher up
No preference
Install a better document camera. The recently introduced doc cam is far worse than the old one it replaced. I need a doc cam where I can easily write on the sheet of paper (in portrait orientation) that I am projecting. It should also come pre-calibrated for the correct brightness and contrast, if possible. The adjustment requirements of the new doc cam are a minus. I need its camera stand and lights to just snap into place, not be infinitely adjustable. If any adjustments are necessary, the controls must be easily idenitfieble, and not easy to mis-adjust by accident. The current camera fails on all counts. It would also help if the doc cam was situated at about the same height as the podium. Leaning down to the doc cam is inconvenient, and detremental to student-lecturer interaction. Also, provide better controls for the lecture hall lighting. The current system of several preset "themes" is inconventient. If I want to turn on/off the lights above the podium, for example, I should be able to do so with a single command.
Figure out how to keep chalk off the podium - maybe install whiteboards?
It is large and clunky and I feel stuck behind it.
I'd like to see a time indicator or watch built in.
none
turn the room into a true project room and don't encourage lecturing
I could use a fold-up or fold-down side table or "tray" where I could run an experiment and show it to students with the doc cam
I don't have any strong opinion on this as I am not very reliant on the podium.
I would most like to see a space with a sloped lecturn
see above
The podium should have a part with leg room. We need to be able to pull a high chair or stool so we can sit while using it. There is no leg room currently so the only choice is to stand while using the camera document. Also larger surface is a must. When we use the camera currently the only place where you can put your notes is to balance them somehow on top of the keyboard

quick to start
More open space on top.
Only slightly lower, but still comfortable to stand and deliver a lecture. A larger flat space so that both a laptop, water bottle, pad are secure and not conflicting with one another. better access below - to connect additional usb, or to reboot computer. a light underneath would help. as one tries to turn on/off one of the devices stored under it, it is difficult to see clearly. Virtually need a flashlight.
I would prefer to teach into a circle. So, I'd like the classroom setup to be in groups, or a circle rather than the current row format.
Get it out of the way. As it is, I push it as far into the corner of the room as I can. Also, get rid of the table at the front of the room. I need to be able to move around.
Desk top area as noted above
The computer screen itself would be flush to the angled top--as it is now, it is awkward (too vertical) to write on and basically blocks the chalkboard view (too tall) for a half dozen seats.
Users' manual. Podiums differ from classroom to classroom. It's very confusing.
Longer surface area for my notes and folders.
Slightly larger top
As mentioned before, I would like to see there be sepereate tier or level for the keyboard to allow for less obstructive use of the Cintiq
I once found water on the podium -- even under the keyboard. It might be a good idea to have a safe place to put a cup, glass or bottle of water so that doesn't happen. I can't be good for the equipment.
More room in front of the keyboard.
none
intuitive light and sound control
Remote control for changing ppts so that I can sit if I would like Addition of doc cam
Only one set of controls. Make it as simple/user friendly as possible.
All the gadgets and controls on TOP of the podium Ability to move the computer to make the use of podium convenient for the operator. Portable microphone.
Increased ease of movement would be good. I like everything the podium has to offer, but I like to move it towards the wall so that I have space to walk around. I do not like having something between myself and the students because it seems to make it harder to engage with students.
Like as is
The problem with the podium is that it blocks the door to the classroom and also blocks the view that some students have of the chalkboard. Since the board space at the front of the room is very small to begin with, one does not want to have to give up using a portion of it.
Does the monitor and keyboard have to be present at all times? can it be stored below if I dont want to use it? Ideal for me would be a lightweight podium with place for notes, pens, my bag (which now gets tossed on the floor), and a place to plug in my computer. Now I have to back up to the electrical outlet in order to charge. I always have to stand the

keyboard up and out of the way in order to use the surface. The controls are also annoyingly located. Can they just be on the side? near the top? the version of controls that are below are too low.
should be smaller so it doesn't block the blackboard
chance to adjust and secure the angle at which the monitor is oriented (if the height of the podium itself remains this low)
This particular podium is very difficult to move--it's heavy and the cords are a safety hazard.
More desktop space, wireless mouse and a more compact wireless keyboard.
Well, portability is very important because sometimes I use the whiteboard, and so I may need to move the podium around to make sure students see what I write.
If anything don't change the podium but have an optional table for use nearby it at a comparable height.
Permit lefties to use the mouse on the left side of the keyboard; adequate space for notes on either side of equipment; move screen, mouse, and keyboard out of the way when not using them. Might suffice to add fold down wings on either side of current podium. Now the top is a mess of tangled, too-short cords, rigidly attached screen, doc camera ready to fall off the right side, etc. Being able to move podium is essential. Bad enough to be trapped behind it. Worse if stuck in a corner, against the wall, etc.
document camera higher so I don't have to lean over when writing on it
25% wider would be nice. Alternatively, the ability to fold up or put away the keyboard would give more work space.
More open space uncluttered by keyboard and computer screen.
The choke dust will ruin the equipment.
The wires on the document scanner should be long enough so that I can actually put it up on the lectern.
N/A
I would like the size to be a little bigger
touch screen monitor (maybe a tablet? but larger)
Somewhat easier to move around. Instructors seem to vary a lot in where they want it.
Get rid of Sympodium. Stop buying cheap document cameras. The camera in AK 116 was defective for about a month, but the replacement is so dim that I am still using a portable document camera.
No obstruction of the chalkboard.

Faculty: If the podium were to be redesigned, what aspects should remain the same?

Control box is ok now
Controls
The color black seems to work. The screen size is okay (not great).

I'm not sure if this is the last page, so I'll put this comment here: it is weird that there are words in Hindi script appearing at the top of each page in this survey.
Capability to be tilted, and enough space to place and open a 3 ring binder and a pen
It would be nice if things were more uniform from one classroom to the next
everything else o.k
Height of the surface
I have finally figured out the control panel...don't change it :-)
General height
Everything else.
Range of functions is good. Also good to have the cables and outlets for a laptop.
--
fine as is
Keep the laptop video connection and AC outlet.
No preference
Size and location are fine.
I like the space to put things down near me. I also like that there isn't the awkward pullie design for the cord to plug into the pro jecto r. I like that it is all right there and no t awkward.
room (shades, lights, screens) controls, keep tech controls the same for a while so we don't always have to relearn a system
most
The podium as it now exists serves computer use only. You can crowd other materials onto it, but that's what your doing, crowding.
no comment
All these podiums and the projectors need to be FACULTY / STAFF USE ONLY. Off hours the students are holding meetings in there and using the projectors, they are holding social / fraternity-sorority-club meetings in there. The real students need the space to study. The faculty want the space reserved for its intended purpose. This should be general across the campus. The space for student meetings is in the student center (which was its intended purpose when the initial talks began on that building in the early 1990's).
height
see above
Don't change the ability of the computer display to be angled to suit the presenter.
the wiring harness is fairly well layed out. the control box options seem reasonable. the size of the monitor is good.
The controls
Keep the computer and the ability to show a PowerPoint presentation. If possible, make the project and the podium screen separate (as with a laptop) so that I can show a presentation on the screen but have the full PowerPoint tools at my disposal on the podium. Find some way that a remote clicker can control the cursor so that Lecture Capture students can see what I am pointing to. I used to have such a clicker, but the cursor was hard to control. This feature is not so important in FL320, because I am tall

enough to reach the screen. However, it is essential in Upper-FLAUD and Lower-FLAUD, where the screen is big. In Upper-FLAUD, I use a laser pointer to highlight something on the screen, but the Lecture Capture audience cannot see that.
location and overall height (NOT the deployed screen height!).
Height.
I'd like a more on/off rationale
weight for portability
Everything else is fine, in my opinion
none
I think new podiums would be a waste of money, they do the job and I've never had problems with any podium in any classroom I've taught in.
Having the controls on top or at least near the top of the podium
No changes
not much, haha
Height, portability.
I've gotten very used to the setup - it's very comfortable with size, height, and portability. I'd be disappointed if anything greatly changed.
Portability; see preceding.
Height and depth are fine as they are.
Lower a bit theupper deck.
Its portability. I stand at the podium for an extended amount of time, and when I'm not using the overhead projector for activities, I write all over the board. I need to be able to move the podium so it does not block my students' view of the board.
I appreciate that the monitor can be rotated backwards to accommodate additional space - so keep this the same
Don't mess with basic LCD functionality and display (and monitor for instructor). For programming classes, those are key as much work is done with programming during class.
portability is pretty good, though it does get a bit cumbersome with the wires coming from the base of the podium.
None.

Faculty: Additional comments about classroom elements.

I don't use the technology much, so my answers should be waited accordingly. Although, I would like to use them more in the future.
I use my own PC to record lectures as the lecture capture is too limiting for editing.
In FL-320, the front lights can be turned off so the screen can be seen, but then the students in the fronts of the rows cannot see their notes.
switching between blackboard and computer takes too much time
Due to shadows from above, the top 6 inches or so of the innermost chalk boards are basically unusable.

It is important that the seating arrangement allows for pair-work and group discussions.
Washburn 229 is a old fashion room. It does not allow students to easily work in groups. The room is not inviting. The color gray is not inviting, The blackboard should be a whiteboard. The carpet on the back wall should be replaced with art work. The students need more electrical outlets or a charging station.
I like a lot of class discussion. The static seating is a hindrance.
I wish two projection screens sometimes can show different contents simultaneously.
Stadium seating in FL PH LWR is very uncomfortable for the prof -- I'm always looking up
The only weakness in the room was the acoustics. It makes it difficult especially when there are more than 40 students in the class.
These queestions do not account for SL 11, which is an abnormal room.
What I trule need is the ability to use the white board while the screen is down. Switching between the two is such a hassle that I am forced to use one or the other at any one time.
I would like to use more than one screen if we can project different screens to compare and contrast various elements of websites, software, mobile apps, etc.
Your form is not very cell phone friendly... iteis hard to type and see the bottom questions on a page. I would be happy to be interviewed if you want...
I love being able to put lecture notes on a screen, since my handwriting is abysmal. I've been in classrooms which are horribly overheated and in which the windows are broken, that's a real drag for everyone.
I was just talking to my students about it would be nice if the projector was moved o the left (closer to the door) so that I have enough board space to write on
I should not be asked about a document camera when there is not one there.
The classrooms vary widely on blackboard/whiteboard space. SL104 has 3 boards and only 1 is covered by the projector screen. That works. SL406 is awful, though. It only has one whiteboard and one screen and the screen blocks 3/4 of the whiteboard when down. I need both blackboard/whiteboard space AND the computer screen.
Two screens for additional(previous) material will begreat
I find the projector to the side of the room set-up in GH012 extremely awkward for students to follow along during lecture and projected demonstrations; and it is totally impossible for the 6 stations that face the side wall. Would love to see a setup that would allow 24 if not all 30 stations face the screen in front.
SL104 does not have a document camera currently. I do not need one often, but it is nice to have the option. For example, in AK116 I often draw diagrams with colored pencils, which are easier to draw and see with the document camera as compared to the board.
The screen should be on the side of the room because the power point light shines in the professor's eyes. This means that the professor must go to the corners of the room to talk. Also, it is important that the lighting is dark enough for the screen to be visible, but light enough so that students can see the professor and talk. Special lighting that enabled this would be most helpful.
THE BIGGEST PROBLEM IS THIS ROOM IS THAT THERE ARE NEVER MARKERS FOR THE WHITE BOARD. HOW SIMPLE A TECHNOLOGICAL FIX CAN YOU GET!!!! THUS I ALWAYS BRING MY OWN AND TAKE IT WITH ME.

The room has been quite cold on one or two days, but this is not a consistent problem. I am not aware of if/how to control.
The issue I'm facing is that not all the projectors work the same with all laptops. In SL 105, I can only use the Left Screen because my laptop does not sync with the Right projector. I can't teach in SL 411 because my laptop only intermittently syncs with the projector. Yet, in other rooms, I have no problems. I do like that if the volume is up load in SL 105, it does not make a loud buzzing noise, like in other rooms (SL 407, SL105).
Lighting is poor for working on the white board. Students in the back complain if certain colors are used.
Need to be able to control temperature and ventillation without having to open doors and windows. Current lack of ability to do so is a disgrace to a technological university.
please fix the windows so they stay open more easily
Acoustics are difficult - you have to work at projecting your voice, which students don't necessarily expect to do, and which can hinder discussion. Standing in the front center, I can't always hear what a student is saying.
again, I'm surprised and disappointed that this IQP is so focused on lecturing as the only way to teach. Really?
Check out SL 105 with regard to the arrangements of the projection screens and the board. THAT's the way to do it!
The lighting controls are usually set to default positions at the beginning of the term, and setting-2 is correct for my purposes (low lighting in front so the students can see the screen) but higher lighting in back (so the students can take notes). But as the term wears on, anyone who attempts to adjust the lighting negates the default positions and all hell breaks loose. Very difficult without the default positions in place to get what you want (low in front, high in back).
The major benefit of Ak116 is the large amount of bard space, but it is limited by the fixed podium in the center of the room. The worst"upgrade" to this room would be the fate of SL 104, pictured above, where the mutiple vertically sliding boards were removed for no apparent reason. This is by far the best feature of AK116, since it is a technology that does not inhibit other instructors from using the technology they find most effective in teaching.

Faculty: Technologies that should be incorporated into the classrooms.

Higher resolution projection system allowing the appropriate use of Multisim simulation software.
See above. I would like to be able to control the cursor from my wireless clicker.
Wish there was an easy way to capture the chalkboard notes (perhaps there is, but I am unaware) as a still photo. I revert to posting an iPhone photo of there boards after each class...
In HL 202 there is no document reader (ELMO) which an essential part of teaching and learning in my course.

I think FL222 needs a dedicated network drive for students to be able to hand in class work, and more easily collect larger files from faculty. Right now all of the file processing is handled through the net (whether it's through Dropbox, We Transfer or Blackboard)
Electrical outlets near each row or every two rows of desks. I could set up better lights from my students .
Different contents can be shown on the two projection screens simultaneously.
No
clickers, ability to do instant surveys or collect answers to multiple choice questions
Yes, I would like a touch-screen white board.
make the windows electronic so they can be easily openend
Yes, a very important technology is Bloomberg access. This would be essential for business students and also students in engineering/technology who are taking business classes.
In my personal opinion, amphitheatre arrangement best suits my syle of teaching. The current seating arrangement is in FLH-UPR and LWR is ideal for screening movies, not for teaching a class.
ability to have different projectors to display different screens simultaneously.
i'm an old guy and don't even know what the possibilities are. Still, in my courses what's essential is thought, not screens or the web.
I would like to use student response systems, but I don't like the expense of clickers and am not impressed with their multiple-choice format.
There's not DocCam in GH 227 that I'm aware of and i'd like one/ I want a DVD player that does not require checking out a remote from ATC
I use the document cameras a lot and many of these devices, including the one in AK233, work spotty at best. Better DOC CAMs would be ideas.
students complain that the monitor does not allow them to use dropbox for accessing powerpoint presentations
I hope we do not lose the ability to project contents from prerecorded DVDs and VHS video tapes, in all the rush to modernize and update technologies.
Need full HD 1080p projection with Blu-ray player, auxiliary HDMI input, and a STEREO audio system with speakers at the front of the room.
Windows are important!!!! Would love to be able to move around the classroom more; but difficult with the seating arrangements- woudl like a middle aisle
Not in SL104, but in computer labs it would be handy to be able to copy a student's display onto the big screen. About the U of Iowa room -- this might be a good layout for a computer lab for our CS lab sections, but impractical for the large lectures we have, often 100 studnets or more.
I would like it to be easier to have guest speakers Skype in if necessary.
If a whiteboard is considered technology then yes, I think all 9 usable chalkboards should be replaced.
depend on the ATC to keep me up to date - they've done a great job.
While not specifically technology, I think whiteboards we be good. Less chalk dust, more options for colors. Of course, I always struggle to find good whiteboard markers.

Bring back the remotes! I need to show DVDs and get to certain scenes, and I forget to have to book a remote and then you have to remember to return it. My solution is I just load the DVDs in my laptop, but newer computers are getting rid of DVD drives, so. . . it will be more problematic when this isn't an option anymore.
all classrooms should have capture
not that I'm aware of.
Let's get the environmental controls right before we swan off into other technologies.
There are already too many gimmicks
N/A
no
student centered project spaces.
I am thinking of buying a Samsung Galaxy to write circuits and other diagrams on. I wondered if this could be used live in the classroom and sent wirelessly to the overhead projector?
Professor Ivon Arroyo experimented with using cell phones and text messages as a smarter clicker system: pretty much all students have cell phones, and lets them submit free form responses. That could be useful.
I was not able to see the picture mentioned in the next question.
Instructor ability to disable the WiFi during lecture. This is done at Babson College, for example.

Faculty: All other comments.

Flexible seating and tables are essential to my teaching . Old Plc classroom was my ideal . 305 almost got there.
I find room arrangements like SH202 where the screen and blackboards are on the long side of the room very awkward for teaching. Other rooms, like HL154 are too small with 24 students to allow me to roam around.
Most times the rooms are just fine.
Please see comments in survey.
In other classrooms, I use the both the screen and the whiteboard. In rooms with blackboards, it's essential to keep the chalk away from the electronics. In AK 233, for example, the instructor station, where I put my laptop, is always covered with chalk dust. People store chalk on the instructor station, increasing the amount of chalk dust. Not good for electronics.
The layout of the classrooms need to be flexible but there is still a use for lecture halls at WPI. I use SL411 to teach the Great Problem Seminar and that allows for the students to move the table and chairs into clusters. (SL411 is better than Washburn 229 for group work.) They bring their own laptops to class and look at the little screens in their groups ... so large monitor would be nice for them.
please improve acoustics and give me windows than open and close without five people helping

ME has the worst classrooms in HL and WB that I have used on campus. The lighting and control is poor and the screns cover the board.
Please go to SL 11. It's a strange room. Most of the questions are much more sophisticated than the room will account for.
I think you have two questions that ask for additional feedback. Email me at torbjorn@wpi.edu if you want more feedback. I've been a professor and a student here over more the 20 years...
I feel that the basic seating set up in HL 116 is excellent and that it would be a shame to change it. Having both a whiteboard and the screen available would be an excellent improvement.
Flexible seating a nice idea. All classrooms wired. Make sure the heating system works--it's actually kind of embarrassing that a hi-tech school has classrooms where the heating doesn't work and the windows don't open. Other than that I'm generally fine.
Biggest problems: 1. Not enough space at the podiums to place your laptop, coffee cup etc. 2. Need WHITE Boards, NOT blackboards. 3. Need to be able to both show a screen AND write on the WHITE board at the same time. 4. Kids need electric plugs at their sets. 5. Flexibility of seating sometimes useful (e.g., push tables together for group work) 6. Kill Switch for the WiFi in the room
There isn't enough whiteboard space to write in when the screen is lowered down
The layout of GH 227 is awful for a large, visuals-heavy lecture class.. I's a space clearly repurposed from some other use, inadequately and rather thoughtlessly.
AK219 is generally considered an excellent classroom space (along with AK233). The size and layout tend to keep the faculty member in close proximity to the students. So, the classroom seems more personal than other spaces. The seating is in levels, but the risers are small enough to not separate the students from the faculty. These rooms could benefit from additiona electrical outlets available to the students. There are not enough places for student to plug in.
I do not use much techology in my undergraduate course. but flexible seating would be a plus .
The technology in the classroom at WPI is in good conditions and useful. the classrooms have adequate layout. Maybe a bigger monitor and a permanent document camera would be a great addition to the podium.
Projectors need to be upgraded to HD 1080p, with integrated Blu-ray player and auxiliary HDMI input. Audio systems need to be STEREO, with ceiling speakers replaced with speakers at the front of the room.
I like the all-electronic controls in AK116, although they take some getting used to. Also the multiple screens and document camera.
I like the Iowa space. One concern would be that I like to bring the students back together at the end of the class to share what groups came up with and to summarize.
GET THE DAMNED MARKERS INTO EVERY CLASS BEFORE CLASS. WONDERFUL SURVEY ABOUT ADVANCED TECHNOLOGIES BUT THE WPI STAFF--OBVIOUSLY NOT IT--IS FAILING IN THE MOST BASIC AND ESSENTIAL ONES.
More rooms with two screens would help me.

Most are very acceptable, particularly for the large lecture classes I teach. However, some make it difficult, such as GH227 where the screen covers the chalkboard. Olin107 could use more light. I don't know why chalkboards are still so popular. They should all be whiteboards.
The classroom technology at WPI is generally pretty minimal. I consider this appropriate for most lecture courses. The blackboard is still a good medium for teaching introductory subjects. The overhead projector with doc cam is a viable alternative. I consider Powerpoint presentations an inferior method of lecturing, perhaps suitable only for the most advanced courses. The ability to connect a laptop to the projectors is valuable for in-class demos. No new classroom technology is really necessary, aside from improvements in the usabiliy, flexibily and reliability of the existing features.
I have found AK219 quite good for lecturing. There are a few broken chairs in the room that could be prepared. I am not sure moving the podium would make the room better - perhaps just different. I currently walk between podium and presentation screens. If the podium were off to one side, I would have to walk further.
I think better technologies are needed for computer labs that we teach in. When I teach one of my classes, I need students to be able to log onto computers to use statistical software and I need to show them how to do it from the projection screen. But, in SL 123, the screen hangs to low so they can't see the bottom of the screen, the computer monitors/towers are in the way and cut of vision to the screen, and sometimes the software (SPSS) just doesn't work right. There is also no space to put anything do wn in that ro o m . Students literally hand in their exam s o n a chair.
Definitely would like to see more white/black board space available when the screen is down, especially in FLAUD. I really don't like being trapped behind the podium, so I don't use the digital pen because it makes me stand behind the podium, which is not as interactive. Even just a movable white board which I could position to the side of the screen would be a help. Also the screen is so large (I realize its a movie theater, too) it would be great if there was a second screen I could use for teaching that was slightly smaller and slightly off-center so that the white board could also be used.
I like the way AK116 classroom is set up. I like to be able to use blackboard and document camera / computer at the same time. That would be very helpful when working with problems in chemistry.
I like the classroom a lot because the seats can be moved around, and the technology is very good but not dominant. mostly I want talking in the room (between students, me and students, etc.), interspersed sometimes with something on the screen or white board, but often without disttraction.
stop creating architectures that force us into lecturing (or that make students see lecturing as the default pedagogy). W need better collaborative project spaces in our classes. SL 110 is terribly designed (with the chalk board along the side of the room I typically walk over top of students to use it). why not re-design it in a more creative way?
Well, I am sure no one wants to hear this, but the space is too large. I teach ME3901 and ES1310. Both in that space. These courses have 40-90 students per term. ME3901 is a complicated subject, they need all the help that they can get.... The slow students - the ones who need help and should be there to get help - just see the big space, get

intimidated and go into the back and hide (I recognize this is not a new problem, sorry). The space is so big that maybe 1/3 of the students are checking email, texting, playing games, or watching videos on there computers/phones/tablets. I would suggest a more intimate space, like the laboratory itself. I don't think the lectures are effect (or reaching students). Both classes are "hands-on" and so the traditional lecture format is just not effective for these courses.
Chairs that can be moved are essential. Fixed desks/tables are somewhat inflexible for group work, but we manage anyway. Having a video capture system (ECHO) in every classroom would be nice, especailly it if could capture more than just the podium area of the classroom. I would use this for capturing student presentations to help them get feedback on their presentations. A long rectangular room is less useful than a squarer room, and boards on more than one wall in a classroom is also very helpful, but is not available in all classrooms, specifically SL406.
The image from the U of Iowa, I think is a really excellent design that would be especially useful in larger humanities class where you must use small group discussions along with lectures.
This is not so much about the podium, but it would be great if all classrooms had whiteboards instead of chalkboards. The whiteboards on the side walls are not very useful. Also, individual seats, instead of long tables would make it easier to engage in group activities. In terms of the podium, it would be nice to have a display adapter for Mac. I do not use my laptop because it is a Mac and oftentimes the system does not connect well to it with my own adaptor.
Just my previous comments on the difficulty of setting the lighting to what you want.
I dont think there is a document camera in KH116. I wanted to use it once, but could not locate it anywhere.
For combined in-class and on-line education, high resolution video capture of the white board would help a lot. OH107 has black boards, the sliding options on them are very good, but if they were white boards, then much more vivid colors could be used. If the lecturer could have a square or rectanbular beam that delineated the limits of the camera resolution pick up and the user could move the captured space, that would be a help for electronic capture.
This is a very important survey to reflect on and try to improve my teaching methods. Thank you
Different courses have different classroom requirements. For example, 4000-level courses behave very differently in the classroom than 1000- or 2000-level courses. The Iowa classroom may make sense for a 1000-level course, but not if it has 100-200 students in it. It would be wasted on my 3000- and 4000-level courses, and my 2000-level courses are too big for it.
It would be very helpful to record our students' presentations without having to bring in a separate video camera to do so. It would also be helpful if the presentation recording could be uploaded to our myWPI site so the students could evaluate their presentation style and content.
The smart note at room 107 is great. But it would be better if the digitizer pen can work with the microsoft ONENOTE, . Some of the rooms, OH109 for an example, has the

digitizer pen support for ONENOTE. This makes my lecture prep much easier, since always use ONENOTE to prepare my lecture, capture notes, and distribute the PDF versions of the lecture to students right after the lecture.
That Iowa classroom looks terrible to me. I could never teach effectively in a room like that.
My comments are pertinent to the course that I currently teach in HL116. They may be different if I teach a different course in the same room.
The layout of all the classrooms at WPI should be redesigned as soon as possible to accommodate the new learning/teaching trends and to respond to the impacts of MOOCs.
Spontaneous use of the blackboard is essential to me. Electronics are unimportant.
overall, I'm very happy with it. clickers would be nice.
One thing that has surprised me since beginning to work at WPI is the fact that there are not many classrooms with pod seating, or round seating. At RPI we would always have pod seats to work together on problem sets or have smaller discussions. Although I don't have a need for that in the course that I instruct, I could definitely see that as being valuable in some of the other courses here.
I like that most of them are equipped with a media podium. I don't like chalk and blackboard- very messy. Some of the classrooms are noisy in the winter from clicking heating radiators, or are overheated that the students fall asleep. In the summer the air conditioners make the rooms too cool or create a lot of noise. I teach foreign languages and noise interference can impact listening and pronunciation exercises.
I like the arrangement in AK219 where I can use both the projection screen and the board. As for technology, I would prefer to project my ipad on to the projector wirelessley, where I can both project the PPT slides and project hand written notes in real time.
Just improve the doc cams and provide MORE classroom space (we're really crowded)
See my previous comments about the placement of the podium.
In SH 308, it is difficult to move the podium out of the way sometimes to use all the board space. I love the podium in SL104?5? The controls are easy and convenient.
My biggest concern is the lack of better technology for displaying hand-written lecture notes during course captured lectures. I cannot believe that the best WPI can provide is writing notes on white paper while using the document camera. There must be better technology out there (electronic whiteboards?)
students report a problem accessing dropbox from the monitor. Heating and cooling seems to be a problem in many rooms: it is often too hot up there with no way to open windows or turn down the heat. Most of my issues usually concern mac compatibility with the projectors. With most students now coming in with macbooks, it seems like that should be an easier interface.
my biggest complaint about the podium in OH223 is that it is **just in the way** -- I'm constantly having to struggle to push the thing around so the door can be opened, and so that it doesn't block a good deal of the board. Plus, it blocks the view of the board for some students. It should be on the side of the room opposite the door, not near the door. And it should be easy to see around and push out of the way.

AK232 has had terrible heat and climate control issues. All the rooms that have fixed seats, and especially those rooms that have fixed seats and fixed concentric amphitheater desk surfaces, are virtually designed to prevent good small group discussions (which are a key mode of active learning that I depend upon in my lecture classes).
I greatly enjoyed teaching during the A term in two very good rooms, both with fine technology. If I have one complaint, it's that the acoustics in KH 115 are terrible (the room is too close to a stairwell and the parking lot to really have this change, however). The acoustics in Stratton 306 are far worse--any time the air conditioning kicks on, students three rows back have a hard time hearing lectures.
two projector screens and better lighting
I'm always looking to make marginal improvements - but I think having learned how to use the technology has greatly enhanced my teaching and student learning.
I like the podium to be in the center of the clasroom and not in a corner. Moving it to a place where it is useful is not easy as the podium is very heavy to move around. The lighting settings are good. I would like to use the whiteboard in the class, but the screen gets in the way. Salisbury 104 does a good job of managing my requirements actually. One can use the screen as well as the blackboard quite well. A similar setup here would be nice.
Your final example from Iowa seems to have no provision for eye contact with students during conventional lectures. I find such contact essential to judge comprehension. Of course, active learning strategies do accomplish something similar, but they aren't feasible with large lecture sections of 100+. (I'm not a fan of clickers and similar.)
In general classrooms are good for lecturing in and I think I am able to teach reasonably effectively and I think (hope?) the students are learning effectively too.
A lot of rooms have been optimized for projectors at the detriment to those of us who still use black/white boards. Lighting and occlusion from screens and podiums are typical problems. We really need more classrooms that can hold many students. Cramming 90 students into a room with 86 seats is just dumb. We need room to separate students during exams, and that is impossible when the enrollment is near or above the room capacity. While I'd like to have good sized rooms for modest numbers of students (such as with the picture of the media classroom), the reality is most departments have courses with bigger enrollments, for which those rooms are not appropriate. This is one of the reasons lots of students skip class.
HL116 needs to have the projection screen closer to the wall, right in front of the whiteboard, so that the instructor can easily see what is actualy being projected without having the lecturn against the front row of desks. HL116, HL218, SL115, Perrault Upper, and Perrault Lower need better ventilation and temperature control.
The last image of the classroom layout with multiple screens and round tables would be useful for the courses I intend to run simulations in. But I would not need such a layout for every course I teach. As it is now, I am able to run the types of activities I want with the current layout in SL. The last set-up would certainly be an improvement, but not essential to running my classes.
I'd bump up my answer to the prior question (seem unable to go back). Space for small group problem solving, and the ability to project student work, would be rather good

features to have. Heating/ventilation are hard to rate: when you don't notice that means it's doing great. However, many classrooms are too warm and in some cases too noisy for effective learning.
Blackboards in Kinicutt Hall are almost the same color as the chalk and writing can't be seen from the middle of the room back. This situation has been in place for years, but it hasn't been fixed. Neither the Sympodiums or lecture capture work well enough to be useful.
The previous question recommended a layout for active learning space. I enjoy teaching this way, but with current staffing resources in mathematical instruction at WPI, this is not feasible. The space from the University of Iowa shown in the previous query would require 1-2 PLA's per 1-2 tables to be a functional teaching approach in my experience.

Students: Comments about layout and technology.

Provide way to standardize sound from the microphone and sounds generated from the computer. If I was listening to a lecture with headphones in, the professor would be talking at a normal level but any computer-generated sound would be deafening.
Projection Screen should not be in middle of board. Should be visble to end rows.
None.
For Computer Science classrooms, have outlets built into the tables or emerging from the ground, similar the Campus Center meeting rooms. If one needs an outlet, they're usually tethered to the sides of the classroom or in the back; in non-ideal learning locations.
Use staggered seating so sitting behind a tall person doesn't impair a shorter persons view.
I really like the university of iowa classroom and i would really like to see that at WPI.
The seating is terrible in AK116. There is almost no space for people to sit side by side. Add to that squeaky, wobbly desks and its practically a challenge to take notes. I'm lucky enough to get to class early, so I always get a seat at the isle. It's even worse in the middle.
SL 115 needs major improvements in the seating area
The wireless internet really must be fixed. Despite working everywhere else I go, and having had it fixed by the helpdesk several times, my computer can almost never connect to the wireless networks. This problem is absurd and should be fixed as soon as possible. Just a few hours ago I could not get the physics help i needed from the tutoring center because my computer could not connect to the internet.
Some of the attached desks are either broken or they aren't there.
I think split screen options on a projector would be useful, so that professors can display both the document camera and power point slides simultaneously when do example problems.
Interactive learning is important
the lack of power supplies in the AK classrooms is frustrating.

-improve seating -improve screen sharing functionalities -simplify the overal setup within classrooms
The most important thing that I feel gets overlooked far too often is the placement of the projector vs the placement of the white/black boards. White boards and blackboards are awesome! They're big, provide WAY more space than a projector screen if used properly. They force the professor to get up and move around and actually physically interact with the content, which is especially awesome in huge classes. They give the presenter room to deviate from the lesson plan and explain confusing concepts if necessary. They encourage pictures, and the kind that you can actually copy down in your notes! Power point, on the other hand, is terrible. It gives bad presenters a way to feel good about the content because at least it's "organized" and they won't get lost. Let me tell you in case it wasn't obvious: 7 layers of bullets != organization. You may as well be showing us code. Even worse is when professors just stand at the computer podium and read from the slides. Of course, you don't have to do this, but it's way easier with power point and never happens to professors who use the blackboard. This isn't to say classrooms shouldn't have projectors. On the contrary, the link they provide with a computer provide a fantastic link with a computer. However these should only *augment* the whiteboard, never replace it. That's why the projector screen should NEVER block the whiteboard. AH B30, the Higgins lecture halls, many of the Salisbury classrooms all come to mind. Whoever invented the projector screen that rolls down and blocks the whiteboard was a dumbass. Document cameras: On the surface, they seem like they should be as good as the blackboard. However, I have never once observed this to be the case. When the professor uses a document camera, I just feel like I'm copying, not taking notes and learning. Perhaps it's the lack of motion, perhaps blackboards just lend themselves better to pictures and "notes" style organization. Whatever it is, blackboards are better. Disclaimer: I have ADHD. But I think that if anything this makes me *more* qualified to make these distinctions, not less. Since I'm always struggling to pay attention, I know what works. Ideally the students' ability to learn and comprehend the information should be independent of the professor's presentation style, but this is real life, and that's not what happens. I'm almost inclined to think that teaching at WPI would benefit more from a seminar for professors on how to make effective use of white boards than on new projectors and document cameras and wifi. If I were you guys and I had the resources, I would totally run a controlled study next term and use the course feedback as data to find out. Also I'm sure there must be a lot of research in education on which of these strategies is more beneficial for students. Come to think of it, why did you even send out a survey? The students won't know what's best, most of them never even think about this! Ask people who have dedicated their lives to this problem and have actually done experiments! Forget what I said, forget all the survey responses. This is science, not a democracy! Unless of course, you don't actually plan on improving anything or making a material difference and this survey is just as phony a PR move as every other button on campus. Then I just wasted 15 minutes of my time for no reason.

I think that the most important aspect of the classroom is visibility of the board, adequate seating, and being able to hear the professor. You can usually make it through a lecture without using the internet, so the wireless is not essential for a lecture.
Powerpoints are awful because professors oftentimes just read the slide and aren't prepared to have discussions or to answer questions
All of the technology in the rooms I have been in has been great.
No comments
The heating/cooling system is way too loud in KH116. Having more outlets to charge laptops would be nice.
having less tier'd classrooms and more round table style would be better better access to outlets is clutch good wireless and an option to plug into ethernet is also important having at least one projector is important - smartboards are nice but most professors don't know how to use them. It'd be better to do the computers where you can use the smart pens to draw on the slides they're showing.
More power outlets or power strips. larger desk space in the large lecture halls
A classroom like the one in Iowa would mean professors would have to teach in ways different than the traditional lecture format I typically take most of my notes in notebooks, so I don't notice technological problems
Wifi in class rooms (specifically the largest ones) is notorious for dropping connections. It would be great if I could manipulate the presentation the instructor is using so I could be able to fully copy down any information I may have missed. The projectors are very bright, but the screen placement in some rooms could be optimized to allow the best viewing angle for higher numbers of people.
Some professors are very hard to hear in larger classrooms. If more professors used microphones it would be really helpful. Also, having more classes be class captured would be a great study tool! However, while it is sometimes funny, a major hinderance of technology in the classroom is that many professors have no idea how to use the stuff and they cannot get the equiptment to run properly.
Why is there no VGA -> HDMI adapter available in the lower Fuller lecture hall? Very few people have laptops with VGA adaptors because that technology is obsolete. It makes it extremely difficult to have a presentation when everybody on their computers with Linux, Windows, and Mac OSX operating systems cannot connect to the projector. Being able to share the content of your laptop on the projector screen wirelessly when the professor selects your laptop's IP address from his registered list would be an excellent addition, especially in a programming class. Be aware that AK 116 does not have the ability to have two working screens (this is weird and has not been resolved by the ATC when they have been asked). Have it so that students can wirelessly connect to the projector without the need for any kind of adapter in between. This would solve a lot of issues when making presentations.
The availability of outlets in the classrooms is a difficult matter. Generally it is needed to cross a walkway with a cord to plug in a laptop.
n/a
Seating is uncomfortable for 2 hour classes. It would be beneficial to align course type with classroom type - keep courses with primarily lecture in stadium-style classrooms,

courses with labs in labs, courses with group work in Iowa-styled classrooms. 'smart' classrooms are a beneficial investment. Chalkboards are often difficult to read but whiteboards also often have glare.
More power outlets would be my number one concern.
Specific to KH116, the ventilation system is very loud, and unfortunately many professors don't understand how to turn off the system. Sometimes these professors also talk very softly and therefore are impossible to hear during class. In addition, most WPI classrooms, as a function of the HVAC systems are either boiling hot in the winter or freezing cold in the summer. I find these conditions unacceptable for learning, especially since I became sick because of an overactive AC in HL218 my freshman year. If at all possible within the constraints of the current HVAC systems, and maybe in conjunction with facilities, these issues should be addressed in order to improve student health and comfort during classes. Thanks.
I hate classrooms where the board and/or projector is on the side and I have to turn my head sideways (over my shoulder) to see the board/projector; it hurts my neck! Also, projectors should not be put over the whiteboards, if possible. I understand this is impossible in some rooms but if it can be avoided, it would make it easier when teachers want to show you something and write notes about it.
i think it is good right now
I thoroughly believe that extending the usage of technology in classrooms can be highly beneficial if done correctly. This includes consistent maintenance and timely expertise to avoid the (ideally) rare "technical difficulties", as well as using cross-platform and open-source software to allow users of all operating systems to be able to take part in the use of technological ammenities and locally modify the software to better suit their needs.
Improving classroom layout: Well, obviously we can't do away w/the traditional lecture hall entirely; plenty of classes don't NEED a technological aspect. And given that even the most genius triple-doctorate becomes technologically illiterate when faced with a projector (you know what I'm talking about...), I think it's safe to say that upping the technological complexity of our teaching methods would not end well in many cases. That being said, I think that for computer-heavy courses (CS and Robotics) or classes that could use computer analysis programs (high-level ECE, ME, Math, etc), something like the computer lab/lecture room shown on the previous page would be helpful. Technologies that should be added to classrooms: Clickers; all day, every day. They provide immediate feedback both for the professor (to know if the class understands or if they need to reiterate something) and for the student (to know if THEY understand, or need to ask for clarification). It's also a handy way of taking attendance, and of making sure that students actually show up to class. Technologies that hindered your learning experience: Clickers. Again. Every class I've used clickers in has had some really irritating technical difficulties, whether it be clickers not registering to students for some reason, the professor not using the program correctly (again, they have a PhD in rocket surgery or brain science or quantum biology or something, and can't navigate a simple computer program; if your staff is going to start using a new system, TRAIN THEM FIRST), the IR receiver in the podium not having enough range, or any other myriad of

technical issues that I'm sure have cropped up. I think clickers should be implemented more often, but that the issuing and registering systems should be streamlined, and professors should be trained to use the receiving program properly and effectively.
seating quality and acoustics can be upgraded. A screen share feature would be very nice in any class. The overhead projectors are very cumbersome. Professors have to keep zooming them in and out when working problems of showing notes.
My German teacher always wants us to move the desks into a circle--some desks are a pain in the ass to move. I have one class that utilizes class capture (video) and I love it. The ATC clickers don't always seem to register a response, even when on the correct channel
I find that in large lecture halls, the rows are difficult to get in and out. Often when someone leaves or if your taking an exam and someone in the middle has to leave, its very difficult to get out without distracting and disturbing everyone in the row you need to pass. Also when taking exams, I prefer to have a table and not the flip table with the seats (SL115, FLUPPR, etc). I find white boards better than chalk boards.
There is gum on some of the seats in there, that no one wants to sit on. There are also some REALLY broken seats/desks in Fuller LWR & UPR. These should be fixed, as they are distracting and no one wants to sit in them, making the room crowded and hindering learning.
Prescott FPE 50P1226 the room is excellent however the projector constantly flickers every 5 seconds or so. This is very distracting and needs to be fixed. The professor can't see this and it is not his job to make sure it is in working order. I have reported this to the secretary and nothing got done. Considering WPI is making about $200 per lecture per student (plus ADLN) they could have a work study student on call to tend to this and get it fixed.
Technologies that I believe should be added are interactive media that can be used during presentations and lectures in order to improve interaction with the students that do not learn quickly on a visual scale. The lack of good placement for the projection screen has hindered me in some classes, which then required extra time in order to understand the material as I could not read and understand it through the medium.
I have yet to enter a classroom and feel the temperature is perfect. I would expect a tech school to have some idea of how to keep a room at a pleasant temperature, but have not seen this ability present as every room I walk into is either freezing cold or uncomfortably warm.
Lecture halls with real desks (like the ones on the second floor of AK) make note taking far easier and exams are much more difficult without them.
The ideas of sharing screens is excellent!!!!
In most big classrooms it is very difficult to take notes when the professor uses the dry erase board or chalkboard. Thus, a projector screen would really help my learning since I can easily see the projector screen. Also, the placement of projector screens should depend on the size and layout of each individual classroom. For example, if the classroom only has one board in the front of the room, the projector screen should not be in the middle of the board in case a professor wishes to use the board as an aid to his presentation currently on the screen.

The camera used for the Classs Capture in AK 116 produces video of such low quality that it is not possible to read what is being written on the board.
It cannot be stated enough the importance of improving the power availability especially since most students have some sort of mobile devices and that WPI is an Engineering school. Better camera technolgy for off campus students access class through wimba Better microphone accessibility throughout the front of the classroom so that professors dont need to be the lecturn.
comfortable chairs. OH halls should be warmer during the fall.
Biggest issue is the distance from the back of the classroom makes it somewhat difficult to see either the chalkboard or projector.
Sometime, the whiteboard does not clear in records (my WPI) due to distance from the camera, paled written from marker.
Classrooms with individual desks should have desks that are full rectangles. If I lean my weight forward I do not like worrying about falling over, and I don't like how my arm is about the only thing that fits on the desk, and I have only one direction to lean in when using the desk and my right hand. I do not think the technology needs to be improved. It's fine just as it is. It should be kept in mind that too much technology is distracting, and I want to have the option of opting out of using too much if that is my choice, I shouldn't be forced to use a bunch of fancy gadgets that I don't even care for and probably increase chances of cancer with radiation.
There is some noise from the airconditioner
A about way to erase chalk from the chalk board because once you write then erase then write again its no good. About have some smart boards, so when the teacher writes on the board you can see it on your computer.
Class capture NEEDS to be a priority for every classroom on campus. The short length of or terms makes it easy to get behind if you are unable to attend class. It makes no sense that at a technology school this isn't a possibility in most classrooms.
It is very unclear at times when professors write on ipads. It's is distracting and messy
More power outlets!
I still take all of my notes using pencil and paper, so much of the steaming software mentioned earlier does not really interest me. I could see it being useful for students who take notes on a computer, or do more computer based work than I do as a Civil Major. In traditional lectures, I prefer the instructor to use the chalkboard or a whiteboard rather than a powerpoint and smart ink, as the smart ink is typically more difficult to read.
The pictured University of Iowa classroom seems like a great idea. Often times one of the more prominent learning difficulties in a traditional classroom is the monotony of a 50min or (god forbid) 2hr lecture. An interactive learning experience that utilizes new technology, collaborative seating arrangements, and less monotonous lecturing would be ideal.
Grills sucks
Document camera seems to fail or be less than perfect for a majority of the time
Smart boards More comfortable seating More regulated temperature Water cooler

Lecture capture is quite useful, although it only plays over ethernet and tends to stutter over wifi. It should be an available option for most classes, especially larger lectures and in the classes of professors renowned for verbal communication rather than board notes.
There are so many various style rooms at WPI, and I haven't been able to experience them all. For example, I've never used the room with the projector angled off to one side, but it seems like it might be a useful thing when it had plenty of board space on either side. I always try to sit in the front of the classroom, so the layout is not something I'd be qualified to comment on. As for technologies, easy connectivity to the projector is key in many of the classes I have where there are project presentations. Waiting for people to log in and go to wherever they host their presentation is slow and sloppy. And for those with Mac laptops, many cannot connect to the projector as they do not own the converter. Additionally, for those who do hook their laptop up, they often have trouble mirroring the displays. The wireless, and I assume quick, mirroring to projector software that was suggested earlier in this surbey would be a big improvement.
I'd prefer professors that used the technology, vs excess amounts of technology that they can't use.
The most important part is doc cameras as long as teachers post their notes online. I think the lecture cameras should be used more. Personally I have trouble listening and writing everything down, or in a lecture style class when the teachers doesn't were everything down, I would love to be able to go back and relisten to certain parts.
I hate large lecture classrooms where the desks are the little fold down desks that are usually broken and are about a third the size a desk should be. I feel very claustrophobic in those lecture halls. People put their feet up on the back of my seat and I hate that and I'm so crowded I get very anxious. I like lecture halls where you have real desks and comfortable chairs. I like to be able to spread my legs out- that being said, the classroom shouldn't be overbooked. All professors should put their notes- whether they be slides or notes or class captures or whatever they have...just some sort of documentation that they lectured in class that day--on blackboard (not their own separate website). It would be nice if every class had a registered note taker (a student) who took notes and those notes were posted on blackboard as well. Professors should also announce homework due dates online and not just in class. I hate it when blackboards don't erase well and it's difficult to see what professors are writing. I don't like it when professors write all in red on whiteboards, because red makes me anxious--but I do like it when professors use different colors to demonstrate different types of forces for example (but they should stay consistent), but it's bad when the pen runs out and it's difficult to see. It's frustrating when a professor has to turn off the heating/cooling in a room for us to be able to hear the sound on a video s/he is playing.
The slope of the rows of seating in this room is not steep enough. Each row is too low compared to the row in front of it, so other students sitting in front of you block the board.
no comment
Technology can be a aid to distraction as opposed to a wonderful resource. Also technology malfunction (which rarely seems to happen-congratulations!) can result in reduced productivity. For this reason, since this school is a school of theory and practice,

I fear moving away from physical boards might represent a move away from practice and moving toward theory.
For KH 116 specifically, there are no power outlets for any of the seats besides the back row. Also, the AC unit is SO LOUD, you can't hear the professor when he is teaching. The room is old, so the chalkboard is a little hard to read. A white board would be great in this room, but the projectors work fine.
The MIT/Lincoln Labs CTF (a cybersecurity competition) was hosted in a room very similar to the University of Iowa room that was shown in the survey. The room worked very well for the competition and this type of competition is one that the cybersecurity club may be trying to bring to WPI.
I wish there were more outlets acessable. I use a tablet with a stylus to take notes, and it would be nice to charge my computer/tablet while in class. In my Physics conference the TA uses the computer handwriting stylus and then sends the notes out for reference. This is very helpful when studying for the test. I don't know if it would make a difference in lecture (vs in conference)
every think was fine thank you
I like the doc cam best in terms of note taking because its the clearest (good handwriting permitting)
Technology is important, but a lot of a student's success is based upon how the professor uses it.
Please add more outlets to the classrooms plus having interactive (stylus pen) screen integrated with the in-class projector and sharable online would be a very big help.
With the permission of the professor, I would like it if each lecture was video recorded and uploaded so students can later go back and review it. This would be extremely helpful in some classes. Professors that do not consent to video recorded lectures will simply not record them. This gives the right of privacy to a professor but also enables the student to access material for those professors that do consent to being video recorded. In addition, if a student feels a professor is not doing a good job of teaching and failing to meet WPI standards, the WPI staff can review the video material and decide if the professor needs to go and a new one hired.
In the back of AK 116 it is sometimes hard to see the dual projectors and the professors writing. Also if a teacher is digitally recording a lecture with a camera in the back of the class they should have a camera man to follow their movements so that the notes are readable. MIT has a good example of how to record classroom lectures with a camera.
better, clearer projection screens would be very useful in ECE/CS classes so that professors could explain code and do examples....they never do and that makes coding a lot more difficult for me
Love the double screen with additional chalkboard in AK 116 to allow for both screen and notes at the same time. In smaller classrooms (HL 116) where the screen covers the whiteboard, makes it difficult because the professor has to choose between using the board or projector screen or if they try to do both it gets distracting
In big classrooms it's hard to see the projector screen. Some lecture rooms need bigger screens. More power outlets needed. They should be evenly distributed. Projectors (eg. AK219) doesn't always work right.

I believe that in larger classrooms there should be a speaker system that allows the professor to project his or her voice over it. It is sometimes difficult in larger classrooms to here the professor when he or she is speaking, so I believe that a speaker system would be very beneficial.
the Univ of Iowa seems to have a great idea there. and if you couple that with the ability to screen share between the students and teachers (going both ways for kids that do their own thorough research and want to share it) i think the learning process would greatly benefit.
I really recommend wpi to change the seats in the SH308. Some of them are in poor condition, and the table is too small to put my notes and text book. I have to put my textbook on the floor when I took note and then picked them up when I want to view the textbook.
All classes should be recorded, that way students can still access to any lecture. This is very important for that lectures that students can't make it to. For large classrooms, some times its hard to see what the professor is doing, it would be very useful if we can see whats going on in our laptops/tablets. I think the layout of many classroom is excellent.
Document cameras are great in theory, but often documents end up out of view, or too small or large. Some professor's handwriting is hard to read. Interactive pens also great in theory, but hard to write with and often not able to be saved for view later. Professor with microphone helpful in large lecture halls Recorded lectures helpful Layout: I prefer Fuller Upper & Lower Layout to rooms like Kinnicut for simple lecture notes. Rooms with movable chairs with long bench tops best for tests (Higgins large lecture halls, AK second floor). Clickers were helpful in some classes (when professor knew how to work the technology) but they often had more problems than they were worth
I like small classrooms. They are more convenient to students. As for technologies, they are great
There are some things, like a scanner and other equipment, that are essential to IMGD students that are not present in FL222. The projector needs to be lit so that students' work does not get washed out by the screen when students show their work.
biggest impact to me as part of graduate programs is lack of power outlets in classrooms and lecture halls like AK (233?)
Classroom layout: the seating in SL115 is very crammed and if people do not sit down in the center of the row, you won't be able to find a seat since you can't walk past seated people. If the rows could be more spaced out like the seats in AK116 or in lower Fuller, then that would certainly help. Some of the large lecture halls with chalkboards should get more of the sliding boards. Technologies to add: should encourage professors to do class capture or synchronous online courses, especially for 4000lvl courses. Prof. Shivkumar does a great job doing this. some students stop attending lecture because they are lazy but others could take two courses at the same time. Prof. Heilman shares his ipad screen on the projectors and that is awesome, he can write with a stylus which is much more legible than the pen on the podium screen. Technologies that hindered learning experience: writing on through the podium is illegible.

Most classrooms have a layout that is antiquated. They are built with rows that only have two exits making it annoying to move in and out of your seat. I loathe the issue of wanting to sit in the middle to get the best view, but not being able to leave my seat and return with little to no issues. Sometimes, I may seek to recharge my phone or laptop requiring me to find a seat that is close to an outlet. Some rooms have limited outlets, and others took me a year to discover! I would find it worthless to have ALL classrooms be completely "state of the art" with cutting edge teaching implements since for many classes that would be overkill. There should be a few classes per building that have better projectors, interactive systems with students, and desks that are made for humans. That would be great.
The desks need to be bigger The technology at IOWA seems interesting
I would like to be able to submit more essays and written work online so that I do not need to print so often.
SL 011 has an awful layout. put a smartboard in the front because the chalkboard is useless.
Lower fuller has some broken chairs
First and foremost would be power outlets. This appears to be an increasing issue as more students use laptops and tablets in class. Keeping those devices charges is essential. As for collaborative "flex" spaces, I do believe this to be a useful design options for some classes. GPS classes would be perfect for this. Also, specific rooms for IQP and MQP on campus work would utilize spaces like this. In terms of average non-project based classes, this type of classroom is not as pertinent. With the proper education of professors in how to actually use these spaces though, most professors could grow into using these spaces effectively. The only technologies that have hindered my learning experience is the different class software offered. There is no software listing for courses you take. Similar to purchasing books at the bookstore for all of your classes, there should be a recommended software for class listing as well. In terms of physical technologies, I have not had any hindrances with them.
There are some technologies in some rooms that the professors choose not to use. That being said, it would be useless if the classes have the technology but the professor chooses not to use them. How are much interest is shown by the campus professors? An example would be the recordings of lectures, some professors just don't use it even though it is always very helpful!!
The only problem I had with technology was when the overhead lighting saturated the screen with light, so the projector did not show clearly.
The University of Iowa idea is an interesting one, but I believe it would be reasonably difficult to use well. Many classes require a strong lecture presence, and the use of collaborative learning is useful, but not essential. I would find it interesting to construct one or two of such classrooms, and see which professors are interested, and how their experiences in such rooms compare to in other rooms. A comprimise solution that I believe works reasonably well is a setup similar to OH109 (and some other rooms), where the primary room setup is as a forward-facing lecture hall, but if it was desired, students in some rows can turn their chairs around and work with the group behind

them. This allows collaborative group work to be done relatively easily without compromising the integrity of the primary-lecture function of the room.
A lot of classrooms have poor outlet location or not enough outlets. I prefer the lecture halls with tables that do not move like GH 227. With only 4 or so chairs per section of table there is plenty of room to spread out and take notes, have my computer or a book open.
The back seats easier to hear the professors, there are actually a lot of students that want front seats that can't get them.
An outlet in every seat, bigger seats and bigger table spaces would be awesome. Example: Take all the technology out of AK116 (two screens, good sound, light schemes, easy control) and stick it in HL 218 (large tables, chairs that fit non-anorexic people, outlets at least used to be under the tables every few seats).
White boards are only easy to read when the markers work. In general, I like chalk better for visibility, but only when soft chalk is used that shows up well. Black boards are better than green. Still, it is very difficult to see the board in SL 115. AK 116 is a good example to follow for boards. Also, SL 104 and 105 are great The projectors are usually great and work well almost all the time. The systems are easy to use. It would be cool if mac connectors were provided. Internet is never an issue in classrooms, but is unpredictable in the dorms.
The front of the lecture hall in SL 115 needs more leg room between rows of seats.
Seats with individual desks on them are very difficult to use. I prefer sitting at long tables.
The lay out in the class room would be better if there is a little slope on the ground the technologies in the classroom has satisfied the daily learning requirements. If the cooling/heating system and the seats are more comfortable, students could study better.
I personally hate it when podiums for the teacher are not in the center third of a room, as it makes it harder to hear/see the teacher when on the outer thirds of room. Two projectors are a must in big lecture halls.
N/A
I would like bigger desks in some classrooms
The screen blocks the entire white board in Fuller Lower so every time my professor wants to do an example from their power points out on the board they have to keep putting the screen up. This wastes a lot of time waiting for the screen to go up and down.
FIX THE SEATS IN SL 115!!!! PENCIL SHARPENERS IN ROOMS.
I would like to see more outlets in larger lecture halls, especially with more and more students bringing laptops/tablets to class to take notes on
Seats that face away from the projector are annoying to sit it because you have to constantly turn back around.
Standing Desks
-classroom layouts are good -add more elmo writing devices to project hand written data to a projector screen
Better instructions for the professors on how to use the technology. We end up wasting time in some classes while the professors try to Figure out the screens etc

Reliable wireless access is essential. WPI Always needs more group working spaces. There are a lot of great spaces, but they are hard and not intuitive to reserve. Sometimes groups/clubs/etc... does not even show up. Disable SMART software annoyances. It is good software, but it pushes too much onto the user, and professors needs some lessons on how to use it.
The class capture systems must be able to legibly capture text on the whiteboard/chalkboard. More proffessors should be advised to use this classroom technology. The document cameras are easy for proffessors to mess up, either by bumping buttons on the poorly designed keyboard/palm rest or because the settings are too complicated. Some podium source controlls often take very long (5-7 seconds) to update video source. In rooms limited to one screen, this makes switching back and forth between sources very cumbersome. This makes demonstartaions time consuming, especially when moving back and forth between explanatory literature and document camera demos. The screen should never cover the entire whiteboard/chalkboard. This makes it hard to write out something (i.e. a math problem) when also stuck to a presentation.
The lack of power outlets has always been a big problem for me, especially in classes where the professor teaches off of powerpoints or electronic documents. Otherwise the only other issue that bothers me during lecture is lack of table space.
More power outlets would be fantastic, especially for classes that are 2+ hours long. It would be nice to have an outlet to keep my laptop charged.
I personally disliked all of the options of where the screens were located in the options given. I just picked the one where the screen blocked use of the white board the least. I sit near the front most of the time in classes so I can hear and see because I have listening and vision problems. Sharing what is on our laptop using the projector is already feasible since there are VGA cables...we just have to get up and go to the podium.
I think the most important things for me is easily record the real time note from professor, either from projector or some camera, for chalk board, it is very hard to capture hand writing note sometime. Best Jingwei
Some of the classes like Olin Hall 218 that we had advanced thermodynamic there are freezing cold in winter. I think most classes do not provide people with enough heat.
Projector screens should all support VGA and HDMI, not just one. Makes student presentations easier.
As an online student, I cannot see the writing on the Whiteboard. The camera #2 should be zoomed into the area where the professor is writing notes. This is very frustrating for the student and lowers the quality of education received. There is no need to have the pointed of the whole classroom or projector screen, since the projector is captured on camera 1 (content not screen not visible anyway)
The heating, A/C is very noisy in HL116. Can't hear anything at the back of the room.
Higher resolution document cameras, higher resolution digital pens
more class capture
Lighting the board and leaving it unobstructed by projector screens are essential!

I like the interactive smart board in SH 106. I don't know what other classrooms have that technology, but this is the only classroom where my professor has used it
Power outlets in the floor under every few seats in the lecture halls such as SL 115. Also in older class rooms the seating should be replaced with newer chairs/rows. A lot of the chairs in class rooms are broken.
I take classes by ADLN because I am located out of state. I was an on-site undergraduate student. I think that using projection screens coupled to laptops is good for both in class and distance learning. Recorded videos should be posted for permanent download and in Quicktime format, not just available while connected to the internet streaming in Echo360. The audio recording must be good. In general the ADLN recorded video classes are good in terms of picture and sound quality (unless the battery fails in the microphone, or for some reason the lecture does not get recorded at all). I would good to have more ADLN-compatible rooms like those already at WPI. Today, the number of ADLN classes is limited. Professors who have not used it in the past are not incentived to modify their lectures to be compatible with ADLN, and one of the reasons is that there are so few ADLN rooms. So that is good excuse not to modify their lectures, if they do, there may not be classroom equiped ot teach it that way, anyway. But that is limiting access to key courses for distance learning students.
The seating needs to be updated - many chairs/desks are broken and they are not comfortable. uncomfortable conditions (broken chairs, poor lighting, too hot or cold) can be very distracting and almost negate any efforts to upgrade the technology in a classroom if students can't pay attention.
The wireless internet access is too poor in almost all areas of the WPI but especially inside the buildings. The WiFi network is not stable. This is the most important issue that I don't like about WPI. Classroom seating is not comfortable, for instance in OH. However there are nice classrooms. The projectors are very old in all around the campus. There should be HDMI connection to the projectors since the newer computers has HDMI other than very old VGA. The old ones should be replaced. The heating and ventilation should be renewed in the classrooms. There should be nice acoustic in the classrooms. What hinders me from research or learning is the poor WiFi connexion. Because I do my research and study on computers and mobile devices which require stable and good connexion. I also have video/audio conferences with my collaborators for our regular meetings which are almost not possible without any call drops both because of unstable network and very poor bandwidth on both wired and wireless network on campus.
Classrooms should have power and wired internet for each space.
The current set up is fine but needs to be updated in all classrooms. Projector, whiteboard, power outlets, desks/chairs need to be new. Power outlets and interet access (preferably ethernet rather than wireless) are HUGE now since a lot of courses take advantage of online learning tools and digital textbooks. Also not having left-handed seating options is a huge distraction on the classroom. The chairs with desks attached are the worst for left-handed learners because they are not ergonomic. And whiteboards should be in every classroom along with FUNCTIONING MARKERS. The worst part

about whiteboards is the lack of markes. Another useful feature is class capture. Why isn't this in every classroom being used by every professor?
Fix seats in sl115
Automatic video recording of classes should be provided. So that students can go back to lectures and refer to what professor taught in the class.
-black boards are too hard to see, they should all be white boards at the very least!
Have lots of outlets and consistent heating super please. For example the smaller classrooms don't have a lot of outlets. As well as hl218 has the most ridiculous heating I have ever experienced.
It is hard to take notes when a teacher is writing on the board while the projector is down- sometimes I can see (if it is on my side of the class room) but other times I can not. I think that if the projector was placed differently this would help.
-Have more space between rows. -have color on the wall that isn't neutral. it just puts us to sleep. -WIRELESS ACCESS needs to have more access points -cables like HDMI should be in lecture podium. -have the technology to change professor's hand writing to text.
Having multiple boards that move like those in Lower FLAud, AK 116, and OH 107(?, whatever the big lecture hall is) make it significantly easier to take notes because it allows the professor to write large enough to see what is written, but also allows for notes to stay up and be referred to during the course of the lecture.
I consider that desks are no longer functional, also they are really uncomfortable. WPI should invest in having classrooms with tables as SL 104 & SL 105. By doing so students have more space to work, making them to feel more comfortable.
Wifi in large lecture halls is always extremely slow and bogged down. This is especially noticeable when instructors are using software that requires feedback such as rwpoll.com
The most important thing for me, besides acoustics, which I think is adequate in most rooms, is having enough space to take notes, store writing utensils, have formula sheets to refer to when taking exams, etc. Small work spaces are awful, especially in classrooms, where the desks are very inadequate. Rows of long tables such as those in HL 218 are ideal; tiny folding desks such as in AK 116 are bad.
Some professors should get more training in using computers connected to projectors.
Only comment is that most teachers have worse handwriting than me on a white/black board, and it makes it very hard to take notes and understand the material. That's why I think doc cams and the e-pen are the best methods.
The lighting does not always work with the projector. There is usually a glare. More outlets are needed. Bigger desks in lecture halls such as Upper and Lower Fuller.
2 screens needed in all large rooms
Classroom layout does not need to be perfect because student can move their heads. However, the classroom shuld not be too large if there is no room for a large board or projector. Having a projector in a classroom is useful for some classes, but not essential. Outlets and proper WiFi connection is extremely useful for classes that use projectors.

Class capture cameras help for re-listening to lectures and fixing notes or watching a missed lecture.
The projectors timing out, i.e. on the hour...It should be left out to Instructor to turn it off! Zig-Zag seating area instead of lining up every Chair in Rows! I.e. Front Row : CH1 CH2 CH3 Behind it CH1 CH2 CH3 next CH1 CH2 Ch3
Nothing.
While the interactive room in U of Iowa looks nice, I can't think of any class I've taken where that would have greatly improved the flow of the class. Most of my professors used a traditional lecture format for teaching, possibly due to the room's setup. Perhaps it would be useful for labs or conferences with a TA, where a specific exercise is to be completed as practice, but I don't see the benefit for a classroom the size of AK 116 or something like that.
The chairs!!! The chairs are brutal in many lecture halls. I personally dont bring a laptop because I need a power source, which are hard to come by in a lecture hall.
Things like Apple TV would be good. I use it at home and it's very easy to show what is on your computer, tablet, or smartphone without the need for a VGA or HDMI cable.
I have taken many courses with class capture. It makes taking notes a lot easier and when working through problems and studying for exams, it helps to go back and work through example problems.
The chairs, the chairs, OMG the chairs. Get seating that is comfortable and has locking backs so you don't HAVE to recline. We grad students are ass-in-chair for three hours at a time. HVAC is often poor. We have the window open in SL105 half the time in the middle of the winter. Cleaning staff are great. Wi-Fi is an ENORMOUS pain in the ass to get up and running. I almost always have to go to the helpdesk when I get a new device. Every company on Earth offers a guest wifi, can't WPI have that? Elevators are painfully slow in SL, WB and Olin. The classrooms are not great but they are functional.How about we get some infrastructure for real time (synchronous) interaction in online courses? Videoconferencing, virtual whiteboarding, something to approximate a real classroom environment.
ability to share screens wirelessly to the projector screen
Something that would improve classroom experience is increasing the processing speed of the computers that are on podiums in the larger lecture halls. When students have to give presentations in these settings, simply loading the presentation can take up to 10 minutes because of how slow these computers are (specifically HL 218)
Well a general observation with lecture capture is that sometimes the mic 'chips out' during the capture and when it is viewed online later their is some moments with no audio. This sometimes becomes an annoyance as it chips out during very important points. Also sometimes the mic is just off and the teacher does not realize.
Should be able to lower light in front of one board and leave them on for another so the projector can be used on one screen and the chalkboard on the other side may be used.
I like technology as a CS major, but I actually prefer lectures that just use whiteboards/notes. I've found demos are hard to pull off correctly and sometimes professors end up spending a bit of time getting everything setup and working. I find that slides can be less effective because the material is presented all at once and there's less

time to to walk through and absorb it because it's pre-packaged. Sometimes I have to do presentations on my macbook and I haven't seen any standard connectors for these in the classrooms.
The clickers that some professors use are nice because they can see feedback from every student and not just the ones that answer every question. The ideal system would interface the students electronically with the professor so that they don't need to raise their hand to ask questions and potentially disrupt the flow of the instruction. This system would allow students to "chat" with the professor during class, which could in turn help make the classroom more engaging and participatory. Also, the professor would be able to chose which questions to address during class and which ones could be better directed to a different setting.
Desks that are bigger would be great. More accessible outlets would be beneficial.
better lighting to see the projected screen better
Fix the classroom enviornment in Salisbury Labs 115
Most of the classroom around campus are ok, some of the bigger lecture halls really need to have updated seating! SL 115 especially! I do think that it would be really nice if more lecture halls were set up like the other two smaller halls in Salisbury because it helps with professor student interaction.
I think all professors should be better trained in using technologies available in classrooms (or at least those who plan to use such technologies). It is completely useless to have a high quality document camera or interactive response technologies in the class if the professor can't Figure out how to use them. I find that in classes where the professor knows how to use the equipment provided to them, the technology is extremely useful, but when it becomes a hindrance (professors spend more time trying to Figure out the computer than actually teaching) it makes it difficult to remain focused in class and be willing to participate and the class becomes more irritating than educational. I think if professors understand how to properly use technologies available in their classrooms, than WPI is well-equipped with the necessary equipment to provide a constructive learning environment. The only technology I think should seriously be considered for classroom incorporation is the ability to view the projector screen or document camera on our own laptops. This would help in rooms where large lectures (100+ students) are held (ex: Fuller Labs Upper Perrault Lecture Hall) because students will not be disadvantaged when seats are no longer available in the front of the room. I think in most rooms, though, the overall layout of the classrooms are good. I think all lecture halls, however, should be equipped with the sliding whiteboards or blackboards such as those in Fuller Upper Perrault Lecture Hall (whiteboards) and Atwater Kent 116 (blackboards).
Make sure the wifi works properly in every classroom. There are places where it doesn't work and is very annoying. Temperature sensors should be placed in every room and should control the hvac system because during the winter some rooms get unbearably hot
This classroom is always too cold. The seating arrangement makes it very difficult to get in and out of your seat or do any sort of group work.

The seats are in pretty bad shape in a few classrooms (missing tables etc.). Updating seating would make a huge improvement on my ability to take notes and concentrate on tests. I like the document projector that allows professors to write. Trying to take notes from powerpoints is difficult sometimes.
more power point would be great...
I understand the need to pilot technology, but when a professor tries to use something they are not comfortable with, it is a painful experience that makes it very difficult to learn. Example clickers. In A Term 2011 PH 1110 with Nancy Burnham, the repeated efforts to use clickers daily as an integral part of class really hindered the effectiveness of lecture. In C Term 2013, George Heinemann used them very effectively as a small portion of class.
We need more power outlets and better seats.
Better lighting, better seats, white boards (if use chalk board cleaned regularly). improvement in desktop speed (to log into individuals account) and fix the seats in lectures halls (Fuller Upper & Salisbusry labs). Live Lecture capture. Ground outlets to charge computers.
In big classrooms, with seats far from the instructor, please consider giving him or her a microphone and acompanying speakers. The two main problems with black- and whiteboards are 1) If the professor wants to both explain and see what he's writing, he is forced to talk TO the board and 2) the instructer often has to stand directly in front of what his students are trying to copy down.
better seats More elbow room Bigger folding desk parts to write on
Some professors have difficulty writing with chalk, (integral signs,9 or g, and 5 or s) so the adoption of more dry erase boards could be helpful to these professors.
I would change the chairs, they are not comfortable to sit on for hours.
In larger lecture rooms it's difficult to see a Professor who is writing on the chalk/dry erase board on the other side of the room. Sometime the podium equipment in rooms like AK 219 and AK 233 get in the way of the board. In larger rooms a microphone should always be available, as well as computer screen sharing/close up cameras on the chalk/dry erase boards. Also, class captures should be used by more professors.
More power outlets
Many chalk board in math department are very hard to clean. Maybe replace them with dry clean board?
Sometimes certain professors have a difficult time working the podium technology and it takes away from class time while the professor tries to Figure out the projector. I feel that the technology in most classrooms is adequate, but I have found that the largest issue with me has been the quality of many of the professors either not understanding how to use the equipment and wasting class time or not utilizing the available equipment at all.

Students: All other comments.

None.
Overall technology used in classrooms is ok but can be improved considerably.

Please improve the Wi-Fi.
Some of the chairs in the lecture halls (lower Fuller and OH 107) are missing tables or need to be repaired.
Consider updating the podium VGA inputs to HDMI; newer computers are now not including the VGA output.
Comfy chairs and nice desks are the most important aspects of classrooms.
Some rooms have the AC still running and it's December, not cool.
Please set up classrooms in more buildings with projectors, etc. At the moment scheduling in Olin is difficult because so many out-of-department professors want to use rooms with AV equipment. If they could use other buildings, that would reduce competition and make scheduling significantly easier. Also, unless it's as the final stage to make every room on campus have an AV loadout (at which point there is really no competition), please leave a roughly equal balance of AV-less rooms across buildings (as discussed with the departments of the buildings in question). At least in physics, there are a significant number of blackboard-only classes, and it is frustrating when they end up getting scheduled into different buildings because there aren't enough rooms without AV in Olin (and all the AV rooms are taken by people who need it and can't get it elsewhere).
I'm not a fan of the high school combined desk/chair things in the physics conference rooms. They don't allow enough room to have your work, calculator and book on them.
The only thing that would be cool is if recorded classes for online students could also record the students' questions and comments without the professor having to repeat them (they forget).
Professors that teach in bigger rooms need to be able to have access to a microphone.
For the love of everything holy put a goddamn pencil sharpener in one of the classrooms. I feel like I'm taking crazy pills because no one else notices this and I can't bring any of my unsharpened pencils to campus.
The wifi and mobile signals are bad in many classroom.
seats in SL 305, and 4th levels are TERRIBLE. they are squeaky and require incredible back strength and perfect posture to keep from sinking back to the floor. "the mind can only retain what the seat can endure"
In the library and in computer labs, the bottoms of the mice get really dirty, and the popular locations are to the point where the dissident of static friction between it and the desk can be compared to that of an eraser on desk. Take a look at the bottoms, and it will be clear.
More outlets!
i would like to see more small classrooms which focus the students on group work and collaboration. Set ups like the picture you showed in this survey of the school in iowa, or wherever it was.
Some classrooms mainly the large lecture halls with auditorium seating have a number of broken chairs making it hard to find a seat and not make a disturbance if late to class
Power outlets are essential and most classrooms lack these
AK116 is a sauna in the afternoon, even on the coldest day of the year. Fix it please thank you. Also stop blocking whiteboards with projector screens

The only complaint I have is about the chairs in some of the classrooms. There are some terribly uncomfortable chairs that make it very difficult to pay attention to class in some of the classrooms on the fourth floor of salisbury. You can't sit in the chair because as you lean back the back support keeps leaning back with you until you are lying down in class. These chairs were also added this year to the new music lab B30 in Alden. I have a back ache every day I have a class in a room with these chairs because they are so terrible.
FL 320 gets very stuffy after being in there for an hour with 50-70 other people. Needs better ventilation since so many people are in such a small room.
I'm glad that this survey has gone out because they're getting outdated, and while a focus on new lab technology is great, the kids in the School of Business and other departments don't get to appreciate that benefit. New and improved classrooms would benefit any group looking to book them, from academics to organizations and more!
Fix the lights please. They clearly aren't energy efficient.
The desks on many seats are broken or nonexistent. I also think the desks are entirely too small
Many classrooms, whether large lecture halls or smaller classrooms, have desks and chairs that are old and falling apart. They are uncomfortable, difficult to take notes at, and can disturb other students due to things such as squeakyness.
It is time to phase out chalk boards.
A main problem that I have is that they put too large of classes in too small of rooms. Having every seat filled in a room like Lower Fuller makes it nearly impossible to comfortably take exams or even notes.
SL 115 needs new seats! They're all broken
n/a
Putting technology in the classrooms is one thing. Getting professors to both be able to and want to use it is another entirely.
sometimes some professors would cancel the lecture just because the document camera wasn't working. I think the ATC should be running periodically check for the classrooms equipment.
-projector controls differ from classroom to classroom, standardization would streamline professors getting ready for class
Don't make us freeze. AC can be turned down and heat turned on in winter.
Comfortable seats in lecture halls, like those in AK 116 make lecture bearable, especially with decent leg room. Also, The classroom layouts of Salisbury 104/105 is really nice because it is well lit, comfortable to sit in, and there is decent space for notebooks, etc, and it allows for a "Goldilocks" class size.
All the classrooms should have enough outlets to all the students. A good among of students use their laptops or tablets, sometime you are not able of do so since there is not an outlet close to you. Additionally if there is an outlet your sit location will be affected. For last, some classrooms have troubles with the wifi, making it hard to connect to the internet, maybe if the classrooms have an enthernet port with a cable in each sit students could stop struggling to connect to the wifi.
They could all use a make-over... They're all kind of in disrepair

SL 115 is HORRIBLE! Especially if your professor prefers to take notes on the chalk board. You cant see anything! Also the seating is falling apart which is unfortunate if you happen to get stuck in one of those seats.
The classrooms with the stadium seating and full table-rows are the best! (Salisbury Labs first floor). More classrooms like that would be better. Higgins Labs desks are VERY small and hard to write on; which is quite distracting. Chalkboards should all be replaced with whiteboards.
Prescott FPE 50P1226 the room is excellent however the projector constantly flickers every 5 seconds or so. This is very distracting and needs to be fixed. The professor can't see this and it is not his job to make sure it is in working order. I have reported this to the secretary and nothing got done. Considering WPI is making about $200 per lecture per student (plus ADLN) they could have a work study student on call to tend to this and get it fixed.
SL115 desperately needs new seats. AK116(? the big lecture hall, in the back) has excellent lighting, acoustics, projectors, and seating. This is a great example of lecture halls. Also HL116 and HL218 are another great set-up with the tables and chairs. The new desks (for example, in HL114) are a great improvement to the old, smaller ones.
good overall so far
Please fix the seats in SL 115
Nope.
I find it hard to stay awake and focus in very bright environments, but something slightly darker is perfect and allows me to focus.
Teaching by dry erase or chalk board forces students to write notes. Teaching by slides on a projector discourages note-taking. Therefore, technologies like projector screens in classrooms are not essential but can be useful if used properly by professors. Unfortunately, many professors have developed their lectures based on slides and fail to actively teach their students, which stems from their use of these projectors.
The chairs need to be more comfortable and the lights just above the heads of the students should be slighted angled in the direction of the board because after two hours lectures our eyes get tired and dried due to the lights directed targeted to our heads/ offers our eyes.
Seating in some of the older lecture halls is horrible! Particularly, seating in SL 115. Where most seats screech with any movement and are uncomfortable to sit in for more than 30 minutes. Also, I would like to add that desk space should also be increased if at all possible.
Nothing else
Having a clean environment always help!
The chairs in all of the lecture halls are falling appart. i have fallen out of a seat before because it was hanging on by a thread and it snapped when i was sitting there after a full lecture...
More Wi-Fi routers can't hurt, but I haven't had any access issues that would be detrimental.
N/a

It's hard to take notes from a chalk board in a class during the afternoon because the board is so dirty. Sometimes professors don't realize that they write too small or speak too quietly.
In SL115 its sometimes hard to take tests because the seat is really far back from the "desk" and the desk is angled really far forward. I don't like having my neck and back hurting in a test because I'm too small and have to crunch my spine when taking an exam.
The chairs, the chairs, OMG the chairs, they are AWFUL. Olin Hall is embarrassing. For a grad class we had some prestigious speakers come in, and I can only imagine what they thought.
I find the overall classroom quality acceptably good. Some specific suggestions: Many seats in Kinnucut Hall in Salisbury Labs are broken. The writing surfaces connected to the seats in Olin 107 and most classrooms with individual desks (HL 154 and Stratton Hall 202, for example) are prohibatively small. This small space sometimes makes taking notes inconvinient and is difficult to cope with during exams in which students can bring notes. The writing surfaces in HL 216 and 118 are much more student-friendly.
I like when teachers write the notes on the paper and project it to the screen however some teachers handwriting is not conducive to this method. Also when teachers do opt to use chalkboards, I would advise they follow professor Makarov in using a yellow chalk as it is most legible even in poor lighting. Also most classrooms at wpi have adjustable lighting, if professors would adjust the light to maximize the viewability for the students, this would be most helpful. Also write big and legibly enough so that students at the back of the class can read it. They can do as Dalin Tang did in his Diff Eqs class. He would write some notes on the board and then go to the back of the room and see if he could read it from there. This was very considerate of him in my opinion.
Seating could improve in some classrooms. I'm 6' 4" and many of the individual desks feel small to me. Also some of the classrooms I've sat in in the civil engineering building were a little crowded. Overall I think they are well equipped.
Overall good but the disparity between classrooms in different buildings is strange
I much prefer lecture halls that have the continuous tables with chairs rather than the auditorium style seating with the half desks; I get more room to work and the chairs don't put me to sleep as much.
nopes
95% of the experience is based on the subject matter and quality of instruction, without a good professor who understands how to teach the material to students the classroom is irrelevant.
I also feel that individual classrooms should be evaluated for necessary technology upgrades, as some classes I have encountered have projectors that make distracting continuous noises, squeaky projector screens, computers that are slow, poor internet connectivity, things like that.
Grills sucks
The need more outlets, I'm Stratton some of the carpets are gross.
Limited left handed desks is very annoying

no comment
Having professors that speak clearly, loudly, and on the subject in question is most important. Chalk boards are easy to read when they are cleaned/wiped after use (as opposed to being erased with a chalk board eraser). So having class early in the morning in a room with a chalk board that has been recently cleaned makes note taking easier than it would be late in the day. There is one class room with a brown black board (?) and it can be exceedingly difficult to read any notations written from various seats in the class after it has erased once. Dry Erase boards erase well, (unlike chalk boards) but dried dry erase markers often make reading the professors writing near impossible. Digital chalk boards do work well, and have the advantage that sometimes the professor will post the class notes after each class. However, board space is usable for groups of students- and is indispensable when it comes to practice problem solving-and for the occasional professor resistant to change. No, I do not feel ready to live entirely in a class room without a physical writing board, but improvements to the current writing systems are due. In my opinion these are the best options, -Have a ready and large supply of white boar markers-and convert to whiteboards. -Invent a better chalk board eraser (that does more than smear it around-perhaps you could collect chalk dust with static electrical charge. Not only might it erase more completely, but the chalk dust might be able to be recycled). -Clean chalk boards between classes. -Develop, consider, or research alternatives (to any of the above), choose one and TEST IT. Thanks for your time.
Hi, I was having a class in SL-011, for Fall 2013 semester. I was not able to connect my Laptop by HDMI port to the projection system (The HDMI socket exits, but not working). HDMI and DisplayPort ports are industry standards for years, and a lot of laptops/tables do not include the legacy VGA video output anymore. I think It is necessary to include working HDMI/DisplayPort adapters and cables in classrooms. Thank you very much. Sia.
In some classroom, the blackboard is not so good that the professor or students may feel quite difficult write their formulae in s smooth way.
Please have a periodic checkup for the classes to have all the devices working properly. At our AI class the presenter didn't work/ the professor couldn't start it. Or at AK219 one of the lamps where blinking all the times and distracted my attention.
I like the new desks that have been added to some classrooms
Lecture classrooms (not computer labs) should have more outlets for laptops spaced between aisles as well as around the room
Most of them need better wifi
N/A
-
Furthermore I think adding in some sort of small cafe or convenience store to ALL of the buildings would benefit the students and teachers alike. A quick stop for sustenance, sugar, caffeine, a nice hello- all aid learning especially at the high rate we at WPI are expected to learn at. The CC, Library Cafe and Founders are not enough to service all kids at the right times.
If wpi can provide more lab classroom will be better.
Please focus on having lights that do not flicker. Additionally the document cameras suck

Desks that have decent surface area would be appreciated. Chairs that work properly would be too.
The acoustics has not been a problem, but the fold-able desks are sometimes not level, and chairs are broken.
Seating/Desks in Gateway lecture hall are awkward and not very comfortable. Movie theater style seating (high rise) makes best visibility.
They are too big. They are like conference rooms. The Math department has smaller classrooms and I think that help a lot.
1. There needs to be more of them! Campus infrastructure has yet to adjust to the increase in student population over the years. 2. The white boards need to be replaced with chalk boards, especially in large lecture halls. White boards, although initially cheap, become expensive to maintain in the long run (cleaning supplies, special erasers, expensive markers, and often warp). I've been a grad student here for over two years, and have seen 4 white boards replaced in my buliding. Chalk boards, although initially expensive, are cheaper to maintain in the long run (chalk is cheap, water is only needed for cleaning). Also, white lettering on a black background pops out more for a distance (and a computer screen!) and if the lettering is too small, just use fatter chalk. There is no analog to this for white board markers.
I would say most of the classroom in WPI has awful temperature. Some people feel too hot and the others feel frozen.
It would be ideal if the computer keyboards/mice in FL 222 could be cleaned from time to time. It's not the most satisfying experience getting sticky fingers while typing on someone's spilled soda/pizza/doughnut.
fix the broken seats!!!!! and get more outlets!
Glow in the dark strips, or floor lighting in all rooms would be awesome. Some classes use projectors, causing lights to be turned off. Movement can become difficult. I believe some rooms have such lighting, but not all. Also, can Stratton Hall have an elevator? For an engineering institute, we are found wanting in many fields. And signs letting people know to always walk on the right side of doorways would be great. Although, I do enjoy pushing those in my way.
Many of the rooms in Stratton are overly heated to the point that it is purely uncomfortable to even be in them.
the classrooms need more maintenance. There are broken chairs, broken blinds/windows, computer stations with broken/missing pieces. The condition of many of the classrooms is embarrassing considering the tuition and standing of this school.
They are as a whole quite good , however some of the labs could stand to be redesigned to maximize the usable area and equipment.

Appendix K: Survey Results Analysis

Faculty: New Technology & Studio Rooms – By Department

	Studio Classroom			Faculty: Students share screen w/ class			Faculty: Control screen content from wireless device		
	Interest Level								
Dept	Not	Somewhat	Very	Not_	Somewhat_	Very_	Not__	Somewhat__	Very__
Business	2	2	7	2	5	4	2	3	8
Engineering	13	12	5	7	17	3	5	16	8
Humanities	7	7	7	3	6	5	3	4	8
Social Science	2	4	5	1	2	5	1	2	9
Sciences	8	21	9	12	6	10	8	12	16
Grand Total	**32**	**46**	**33**	**25**	**36**	**27**	**19**	**37**	**49**

Faculty: Quantitative Analysis – By Podium Type

Q39 Have you ever experienced difficulties while using the interactive pen display?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Never	9	37.50%	0	0%	9	31%
Rarely	1	4.17%	4	80%	5	17%
Always	3	12.50%	0	0%	3	10%
Sometimes	11	45.83%	1	20%	12	41%
Total	24	100.00%	5	100%	29	100%

Q55 Do you continue to use the interactive pen display?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Yes	7	53.85%	3	60.00%	10	56%
No	6	46.15%	2	40.00%	8	44%
Total	13	100.00%	5	100.00%	18	100%

Q4 When you use the document camera do you prefer to stand or sit?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
I prefer to stand	24	70.59%	9	69.23%	33	70%
I prefer to sit	0	0.00%	2	15.38%	2	4%
No preference	6	17.65%	2	15.38%	8	17%
Both sit and stand	4	11.76%	0	0.00%	4	9%
Total	34	100.00%	13	100.00%	47	100%

Q2 When you use lecture capture, does it change how you teach the class?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
I use the same teaching method and technology regardless of whether I am using lecture capture or not.	16	72.73%	4	66.67%	20	71%
I teach differently when using lecture capture. Please explain:	6	27.27%	2	33.33%	8	29%
Total	22	100.00%	6	100.00%	28	100%

Q6 If the podium were redesigned to have a bigger desktop space for notes or a laptop, would you consid...

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
An improvement to the overall podium design, making it more useful	68	62.96%	12	57.14%	80	62%
A drawback to the overall podium design, making it more inconvenient to use	8	7.41%	0	0.00%	8	6%
A change that would not impact you positively nor negatively	32	29.63%	9	42.86%	41	32%
Total	108	100.00%	21	100.00%	129	100%

Q8 In your opinion, which is more important: the space (size) available on top of the podium or the por...

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Having a large amount of space on the top of the podium is more important than the portability of the podium	39	37.86%	11	52.38%	50	40%
Portability is more important than having large amount of space available on top of the podium	29	28.16%	5	23.81%	34	27%
They are equally important	35	33.98%	5	23.81%	40	32%
Total	103	100.00%	21	100.00%	124	100%

Q9 In your opinion, is the height of the podium top currently

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Too tall for comfortable use	13	12.26%	1	4.76%	14	11%
Too short for comfortable use	2	1.89%	1	4.76%	3	2%
Good for comfortable use	91	85.85%	19	90.48%	110	87%
Total	106	100.00%	21	100.00%	127	100%

Q38 Would you prefer a section of the podium to have a sloped surface for notes or books (lectern style)...

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Yes	22	20.37%	4	18.18%	26	20%
No	50	46.30%	10	45.45%	60	46%
No Preference	36	33.33%	8	36.36%	44	34%
Total	108	100.00%	22	100.00%	130	100%

Q10 Do you prefer to stand or sit while using the podium?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
I prefer to stand	97	91.51%	21	100.00%	118	93%
I prefer to sit	1	0.94%	0	0.00%	1	1%
I do both	8	7.55%	0	0.00%	8	6%
Total	106	100.00%	21	100.00%	127	100%

Q27 Are the podium controls in ${q://QID36/ChoiceGroup/SelectedChoices} easy to understand and use?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Very Difficult	2	1.87%	0	0.00%	2	2%
Somewhat Difficult	19	17.76%	3	13.64%	22	17%
Neutral	32	29.91%	6	27.27%	38	29%
Somewhat Easy	26	24.30%	7	31.82%	33	26%
Very Easy	28	26.17%	6	27.27%	34	26%
Total	107	100.00%	22	100.00%	129	100%

Q11 If the location of the fixed podium were to be moved where, in your opinion, where would be the idea...

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Off to the side angled 45 degrees between projector screen and students' seats (left picture)	0	0.00%	7	31.82%	7	25%
Centered across from and facing the students' seats (right picture)	5	83.33%	11	50.00%	16	57%
Other, please specify	1	16.67%	4	18.18%	5	18%
Total	6	100.00%	22	100.00%	28	100%

	Movable		Wooden		Faculty Total		Student Total		Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**	**Response**	**%**	**Response**	**%**
Centered in the front of the room	33	42.86%	6	40.00%	39	42%	272	52.82%	311	51%
Angled off to one side	23	29.87%	5	33.33%	28	30%	133	25.83%	161	27%
Left of the board	18	23.38%	2	13.33%	20	22%	58	11.26%	78	13%
No Preference	3	3.90%	2	13.33%	5	5%	52	10.10%	57	9%
Total	77	100.00%	15	100.00%	92	100%	515	100.00%	607	100%

Q14 Would you use a combination of both the projector screen and the white/black boards if their layout...

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
Yes, I currently use both now	44	41.12%	8	36.36%	52	40%
Yes, I want to use both the projector screen and boards, but the projector screen covers the boards too much	34	31.78%	8	36.36%	42	33%
No, I stick to just using the boards or the projector	14	13.08%	2	9.09%	16	12%
Maybe, I would try using both if the layout made it easier to do so	11	10.28%	2	9.09%	13	10%
Other; please specify	4	3.74%	2	9.09%	6	5%
Total	107	100.00%	22	100.00%	129	100%

Q48 Do you think there needs to be more usable board space with the projector screen down?

	Movable		Wooden		Faculty Total	
Answer	**Response**	**%**	**Response**	**%**	**Response**	**%**
There needs to be more space	52	49.52%	9	42.86%	61	48%
There is space enough now	37	35.24%	7	33.33%	44	35%
I don't use the board while the screen is down	16	15.24%	5	23.81%	21	17%
Total	105	100.00%	21	100.00%	126	100%

How would you rate the following classroom elements:

	Question	Overall Classroom Technology	Lighting Quality	Lighting Controls	Acoustics	Seating	Heating & Cooling / Ventilation	Power Outlet Accessibility	Projector Screen Visibility	Wirelesss Inte
	Poor	3	10	17	5	11	20			
	Fair	12	18	24	13	18	25			
	Good	32	40	35	41	37	26			
Movable Podium	Very Good	33	24	18	29	27	22			
	Excellent	24	16	12	17	13	11			
	Not Sure	4		2	2	1	3			
	Response	108	108	108	107	107	107			
	Poor									
	Fair	4	4	5	1	3	2			
	Good	10	8	7	9	10	7			
Wooden Podium	Very Good	4	7	10	7	7	6			
	Excellent	4	2		3	2	4			
	Not Sure		1		2		3			
	Response	22	22	22	22	22	22			
	Poor	3	10	17	5	11	20			
	Fair	16	22	29	14	21	27			
	Good	42	48	42	50	47	33			
Faculty Total	Very Good	37	31	28	36	34	28			
	Excellent	28	18	12	20	15	15			
	Not Sure	4	1	2	4	1	6			
	Response	130	130	130	129	129	129			
	Poor	29	24		28	76	69	197	14	42
	Fair	96	90		97	117	115	127	58	55
	Good	199	179		202	176	179	82	153	149
Student Total	Very Good	180	175		159	118	130	42	170	140
	Excellent	53	89		50	71	53	34	157	75
	Not Sure	1	1		18	2	14	76	8	99
	Response	558	558		554	560	560	558	560	560

Importance of Clasroom Elements

	Question	Overall Classroom Technology	Lighting Quality	Lighting Controls	Acoustics	Flexible Seating	Heating & Cooling / Ventilation	Two Projection Screens (large rooms)	Power Outlet Accessibility	Wirelesss I
	Not Important	3	1	2	1	5	2	24		
	Low Importance	2	1	5	6	13	2	19		
	Moderate Importance	22	33	39	18	31	31	23		
Movable Podium	High Importance	37	54	46	58	30	47	14		
	Essential	41	18	13	23	26	25	6		
	Not Sure	2		1		1		18		
	Response	107	107	106	106	106	107	104		
	Not Important					2	1	4		
	Low Importance	2		1	1	7	3	6		
	Moderate Importance	1	8	6	7	8	7	5		
Wooden Podium	High Importance	10	9	10	11	3	7	2		
	Essential	8	4	5	3	1	3	5		
	Not Sure		1			1	1			
	Response	21	22	22	22	22	22	22		
	Not Important	3	1	2	1	7	3	28		
	Low Importance	4	1	6	7	20	5	25		
	Moderate Importance	23	41	45	25	39	38	28		
Faculty Total	High Importance	47	63	56	69	33	54	16		
	Essential	49	22	18	26	27	28	11		
	Not Sure	2	1	1	0	2	1	18		
	Response	128	129	128	128	128	129	126		
	Not Important	5	4		5	2	4	27	39	15
	Low Importance	27	23		30	22	25	82	105	46
	Moderate Importance	239	148		146	175	165	203	160	112
Student Total	High Importance	191	236		220	216	231	137	154	165
	Essential	88	144		147	138	126	93	94	210
	Not Sure	5	1		5	2	2	13	5	8
	Response	555	556		553	555	553	555	557	556

Appendix L: Classroom Design Standards at Other Schools

School	Podium Design	Podium Placement	Projector Screen Size	Projector Screen Placement
University of New Mexico			16:10 ratio and height is 1/6 distance to back of room	2 in rooms more than 48 people. Orr to one side in rooms with one screen.
University of Cincinnati	66”x32” with wheels to move	In the corner, but movable	16:9 and height 1/5 for furthest distance	Angled in corner opposite the podium
University of Maryland			Width of screen is ¼ of distance to farthest point	2 screens in most rooms and minimum of 6’ on each side for board space. Mount one in corner and other in center.
Arizona State University	Lectern/table in small rooms and podium in large rooms	Off to one side in front of room	16:10 ratio and height is 1/6 distance to back of room	Angled opposite the podium if possible. If not maximize board space
George Washington University	Custom units from Marshall Furniture	Corner opposite door	16:10 ratio and height 1/6 distance to back of room	
Emory College		Podium on left, boards in the middle, and screen on the right.	16:9 and height 1/5 for furthest distance	One screen for most rooms and two in 100+ rooms
Montana State University		If one screen opposite the door	Screen height 1/6 distance to farthest row	Opposite side of podium. Maximize board space.`
Penn State	Mostly wooden podiums with sloped surfaces and connections for power and projector. Larger podiums and built	Left corner of room	16:9 and width is ¼ farthest distance	Minimum of 2 screens in all rooms and placed in corner and front of room to maximize board space

	in computers in lecture halls and auditoriums.			
University of California	Large rooms have 48”x30” media lectern with fold up shelves (nonmoving) for notes and document cameras. Small rooms have controls mounted on wall and simple lectern in front of room	Corner in small rooms and centered between screens in large rooms	16:10 and height 1/6 distance to farthest seat	Off to the side to maximize board space.
Kutztown University		In the corner, but movable	16:9 and height 1/5 for furthest distance	Angled in corner opposite the podium

School	Power Outlets	Seating	HVAC	Lighting
University of New Mexico	One plug for every two students mounted on walls and in the floor		Noise levels below 35 db. and temperature set to 68072 degrees.	Dimmable lighting zones for instructor and seating areas. Separate zone for whiteboards.
University of Cincinnati	Outlets located in floor in student seating areas	<50 moving tables and chairs. 50-400 fixed tables and moving chairs. >400 fixed auditorium seats.	Quiet system. Maintain 72 degrees year-round	Student zone dimmable, zone for boards, zone for instructor area. Engraved switch plates to identify function
University of Maryland	Install floor boxes for wired tables	Movable seating for 50 or less and	Insulate system to prevent noise transfer.	Zone for student seats, zone for instructor area, zone for boards. Dimmable for note

		fixed for more than 50	Keep temp 68-75	taking. Minimize switches and clearly label all of them.
Arizona State University	Locate outlets every 6' around perimeter and where possible in floors.	Movable seating in classrooms and lecture halls. Fixed seats in auditoriums.	Sound should not interfere with class	Zone for student seats, zone for instructor area, zone for boards, and zone for podium.
George Washington University				
Emory College		Fixed tables and movable seats in rooms of 40-100. Tiered in larger rooms.	70-72 degrees year round and noise less than 30 db.	Dimmable light switches by door and on lectern. Optional Crestron controller. Zones for main seating, projector area, boards, and podium area.
Montana State University	Outlets around room and on all tiers if tiered classroom.	Movable seats w/ table arms in rooms less than 40 and fixed tables with movable seats in rooms with more than 40 seats (except auditorium)	Maintain 68-78 degrees and noise should be minimized to below 30 db.	Lighting controls near each door and near podium. Should be dimmable fluorescents. Optionally include Extron controls on podium for scenes. Zones for main room, boards, projector screen area and podium area.
Penn State	Plugs around perimeter of room and on fixed tables	Movable chairs and tables in all rooms except large auditoriums.	Maintain 70 degrees and less than 30 decibels	Zones for front, middle, and back; all dimmable and clearly labeled.
University of California	Outlets distributed for 10% of seats		Managed remotely based on class	Zone for student seats, zone for instructor area, zone for boards. Dimmable for note

			schedule. Maintain 70 in winter and 75 in summer	taking. Minimize switches and clearly label all of them.
Kutztown University	Outlets located in floor in student seating areas	<50 moving tables and chairs. 50-400 fixed tables and moving chairs. >400 fixed auditorium seats.	Quiet system. Maintain 72 degrees year-round	Student zone dimmable, zone for boards, zone for instructor area. Engraved switch plates to identify function

School	Year	Diagrams	Controls	
University of New Mexico	2012	Yes and pictures		Mostly whiteboards, some chalkboards remain.
University of Cincinnati	2003	Yes lighting and layout		Whiteboards only
University of Maryland	2004		Standardize controls as much as possible	
Arizona State University	2011	Yes plugs	Standardize controls as much as possible	
George Washington University	2013	Many drawings and pictures		
Emory College	2010	Some		Whiteboards

Montana State University	2012	Yes, pictures of podiums		Whiteboards only
Penn State	2013	Yes		Chalk boards in most rooms
University of California	2012			Whiteboards in all rooms
Kutztown University	2013			