STUDENT ATTITUDES TOWARDS AVAILABLE LEARNING SPACES AND TECHNOLOGY

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Abstract

The following thesis sought aims to answer three essential research questions: What are University College Cork student attitudes towards learning spaces on campus? What are University College Cork student attitudes towards available learning spaces on campus? Is there a link between these attitudes and the demographics of affluence, achievement, and disability? A survey on learning spaces was sent to the student population of UCC. The response to the survey was four hundred and forty respondents, which is enough to be representative of a university the size of University College Cork. The findings show spaces already exist on campus that students find useful, but that they are not in supply enough for the needs of students. Students have little desire for extremely innovative spaces and technology but rather require more of what is already available. When it comes to the design of a space there is no one option that fits the needs of all students but there are general leanings of attitiudes. Students prefer overall natural lighting, quiet spaces, comfortable seating, warm temperatures, larger desk space, and uncrowded spaces. An interesting link was discovered between reliance on technology and the student population registered with Disability Services, indicating such students are more reliant on said technology.

Chapter One: Introduction

Internationally, the academic study of learning spaces is fairly new. As such, the literature on the subject is disappointing in regards to quantitative research. This is even more so in Ireland where there have been few empirical studies of learning spaces. Furthermore, the literature lacks empirical data. Most published papers have been case studies or drew from a small number of informal interviews. Several academics have called for more quantitative research on learning spaces (Fisher, 2010; Temple, 2007). While this has started to emerge (i.e. Bennet, 2011), there is still a large focus on preferred behaviours in relation to the spaces, rather than in depth student attitudes towards available technological tools and the spaces given to them. That is, the student's voice has remained somewhat silent in the academic literature. Finally, the literature has seldom examined potential demographic links towards attitudes, including how economically disadvantaged and students registered DSS (the centre that caters to disability services on campus) serves engage with learning spaces.

On the fringe of the literature there is an assertion that the disadvantaged can be left behind by technological change (Punie, 2007), and the need to garner student input when building spaces (Fisher, 2010). Disadvantaged is defined in the scale of this research as not having access to the same abilities or pre-aid finances as other students. This research aims to fill the methodological gap in this area. It aims to gain student input on their attitudes towards the available spaces and technology quantitatively, and see if there is a demographic link, so the new building on campus can be as inclusive and supportive as possible. Giving students the recommended input, formally.

The research was funded by the Department of Education at UCC as part of a larger project entitled 'The Student Hub Programme' which aims to research learning spaces as the university develops a new learning space. This specific research is geared towards student opinions on available spaces and technology. It aims to answer three essential research questions:

- What are University College Cork student attitudes towards learning spaces on campus?
- What are University College Cork student attitudes towards available learning spaces on campus?

- Is there a link between these attitudes and the demographics of affluence, achievement, and disability?

The research into answering these questions was conducted via a survey of UCC students. A survey was sent out to the entire student population, eliminating the need for random selection. Research shows this as an effective way to get a representative sample (Michaelidou and Dibb, 2006; Becker, 2011). The survey specifically addresses issues about how students perceive their available spaces and technological tools, and in the under researched area of learning spaces in third level institutions in Ireland.

The survey suggests that spaces already exist on campus that students find useful, but that they are not in supply enough for the needs of students. Students have little desire for extremely innovative spaces and technology but rather require more of what is already available. When it comes to the design of a space there is no one option that fits the needs of all students but there are leanings. Students prefer overall natural lighting, quiet spaces, comfortable seating, warm temperatures, larger desk space, and uncrowded spaces. An interesting link was discovered between reliance on technology and the student population reliant on disability services, indicating these students are also more reliant on said technology. However, a common thread running through the literature is that changing the spaces is not enough, but rather the method of teaching must be changed with it; and inherently changing the space can make other methods more effective. For example, it can enable incorporation of learning technological skills, creating students that are better prepared for the real world.

The thesis is composed of four main chapters. Chapter two is a review of the relevant literature. Sub chapters discuss the link between technology and learning spaces, how changing a learning space is only part of the battle for better education, the holes that exist in current literature (especially the lack of quantitative research), and the impact learning spaces could have on the disadvantaged. Chapter three lays out the methodology in great detail. It discusses not only the consideration that went into executing the survey, but how it was effectively executed. This involves subchapters about how the survey would be carried out in an ideal way, how the survey was actually carried out, and how the survey was designed. Chapter four discusses the results including analysis of student opinions on the factors that make a space, the space itself, technology, and cross-analysis with the aforementioned demographics. Chapter five further analyses this data and draws conclusions as well as

highlighting areas where future research is needed. Beyond these chapters is a bibliography and appendices. The appendices contain added information- including as the survey itself.

Chapter Two: Literature Review

A crucial part of researching a topic is to establish what is already known, and what gaps in knowledge exist. This thematic literature review sets out to do just that in relation to the topic of learning spaces. By analysing primarily academic publications in relation to learning spaces, specifically technologically influenced spaces, this review discusses the current knowledge and specifically demonstrates the need for more quantitative research, as well as the lack of consideration for the demographic of disadvantaged students.

A key piece to work to reference is a comprehensive literature review done on the subject by Paul Temple in the UK in 2007. This piece indicates that the discipline of learning spaces is not well researched, with most research relying heavily on more qualitative methods (Temple, 2007). It is quite comprehensive review with 143 references from various nations, serving as a important point of reference and base for further research into learning spaces. It wold appear that in the contexts of the literature review done for this thesis, little has changed in regards to student experiences within various demographics.

Temple discusses the difficulty of nailing down a definition for a "learning space", but for the purpose of this research it will be defined as any physical space on campus. Indeed, there are a lot of gaps in the literature, which will be discussed later in this chapter, but there is also consensus on some issues- such as the need for pedagogy to change along with spaces and the benefit of adapted spaces for preparing students for future success (Temple, 2007). A key consensus is the agreement that how technological advances in society have led to a shift in how spaces accommodate new technology, in an effort to best aid students (Temple, 2007).This is a topic that will be investigated in the course of this research in relation to an Irish third-level student body and it's opinions on the matter, which has not been empirically researched before.

Technology and Learning Spaces

The literature has a common theme of addressing how an increase in ICT (Information and Communications Technology) in society has led to learning spaces increasingly trying to accommodate new technology (Temple, 2007). The piece acknowledges that a key to efficient space is flexibility, seeing as technological change happens quickly (Temple, 2007). The idea that technology may advance faster than the ability to build new building is reiterated in later academic works. An Australian piece

published in 2010 reaffirms this point. It discusses how every aspect of a learning space will have a different life cycle, so a computer may only last three years while a building can last a hundred years, so flexibility of a space is crucial if it is going to be able to adapt to advancing technology that could aid students (Fisher, 2010). If students rely on technology to learn, as these pieces suggest, the space needs to be equipped to incorporate them now and to adapt to new technologies as they are made available.

The piece by Fisher references the more technologically specific TEAL (Technologically Enhanced Learning Spaces), rather than ICT which is discussed in the Temple review and other literature. TEAL refers not only to how ICT impact learning spaces, but rather how learning spaces and technology are as one, however both implicate the same concept: that technology and learning spaces combine. TEAL is a view that was first established at MIT in 2003 and refers to how elements like lighting and furniture can help support information and communications technology, as well as audio-visual technology (Fisher, 2010). Temple comments on the importance of these aspects in relation to ICT, by establishing that the makings of a space can better accommodate technology and influence learning (Temple, 2007). Both Fisher and Temple acknowledge, though, with the increase of technology, there is a possibility of physical classrooms becoming less important with students being able to reach education through technology, or a “third space” as Fisher says. Both, however, acknowledge the importance and prevalence of face-to-face-education (Temple, 2007; Fisher, 2010).

Temple and Fisher disagree on the importance of how information and communications technology will play into specialized face-to-face specialized learning spaces. Temple sees the increase of wireless technology leading to a phase out of such spaces, not seeing them as crucial but rather more important for marketing purposes. He does, however, acknowledge the unpredictability of the matter given the future of technological advancements is largely unknown, and the current investment in ICT equipped learning spaces (Temple, 2007). Fisher sees a need for classroom spaces that enable technology relevant to certain fields, like medicine and engineering, as crucial to preparing students for real world jobs, and does not see these spaces fading out of existence (Fisher, 2007). Indeed, Temple highlights the importance and prevalence of ICT enhanced classrooms in the science and technology based fields (Temple, 2007). A European based study conducted in 2007 supports Fisher. It states that in order for Europe to produce workers that can compete in modern society they must learn to be competent with ICT in the classrooms because ICT is a

core element of most sectors of the job market and society in general (Punie, 2007). Fisher sees the benefit of having relevant technology accessible to students of all fields to help prepare them, but understands that so many specialized learning spaces would be costly (Fisher, 2010). She hopes employing the TEAL method can help this matter by creating spaces that support multiple learning styles, helping students in other fields, and acknowledges the importance of other similar surfacing methods like CDIO (create, design, implement, operate) (Fisher, 2010). The similar method of CDIO is a framework specific to engineers consisting of an open architecture model providing current materials and technology essential for outcome based learning and preparing students for their careers (CDIO Office, 2019). So essentially, it is also an implementation of a space meant to better prepare students that is designed with consideration towards all aspects of learning.

Around the same time the concept of TEAL was developed, an article was published in the UK by Stephen Heppell and colleagues about the importance of considering the surroundings of ICT. It confirmed ICT enabled active engagement with students when adopted (Heppell et al, 2004). The piece also discusses other concepts touched upon later in this literature review such as: ICT being a 'catalyst' for change of spaces, how even minor changes can make a big impact, and that pedagogies must change with the space (Heppell et al, 2004). Heppell and colleagues make a key point that many spaces being built view technological aspects like lighting as architectural but not other ICT components, and ICT is increasingly important in the technological world (Heppell et al, 2004). While this study drew this conclusion from interviews with over 21,000 head teachers, as opposed to students, a 2013 article with one of the same authors looked further into user preference, both employees and students. It highlights the importance of user guided design (Mokhtar Noriega et al, 2013). That is something this research hopes to establish by interviewing students, the main benefactors of a learning space. Although Mokhtar Noriega and colleagues discusses non-physical spaces (i.e. social media) in addition to physical spaces, an aspect less addressed in this research, it importantly highlights the importance of technology enhanced spaces sand spaces that are flexible to changes (Mokhtar Noriega et al, 2013).

Overall, there seems to be an understanding that considering technology when building learning spaces can better prepare students for their careers, technology here includes structural concepts like lighting. This was evident in one of the case studies Fisher conducted, where the graduation rates of two secondary schools were compared, one having implanted TEAL and the other having not. While both had 90% graduation rates, interviews

with students suggest that students from the TEAL operated school will benefit more in the long run because better absorption of materials improved attitude, collaboration, and better prepared for their future (Fisher, 2010).

Physical Space as a Partial Factor

These pieces all agree on the concept, however, that changing a space and its incorporation of technology alone is not enough to make a significant difference. The pedagogies must change as well. While the current study emphasizes physical learning space more than the pedagogy, it is helpful to understand that the results of the current study are but a factor in the success of learning spaces.

Temple lays the groundwork by saying significant research had been done in regards to how teaching styles drive the design of buildings, but little research has been done into the opposite (Temple, 2007). Fisher comments on the relationship by stating that not only do teaching methods need to adapt beyond the traditional classroom lecture style in order to get the most out of these enhanced spaces, but also that changing the spaces makes more innovative teaching styles easier to achieve (Fisher, 2010). This may be easier said than done. Temple establishes that including technology into the classroom was seen as a hopeful way to push towards an improvement in pedagogy, but increased ICT enhanced classrooms have done little to push the traditional teaching methods towards any reform (Temple, 2007). Based on the writings of Punie, this is especially concerning. Punie observes that student centred learning is a social process and the traditional standard of teaching is outdated and meant for the industrial age of the past (Punie, 2007). To help encourage the teaching methods to change along with the change of learning spaces, Punie sees a need for the issue to be approached from a broader angle: “a social, economic and organizational context that is open to innovation and supported by a favourable policy environment” (Punie, 2007). It appears as though, for a new learning space to be effective, there has to be more communication between those designing the space, the educators that will be working in the space, and the students that will benefit from the space.

Fisher takes it a step further by indicating that students should have a role in influencing the design of the buildings they learn in as well (Fisher, 2010). A study based on 103 informal interviews with pupils originally published in 2009 did just that by showing that students benefitted from having “informal” learning spaces on campus (Matthews et al.,

2011). Respecting the right of students to influence their setting is one of the key reasons this research is largely focused on student attitudes towards their campus and its facilities.

Holes in Research

The existing literature, while maintaining some quantitative elements, appears to remain largely qualitative due to the clear lack of quantitative research on learning spaces found during the literature review conducted on this matter. As in the above study and the case studies conducted by Fisher, data is heavily qualitative. Both Temple and Fisher call for more quantitative work into the subject. Temple says that so few successfully designed quantitative studies have been conducted that a systematic review could not be conducted (Temple, 2007). Though this study is incapable of filling that void, it hopefully will add to the lack of quantitative literature on the subject.

Fisher highlights that while there is some quantitative data in her case studies, it is not extensive enough to support TEAL (Fisher, 2010). This study will hopefully expand the quantitative data surrounding TEAL that is currently not extensive enough. Much of the literature is based on qualitative case studies, interviews with teachers or students or literature review: although an overreliance on documents has been noted in other fields (see Windle and Silke, 2019).

Other researchers have started to hear this call. Bennett published a quantitative study on learning spaces in 2011 in the United States. The study asked the following three questions across six universities: “What specific learning behaviours are important to students and faculty members? Does the campus provide spaces that foster these behaviours? Where are those spaces?” (Bennett, 2011). The findings aligned with 2009 study, finding that the responses vary across student and staff, revealing a lack of proper support outside the classroom (Bennett, 2011). This variance among students and staff only exacerbates the need for more research into the student opinion, the benefactor opinion, which is not always included in research. The study also suggests a “misalignment” between “learning behaviours identified as important” and the spaces available on campus (Bennett, 2011). Though Bennett’s study helps shrink the hole of quantitative data on the field, it lacks sufficient depth. The current research includes far more questions and far more consideration for technology’s impact, even in terms of small aspects like lighting.

Discussions around technological impact seems to have recently taken traction. A case study on the effectiveness of learning spaces was published in 2018 in reference to a Malaysian University. The study primarily focused on how relevant the space planning and design of one specific space was for students using the learning space. The study found through surveying thirty eight respondents that the colourful seating, open space, available outlets and laptops, and writing boards aided particularly in group presentations and discussions according to participants (Zainuddin et al., 2018). The study is also one of the first to use quantitative data on an in-depth analysis to prove student opinions on the efficacy of space. Unlike the Malaysian study, the current study focuses on more than one space and general opinions about space arrangements, furthering the quantitative analysis in an even more comprehensive way.

The current study is also one of the first studies to be conducted about third level student attitudes towards their educational space in Ireland. The majority of the previous studies, qualitative and quantitative, come from Australia, the US, and the UK. Another distinguishing factor of the current study is it's consideration for how disadvantaged students might be impacted by their learning spaces- an aspect that had only been mentioned in the fringe of the literature with no quantitative analysis.

Representation of the Disadvantaged in Research

Punie discusses how, seeing education as a social process with the knowledge based society, disadvantaged students might be left behind as learning spaces and technology advance (Punie, 2007). Punie references the "innovation dilemma" and how it often means the wealthy benefit from technological advancements, and warns that enhancing ICT classrooms should be done in an inclusive way so the marginalised do not lack opportunity to become as technologically competent as their peers (Punie, 2007). This greatly influenced the research, seeing as many universities, including UCC, have a motto of being inclusive and providing an even playing field for all students. The research questions guiding the current study of "What are student attitudes towards available learning spaces" and "What are student attitudes towards available technology" became supplemented with the question "How are these attitudes influenced by the demographics of achievement, affluence, and disability?". Many questions were designed in a way so that mathematical, and therefore quantitative, correlations could be made between presence of a disability, measure of socio-economic status, and measure of performance with preferences. This way, if it was seen, for

example, that students from lower socio-economic backgrounds relied more heavily on campus computers, a school constructing a new building might want to include an ample number of computers. While students who are not achieving well at university are not necessarily an example of a disadvantaged group, it made sense to research if there were any patterns amongst the spaces utilized by students who perform well as correlations were being investigated.

Though seemingly scarce and not the focus of most studies, documentation has surfaced that improved learning environments can have a significant impact on the learning outcomes of disadvantaged students. A study published after Paul Temple's review discusses how third-level education is housing an increasingly diverse student body, and making the spaces they learn in more flexible and creative can allow for more autonomy in student learning, enabling more student engagement and success from students of all backgrounds (Jankowska & Atley, 2008). If the spaces being developed provide flexible and advanced resources that students can apply more individualistically to their learning, then all students, including those facing challenges of financial disparity and disability can benefit. An Australian 2011 study furthers the point by demonstrating that creative learning spaces had proven to increase attendance and engagement in schools catering to disadvantaged populations in America (Blackmore et al., 2011). Both publication also note that teaching methods must be altered in accordance with the development of these creative spaces, with the latter putting emphasis on the intimacy of smaller schools (Jankowska & Atley, 2008; Blackmore et al.; 2011). Therefore, the points of other publications that changing space alone is not sufficient applies yet again. Neither study, however, goes assesses the preferences or patterns of disadvantaged students regarding learning spaces, something this study does.

Conclusion

The key finding of this literature review is that it appears not enough has changed since Paul Temple's review almost a decade ago: as a result of the research done for this thesis the literature still seems to lack sufficient empirical studies of learning spaces, especially lacking is quantitative studies of student preference. It seems as though much consideration has gone into how technological advances can be incorporated into educational settings, and might better prepare students for their careers. A key consistent finding is, however, that pedagogical changes must be made as well as physical changes to learning spaces. In regards to this, more recent research has begun to highlight how technological

developments may leave disadvantaged students behind. This research will take into account student attitudes towards their current spaces and available technologies through an in-depth quantitative and qualitative survey. The former helping answer the research call for more quantitative data in field. The research also aims to shed a brighter light on the opinions of marginalised students, and students of a third level Irish institute.

Chapter Three: Methodology

A primary goal of this research was to add quantitative research to the field of learning spaces, given that much of the previous research had centred on qualitative measurements, like informal interviews, as discussed in the literature review. Also, no quantitative research methods had been published within the context of the Irish learning system. Therefore, the aim was to make the quantitative measurements gathered statistically relevant.

Both the planned methodology of distribution and the executed methodology of distribution involve the same survey, which shares both quantitative and qualitative questions. These questions aim to research any link between certain demographics and opinions about creative learning spaces. As addressed in the literature review, this has never been done before. The survey design aspect of the methodology, and its content, will be discussed later in this chapter. For a start, the differences between the planned and executed methods of distribution will be discussed.

Original Methodology

Consideration was given for how to accomplish the laid out goal. To do this, an element of random selection was incorporated into the selection of participants. This increases the chance of reliable results, as limiting self-selection in favour of random selection increases the likelihood that the sample is representative (Fraenkel, et al., 2018).

The method designed was multi-stage, influenced by cluster sampling. Seeing as the survey is a large part about learning spaces, it makes sense to make sure each learning space is covered. It ensures that the results and opinions about the spaces on campus do not come just from students who only use or learn in specific buildings. The process was to separate all the buildings on campus, and then for each building list all classrooms that were occupied at a certain date and time. The list for each building would be in order from ground floor up, smallest number to highest number. The first classroom listed per building would be assigned a one, the second a two, and so forth. Then, from each list, a classroom would be randomly selected. This list, made with allowances that are discussed later in this segment, can be found in the annex of this thesis.

Essentially, within each building the occupied classrooms are clustered. This is where the influence of cluster sampling shines. This is evident by the definition of cluster sampling being the act of creating mutually homogenous and internally heterogeneous groups within a population, randomly selecting one, and then testing all members of that group (Jupp, 2009). In this case, rather than creating clusters in the population as a whole, they are made within each building group. This practice would ideally reduce bias, and leave results unrepresentative of the student body at large. This multi-stage process would have reduced the potential bias by testing students across each building, while they are in them.

Once the respective classrooms were chosen, the lecturers were to be emailed and asked to help participate in giving the survey to their class. The teachers would be given a script of how to inform the participants, give them the link to access the survey, and debrief them. It was also considered that the teacher would get a student volunteer to do the aforementioned. The breakdown of selected spaces is in the appendices.

To clarify on the steps of the method:

STEP NUMBER	STEP ACTION
1	Each of the university buildings will be grouped
2	A date and time will be selected
3	List all occupied classrooms per group
4	An occupied classroom will be randomly selected from each list of classrooms per building
5	I will email the module coordinator of each selected class and ask them to participate, making clear they do not have to
6	If the module coordinator agrees to participant, I will bring them the printed introduction, debriefing, and instructions. I will talk them through the process when we meet
7	On the selected date/time, each of the selected module coordinators will enlist a student volunteer to read the introduction, provide a link to the survey that students may put into their phones/laptops to take, and give the debriefing after ten minutes

This method would allow for the survey to be administered all at one pre-selected date and time across all randomly selected classrooms. This allows for the perk of a higher response rate associated with in person research (Kaplowitz et al., 2004). This higher response rate is usually attached to paper surveys vs. online surveys, but a crucial part of this difference is the common nature of delivering paper surveys in person (Nulty, 2008). Though this survey is online, it would be administered in person as is common for paper surveys. Students would be informed of the survey and given access to fill it out via a person, rather than having no middle man and receiving access and intel electronically. The former is associated with paper surveys (Nulty, 2008). Therefore it might not have as high a response rate as a paper survey administered in person, but it would have a higher response rate than an online survey administered in a typical, non-face-to-face method, having more attributes linked to a paper survey than common electronic surveys.

This method also decreases the variables that would come with surveying classrooms at different dates and times. Since there is only one researcher, if the researcher were to go to classrooms to directly administer the survey, it would have to be over different times. Multiple issues could arise from classrooms being randomly selected in relation to different times. It could result in an overlap of respondents, as a student could be registered in multiple classes across times but not more than one class at the same time. Therefore, there is no guarantee each classroom would be mutually homogenous and internally heterogeneous. Additionally, the likelihood of attendance could vary greatly, given the outside factor of events, student nights, relation to the weekend, etc.

The above justifications, and the consideration that teachers had the right to refuse participation, was not enough to overcome the Ethics Committee's concerns. The committee was especially worried about the unnecessary pressures this method would put on teachers and/or a selected student.

Also, though random selection limits self-selection bias, it would not entirely rid the methodology of selection bias entirely. A selection bias in a study creates an increased likelihood for students of certain characteristics, who are more likely to respond to the survey a certain way, to be the participants (Hernán et al., 2004). This could skew the results in a way that is in favour of the respondents, and not the population as a whole. Ways that this method could potentially allow for selection bias were considered. Under this methodology,

students can still opt out of completing the survey, and students with certain characteristics might be more likely to do so. The method would target students who are in class. Not all students attend classes regularly, and those who do are more likely to receive the survey and have their opinions voiced. Also, those without updated technology may find completing the survey via the given link difficult, and therefore opt out, creating an over-representation for those who have access to personal technology. Though, the latter was justified because results from an online survey would be easier to export and analyse, and the former by the convenience of a classroom in gathering students in person, there is still a potential for sampling bias.

One more drawback is that each building would not have the same number of classrooms, meaning the probability of each classroom being selected would not be equal across buildings. There was some consideration to this. The researcher considered grouping buildings together that had few classrooms (by proximity, size, or similar factors), and separating buildings that had many classrooms (by floor or similar factors). This is not done by exact math, and therefore does not aid the statistical relevance in an exact way. The math technique of probability proportionate to size sampling would aid in random selection of classrooms, given the varying student populations of each. This method proportions cluster size to probability (Lohr, 2010). So in this case, the classrooms with a bigger student population would stand a greater chance of selection, bringing more statistical significance to the results, as the sample would be more representative. However, this process required time and resources that the researcher did not have. This is common. When dealing with complex data, often these schemes are overlooked for the sake of efficiency (Tchetgan and Wirth, 2014). Though not including this technique can hinder the relevance of the results, and the sample is not the most complex, the researcher notes that the results would still be more relevant than if random selection was not used to find a sample, and absences of such precision is common. Thus, the list found in the annexes applies the less precise grouping technique.

This method is original. This would be the first instance of this exact process of distribution being used. However, other forms of purer cluster sampling have been used before, even on vulnerable people such as children. The method is seen often in relation to the health field. It is used in a study in 1999 in Belgium in studying infants and vaccines (Vellinga et al., 2007). It was used in an international study surrounding refractive error in children (Dandona, et al., 2002). More recently it was also used in a study into obesity in

youth in Cameroon (Tchoubi, et al., 2015). Cluster sampling was also used across colleges in a study into the sensitive subject of sexual violence in the 1980s (Koss et al., 1987). Therefore, the cluster sampling method is not controversial and has been used as a sampling option for years.

This method, inspired by cluster sampling, would be the first to use random selection with consideration for every learning space on a campus. Had it been possible, it would have harnessed representative, in depth results, from students who have experienced all the main campus buildings. The fact that this distribution method was not able to be conducted does not diminish the methodology overall, as another very suitable, more commonly used method, was always in the works as a support. This distribution method is elaborated on in the next section.

Executed Methodology

Ideally, the previously described method was going to be conducted simultaneously with another method, and the results compared. The executed method of distribution is more straightforward. It relies solely on this other method of distribution, a method that is more commonly accepted. With the rise of technology, emailing surveys to a group for the sake of ease, despite lower response rates, has seen an increase in approved research (Michaelidou and Dibb, 2006). Researchers find the advantages of not having to transfer data into an electronic plane, and the lower cost, especially beneficial (Kaplowitz et al, 2004). Therefore, there is a lot of basis for replacing the in-person conduction with direct to email. With respect to how commonly this method is used in research, and how often it is approved, a great deal confidence formed around solely using an email structure to distribute the survey. However, this method varies not only in changing the form in which students receive the email, but also the selection of students.

This method does not use random selection to find a sample group to test from, however. Rather, it targets the population as a whole. In this regard, there is no need to limit self-selection or sampling bias related to a testing group, as there is no testing group. In the previously described distribution random selection was used to pick a smaller testing group, representative of the population, to expose the survey to. In this method, the entire population is presented with the opportunity to take the survey.

This, however, doesn't limit selection bias entirely. Students of a certain characteristic might be more likely to reply to the survey, and thus the results could be skewed towards students with these characteristics, not representing the population as a whole. So, for example, students who are prone to procrastination could be more likely to fill out the survey. Students who are prone to procrastination might also have on average lower grades, impacting the answers. Another possibility is that students who are able to afford their own technology could be more likely to spend time on a computer, and seeing as the survey will be emailed/delivered electronically, be more likely to complete the survey. This could lead skewed representation. Discussing these hypothetical biases is not indicating that they will happen, just rather indicating that this distribution method is not immune to bias.

Despite this, some researchers would argue that this is still more representative than randomly selecting a sample. Howard Becker argues in his book *Tricks of the Trade* that there is no point in trying to test a sample group if testing the entire population is possible, as the sample is meant to be a reflection of the population anyway (Becker, 2011). Therefore, relying on a distribution method that reaches the whole population is philosophically justifiable and encouraged. The method to complete this distribution involves taking the survey link that would have been provided to the students in the classroom, and emailing it to the entire student body. This is an extremely common methodology, which the Social Research Ethics Committee approved. The university conducted a student experience survey the year prior using this methodology (O'Halloran et al., 2017). Thus, beyond repeated and approved use of email surveys in research, and the justifiable ethics, this exact method is no stranger to researching student opinions across the entire population at UCC.

For the first attempt to reach the population, the survey was emailed to every student via the survey distributer at the university. Essentially, students email their surveys to a central email, surveys@umail.ucc.ie, where they are approved and forwarded out to the student population. It can be specified through contacting the systems administrator if only certain segments of the population should receive it, but in this case the entire population was sent the survey. This initial distribution resulted in a low response rate, of around 30 respondents. There are around 15,000 undergraduates and 4,400 postgraduates (University College Cork, 2017). The response was nowhere near the desired number of participants. There were not enough respondents for the margin of error, and thus confidence level to be respectable. A respectable margin of error and confidence level are crucial when calculating many statistics (Imai, 2017). Seeing as a goal of this research was to allow for the possibility

of advanced statistical analysis, at least in comparison to the survey being repeated at a future date, this was not ideal.

When the survey was approved and distributed in this instance, it was both a Friday and the day before St. Patrick's Day, as well as a bank holiday weekend. This could have contributed to the extremely low response rate. Given the festivities, it is possible students were more distracted than usual. Additionally, it is quite possible that students had marked emails coming from the survey email. To support this theory are the results of the survey conducted by the university in 2017 surrounding the student experience. The results demonstrated numerous students asking for fewer surveys to be emailed out (O'Halloran et al., 2017). Survey fatigue is not unique to this campus or time either, with previous research demonstrating students growing tired of answering surveys (Porter et al., 2004). This would indicate that many students felt overwhelmed by surveys, and so it is logical that they would take steps to limit exposure to them; like blocking the survey email or designating all emails to clutter. This, however, is just speculation. The email read:

Dear Student,

You are invited to participate in a survey being conducted as part of a Research Masters under the Student Hub Project. The survey looks into student attitudes towards available learning spaces and technology. For more information, and to give your voice, click into the survey:
https://goo.gl/forms/0mfLZ8MYvQaQebUf1

Sincerely,

Kelley Hammeran, Masters Student

In order to combat the low response, without changing methodology, a new avenue was approached. An avenue aimed at ensuring the email was seen. This plan started with drafting a more informal message in hopes of being more inviting. It read:

Dear Student,

You are invited on behalf of Masters student Kelley Hammeran and the Student Hub Committee to give your voice on the available learning spaces and technology on campus. For more information, and to give your much needed opinion, please click the link below:
https://goo.gl/forms/0mfLZ8MYvQaQebUf1

Sincerely,

Additionally, this effort considered pre-selected times that would coincide with fewer national festivities, and thus hopefully fewer distractions. In line with this thinking, the systems administrator was contacted, who agreed to redistribute the survey via the new email the week before study week. Preference was given to Monday through Thursday, to avoid the distractions of the weekend. The survey was ultimately emailed out on April 19th, 2018. This, however, does not counter-act the concern that students may have blocked or ignored the specific survey email due to survey fatigue.

Therefore, the university's students' union, which also has the capacity email the entire student population, was contacted. Given that the students' union is involved in the Student Hub Project that is sanctioning this research, and the research deals with opinions of the student body, it makes sense to coordinate with the student body representatives. The hope was that students would be more likely to receive and respond to a survey sent out by someone they elected than the generic survey email. So, in line with this, the President of the Students' union, whose email is used for mass communication, emailed out the survey to the entire population. A time of minimized distractions was also considered for this distribution, and the survey was sent out April 17th, 2018.

These combined efforts resulted in a much more workable response rate. As of April 30th there were around 440 responses.

Survey Design

The survey design was always going to be the same, no matter the method of delivery. The survey was influenced by a number of different surveys. These included UCC class evaluations, a Eurogang survey, and well as a global drug survey. The survey questions were also influenced by exposure to the academics working on the new Student Hub in UCC. Hearing the concerns of these academics (varying in discipline from teaching and learning to architecture and more) in regards to how students were utilizing their space was influential. It deepened the understanding of how to address a student's experience in a learning space from multiple angles.

It is important to note that great consideration was taken to meet the standards of informed consent, debriefing, and minimizing harm. An informed paragraph would have been provided to the teacher to speak themselves or give to a selected student before the link was

shared had the primary method been conducted. In the secondary method the same information was provided, but listed when the survey was opened. It can be found in the appendices and below.

You are all being invited to participate in a study researching student attitudes towards available learning spaces and technology at UCC as part of Masters of Research Thesis sanctioned by the committee for the Student Hub Project. The data collected will be secured and possibly be used for future studies surrounding learning spaces. A benefit of participating in the study is that your voice and opinions can be heard by members of the university!

If you decide to participate you will be asked to take part in a short survey, which should take about eight minutes.

- *Participation is completely voluntary.*
- *Participation is not linked to any academic forum.*
- *You have the right not to complete the survey, not to answer questions that make you uncomfortable, and to cease participation at any time.*
- *By participating (i.e. answering questions), you are consenting for that data to be used.*
- *Please do not participate or consent if you are under 18.*

Your data will be completely confidential and anonymous, so we will not ask you for your name or any other identifying features. It will be stored for ten years by the university, and then destroyed.

Thank you for listening! If you have any questions feel free to contact Kelley Hammeran at 115123146@umail.ucc.ie

You can also contact Dr. James Windle at james.windle@ucc.ie and Dr. Mike Cosgrave at m.cosgrave@ucc.ie

The information covers the process of consent, how long the data will be stored (meeting the university's ten year standard), what the study is for, how anonymous the responses are, etc. Given that the survey is taking place in an academic setting it was also important to note that participation was not linked to academic forum or results. Then, beyond the statement, students must click that the consent to access the rest of the survey.

In line with the ethical responsibility to not harm the researcher or the participants, no harmful or unnecessarily sensitive question. However, there are questions regarding disability

status, income, and grades that could be considered sensitive. They are essential given that much of the study is looking into links between these demographics and opinions about the available learning spaces and technology. Therefore, they are justified. To cover all bases, at the end of the survey there is a debriefing that contains the contact information for the student counselling centre, the student assistance fund, and disability services. This way, in the unlikely event that students were unnerved, resources are readily available to help aid them. This debriefing also reminds the students about what will happen to their data. It can also be found in the appendices and below.

Thank you for your cooperation.

- *Your anonymous data will be passed onto the researcher and research team.*
- *Your data will be safely secured.*
- *Your opinions will be analysed in conjunction with your demographics.*

In case you found any of the questions disconcerting, attached is the contact information for the counselling centre, disability support service, and the student assistance fund.

UCC Counselling Centre

By Phone: *021 490 3565*
By Text: *087 215 2505 (Please include your full name)*
By Email: *counselling@ucc.ie*

Address: *Room 6, Ardpatrick House, College Road, Cork. (Next to College Car Park)*

UCC Disability Support Service

By Phone: *021 4902985*
By Fax: *021 4903123*
By Email: *dssinfo@ucc.ie*

Address: *Cork South Lodge, UCC, College Road, Cork*

UCC Student Assistance Fund

By Phone: *021 490 3562*

By Email: *studentassistancefund@ucc.ie*

Address: *Upstairs on 1st Floor, 1-2 Brighton Villas, Western Road, UCC*

The questions themselves are a mix of qualitative and quantitative. This covers numerical analysis and in depth specifics. For the quantitative questions, consideration was given so that analysis would be not only pie charts and bar graphs, but potentially more advanced statistics. There are numerous questions that ask for the respondent to pick a multiple choice answer, all the answers being evenly distributed number groupings. So for a hypothetical example: a could be 0-5, b could be 6-10, and c could be 11-15. This will aid in statistical analysis, especially if the survey is repeated in the future, as is anticipated. This is because it will allow for two uniform distributions of the same variable to be compared, enabling a statistician to more easily run t-tests, determine t-scores, etc. (Imai, 2017). Thus, the design of these questions enables comparing answers to the same question across different times of distribution easier.

There are also multiple questions that just ask for a numbered response. This way, the answers from two different questions can be placed on a scatter plot and regression analysis can be used to see if there is a correlation between the two categories (Miles and Shevlin, 2015). The research wanted to allow for this. So, for example, there is a question asking the average number of hours a student works and a question asking how many times the student relies on university technology. Thus, in analysis, it can be determined if there is a correlation between the number of hours a student must work to support themselves and the number of times they rely on provided technology. From here, if there is a strong correlation, it can be speculated why.

More basic quantitative questions were modelled after survey questions that worked before. For example, the national drug survey asked how often a specific substance was used within a short time frame, then a medium one, then a long one (Global Drug Survey, 2017). This was replicated for this survey in terms of how often areas on campus were used by students. For example, a list of spaces was given, and students were asked to check all that they had used in the past two weeks. The same question was asked twice more, except the time frame of two weeks was replaced with a month, and then a year. This allows for consideration into use at different instances. The qualitative questions were also inspired as

well. The format of listing a statement and then having the participant identify from multiple choice how much they agree or disagree was used for an academically respected survey conducted studying youth and crime (Eurogang Program of Research, 2010). This design was used in reference to statements of preference surrounding learning space characteristics. This allows for consideration to subjective attributes like “quietness” in a uniform way. The logic was that if these designs worked for accredited surveys, they should work here.

The questions in their entirety were piloted to ten UCC students across all years and schools. This allowed confidence that none of the questions were confusing or misleading. The diversity of those who piloted the survey also ensured that feedback wasn’t one sided or favoured one discipline.

Chapter Four: Results

This chapter will present the analysis of the survey, which was distributed via email to the entire student body of University College Cork. The survey received 446 responses to over 45 questions. Given the population size, this is a representative sample for about a 5 percent margin of error. Given the number of questions and in depth nature of many, it is unfeasible to analyse them all, however, the dataset will be made available and can be analysed for future research or compared to any new findings should the survey be repeated. The results most relevant to the research question revolve around in-depth student opinions on the learning spaces available to them, the makings there of, the available technology, and correlations to the demographics of achievement, affluence, and disability.

As such, this chapter will establish the results by discussing how students responded to certain characteristics of a space, how they felt about the current spaces on campus, their opinions and reliance on current technology, and these opinions cross-referenced with selected demographics.

The Makings of a Space

This survey does not just explore student opinions on available learning spaces, but also on the technology that forms learning spaces. The components considered are lighting, temperature, sound, desk space, crowding, seating, and ability to accommodate group work. First students were asked if the above considerations mattered to them when choosing a place to study. If they answered yes, they were then given the option to respond to a subjective statement on the matter, a statement that aired towards one extreme possibility of how each component could be represented. The available responses were: strongly agreed, agreed, were neutral to, disagreed, or strongly disagreed with the statement. These statements are in large part subjective due to the nature of the components. A student is unlikely to know the exact temperature or light level of preference, so they must respond to statements that discuss these aspects in subjective terms (like warm) as opposed to numerical value (like 30 degrees Celsius). Still, this method, which was modelled on a long running global survey (Global Drug Survey, 2017), allows researchers to roughly quantify how important these components are to students and the direction the majority of students prefer to see these components developed. The numbers below are rounded to the nearest tenth.

For the designation of lighting, 65.3percent of respondents indicated that lighting levels impacted where they prefer to learn. In response to the statement: “I prefer natural lighting in my learning space”, of those that had selected yes to an impact, 49.5percent indicated that they strongly agreed, 28.2percent indicated that they agreed, and 17.2percent remained neutral, while 2.7percent disagreed and 2.4percent strongly disagreed. This demonstrates the importance of having access to natural lighting in campus buildings to draw students to a space and to aid in their utilization of it.

Figure 1: Do light levels impact why you chose your preferred learning space

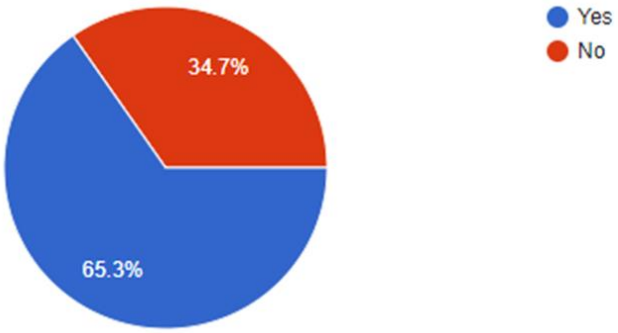
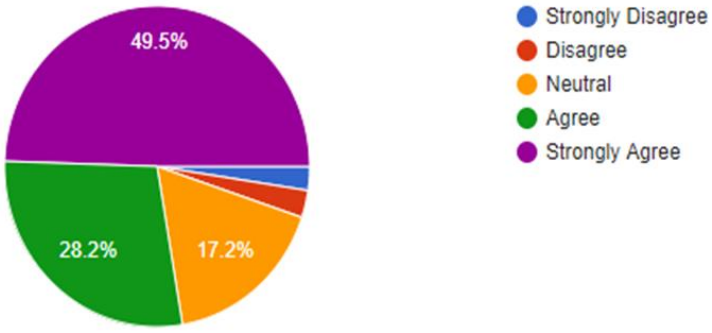


Figure 2: How do you feel about the statement ‘I prefer natural lighting in my learning space’?



For the designation of temperature, 82 percent of respondents indicated that temperature levels impacted where they prefer to learn. In response to the statement: “I prefer a warm learning space”, of those that had selected yes to an impact, 16.5 percent strongly

agreed, 43.3 percent agreed, 20.9 percent remained neutral, where 16.5 percent disagreed and 2.8 percent strongly disagreed. That is, although temperature seems to be more important to students when selecting a beneficial learning space, there is less of a consensus on what temperature itself is preferable. Though there is a significant leaning towards warmer over colder climates, this highlights that there is no 'one choice fits all' when dealing with a student population. This may indicate that students prefer a mild temperature that is neither too hot nor too cold. While this seems intuitive, this reading of the data would require further research to verify.

Figure 3: Does the temperature impact why you chose your preferred learning space

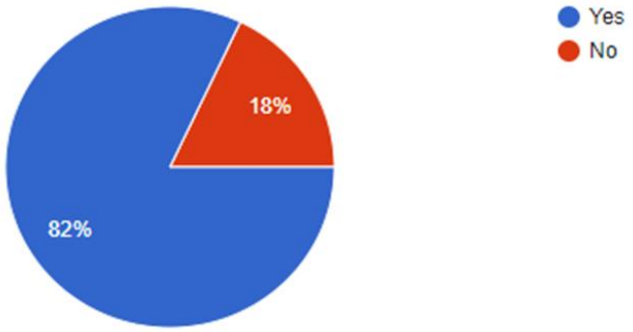
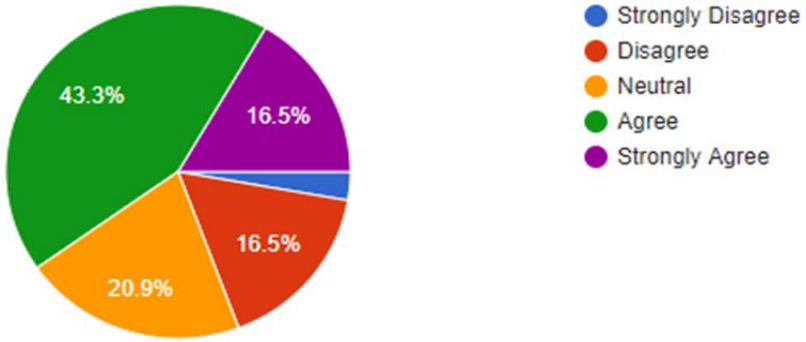


Figure 4: How do you feel about the statement 'I prefer a warm learning space'?



For the designation of sound, 91.8percent of respondents indicated that sound levels impacted where they prefer to learn. In response to the statement: “I prefer my learning space to be quiet”, of those that had selected yes to an impact, 58.1percent strongly agreed, 28.3percent agreed, 7.6percent remained neutral, where 3.9percent disagreed and 2percent strongly disagreed. These findings indicate sound as a crucial factor to students in choosing and benefiting from a learning space, with a strong general consensus that quiet spaces are the most preferred in aid of learning.

Figure 5: Do the sound levels impact why you chose your preferred learning space

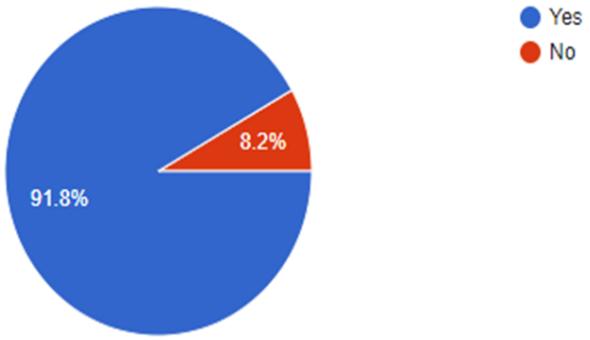
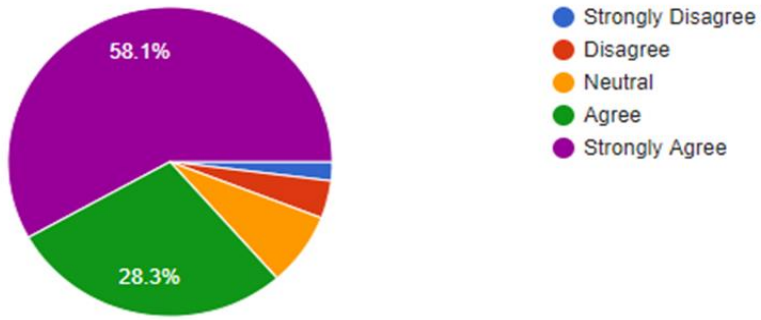


Figure 6: How do you feel about the statement ‘I prefer my learning space to be quiet'?



For the designation of desk space, 88.9 percent of respondents indicated that the amount of desk space impacted where they prefer to learn. In response to the statement: “I prefer to have a larger desk space”, of those that selected yes to an impact, 59.1 percent strongly agreed, 35.4 percent agreed, 3.6 percent remained neutral, where 0.5 percent

disagreed, and 1.5percent strongly disagreed. There seems to be a strong consensus amongst the student population that finds large desk spaces are more beneficial than smaller ones.

Figure 7: Does desk space impact why you chose your preferred learning space

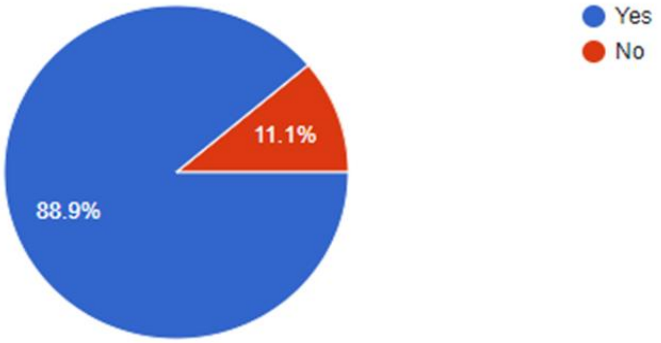
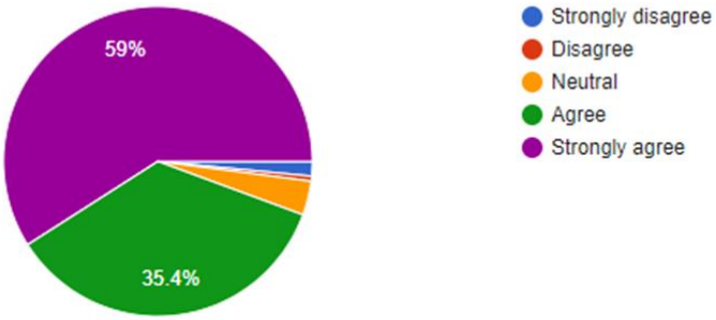


Figure 8: How do you feel about the statement 'I prefer to have a large desk space'?



For the designation of the amount of people in a space, 73.5 percent of respondents indicated that the amount of people in a learning space impacted where they preferred to learn. In response to the statement: "I prefer to be in a crowded learning space", of those that had responded yes to an impact, 3.4 percent strongly agreed, 6.8 percent agreed, 9.5 percent remained neutral, where 33.2 percent disagreed, and 47.1 percent strongly disagreed. Though these results indicate the crowdedness of a learning space is not as crucial to as many students as some other factors (especially sound and desk space), there is still a strong indicator that

the majority of students prefer to learn in a an uncrowded space. As such, this is worth taking into consideration when establishing places on campus.

Figure 9: Does the amount of people present impact why you chose your preferred learning space

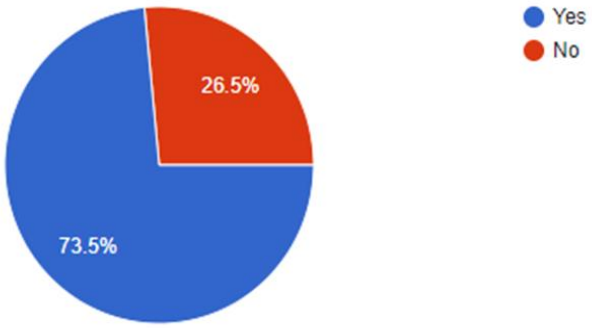
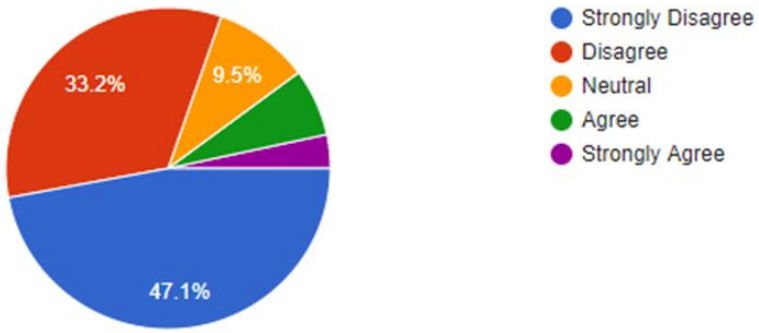


Figure 10: How do you feel about the statement 'I prefer to be in a crowded learning space'?



For the designation of seating comfort, 80.5 percent of respondents indicated that the comfort level of the seating in a given place impacted where they prefer to learn. In response to the statement: "I prefer to use comfortable seating in a learning space", of those that responded yes to an impact, 53.1 percent strongly agreed, 39.3 percent agreed, 5.3 percent remained neutral, where 0.8percent disagreed, and 1.4percent strongly disagreed. Data here

points to a significant preference of students to have access to comfortable seating in their learning space to enhance their experience.

Figure 11: Does the comfort level of seating in a space impact why you chose your preferred learning space

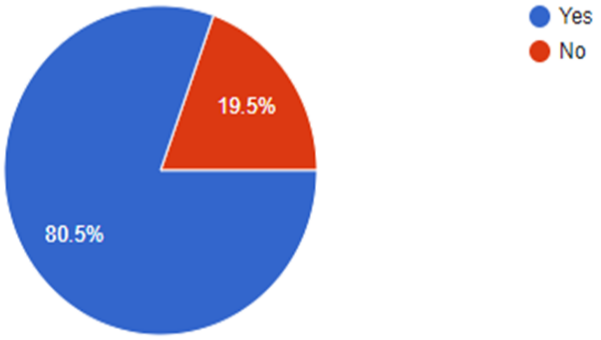
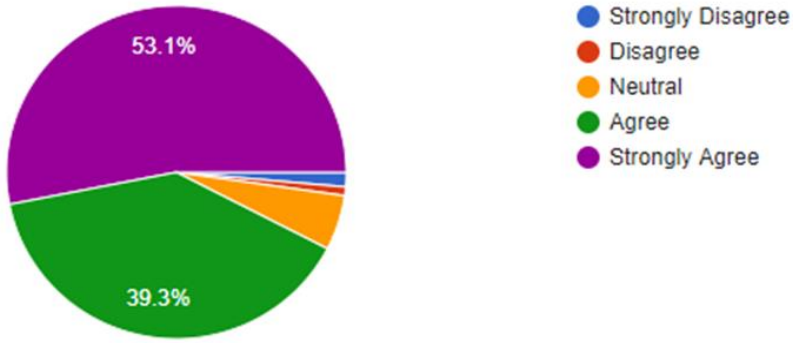


Figure 12: How do you feel about the statement 'I prefer to use comfortable seating in a learning space'?



For the designation of a space's ability to accommodate group work, only 42.8 percent of respondents indicated that such an ability impacted where they prefer to learn. In response to the statement: "I prefer an isolated learning space", of those that had responded yes to an impact, 18.9 percent strongly agreed, 25.8 percent agreed, 34.2 percent remained neutral, where 14.7 percent disagreed, and 6.3 percent strongly disagreed. Of the factors that make up a learning space considered in this research, the space's ability to accommodate

group work seems the least important to students and the most divisive in terms of preference.

Figure 13: Does a space's ability to accommodate group work impact why you chose your preferred learning space

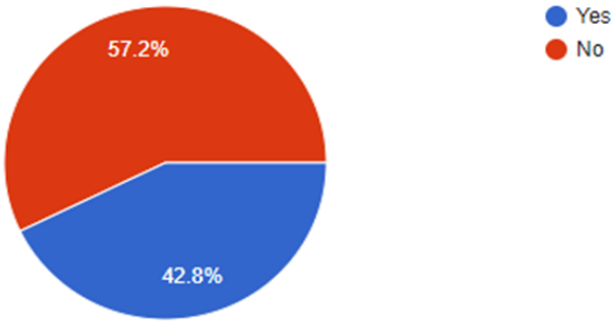
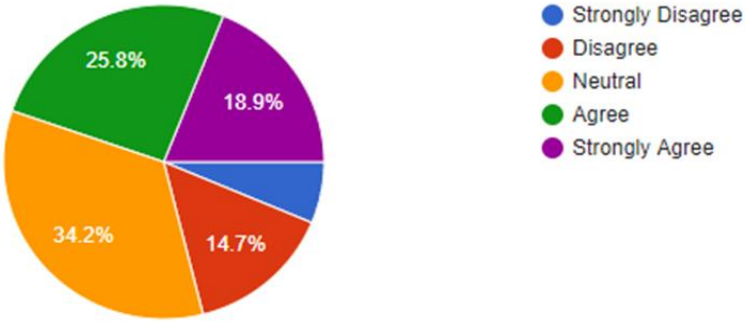


Figure 14: How do you feel about the statement 'I prefer an isolated learning space'?



Comparison

When ranked in order of importance to respondents, from most important characteristic to least, the results are presented in Table 1

Table 1: Student opinions on varying characteristics of a space

Characteristic	**% of students who state it matters**

Sound Levels	91.8%
Desk Space	88.9%
Temperature	82%
Seating Comfort	80.5%
Amount of People	73.5%
Lighting	65.3%
Ability to Accommodate Group Work	42.8%

Table 2 breaks this down further into the students who preferred particular scenarios. The amount of desk space has the highest percent for a "strongly" response, with 59.1 percent of students responding that they prefer a larger desk space. Sound comes in a close second with 58.1 percent preferring quietness. Third through seventh respectively go to the following: comfortable seating, natural lighting, uncrowdedness, and isolation. The strongest consensus amongst students goes to the amount of desk space, with 94.5 percent leaning towards a larger desk space. From most consensus to least, meaning from highest to lowest percentage of non-neutral opinions on one side (i.e. prefer), are the following characteristic leanings: comfortable seating, natural lighting, quietness, uncrowdedness, warmness, and lastly isolation. Thus, importance does not always equate consensus on student opinions. More students agree that sound levels are important, but fewer agree on what the sound levels should be than agree on what size the desk space should be.

Table 2: Breakdown of student preferences on varying characteristics of a space

Characteristic	**% that strongly prefer**	**% that prefer**	**% that were neutral**	**% that disfavour**	**% that strongly disfavour**
Natural Lighting	49.5%	28.2%	17.2%	2.7%	2.4%
Warmness	16.5%	43.3%	20.9%	16.5%	2.8%
Quietness	58.1%	28.3%	7.6%	3.9%	2%

Larger Desk Space	59.1%	35.4%	3.6%	0.5%	1.5%
Crowdedness	3.4%	6.8%	9.5%	33.2%	47.1%
Comfortable Seating	53.1%	39.3%	5.3%	0.8%	1.4%
Isolated	18.9%	25.8%	34.2%	14.7%	16.3%

Attitudes towards Available Spaces

A key aspect of this project was to establish in depth research into student opinions on the spaces available to them. The spaces discussed were largely spaces specifically found on the campus of University College Cork, but are likely comparable to spaces on campuses at other universities. Participants could choose from the following spaces:

- A traditional lecture hall. Defined as a space that has vast, fixed seating facing the direction of teaching supplies such as whiteboard or podium. Students are responsible for keeping notes on their own supplies.
- A small classroom. Defined as a having less extensive, more flexible and movable seating that faces similar teaching supplies. Students are still responsible for keeping notes on their own supplies.
- The library book stacks. Defined as seating available amongst the book shelves of the library, where students mainly bring their own technology.
- The library reading rooms. Defined as having rows of seating that are confined to a space that mandates quietness, and has access to plugs. Students must bring their own technology for the most part.
- The library creative zone. Defined as a room in the library equipped with various technology like Blackstone Launch Pads, a data projector, audio and recording facilities, PCs, flat screen monitors, and more. It provides space for students who brought their own technology. It has various seating arrangements to accommodate lectures, group work, and individual work.
- Computer labs. Defined as being equipped with rows of PCs and printing equipment, but different labs would be equipped with different add-on technology.

- Common rooms. There are various common/sitting areas in the academic buildings of UCC. Many have seating arrangements for students to use.
- Cafes. The campus is equipped with a few cafes that have various seating arrangements, but all have access to coffee, teas, and food.
- Outdoor spaces. UCC also has extensive outdoor space that students can utilize, such as the grassy President's Garden or the amphitheatre.

The survey given asked students to rank these spaces in terms of how likely they were to facilitate creativity and engagement. These were crucially mentioned in the literature as capable of enhancing a student's experience, and something alternation of space can contribute to (Fisher, 2010). They were asked to rank each space between a one and five, one being the least likely to encourage the aforementioned behaviours.

In terms of active engagement, the spaces that received the most "ones", indicating least likely to encourage active engagement, were the traditional lecture hall and the outdoor spaces. On the contrary, the space that received the most "fives", indicating most likely to encourage active engagement, was the library reading room. As for creativity, the space that received the most "ones", indicating least likely to foster creativity, was a traditional lecture hall. The space that received the most "fives", indicating most likely to foster creativity, was the library creative zone. When taking an average (mean), the spaces score as follows:

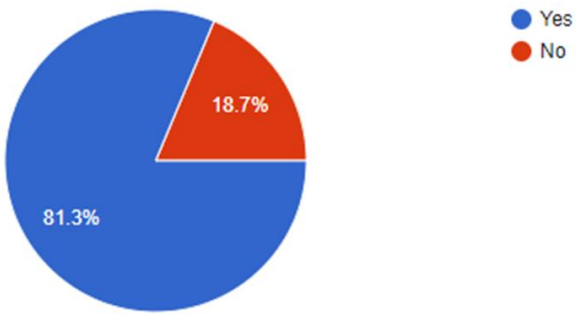
Table* 3: *Mean of engagement and creativity scores by space

Space	**Average Engagement Score**	**Average Creativity Score**
Traditional Lecture Hall	~2.286	~2.015
Small Lecture Classroom	~2.986	~2.674
Library Book Stacks	~3.439	~2.697
Library Reading Room	~3.737	~2.806
Library Creative Zone	~3.655	~3.697
Computer Lab	~3.513	~3.110

Common/Sitting Area in Academic Building	~2.683	~3.013
A Cafe	~2.345	~2.881
Outdoors	~2.152	~3.026

Therefore, the spaces that are above average (3) at encouraging engagement, from most encouraging to least are the library reading room, the library creative zone, computer labs, and the library book stacks. The spaces that are above average at facilitating creativity, from most likely to facilitate to least, are the library creative zone, computer labs, outdoors, and common/sitting areas in academic buildings. The creative zone more than marginally stands out in this category. The creative zone and computer labs being the only two that score above average in both categories. It is important to note that a space like the cafés may still serve a purpose even if they do not incite creativity and engagement, as a majority (81.3 percent) of student's state that having a place to relax on campus is beneficial to their academic achievement. Indeed, well-designed outdoor spaces may both increase creativity and help students relax (Jones, 2013). This is in line with Matthews and colleagues' research discussed in the literature review- that informal spaces can be quite beneficial to student success (Matthews et al., 2011).

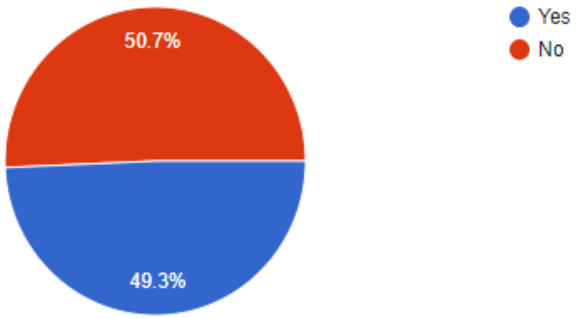
Figure 15: Percent of students reported having a space to relax on could increase their academic potential



Just because a space is on campus, such as the library creative zone, which marks highly in stimulating engagement and creativity, does not mean it is always available to benefit students. Almost half of students stated that the space they prefer to use is often

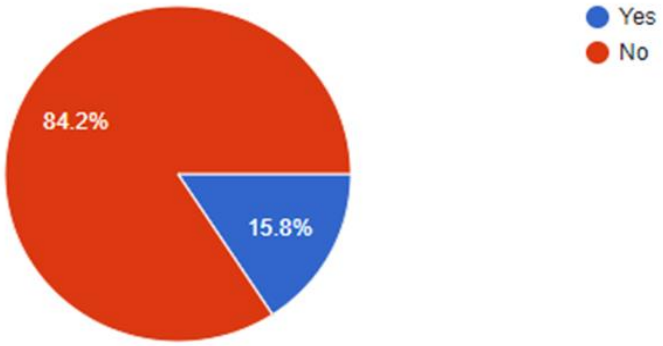
unavailable. Students were given the chance to say which preferred rooms are unavailable, and the library rooms and computer labs were listed most frequently. The spaces that students find incite the most engagement are also found to be the most unavailable.

Figure 16: Percent of students who often find preferable spaces unavailable



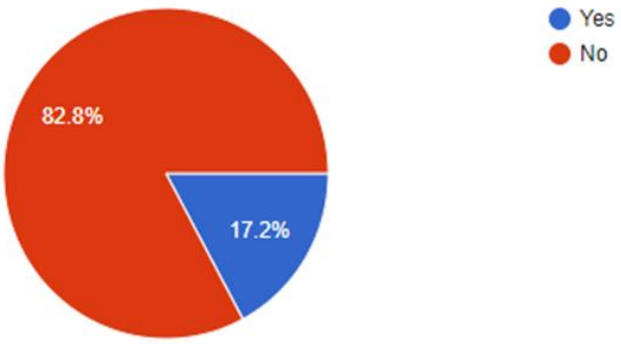
Additionally, just because a successful space exists, does not mean students are aware that it does. If a student does not know of a space, they cannot use it. The survey asked about student knowledge of newly implemented creative, technologically enhanced spaces on campus and the results indicated little awareness: Only 15.8 percent of respondents knew of the Digital Humanities Lab which, like the Library Creative Zone, is equipped with various state of the art technologies and seating arrangements.

Figure 17: Percent of students who have knowledge of the Digital Humanities Lab



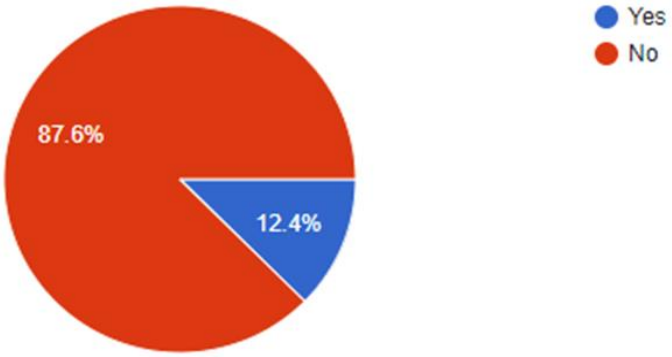
Only 17.2 percent of respondents were aware of Library Studio B.08, which operates as a recording studio and allows students to self-record videos and more.

Figure 18: Percent of students who have knowledge of Library Studio B.08



Only 12.4percent of respondents were aware of the Assistive Technology Quiet Room, which provides a quiet and tailored learning environment for students registered with disability services.

Figure 19: Percent of students who have knowledge of the Assistive Technology Quiet Room

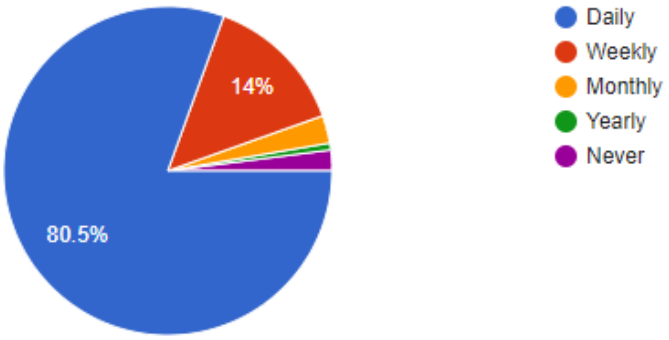


Attitudes towards Available Technology

Another key aspect of the project was to research student attitudes towards available technology on campus. As has been previously established in this chapter, technology is a major component of a space, both as a draw and an aid. Students were asked a variety of questions on the matter.

Many of the questions focused on student reliance on available technology, in order to establish it's use and importance. The results demonstrated a notable reliance, but also a strong degree of indpendence: 80.5 percent of respondants noted that they use their own technology daily for academic purposes and 14 percent at least weekly. With many of the spaces requiring students to bring their own technology, this seems logical. It also makes sense then that by a long shot the most requested technological change was more plugs.

Figure 20: Percent of students who use their own technology daily, weekly, monthly, yearly, or ever



This is not to say, however, that the campus providing technology goes unused or is by any means pointless. Nearly half of students note that the campus provides technology they lack at home, with printers being the most commonly noted. There is reference to advanced software and more advanced devices like photocopiers as well. More than half of respondants say they rely on campus technology to reach their academic goals. Furthermore, of those that do rely on campus technology, a strong frequency was recorded. Nearly 46.5 percent of relient students use the technology daily, while another 42.9 percent do weekly.

Figure 20: Percent of students who acknowledge technology on campus they do not have access to at home

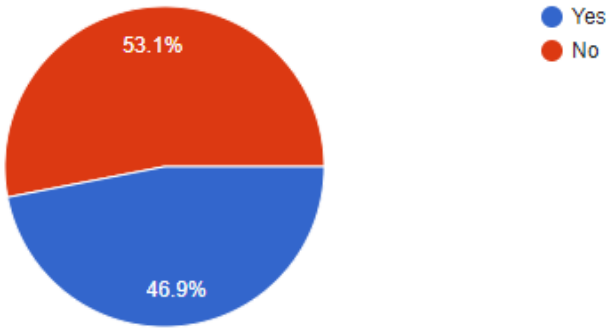


Figure 21: Percent of students who rely on campus technology

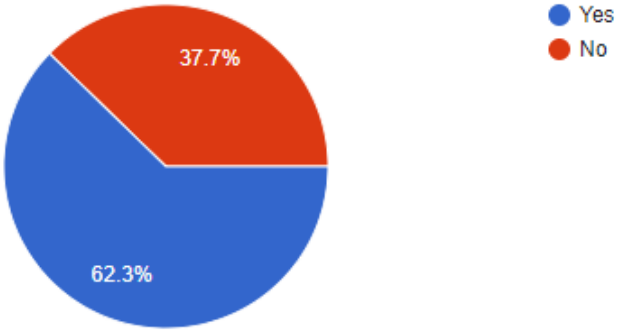
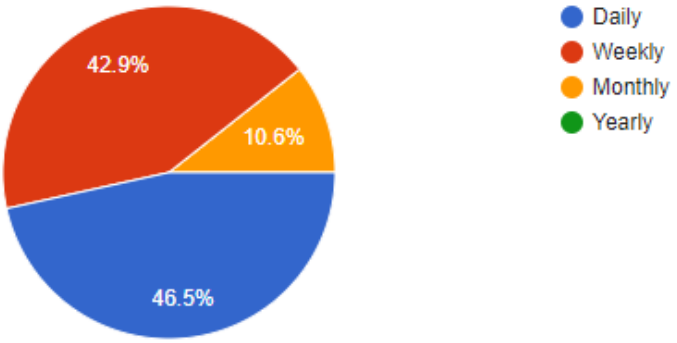


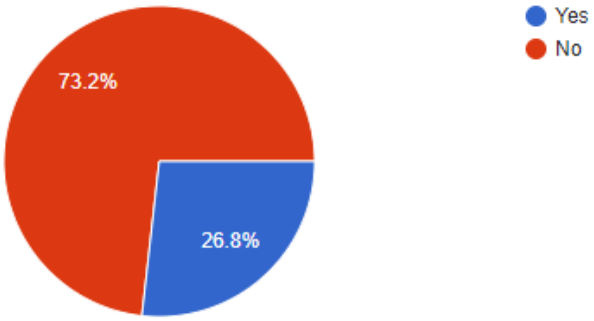
Figure 22: Breakdown of the frequency in which reliant students use campus technology



When questioned further, this relient group mentioned technologies such as laptops, wifi, software, etc. By a long shot, however, the most frequently used by this group was computers, followed by printers.

Though there is a reliance, demonstrating a need that the university is filling, that does not necessarily mean the need is being fulfilled to its' fullest. More than a fourth of respondants state they did not believe the technology on campus was being used to its' full potential. Some participants were critical that the technology was outdated in many spaces and some advaced technology was confined to certain spaces, such as statistical software to the computer labs in the Western Gateway Building. Another frequently mentioned request was to apply the recording technology more universally by implementing "Panapto" to record lectures. On the flipside, that means almost three fourths of respondents indicate that the technology *is* being used to the full potential. That is, while some are unsatisfied, the majority are satisfied. There are areas for improvement, but the reliance and response to the question of fulfilment show useful and used technology on campus.

Figure 23: Percent of students who feel technology is not reaching its' full potential



Cross Ananylsis

Another focal point of this research was to establish any correlation between students opinons on learning spaces and disadvantage (specifically economically disadvantadged and students registered withDSS) and academic success.

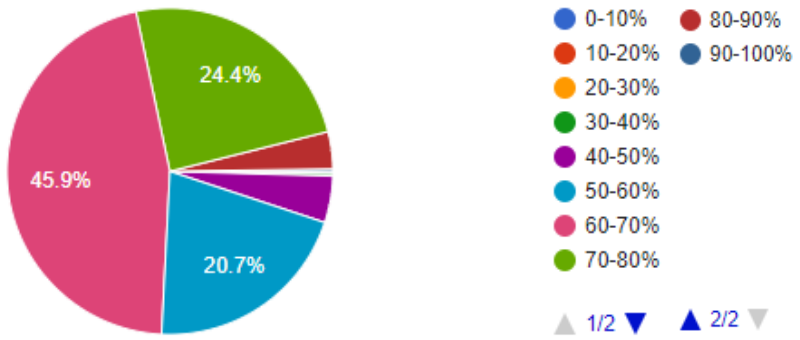
There is a lot of data, and therefore a large chances of finding correlation, but one of the most straightforward is to look into a corrrelation between technological reliance and these demographics.

First, the demographics themselves must be established. In order to establish economic disadvantadge, the survey asked participants if they received dispersement of the SUSI grant, as well as the need/hours of employment by the student to fund schooling. This was more objective than asking students if they felt they were financially undersatsified. The measurement of the SUSI grant was particularly helpful as those who recive it would be from established households under financial strain, as that is the qualification to receive such college funding from the government. Only about one third (34.1%) of respondants stated that they received the SUSI grant.

The establishment of disabilty was fairly straightforward and objective, by asking the respondents to identify if they are registered with the campus' Disability Support Services. Further analysis was also be conducted, asking which branch of disability that the DSS acknowledges they qualified under: 12 percent of respondants are registered.

Next, for academic achievement, the survey asked students to state their average grade in college, as well as their leaving certificate score. Each of these questions were multiple choice and in distributed categories, so that they might be easier compared to repeated surveys using statistical analysis techniques like z or t scores. The results of current grades are more important as they are more in line with current student interaction on campus. The results are shown below in Figure 25, with just under half (45.9%) averaging 60-70%

Figure 24: Participants average grade



Once the demographics have been established, correlations can be made. As aforementioned, one of the most straightforward ways to cross reference the demographics is with technological reliance. This is for multiple reasons. One, is that technology has been established as a key component of any space, another is that, as established in the literature review, technology has a shorter life cycle than the architecture of a building. For example, Fisher pointed out that a building might last one hundred years and a piece of technology only three (Fisher, 2010). Therefore, it is easier to change and adapt. Additionally, the yes/no nature of the question of reliance and the yes/no nature of the first two demographics makes binary regression possible which is a direct way to make a correlation. Furthermore, it is logical to question if the disadvantaged would be more reliant on technology, possibly due to lack of adequate access outside campus, insufficient funds or specialized needs. If this were proven correct, and the university wants to remain a place that supports learning in students from all walks of life, it might want to consider providing adequate technology so the

disadvantaged can be supported, and not left by the wayside as the literature review (Chapter 1) points out can happen as technology advances (Punie, 2007). These regressions can help see if there is any truth to previous research findings.

The first correlated was if a student received the grant and if they relied on campus technology to complete their academic goals. No statistically significant correlation was found. In a proportional analysis, roughly 60 percent of students who receive the SUSI rely on campus technology versus 65 percent of those who do not. In a numerical analysis conducted via binary regression logistics model with a 95 percent confidence interval and the assumption that there would be no statistical difference, the P-Value is above .05, accepting the assumption. Therefore, there is no statistical correlation between receiving a SUSI grant and relying on campus technology. Further analysis could be conducted by making a plot point distribution between the number of hours worked and the number of hours a week each student relies on campus technology, but given that a binary regression logistics model correlating if a student required employment with reliance similarly found no statistical significance, the matter was not further analysed.

Table 4: Proportional analysis of receiving a SUSI grant vs. reliance on campus technology

		Do you rely on the technology on campus to help reach your academic goals?			
		No		Yes	
		Count	Row Total N %	Count	Row Total N %
Do you receive the SUSI grant?	No	115	39.4%	175	59.9%
	Yes	51	33.8%	99	65.6%

Table 5: Numerical analysis of receiving a SUSI grant vs. reliance on campus technology

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Do you receive the SUSI grant?(1)	.243	.210	1.343	1	.246	1.276	.845	1.925
	Constant	.420	.120	12.233	1	.000	1.522		

a. Variable(s) entered on step 1: Do you receive the SUSI grant?.

The next correlated was registration with the Disability Support Services and reliance on campus technology. A statistically significant correlation was found. Roughly 80 percent of DSS students relied on campus technology versus roughly 60 percent of non DSS students. In a numerical binary regression logistics model with a 95 percent confidence interval based on the assumption there would be no statistical difference, the P-Value was less than .05, rejecting the assumption. Therefore, there is a statistical correlation between being registered with DSS and reliance on campus technology. It is important to note that correlation does not mean causation, and a third unforeseen factor could be responsible for this correlation. This said, that students registered with campus disability services would rely to a greater extent on technology is both intuitive and supported by previous research on learning spaces (Blackmore et al., 2011). It is important information that this segment of the student population students are more reliant on campus technology, and is something to consider when establishing learning spaces on campus. The odds ratio is 2.551, meaning DSS students are roughly two and a half times more likely to rely on campus technology than their peers not registered with DSS, only adding to the significance.

Table 6: Proportional analysis of disability status vs. reliance on campus technology

		Do you rely on the technology on campus to help reach your academic goals?			
		No		Yes	
		Count	Row N %	Count	Row N %
Are you registered with the Disability Support Service?	No	155	40.1%	232	59.9%
	Yes	11	20.8%	42	79.2%

Table 7: Numerical analysis of disability status vs. reliance on campus technology

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Are you registered with the Disability Support Service?(1)	.936	.354	6.989	1	.008	2.551	1.274	5.108
	Constant	.403	.104	15.114	1	.000	1.497		

a. Variable(s) entered on step 1: Are you registered with the Disability Support Service?.

The last considered demographic was academic achievement, which could not be performed via a numerical binary regression logistics model, nor directly deals with how disadvantaged the student is. However, it is worth looking into whether or not there are trends in preferences and reliance among the more successful students. Using a numerical anova model, basing the assumption there is no statistical difference, the P-value is .37 indicating no statistical correlation between reliance on technology and grades.

Conclusion

This research delves deeply in student attitudes towards their available learning spaces and technology, as well as correlations with the demographics of achievement, affluence, and disability. This thesis is the first to quantitatively analyse much of this data.

Based on surveys, to a varying degree, students prefer spaces to; have natural lighting, be warm, be quiet, have a large desk space, be uncrowded, have comfortable seating, however, they remain relatively indifferent to a space's ability to accommodate group work. Though these are the trends, it is important to note that no stance suited 100 percent of students. This suggests that while some choices for devising a space may suit the majority, every student learns differently and no one choice suits all.[1]

The spaces that scored above average in encouraging active engagement, from most encouraging to least include the following: the library reading room, a quiet room in the library that provides desks and outlets for students to bring their own learning materials; the library creative zone, a space with the newest technology and various seating arrangements; computer labs, spaces with rows of computers and printers and occasionally software; and the library stacks, seating amongst the bookshelves of the library where students bring their own technology. The spaces that scored above average at inducing creativity from most prompting to least include: the library creative zone; computer labs; outdoors, which includes a garden and amphitheatre; and common/sitting areas in academic buildings, which is comprised of various seating between other learning spaces. The creative zone stands out significantly in this regard. The only two spaces that scored above average in both categories are the creative zone and the computer labs.

[1] In fact, the author prefers learning in dark, noisy, overcrowded and uncomfortable coffee shops, so is an outlier in almost all categories.

However, just because spaces that serve students creativity and engagement exist, does not mean they are always available. Students often find they do not have access to such spaces and there is a lack of awareness about newer learning spaces that could potentially aid their learning. Additionally, spaces that do not serve the purpose of either academic engagement or creativity, such as cafes, might still be beneficial as students find relaxing spaces helpful in their academic endeavours.

When it comes to technology, the majority of students use their own technology and are more interested in having access to more plugs and other common technology (i.e. printers) than more advance technology. That is not to say, however, that there is not a significant reliance on campus technology. Once again more simple devices like computers and printers were most used. A noticeable proportion of students did reference making software more easily acceptable, there was a focus on expanding recording software to record lectures.

The reliance on technology is significantly higher among the students registered with disability support services, but not those receiving the governmental financial aid or those getting certain grades. Further analysis might reveal other correlations between student attitudes and the demographics of achievement, affluence, and disability. Future research could delve deeper into the relationship between other opinions (i.e. attitudes about temperature and technology) and these demographics.

Chapter Five: Discussion/Conclusion

Now that the framework surrounding learning spaces and available technology has been explored, along with the format and results of this research, a more in depth discussion can be made. It is clear that this case study helped fill a gap in the data, but it is in no means an answer to all gaps.

One of the most prominent gaps this study addresses is the lack of quantitative data, which was established in chapter one. This study was original in this regard. It was one of the first to ask in depth quantitative questions about student attitudes towards various spaces across campus, the technology that is present in said spaces, and the aspects that make up said spaces.

However, the study is unoriginal in the fact it represents only one university. As a case study it joins the ranks of many of the studies discussed in chapter one. This leaves room for more original research into comparing these results with results from other institutions. Such research is especially needed in Ireland, as most research discussed previously is from Australia, the United States, and the United Kingdom. Therefore, the fact that this study takes place in Ireland adds to its' originality, even if it is a case study.

Still, as aforementioned, this study is in no way comprehensive enough to answer the call for more quantitative data. More research is needed outside of Ireland as well as in Ireland. After all, the studies calling for more quantitative data were not even conducted within Ireland's limits. This is expected given the comparative lack of research into learning spaces compared to learning styles in general. The data found in this study not only answers that call for quantitative data, but also the call mentioned in chapter one to include student opinions in research. They are, after all, the main benefactors of learning spaces.

Their opinions, as this research demonstrates, are never one hundred percent in unison. This serves as a reminder that there is no one design of space that fits the needs of all students. However, trends can be established. There was a clear trend in this research that students were both independent in their technological use, as well as dependant on campus technology, establishing that the two are not mutually exclusive. For example, a student may use their own laptop but rely on a campus printer.

Interestingly, such reliance was significantly higher amongst those registered with DSS compared to those not registered with DSS. Correlation does not equal causation so such results could be due to a third factor, but it is worth noting the correlation so the university can provide adequate amounts of technology for students reliant on disability services to level the playing field and provide inclusive support. This is especially important given that the fringe of the literature references the possibility that as technology advances the disadvantaged are at risk of being left behind (Punie, 2007).

No significant difference was found in regards to technological reliance between those who received governmental financial aid those who did not. Perhaps this study indicates that the financial aid system is sufficient enough that students from lower socio-economic backgrounds can afford the same amount of independent technology. This is or course speculation, but it would be interesting to repeat a similar study in a county with less financial assistance to see if the results differ.

There was also no significant correlation between reliance on campus technology and grades. Therefore, this study finds no correlation between academic success and reliance on campus technology.

When it comes to exact opinions on campus technology, students rarely requested innovative technology, but rather more of what is already present. For example, plugs were by a long shot the most requested. Making software available across all of campus rather than just some computers was also requested enough to be noticeable.

There are trends in regards to the makings of a space. Students prefer natural lighting, a warm atmosphere, a quiet atmosphere, larger desk space, an uncrowded atmosphere, comfortable seating, and were rather neutral about a space's ability to accommodate group work. The characteristics that the most students cared about to least are as follows: sound levels, amount of desk space, temperature, seating comfort, lighting, and then ability to accommodate group work. From most consensus to least, meaning from highest to lowest percentage of non-neutral opinions on one side (i.e. prefer), are the following characteristic leanings: comfortable seating, natural lighting, quietness, uncrowdedness, warmness, and lastly isolation.

There are also quantitative trends in regards to current existing spaces. As this is a case study, the spaces are specific to University College Cork. However, each space is

described so the study could be repeated at another university if they were to substitute their own similar spaces. The survey is designed to be repeated within UCC as well. Some questions were specifically put into evenly spaced categories so t-tests or other statistical comparisons could be made. So, for example, the grades of students at this time could be compared to the grades of students at a future time after changes are made on campus to see if there is a statistical difference.

Students identified only two spaces, the library creative zone and the computer labs, that ranked above average in terms of encouraging creativity and active engagement. As has been established numerous times in this research, these are some of the best measurements for the success of a space. This is because, as mentioned in chapter one, enhanced spaces don't necessarily increase graduation rates but by increasing creativity and active engagement they can make students feel better prepared for their careers (Fisher, 2010). This has already been established for the fields of engineering and medicine (Fisher, 2010). However, it can be useful for other spaces as well. For example, someone taking a marketing course would be better prepared to enter the field if that had repeated practice with relevant software like graphic design software (i.e. photoshop). One scholar took it as far as to say traditional classrooms were remnants of the bygone industrial age, preparing students for positions that are no longer relevant (Punie, 2007). It does make sense that as society changes the teaching styles, tools, and spaces change with it.

This brings to the front the belief that changing a space alone is not enough, but the teaching must change along with it. An example within UCC is the moot courtroom. The space is used to its full potential if students are able to practice as if it were a real courtroom, rather than just sit and listen to a lecture in the space. On the flip side of the coin, the teaching style of having students practice their field (i.e. presenting a case) is easier in the moot court room than a traditional lecture theatre. The two are interconnected, flip sides of the same coin. This research, however, focuses on the physical space. Just because the focus is not teaching styles, does not mean it can't be brought to attention that teaching styles must change along with the physical space in order for the physical space to be used to its' full potential.

It is important to note that spaces other than the computer labs and library creative zone serve a purpose as well. Other spaces rank above average at creativity or encouraging active engagement independently. For encouraging active engagement the spaces that are

above, from most encouraging to least are the library reading room, the library creative zone, computer labs, and the library book stacks. The spaces that are above average at facilitating creativity, from most likely to facilitate to least, are the library creative zone, computer labs, outdoors, and common/sitting areas in academic buildings. Additionally, a space cannot be counted out as useful just because it does not mark above average in the aforementioned categories. More than half of students report that having a place to relax on campus helps them in their academic goals, so a place like a café, which did not mark above average in either category, may still serve a purpose. This is in line with the research done by Kelly E. Matthews, Tori Andrews, and Peter Adams. Their research qualitatively finds through 103 informal interviews that spaces like these can foster belonging and social interaction which are crucial to student engagement (Matthews et al., 2011).

Another important note that this research uncovers is that just because innovative spaces exist, students aren't always aware of them. When questioned about the awareness of three technologically enhanced spaces on UCC's campus, the results were strikingly low. This indicates that building enhanced spaces is not enough, they must be marketed as well. Students cannot benefit from a space they do not know about.

Similarly, students will have trouble benefitting from spaces that are often unavailable to them. A majority of students state a preferred space is often unavailable. Among the most listed are the spaces students find most encouraging in terms of active engagement and creativity- the library creative zone and computer labs. This supports the aforementioned result that students are more concerned with more of what already exists on campus than new spaces and technology.

Of course, the changing of a space is only a partial factor in the advancement of education, pedagogy must change with it (Temple, 2007; Fisher, 2010; Punie, 2007). Therefore, it would be interesting to follow up with both students and lecturers after the change of a space to investigate how they adapt to the new space. Education is a multi-faceted field and the physical space is just one facet.

Given these considerations, the following recommendations are made:

- More marketing of enhanced spaces
    - Students cannot benefit from spaces they are unaware of and this research demonstrates a significant lack of awareness

    - Research into student awareness of said spaces before and after marketing could demonstrate effectiveness of marketing
- Adequate technology should be set aside for students registered with disability services and more research should be conducted on the needs of this population
    - This research finds a significant link between reliance on technology and the student population reliant on disability services
    - Further research into the exact needs of this population and cause of this link is, however, urgently needed
    - If a campus is to adequately support this population, it must acknowledge this link
- Further cross-analysis
    - There may be trends amongst certain courses and genders that are relevant when designing specific spaces
- More access to technologically enhanced spaces on campus
    - This research demonstrates a lack of availability of the spaces students benefit from the most (i.e. computer labs and the library creative zone)
    - Many students find their favourite learning space unavailable
    - One of the more common technological complaints is that software is limited to only certain computer labs
    - Similar to students being unable to benefit from spaces they do not know about, they cannot benefit from spaces that are unavailable to them
    - When building new spaces quantity over innovation might need to be considered

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Appendices

Survey Pre-statement:

You are all being invited to participate in a study researching student attitudes towards available learning spaces and technology at UCC as part of Masters of Research Thesis sanctioned by the committee for the Student Hub Project. The data collected will be secured and possibly be used for future studies surrounding learning spaces. A benefit of participating in the study is that your voice and opinions can be heard by members of the university!

If you decide to participate you will be asked to take part in a short survey, which should take about eight minutes.

- *Participation is completely voluntary.*
- *Participation is not linked to any academic forum.*
- *You have the right not to complete the survey, not to answer questions that make you uncomfortable, and to cease participation at any time.*
- *By participating (i.e. answering questions), you are consenting for that data to be used.*
- *Please do not participate or consent if you are under 18.*

Your data will be completely confidential and anonymous, so we will not ask you for your name or any other identifying features. It will be stored for ten years by the university, and then destroyed.

Thank you for listening! If you have any questions feel free to contact Kelley Hammeran at 115123146@umail.ucc.ie

You can also contact Dr. James Windle at james.windle@ucc.ie and Dr. Mike Cosgrave at m.cosgrave@ucc.ie

Survey Exit Statement:

Thank you for your cooperation.

- *Your anonymous data will be passed onto the researcher and research team.*
- *Your data will be safely secured.*
- *Your opinions will be analysed in conjunction with your demographics.*

In case you found any of the questions disconcerting, attached is the contact information for the counselling centre, disability support service, and the student assistance fund.

UCC Counselling Centre

By Phone: *021 490 3565*
By Text: *087 215 2505 (Please include your full name)*
By Email: *counselling@ucc.ie*

Address: *Room 6, Ardpatrick House, College Road, Cork. (Next to College Car Park)*

UCC Disability Support Service

By Phone: *021 4902985*
By Fax: *021 4903123*
By Email: *dssinfo@ucc.ie*

Address: *Cork South Lodge, UCC, College Road, Cork*

UCC Student Assistance Fund

By Phone: *021 490 3562*

By Email: *studentassistancefund@ucc.ie*

Address: *Upstairs on 1st Floor, 1-2 Brighton Villas, Western Road, UCC*

Survey:

Learning Space: any physical space used to enhance academic insight

1. What is your gender?
   A. Male
   B. Female
   C. Other

2. What is your age?
   A. 18-19
   B. 20-21
   C. 22-23
   D. 24-29
   E. 30-35

F. 36-40
G. 40+

3. Do you receive the SUSI grant?
A. Yes
B. No

4. Do you need to have paid employment to support yourself during college?
A. Yes
B. No

4a. *Free write*- If yes, how many hours do you work a week on average?

5. Are you registered with the Disability Support Service?
A. Yes
B. No

5a. If yes, please check all that apply:
A. Aspergers Syndrome
B. Blind and vision impairment
C. Deaf and hard of hearing
D. Mental health difficulty
E. Physical difficulty
F. Significant ongoing illness
G. Specific learning difficulty
H. Neurological condition
I. Speech, language, and communication disorders

5a. *Free write*- Also if yes, which specific learning space on campus to you find the most accommodating and why?

6. What was your leaving cert score, if you have one?
A. 0-50
B. 51-100
C. 101-150
D. 151-200
E. 201-250
F. 251-300
G. 301-350

H. 351-400
I. 401-450
J. 451-500
K. 501-550
L. 551-600
M. 600-650
N. Do not have one

7. What is your average grade at the university?
A. 0-10%
B. 10-20%
C. 20-30%
D. 30-40%
E. 40-50%
F. 50-60%
G. 60-70%
H. 70-80%
I. 80-90%
J. 90-100%

8. *Free write*- What is your course?

9. *Free write*- Which place do you prefer to learn on campus (excluding classrooms)?

10. Do the light levels impact why you chose your preferred learning space?
A. Yes
B. No

10a. If yes, please select how you feel about the statement *"I prefer natural lighting in my learning space"*:
A. Strongly Disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

11. Does the temperature impact why you chose your preferred learning space?
A. Yes
B. No

11a. If yes, please select how you feel towards the statement *"I prefer a warm learning space"*:

A. Strongly Disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

12. Do the sound levels impact why you chose your preferred learning space?

A. Yes
B. No

12a. If yes, please select how you feel towards the statement *"I prefer my learning space to be quiet"*:

A. Strongly Disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

13. Does the desk space impact why you chose your preferred learning space?

A. Yes
B. No

13a. If yes, please select how you feel towards the statement *"I prefer to have a large desk space"*:

A. Strongly disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

14. Does the amount of people present impact why you chose your preferred learning space?

A. Yes
B. No

14a. If yes, please select how you feel towards the statement: *"I prefer to be in a crowded learning space"*:

A. Strongly Disagree
B. Disagree

C. Neutral
D. Agree
E. Strongly Agree

15. Does the comfort level of seating in a space impact why you chose your preferred learning space?
A. Yes
B. No

15a. If yes, please select how you feel towards the statement *"I prefer to use comfortable seating in a learning space"*.
A. Strongly Disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

16. Does a space's ability to accommodate group work impact why you chose your preferred learning space?
A. Yes
B. No

16a. If yes, please select how you feel towards the statement: *"I prefer an isolated learning space"*.
A. Strongly Disagree
B. Disagree
C. Neutral
D. Agree
E. Strongly Agree

17. Is there a space you prefer that is often unavailable?
A. Yes
B. No

18. *Free Write*- If yes, please list the space(s):

19. Which of the following learning spaces have you independently of lectures done schoolwork in the most?
A. Traditional Lecture Hall

B. Smaller Lecture Classroom
C. Library Book Stacks
D. Library Reading Room
E. Library Creative Zone
F. Computer Lab
G. Common/Sitting Area in Academic Building
H. A Cafe
I. Outdoors
J. Other (Please List):

20. Please select **ALL** of the following that you have used in the past two weeks independently of lectures:

A. Traditional Lecture Hall
B. Smaller Lecture Classroom
C. Library Stacks
D. Library Reading Room
E. Library Creative Zone
F. Computer Lab
G. Common/Sitting Area in Academic Building
H. A Cafe
I. Outdoors
J. Other (Please List):

21. Please select **ALL** of the following that you have used in the past month independently of lectures:

A. Traditional Lecture Hall
B. Smaller Lecture Classroom
C. Library Stacks
D. Library Reading Room
E. Library Creative Zone
F. Computer Lab
G. Common/Sitting Area in Academic Building
H. A Cafe
I. Outdoors
J. Other (Please List):

22. Please select **ALL** of the following that you have used in the past year independently of lectures:

A. Traditional Lecture Hall
B. Smaller Lecture Classroom
C. Library Book Stacks
D. Library Reading Room

E. Library Creative Zone
F. Computer Lab
G. Common/Sitting Area in Academic Building
H. A Cafe
I. Outdoors
J. Other (Please List):

23. *Free Write*-Which specific space, out of all the learning spaces on campus, do you feel actively participate in the most?

24. Please assign a number between one and ten to **each** of the following spaces, one signalling not encouraging active engagement and ten encouraging the most:

A. Traditional Lecture Hall
B. Smaller Lecture Classroom
C. Library Book Stacks
D. Library Reading Room
E. Library Creative Zone
F. Computer Lab
G. Common/Sitting Area in Academic Building
H. A Cafe
I. Outdoors
J. Other (Please List):

25. *Free write*- Which specific space, out of all the learning spaces on campus, do you feel facilitates the most creativity?

26. Please assign a number between one and ten to **each** of the following spaces, one signalling not fostering any creativity and ten fostering the most:

K. Traditional Lecture Hall
L. Smaller Lecture Classroom
M. Library Book Stacks
N. Library Reading Room
O. Library Creative Zone
P. Computer Lab
Q. Common/Sitting Area in Academic Building
R. A Cafe
S. Outdoors
T. Other (Please List):

27. Does having a space to relax on campus increase your academic potential?
    A. Yes
    B. No

28. If you had to estimate how many times you remained on, or came to, campus to study in the last month- how many times would you say?

29. *Free Write*- What one thing would you change about UCC learning spaces?

30. Please rank the following learning spaces from worst to best, one indicating worst:
    A. Traditional Lecture Hall
    B. Smaller Lecture Classroom
    C. Library Book Stacks
    D. Library Reading Room
    E. Library Creative Zone
    F. Computer Lab
    G. Common/Sitting Area in Academic Building
    H. A Cafe
    I. Outdoors
    J. Other (Please List):

31. Are you aware of the Library Studio B.08?
    A. Yes
    B. No

32. Are you aware of the Assistive Technology Quiet Room?
    A. Yes
    B. No

33. Are you aware of the Digital Humanities Lab?
    A. Yes
    B. No

34. Have you seen any university technology that you lack at home?
    A. Yes
    B. No

34a. *Free write*- If yes, please list.

35. *Free Write*- Which specific space, out of all the learning spaces on campus, has the most useful technology?

36. *Free Write*- Which specific space, out of all the learning spaces on campus, has the most outdated technology?

37. *Free write*- Which specific space, out of all the learning spaces on campus, best uses the technology it has? Why?

38. How often do you use your own technology (i.e. laptop, tablet, etc.) for an academic purpose?

A. Daily
B. Weekly
C. Monthly
D. Yearly
E. Never

39. *Free write*- Which specific space, out of all the learning spaces on campus, best allows for you to use your own technology? Why?

40. Is there a technology you feel is not being used to its full potential?

A. Yes
B. No

40a. If yes, please state what it is and describe why you feel this way:

41. Do you rely on the technology on campus to help reach your academic goals?

A. Yes
B. No

41a. If yes, how often do you rely on campus technology?

A. Daily
B. Weekly
C. Monthly
D. Yearly

42. *Free write*- If you had to estimate how many times you relied on campus technology in the last month, how many times would you say?

43. *Free write*- Also if yes, what technology do you use most?

44. *Free write*- What technology do you wish the university would add?

45. Has your use of technology while attending the university better prepared you for your desired career?

A. Yes
B. No

46. *Free write*- Specifically, list the software you benefit most from on campus:

47. *Free write*- Please state what software you wish the university would incorporate:

Breakdown of Selected Classrooms for Original Methodology:

Cluster	***Class on March 13th at 12:15?***	***Randomly Selected? If Yes: Class Name, Time, And Maximum Students***
Aras Na Laoi	**Yes #1**	
Aras Na Laoi	**Yes #2**	**LW6630/S, LW6631/S, LW6571/S, LW6575/S, LW6594/s, LW6538/S, LW6547/S, LW6565/S, LW6569/S (11:00-13:00), 70 Students**
Aras Na Laoi	**Yes #3**	
Aras Na Laoi	**Yes #4**	
Aras Na Laoi	**No**	
Boole	**Yes #1**	

Boole	**Yes #2**	
Boole	**Yes #3**	
Boole	**Yes #4**	
Boole	**Yes #5**	**SS3118/L, SS2010/L, SS6320/L (11:00-13:00), 35 Students**
Boole	**Yes #6**	
Brookfield G	**Yes #1**	
Brookfield G	**Yes #2**	
Brookfield G	**No**	
Brookfield G	**Yes #3**	**GM1002/SGL (12:00-13:00), 8 Students**
Brookfield G	**Yes #4**	
Brookfield G	**Yes #5**	
Brookfield G	**Yes #6**	
Brookfield 1	**Yes #1**	**OT1005/L (11:00-13:00), 30 Students**
Brookfield 1	**Booked, but 0 students**	
Brookfield 1	**Booked, but not for class**	
Brookfield 1	**Booked, but 0 students**	

Brookfield 1	**No**	
Brookfield 1	**Booked, but 0 students**	
Brookfield 2	**Booked, but 0 students**	
Brookfield 2	**Yes #1**	**GA3030/L (12:00-14:00), 6 Students**
Brookfield 2	**Booked, but not for class**	
Brookfield 2	**No**	
Brookfield 2	**Booked, but not for class**	
Brookfield 2	**Booked, but not for class**	
Brookfield 2	**Yes #2**	
Brookfield 2/3	**Yes #1**	**NU2055/L (12:00-13:00), 23 Students**
Brookfield 2/3	**Booked, but 0 students**	
Brookfield 2/3	**Booked, but 0 students**	
Brookfield 2/3	**Booked, but 0 students**	
Brookfield 2/3	**Booked, but not for class**	

Brookfield 2/3	**Yes #2**	
Civil & Elec	**Yes #1**	
Civil & Elec	**Yes #2**	**EC2209/L (12:00-14:00), 40 Students**
Civil & Elec	**Yes #3**	
Civil & Elec	**Yes #4**	
Connolly	**Provisionally booked, cannot see what for**	
Connolly	**Yes #1**	
Connolly	**Yes #2**	
Connolly	**Yes #3**	
Connolly	**No**	
Connolly	**No**	
Connolly	**Yes #4**	
Connolly	**Yes #5**	
Connolly	**Yes #6**	
Connolly	**Yes #7**	**ES4028/L (12:00-14:00), 60 Students**
Donovan's Rd	**Yes #1**	
Donovan's Rd	**Yes #2**	
Donovan's Rd	**Yes #3**	**SS2104/L (11:00-13:00), 25 Students**

Donovan's Rd	**Yes #4**	
Donovan's Rd	**Yes #5**	
Food Science	**Yes #1**	
Food Science	**No**	
Food Science	**Yes #2**	
Food Science	**Yes #3**	**ST6006/L, ST4055/L (12:00-13:00), 80 Students**
Food Science	**Yes #4**	
Kane	**Booked, but not for class**	
Kane	**Yes #1**	
Kane	**Yes #2**	**PY1006/L (12:00-13:00), 175 Students**
Kane	**Yes #3**	
Kane	**Yes #4**	
Kane	**Yes #5**	
Kane	**Yes #6**	
Kane	**Yes #7**	
North Mall Campus	**Booked, but 0 students**	
North Mall Campus	**Yes #1**	

North Mall Campus	**No**	
North Mall Campus	**Yes #2**	**AP6128/L (12:00-14:00), 20 Students**
North Mall Campus	**Yes #3**	
North Mall Campus	**No**	
North Mall Campus	**Booked, but not for class**	
North Mall Campus	**Yes #4**	
ORB G	**Yes #1**	
ORB G	**Yes #2**	
ORB G	**Yes #3**	
ORB G	**Yes #4**	
ORB G	**Yes #5**	
ORB G	**Yes #6**	
ORB G	**Yes #7**	**LC EFL/L (9:00-13:00), 15 Students**
ORB G	**Yes #8**	
ORB G	**Yes #9**	
ORB 1	**Yes #1**	
ORB 1	**Yes #2**	

ORB 1	**Yes #3**	
ORB 1	**Booked, but not for class**	
ORB 1	**Yes #4**	**IT3101/LC Gp B (12:00-13:00), 17 Students**
ORB 1	**Yes #5**	
ORB 1	**Yes #6**	
ORB 1	**Yes #7**	
ORB 2/3	**Yes #1**	
ORB 2/3	**No**	
ORB 2/3	**Yes #2**	
ORB 2/3	**Yes #3**	
ORB 2/3	**Yes #4**	**GE2101/LC (12:00-13:00), 12 Students**
ORB 2/3	**Yes #5**	
ORB 2/3	**Yes #6**	
Perrot Ave/College Rd	**Yes #1**	
Perrot Ave/College Rd	**Yes #2**	
Perrot Ave/College Rd	**Yes #3**	
Perrot Ave/College Rd	**Yes #4**	

Perrot Ave/College Rd	**Yes #5**	**GA3001/RT4 (12:00-13:00), 18 Students**
Perrot Ave/College Rd	**Booked, but not for class**	
Perrot Ave/College Rd	**Yes #6**	
Perrot Ave/College Rd	**No**	
Perrot Ave/College Rd	**Yes #7**	
West Wing	**Yes #1**	
West Wing	**Yes #2**	
West Wing	**Yes #3**	**FR2202/S (12:00-13:00), 18 Students**
West Wing	**Yes #4**	
West Wing	**Yes #5**	
West Wing	**Yes #6**	
West Wing	**Yes #7**	

West Wing	**Yes #8**	
Western Rd	**Yes #1**	
Western Rd	**Yes #2**	
Western Rd	**Yes #3**	**AS1603/L (12:00-14:00), 6 Students**
Western Rd	**No longer centrally allocated**	
Western Rd	**Yes #4**	
Western Rd	**No**	
WGB G1	**Yes #1**	
WGB G1	**Yes #2**	
WGB G1	**Yes #3**	
WGB G1	**Yes #4**	**AN3013/L (12:00-13:00), 50 Students**
WGB G1	**Yes #5**	
WGB G1	**Yes #6**	
WGB G1	**Yes #7**	
WGB G2	**Yes #1**	
WGB G2	**Yes #2**	
WGB G2	**Yes #3**	
WGB G2	**Yes #4**	**GE2101/LC (12:00-13:00), 26 Students**
WGB G2	**Yes #5**	
WGB G2	**Yes #6**	

WGB Upper 1	**Yes #1**	
WGB Upper 1	**Yes #2**	
WGB Upper 1	**Booked, but not for class**	
WGB Upper 1	**Booked, but not for class**	
WGB Upper 1	**Booked, but not for class**	
WGB Upper 1	**Yes #3**	
WGB Upper 1	**Yes #4**	**HS2026/L (12:00-14:00), 45 Students**
WGB Upper 2	**Yes #1**	
WGB Upper 2	**Yes #2**	
WGB Upper 2	**Yes #3**	
WGB Upper 2	**Yes #4**	
WGB Upper 2	**Yes #5**	**CS6407/L (12:00-13:00), 27 Students**
WGB Upper 2	**No**	

Results Graphs and Tables:

Figure 25: Do light levels impact why you chose your preferred learning space

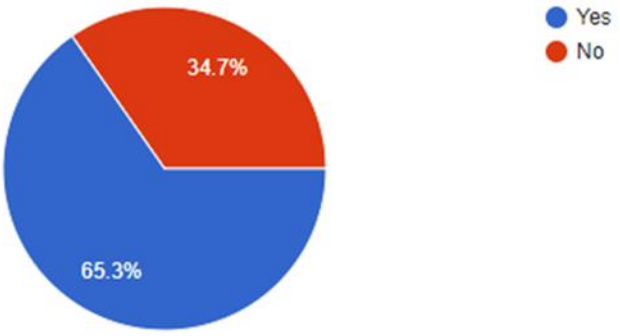

Figure 26: How do you feel about the statement 'I prefer natural lighting in my learning space'?

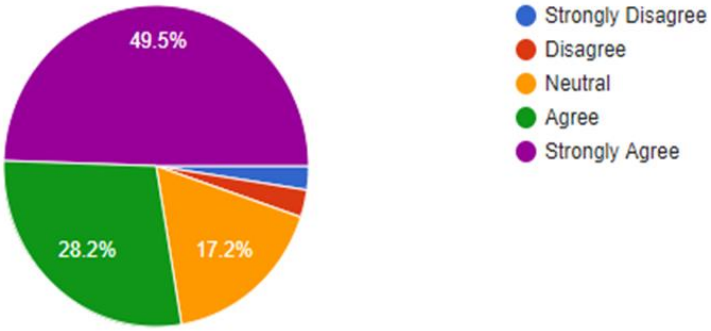

Figure 27: Does the temperature impact why you chose your preferred learning space

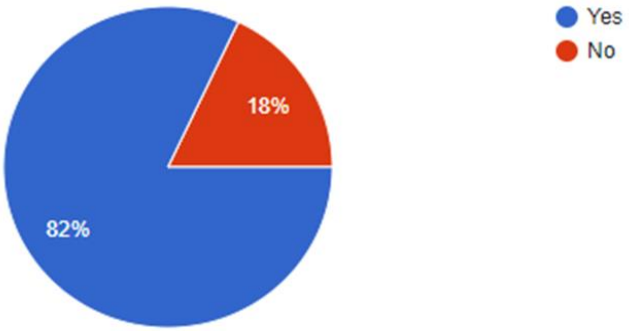

Figure 28: How do you feel about the statement 'I prefer a warm learning space'?

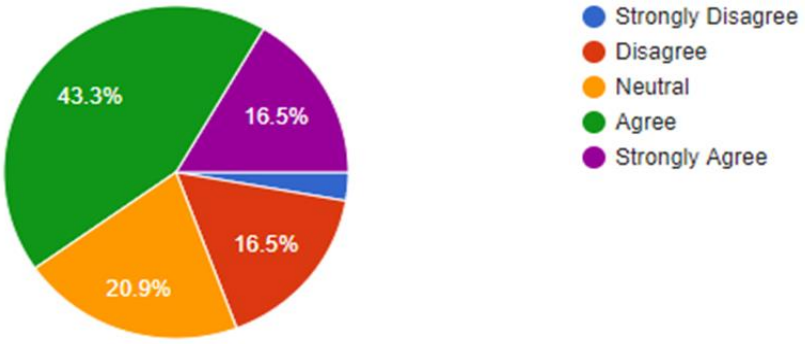

Figure 29: Do the sound levels impact why you chose your preferred learning space

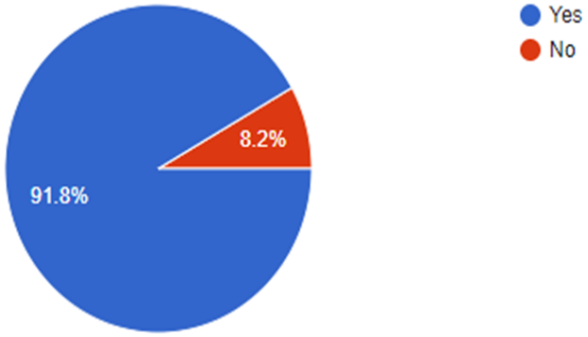

Figure 30: How do you feel about the statement 'I prefer my learning space to be quiet'?

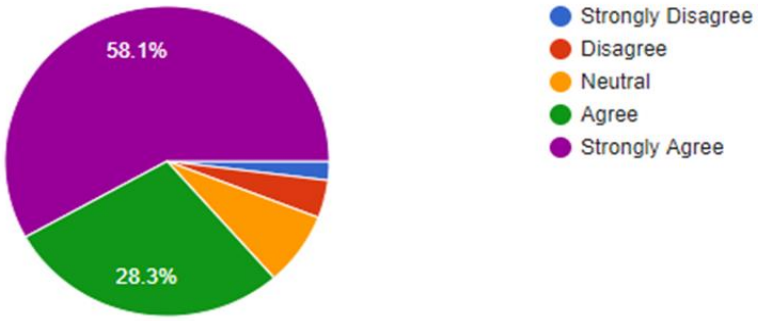

Figure 31: Does desk space impact why you chose your preferred learning space

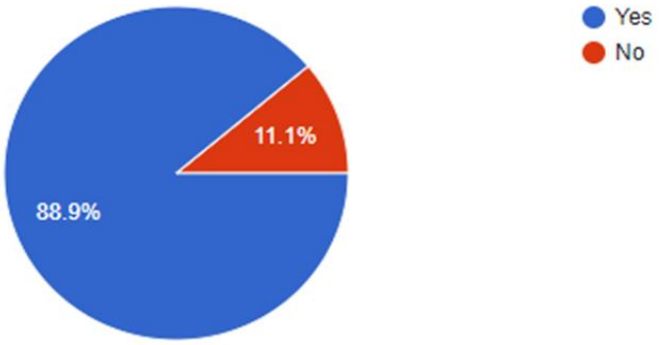

Figure 32: How do you feel about the statement 'I prefer to have a large desk space'?

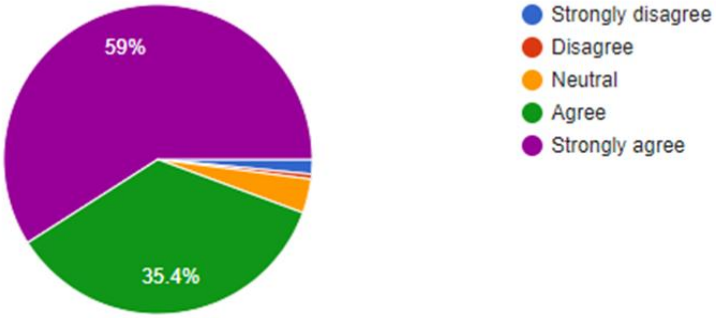

Figure 33: Does the amount of people present impact why you chose your preferred learning space

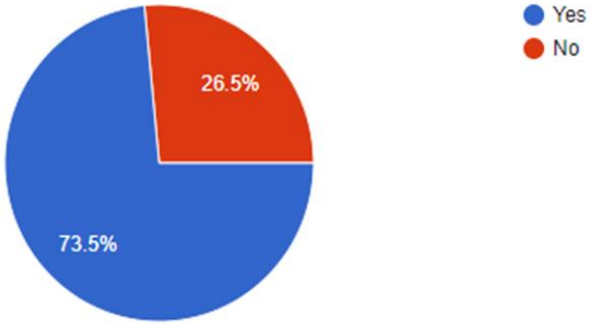

Figure 34: How do you feel about the statement 'I prefer to be in a crowded learning space'?

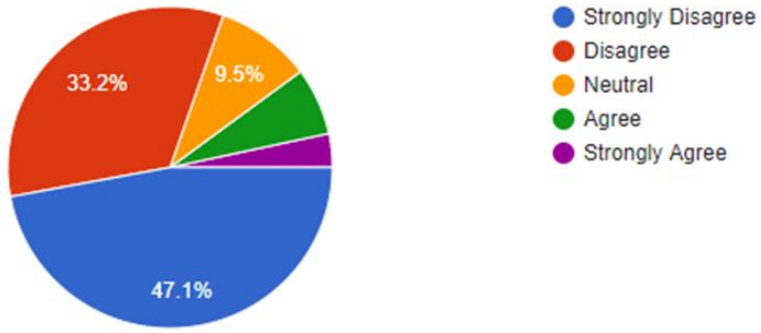

Figure 35: Does the comfort level of seating in a space impact why you chose your preferred learning space

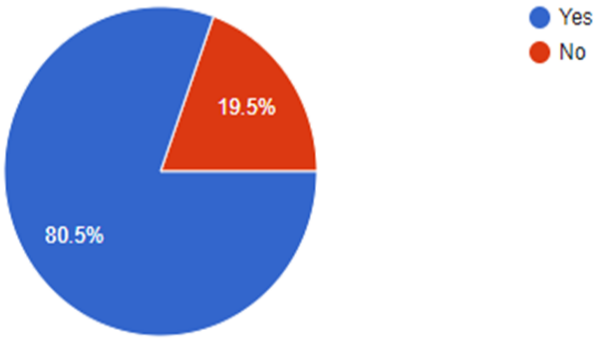

Figure 36: How do you feel about the statement 'I prefer to use comfortable seating in a learning space'?

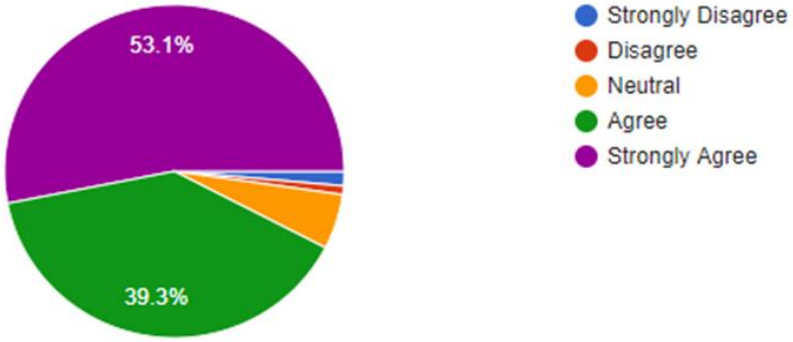

Figure 37: Does a space's ability to accommodate group work impact why you chose your preferred learning space

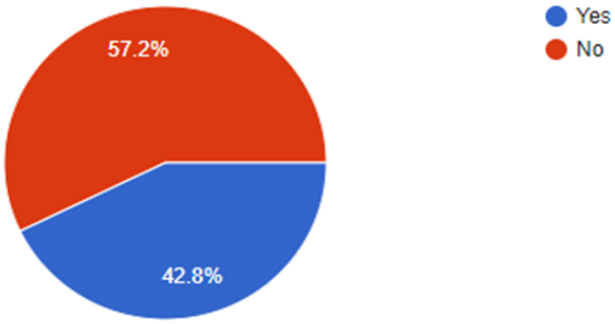

Figure 38: How do you feel about the statement 'I prefer an isolated learning space'?

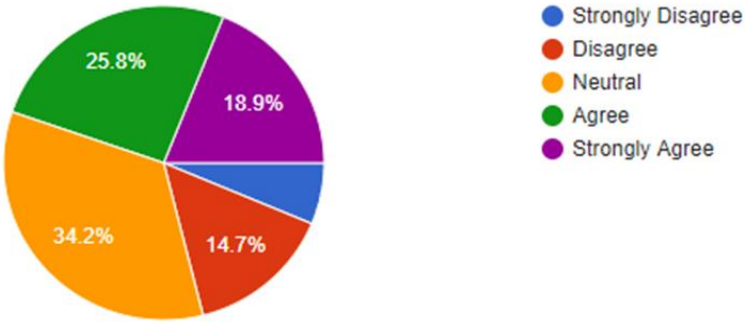

Table 2: Student opinions on varying characteristics of a space

Characteristic	**% of students who state it matters**
Sound Levels	91.8%
Desk Space	88.9%
Temperature	82%
Seating Comfort	80.5%
Amount of People	73.5%
Lighting	65.3%
Ability to Accommodate Group Work	42.8%

Table 2: Breakdown of student preferences on varying characteristics of a space

Characteristic	% that strongly prefer	% that prefer	% that were neutral	% that disfavour	% that strongly disfavour
Natural Lighting	49.5%	28.2%	17.2%	2.7%	2.4%
Warmness	16.5%	43.3%	20.9%	16.5%	2.8%
Quietness	58.1%	28.3%	7.6%	3.9%	2%
Larger Desk Space	59.1%	35.4%	3.6%	0.5%	1.5%
Crowdedness	3.4%	6.8%	9.5%	33.2%	47.1%
Comfortable Seating	53.1%	39.3%	5.3%	0.8%	1.4%
Isolated	18.9%	25.8%	34.2%	14.7%	16.3%

Table 3: Mean of engagement and creativity scores by space

Space	Average Engagement Score	Average Creativity Score
Traditional Lecture Hall	~2.286	~2.015
Small Lecture Classroom	~2.986	~2.674
Library Book Stacks	~3.439	~2.697
Library Reading Room	~3.737	~2.806
Library Creative Zone	~3.655	~3.697
Computer Lab	~3.513	~3.110

Common/Sitting Area in Academic Building	~2.683	~3.013
A Cafe	~2.345	~2.881
Outdoors	~2.152	~3.026

Figure 39: Percent of students reported having a space to relax on could increase their academic potential

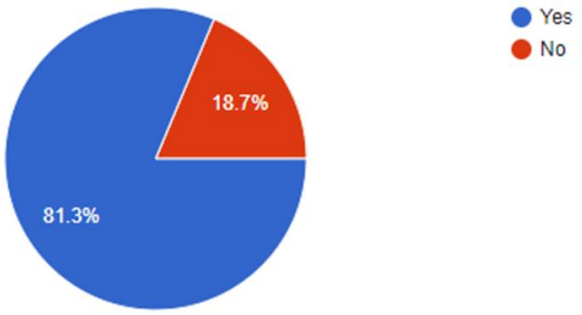

Figure 40: Percent of students who often find preferable spaces unavailable

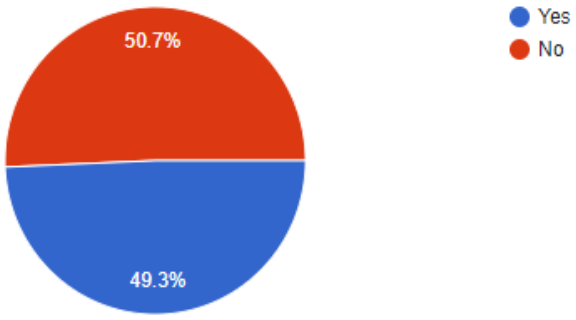

Figure 41: Percent of students who have knowledge of the Digital Humanities Lab

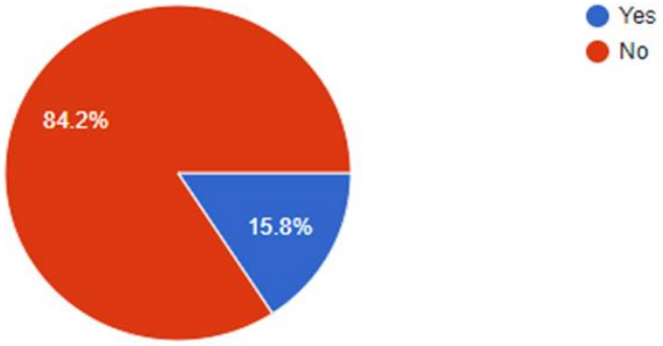

Figure 42: Percent of students who have knowledge of Library Studio B.08

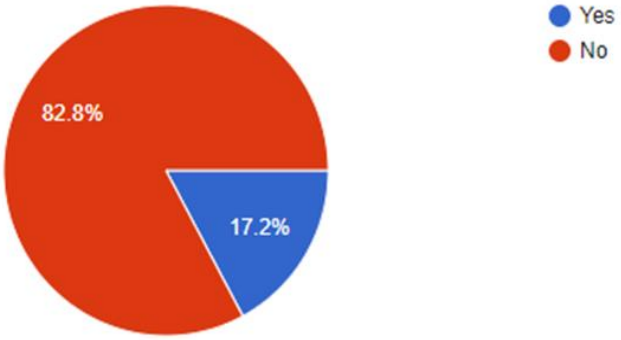

Figure 43: Percent of students who have knowledge of the Assistive Technology Quiet Room

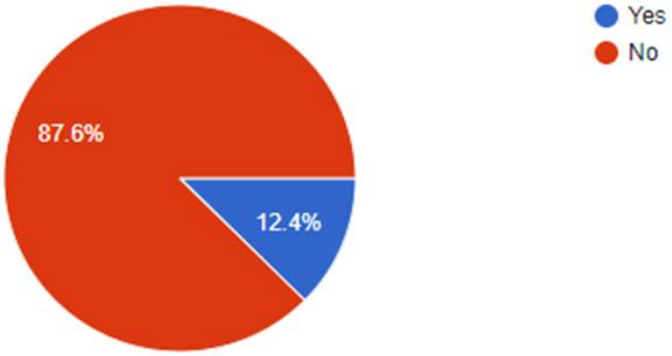

Figure 20: Percent of students who use their own technology daily, weekly, monthly, yearly, or ever

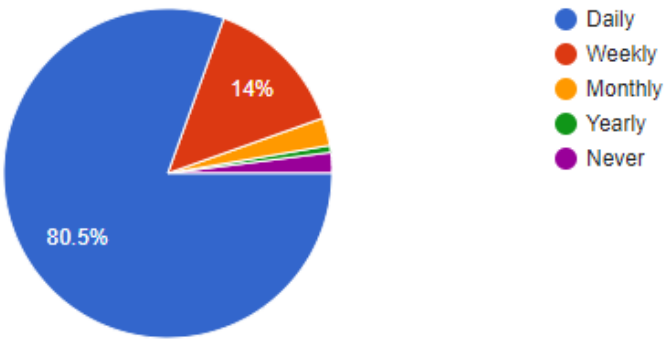

Figure 44: Percent of students who acknowledge technology on campus they do not have access to at home

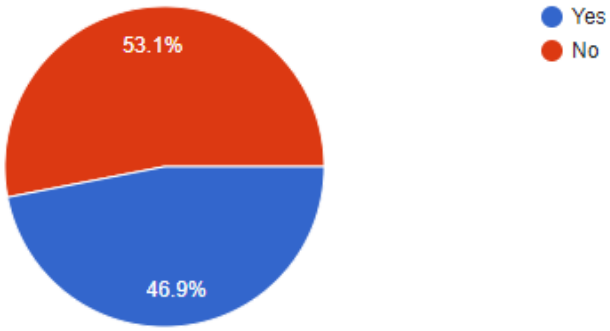

Figure 45: Percent of students who rely on campus technology

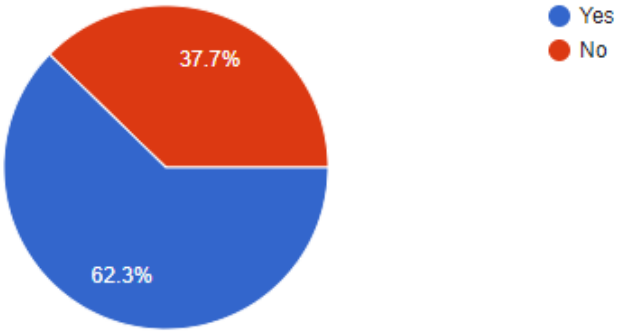

Figure 46: Breakdown of the frequency in which reliant students use campus technology

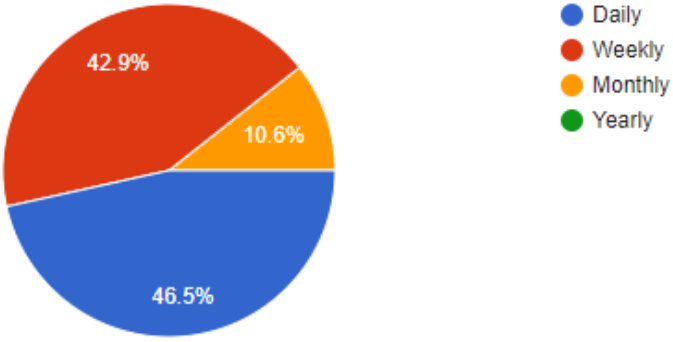

Figure 47: Percent of students who feel technology is not reaching its' full potential

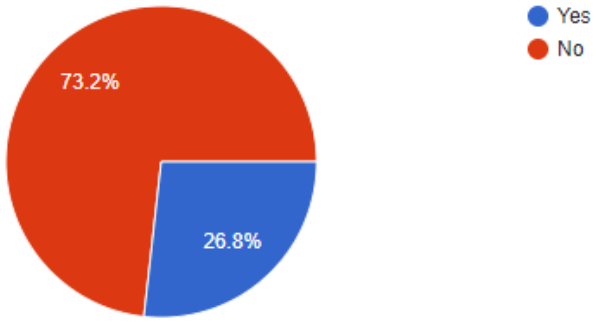

Figure 48: Participants average grade

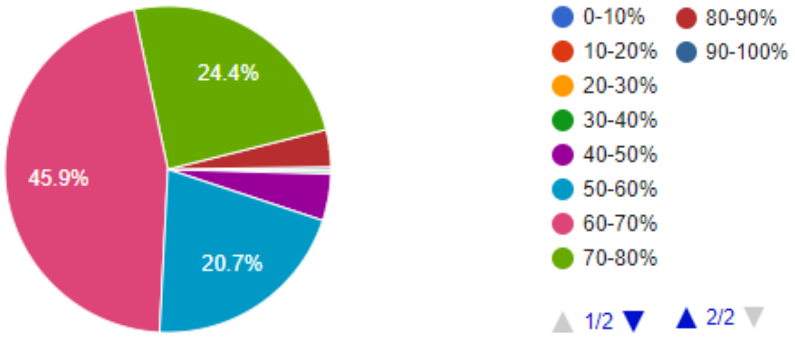

Table 4: Proportional analysis of receiving a SUSI grant vs. reliance on campus technology

		Do you rely on the technology on campus to help reach your academic goals?			
		No		Yes	
		Count	Row Total N %	Count	Row Total N %
Do you receive the SUSI grant?	No	115	39.4%	175	59.9%
	Yes	51	33.8%	99	65.6%

Table 5: Numerical analysis of receiving a SUSI grant vs. reliance on campus technology

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Do you receive the SUSI grant?(1)	.243	.210	1.343	1	.246	1.276	.845	1.925
	Constant	.420	.120	12.233	1	.000	1.522		

a. Variable(s) entered on step 1: Do you receive the SUSI grant?.

Table 6: Proportional analysis of disability status vs. reliance on campus technology

		Do you rely on the technology on campus to help reach your academic goals?			
		No		Yes	
		Count	Row N %	Count	Row N %
Are you registered with the Disability Support Service?	No	155	40.1%	232	59.9%
	Yes	11	20.8%	42	79.2%

Table 7: Numerical analysis of disability status vs. reliance on campus technology

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Are you registered with the Disability Support Service?(1)	.936	.354	6.989	1	.008	2.551	1.274	5.108
	Constant	.403	.104	15.114	1	.000	1.497		

a. Variable(s) entered on step 1: Are you registered with the Disability Support Service?.