The Evolution of Campus Process

&

Innovative Classroom Design at Indiana University

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ABSTRACT

This report documents the process of the ongoing Evolution of Campus project at DLR Group. The project started out as an attempt to understand the pandemic and the response from the higher education industry, and has continued to evolve to incorporate various universities' goals in the spaces of carbon neutrality, space utilization, and new technology. In addition to documenting the details of this project, this report will have an emphasis on the technology and tools used to obtain the information and insights that the research has provided.

Using what I learned from this project, I also set out to understand the focus behind classroom design at Indiana University, and what needs to be done to adapt to new systems of learning.

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1 Introduction

This chapter presents the starting motivation and objectives of the initial Evolution of Campus proposal and the foundations for approaching the project.

1.1 Background and Motivation

DLR Group is an employee-owned integrated design firm, providing services in planning, architecture, engineering, interior design, and building optimization in construction, renovation, and adaptive reuse. Sustainability is intrinsic to the design culture at DLR Group, and is a main focus of the firm throughout its history.

The COVID-19 outbreak was a major disruption all across the world in many factors. One such area was higher education, as many institutions began canceling in-person classes and shutting down campuses, transitioning to online-only instruction. These abrupt and unplanned changes shone a spotlight on the vulnerabilities of the higher education industry, and a response was needed from universities across the country.

The higher education team at DLR Group used this as an opportunity to understand the reactions and challenges with the COVID pandemic at universities, and thus the Evolution of Campus project was started.

2 Evolution of Campus 1.0

2.1 360 Engagement

When understanding the wants and needs of users in a campus environment, it's imperative to understand the users themselves. Typical practice of gathering this kind of information usually consists of engaging with a few groups of students and staff to create a framework for a project. Instead of this approach, a more immersive solution - coined the 360 engagement process by DLR Group - was created and serves as a basis for all projects within the firm.

A 360 view process on a typical college campus begins with a list of conversation starters as well as a location in which to conduct those conversations as they relate to the area of interest. As an example, if a new dining hall is being constructed, interviewers might position themselves at an existing dining hall and speak with students who are using current services and programs to understand their needs for the new project. This approach can grant much stronger leads with a more personal touch as well as being able to engage with a larger amount of the student body. If the plan consists of something on a larger scale that impacts more students, conducting conversations across multiple areas of a campus to access a cross section of students to mimic demographics of an institution is key. This process takes more time and more effort than a focus group, but as students understand that their feedback is valuable, the insights that can be gathered ultimately produces projects that accurately embody the culture of a campus.

The 360 name implies talking with multiple groups of users, and that is not limited to students. This includes faculty, facilities managers, community members, industry partners, and anything else that goes into a particular project. The students themselves are absolutely

important to the research process, but having discussions with other groups of users can reveal information about how a project will impact them. Overall, the 360 engagement process provides a foundation so that the work done does respond to the real needs of everyone involved who may be affected. Incorporating a diverse set of users to receive feedback from can create a story that defines a project - and the story of how campuses have been evolving is never ending.

2.2 Phase 1 Timeline and Technology

The Evolution of Campus project stemmed from the aforementioned 360 engagement process, as the idea was to get all user groups at various college campuses involved to understand the reactions and challenges that came with the pandemic. Data collection started in early 2020, and with a relatively large team, personal conversations across 85 institutions were able to be recorded and findings were released from May to July of 2020 for a quick turnaround.

SurveyMonkey

SurveyMonkey was the initial tool used for gathering information regarding student conversations/surveys and one-on-one interviews. At the time, it was useful for sending out surveys that would require simple yes or no kind of answers.

Qualtrics

As the project scaled in size, there was a need for better reports and data exports, which is where Qualtrics was introduced. Due to the quick reaction of 1.0, much of the data was in handwritten notes of conversations had when researching. In this first phase of the project, Qualtrics was used for interviewers to manually put their comments into an online survey to quantify data and look for trends with the tools that Qualtrics allows for. The addition of Qualtrics to the project came after data had already been collected, and as such access to live

data was not available, and the flexibility of questions that Qualtrics could provide did not factor in either. Although the process of adding survey data to Qualtrics was manual, the more control in exporting data was useful for transferring it to analyze in Power BI.

Power BI

Early on in this first phase of the Evolution of Campus there were discussions about how the data that was being collected should be presented. Not only was there a lot of data to collect, figuring out how to visualize it in the most efficient way to interviewees and within the firm was also an important topic. The standard practice for reports up until phase one was a static PDF. However, it was quickly realized that in order to get specific insights from data that had been stored, a static PDF was not going to be able to manipulate the datasets and be able to filter specific information related to particular universities (examples include searching for schools in Colorado, or searching for just private institutions). Power BI is an interactive data visualization software developed by Microsoft, and it was presented as a solution to suit the needs of the Evolution of Campus project.

In phase 1.0, transitioning to Power BI was a trial and error process. During the process of exporting Qualtrics data to Excel, and then from Excel to Power BI, there was a lot of manual work done to clean up the data in regards to grammar, syntax, and formatting. When creating a survey, the types and formats of questions you can ask in Qualtrics impacts how the data is exported, and this influences how easy or difficult the information can be used to create a visualization. The end goal for creating dashboards in Power BI is that a particular person's answers always have to link back to that person so the information can be filtered. This can be challenging with different types of questions, such as one that gives the option for multiple answer choices.

Prior engagement reports show that maps are helpful when displaying information in regards to where people are, and general histograms to visualize information is standard, but something already possible with just Excel. What Power BI is able to add to this particular project is more dynamic visualizations, where someone could hover or click on a particular area to get more detailed information right away. By selectively choosing what data to visualize at any particular time, the more questions someone is able to ask and have answered in comparison to looking at a static PDF report. The ability to visualize qualitative and quantitative through Power BI is especially helpful. During interviews, if someone says something particularly notable as a comment, you are able to store and visualize that comment as a filter. Note that Evolution of Campus dashboards created by DLR Group are only currently available to those institutions that have interviewed and been a part of the project.

2.3 Phase 1.0 Findings

Through the first phase of the Evolution of Campus project, the goal was to capture the realities facing higher education institutions across the nation and propose recommendations in the short term following spring of 2020 to overcome immediate challenges such as institutional vulnerabilities, reliance on tuition dollars, and international students. Across 85 institutions, there were many common themes expressed. These reports were distributed in the form of a Power BI dashboard, white papers, and various articles published on DLR Group's website.

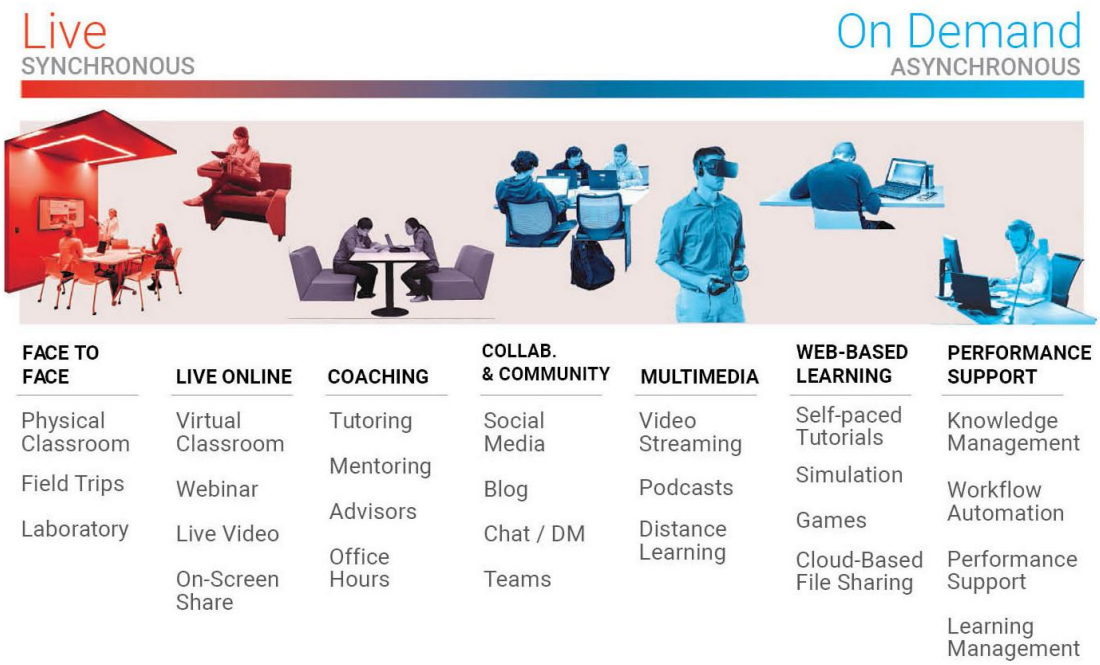
Students professed a desire to return to campus to continue not only their academic life, but their extracurricular and social activities that were associated with the physical campus. Other participants mentioned that the campus needs to become more flexible, able to adapt and

be safe in a pandemic environment. This could take the form of changing building inventory so that one facility can support various different methods of learning.

In the first few months of the in-person learning shutdowns, universities had to quickly transform into online-only learning as the only option. While there was a noted rough transition period for many, it became the norm and had to be for an unspecified period of time. Programs had to focus on being able to deliver quality content without relying on the physical space of a classroom. Ultimately, the value of remote learning most likely has a mutual dependence between the faculty and students, as well as the support to create and deliver appropriate coursework. To progress during this time, universities have to consider the immediate priorities to invest in existing learning spaces while keeping quality experiences for the students.

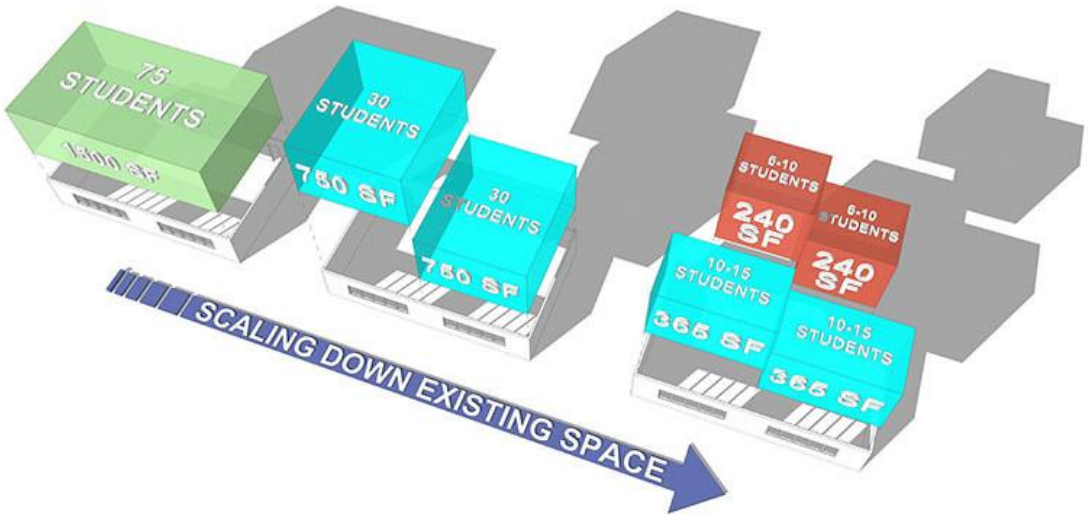
However, some virtual tools do not quite replicate the full experience that some programs try to provide. In person curriculum requires more in-person interaction and preparation, but in some cases reduced course capacity may be the short term solution. Faculty office hours could evolve into fluid online engagement, decreasing space requirements while increasing the utilization of that space at campus.

In regards to students' access to learning, it was predicted that there would be a wide range of delivery methods depending on the course type. General studies courses at a lower level might favor remote options, whereas team-based courses would favor in-person options when possible. As higher education continues to evolve in the recently restricted world of higher education, investing into more accessible and blended learning has the potential to create a new way to educate students.



The spectrum of higher education pedagogy. Image © DLR Group.

Designing a campus environment in a pandemic world has its own set of limitations. The goal is to create a place where students can connect in a safe way, and going into late 2020 and beyond it will look very different. Universities updated policies about use of common areas as well as implementing social distance protocols, limiting the number of students on campus. Some recommendations made at this time include creating open workspaces to allow for small group collaboration as well as shifting from large lecture delivery to asynchronous content. This frees up lecture halls to be used in various ways.



A model to scale down higher education campus buildings. Image © DLR Group.

Many institutions were facing big questions about the return of the new semester in Fall of 2020, many of which had lasting ramifications on the campus environment. These questions include how many classrooms and other supportive spaces will be needed and available, and how many students and faculty will be able to be on campus for those spaces. Can the campus remain active with the limitations due to COVID-19?

One of the many negative aspects of college life during this time period is the lack of student interaction. With limited opportunities to connect with peers, the student life many institutions are known for becomes redundant. Policies for group size and safe distancing became standard, but complementary spaces throughout campus and the surrounding community may still be able to provide social experiences before a final opening of campus happens.

When it comes to funding, many institutions found that appropriations for new buildings were not common. Instead of large projects intended to completely transform facilities, universities may find it beneficial to approach planning in small increments in reconstruction and renovation. As academic, research, and workplace needs change, small, less expensive projects can continue to provide improvements in space utilization.

Ultimately, this sudden change in direction for institutions across the nation shows the necessity of planning and being prepared to be able to handle the world as it changes. The goal isn't to guess the future, but to be able to be flexible during times of uncertainty. It challenges universities to re-imagine how to promote growth, utilize space, and adapt to new realities.

3 Evolution of Campus 2.0

3.1 Building Upon Phase 1

After the findings of phase 1 came out during the summer of 2020, the Evolution of Campus 2.0 launched that fall of 2020 once again through the lens of the COVID-19 pandemic. Now that schools had one semester and the summer to strategize, what did they have to say about their efforts to remedy problems that were reported during phase 1? What were they learning from the process, and what could they expect from the winter and spring semesters? Phase 2.0 was meant to be a touchpoint for these institutions while building upon similar questions to phase 1.0. Topics included a broad range from financial, academic, classroom space, student life, sustainability, and more.

3.2 Phase 2.0 Technology

Qualtrics

Unlike phase 1.0 of the Evolution of Campus, a framework was already established for survey making. Right from the beginning, all interview questions were directly built into Qualtrics right away, no manual input required after the fact. This opened up new and more flexible ways to communicate with all kinds of users as well as have access to live data after each dump from one interview. Now that Qualtrics was used from the start of the process, its flexibility in question types and designs were able to be used. Examples include a hot spot question to get feedback on images as well as likert scales. There is also much more variety and control in distributing surveys as well, such as sending customized messages and QR codes.

Student Engagement Through Qualtrics

Qualtrics as a tool is also consistent for collecting data through student engagement across the various campuses included in phase 2.0 of Evolution of Campus. Combined with the 360 engagement process, Qualtrics has allowed for flexible ways to collect data in various situations. In a typical scenario when interviewing students on campus, interviews were designed to be conversational and fast, with about 10-12 questions and a 10-20 minute time limit. Conducting interviews face to face allows for more in depth data collection as well as a mix of both qualitative and quantitative data you can only receive if you are able to have a conversation instead of having students complete a survey online. Personal stories and unique perspectives are very important and allow for insights on how to evolve a campus.

Qualtrics serves as a framework for these instances. Depending on the location that information is being collected on, survey questions will be pre-loaded with possible answers that students can give (Ex: common dining options already listed as options for a question such as: where do you eat on campus?) This helps target common answers on campus. Instead of simply handing the device to students with the survey questions on it, the engagement process involves having a real conversation discussing the issues or topics the survey deals with, and then afterwards the interviewer will put that data into the survey. This helps in not limiting responses while also categorizing similar ones together. Qualtrics and other survey analysis tools run on similar use of syntax. In a situation where students respond to questions with a consistent theme but use different exact wording, it can be hard to target consistent themes. This set up allows for efficient data collection that captures the sentiment of the students accurately.

Power BI

As Evolution of Campus continued to grow past phase 1 into phase 2, the way in which visualizations were approached became more refined over time. The map of universities covered

within the study is clearer and each individual institution is displayed and easier to interact with. Further filtering allows for specific information regarding the type of institution: 4 year public, 4 year private, academic medical center, and community college. This allows anyone with access to look for specific data points and ignore the unnecessary noise.

The overall look of the dashboard was iterated upon from the version used in phase 1. Other filters became more intuitive, separated by blocks of questions asked in the corresponding Qualtrics surveys relating to academics, research, equity, and more. The overall look of the visualization was updated - the main page was less text heavy and included more tabs so that people could get to what they were looking for quicker. The look of the dashboard resembles in some ways an online shopping service, with filters that can be expanded to specify your interests on the left side of the screen. This approach to design makes the user interface friendly to anyone, even those inexperienced with data visualizations. The new website feel of the dashboard allows for more site navigation as well. When it comes to the dashboards created in Power BI, how useful they are corresponds directly to the graphical layout of said dashboard. If it doesn't make sense where and how you filter the information, no one is going to be able to figure out how to use or access the information or visualization presented, however aesthetically pleasing it may look.

From a marketing perspective, these visualizations allow for universities to see DLR Group as experts in these areas and a resource for information. In turn, it allows for a more rigorous research approach.

In addition to the dashboard that is available to the institutions part of the study, an internal version of the 2.0 dashboard was created which showcased specific information regarding interview data. This can be referenced by other DLR Group employees to see what

representatives from particular institutions were saying about the various topics introduced in this part of the project.

3.3 Phase 2.0 Findings

The goal of the second phase of the Evolution of Campus project was to expand on the topics presented in the first phase on a bigger scale. Around 5 million students were represented in this study from 171 institutions across the country. Topics include academics, design, planning, equity and justice, works spaces, research, finance and enrollment, and student experience. Recommendations for institutions to focus on in the near future were created based on the information received from the interviews conducted.

Academics

As schools opened up again for the fall 2020 semester, hybrid learning became the normal experience for students on campus. Due to this, universities need to find ways to create and improve virtual learning experiences that can equal in-person learning. The priorities and needs for students and faculty have to be re-evaluated when it comes to the environments for learning.

Classrooms that are over designed and only apply for a few particular purposes tend to not be very useful, and instead classrooms that are average sized with flat spaces serve more purpose. Flat flexible spaces allow for more collaboration with students and teachers, as well as provide a better experience for those who cannot be in the classroom.

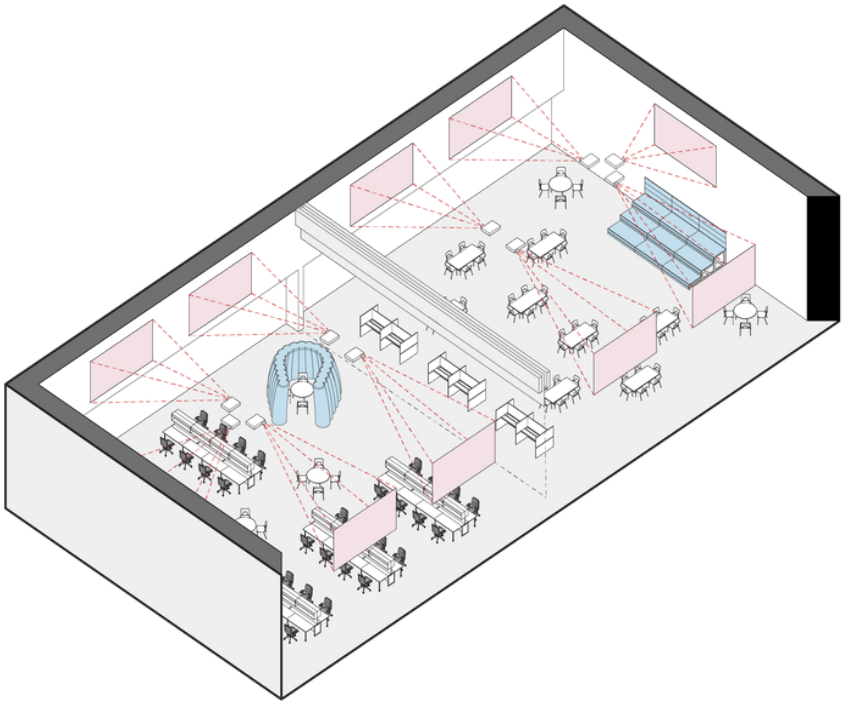


Image © DLR Group.

When it comes to curriculum delivery, making sure that faculty are comfortable with the technology required for hybrid teaching is crucial in providing an elevated experience for learners.

Recommendations include understanding how students want to learn and how they do their best work. This can take the form of planning and evolving accommodations in space utilization wherever possible.

Design

The pandemic has shown that learning will continue to grow beyond the traditional classroom space. The usual delivery models may not work for many students now, and technology should be used more to connect students whether they be in person or online.

During the transition back to opening campus spaces again, social distancing in the learning environment will be required and crucial for safety. Incorporating visual cues in the classroom easily allows faculty and students to follow the required practices while learning in person. In public spaces, comfortable, distanced, and easily cleanable seating is a priority, and power outlets allow students more freedom in where they work or attend classes virtually.

When classes have to make the switch to hybrid learning or fully remote, new problems arise for students that may not be able to consistently attend virtual lectures when on campus. Asynchronous options for some students have shown to be successful for these students, and campuses should accommodate these virtual environments.

Planning

Planning allows institutions to become adaptable during new and unexplored situations, and makes the campus experience more collaborative. The value of education is changing as universities manage the pandemic, and one of the biggest aspects is how the campus environment changes during these times. Space planning can allow universities to make decisions about facility conditions and the demand for space, as well as understanding what different programs need.

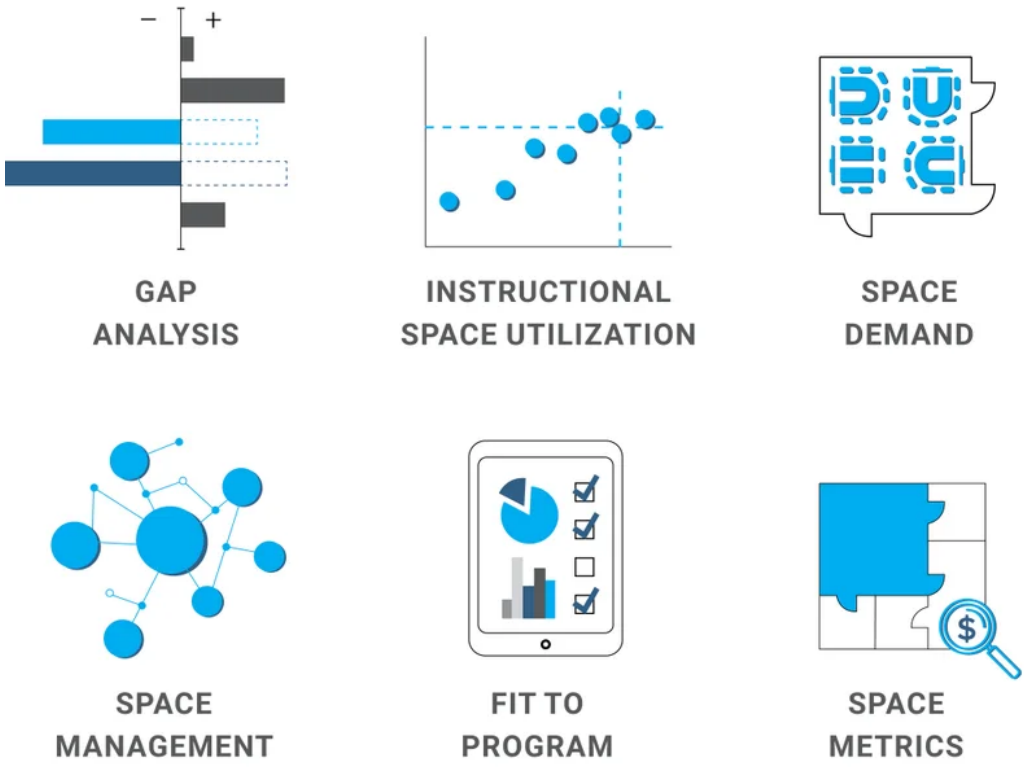


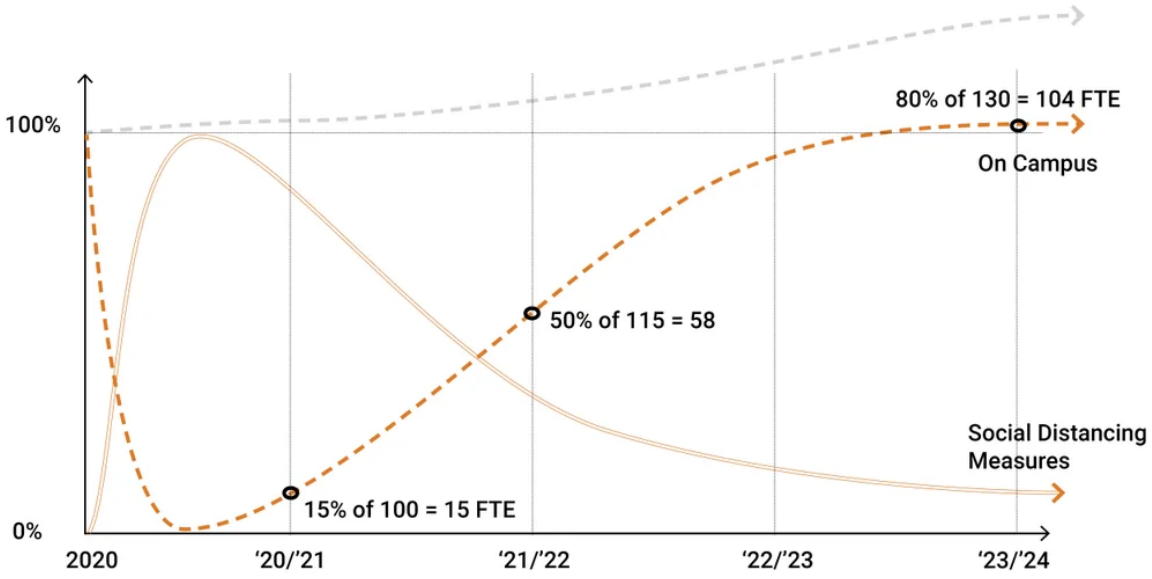
Image © DLR Group.

Equity & Justice

Issues have always plagued higher education in regards to food, housing, and technology, and the pandemic only exacerbated them. It was made clear just how many students rely on the physical campus environment and what it provides in order to live. Some ways institutions are helping include expanding food pantries and providing more housing options. However, there is much more to do on this front, including better access to technology for those who do not have it. In addition, creating an environment where all members of a campus community can have conversations on these important issues allows for a transparent decision making process.

Work Spaces

Remote learning has created situations in which institutions have to understand the value of work spaces around campus. In some cases, some tasks may continue to be completed remotely even after the pandemic ends. Due to this, the future of workplaces is academics should be approached not on titles, but aligned with the tasks needed to effectively complete the work. With the number of students on campus changing more rapidly than ever before, universities need to identify where they can be more effective with their real estate, as well as what allows students and faculty to do their best work in regards to an optimal workplace environment.



Projected Future Remote Working for a 4-year Institution. Image © DLR Group.

Research

The academic research community was disrupted by the pandemic, and changes need to be made in order to support and create opportunities for those that enter the field in university.

Some trends observed during this time include limited access to labs, which allowed more flexibility in work. During this time, papers written significantly increased in quantity. However, for some, this came at the expense of diminished causal collaboration, affecting the creative process. Perhaps one of the biggest issues is the negative impact the pandemic had on particular groups of people. In particular, women and minority postdocs have been disproportionately affected by limited funding. Institutions can work to level the playing field by creating an equal environment allowing and accommodating different backgrounds as well as developing and encouraging diversity in a research setting.

Finance & Enrollment

For many students, the experience of being on campus and exploring life there is one of the main selling points of the entire experience. However, in situations where they are forced to be off campus, those positives of the college experience are no longer available, and yet the high cost of attending university still applies. This understandably leads to a question of the value of the education experience. For the institutions, enrollment numbers decreased, especially for those that operated at a 100% virtual experience.

Re-evaluating technology budgets is one possible option, this would create remote environments of a higher quality considering the amount of students who have started to favor hybrid learning and work spaces.

Student Experience

Campuses that focus their brand on the lived experiences of students naturally have a stronger brand, able to attract more students and quality faculty. Students new to a school during this time will have a harder time connecting with each other, and so institutions need to focus on ways to bring students together to enhance well-being. On top of this, being in person is

fundamental to many programs in college, particularly the arts education. In situations where in person events can be held, guidelines need to be created and maintained while also being easy to follow. Technology can be used to let even more people experience the event in some capacity.

4 Evolution of Campus 3.0

Following the conclusion of phase 2.0, the Evolution of Campus 3.0 was started in the Spring of 2021 and is ongoing, with a focus on understanding next steps universities would take in various particular areas, namely carbon neutrality and sustainability, space utilization, and science and technology. Although COVID-19 continues to be impactful, the idea was to expand the project scope.

During phases 1.0 and 2.0, the goal was to use the 360 engagement process to understand how higher education institutions continue to deal with the effects of the pandemic on various relevant aspects. The data from that was filtered and the end product was that the information captured would be relayed to campus leadership. However, outside of basic recommendations made by the supplemental readings done by DLR Group, the end product of these two phases were a data resource that universities could use. The current goal for the Evolution of Campus 3.0 and beyond is to create a more immediate deliverable. Instead of compiling knowledge, there will be finite solution suggestions and idea teasers. This is due to how the project is being approached. Instead of targeting a massive amount of institutions and students to represent, small teams were formed to do deep dives on a smaller number of schools.

4.1 Phase 3.0 Research Process

For each of the three aspects that phase 3.0 focuses, background research was conducted about current and future plans regarding climate neutrality, space utilization, as well as science and technology. In addition, Qualtrics surveys were developed to identify and understand where and why schools currently were on these topics, and in what direction they were headed. Later, interviews were conducted to build upon the answers in these surveys.

UserTesting

UserTesting is a platform that specializes in uncovering human insights in order to create better experiences. For this project in particular, it allowed employees to record interviews in respect to all 3 aspects of this project, as well as create clips to highlight specific important parts of said interview with an automated captioning system. For phase 3.0 of the Evolution of Campus, UserTesting has been an important piece in the process of engaging with faculty across the U.S. and discovering key information about how various universities are attempting to elevate the experience for members of the campus.

Throughout a year and two phases, the Evolution of Campus project has increasingly grown and progressed. In order to become a thought leader and resource to the community, DLR Group has increasingly iterated upon the research approach to ensure the best possible quality of data. Another important aspect of the project is to manage the load of work on the teams involved. As there are many other projects happening within the company, being able to streamline the process and make it more efficient is very important, which is what UserTesting has been able to do. When gathering data from people that have been surveyed, important specific details can get lost in translation. When analyzing and coding data in UserTesting, the high level of capture is crucial for peer review and for scrutiny of data. Through direct quotes and verbatim data, the platform has allowed for improved accuracy and accountability in the research for Evolution of Campus. DLR Group may not be a research driven firm, but every design created is driven by research and data. Putting in good data ensures you get good data out, and influences the best practices and gives more credibility in future projects.

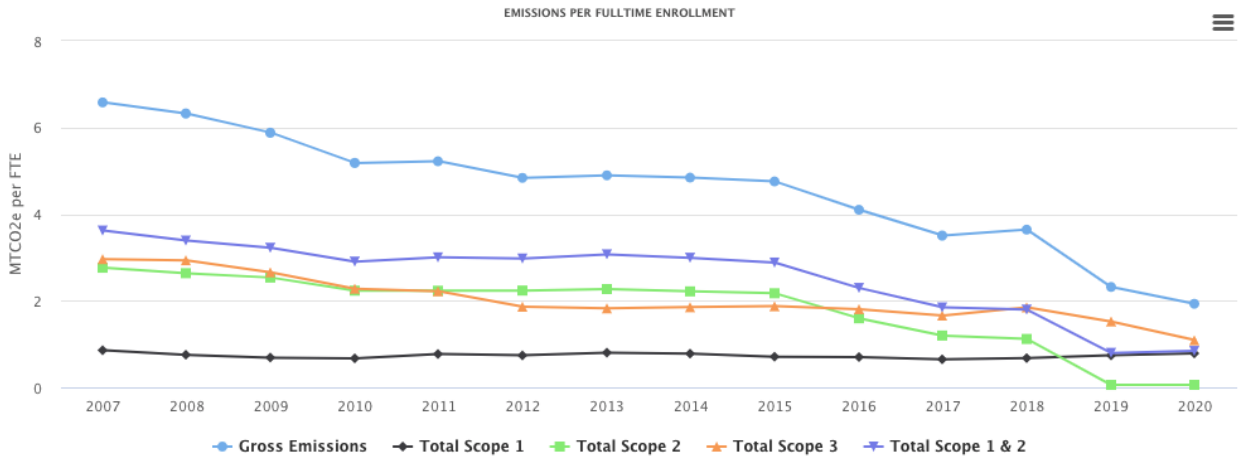
In addition to improving the quality of external projects meant for clients, UserTesting has also helped internal employees of DLR Group understand why qualitative research can be so important. A smaller number of well conducted UserTesting interviews can give designers as much insight or more than a large number of quantitative surveys from Qualtrics. Using a vetted platform gives validity to the process in and out of the firm.

A continuously evolving codebook was written for all 3 sectors of the phase 3.0 project, and was made to be inserted into UserTesting. Through the platform clips can be created of specific slices of an interview where hashtags can be added alongside captions for coding purposes.

Being able to efficiently gather strong data while on a strict schedule is an important aspect of the qualitative research data gathered on UserTesting. When dealing with the scope of how big the Evolution of Campus project has become in addition to other responsibilities DLR Group Employees have, attempting to get a very large number of survey responses to validify sample size just is not realistic. Identifying the problems and processes of a particular area on campus can be done with a decent amount of conversations held with relevant parties. UserTesting allows for an easy process of leveraging its tools to paint as clear a picture as possible.

4.2 Carbon Neutrality and Sustainability

Initial background research into the sustainability goals for selected universities started with the plan to become carbon neutral. This consists of climate action plans and progress reports on those plans. Examples of other kinds of useful information would be an institutions change in emissions for scope 1, 2, and 3 over time.



Emissions per full time enrollment at Arizona State University. Image © Second Nature Reporting.

Other points of note would be any other pieces of information that was publicly shared by the university, which contains but is not limited to: building policies, campus goals, and water reduction. The current target is to reach out to around 15-18 schools.

After the initial surveys through Qualtrics were sent and completed by various faculty, interviews were conducted throughout 2021 through Zoom and posted to UserTesting. The main themes across these interviews were focused on institutional commitment, funding, and implementation of plans.

When it comes to the institutional commitment to keeping emissions down, scope 1 and 2 deal with actions the company can take (Scope 1 emissions are owned sources, scope 2 emissions are created from purchased heat, cooling, electricity, etc.). Scope 3 is found to generally be harder to make a tangible commitment to as it covers other indirect emissions created by those within the institution such as commuting and investments. Paid carbon offsets are the most common way to deal with the negative impact of scope 3 emissions. Some schools have a strong student culture of activism which is relevant to certain schools in their commitments to sustainability.

Funding is categorized in these interviews as both a return on investment as well as the cost of inaction. Costs of making changes to facilities and policies on campus can be expensive and not feasible to all types of institutions. However, the lower costs of inaction in return may be worth it.

Implementation of plans set by universities are continuously evolving over time, and can take many forms. Self-regulating implementation can apply to something like an energy plan that requires updates on a regular basis. Reports can also be made to record progress internally as well as to 3rd parties.

For the carbon neutrality and sustainability section of the project specifically, DLR Group is planning to reach out to student groups in addition to the faculty interviews that have been done as a part of a deeper dive into campuses. The targets are going to be various different tiers of institutions such as big public and private schools as well as community colleges. Other factors are universities who are at various stages of their plans to achieve carbon neutrality. In the next months, student value workshops will be conducted across these different institutions in-person and online to learn more about what it means for them to have a net-zero campus.

4.3 Space Utilization

Space utilization was a topic covered in the previous phases of the Evolution of Campus project, and has continued to be covered here. As the campus population makeup continues to grow and change, institutions must be ready to adapt with it. During interviews with faculty across different types of institutions, some common themes that were discussed included the schedule for faculty and students returning to campus, as well as what the expected outcomes are for the model of learning. Institutions have overall been pushing to bring faculty back to work

and to head in the direction of all instruction to be in person, although in particular striving for only in person learning at this time proves to be a tough hurdle to climb. For many institutions, it doesn't make financial sense to continue to spend and build more, and instead the approach switches to reimagine current work space. Faculty offices are quite important spaces for teachers, as it serves as a hub for them on campus and as such can be resistant to change or reduction in that aspect.

Various different experiences for returning students in hybrid learning environments was discussed as well. For instance, there are students who attend lectures remotely, but need to be in a space that's not distracting to them or others around them, ruling out potentially staying at their place of residence. Outdoor space expansion was mentioned, with increased Wi-Fi signals outside of buildings. With more students returning to campus, being outside is a common flexible space for collaboration and social interaction.

The pandemic has really highlighted the benefits of hybrid working and learning on campus spaces. As mentioned, the campus environment is very important to the culture and in person learning and events highlight that aspect. However, student flexibility increases when they have multiple options to attend a class and learn. With this in mind, perhaps classes can optimize their space, room, and technology requirements to better suit those needs.

An interesting but relevant point that was discussed in interviews was the roll over of students coming on campus who deferred and took a gap year, and due to that the number of students on campus for the following year will be significantly higher. This disrupts not only the space requirements, but also creates a situation where there are essentially two sets of a freshman class.

4.4 Science & Technology

The science and technology team at DLR Group focuses on projects of that nature in higher education institutions across the country, as well as private workplace clients. It's made up of staff who specialize in higher education and the projects surrounding it. Like the other parts of phase 3.0, recorded interviews took place during 2021 with various types of institutions across the country to understand where these schools currently lie in this area.

Among the topics discussed were the location of research zones across campuses, whether or not they are centralized, and where the desired location spot should be moving forward if different from the current state. Attempts to promote collaboration in interdisciplinary research for decentralized campuses include change in federal grant structure.

When it comes to capital projects and improvements, questions were asked along the lines of if schools had a history of building new research facilities, or if they took the path of renovation. The response from schools can vary depending on campus leadership and if they identify growing the research enterprise as a priority. The amount of space researchers are granted on campus are also decided from leadership.

More modern lab design tends to push toward collaboration between different departments in a more casual setting. As a trend, creating open spaces where people of different scientists can gather and together in comfortable spaces in a lab setting is something that some schools are adopting.

The pandemic induced a new wave of research groups and methods that take advantage of remote research and techniques, which moves away from traditional lab based research on a campus. Despite this, there are many opportunities that can open up with remote research that haven't been possible before. Some examples include 3d visualization technology as well as

robotics. Similar to findings from the space utilization group, generally the location in which information is relayed is no longer as rigid as it once was with the addition of hybrid learning and researching.

5 Reflection and Evolution of Campus Beyond 3.0

Phase 3 of the Evolution of Campus is still ongoing, with many more potential insights to be found as the research progresses in all 3 sections of focus. Ultimately, the entire process started out as an opportunity to learn more about the reactions of the higher education industry during a time when vulnerabilities throughout it were showcased thanks to the shutdowns in 2020 caused by the pandemic. From that, the project has turned into a system and framework that dictates practices throughout DLR Group, and can lead to changes across the industry.

As more information was collected about how campuses were evolving over time, in many ways the entire process has been an evolution of sorts for DLR Group as well, with respects to the ways research was conducted, insights were collected, and the type of outputs of resources the firm was able to create and distribute. The core behind the firm has always been about hands on and personable engagement, but the methods have become more efficient over time. It wasn't very long ago that taking handwritten notes and making tabs on a whiteboard during and after an interview was the main way of gathering information and insights. That developed into using Qualtrics to store data and create reports, and then later UserTesting for more live qualitative data in addition to that.

Data visualizations within the firm have changed as well. Excel charts and Illustrator templates were used to make charts, in some situations bar charts were created and judged by eye to determine how close the visualization looked like whatever percentage it was trying to display. Over time, employees got better at using Illustrator and InDesign, and the static PDF format of presenting information began to look cleaner and more professional. Once Power BI became a thing, visualizations continued to improve alongside color control. The Evolution of Campus

dashboards for both 1.0 and 2.0 also represent the evolution of technology used within DLR Group as well.

The end goal for Evolution of Campus is to be a thought leader and a resource for the higher education industry, and a focal point for the project in the future is going to be tracking changes over a long-term period of time. A data library is slowly being put together which can potentially hold 5 plus years of information regarding the challenges and focuses of various institutions. Looking further into the future, this library can be accessed again and again to see if those challenges were met, and what is the focus now. As a firm, this allows for keeping up to date with contacts as well as becoming more rigorous in the design research process. Technology is always evolving as well and as new questions arise in design fields, new problems will be explored. There's no way to guarantee the platforms that have been important to this project will continue to exist over the years, but maintaining data cleanly and internally while making a commitment to continuously iterate on the research process is a big part of the backbone of this project.

As more and more data is added over the course of many years from different institutions, it's possible to keep discovering new trends and key metrics, making the possibilities for the Evolution of Campus project endless.

6 Innovative Classroom Design at Indiana University

6.1 Background

In March of 2020, Indiana University closed its physical campus as the students and faculty continued instruction from their residences for the rest of that spring semester. It was an abrupt shift, and one that had consequences in regards to the quality of the education received by students.

The following fall 2020 semester was a particularly notable one for obvious reasons. While the campus was open for students to use, traditional models of teaching were not something that could return at this time. During this semester, Indiana University had classes mostly in a hybrid format which consists of attendees in person and remotely, with some classes being fully online as well. This format was still incredibly different from what most students were expected to, and the reactions to it were mixed. Regardless, this system of learning was here to stay for the time being.

Coming into the spring semester of 2022, there have been significant updates to the situation. Vaccines have been distributed widely and are now required to be able to attend Indiana University on campus, not to mention the booster shots that have been administered as well. As time has passed, some students have returned to an academic schedule of classes entirely in person. But for a significant portion of the student body, hybrid learning is still a part of their schedule. That's not to say it detracts from their experience, but rather for some, hybrid learning is their preferred way to navigate their coursework.

To accommodate this new world, classrooms need to be able to fit the needs of the faculty, students, and coursework of a particular class. During this most recent spring semester, I

wanted to understand what Indiana University is doing to support active learning during this time, and how they are adjusting their classroom design choices to fit an ever changing academic world.

6.2 Student Interviews

To get an understanding of the needs and experiences of students this past year, I reached out to 15 current students at Indiana University, both graduate and undergraduate. The goal of these interviews was to listen to student experiences and identify the strengths and weaknesses of the current learning environment in their classes. The conversations I had revealed themes surrounding flexibility, classroom space and size, studying habits, remote learning experiences, and communication and collaboration in class.

Flexibility

I found that simply asking if students simply preferred remote vs in person learning doesn't tell the full story of academic life. Generally speaking, if there was only the option to pick one, then in person would be favored. However, flexibility that having multiple options gives a student is valuable. Examples of this include being able to receive instruction and possible attendance and participation points in the instance they feel unwell and are not able to physically attend class. In relation, student life can be hectic and unpredictable. Being able to instantly get to class online can provide more schedule flexibility. This can take the form of other meetings and commitments that start or conclude shortly after or before class.

Of course, the impact of the COVID-19 pandemic still persists today. While there are more defenses in place against the virus, students cannot be faulted for attempting to be as safe as possible, especially if they are immunocompromised or live with someone who is. Some

students reported that they chose not to go to a specific class in person for various reasons surrounding this issue, including the classroom size to student number ratio, or the decision of their classmates to wear masks or not.

Classroom Space and Size

My time working for and with DLR Group opened my eyes to how the design of a classroom can benefit or detract from the learning experience. It's important that any one class is in a classroom that can get the most out of the curriculum. I received both positive and negative answers on this topic. Some students mentioned that the classroom size served the material well in terms of being able to clearly see presentations and in collaboration with fellow classmates and the professor. There were also responses that mentioned they felt the classroom was too restricting and negatively impacted the learning experience. One particular example described one class in a medium sized lecture hall style classroom. This class emphasized group collaboration, but the seating arrangement made it uncomfortable to work together, with all seats facing forward and no easy way to walk in between them. On top of this, the class was close to capacity, so many times when students were split into groups, they would be sitting very close to other groups, which could be distracting.

The influence of space on teaching and student learning has been the subject of research quite often. Past research shows that in some situations students in "traditional lecture-oriented spaces…are passive listeners. This results in poor retention of information and limits students' opportunities to develop higher order skills such as synthesizing, applying, and evaluating." (Copridge et al. 2021) In response to insights similar to this, the concept of building active learning classrooms was developed, with the goal emphasizing faculty support in student

engagement with material through various means such as discussions, problem solving, and more.

Studying Habits

Remote learning certainly is not the preferred method of learning for a significant number of students. For some, attending classes in the same space that they use for homework, projects, and studying is not ideal. Everyone works differently, and being able to separate particular environments for specific tasks creates a positive effect that can definitely be useful.

For neurodivergent students, remote learning can create even more possible distractions than those that already exist. In particular, students I talked with who are diagnosed with ADHD mentioned the struggle of learning on a laptop screen, where it is incredibly difficult to easily tune out important information by doing anything else on it. These students much preferred to be in person as to better limit distractions for themselves. Studies have shown that the number of students with ADHD in college is growing that affects relevant areas of schoolwork such as "time management, concentration, test taking" and more (DuPaul et. al 2015). For these students, remote learning can be a significant crutch in academic life.

Remote Learning Experiences

For those that like or were forced to attend classes online, there was a variety of mixed feedback regarding the actual experience of attending class. Positives include more privacy and the option to be able to do other activities that require little attention while also being in class. Muting the mic and turning off the camera is included in this sentiment. Other responses mentioned the technology available via Zoom. This includes the option to type in a chat box for those who may feel uncomfortable speaking up for whatever reason. Screen sharing was a big positive as well, being able to present and share things from their own laptop is another plus in

comfortability. One of the most common responses I received was the option to watch recorded lectures at a later time. Having more options to attend class or the ability to go back and rewatch a particular part of a lecture was something that was greatly appreciated by students. Other collaboration tools available on Zoom such as breakout rooms and whiteboards were mentioned as sufficient replacements for in person collaboration.

There were also a fair amount of negative experiences shared as well. Most of these dealt with the technology in the classroom not being able to provide what was needed. Examples include poor camera quality in terms of resolution and also not being able to see many parts of the classroom. This is particularly important in a situation where the teacher may move around. Microphone quality was also mentioned. In classrooms not built for remote learning, microphones built into the computers in the classroom may not be adequate, and limits the teacher's ability to engage with students who are in person as they are forced to stay where online students can hear them. These factors can combine to generally promote a feeling of disconnection between students online and the activities happening in the classroom.

Communication and Collaboration

For most students, there was a clear message from my interviews of a lack of both communication and collaboration between those in person and online. In some classrooms with limited displays, students in person cannot see those who are online if there is something being shared on a screen. Even if there isn't, due to the pattern we see of students preferring to turn cameras off, both students and teachers in person can feel as if they are talking to a black screen, because that is literally what they would be seeing. Participants online may feel as if they are watching the teacher address students in person rather than being in the class themselves, and as a result may refrain from speaking up to participate in discussions. One talking point brought up

often is that during class activities meant to promote collaboration, the in person and remote students are separated to work only with those attending class the same way, using Zoom breakout rooms for online learners. It definitely is the convenient solution, but at the same time has its disadvantages. In classrooms with inadequate technology, students in person cannot talk to ones online due to the microphone being at the front of the class, not able to pick up all the voices. One way to fix this was to have everyone join the Zoom room whether online or not. Drawbacks of this result in clunky and often confusing situations where sound gets distorted if both the student's personal computer is unmuted along with the teacher or another student.

6.3 Designing Active Learning Classrooms at IU

In order to continue to elevate the student experience Indiana University has established frameworks of active classroom design in order to increase student engagement across campus. Classroom designs range from active lecture classrooms to reality labs, and allow for new methods of learning.

Learning Space Rating System 3.0

The learning space rating system (LSRS) is a framework to measure the potential performance of learning spaces written by a group of higher education architects associated with universities across the nation, of which Indiana University is a part of. It provides measurable criteria to assess how well a classroom is able to assess multiple ways of teaching and learning. The LSRS uses sustainable building design as its base to create a rating system that allows institutions to compare their environments against best practices in the community.

During the creation of the third edition of the LSRS, the pandemic hit and caused a reevaluation of the importance of physical learning spaces as classes transitioned online. Some

of the essential questions surrounding hybrid learning include which aspects are best done online compared to which aspects are best done in a face-to-face classroom setting. Part 1 of the framework exists for universities to set up a base in order to implement the criteria in part 2. This includes encouraging professional development in place for faculty, having a good technology support structure, understanding the limits of the space available, as well as looking to the future of classroom design

The evaluation metrics within the LSRS is very extensive. The major topics included are environmental quality, layout and furnishings, technology and tools, and inclusion, with each topic having multiple subtopics. All these aspects combine to create not only a blueprint for future designs, but also a reflection tool to measure how an existing classroom meets or does not meet expectations.

Mosaic Initiative

While the LSRS is a very detailed overview of the aspects that go into creating an active classroom, due to its extensive criteria it's not entirely feasible to analyze bigger campuses like Indiana University with it. Due to this, a streamlined model of the LSRS 3.0 was developed and named The Mosaic Active Learning Initiative with the same goal of understanding what the experience for students, instructors, and other users of the classroom space is like.

The Mosaic Initiative Framework. Image © Indiana University Bloominton.

This is the evaluation tool used for every classroom at Indiana University. The basis of this tool is a 13-point certification scale meant to measure if a classroom is conducive to active learning pedagogies. Minimum requirements include room availability, stable room condition, and a signal path for technological displays.

What makes an effective classroom in today's era? First, no matter how many features a classroom may have, it won't mean anything if no one inside the classroom knows how to use any of it. Providing orientation to faculty that need it is crucial for implementing an active learning classroom. Seating density is important so that a room does not become overcrowded.

Space should be made in the instance the furniture needs to be reconfigured to suit a particular class activity. This includes movable furniture for grouping of students. Classrooms should have adequate work surfaces so students can bring devices that may be necessary for the class they are taking. Dry erase surfaces allow for collaboration and interaction between students as well as instructors. These surfaces should not be obstructed at specific angles. Safe and convenient electrical power is necessary to support various technologies used in the classroom. Visual displays should be easily available and visible to everyone in the classroom. It may not be feasible to do so, but having multiple displays allows for more flexibility in the content that can be shared at once.

Currently, the focus at Indiana University is to improve the quality of the remote experience with a proposal to purchase high end pan-tilt-zoom (PTZ) cameras that are capable of remote directional and zoom control. Additionally, better audio systems are a part of this proposal as well.

6.4 Reflections and Discussion

A common theme I've seen during both my work with DLR Group and at Indiana University is that midsize level classrooms that can be flexible in what it provides are very effective in creating classrooms that can be adapted to fit the needs of many different types of class structures. Huge, expensive lecture halls can be a selling point for a university, and in some cases they are necessary for classes that have a large population, but generally we see that over the top classroom design isn't really very necessary. Sometimes, keeping it simple is the best way forward.

Some of the issues brought up during my interview sessions don't have clear solutions. I think one of the natural drawbacks to having hybrid learning is that it can be pretty easy to feel disconnected, especially when the technology isn't there to improve the experience. Ultimately, I think for more specific problems that arise in particular classes, creating an understanding between the instructor and the students is crucial. Some small changes that can make a big difference include using one display in a classroom to show the students attending online - with their cameras on being required. Perhaps remote learning just won't work for some classes, and that is on the instructors to decide which method of learning suits their class the best. That being said, listening to students is also crucial for an institution, and there is a significant demand to at least have that hybrid option.

Administrations initially stressed that the goal returning from the pandemic was to eventually transition back to a fully in person instruction system, and that would be the future. However, time has shown that may not be the case. Hybrid learning is still an option for many classes during this time, and what comes next is impossible to predict. At the very least, if hybrid classes diminish in the near future, there may be a time when the need for it arises once again, and this time institutions will be more prepared. In the meantime, the design principles of classrooms at IU are continuing to evolve to suit the needs of all its students.

References

Rothenburger, Stuart. “A 360-View Design Approach.” *DLR Group*, 3 Mar. 2022, https://www.dlrgroup.com/idea/a-360-view-design-approach/.

Eckhardt, Jackie. “Evolution of Campus: Pedagogy Model.” *DLR Group*, 7 Feb. 2022, https://www.dlrgroup.com/idea/evolution-of-campus-pedagogy-model/.

Elias, Jacquelyn, et al. “Here's Our List of Colleges' Reopening Models.” *Chronicle.com*, 2020, https://www.chronicle.com/article/Here-s-a-List-of-Colleges-/248626?campaign_id=9&emc=edit_nn_20200520&instance_id=18629&nl=the-morning®i_id=120477271&segment_id=28532&te=1&user_id=cb2e11a7c31c9837f6b1a5f4f610c246&cid2=gen_login_refresh&cid=gen_sign_in.

Osterby, Krisan. “Evolution of Campus: Resilient Planning.” *DLR Group*, 31 Jan. 2022, https://www.dlrgroup.com/idea/evolution-of-campus/.

Strain, Benjamin. “Evolution of Campus Design.” *DLR Group*, 7 Feb. 2022, https://www.dlrgroup.com/idea/evolution-of-campus-design/.

Rothenburger, Stuart. “Evolution of Campus 2.0.” *DLR Group*, 3 Feb. 2022, https://www.dlrgroup.com/idea/evolution-of-campus-2-point-0/.

“Evolution of Campus.” *Rethinking K-12 Education Post-Pandemic*, https://engage.dlrgroup.com/evolution-of-campus/p/1.

Smalley, Andrew. “Higher Education Responses to Coronavirus (COVID-19).” *Higher Education Responses to Coronavirus (COVID-19)*, 22 Mar. 2021, https://www.ncsl.org/research/education/higher-education-responses-to-coronavirus-covid-19.aspx#:~:text=Closures%20and%20Learning%20Disruption&text=The%20spring%20semester%20of%202020,shifted%20to%20online%2Donly%20instruction.

“Briefing: What Are Scope 3 Emissions?” *The Carbon Trust*, 23 June 2020, https://www.carbontrust.com/resources/briefing-what-are-scope-3-emissions.

Staggs, J. & Ambrose, A. (2021). The effects of COVID-19 on Learning Space Rating System scores. *EDUCAUSE Review*.

Bent, Tessa, Knapp, Julia S., & Robinson, Jill K. (2021) Evaluating the Effectiveness of Teaching Assistants in Active Learning Classrooms. *Journal of Learning Spaces*, 9(2), 103-118.

Copridge, Keeley Webb, et al. “Faculty Reflections of Pedagogical Transformation in Active Learning Classrooms.” *Innovative Higher Education*, vol. 46, no. 2, 2021, pp. 205–221., https://doi.org/10.1007/s10755-021-09544-y.

Gibau, Gina Sanchez, et al. “Starting with the Space: Integrating Learning Spaces and Technologies.” *Journal of Teaching and Learning with Technology*, vol. 8, no. 1, 2019, pp. 17–32., https://doi.org/10.14434/jotlt.v8i1.26743.

Perkins, Tanya. “Strange(r) Places: Collaborative Creativity in Real and Virtual Spaces.” *Journal of Teaching and Learning with Technology*, vol. 8, 2019, pp. 99–107.

DuPaul, George J., et al. “College Students with ADHD.” *Journal of Attention Disorders*, vol. 13, no. 3, 2009, pp. 234–250., https://doi.org/10.1177/1087054709340650.