Doctoral School of Regional Sciences and Business Administration

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The Impact and Lasting Effects of COVID-19 on Higher Education

Doctoral Dissertation

Supervisor: Prof Dr Márta Konczos Szombathelyi
Széchenyi István University, Győr

Győr, 2023

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Author's Declaration

No portion of the work referred to in this dissertation has been submitted in support of an application for another degree or qualification to this or to any other university or other institution of learning.

The dissertation contains no material previously written and/or published by another person, except where an appropriate acknowledgment and reference is made in the bibliographical references.

Acknowledgement

I am grateful to my PhD supervisors, professor Márta Konczos Szombathelyi and professor Zoltán Baracskai, who supported me through the entire PhD program and its difficult challenges. I would also like to special thanks my statistics advisor, Klára Soltész-Várhelyi, for her incredible professionalism and patience with a stubborn, old student like myself. Finally, a special thanks to all the students who contributed their time and energy to my research.

I would also like to thank the Széchenyi István University in Győr and the Hungarian National Bank with its PADME Foundation for funding my PhD education by providing a generous scholarship to support my research work. I am eternally grateful.

Abstract

Higher education in the post W.W. II era has endured a plethora of challenges. Many of these challenges are related to evolving curriculums, re-defining admission policies, rising tuition costs, responding to social issues, job attractiveness its graduates, and how to appropriately adopt technology. These important issues have historically been addressed in a measured way and solutions were identified and implemented gradually over time. It was almost inconceivable before COVID-19 that the global education system could be ever shut down in a matter of days. Since March of 2020, however, higher education no longer has the luxury of taking gradual approaches as institutions all over the world were forced to teach exclusively online with available technology on nearly a moment's notice. Many students had to quickly learn "how to learn" online, and the classical control of classrooms was scattered into virtual fragments fronting unknown home environments. More than two years later, higher education, like all other industries, is trying to assess the true impact of COVID-19 and how to define the "new normal." While higher education has been remarkably resilient to rapid change in the past, it must now recognize that COVID-19 is the most disruptive force it has ever faced. The higher education institutions that can harness the power of data and technology to offer best education to the most students at the best prices will be the ones that will survive to see the next big challenge.

Before COVID-19, my PhD research was based on a high school entrepreneurship program I founded in 2019 called the Lean Learn Academy (LLA). I attended the INTED 2020 conference in Valencia, Spain and presented two conference papers and later presented a third conference paper on high school entrepreneurship at the Economic and Social Development 2020 Online Conference. Due to COVID-19, the Lean Learn Academy was unfortunately shut down and I realized that my research could not continue without live, in-class sessions. In January of 2021, I changed the focus of my research to the impact of COVID-19 on higher education and viewed it as a once in a lifetime opportunity due to the extraordinary circumstances. This decision was heavily supported by the fact that I was teaching eight courses during this semester to a diverse group of international, undergraduate and master's students. Since the conditions regarding education were changing so quickly, I chose to conduct surveys at the beginning and end of the Spring 2021 and Fall 2021 semesters and subsequently used this data to publish three articles in the Acta Polytechnica Hungarica Journal of Applied Sciences (Q2), the Economics & Sociology Journal of Scientific Papers (Q2), and the the Education Sciences Journal (Q2). My research, overall, covers a semester with a total COVID-19 lockdown and one with a partial COVID-19 lockdown.

The purpose of my dissertation is to combine my literature review with the insight gained from my research to deliver meaningful recommendations to those currently involved in higher education. As higher education institutions look to the future, they must recognize that the delivery and pedagogy of higher education in a post COVID-19 world must change to restore and maintain relevance. While hybrid learning has been frequently debated, yet used sparingly for decades, it is now becoming more of a necessity and less of a novelty in a world where future pandemics and geo-political events are a veritable certainty. My research provides credible evidence that hybrid learning represents a constructive compromise that can cost effectively create better learning outcomes for greatest number of students. This compromise is highly consistent with the shift to a hybrid work environment that enables workers to split time between the office and at home and online. There is growing evidence that supports the permanent transition to hybrid working environments and how hybrid learning in higher education is reflective of this trend. Technology in education has undoubtedly advanced

significantly since the beginning of COVID-19, but technology itself is only the delivery mechanism. Better education must involve a pedagogy that uses technology to stimulate better and faster interaction between teachers, students, and both the private and public sectors. My research on high school entrepreneurship provides compelling evidence regarding how activity-based learning is critical for relevant education in a post COVID-19 world that is characterized by rapid and unprecedented change This is further supported by my own teaching experience in higher education. The relevance and cost of higher education are in serious question in a world still recovering from the COVID-19 pandemic, becoming transformed by A.I. and automation, and now feeling the negative effects of a war in Ukraine. The days of incremental change are over and successful higher education institutions will need to use data, technology, activity-based teaching, and unwavering innovation to remain relevant in tomorrow's global economy.

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1. Introduction

In 1990, I had just finished the first year of my undergraduate studies at Amherst College and came home to Grand Blanc, Michigan for the summer. My parents had just started a business in the basement of our house called J-COM EDI Services and it consisted of nothing more than a few tables, telephones, and fax machines. EDI stands for "electronic data services" and their business is still focused on helping automotive suppliers to the "Big Three" automakers (GM, Chrysler, and Ford) to become compliant with mandatory data requirements. My father had a background in EDI and had worked for decades as a data processing manager in numerous U.S. auto parts manufacturers, and my mother was a substitute schoolteacher. While both of my parents are college graduates and had relevant work experience and skills, the early days of J-COM were incredibly challenging. My parents were thrust into an environment of extreme uncertainty where there was no magical "How To" guide outlining the steps to success. Their only options were to either learn how to adapt or accept failure. The situation that I have just described is not unique to my parents, but rather very common amongst startups and businesses operating during periods of elevated uncertainty. My parents realized that the only way to deal with uncertainty was to adopt the "Build, Measure, Learn" mentality that was later popularized in Eric Ries' book "The Lean Startup" (Ries, 2011). This meant building a model, testing it, and improving it in rapid cycles called "iterations." Slow iterations for many businesses were synonymous with bankruptcy. If you ask them now, then my parents will tell you that they learned more in 1990 than they did in any other year of their lives by a wide margin.

When I founded the Lean Learn Academy in April of 2019, my goal was to teach high school students how to adopt the "Build, Measure, Learn" mentality and apply it to their own business ideas just like my parents did. The program began at the Bornemisza Péter High School and later included the Fazekas Mihály High School. In addition to creating business ideas, the goal of the program was to evaluate whether high school students can achieve a level of problem solving and critical thinking equal to or greater than adults with far more life and work experience. The results of my research were supportive of this goal until the COVID-19 pandemic forced the suspension of this program in the Fall of 2020. While this was a difficult setback, the research, and the publishing of three conference papers on the Lean Learn Academy still directly complement my new research topic of exploring the impact and lasting effects of COVID-19 on higher education.

1.1 Has COVID-19 Permanently Changed Higher Education?

Many prominent and well-respected individuals have predicted that higher education would be significantly disrupted by technology. The "founder of modern management," Peter Drucker, famously predicted in 1997 that "big university campuses will be relics" and that "the future is outside the traditional campus, outside the traditional classroom" (Drucker, 1997). Clayton Christensen was a prominent Harvard professor and creator of the widely acclaimed "disruptive innovation" theory. In his work "The Innovative University: Changing the DNA of Higher Education from the Inside Out" (2011), Christensen argued higher education would be transformed by technology. While technology has certainly played an increasingly larger role in higher education leading up to its global shutdown on March 11th, 2020, its adoption was more of a choice than a mandate. The COVID-19 pandemic has uniquely become the first crisis in history that forced educators on all levels worldwide to use technology to keep teaching. By April of 2020, schools, and universities in 191 countries were closed affecting more than 1.5 billion students and approximately 90% of total enrolled learners (UNESCO, 2020). Once educators realized that COVID-19 was not going to be transient, emergency remote teaching

(ERT) was the only viable option. ERT can be defined as temporary shift to an alternative teaching method due to circumstances that make traditional teaching untenable such as disasters, wars, and disease outbreaks. This sudden shift to online teaching caused significant stress and anxiety for teachers, students, and administrators as their primary goal was to just "get online" and the quality of learning outcomes was a distant second. Unlike during previous decades and disruptions, there were no other options to consider or debate.

COVID-19 was an unprecedented, global crisis and education on all levels is still trying to assess its impact and understand its lasting effects. As one can clearly see from the history of higher education, disruptions and challenges have always existed and overcome. Technology has not transformed higher education despite very credible people making powerful cases for it. As education returns to normalcy, however, there are so many questions that remained unanswered in the wake of a global pandemic and whether COVID-19 will "this time" truly usher in the long-anticipated era of disruptive change in higher education. Using my literature review and research, I will argue why COVID-19 represents a point of no return for higher education.

The main pillars of this dissertation seek to answer the following research questions:

RQ1: What was the impact of COVID-19 lockdowns and emergency remote teaching (ERT) on higher education students during the Spring 2021 semester?

RQ2: How did online learning during the COVID-19 lockdowns affect the sentiments of higher education students towards the usage of technology in education and what is the significance of remote learning sentiment?

RQ3: Did the return to the classroom during the Fall 2021 result in improved student learning sentiment and lower burnout for higher education students?

I will also deliver my own recommendations in Chapter 8 regarding how higher education institutions can successfully adapt the "new normal."

1.2. Problems identified during the literature review, data collection and gap analysis

The impact of the COVID-19 pandemic is a topic that will be researched for many years to come. The challenge of conducting research during the COVID-19 pandemic involved how to properly design and execute research during such a chaotic period. One big advantage I had from the beginning was my access to a diverse group of international students and did not have to rely exclusively on students from a single university. I consider this to be a significant gap that my research is able to fill.

1.21 Spring 2021 Surveys

Since the conditions during COVID-19 were evolving so quickly, I felt it was imperative to conduct surveys both at the beginning (BOS) and the end (EOS) of the Spring 2021 semester. I consider this to be a research gap as most of the research conducted during COVID-19 did not consider how quickly the conditions were evolving. The Spring 2021 BOS survey provides insight both from the beginning of the Spring 2021 semester and from previous semesters (Fall 2020, Spring 2020) that were affected by COVID-19 to different degrees. The Spring 2021 BOS and EOS surveys were designed to gather data on a wide variety of topics that included

technology, home environments, quality of education, and the emotional states of students during the pandemic (Appendix I).

The students in the Spring 2021 surveys were also given the opportunity to respond to free answer questions. I realized that my ability to ask the right questions was limited due to the pace of change that was occurring during COVID-19 and the research needed to include the voices of students. My research is one of the few to use free answer data, which has proved to a useful complement to my quantitative, survey-based research. Once again, I think this is another significant gap that my research was able to address.

Using my Spring 2021 research, I published the journal article entitled "Holistic Online Learning in a Post COVID 19 World" in the Acta Polytechnica Hungaria Journal of Applied Sciences and the journal article entitled "The Influence of COVID-19 on Sentiments of Higher Education Students – Prospects for the Spread of Distance Learning" in the Journal of Economics & Sociology.

1.2.2 Fall 2021 Surveys

Using feedback from the Spring 2021 survey, the Fall 2021 BOS and EOS surveys were extended to include questions related to self-efficacy, resilience, and burnout. It was clear that the stress of COVID-19, home environments, and online learning was affecting all students to varying degrees. These surveys were designed to gain insight about how student sentiments toward their education changed during this still turbulent period.

I published the journal article entitled "Student Burnout in Higher Education: From Lockdowns to Classrooms" in the Education Sciences Journal.

1.3 Combined Research Methodology

To shed light on the current state of higher education and its future, the research presented in this dissertation addresses two main areas: education delivery and education pedagogy. Figure 1.1 offers a flow chart summarizing the flow of this combined research.

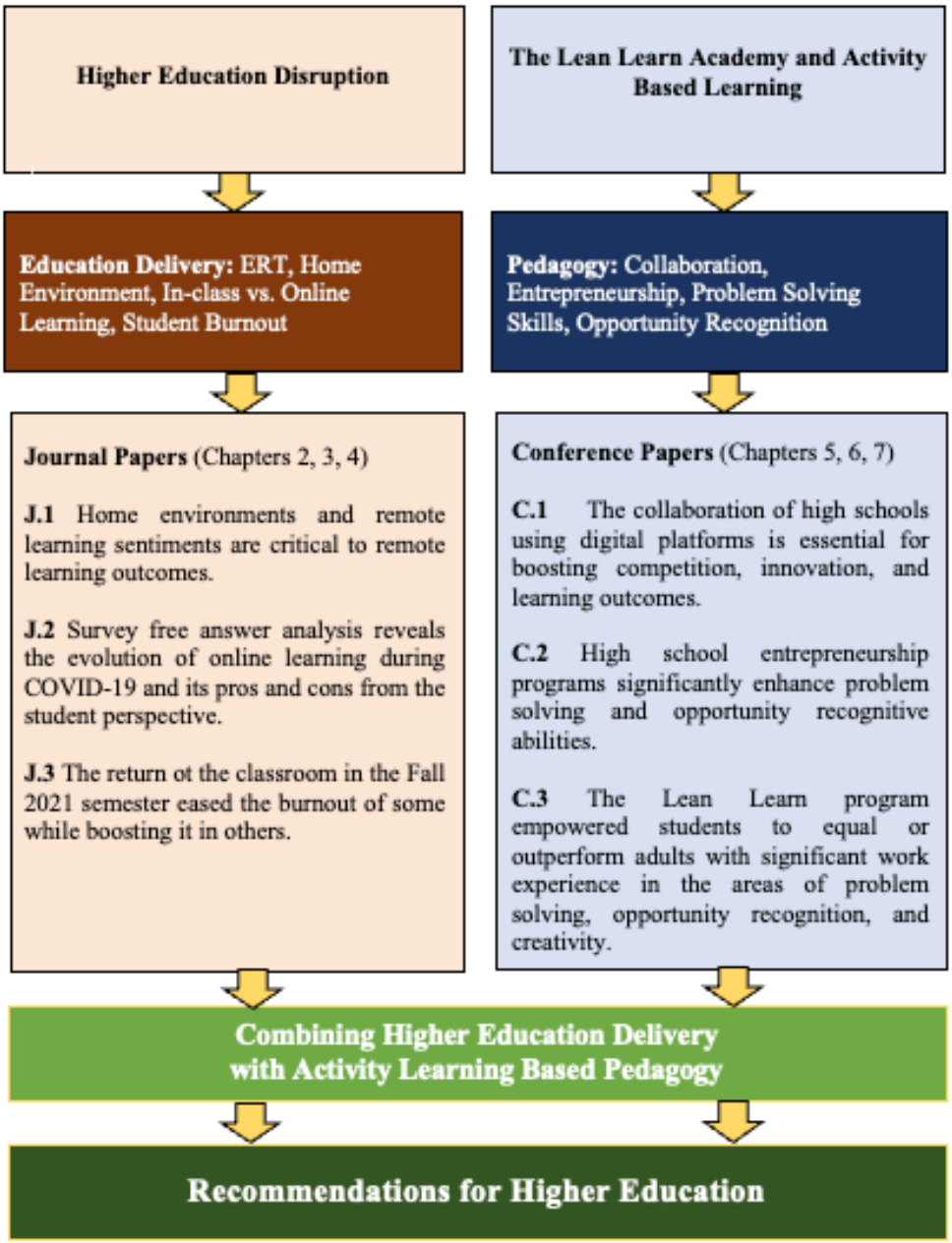

Figure 1: Combined research flow chart

1.4 Journal articles included and contribution

A flowchart of my research regarding the impact of COVID-19 and its lasting effects on higher education is shown in Figure 1.1. A summary of the research questions and conclusions from my journal articles (J.1, J.2, J.3) is displayed in Table 1.1.

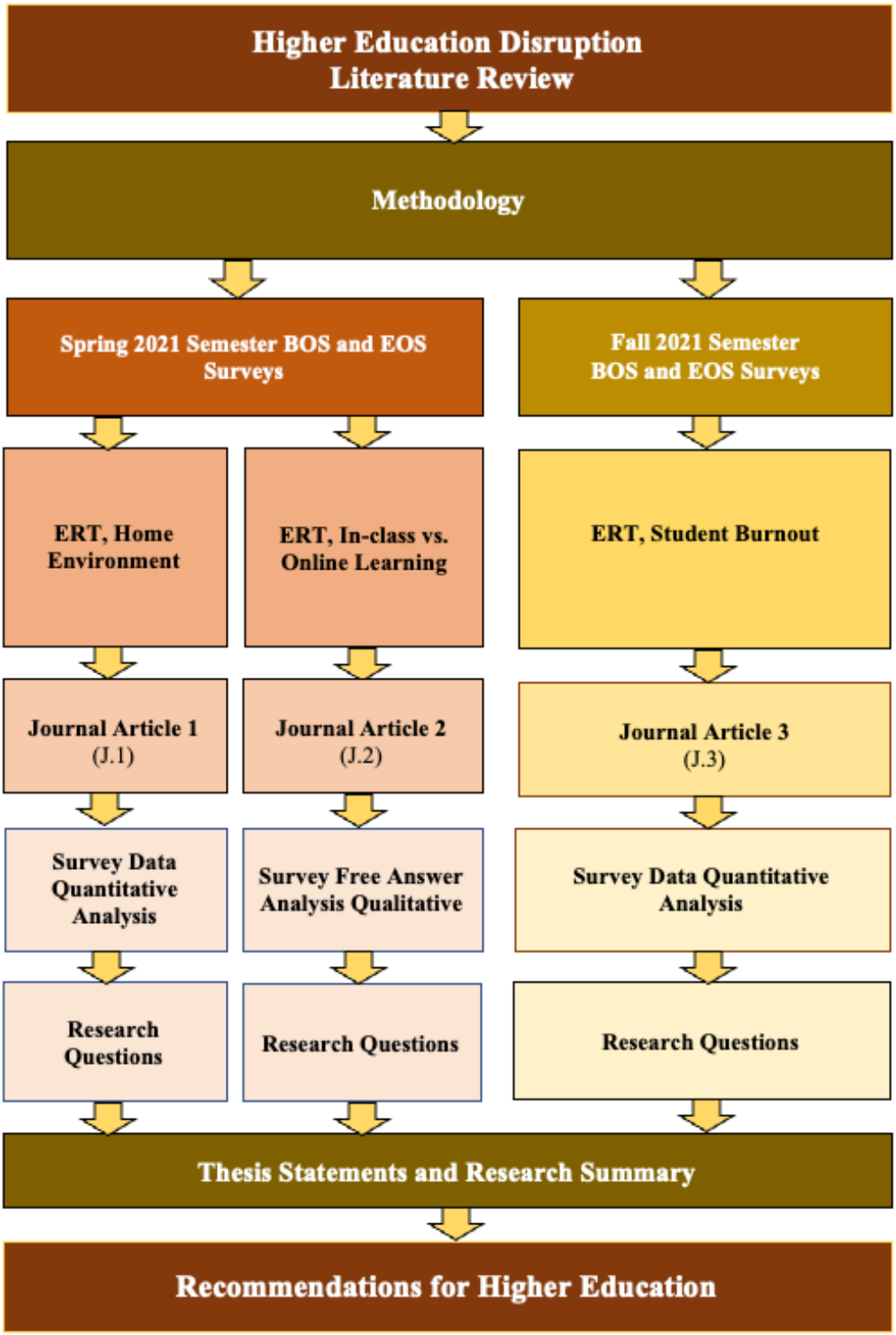

Figure 1.1: High Education Research Flow Chart

Table 1: Summary of the research questions from published journal articles and presented in the doctoral thesis

	Research questions from journal papers (1,2,3)	**Conclusions**
J.1[1] R.1.1	Was the level of home and social disruption for university and graduate students significant during the Fall 2020 semester?	The effects of COVID-19 lockdowns did increase home and social disruption for university and graduate students significantly during the Fall 2020 semester.
J.1 R.1.2	Did home and social disruption for university and graduate students become more significant during the Spring 2021 semester?	While level of home and social disruption was significant during the Spring 2021 semester where COVID-19 lockdowns were the norm, professors and students gained experience and became better able to adapt to online learning.
J.1 R.1.3	Did the usage of emergency remote learning impact the quality of education in the Spring 2021 semester?	The level of home and social disruption did become more significant in some areas, while other areas showed signs of improvement as professors and students gained experience and became better able to adapt to online learning.
J.2 R.2.1	Can the collection and analysis of use of free answer data provide valuable insight into higher education student sentiment?	During particularly turbulent periods, like the COVID-19 pandemic, the student sentiment toward their education can change dramatically and analyzing free answer data is a valuable way for higher education to better understand how to appropriately adapt.
J.2 R.2.2	Will the data from the free answer questions during the Fall 2020 and Spring 2021 semesters show significant changes in student sentiment towards online learning?	The free answer data does reveal significant swings in student sentiments in some areas while other areas remained largely constant.
J.2 R.2.3	Considering COVID-19 disruption, does student sentiment indicate that technology will play a larger role in higher education in the future?	The free answer data clearly indicates that students have become more comfortable with using technology in their education and overwhelmingly support the use of "best in class" technology both with in-class and online learning.

[1] Journal Article 1, Research Question 1

J.3 R.3.1	Will the COVID-19 lockdowns during the Spring 2021 semester negatively and disproportionately affect the burnout of higher education students with lower remote learning and home environment sentiments?	The research data clearly indicates that students with lower remote learning sentiments were far more likely to suffer from burnout symptoms.
J.3 R.3.2	Will the return to the classroom during the Fall 2021 semester positively impact the burnout of students who struggled with remote learning?	The research data shows that the students who suffered burnout when learning exclusively online were far less likely to experience burnout symptoms when returning to the classroom. The research data also revealed that students who were comfortable learning online were far more likely to experience burnout symptoms when returning to the classroom.
J.3 R.3.3	Was the level of a student's self-efficacy significantly and negatively correlated to burnout during the Spring 2021 and Fall 2021 semesters?	In the beginning of the Spring 2021 semester, self-efficacy was significant and negatively correlated with burnout. At the end of the Spring 2021 semester, self-efficacy became less important for students with low remote sentiments while students with higher remote sentiments reported lower levels of self-efficacy due to their unhappiness when returning to the classroom.

1.4.1 J.1: "Holistic Online Learning in a Post COVID 19 World"

My literature review for **J.1** includes journal articles that have published research addressing whether online learning outcomes can equal those from in-class learning. A 2013 randomized, university study showed that the live-only teaching was only moderately more effective than online learning, although in-class teaching was significantly more effective for Hispanic students, male students, and lower achieving students (Figlio, 2013). Another larger randomized, university study, also done in 2013 (Bowen, 2013), studied the effects of "blended" learning and the learning outcomes were approximately the same compared to those who only attended traditional classes. Finally, a third randomized, university trial was conducted in 2016 (Alpert, 2016) over the course of four semesters and its findings show that the student learning outcomes for pure online learning were notably inferior to the ones observed from live classes. As one can see, the debate between the effectiveness of in-class vs. online learning continues as it involves a large and highly diverse set of problems.

The COVID-19 pandemic offered me a unique opportunity to research the effects of online learning when there was no other alternative. For the majority of global higher education students, the Spring 2021 semester was done entirely online. My research results indicate that

the home environments of higher education students in the beginning of the semester had a detrimental effect on the learning outcomes of many students. Distractions at home, staying motivated, and difficulties with keeping a daily routine were commonly cited. It is important to recognize that the students with lower remote learning sentiments were predominantly less satisfied with their home environments. In contrast, students who had higher remote learning sentiments were also ones who experienced less difficulties with their home environments. Overall, my research indicates that most students rejected the statement that they were learning more online than in the classroom.

The students who experienced difficulties with their home environments in the beginning of the semester were also likely to experience the same difficulties at the end of the semester. Once again, it was evident that remote learning sentiment is positively correlated with home environment sentiment. At the end of the semester, students expressed stronger feelings towards missing friends, teachers, and participating in sports. Higher education institutions must now recognize that there can be significant diversity in learning styles amongst the student population and that poor home environment or low remote learning sentiments can be very detrimental to learning outcomes.

COVID-19 had the unprecedented effect of higher education institutions losing control of student learning environments. The design and layout of a university is the product of careful planning, and this was all shut down in an instant. While ERT was necessary to keep education flowing during a health crisis, high education institutions must recognize that home environments and remote learning sentiments are critical indicators of how well a student will learn remotely. Successful online universities are the product of many years of trial and error with the end goal of making online learning outcomes equal or better than in-class learning. The students choosing online universities are most likely students who have relatively high remote learning sentiments and live in stable, functional home environments. Based on my research and literary review, it is undeniable that the ERT deployed by most higher education institutions resulted in significantly lower learning outcomes during the Spring 2021 due to complex combinations related to home environments, remote learning sentiments, technical issues, and the emotional states of students.

1.4.2 J2: "The Influence of COVID-19 on Higher Education Student Sentiment - prospects for the spread of distance learning technologies"

Clayton Christensen's two books on higher education (Christensen, 2008, 2011) made the compelling case following the financial crisis (2007-2008) that technology and economic conditions would lead to a disruption in higher education. He believed that traditional universities around the world would be successfully challenged by educational upstarts offering better education at a better price. The disruption that Christensen predicted did not come to pass before COVID-19, but my research explores whether these predictions will happen after COVID-19 as higher education was forced to adopt online learning out of necessity rather than choice. The sudden and massive move to online learning is commonly referred to as emergency remote learning (ERT). Since beginning of the pandemic, significant research had been done on the consequences of ERT by Müller et al. (2021), Hodges et al., (2020), and Watermeyer et al. (2021), as well research regarding the challenges of transitioning from ERT to high functioning, online platforms from Seaman (2009), Park and Shea (2020), and Cranfield et al. (2021).

As it was discussed in the previous section, a student's remote learning sentiment is a function of a multitude of factors. COVID-19 amplified many of these factors and created new ones fueled by unprecedented health issues. To better understand how students viewed their education during the Spring 2021 semester, they were asked to freely express what they like about online learning and what its biggest challenges are both at the beginning and end of the semester. These responses were then interpreted and coded for analysis. Due to the diversity of my sample, I felt this would be an opportunity to discover the existence and importance of factors that I had not considered or adequately considered. Admittedly, I did not think that many students would take the time to answer these questions due to a lack of time or interest. I was pleasantly surprised to see the number and quality of responses I received in the beginning and end of the Spring 2021 semester. This motivated me to code and analyze this data despite the difficulties typically associated with using free answer data. It was particularly interesting to see the relative change in sentiment in the students (n=83) between their beginning and end of semester responses.

The free answer data revealed a very mixed picture of online learning student sentiment. While the comforts, time, convenience, and cost benefits of learning from home were frequently and positively mentioned, the negative impact of distraction in the home environment were also frequently mentioned. It was also observed that the students who had more problems with their home environments were also more likely to have lower remote learning online sentiment, a result that is consistent with the survey data from the previous journal article. The free answer data from the Spring 2021 semester clearly shows that there is a polarization of remote learning sentiment where many students either embrace online learning or reject it altogether. This helps to explain why many students responded favorably to hybrid learning as a compromise to exclusive in-class and online learning.

Significant shifts in student sentiment were observed between the beginning to the end of the Spring 2021 semester. The mentions of the benefits of the comforts, time, and convenience of at home learning all fell substantially, while positive mentions of the educational benefits, flexibility, teaching methods, and technology all substantially increased. The ability and willingness of students to learn online improved while the ability of professors to teach more effectively online also improved. Many students, however, still expressed frustrations with the local of social interaction and lack of structure and organization that in-class learning provides. The free answer data also revealed that the students who had lower remote learning sentiments in the beginning of the Spring 2021 semester were also the ones who had similar issues at the end of the Spring 2021 semester. These results are consistent with the survey data collected from this semester that were presented in the previous journal article and underscore the need for higher education to be more personalized.

I believe that the significant changes in student sentiment during the Spring 2021 semester represent a significant turning point. Professors and students alike were forced to exclusively use technology to facilitate education. During this unprecedented process, significant improvements were made and a shift away from ERT did occur. In general, students became more able and willing to learn online, and professors became more able and willing to teach online. The disadvantages of learning exclusively online were also discovered and revealed that there are inherent and irreplaceable benefits to in-class learning. To adequately understand what the "new normal" might be in the future, higher education institutions must collect data far more frequently and comprehensively to better understand the diversity of their "customer base."

1.4.3 J3: "Student Burnout in Higher Education: From Lockdowns to Classrooms"

While student burnout is not a new phenomenon, COVID-19 enhanced its effects and frequency. There were several significant research studies conducted during COVID-19 designed to measure its impact on student burnout. A U.K. study (Savage, 2020) used two surveys before and two surveys after COVID-19 lockdowns and found that the lockdowns caused a significant deterioration in the mental and physical well-being of students. Studies in Turkey (Gundogan, 2021), Poland (Tomszek, 2022), and Finland (Salmela-Aro, 2022) all report similar findings related to elevated student burnout due to adverse COVID-19 conditions. To better understand the impact of COVID-19 on student burnout, I created a more comprehensive Fall 2021 semester survey that included questions from the Maslach Burnout Inventory (Maslach, 1981) as it has been successfully used in higher education research for decades (Schaufeli, 2002). Questions from the General Self-Efficacy Scale (GSE) (Schwarzer, 1995) are also used to understand the relationship between self-efficacy and burnout.

The students who participated in the survey at the beginning of the Fall 2021 semester were asked to reflect on their online learning experience from the Spring 2021 semester. The results indicated that the students with lower remote learning sentiments were also more likely to experience burnout symptoms while learning exclusively online. The causes of these symptoms are directly connected to factors frequently mentioned in the previous two articles such as problems with home environments, technical issues, distractions at home, difficulty in staying motivated, struggle to maintain a daily routine, and missing the social environment at school.

It was fascinating to observe that the return in the classroom during the Fall 2021 semester increased the burnout symptoms of students with a higher remote learning sentiment and lowered the burnout symptoms of the students with a lower remote learning sentiment. The students who valued the comfort and convenience of learning at home found the return to the classroom to be stressful and inconvenient. The students who struggled with the distractions, technical issues, and social isolation of at home learning were elated to return to the classroom and in-person driven, administrative system.

It was also very interesting to observe that self-efficacy in the beginning of the Fall 2021 semester was significantly and negatively correlated to burnout. By the end of the Fall 2021 semester, self-efficacy became significantly less correlated to burnout as the services provided by the university acted as a meaningful replacement for many students. For the students who experienced enhanced burnout symptoms due to the return to the classroom, a lower self-efficacy was observed demonstrating that these students prefer the greater autonomy provided by online learning. A polarization is once again observed where burnout symptoms are both enhanced and relieved by the return to the classroom, the opposite of what was observed in the beginning of Fall 2021 semester where online learning had the opposite effect.

1.5 Conference papers included and contribution

The Lean Learn Academy began working with Hungarian high school students in September of 2019 and I published three conferences papers based on this experience. Please refer to Figure 1.2 for a research flow chart and to Table 1.1 for a summary of the research questions and conclusions from these conference papers.

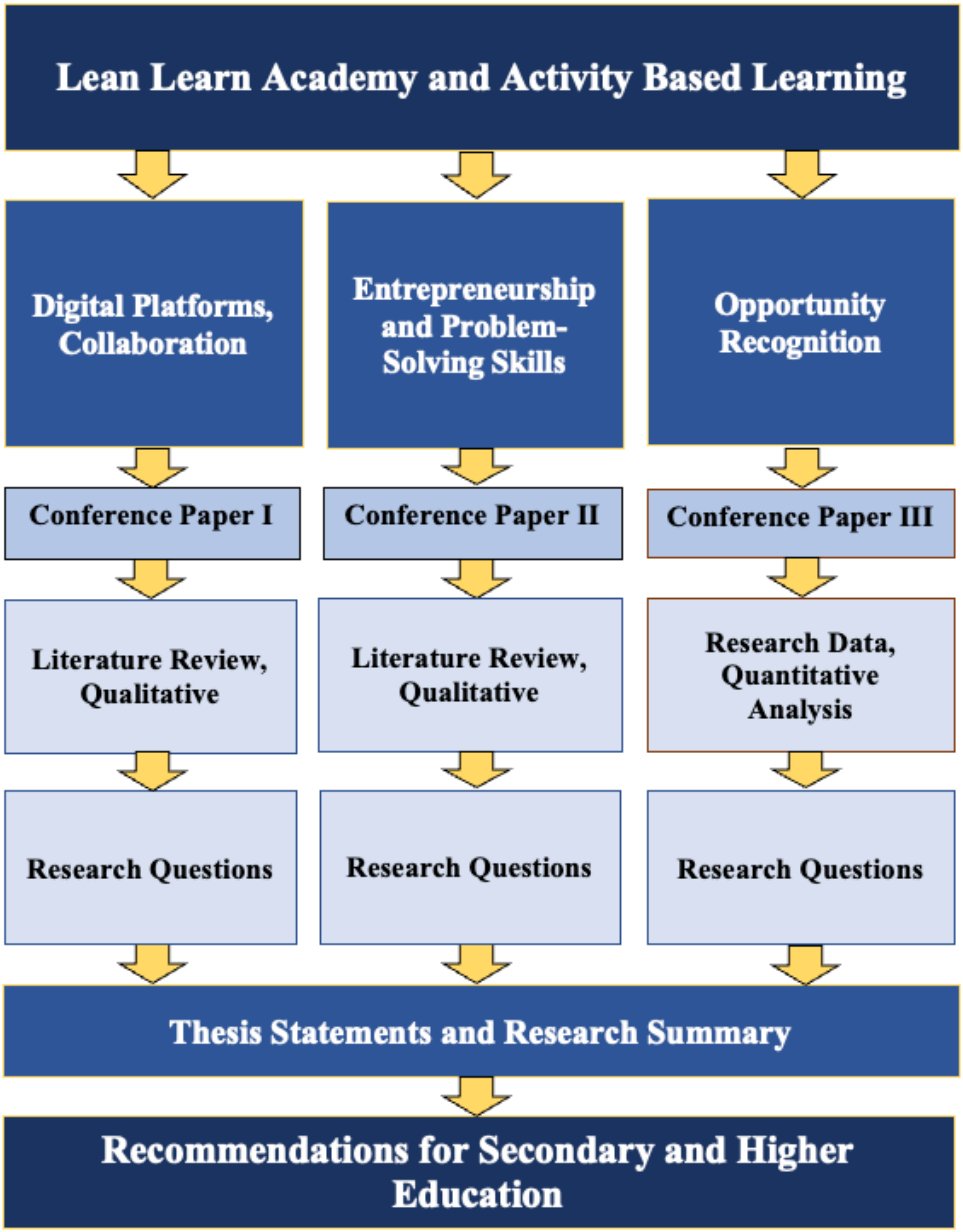

Figure 1.2: Lean Learn Academy and Activity Based Learning Research Flow Chart

Table 1.1: Research Questions and Conclusions from Conference Papers

	Research questions from conference papers (1,2,3)	**Conclusions**
C.1[2] R.1	Are digital platforms essential for high school entrepreneurship programs by enabling coaching, collaboration, and competition?	Coaching, collaboration, and competition are essential for high entrepreneurship programs and cannot be developed in isolation without interconnected digital platforms.
C.2 R.1	Can the Lean Learn Academy significantly enhance the problem-solving skills and opportunity recognition of Hungarian high school students?	See CP3.
C.3 R.1	Can the Lean Learn Academy significantly enhance the problem-solving skills and opportunity recognition of Hungarian high school students?	The Lean Learn Challenge proved that high school students, under the same test conditions, can equal or outperform adults with significant work experience in the areas of problem solving, opportunity recognition, and creativity.

1.5.1 C1: "Digital Platforms Significantly Enhance High School Entrepreneurship Programs by Enabling Coaching, Collaboration, and Competition"

Based on my ongoing experience with teaching entrepreneurship to high school students, coordinating with volunteers and guest speakers, and school administrators and literature reviews, I submitted two abstracts in late 2019 to the 13th International Technology, Education, and Development Conference or, more concisely, INTED 2019. Both papers were accepted and published in the IATED Digital Library, and I presented these papers at the conference held in Valencia, Spain from March 11-13. I also acted as a moderator for one of the sessions.

The E.U. in its 2016 Eurydice Report stated that entrepreneurship education was a key policy objective and essential for building an entrepreneurial culture in E.U. member states. The challenges of defining and delivering entrepreneurship education have been significant, however, and the gaps between member states remain large. The purpose of this conference paper was to suggest that digital platforms connecting high school programs within countries and between countries is a cost-effective way to promote coaching, collaboration, and competition as is often seen in sports.

1.5.2 C2: Entrepreneurship in Hungarian High Schools and its Positive Impact on Problem-Solving

[2] Conference Paper 1

This conference paper (C2) was written as a follow-up to the previous conference paper (C1) showing the problem-solving abilities of Hungarian high school students has been declining in comparison to fellow regional countries according to the 2018 OECD PISA Report. This paper also cities the growing global skills gap that was mentioned in the PwC Annual CEO Survey (2019) and by the World Economic Forum in 2020. As a solution to this problem, this paper outlines how the Lean Learn Academy will create a program to enhance the problem solving and opportunity recognition skills of Hungarian high school students and compare those skills to adults with higher education degrees and significant work experience.

1.5.3 C3: The Impact and Urgency of Teaching Opportunity Recognition to High School Students

My third conference paper (C3) was submitted to the 58th International Scientific Conference on Economic and Social Development in 2020. This paper was accepted later published in their Book of Proceedings and I presented the paper to an online audience on September 5th, 2020. This conference paper positions high school entrepreneurship as a solution to the "Creative Destruction" put forth by Joseph Schumpeter in 1942 (Schumpeter, 1942). Despite the fact the government agree that entrepreneurship education is needed to promote innovation and the creation of High Growth Enterprises (HGEs), governments often promote losing industries and misallocate resources (Shane, 2009), where entrepreneurs themselves select industries that are easy to enter yet do not represent the best long-term opportunities (Johnson, 2005).

This paper is based on a unique methodology that directly compared the progress of active students in the Lean Learn Academy with the skills of adults with significant age and work experience advantages. In the three core areas of opportunity recognition, minimum viable product construction, and creativity. The Lean Learn students managed to outperform the adults in opportunity recognition and creativity. While these results are far from conclusive, they do offer evidence that high school students with the right instruction and motivation can perform on a level way beyond their years. I firmly believe entrepreneurship should be a core subject in all high school curriculums as it facilitates activity-based learning rather than passive learning. In our uncertain world, high school students should be taught to use, find, and retain information rather than memorizing materials for standardized test.

2. Holistic Online Learning in a Post COVID-19 World

Acta Polytechnica Hungarica

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Abstract: In August of 2020, the United Nations reported (U.N., 2020) that the COVID-19 pandemic had affected 1.6 billion learners in more than 190 countries and on all continents. The closing of school and other learning spaces impacted an astonishing 94 percent of the world's student population. These sudden school closures at all levels had the immediate and unprecedented effect of triggering a mass migration to emergency remote teaching. While mass vaccinations have enabled educational institutions to reopen and students to return to classrooms in the Fall of 2021, the educational disruption caused by the COVID-19 pandemic is far from over. Higher education must now permanently transition from reductionist, emergency remote learning systems to permanent, holistic online learning platforms. In order to better understand this transition, an online survey was delivered to diverse groups of international students attending Corvinus University and ESSCA School of Management at the beginning and end of the Spring 2021 semester. The analysis of these survey strongly indicate that the home and social environments of university had a significant impact on their learning aptitudes.

Keywords: higher education, COVID 19, emergency online learning, learning experience, sentiment analysis

2.1 Introduction

According to the UNESCO Institute of Statistics, there were 32.6 million students enrolled in higher education in 1970. In 2000, this number rose to 99.9 million students. Despite headwinds such as a declining youth population and lower fertility rates, the UIS estimates that the enrollment in high education could potentially be 377.4 million students (2030), 471.4 million by 2035, and 594.1 million by 2040 [2]. Even if one halves each of these forecasts, these numbers and growth rates are staggering.

The growth of online learning before the COVID 19 pandemic can be characterized by four phases: 1990s (Internet propelled distance education), 2000–2007 (increasing use of Learning Management Systems – LMS), 2008–2012 (growth of Massive Open Online Courses – MOOCs), and beyond where online enrollments in higher education outpaced traditional higher education enrollments [3]. Since the first phase back in 1990, international organizations, such as UNESCO, the World Bank, and the European Commission, have all argued that online education has the unique opportunity to cost effectively reach rural and disadvantaged areas of the world). Considering the tremendous growth of online that has occurred during the past few years, educators continuously face the significant challenge of ensuring that the quality of online education keeps pace with the quantity of users [4].

During these four phases, the effectiveness of traditional vs. online learning has been vigorously debated and conclusions vary. In the past decade, there have been a few notable

randomized trials studying the effects of online instruction on student learning. One such study involved a large introductory microeconomics course at a major research university where students were randomly selected to watch either live lectures or the same lectures in a traditional educational setting [5]. The results indicate that live-only teaching was moderately more effective than online teaching, although this effectiveness was more significant for Hispanic students, male students, and lower achieving students. In another well-known randomized trial, students at six public universities were given either a hybrid "blended" format (one hour of face time instruction per week) or a traditional format (three hours of face-to face instruction) The results of this study showed that the students learning in the hybrid mode had learning outcomes that were approximately the same as those who attended traditional classes and at a significantly reduced cost. One of the key conclusions of this study was that properly designed online learning programs have the potential to achieve at least equal outcomes as traditional learning [6]. Lastly, a randomized trial involving 1,519 students across four semesters revealed that the students who completed purely online course had learning outcomes that were inferior to those attending live classes [7]. In any case, it must be understood that delivering effective online learning is very complex and the result of careful planning and an evolving design fueled by significant feedback from teachers and students.

The COVID 19 pandemic forced a mass migration to emergency remote learning (ERT) where the primary objective of educators was to get all students online as quickly as possible [8, 9….16]. This rapid transition lies in contrast to how many effective online platforms were previously built using careful design, planning, and significant student feedback [17]. While the shock of rapid online migration has somewhat diminished, the challenge of delivering online education that is comparable with live classroom teaching has not. We now live in a world where online teaching is no longer an option, but rather a necessity [18]. Educators must now understand and properly respond to the fact that dismantling of the physical and social environments of universities will have a permanent impact on the mental and physical well-being of their [19].

A higher education, comparative study was conducted during the COVID 19 pandemic regarding the online learning perceptions of 559 students from South Africa, Wales, and Hungary [20]. As one might expect, the results of this study show that there were significant differences in how students experienced online learning. The underlying causes behind these differences were related to how well a particular country responded to the pandemic and the level of support and resources given to students. The home environments of these students, therefore, played a critical role in shaping online learning perceptions. In another international study conducted during the COVID 19 pandemic involving 1,047 participants, the results revealed that the psychosocial strain was significantly increased during periods of home confinement [21]. A larger study done the in the U.S. involved 30,725 undergraduate students and 15,346 graduate students showed that the prevalence of major depressive disorders was two times higher in 2020 compared to 2019 and anxiety disorders were 1.5 times higher than in 2019 [22]. Finally, a sample of 30,383 students from 62 countries revealed that negative impact of the COVID 19 pandemic, particularly for the most vulnerable student groups [23].

As these research studies indicate, university students from all over the world have been harmed and damaged by the effects of the COVID 19 pandemic. This harm and damage grew as the shared facilities and face to face communities were dismantled [19]. Educators find themselves in the position to not only reflect on what has transpired since March of 2020, but to also use this experience to create online learning platforms that do far more than just "go online" [24]. Universities around the world can longer deny the fact that online learning has already become a permanent part of education at all levels. Success in future, therefore, will lie

in the recognition that holistic online learning must replace emergency remote teaching (ERT) practices [25].

This paper studies the critical importance of home and social environments on university students' learning experiences during the COVID 19 pandemic and poses the following research questions:

RQ_1: What was the level of home and social disruption for university and graduate students during the Fall 2020 semester?

RQ_2: How did home and social disruption for university and graduate students progress during the Spring 2021 semester?

RQ_3: How did emergency remote learning impact the quality of education in the Spring 2021 semester?

The rest of the paper will be organized as follows: Section 2 introduces the materials and methods used, Section 3 presents and discusses the results, Section 4 justifies the results, Section 5 draws conclusions and summarizes the research as well as outlines possible future research options.

2.2 Materials and Methods

2.21 Demographics of Participants

A total of 212 students from Corvinus University (103 students) and the ESSCA School of Management (109 students) were surveyed at the beginning of the Spring 2021 semester (Figures 1, 2 and 3).

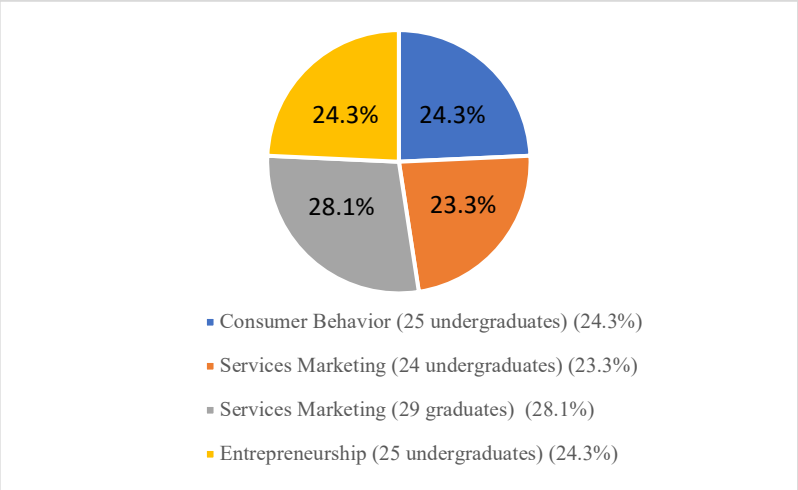

Figure 2: Students' majors surveyed at Corvinus University, N=103

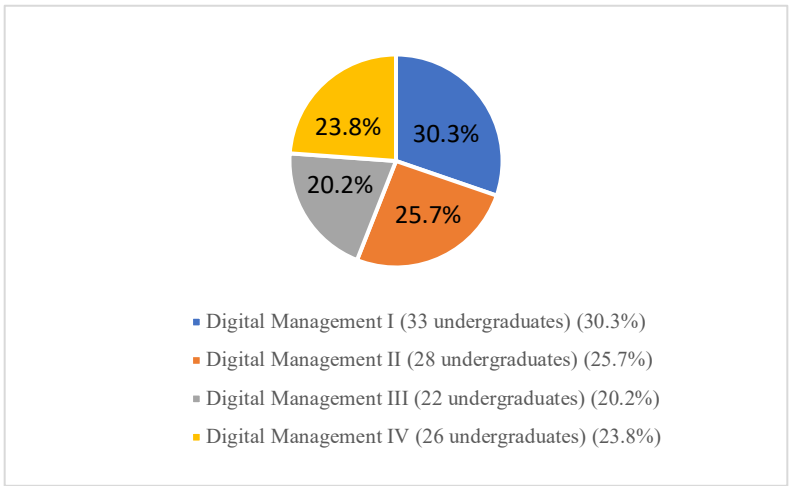

Figure 2.1: Students' majors surveyed at ESSCA School of Management, N=109

Figure 2.2: Students' Academic Disciplines
(Corvinus University and the ESSCA School of Management), N=212

The survey given at the beginning of the Spring 2021 semester (BOS) measured the student remote learning sentiment from the Fall 2020 and Spring 2020 semesters. The end of the Spring 2021 semester survey (EOS) was primarily focused on the changes in student remote learning sentiment that occurred during this semester. All the following classes were taught entirely in English and online using Microsoft Teams.

There were 109 students who responded to the BOS survey that included 45 males (41.3%) and 64 females (58.7%). The average age was 21.5 years (standard deviation = 2.2) (Figure 4).

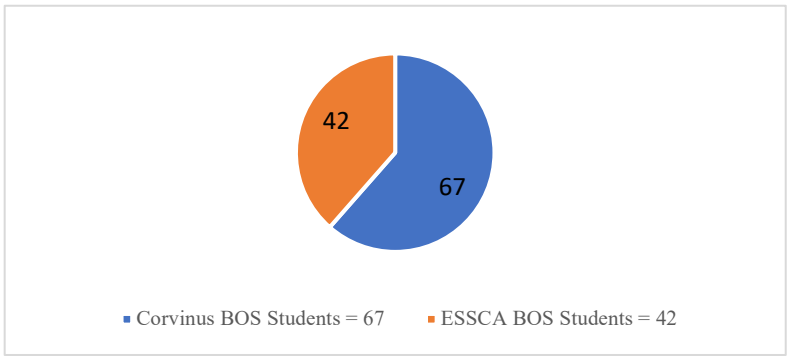

Figure 2.3: BOS Corvinus vs. ESSCA students, N=109

There were 129 students who participated in the EOS survey that included 53 males (41%) and 76 females (58.9%). The average age was 21.8 years of age (standard deviation = 2.2) (Figure 5).

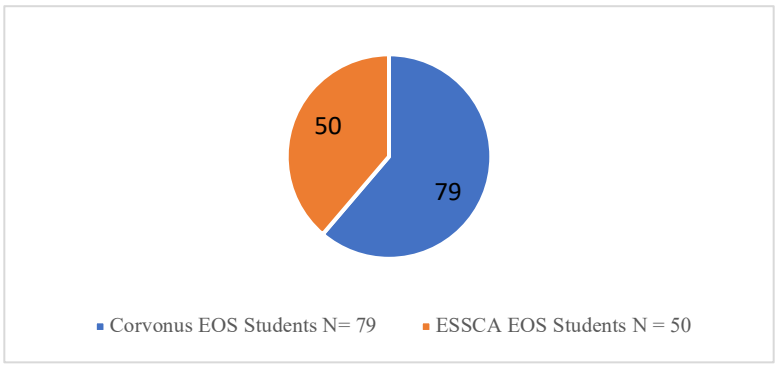

Figure 2.4: EOS Corvinus vs. ESSCA students, N=129

The sample size of the EOS Average Age is only 87 students, which only includes the students who took both the BOS and EOS surveys. The data, however, shows that there not a significant difference between the average age of the students in BOS vs. EOS.

The students participating in the BOS and EOS surveys were from 29 different countries. The highest concentrations of students came from the following countries: France (52), Germany (12), Hungary (6), Azerbaijan (5), Romania (4), China (3), Ireland (3) (Figure 6).

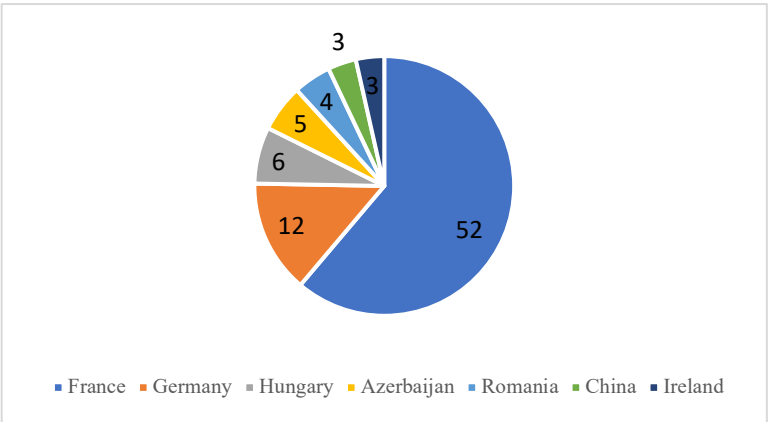

Figure 2.5: The highest concentrations of students came from seven countries, N=85

2.22 Internet and Technical Issues

When considering that a total of 83 students completed both the BOS and EOS surveys, we can conclude that there was a relatively low number of students who experienced poor Internet conditions throughout the Spring 2021 semester. Using a chi square test ($\chi 2 = 0.98607$ and $p = 0.3207$), the data shows that Internet problems were not a consistent problem for these students and that students who reported a problem in the beginning of the semester did not also report problem at the end of the semester. It can be concluded that poor Internet was a not big problem amongst this sample during the Spring 2021 semester and therefore did not affect student remote learning sentiment.

Applying a Spearman's rank correlation between the student Internet BOS sentiment and student BOS remote learning sentiment (0.066, $p = 0.501$, $n= 109$) again shows that Internet problems did not weigh heavily on students' sentiments toward remote learning. In a similar fashion, the Spearman's rank correlation between student Internet EOS sentiment and student EOS remote learning sentiment (-0.077, $p = 0.389$, $n = 129$) yields a similar result.

2.23 Confirmation of Dimensions

As it was previously mentioned, due to the COVID 19 pandemic, all the students who participated in the BOS Spring 2021 survey had at least some experience with online learning during the Fall 2020 and Spring 2020 and semesters. While this drastic and sudden shift to online learning has clearly had significant impact on university education, it has also pushed educators to discover and embrace the benefits of using online tools. This purpose f this research is to shed light on how universities need to adapt to a world that has permanently changed in just two years. PCA analysis was used to recognize the patterns related to student sentiments from the Fall 2020 and Spring 2020 semesters and the ones that occurred during the Spring 2021 semester.

The initial parallel analysis revealed the following three dimensions that displayed significant loadings. Two of these dimensions ("Home Environment" and "Social Sentiment") were immediately recognizable and display a clear connection between BOS and EOS. The third dimension includes a mix of student responses that were not consistent from BOS to EOS and offered weaker and inconsistent data. For example, many loadings appeared in either BOS or EOS, but not both. In other circumstances, the values themselves were not significant enough to offer insight and had higher variances. After eliminating this dimension and using only two dimensions, the loadings became stronger and more significant. These two dimensions are labeled as "Home Environment" and "Social Sentiment" (see Table 1).

2.3 Results

2.31 Home Environment Dimension BOS vs. EOS

When analyzing the home environment loadings from the BOS and EOS, the shift to remote learning clearly had a significant impact on the students participating in these surveys. A strong negative value (-0.687) was observed for the statement "I like working at my own pace" at the BOS, which indicates many students were missing the organization and structure provided by traditional teaching and found the task of organizing the pace of their learning to be difficult. While this loading in the EOS dropped to (-0.532), it can still be concluded that many students found organizing the pace of their own learning to be a challenge even after another semester of remote learning experience. A moderate, negative value of (-0.519) (was observed in the BOS regarding how much students like to set their own daily schedules. This value became

even more negative (-0.579) at the EOS. Both values indicate that many students still value the organization and structure offered by live classrooms and physical school campuses and view organizing their own schedules negatively. When students were asked about their struggles in keeping up with a daily routine, we observed a moderate, positive loading (0.504) in the BOS, but a much stronger one (0.669) in the EOS. Overall, many students struggled with organizing their daily schedules and learning activities at the beginning and end of the Spring 2021 semester. These difficulties created a negative impact on the university students' remote learning environments and are ones not adequately addressed by emergency remote teaching.

A strong, positive value of (0.782) was observed in the BOS regarding how easily students become distracted at home when compared to the classroom. This value dropped significantly in the EOS to (0.539). These values tell us that students were able to better adapt to remote learning during the Spring 2021 semester and find ways to reduce or become more tolerant of distractions while learning from home. This may also indicate a higher self-efficacy (an ability targeted in my Fall 2021 research). At the BOS, a moderate, negative value of (-0.630) was observed showing that students reject the idea that distractions at school are significant. At the EOS, we curiously do not see a loading in this dimension, although we do observe a moderate, positive value (0.688) for how students feel they are not learning as much remotely as in the classroom and a strong, negative value (-0.734) for the statement that students are learning more remotely than in the classroom.

A strong, positive value of (0.754) was observed in the BOS regarding how motivated students are to complete their assignments. At the EOS, this value dropped to (0.641). While these students' abilities to motivate themselves may have improved marginally during the Spring 2021 semester, the end results still show that staying motivated while learning remotely was still an issue and one that must be recognized and addressed by educational institutions seeking to create holistic online learning platforms. The negative, moderate value of (-0.657) in the BOS further reinforces that many students saw remote learning as inferior to traditional classrooms in terms of their education. At the EOS, this value strengthened to (-0.734) further underscoring that many students became wearier of remote learning and the quality of education that it delivered as the Spring 2021 semester progressed (Table 1).

Table 2: BOS vs. EOS Home Environment Sentiment
(Applied rotation method is oblimin.)

Survey Questions	BOS Home Environment	EOS Home Environment
I like working at my own pace	-0.687	-0.532
I miss my friends		
I am more easily distracted at home than in the classroom	0.782	0.539
I like setting my own daily schedule for schoolwork	-0.519	-0.579
I miss my teachers		
I have difficulty staying motivated to complete my assignments	0.754	0.614
I miss participating in sports		

I feel I am learning more than I do in school	-0.657	-0.734
It is easier to focus without the distractions of school	-0.630	0
I feel that I'm not learning as much as I would in the classroom	0.543	0.688
I struggle to keep up with a daily routine	0.504	0.669
I miss the social environment at school		

2.32 Social Dimension

In the BOS, there was a moderately strong value of (0.560) for students who missed their friends. Not surprisingly, this value became much stronger (0.763) at the EOS as lockdown fatigue became greater and the time away from friends became more significant. This makes sense as the participants in these surveys are foreign exchange students predominantly living away from friends and family. It is also interesting that while a strong value for missing friends was observed, the analysis showed a low EOS value of (-0.467) for "I miss the social environment at school." This most likely indicates that the survey participants separated their friends from the social environment of the school, which was heavily disrupted due to COVID 19.

A moderate, positive value of (0.535) is observed in the BOS regarding how much students miss contact with their teachers. At the EOS, this value strengthened to (0.641) indicating that student weariness with lockdowns and remote learning became more acute over time and this result is consistent with data from the home environment dimension. At the BOS, there is a moderate, positive value of (0.451) regarding how much students miss participating in sports. This value became more significant (0.701) at the EOS as the length of the lockdown became greater and the weather became warmer. This upward trend indicates that lockdowns are detrimental to the lives of students and close off needed outlet areas. A strong, positive value of (0.703) is observed at the BOS, and value weakened to (0.466) at the EOS. One explanation for this weakening value is that students became more accustomed to remote learning and found new ways to socialize. Another explanation is that many students were able to go home before the end of the Spring 2021 semester and this lifted their spirits (Table 2).

Table 2.1: BOS vs. EOS Social Sentiment
(Applied rotation method is oblimin.)

Survey Questions	BOS Social Sentiment	EOS Social Sentiment
I like working at my own pace		
I miss my friends	0.560	0.763
I am more easily distracted at home than in the classroom		
I like setting my own daily schedule for schoolwork		
I miss my teachers	0.535	0.641

I have difficulty staying motivated to complete my assignments		
I miss participating in sports	0.451	0.701
I feel I am learning more than I do in school		
It is easier to focus without the distractions of school		
I feel that I'm not learning as much as I would in the classroom		
I struggle to keep up with a daily routine		
I miss the social environment at school	0.703	0.466

2.33 Remote Learning Sentiment (Before) vs. Home Environment Sentiment (Before)

Sample size = 108

A p-value of <.001 and a Pearson correlation (r) of -0.483 indicates a strong negative correlation between how students felt about remote learning at the beginning of the semester and how they felt about their home environments at the beginning of the Spring 2021 semester. The students who experienced more problems with their home environment at the BOS were also the ones who were less satisfied with remote learning. The students who had less problems with their home environment were more satisfied with remote learning.

2.34 Remote Learning Sentiment (Before) vs. Home Environment Sentiment (After)

Sample size = 82

A p-value of <.001 and a Pearson correlation (r) of -0.509 indicates that strong negative correlation between how students felt about remote learning at the beginning of the semester and how they felt about their home environments at the EOS. The students who displayed a more positive remote sentiment were the ones who experienced less problems with their home environments at the EOS. The students who had a negative remote learning sentiment were the ones who experienced lots of problems with their home environments at the EOS.

2.35 Remote Learning Sentiment (After) vs. Home Environment Sentiment (After)

Sample size = 124

A p-value of <.001 and a Pearson correlation (r) of -0.322 indicates a moderate, negative correlation between how students felt about remote learning at the end of the Spring 2021 semester and how they felt about their home environments at the end of this semester. The correlation is weaker than in the previous examples, but nonetheless still indicates that a student with a low remote learning sentiment most likely also experienced problems in their home.

2.4 Discussion

RQ1 What was the impact on the home and social environments for university and graduate students at the beginning and end of the Spring 2021 semester?

For the home environment at the BOS, there were strong, positive loadings for the negative impact of distractions at home and the difficulty of staying motivated to complete assignments. The students did not see the ability to work at their own pace as a positive more moderate loadings were observed for students who expressed difficulties with setting their own daily schedules and maintaining their daily routines. In the BOS, students who experienced problems with their home environments were also the ones who were less satisfied with remote learning. Similarly, the students who had less problems with their home environment viewed remote learning more favorably. Overall, students at the BOS rejected the statement that they were learning more remotely than they were in the classroom.

At the BOS, there were moderate loadings for missing friends, teachers, and participating in sports. A more significant positive loading was observed for missing the social environment at school. It was clear that students at the BOS did not feel the impact on their social environment and were nostalgic about the social scene from their home universities from the Fall 2020 semester.

RQ2: How did home and social disruption for university and graduate students progress during the Spring 2021 semester?

The loadings for daily routines and setting daily schedules were higher in the EOS suggesting that these continued to be problems for many students throughout the semester. The data also shows that the students who a negative remote learning sentiment in the BOS, were the ones who also experienced problems with their home environments in the EOS. A more moderate loading was also observed connecting those who have negative remote learning sentiment to those who have a poor home environment sentiment in the EOS. Strong loadings were also observed for students how did not feel they were learning as much as they otherwise would in the classroom.

For the social environment impact at the EOS, a much stronger loading was observed for missing friends, teachers, and participating in sports. These stronger loadings clearly reflect the fatigue students felt during the semester and the isolation caused by COVID 19 lockdowns. The loadings for missing the social environment at school was significantly lower and could be caused by students returning home for the summer.

RQ3: How did emergency remote learning impact the quality of education in the Spring 2021 semester?

Emergency remote teaching (ERT) was a necessary step made by educational institutions to keep education working during a global pandemic. The main goal was to get everyone online as quickly as possible where attention was focused on the platform being used and technical and Internet related issues. Microsoft Teams was used by all 212 students in this study, and it is a developed, multi-functional educational platform. Despite this capability, however, it did little or even nothing to alleviate the problems identified by this research. Home and social environments are key components to the learning experiences of university students and are ones not addressed by emergency remote teaching [26].

Schools are designed to create the optimal learning environments for students and some certainly achieve this better than others. During remote learning, the school's lose control of the physical environment and assume that the students will create adequate home environments for themselves. The home environment goes way beyond an adequate Internet connection or personal computer, and a bad one can significantly and negatively affect a student's learning experience. Bad home environment can include elements like distracting noises, poor heating and/o cooling, too many people living in one space, bad furniture, inadequate lighting, thin walls, and many other factors. If the home environment can affect student learning experiences

during remote learning, then schools need to transcend beyond emergency remote teaching and ensure students at least know what a suitable home environment is.

Having a good home environment, however, is not enough to ensure that a student will learn effectively from home. As the loadings from the research indicate, students struggled to set their daily schedules, create effective routines, and organize their own studies. The loss of contact with the school creates lots of responsibilities that students are not used to undertaking. A student who is lacking in organizational skills can struggle with keeping up with online studies even though that student did well in a live classroom.
The social environment is another aspect that is critical to successful student learning experiences and not addressed by emergency remote learning. As it was previously mentioned, the prevalence of major depressive disorders was two times higher in 2020 compared to 2019 and anxiety disorders were 1.5 times higher than in 2019 [22]. Universities cannot also assume that the well-being of students is constant and healthy when there is so much evidence to the contrary.

2.5 Conclusions and Future Work

The rise of online learning is not a new phenomenon, but the rise of emergency remote teaching (ERT) is. The COVID 19 pandemic has permanently changed education at all levels, and it is time for educational institutions to transition to the "new normal." Online education is no longer a consideration, but rather an imperative. While many are quick to point out, however, all the benefits of online learning, such as convenience and cost, it also has some serious side effects that must be addressed. Holistic online learning is a way to view students as more than icons on a dashboard and to understand that the loss or reduction of a school environment has consequences.

To better understand the factors contributing to the well-being of university students and how universities can implement holistic online learning, we are conducting follow up survey at the beginning and end of the Fall 2021 semester with a diverse group of international students.

3. The Influence of COVID-19 on Higher Education Student Sentiment - prospects for the spread of distance learning technologies

ECONOMICS
& Sociology

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***JEL Classification**:* I23

ABSTRACT. Clayton Christensen's theory of "disruptive innovation" describes how smaller firms, with access to far fewer resources, are still able to challenge and displace well-established, industry leaders. Uber and Airbnb were startups that were able to disrupt the global taxi and hotel industries despite the economic shock of the financial crisis (2007-2008). The COVID-19 pandemic is currently an even more powerful catalyst that is forcing businesses and institutions to define and adapt to the "new normal." Higher education also finds itself at a critical crossroads where universities around world need to quickly adapt to the changing needs of younger generations, discover the optimal balance between traditional and online learning, find ways to reduce costs and avoid tuition escalation, and become better prepared for future health crises and geopolitical events. The COVID-19 pandemic has already significantly accelerated trends in education and a failure to adapt could spark the disruption in education that Christensen spoke of more than a decade ago. This research utilizes the valuable feedback from a diverse group of international students to help educators better understand changes that occurred during COVID 19 and recommendations regarding how to use technology to maximize learning outcomes.

Keywords: higher education, face-to-face learning, blended learning, COVID-19, technology, sentiments

3.1 Introduction

In the aftermath of the financial crisis of 2007-2008, Clayton Christensen argued that universities were at a "critical crossroads" and at "great risk of competitive disruption and potentially poised for an innovation-fueled renaissance" (Christensen & Eyring, 2011). Before the COVID-19 pandemic, however, his prediction proved to be incorrect as there was no substantial evidence of disruption in higher education. According to the U.S. Department of Education, there were 19,637,499 total students in 2019. 3,3450,00 (17%) of these students exclusively took courses online, and 3,863,498 (19.7%) students that took at least one course online. According to Eurostat, 8% of the people in the European Union in 2019, aged 16 to 74, indicated that they did an online course within three months of the survey, a slight increase of

7% in 2017. The data also showed that people doing an online course in Europe doubled from 4% in 2010 to 8% in 2019. Of those 16 – 24 years old, 13% participated in online courses in 2019. While steady progress has been made in both the U.S. and in Europe over the past decade, it cannot be classified as disruption since online learning did not fully replace traditional learning at a significant scale. The question now for all educators is whether COVID-19 has created the conditions where disruption in higher education will now occur.

On March 11, 2020, the World Health Organization declared COVID-19 to be a pandemic. According to the United Nations, 1.6 billion learners in more than 190 countries were instantly affected. The only choice for educators on all levels was to frantically adopt "Emergency Remote Learning (ERT)," which is the creation of temporary access to educational interaction materials that are quick to set up and reliable during a crisis (Hodges, Moore, Lockee, Trust, & Bond, 2020). In a post-pandemic period, universities are now faced with the tough choice of either shutting down their ERT programs and reverting to pre-pandemic operations or transitioning their ERT programs to permanent online learning platforms. The development of an online learning platform is certainly the harder option as it involves committed faculty support, training, and online course design and support (Hodges et al., 2020). In a comprehensive, ten-year research study of online learning, distance learning, and blended learning, one of the principal findings was that online courses must be designed far beyond simple platforms if learners' intellectual advancement is to occur (Park & Shea, 2020). Please consider the time and effort it took to design and create university campuses, physical classrooms, and live teaching techniques. Despite the challenge of adoption, many university leaders view online learning as an opportunity and student support is growing (Müller, Goh, Lim, & Gao, 2021). Traditional universities have also realized during the pandemic that they have direct and rapidly growing competition from distance education universities with far more advanced online learning platforms (Cranfield, Tick, Venter, Blignaut, & Renaud, 2021).

There are many academics, however, that do not view online learning favorably and remain hesitant to embrace its usage. In a 2020 survey of 1,148 academics working in the U.K., most respondents expressed their fear that the digital disruption of higher education will leave them vulnerable and marginalized (Watermeyer, Crick, Knight, & Goodall, 2021). These fears are understandable given the fact that online education cannot be turned on like a light switch and requires significant time and effort to be on par with live classroom teaching (Seaman 2009). Another significant survey was conducted in Canada in 2020 that included 1,626 teachers (Sokal, Trudel, & Babb, 2020). The analyses from this survey revealed that the level of burnout of teachers during the pandemic was a function of their attitudes to technology, willingness to change, and efficacy. If we assume that online learning will be a permanent part of higher education in the future, then minimizing teacher burnout and boosting positive attitudes toward online learning and technology is critical. Regardless of what universities and educators think about online learning, however, it their moral responsibility to understand whether online education has the potential to outperform in-person teaching (Zimmerman, 2020).

The need for significant educational reforms, which would lead to an increase in the quality of higher education is underpinned by Draskovic, Jovovic, and Rychlik (2020), Sułkowski, Gregor, and Kaczorowska-Spychalska (2020), and Pup and Filep (2021). The article is devoted to the study of prospects for the spread of distance learning technologies in higher education. The relevance of this study comes from the fact that the development of distance learning using online platforms is currently the most significant competitive advantage for higher education institutions. Since distance learning has not only advantages but also disadvantages, it is

important to manage the quality of distance education, in particular the collection and analysis of students' opinions on such technological transformations.

3.2 Literature review

This literature review studies the integration of online learning into higher education before and during the COVID-19 pandemic, as well reviewing recommendations for the future. The renowned management consultant and Harvard professor, Clayton Christensen and his co-authors wrote two books about higher education entitled "Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns" (Christensen, Johnson, & Horn, 2008) and "The Innovative University: Changing the DNA of Higher Education" (Christensen, & Eyring, 2011). While Christensen's predictions did not happen as quickly as he originally envisioned, his view that higher education will be transformed by technology has now become more relevant, which is the topic of this research.

The emergency remote teaching (ERT) used during the early stages of the COVID-19 pandemic, and its consequences was well researched by Müller et al. (2021), Hodges et al., (2020), and Watermeyer et al. (2021). The challenge of the transition from ERT to high-end online learning platforms was well documented in Seaman (2009), Park and Shea (2020), and Cranfield et al. (2021).

3.21 COVID 19 Education Transition

While Christensen believed that universities were threatening their futures by holding on too tightly to their traditions, he also believed that traditional universities are also indispensable and a place for students to broaden their horizons (Christensen &Eyring, 2011). It is quite logical; therefore, that blended learning (BL) or hybrid learning, a combination of in-class and online learning, has gained popularity as educators look to the future (Konczos, Horvath & Jackson, 2021). A 2020 U.K. study indicated that while students preferred face-to-face learning before COVID-19, they much preferred BL during COVID-19. For practical purposes, BL helps to better prepare educators and students for future pandemics and can eliminate the stress and anxiety that is associated with rapid transitions from offline to online (Mali & Lim, 2021). The implementation itself of BL requires universities to decide how to split class times between in-class and online and this represents a wide range. Many programs with more developed online programs have 20-30% in-class and 70-80% online (Bokolo et al., 2019, 2020). While BL seems to be a convenient solution, however, it also takes significant resources and time to create and maintain the right balance between in-class and online. A comprehensive Canadian survey of teachers indicated how any successful transition from ERT to high-end learning platforms must involve teachers that are motivated and embrace the change (Sokal et al., 2020).

A 2018 survey in India asked teachers about their perceptions of BL based on the following criteria: learning flexibility, online learning, study management, technology, classroom learning, and online interaction (Saboowala, & Manghirmalani, 2021). Not surprisingly, the teachers with more positive and adaptable attitudes were the ones who viewed BL favorably. These positive attitudes are critical when transitioning from low-end online learning, which commonly includes content transmission and knowledge transfer, to high-end online learning, which is the establishment of an interactive environment where students are engaged at the same time (Openo, 2020). The recognition that the "new normal" will involve the migration towards digital by higher education is well supported by Bhagat & Kim (2020), Cesco et al, (2021), Kedraka & Kaltsidis (2020). COVID-19 has undoubtedly unleashed the great online-

learning experiment and educators must decide if there will be a "new normal" or just normal (Zimmerman, 2020).

3.22 Measuring Student Sentiment during COVID-19

In turbulent times, successful businesses continuously collect and analyze data to understand rapidly evolving customer sentiment. Entrepreneurs follow the "build, measure, learn" model to ensure that they are always putting their precious resources to work in the most productive way possible. Higher education institutions must now operate in a similar fashion as education will increasingly become more digitized in the future. Constant feedback from administrators, teachers, and students is critical for creating an effective roadmap during turbulent times and detecting problems at an early stage can prevent more serious consequences (Ilieva, Yankova, Klisarova-Belcheva, & Ivanova, 2021). Feedback evaluation tools (Aryal, 2021) and large amounts of data collected from student surveys, discussion forums, blogs, and other sources (Rani & Kumar, 2017), however, are too often underutilized by universities.

A growing number of researchers regularly use Twitter to get a quick read on public opinion, sentiment, or a belief related to a particular area of interest (Antonakaki, Fragopoulou, & Loannidis, 2021). Mujahid et al. (2021) used machine learning and deep learning to analyze a dataset of 17,155 tweets about the effectiveness of e-learning. Their conclusion was that online education should be modified to realize its full potential. Duong, Pham, Yang, Wang, & Luo (2020) conducted similar research by analyzing 73,787 tweets from 12,776 Twitter college followers regarding their living conditions during COVID-19. The results showed that the students were frustrated and troubled during COVID-19. Almossa (2021) conducted an even larger study in Saudi Arabia analyzing 124,810 tweets from students during COVID-19 regarding their experience with online learning. The result indicated that the students felt disengaged and had a reduced desire to learn. While significant in scope, these studies are good for measuring general trends and not the discovery of specific issues.

Additional approaches to measuring university student sentiment during COVID-19 included extracting and analyzing articles from Google and DuckDuckGo related to online learning (Bhagat, Sanjaya, Alakh, & Chun-Yen, 2021). Another approach involved conducting a sentiment analysis based on feedback of classes collected through Google survey forms and WhatsApp (Umair, Hakim, Hussain, & Naseem, 2021). The use of online surveys was also frequently used during the pandemic like the ones conducted at the University of Katowice in Poland (Cicha, Rizun, Rutecka, & Strzelecki, 2021) and a survey that included the three universities of Istanbul Bilgi University, The Northcap University (India), and the Universidad Latina de Costa Rica (Benito et al., 2021).

3.23 Gap in COVID 19 Student Sentiment Research

While Twitter has emerged as a useful tool for sentiment research and analysis, there are many reservations about its effectiveness. Such Twitter research reservations include the accuracy of using hashtags to measure sentiment, the inability to properly understand sentiment from different cultures and languages, and not using comparative analysis to compare public sentiment to the same entity, such as climate change, immigration, or education (Antonakaki et al, 2021). Extracting articles related to online learning from Google and DuckDuckGo has the limitations such as a small set of individuals influencing public opinion by creating frequent and large amounts of content. According to a 2021 Pew research study, the most active 25%

of U.S. adult on Twitter produced 97% of the tweet volume (McClain, Widjaya, Rivero, & Smith, 2021).

The research gap in these sentiment research and analysis techniques is related to the level of involvement from the survey participants and the amount of outside influence during the data collection process. This sentiment research study involves a diverse group of international students that were all university students during the previous Fall 2020 semester. The sentiment of this sample was done both at the beginning and at end of the Spring 2021 semester, which at least includes their experience from Fall 2020 semester and the Spring 2021 semester. The students were given the opportunity to respond to "free answer" questions and there was a significant number of responses to these questions from many students. These free answer responses require a much higher level of involvement by the students over multiple-choice surveys. The range of responses was far wider than the limited answer options used in typical surveys since students has the freedom to create their own responses. This research represents a deeper dive into student sentiment during COVID-19 and powerful complement to student sentiment studies conducted with alternative methods.

3.3 Methodological approach

3.31 Research objectives

The goal of this paper is to improve learning technologies due to the analysis of the results of the ABO survey, which aim was to measure and analyze university and graduate student sentiment in the Fall 2020 and Spring 2021 semesters. Further aim is to present a survey methodology that can be used by other educational institutions that want to manage consumer quality of educational services. Further aim is to measure and analyze university and graduate student sentiment in the Fall 2020 and Spring 2021 semester.

The speed of change during COVID-19 was unprecedented in education. To better adapt to this change, surveys were given at the beginning and at the end of the Spring 2021. At the beginning of the semester, students reflected on the Fall 2020 semester at their home universities. The Fall 2020 semester was a very mixed picture where some students attended live classes, some students learned exclusively online, and some had a combination of the two. The Spring 2021 semester at Corvinus University and the ESSCA School of Management was done entirely online due to COVID-19 restrictions. Due to the different conditions between the Fall 2020 and Spring 2021 semesters, the purpose of the survey was to see how much change in sentiment occurred during this period given the severity of the COVID 19 disruption.

This paper seeks to answer the following research questions:

R.1: Can the collection and analysis of use of free answer data provide valuable insight into higher education student sentiment?

R.2: Will the data from the free answer questions during the Fall 2020 and Spring 2021 semesters show significant changes in student sentiment towards online learning?

R.3: Considering COVID-19 disruption, does student sentiment indicate that technology will play a larger role in higher education in the future?

The rest of the paper will be organized as follows: Section 2 outlines the research methodology, Section 3 presents and discusses the results, Section 4 provides a discussion of the results, the conclusion, and possible future research options

3.32 Demographics of Participants

The research was conducted among students from the Corvinus University and the ESSCA School of Management (Figures 3, 3.1). The survey given at the beginning of the Spring 2021 semester (BOS) measured the student remote learning sentiment from the Fall 2020 and Spring 2020 semesters. The end of the Spring 2021 semester survey (EOS) was primarily focused on the changes in student remote learning sentiment that occurred during this semester. All the following classes were taught entirely online, in English, by the same teacher, using Microsoft Teams.

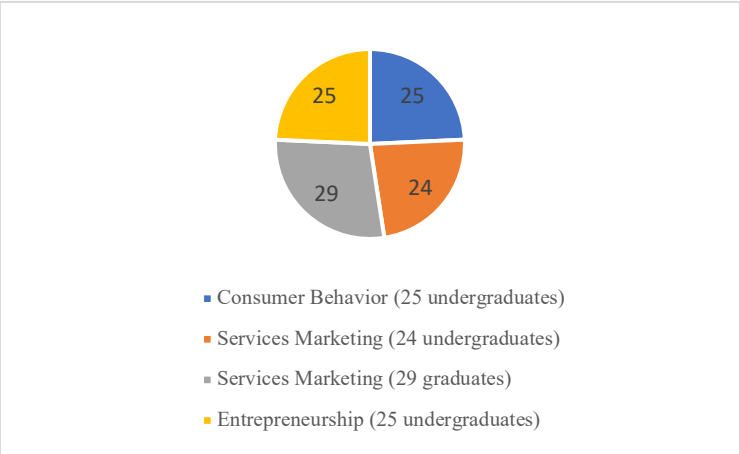

Figure 3. Corvinus University (103 students)
Source: own data

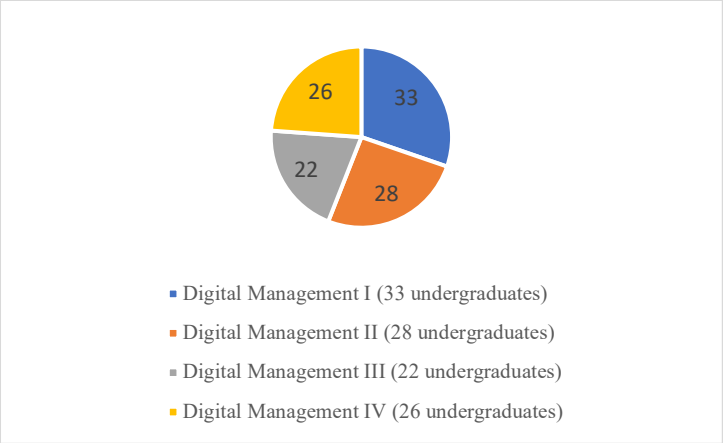

Figure 3.1. ESSCA School of Management (109 students)
Source: own data

There were 109 students who responded to the BOS survey that included 45 males (41.28%) and 64 females (58.72%). The average age was 21.48 years (standard deviation = 2.18). There were 129 students who participated in the EOS survey that included 53 males (41.01%) and 76 females (58.91%). The average age was 21.78 years of age (standard deviation = 2.19). The sample size of the EOS average age is only 87 students, which only includes the students who

took both the BOS and EOS surveys. The data, however, shows that there not a significant difference between the average age of the students in BOS[3] vs. EOS.

The students participating in the BOS and EOS surveys were from 29 different countries (Figure 3.2). The highest concentrations of students came from the following countries: France (52), Germany (12), Hungary (6), Azerbaijan (5), Romania (4), China (3), and Ireland (3).

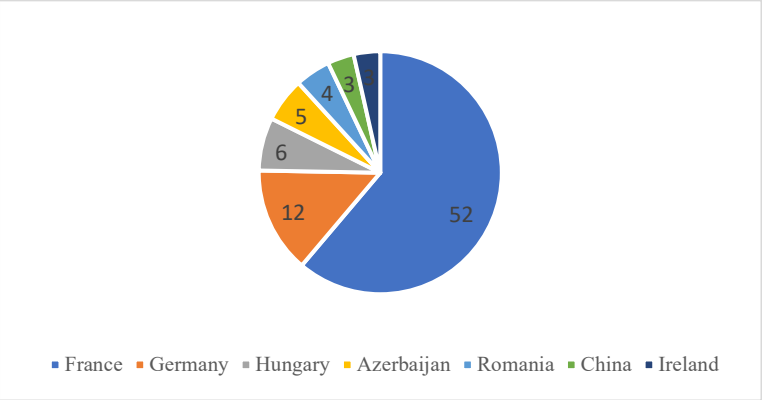

Figure 3.2. Student Country Breakdown
Source: own data.

The 109 survey participants were also asked to rate their remote learning sentiment on a scale of 1-10 at the beginning on the Spring 2021 semester. The distribution of these responses is fairly even where the average rating was 5.5 (Table 3).

Table 3. Remote Learning Sentiment (n=109) Spring 2021 BOS

Remote Learning Scale	Number of Students
1	3
2	9
3	13
4	17
5	11
6	15
7	16
8	10
9	8
10	7

Source: own data.

3.33 Free Answer Questions

The Spring semester in 2021 was done exclusively online at both Corvinus University and the ESSCA School of Management. While many students previously experienced online learning, this semester proved to be difficult for educators and students. Most of the students included in these surveys came to Budapest as exchange students and spent the entire semester learning online from locally rented flats.

[3] BOS refers to the students who participated in the beginning of the semester survey. EOS refers to those students who participated in the end of the semester survey.

To better understand how students view their education and the future of education, they were given the opportunity to freely answer questions rather than be limited to a few choices created by a researcher. By giving students the freedom to provide their own answers, the results will act a useful complement to the quantitative data collected from similar surveys and student sentiment research conducted during the COVID-19 pandemic. All the text provided by students was analyzed and sorted into relevant categories.

The following are the free answer questions from the beginning of the Spring 2021 Semester (BOS) and the end of the Spring 2021 Semester (EOS) (Table 3.1).

Table 3.1. Free answers questions from the BOS and EOS of Spring 2021

BOS: Question 7	What are the top three things you like about online learning?
BOS: Question 8	What are the biggest challenges of online learning?
BOS: Final Question	Please tell us how you would improve the university education experience in the future.
EOS: Question 6	What are the top three things you like about your online learning experience?
EOS: Question 7	What were the biggest challenges of your online learning experience?
EOS: Final Question	Please provide any additional suggestions regarding how university education should be improved.

Source: own data.

After reading all the students' free answer text, codes were created to capture and quantify the range of responses. The coding for the questions is the following (Table 3.2, 3.3, and 3.4).

Table 3.2. Coding from the students' free answer responses in the BOS and EOS

Categories/Coding	The following codes are derived from the students' free answers to these questions: • "What are the top three things you like about online learning?" • "What were the biggest challenges of your online learning experience?
Positive Online Impact on Home Environment, Comfort, Health	
B_P_HO+	Comforts of a home environment when learning.
B_P_Covid+	Learning online from home reduces exposure to COVID-19.
B_P_EatDr+	Online learning from home offers the freedom to eat and drink.
B_P_Distract+	Online learning from home has less distractions than in classrooms.
B_P_Stress+	Home learning environment is less stressful than in-class learning.
B_P_Sleep+	Online learning allows students to get more sleep.
Positive Online Impact on Time, Cost, Convenience	
B_P_TCCB+	Time, cost, and convenience benefits when learning online.
B_P_Time+	Online learning is time saving for students daily.
B_P_Conven+	Online learning is more convenient than in-class learning.
B_P_Trav+	Online learning eliminates the needs for students to commute.
B_P_Fam+	Online learning allows students to spend more time with their families.
B_P_Cost+	Online learning reduces students' cost.
Negative Online Impact on Time, Cost, and Convenience	
B_P_TimeMan-	Online learning makes it harder for me to manage my time.
B_P_Conven-	Online learning resulted in a loss of convenience.
Positive Academic Benefits of Online Learning	
B_P_ED+	Educational benefits of learning online.
B_P_Flex+	Online learning is more flexible than in-class learning.

B_P_TeachMeth+	There are better teaching methods when learning online.
B_P_Tech+	Online learning makes better use of technology.
B_P_OppLearn+	Opportunities to learn are better online.
Negative Academic Benefits of Online Learning	
B_P_Focus-	Learning online affects my ability to focus.
B_P_Workload-	Online learning increases my academic workload.
B_P_Technical-	Technical issues related to online learning negatively impact my studies.
B_P_ClassInt-	Class interaction while learning online is lower than in-class learning.
B_P_EdQual-	The quality of education went down while learning online.
B_P_CommInfo-	The communication of information is worse while learning online.
B_P_Monotony-	Learning online is monotonous.
Negative Online Impact on Personal and Social	
B_P_Soc-	Online learning has had a negative impact on my social life.
B_P_SelfOrg-	While learning online it is harder for me to organize my activities.
B_P_Motivate-	Learning online negatively affects my motivation.
B_P_Personal-	Online learning negatively affected my personal life.
B_P_Health-	Learning online had detriments effects on my health.

Source: own data.

Table 3.3. Coding from the students' free answer responses in the BOS and EOS

Category/Coding	The following codes are derived from the students' free answers to these questions: • "Please tell us how you would improve university education experience in the future."
Online Learning and Technology Suggestions from Students	
B_P_HYB+	Hybrid learning is the best educational model.
B_P_INTERACT+	University education needs to be more interactive.
B_P_TECH+	University classes should make better use of technology to enhance learning.
B_P_Record+	University education should offer the ability to record all lectures.
B_P_ONL+	Online learning offers significant benefits over traditional, in-class learning.
B_P_TRAD-	Traditional, in-class learning had detrimental effects and is inferior to online learning.
B_P_ONL-	Online learning has detrimental effects and is inferior to in-class learning.
B_P_MOTIV+	Classes should be more motivating and interactive. Non-traditional.
B_P_NoLike	I do not like online learning and prefer in-class learning.
Student Pedagogical Suggestions	
B_P_DISCUSS+	More engaging discussions about topics to encourage active student participation.
B_P_Flex+	University education should be more flexible and less rigid.
B_P_Group +	University education should have more group work.
B_P_Theory-	University education should focus less on theory and more on practice.
B_P_Pract+	Practical applications of theory enhance university education.
B_P_Grades-	Universities are too focused on grades and not enough focused on learning outcomes.
B_P_Eval+	Constant evaluation rather than infrequent evaluation enhances university education.
B_P_Class-	There should be less class time.

Source: own data.

Table 3.4. Course coding

Course Name	Course Code
Consumer Behavior	CB
Services Marketing Masters	SMM
Services Marketing Undergraduate	SMU
Entrepreneurship	ENT
Digital Management	DM
BOS 1/EOS 1	Includes only the students that completed the survey in both BOS and EOS.
BOS 2/ EOS 2	Includes all students who participated in the survey in either the BOS or EOS.

Source: own data.

Appendix II: Collection of the following appendices:
Appendix A presents a detailed breakdown of the survey participants.
Appendix B shows the BOS and EOS survey questions from the Spring 2021 semester.
Appendix C displays Tables 9-14 showing more detailed data regarding the students who participated in both the BOS and EOS surveys.
Appendix D displays Tables 15-17 showing a comparison BOS and EOS results.
Appendix E displays Tables A-E that use the data from the BOS survey (n=109) and EOS survey (n=129) including the students who participated in one or both surveys.

3.4 Conducting research and results

At the beginning of the Spring 2021 semester (BOS), students were asked to list the top three things that they like about online learning. Their BOS responses draw on their experiences with online learning from Fall 2020 and Spring 2020 semesters. March 2020 was the period when the COVID 19 pandemic globally shut down education worldwide.

During the BOS Spring 2021, many students positively mentioned the comforts of their home environment when learning online (26) and the ability to eat and drink during their online classes (15). The benefits of timesaving, cost, and convenience when learning online (46) were also frequently mentioned. Many students communicated that online learning has positive educational benefits (38). Having more free time (31) was also a strong positive, while convenience (4) was more muted. Travel (19) and sleep (18) were both positive benefits that were mentioned when learning online, showing that many students did not miss commuting back and forth to school and used the extra time for either leisure or getting more sleep. Flexibility was another positive (21) that reflects the fact that students did see online learning as being less rigid than in-class learning. Finally, many students think that teaching methods (26) are positively influenced by online learning where recorded lectures, professor accessibility, and more interactivity were commonly cited. Technology (18) was also seen as a positive benefit of online learning over traditional in-class learning.

Students were again asked in the BOS to share their thoughts on what the biggest challenges of online learning are. While there were positives associated with online learning, there were numerous negative influences. Many students indicated that online learning had a detrimental effect on their social lives (27) and personal lives (19), a negative effect on their ability to focus (56) and organize their studies (10), and a dampening effect on their motivation to study (15). Technical issues related to online learning (13) received negative comments and many students saw class interaction (21) and quality of education (10) decline while learning online. Finally, we saw a significant number of students mention that group projects and activities were

negatively impacted by online learning (36). While students do favor certain aspects of online learning, the exclusive use of online learning generates a wide range of negative effects for a significant number of students.

The students were also asked to share their thoughts on how university education can be improved in the future. Many students positively mentioned hybrid learning (29) as a solution that combines online and in-class learning. Other notable mentions touched on the need to have university education be more interactive and focus less on theory. Again, flexibility was mentioned, which suggests that students find in-class learning to be too rigid, and online learning as more flexible offering the ability to watched recorded videos at one own leisure.

At the end of the Spring 2021 semester, students were again asked to list the top three things that they like about online learning. An analysis of how the EOS responses compare to the BOS responses from the same students can be found in Tables 3.5 and 3.6. The purpose of using beginning and end of semester surveys was to see how fast COVID 19 was affecting student sentiment toward their education.

Table 3.5. Students who participated in both BOS and EOS surveys, (n=83)

Coding	**BOS 1** Total	**EOS 1** Total	**Change** +/-	**Comments**
Change in Home Environment, Comfort, Health				
B_P_HO+	26	12	**-14**	Students mentioned the benefits of their home environment far less at the end of the semester. This indicates that the negative of the COVID 19 increased during the semester.
B_P_EatDr+	15	7	**-8**	The ability to eat and drink whatever and whenever became less important during the Spring 2021 semester.
B_P_Sleep+	19	14	**-5**	While many students mentioned the bonus of extra sleep when learning online, this enthusiasm faded a bit as the length of the lockdown became greater.
B_P_Distract+	6	3	**-3**	The distractions at home from remote learning became less of a factor.
B_P_Stress+	6	4	**-2**	Fewer students mentioned stress as an issue for them perhaps implying that they became more comfortable with the conditions of their education since the beginning of the semester.
B_P_Covid+	4	4	**0**	COVID 19 did not see any increase in mentions as students became more accustomed to living with it.
B_P_Health-	6	3	**-3**	The belief that online learning is detrimental to your health decreased during this semester.
Change in Time, Cost, Convenience				
B_P_TCCB+	46	16	**-30**	The number of mentions for the Time, Cost, and Convenience of online learning became much lower at the end of the semester as students began to reassess the consequences of online learning.
B_P_Time+	31	9	**-22**	It is consistent with the TCCB+ result those students saw less value in the time saving element of online learning.

B_P_Fam+	6	1	**-5**	The positive of spending more time with family lessened according to these results.
B_P_Conven-	5	1	**-4**	This result is again consistent that the convenience of online learning became less important during this semester.
B_P_Trav+	18	16	**-2**	Students continued to not miss their commutes back and forth to school.
B_P_TimeMan-	2	2	**0**	Only a few students thought online learning had a negative effect on their time management.
B_P_Conven+	4	3	**-1**	The overall convenience of online learning remained flat during the semester.
B_P_Cost+	5	16	**+11**	Students continued to see cost as a clear positive of online learning.
Change in Academic Benefits of Online Learning				
B_P_ED+	38	61	**+23**	The educational benefits of online learning showed a significant rise in mentions from the same students in the same semester. This indicates that sentiment towards online learning potentially changed significantly in just one semester.
B_P_Tech+	18	37	**+19**	Students also specifically mentions the positive benefit of technology in education, reinforcing the ED+ and TeachMeth+ results.
B_P_TeachMeth+	26	43	**+17**	A significant jump in positive mentions for online teaching methodology. This supports the earlier ED+ result.
B_P_ClassInt-	21	35	**+14**	There was a significant increase in students who mentioned that the class interaction with online learning was inferior to traditional in-class learning.
B_P_CommInfo-	6	13	**+7**	More students commented that communication of information with online learning was a problem.
B_P_Onlinetran-	5	9	**+4**	Four more students commented that the transition to online learning was a difficult process.
B_P_Technical-	13	16	**+3**	There a slight increase in mentions of technical issues being a problem when learning online. This remained an issue throughout the semester.
B_P_NoLike	7	9	**+2**	There was a modest increase in those who do not like online learning.
B_P_OppLearn+	4	4	**0**	The was little change in sentiment towards the opportunity to learn and use new technologies. Only four mentions make this result insignificant.
B_P_EdQual-	10	8	**-2**	The number of students who believe online education is lower quality than traditional in-class learning dropped slightly.
B_P_Workload-	8	4	**-4**	The number of students mentioning that online learning caused an increase in workload dropped.
B_P_Monotony-	7	0	**-7**	The mentions of online learning being monotonous fell to no mentions.
B_P_Flex+	21	16	**-5**	A marginal decrease in the positive mentions of flexibility. This remains a strong result.

B_P_Focus-	56	40	**-16**	One of the most negative observations about online learning is that it impairs one's ability to focus. This number came down significantly during the semester but remains an issue for many students at the end of this semester.
Change in Personal and Social Life				
B_P_Soc-	27	6	**-21**	The number of students who mentioned a negative impact on their social lives from online learning dropped significantly. This drop could be due to students being close the end of the semester.
B_P_Personal-	19	17	**-2**	The negative impact of online learning on personal lives, however, remained a consistent negative.
B_P_Motivate-	15	9	**-6**	Less students cited a loss of motivation from online learning. This implies that students gained valuable experience during the Spring 2021 semester and their online learning competency rose.
B_P_SelfOrg-	10	8	**-2**	Self-organization problems remained an issue for many students during the Spring 2021 and many were missing the organization and structure offered by university campuses.

Source: own data.

Table 3.6. Students who participated in both surveys, providing their ideas about how university education can be improved (n=83)

Coding	**BOS 1 Total**	**EOS 1 Total**	**Change +/-**
B_P_HYB+	29	16	**-13**
B_P_INTERACT+	11	13	**+2**
B_P_DISCUSS+	7	7	**0**
B_P_MOTIV+	1	1	**0**
B_P_Flex+	10	1	**-9**
B_P_TECH+	9	3	**-6**
B_P_Group +	4	1	**-3**
B_P_Record+	3	1	**-2**
B_P_ONL+	0	0	**0**
B_P_ONL-	3	5	**+2**
B_P_TRAD+	3	1	**-2**
B_P_TRAD-	4	1	**-3**
B_P_Theory-	10	4	**-6**
B_P_Pract+	7	3	**-4**
B_P_Grades-	2	0	**-2**
B_P_Eval+	5	1	**-4**
B_P_Class-	1	1	**0**

Source: own data.

Although these 83 students were the same in the BOS and EOS, their responses show significant differences between the two surveys. The home environment was much less

mentioned (-14), along with time, convenience, and cost (-30). Time (-22) was also mentioned far less. The significant drop in these variables could reflect the fact that while many students do like learning from a comfortable home environment, they also realize that it comes at the expense of intellectual and social interaction. The students participating in the EOS survey rather focused on how online learning had a positive effect on their education. More specifically, they mentioned the convenience of recorded lectures, online learning was more interactive than offline and professors more accessible online. These results are further supported by the positive changes for online teaching methods (17) and the use of technology (19). It is clear at the EOS of the Spring 2021 semester; students were recognizing both the downside of learning exclusively online and the upside of technology on the quality of their education.

Students mentioned the detrimental social effects of online learning far less in the EOS than the BOS (-21). This result could reflect the students were already anticipating the end of the semester, the weather was improving, or that they learned how to better cope with home learning conditions. The ability to focus was frequently mentioned in the BOS (56) and dropped to (40) in the EOS. Although the mentions of focus dropped, it remained a problem for many students throughout the semester. Class interaction (-14) was seen more negatively as many students see online learning as a poor substitute for in-class learning. Although the values for group activities and projects remained unchanged, the values for BOS and EOS (36) indicate that this was an ongoing issue and a negative effect on online learning for many students.

Students mentioned hybrid learning less in the EOS (-13), but it still received a significant number of mentions (16). These responses were not prompted as students chose to mention hybrid learning for these questions.

Students who participated in either the BOS or EOS Survey: The results from these larger samples provide similar insight from the previous data set (n=83). Students mentioned their home environment (-15), time, cost, and convenience (-30), time (-25), and convenience (-16) far less in the EOS than the BOS. The positive effects of online learning on education (+49), teaching methods (+32), and the use of technology (+40) were all mentioned significantly more at the EOS than at the BOS.

Fewer students mentioned the negative social impact of online learning and the negative health effects of learning from home. A positive gain can be seen in class interactions, but this means that significantly more students saw class interaction as being negatively affected by online learning. A similar drop was observed in the number of hybrid learning mentions, along with flexibility.

3.5 Discussion and Recommendations

R.1: Can the collection and analysis of use of free answer data provide valuable insight into higher education student sentiment?

All the students' responses were coded and the students who answered surveys both at the BOS and EOS (n=83) were separated from the total number of responses that were received. In the BOS, the students frequently mentioned how they liked learning in the comforts of their home environments and the time, convenience, and cost benefits associated with online learning. The students also commented how they like the teaching methods that are a part of online learning such as recorded videos, interactivity, and use of technology. Many students did mention their

support of hybrid learning as a good compromise between in-class and online learning. These results are very consistent with a Pearson correlation (r) of -0.483 that was done on the survey data at the beginning of the Spring 2021. The test showed that students who experienced more problems with their home environments were more likely to have a more negative online learning sentiment.

The loss of focus was the most mentioned negative effect of online learning. Many students mentioned the negative impact that online learning had on their social and personal lives, as well as a loss of motivation and self-organization. This was also well supported by the survey data that indicated strong loadings towards the negative impact of distractions in the home environment. Group activities, class interaction, technical problems were also areas of online learning where students felt a negative impact.

There are clearly conflicting views regarding many aspects of student sentiment towards online learning. While many students favored the teaching methods, interactivity, and technology from online learning, others viewed the technical issues, class interaction, education quality, and group activities quite negatively. These diverse responses suggest that students have diverse views regarding university education. The BOS (n=109) and EOS (n=129) surveys that included all the survey participants show very similar results. The analysis of the survey data also corroborates these findings.

The level and quality of student participation in the surveys was both surprising and inspiring. The commitment to write in answers freely as opposed to checking boxes is far greater and offers a much deeper level of insight. We see the use of free answer data as an effective and complementary tool for educators to gain insight from students based on their free answers and not pre-made questions.

R.2: Will the data from the free answer questions during the Fall 2020 and Spring 2021 semesters show significant changes in student sentiment towards online learning?

At the EOS, there were notable changes in student sentiments toward online learning. The mentions of the home environment, time, and convenience all fell significantly, while mentions of educational benefits, teaching methods, and technology were all much higher. Cost benefits of online learning were mentioned more in the EOS.

The comments about a negative social impact fell significantly, as well as those mentioning a lack of focus. Poor class interaction and group activities continued to be mentioned by a significant number of students. Hybrid learning was mentioned less in the EOS.

Far fewer students saw the benefits of the home environment, time, and convenience at the EOS suggesting that home learning fatigue took place during this semester. Many more students, however, did positively view many aspects of online learning such as the flexibility, teaching methods, and use of technology. After another semester of learning online, more students began to appreciate certain aspects of it as being superior to traditional learning.

The analysis of the survey data again supports the free answer data. The loadings for daily routines and setting daily schedules were higher in the EOS suggesting that these continued to be problems for many students throughout the semester. The data also shows that the students who a negative remote learning sentiment in the BOS, were the ones who also experienced problems with their home environments in the EOS. A more moderate loading was also

observed connecting those who have negative remote learning sentiment to those who have a poor home environment sentiment in the EOS. The analyses of the quantitative survey data and the free answer data provide a more detailed and robust insight into student sentiment.

R.3: Considering COVID-19 disruption, does student sentiment indicate that technology will play a larger role in higher education in the future?

According to these results, we can see fewer students favoring exclusive traditional in-class learning or exclusive online learning. This leaves the majority in the large area that is commonly called blended or hybrid learning. No industry, including education, can ever revert to its pre-pandemic state. The challenge for universities is to accept the fact that they must change and find a path forward that creates the best value proposition to all key stakeholders. The survey data also clearly shows that progress was made away from emergency remote teaching (ERT) towards online learning that is more familiar and with less problems. The difference between the BOS and EOS data demonstrates how quickly student sentiment can change and why universities need must collect and analyze data early and often to better understand the students and environment they are teaching in.

Recommendations for Higher Education

The Fall 2020 and Spring 2021 semesters represented ones of great change due to the disruption caused by COVID-19. While higher education is now in the recovery phase, it is critical to identify what changes will be permanent in a post COVID-19 world. Table 3.7 shows the variables that became stronger from the Spring 2021 BOS to EOS. The biggest change came from students commenting on the positive educational benefits of online learning. The following variables, technology, and teaching methods are also related to online learning and show an increasing amount of student positivity. The case for online learning, however, is not positive as students see a decrease in class interaction as a negative and the communication of information as a negative. The remaining variable that saw a positive increase was related to the cost benefits of online learning.

Table 3.7: The Codes that Had a Significant and Positive Change Between the BOS and EOS

Coding	BOS Mentions	EOS Mentions	Semester Change
B_P_ED+	38	61	+23
B_P_Tech+	18	37	+19
B_P_TeachMeth+	26	43	+17
B_P_ClassInt-	21	35	+14
B_P_Cost+	5	16	+11
B_P_CommInfo-	6	13	+7

Source: own data.

Students found elements of online learning to be superior to traditional, in-class learning and other elements to be inferior. Our recommendations for educator are the following:

1. Like businesses trying to gauge consumer sentiment, higher education must collect more data, more often to understand how to adapt to our rapidly changing world.
2. Recognize that technology will play an increasingly larger role in higher education.
3. Use frequently collected data and secondary data to define what hybrid learning is for your institution (i.e., 20% online, 80% in-class, 80% in-class, 20% online).
4. Identify academic disciplines that require different levels of hybrid learning.

5. In a world threatened by inflation, hybrid learning can reduce costs.
6. Another pandemic could occur in the future and the higher institutions that have more advanced online and hybrid programs will be better off.

3.6 Concluding Remarks and Future Work

Our conclusion is in line with former U.S. Education Secretary, Margaret Spellings thoughts commented in her 2006 report that:

> *What we have learned over the last year makes clear that American higher education has become what, in the business world, would be called a mature enterprise: increasingly risk-averse, at times self-satisfied, and unduly expensive. It is an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing educational needs of a knowledge economy. It has yet to successfully confront the impact of globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs and paradigms. History is littered with examples of industries that, at their peril, failed to respond—or even to notice—changes in the world around them, from railroads to steel manufacturers. Without serious self-examination and reform, institutions of higher education risk falling into the same trap, seeing their market share substantially reduced and their services increasingly characterized by obsolescence.* (Spellings, 2006: 9).

Following the financial crisis (2007-2008), Clayton Christensen saw the potential and power of online learning as a force that would ultimately disrupt higher education. While online learning has grown and significance during the past ten years, disruption in higher education has yet to happen. The COVID-19 pandemic, however, forced educational institutions of all sizes all over the world to rapidly adopting emergency remote learning (ERT). As we look to the future and a post-pandemic world, universities must decide whether to revert to a pre-pandemic state or to transition from ERT to a high-end online learning platform. Successful educational institutions, like businesses, will find ways to collect and analyze data frequently to better understanding the needs of students and of the marketplace. This unavoidable fork in the road will spur the disruption that Christensen predicted would happen more than a decade ago.

In the BOS and EOS surveys conducted during the Spring 2021 semester, there is a clear indication that students believe that technology should play a much larger role in their education. These same students, however, value in-class interaction and do not view exclusively learning online as an attractive option. Blended or hybrid learning, therefore, represent the steps away from the traditional system, and the steps towards a new system that includes technology. As it was previously mentioned, different universities and their faculties have various opinions about the benefits and consequences of integrating technology into their curriculums. Christensen's disruption begins to happen when some universities become relatively better at adopting technology than others. Imagine a situation in the future where a university has far less classrooms and overhead cost yet has far happier students. If this is possible, then disruption is possible.

In July and August of 2008, the Economist Intelligence Unit conducted a global survey called "The future of higher education: How technology will shape learning" that included participants from all over the world that included private sector respondents, professors, deans,

and other faculty members. The major findings of this survey were that 63% of the survey respondents believed that technological innovation would have a major influence on teaching methodologies and a core differentiator in attracting students and corporate partners. Over half of the respondents (54%) viewed distance education as becoming global and a way for universities to leverage to used advanced technology to offer their education globally (Glenn, 2008). While disruption of higher education began a long time ago, it was more of an incremental change. The pace of change in education post COVID-19 will no longer be incremental and will likely be exponential. To avoid disruption in the future, higher education institutions must become better at adopting technology, better listeners to their customers (the students), more frequent collectors and analyzers of data, and more aware of the competition that can come from anywhere on the planet.

The authors of this article hope that BOS and EOS surveys (were conducted during the Fall 2020 and Spring 2021 semesters) will also contribute to the solution. The data collection continued in the Fall 2021 and in the Spring 2022.

4. Student Burnout in Higher Education: From Lockdowns to Classrooms

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Abstract: During the spring 2021 semester, COVID-19 forced most universities around the world to teach exclusively online in a very short time frame. This situation reversed itself, however, during the fall 2021 semester when COVID-19 restrictions were lifted as teachers and students returned to classrooms. This study includes ninety-seven international students who participated in surveys at the beginning and the end of the fall 2021 semester, which included questions related to burnout, self-efficacy, resiliency, home environments, and technical issues. Students were asked to reflect on their educational experiences during the spring 2021 and fall 2021 semesters. The purpose of this study is to identify and examine the most significant changes that occurred between these two semesters. The results indicate a significant shift in student burnout as challenges with home environments were replaced with ones related to returning to the classroom. Even as the concerns about COVID-19 lessen, higher education institutions must understand the magnitude and permanence of its impact.

Keywords: higher education; COVID-19; students' burnout; online learning; face-to-face learning; hybrid learning

4.1 Introduction

Herbert Freudenberger was a well-known psychologist and among the first to coin the phrase "burnout" and conduct comprehensive studies to better understand its root causes. He characterized burnout as the tendency "to fail, wear out, or become exhausted by making excessive demands on energy, strength, or resources" [1]. According to Freudenberger, the symptoms of burnout vary from one person to the next and can be controlled, but not eliminated. Christina Maslach and Susan Jackson made a significant contribution to the study of burnout in 1981 with the creation of the Maslach Burnout Inventory model (MBI). The MBI model is a tool that helps researchers assess the burnout of individuals who are suffering from emotional exhaustion and cynicism that occurs from engaging in "people work" [2]. Since its inception, this model has evolved significantly and the introduction of the MBI–General Survey [3] extended its relevance to include additional professions and occupational groups [4]. While students are not actively employed, their psychological situation due to academic requirements can be considered "work" [5]. The MBI model has been widely used in higher education for decades and COVID-19 has unfortunately further strengthened its relevance. Numerous research studies have also shown that the MBI model has produced data on the burnout and engagement of university students that were both reliable and reinforced the validity of the three-tier construct [6].

Student burnout had been a steady topic of research well before the COVID-19 pandemic. Jacobs and Dodd [7] conducted a study on 149 American university students using MBI to assess student burnout as a function of personality, social support, and workload. Surveys were given at the beginning of the fall Semester and the beginning of the following spring semester to measure the change in student sentiment during this

period. Their findings concluded that personalities, such as negative temperament, can increase the likelihood of burnout in some students. Although academic workload can lead to emotional exhaustion, this study also showed that the definition of workload is often subjective and not an effective measure of burnout. In a similar study, Daniel Law [8] similarly surveyed 163 American business students to test the reliability of the MBI model's three components: emotional exhaustion, depersonalization, and personal accomplishment. The findings from this study indicate that students experienced higher levels of exhaustion and burnout at the end of the semester, mainly due to exams, and that there is a risk that burnout can carry over to the next semester [9–11]. This phenomenon was later supported by a Spanish study that found burnout levels were elevated by COVID-19 lockdowns and remained elevated for long periods of time [12]. In a large MBI study completed in Brazil and Portugal [13], the results showed that burnout was best characterized by factors that relate to physical and psychological exhaustion and ones that address cynicism and disengagement. These results are consistent with the findings of other burnout studies [14,15], where fatigue and exhaustion were found to be core reasons for burnout. It was interesting that self-efficacy was not found to be a significant third factor for burnout in this study. A larger MBI study was conducted on 7757 Italian university students [16]. In contrast to the previous study, the three-factor structure was confirmed and was invariant for male and females and undergraduates and graduates. Exhaustion was found to be a significant cause of burnout that can be mitigated by managing academic demands. A meta-analysis was completed in the UK in 2020 that included over 100,000 students from twenty-nine different studies. Its purpose was to examine the relationship between burnout and academic achievement. The results of this meta-analysis revealed that the burnout symptoms of exhaustion, cynicism, and reduced efficacy were all significantly negatively correlated with academic achievement [17].

Many research studies have concluded that physical and psychological exhaustion are leading causes of student burnout. The COVID-19 pandemic had the unfortunate effect of amplifying the burnout effects of university students by having a significant and negative impact on mental health, education, and the daily routines of students [18,19]. A UK study investigated the impact of COVID-19 on the mental health of 214 university students [20]. The overall study lasted from October 14th, 2019, to January 28th, 2020, and included two surveys before the UK lockdown and two surveys after the UK lockdown. The results show that mental well-being and physical activity decreased during the lockdown, while perceived stress and sedentary time increased. A COVID-19 study completed in Turkey surveyed 485 students for the purpose of examining the direct and indirect relationships between student stress and burnout, depression, and well-being [21]. The results of this study also indicate that COVID-19 did significantly contribute to student burnout, depression, and negative effects on their psychological well-being. A recent and similar study of 199 Polish university students showed that academic burnout during COVID-19 had an indirect effect on post-traumatic stress disorder (PTSD) that was mediated by significant levels of anxiety and fear [22]. Finally, a recent study in Finland conducted three research studies from May 2020 to May 2021 to examine how the burnout and engagement of university students (1501, 1526, 1685) changed during this period. The results show that there was significant volatility from one semester to the next as burnout peaked in April 2021, whereas student engagement reached a low point in December 2020 [23]. This important research demonstrates how educational institutions operating in an uncertain world need to collect data more often to be able to properly address the needs of their students.

Academic self-efficacy refers to a student's belief in their own capabilities and their ability to achieve a certain level of academic performance [24,25]. This means that students who display a higher level of self-efficacy for completing an educational task are more likely to participate more, work harder, and better endure hardships than those who question their own capabilities [26]. While there have been skeptics of how to measure

self-efficacy, it has proven to be pervasive across a multitude of research studies and conceptually and empirically distinct from a wide range of related constructs [27]. In 1995, Schwarzer and Jerusalem [28] created the General Self-Efficacy Scale (GSE) that consists of items designed for the general adult population. The validity of the GSE model has been consistently affirmed by studies since its inception. A large-scale study was completed on 19,120 participants across 25 countries and once again reaffirmed the construct [29]. Another significant study was conducted among 1,933 myocardial and tumor removal patients in Germany, Poland, and South Korea [30] who were experiencing significant amounts of stress and anxiety. Once again, the GSE model proved to be a universal construct that relates well to other constructs. A Turkish study of 354 university students discovered that the relationship between GSE and life satisfaction and burnout was significant [31]. Another Turkish study of 120 university students found a strong negative correlation between self-efficacy and burnout [32].

The COVID-19 pandemic has had an enormous impact on all levels of education worldwide. A recent study conducted on 756 nursing students in Poland, Spain, and Slovakia revealed that while a high level of generalized self-efficacy was observed, there were significant differences between resident countries [33]. Two large studies conducted at American universities surveyed students regarding the impact of emergency remote instruction (EMI) on self-efficacy [34]. The overall results revealed that students showed a 50% loss of efficacy beliefs after EMI but were able to improve to 75% following instructor interventions. Finally, a literature review of various journals, books, and government publications found that the levels of self-efficacy can vary significantly, and that a student's level of self-efficacy is heavily influenced by the level of parental, teacher, classmate, and close friend support [35].

The purpose of this paper is to measure, analyze, and compare the burnout of higher education students in the spring 2021 and fall 2021 semesters. Ninety-seven students from twenty-six different nationalities participated in both the BOS and EOS surveys where Germany and France were the most represented. The courses Consumer Behavior (undergraduate), Services Marketing (undergraduate), Services Marketing (Master's), and Entrepreneurship (undergraduate) were taught at Corvinus University and Digital Management (undergraduate) was taught at the ESSCA School of Management during the fall 2021 semester. Approximately 40% of the students were master's students and 60% were undergraduate students. Of the 97 students in the sample, 34 were male and 67 were female. The mean age of the students was 23 years old, the youngest student was 18, and the oldest student was 27 years old. 82.5% of the surveyed students were between twenty and twenty-four years old.

This paper will address the following hypotheses:

1. The COVID-19 lockdowns during the spring 2021 semester negatively and disproportionately affected the burnout of higher education students with lower remote learning and home environment sentiments.
2. The return to the classroom during the fall 2021 semester will positively impact the burnout of students who struggled with remote learning.
3. The level of a student's self-efficacy remains significantly and negatively correlated to burnout during the spring 2021 and fall 2021 semesters.

The rest of the paper will be organized as follows: Section 2 outlines the Materials and Methods, Section 3 presents and discusses the Results, Section 4 provides the Discussion of the results, and Section 5 offers the Conclusion, and possible future research options.

4.2 Materials and Methods

The following theoretical framework served as the basis for carrying out the study now presented to understand how the root causes of student burnout evolved during the fall 2020, spring 2021, and fall 2021 semesters.

4.21 Spring 2021 Semester Survey Design

At the beginning of the spring 2021 semester, it was clear that the spread of COVID-19 was far from over and that lockdowns would once again be mandated in most universities around the world. Due to these extraordinary circumstances, we initiated a research project to better understand the impact that this pandemic would have on higher education students during the fall 2020 and spring 2021 semesters. Due to the unprecedented and rapidly changing conditions, surveys were given at the beginning of the spring 2021 semester (students reflected back on the fall 2020 semester) and at the end of the spring 2021 semester (students reflected back on the spring 2021 semester). Students in the aforementioned courses were presented with the research topic in class, given the opportunity to ask questions, and asked for their voluntary participation. The students who chose to participate in these surveys did so by clicking a link to surveyplanet.com that was posted in the relevant Microsoft Teams course groups. It should be noted that 83 students voluntarily participated in both the BOS and EOS surveys. The spring 2021 surveys are shown in Supplementary Materials (SM1).

4.22 Fall 2021 Semester Study Design

The fall 2021 semester surveys were created using experience gained from the spring 2021 surveys. Students were similarly asked to participate in the fall BOS survey (students reflected back on the spring 2021 semester) and EOS survey (students reflected back on the fall 2021 semester) on a voluntary basis using the Surveyplanet platform. Ninety-seven students voluntarily participated in both the BOS and EOS surveys. The survey sections burnout (BUR), resiliency (RES), self-efficacy (GSE), technical situation (OED), COVID-19 (COV), remote learning sentiment (HME), and hybrid learning sentiment (HYB) were added and all used a Likert scale (1–5). The fall 2021 semester surveys can be found in SM2 and the abbreviations and terminology can be found in SM3.

4.23 Instrument

To create a survey that was both comprehensive and expedient, the following choices were made in the respective survey sections.

4.23.1 Maslach Burnout Inventory (BUR)

During the lockdowns of the spring 2021 semester, it was clear from our experiences and experiences shared by others that many students were experiencing burnout symptoms. While the Maslach Burnout Inventory (MBI) was originally intended to measure the burnout of workers, many studies have demonstrated its relevance to higher education students where "study" may also be considered "work." A key consideration in selecting specific points from the MBI Inventory was the emphasis on the return to the classroom during the fall 2021 semester and the reactions of students to this transition. There were also overlapping questions from the HME section and the MBI Inventory meaning that fewer items were selected. Items from the depersonalization dimension were excluded as their primary focus is on employment. Please see SM4 for the selected and adapted points from the MBI Burnout Inventory and SM5 for the BOS/EOS data reliability statistics.

4.23.2 Connor–Davidson Resilience Scale (RES)

Based on the experience gained from the spring 2021 surveys, the transition back to the classroom, and the questions from the other survey sections, ten items from the Connor–Davidson Resilience Scale [36] were selected. The aim was to maintain a balance between comprehensiveness and expediency. Please refer to SM6 for the selected items and SM7 for the BOS/EOS data reliability statistics.

4.23.3 General Self-Efficacy Scale (GSE)

All the ten GSE statements were included in the surveys. Please see SM8 for these GSE statements and SM9 for the BOS/EOS data reliability statistics.

4.23.4 Online Education (OED)

Based on the experience gained from the spring 2021 semester, these items were selected to understand how student perception of remote learning changed during the fall 2021 semester while students returned to the classroom. Please see SM10 for the BOS/EOS data reliability statistics.

4.23.5 COVID-19 Response (COV)

This section was designed to measure how the students felt about their home universities' response to COVID-19 and their views on COVID-19 at the start of the fall 2021 semester. Please see SM11 for the BOS/EOS data reliability statistics.

4.23.6 Home Environment (HME) (USM)

This section was also used in the spring 2021 surveys and is designed to measure the impact of home learning on students and its disparity with traditional in-class learning. In the fall 2021 EOS survey, however, students had returned to the classroom and were receiving university services directly. University self-management (USM) reflects this significant shift from remote learning to the return to the classroom. Please see SM12 for the BOS/EOS data reliability statistics.

4.23.7 Hybrid Learning (HYB)

The transition from the spring 2021 semester to the fall 2021 semester was historic as it went from learning exclusively online to the return to the classroom. This section was designed to measure the changes in student perception toward hybrid learning given their exposure to the extremes of lockdowns and then their transition back to the classroom. Please see SM13 for the BOS data reliability statistics.

2.4. Data Reliability

Please refer to Table 1 for a summary of the data reliability of independent variables from the BOS and EOS surveys.

Table 4. Data reliability summary of independent variables (BOS, EOS).

	Beginning of the Semester (BOS)		**End of the Semester (EOS)**	
	Excluded Questions	**Overall Cronbach's α**	**Excluded Questions**	**Overall Cronbach's α**
Burnout (BUR)	2, 5	0.677	2, 5	0.732
Resiliency (RES)	–	0.784	–	0.81
General Efficacy (GSE)	–	0.823	–	0.799
Online Education (OED)	7	0.676	7	0.659
COVID–19 Response (COV)	2, 3	0.698	2, 3	0.69

Home Environment (HME) (USM)	2, 3, 6, 8, 9, 10, 11, 12	0.69	2, 8, 9, 11	0.903
Hybrid Learning (HYB)	1, 2, 3, 5, 6, 8, 9, 12	0.892	–	–

Note: Of the observations, pairwise complete cases were used. The following items were reverse scaled: BOS_HME4, BOS_HME7, and BOS_HME13. For the EOS (HME) and BOS (HYB) sets of questions, principal factor analysis (PCA) was used. Source: own data.

4.3 Results

4.31 BOS and EOS Burnout Correlations

The effect sizes in psychological research are often misinterpreted and underappreciated. To interpret the following data, we will assume that an effect size r = .05 is very small, r = 0.10 is small but more consequential, r = 0.20 indicates a medium effect offering some explanation, r = 0.30 indicates a large effect potentially powerful in the short and long term, and r = 0.40 or greater is potentially an overestimate [37].

As a first step, Spearman's correlation coefficients were calculated between burnout and other independent variables from the BOS and EOS surveys. Please note that Home Environment in the fall 2021 BOS survey was changed to University Self-Management in the fall EOS survey since the place of learning shifted from homes to classrooms and the direct impact of university services became significantly greater.

4.32 Results and Hypotheses

4.32.1 Hypothesis 1: Student Burnout, and Remote Learning Sentiment

The first hypothesis states: **"**The COVID-19 lockdowns during the spring 2021 semester negatively and disproportionately affected the burnout of higher education students with lower remote learning and home environment sentiments." Referring to Table 2, one can see that the remote learning sentiment of university students in the fall 2021 (BOS) was negatively and moderately correlated with burnout ($r = -0.209$, $p = 0.035$).

Table 4.1. Correlations of independent variables with burnout using Spearman's method.

Variables	Fall 2021 BOS Burnout		Fall 2021 EOS Burnout	
	r	p-value	r	p-value
Age	−0.136	0.173	−0.192	0.062
Self-Efficacy	−0.320	p = 0.001	−0.128	p = 0.211
Resiliency	−0.392	p ≤ 0.001	−0.128	p = 0.051
Home Environment +	−0.288	p = 0.003	-	-
University Self-Management	-	-	−0.302	p = 0.003
Hybrid Preference	−0.206	p = 0.038	0.123	p = 0.23
Remote Learning Sentiment	−0.209	p = 0.035	0.424	p ≤ 0.001
Online Learning Preference	−0.178	p = 0.074	0.399	p ≤ 0.001
Technical Support	−0.157	0.114	−0.365	p ≤ 0.001

Note: BOS to BOS and EOS to EOS correlations are used. Source: own data.

During the COVID-19 lockdown, it is reasonable to conclude that students with more negative views of remote learning were also more likely to experience burnout symptoms. As a significant amount of research suggests, there are a wide variety of factors that can influence university student burnout and COVID-19 has added even more complexity to this equation. The data from the fall BOS survey also revealed that home environment sentiment showed an even stronger correlation ($r = -0.288$, $p \leq 0.001$) with burnout. In the fall BOS, there was a strong, positive correlation observed between Home Environment and Remote Learning Sentiment ($r = 0.581$, $p \leq 0.001$).

4.32.2 Hypothesis 2: Student Burnout, and the Return to the Classroom

The second hypothesis states: "The return to the classroom during the fall 2021 semester will positively impact the burnout of students who struggled with remote

learning." Strong, positive correlations were observed in the fall 2021 EOS survey between remote learning sentiment and burnout ($r = 0.424$, $p \leq 0.001$) and online learning preference and burnout ($r = 0.399$, $p \leq 0.001$). These positive correlations stand in contrast to the negative correlations observed in the fall 2021 BOS. On one side, there are the students who experienced burnout symptoms while returning to the classroom. Potential causes of this burnout are the cost and time of commuting, loss of flexibility, less comfort, less interaction, and increased social pressure. On the other side, there are the students who were happy to be back in the classroom and this is evidenced by the negative correlations between university self-management and burnout ($r = -0.302$, $p = 0.003$) and technical support and burnout ($r = -0.365$, $p \leq 0.001$) (Table 3). This suggests that better support services offered by universities lowered the burnout rates for many students. While a higher remote sentiment helped shield students from burnout in the fall 2021 BOS, it became a source of burnout for these same students in the fall 2021 EOS survey. Overall, the data suggest that there are distinct groups of students who have very different views regarding their education.

Table 4.2. Correlations of independent variables with technical support using Spearman's method.

Variables	Fall 2021 BOS Technical		Fall 2021 EOS Technical	
	r	p-value	r	p-value
Age	0.045	$p = 0.65$	0.121	0.241
Home Environment +	0.327	$p \leq 0.001$	–	–
University Self-Management	–	–	0.439	$p \leq 0.001$
Hybrid Learning Preference	0.219	$p = 0.027$	0.078	$p = 0.446$
Remote Learning Sentiment	0.347	$p \leq 0.001$	−0.399	$p \leq 0.001$
Online Learning Preference	0.289	$p = 0.003$	−0.293	$p \leq 0.004$

Note: BOS to BOS and EOS to EOS correlations are used. Source: own data.

4.32.3 Hypothesis 3: Student Burnout, and Self-Efficacy

The third hypothesis states: "The level of a student's self-efficacy remains significantly and negatively correlated to burnout during the spring 2021 and fall 2021 semesters." Self-efficacy was significantly and negatively correlated ($r = -0.320$, $p = 0.001$) to burnout in the fall 2021 BOS. This result was expected as research studies have consistently shown that higher self-efficacy is a burnout deterrent. In the EOS survey, however, self-efficacy remained negative correlated ($r = -0.128$, $p = 0.211$), but weaker and less significant. For the students who were happy to return to the classroom, their self-efficacy became less important as university support services were easier to access thereby reducing stress and anxiety. The students who were unhappy with the return to the classroom and experienced burnout symptoms and this had the effect of lowering their perceived self-efficacy. While Hypothesis 3 holds true for the fall 2021 BOS, the return to the classroom had the effect of reducing the negative correlation between self-efficacy and burnout due to either the substation of university services or the loss of self-efficacy from students who were unhappy with the transition back to the classroom.

4.33 Factors Affecting Home Environments (BOS)

In Table 4, some correlation can be seen between age and fall 2021 BOS home environment ($r = 0.359$, $p \leq .001$). One explanation for this correlation is that master's students are older on average and on two-year programs and the foreign, undergraduate students are only attending for one semester. The transition in and out of another school in a foreign country during one semester often involves challenges. We can also see that the students who have a high remote learning sentiment and prefer online learning were

more likely to be happier with their home environments during the COVID-19 lockdown and less likely to experience burnout symptoms. This result lends further support to Hypothesis 1.

Table 4.3. Correlations of independent variables with home environment using Spearman's method.

Variables	BOS Home Environment +	
	r	p-value
Age	0.359	$p \leq 0.001$
Remote Learning Sentiment	0.581	$p \leq 0.001$
Online Learning Preference	0.566	$p \leq 0.001$
Hybrid Learning Preference	0.244	$p = 0.014$

Source: own data.

4.34 The Importance of University Self-Management (EOS)

In Table 5, a strong, negative correlation can be observed between remote learning sentiment and university self-management (USM) ($r = -0513$, $p \leq .001$) and online learning preference and university self-management ($r = -0.658$, $p \leq .001$). This tells us that the students who have high levels of remote learning sentiment and highly prefer online learning did not value the services and support offered by the university during the return to the classroom. This result lends further support to Hypothesis 2.

Table 4.4. Correlations of independent variables with university self-management (USM) using Spearman's method.

Variables	EOS University Self-Management	
	r	p-value
Age	0.021	$p = 0.842$
Remote Learning Sentiment	−0.513	$p \leq 0.001$
Online Learning Preference	−0.658	$p \leq 0.001$
Hybrid Learning Preference	−0.046	$p = 0.654$

Source: own data.

4.35 BOS Burnout Linear Regression

The first model (M1) is a multiple linear regression analysis designed to predict burnout based on age and gender. A regression equation was found ($F(2, 99) = 1.14$, $p < 0.324$), with an R^2 of 0.023 explaining 2.3% of the sample variance. This analysis indicates that age and gender are not significant predictors of student burnout based on BOS survey data. In the second model (M2), self-efficacy was added to age and gender creating the regression equation ($F(3, 98) = 3.92$, $p < 0.011$), with an R^2 of 0.107 explaining 10.7% of the variance. One can see that the addition of self-efficacy created a more significant model with a higher explained variance. For the third model (M3), remote learning sentiment was added creating the regression equation ($F(4, 97) = 4.25$, $p < 0.003$), with an R^2 of 0.149 explaining 14.9% of the variance. The effect of self-efficacy remained constant, and it is evident that remote learning sentiment did also have a positive impact on the explained variance between M2 and M3. In fourth model (M4), home environment sentiment was added creating the regression equation ($F(5, 96) = 4.188$, $p < 0.002$), with an R^2 of 0.179 explaining 17.9% of the variance. The effect of self-efficacy remained constant between M3 and M4 lending support to Hypothesis 3. The addition of home environment sentiment, however, did have an impact on the remote learning sentiment between M3 and M4. This suggests that there is significant overlap between remote learning sentiment and home environment sentiment (Table 6). Please refer to SM14 for the complete BOS and EOS regression models.

Table 4.5. Explained variance and association between the selected independent variables and burnout (BOS).

Variables	BOS M1 ($R^2 = 0.023$)	BOS M2 ($R^2 = 0.107$)	BOS M3 ($R^2 = 0.149$)	BOS M4 ($R^2 = 0.179$)
Age	-0.047^{ns}	0.034^{ns}	0.043^{ns}	0.109^{ns}
Gender (Female)	0.234^{ns}	0.177^{ns}	0.149^{ns}	0.146^{ns}
Self-Efficacy		-0.303^{**}	-0.303^{**}	-0.293^{**}
Remote Sentiment			-0.206^{*}	-0.085^{ns}
Home Sentiment				-0.224^{T}

^{ns}, ^{T} $p < 0.1$; * $p < 0.05$; ** $p < 0.01$. Source: own data.

4.36 EOS Burnout Linear Regression

In the first model (M1), the regression equation ($F(2, 92) = 1.23$, $p < 0.296$) with an R^2 of 0.026 explains 2.6% of the sample variance. This analysis indicates that age and gender are not significant predictors of student burnout using EOS survey data. In the second model (M2), self-efficacy was added to age and gender creating the regression equation ($F(3, 91) = 1.173$, $p < 0.324$), with an R^2 of 0.037 explaining 3.7% of the variance. Self-efficacy was far less significant in the EOS survey than in the BOS. For the third model (M3), university self-management was added creating the regression equation ($F(4, 90) = 4.348$, $p < 0.003$), with an R^2 of 0.162 explaining 16.2% of the variance. The addition of this university self-management significantly boosted the explained variance, while self-efficacy did not have a significant impact on M3. This starkly contrasts with the influence of self-efficacy in the BOS regression model. In fourth model (M4), technical sentiment was added creating the regression equation ($F(5, 89) = 5.012$, $p < 0.001$), with an R^2 of 0.22 explaining 22% of the variance. The addition of technical sentiment was significant, and it had a negative effect on university self-management. Self-efficacy was again not significant in M4, which does not support Hypothesis 3. The fifth model (M5) added remote learning sentiment creating the regression equation ($F(6, 88) = 6.064$, $p < 0.001$), with an R^2 of 0.174 explaining 29.3% of the variance. The addition of remote learning significantly and negatively affected the significance of university self-management where technical support was affected but to a lesser extent (Table 7)

Table 4.6. Explained variance and association between the selected independent variables and burnout (EOS).

	EOS M1 ($R^2 = 0.026$)	EOS M2 ($R^2 = 0.037$)	EOS M3 ($R^2 = 0.162$)	EOS M4 ($R^2 = 0.22$)	EOS M5 ($R^2 = 0.293$)
Age	-0.156^{ns}	-0.109^{ns}	-0.091^{ns}	-0.117^{ns}	-0.146^{ns}
Gender (Female)	0.091^{ns}	0.056^{ns}	0.056^{ns}	0.046^{ns}	0.044^{ns}
Self-Efficacy		-0.117^{ns}	-0.085^{ns}	0.011^{ns}	-0.013^{ns}
Uni Self Manage			-0.356^{***}	-0.211^{*}	-0.054^{ns}
Technical Sentiment				-0.299^{**}	-0.228^{*}
Remote Sentiment					0.336^{**}

^{ns} $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Source: own data.

4.37 BOS Burnout Mediation

In the BOS mediation analysis, self-efficacy and remote learning sentiment are independent variables, home environment sentiment is the mediating variable, and burnout is the dependent variable (Figure 1). The results show that the direct effects of remote learning sentiment on burnout produced a slight negative correlation ($\beta = -0.076^{ns)}$. The indirect effect between remote learning sentiment and burnout mediated by home environment sentiment ($\beta = -0.09^{**}$) again shows a slight negative correlation.

The total effect of remote learning sentiment on burnout is (β = −0.166**) indicating a moderate, negative correlation. These data tell us that a higher remote sentiment can moderately lessen burnout effects thus lending support to Hypothesis 1. Please refer to SM15 for the complete BOS and EOS mediation models.

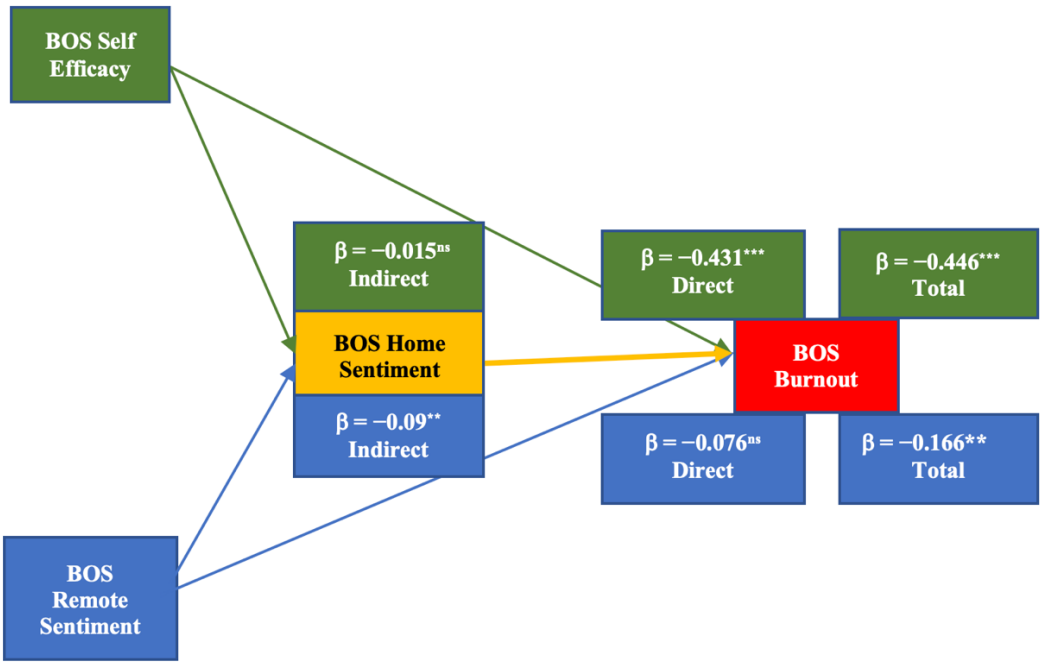

Figure 4. BOS flowchart of direct and indirect burnout effects using beta values. Note: ns p < 0.1; ** p < 0.01; *** p < 0.001. Source: own data.

4.38 EOS Burnout Mediation

In the EOS mediation analysis, university self-management is the independent variable, remote learning sentiment is the mediating variable, and burnout is the dependent variable (Table 8 and Figure 2). The results show the direct effects of university self-management on burnout produced a moderate, negative correlation (β = −0.174**). The indirect effect between university self-management mediated by remote learning sentiment shows a moderate, negative correlation (β = −0.151**). The total effect of university self-management on burnout is (β = −0.325***) indicating a moderate, negative correlation. These data show that both the direct and indirect effects of university self-management on burnout are moderately, negatively correlated. The total effects, however, do indicate that university self-management is fairly broad as it has direct burnout effects and indirect burnout effects mediated by remote learning sentiment.

Table 4.7. The direct and indirect burnout effects between burnout and selected independent variables.

	Direct Burnout Effects	Indirect Burnout Effects	Total effects
BOS Remote Sentiment	β = −0.076ns	–	–
BOS Self-Efficacy	ββ = −0.431***	–	–
BOS Remote Sentiment Home Environment Mediation	–	β = −0.09**	β = −0.166**
BOS Self-Efficacy Home Environment Mediation	–	β = −0.015ns **	ββ = −0.446***
EOS University Self-Management	ββ = −0.174**	–	–
EOS University Self-Management Remote Sentiment Mediation	–	ββ = −0.151***	ββ = −0.325***

ns p < 0.1; ** p < 0.01; *** p < 0.001. Source: own data.

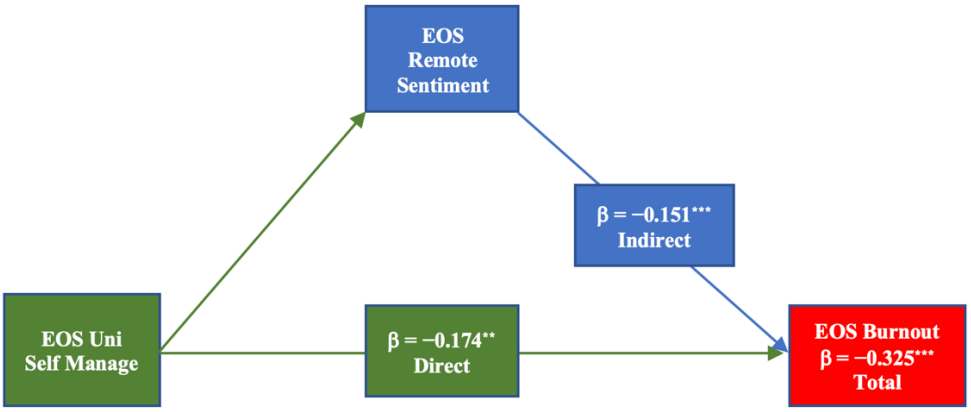

Figure 4.1. EOS direct and indirect burnout effects. Source: own data.

4.4 Discussion

4.41 A Tale of Two Semesters

The rapid transition from face-to-face learning to online learning during the COVID-19 pandemic was unprecedented. While many students briefly returned to the classroom during the fall 2020 semester, this return was short-lived as a spike in global COVID-19 cases [38], particularly in Europe and North America, forced universities to teach exclusively online during the spring 2021 semester. Many research studies over the past year have provided compelling evidence regarding the correlation between COVID-19 and student burnout. This correlation, however, is very complex as burnout disproportionately affects specific groups of students. One recent study in Germany [39] reported that while most students experienced low to moderate burnout symptoms since the start of the COVID-19 pandemic, some students experienced severe symptoms that required urgent attention. Another recent study measured the burnout of medical students and residents in Belgium during the first COVID-19 lockdown [40] and found that those who perceived a higher impact of COVID-19 also experienced higher levels of burnout on all dimensions related to their studies. These studies lend support to the fact that student burnout cannot be resolved using a "one size fits all approach."

While student burnout during the COVID-19 lockdowns is well documented, the burnout associated with the transition back to the classroom is not. The research presented in this paper shows that students with higher remote learning sentiments were more likely to experience burnout symptoms as they returned to the classroom. Students with lower remote learning senitments embraced the transition back to the classroom and consequently experienced less or reduced burnout symptoms. Remote learning sentiment, therefore, is one important variable that can help universities better understand the evolving sources of burnout and how to address them. Self-efficacy was a more relevant variable to burnout during the spring 2021 semester, but became less of a factor during the fall 2021 semester as many students took more comfort in the services provided by their universities. Similarly, resiliency proved to more significantly correlated to burnout during the lockdowns of the spring 2021 semester, but became less correlated following the return to the classroom during the fall 2021 semester. The data from this research study indicate that variables affecting student burnout changed significantly between a short time frame of two semesters and that there are distinct groups of students when identifying sources of burnout.

4.42 Recommendations

4.42.1 Measuring and Addressing Burnout

Since the topic of burnout is quite complex, researchers, Mäkikangas and Kinnunen [41] developed a five-step approach towards creating personal burnout profiles for working people. A similar approach was created Leiter and Maslach [42] calling for a person-centered approach to properly assess burnout in the workplace. Given the complexity of student burnout and the uncertainty present in a post COVID-19 world, universities should create and maintain student burnout profiles in a similar fashion. Such burnout profiles would prove to be very useful if conditions change dramatically similar to what occurred during the spring 2021 and fall 2021 semesters.

4.42.2 Hybrid Learning as the Great Compromise

As the research from this study shows, while COVID-19 has forced most university students to learn online, the range of remote learning sentiments varies significantly. Some students learn better in-class and some students prefer to learn online. Hybrid or blended learning is being increasingly seen by higher education as a compromise that satisifies the needs of the greatest number of students. The data in Table 9 show that a significant number of students in the fall 2021 semester felt that hybrid learning best described their mode of education. Many studies conducted during COVID-19 have concluded that hybrid or blended learning represents a way to be prepared for future disruptions and to better prepare students for a world that will inevitably use more technology [43–46].

Table 4.8. Mode of education in spring 2021 and fall 2021 semesters (n = 97).

	Spring 2021	**Fall 2021**
Entirely Online	66	1
Hybrid Learning	24	49
Entirely in the Classroom	4	45
Internships	3	2
Total	97	97

Source: own data.

4.42.3 The "New Normal" Is Permanent

The term "new normal*"* is now used exhaustively and one of the reasons why is because it is still extremely difficult to define. The transition from face-face learning to online learning was very significant for global higher education. The transition from online learning to face-face learning is also very significant and it is clear that higher education will not be able to return to its 2019 state. It is certain that uncertainty will characterize the "new normal" and this makes understanding student burnout more difficult to idenitfy and manage. Higher education institutions should create student burnout profiles and update them regularly. Hybrid learning has the potential to alleviate the burnout of many students by creating a balance between face-to-face and online learning similar to the growing trend of working from home [47,48].

4.5 Conclusions

While COVID-19 has created unprecedented challenges for higher education, many higher education institutions view the digitization of education as more of an opportunity and less of a burden [49,50]. Technology will enable higher education institutions to gather data about students more frequently and comprehensively so they can proactively mitigate sources of burnout. These burnout profiles are another step in the direction of personalized learning, which is consistent with student experiences outside of the classroom.

Given what we have learned from the COVID-19 pandemic, learning exclusively online has serious drawbacks for a significant percentage of students. Returning to how things were in 2019, however, it also not practical or optimal as an enormous amount of change has taken place during the past two years. Hybrid learning on a discipline-by-discipline basis can be an effective way for higher education institutions to accommodate the needs of diverse groups of students, recognize the lasting role of technology in education, and remain consistent with permanent work from home trends in a post COVID-19 world.

Despite the challenges that higher education has endured since the beginning of the COVID-19 pandemic, there is good reason to believe that it will act as a catalyst for better, more accessible, and more affordable education.

4.6 Study Limitations and Future Work

All the students participating in the surveys were taught by one professor, Kevin Jackson. In the future, it will be preferable to conduct research using numerous instructors along with a diverse group of students. A larger sample size would yield better results and a more compelling analysis. Items from the Maslach Burnout Inventory (MBI) and the Connor–Davidson Resilience Scale were selected, and others were omitted. These choices could have had an impact on the viability of the results.

The COVID-19 pandemic has created a "new normal" that is characterized by a significant increase in uncertainty for higher education institutions and their students. Future work will include conducting studies on the effects of creating student burnout profiles and their impact on mitigating the effects of burnout. It will also be interesting in the future to investigate the viability of the adaptability scale [51] and the expected negative correlation between higher adaptability scores and lower burnout rates.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Supplementary Material 1 (SM1): Spring 2021 Beginning of the Semester (BOS) and End of the Semester (EOS) Surveys; Supplementary Material 2 (SM2): Fall 2021 Beginning of the Semester (BOS) and End of the Semester (EOS) Surveys; Supplementary Material 3 (SM3): Abbreviations/Terminology; Supplementary Material 4 (SM4): Items from the Maslach Burnout Inventory; Supplementary Material 5 (SM5): BOS and EOS Burnout Unidimensional Reliability (BUR); Supplementary Material 6 (SM6): Connor–Davidson Resilience Scale; Supplementary Material 7 (SM7): BOS and EOS Resiliency Unidimensional Reliability (RES); Supplementary Material 8 (SM8): Generalized Self-Efficacy Scale (GSE); Supplementary Material 9 (SM9): BOS and EOS General Self Efficacy Unidimensional Reliability (GSE); Supplementary Material 10 (SM10): BOS and EOS Online Education Unidimensional Reliability (OED); Supplementary Material 11 (SM11): BOS and EOS COVID-19 University Response Unidimensional Reliability (OED); Supplementary Material 12 (SM12): BOS Home Environment and EOS University Self-Management Unidimensional Reliability (HME) (USM); Supplementary Material 13 (SM13): BOS Hybrid Learning Unidimensional Reliability (HYB); Supplementary Material 14 (SM14): Fall 2021 BOS and EOS Burnout Regression Analysis; Supplementary Material 15 (SM15): Fall 2021 BOS and EOS Burnout Mediation Analysis.

Author Contributions: Conceptualization, K.M.J.; methodology, K.M.J. and M.K.S.; software, K.M.J.; validation, K.M.J. and M.K.S.; formal analysis, K.M.J.; investigation, K.M.J.; resources, K.M.J.; data curation, K.M.J.; writing—original draft preparation, K.M.J.; writing—review and editing, K.M.J. and M.K.S.; visualization, K.M.J.; supervision, M.K.S.; project administration, K.M.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study because the results did not involve any personal data, only anonymous aggregated data were used.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available from the corresponding author on reasonable request.

Acknowledgments: We thank the students whose participation made this research possible.

Conflicts of Interest: The authors declare no conflict of interest.

5. Digital Platforms Significantly Enhance High School Entrepreneurship Programs by Enabling Coaching, Collaboration, and Competition

Jackson K., Konczos-Szombathelyi M. (2020a). Digital Platforms Significantly Enhance High School Entrepreneurship Programs by Enabling Coaching, Collaboration, and Competition. 14th International Technology, Education and Development Conference, Valencia, Spain: INTED 2020 Proceedings pp. 8008-8013.

Published: 2020

Reference as: (Jackson K., Konczos-Szombathelyi M. 2020a)

Abstract

The European Commission and the OECD jointly published a thematic paper entitled "Entrepreneurial Learning Environments and a Changed Role for Teachers" that describes how our "globalized and highly technological world" is demanding new types of knowledge and competencies, how high school entrepreneurship can address these changes, and why educational institutions find changes in educational design to be difficult and even disturbing (EU, OECD 2015). As the founder of the True Entrepreneurs Platform (LLA), a high school entrepreneurial program in Hungary, we have discovered that coaching, collaboration, and competition are the three key areas required to motivate and empower high school teachers, students, and local businesses.

Playing high school football in the United States had a huge impact on my life. This impact, however, is not about the game itself, but rather about the motivation and confidence I gained while playing it. While my coaches were always there to teach us the game, they also knew when to take a step back and let us play. It is in these moments of trust between coaches and players that comfort zones are expanded, and limitations recede. Entrepreneurship in high school education also requires a balance between teaching and coaching where students are not only taught, but also empowered to co-design, co-educate, and co-assess their own entrepreneurial education activities (EU, OECD 2015)." LLA coaches high school teachers, using recent and proven materials from Hungarian classrooms, to enable them to discover their own teaching/coaching balance that best suits their students and their respective paths to entrepreneurship.

After coaching, the next key step is to connect students, high school teachers, and qualified business professionals across Hungary in real time. This collaboration creates a dynamic community with "collaborations with the surrounding world integrated as a natural part of the implemented curriculum, in the purpose of offering the students opportunities to create value to themselves as well as to others in their learning process (EU, OECD 2015)." In our rapidly changing world, collaboration is critical to enable a community of teachers and students to share and receive recent and relevant materials thereby creating a virtuous cycle.

Competition is an inherent part of entrepreneurship and a powerful tool to motivate students to make extraordinary efforts. Although competitions are important, these competitions need to provide every participating team regular access to valuable feedback that is not exclusively linked to awards. LLA creates a consensus amongst its members and will organize a Pitch Competition and an Entrepreneurship Hackathon at the end of the 2019-2020 academic year.

These events are fantastic ways for teachers, students, and business professionals to all come together to celebrate entrepreneurship and honor the extraordinary efforts of participating students.

Building a national awareness regarding the importance of high school entrepreneurship will require time and resources. Many high schools that do show an interest in high school entrepreneurship will immediately point to their lack of resources as a principle reason for not supporting it. My research indicates that a real-time platform supporting high school entrepreneurship in these key areas will significantly increase the number of participating high school teachers, students, and business partners in Hungary. This increase in participation creates a powerful and positive network effect that significantly raises the standard of entrepreneurship education for all participants in a cost-effective way.

Keywords: Entrepreneurship Education, Digital Platforms, Innovative behavior, Coaching, Collaboration, Competition.

5.1 Introduction

New Zealand is a remote island country located the Pacific Ocean with a population of approximately five million people. While New Zealand is internationally recognized for excellence in many areas, its All Black rugby team is perhaps the most successful and well-known. Whether you are a rugby fan or not, the ability of a small nation to consistently produce a world class team decade after decade is truly remarkable and has attracted global attention.
Rugby is introduced to children at a very young age and later to schools where 90% of the teachers are female (BBC 2011). It was discovered many years ago these female teachers were often not familiar with how to play rugby or were concerned about their students getting hurt. Rippa Rugby was created as a non-contact, simplified game that is now played by kids as young as three years old. All schools are given a Rippa Rugby Kit and digital materials are available to explain how to train and play the game (BBC 2011). The ability to motivate, empower, and support female schoolteachers demonstrates that the All Black organization made the effort to understand the limitations and concerns of teachers and come up with a working solution that facilitated inclusion. A great lesson for any organization seeking to build a successful network. The All Blacks have created an inclusive, dynamic platform for the coaching, collaboration, and competition of rugby players that starts with toddlers and ultimately creates lifelong members of an elite club. In addition to rugby clubs from around the world, businesses look to the All Black system that "encourages a learning culture or problem solving approach to goal achievement through empowerment from which the whole team is benefited" (Martin A., Johnson T., Palmer F., Watson, G., Ramsey P., p. 65). This is very consistent with the build, measure, learn approach that we teach in high school entrepreneurship using the Lean Startup Methodology developed by Eric Ries.

5.2 Entrepreneurship Education in the E.U.

Let's now look at the culture of high school entrepreneurship in the European Union and, more specifically, in Hungary. Entrepreneurship education itself has been a key policy objective for the European Union for many years and "is essential not only to shape the mind-sets of young people but also to provide the skills, knowledge and attitudes that are central to developing an entrepreneurial culture" (Eurydice 2016, pp. 9). The problem continues to be, however, the huge gap between policy objectives and the actual execution of high school entrepreneurship programs in E.U. member states.

The 2016 Eurydice Report, "Entrepreneurship Education at School in Europe," offers detailed insight regarding the challenges entrepreneurship education currently faces. Some of the key challenges that were reported are the following:

Targeting learning outcomes is rarely defined as a priority action within strategies

The European Qualification Frameworks (EQF) defines learning outcomes as '…statements of what an individual should know, understand and/or be able to do at the end of a learning process'. The learning outcomes perspective is used for a number of different purposes, the most important being:

- Qualifications frameworks and their level descriptors
- Qualification standards
- Curriculum development
- Assessment and validation
- Quality assurance
- Teaching and training
-

Few strategies feature detailed approaches to monitoring progress and impact

There is a big difference between creating a strategy and implementing one. In Hungary, for example, there is a strategy that identifies entrepreneurship education as a key competence. This identification by itself, however, has not and will not stimulate entrepreneurship education activities. There are very few details about the monitoring approach because there is very little to monitor. I expect this is the case in a number of other E.U. member countries (Eurydice Report 2016).

Entrepreneurship education is increasingly recognised as a cross-curricular objective in primary education, but is most commonly taught in upper secondary education through a variety of approaches

The variety of approaches is not a problem as long is as the learning objectives are clearly defined ad adhered to. As shown in section 1.1.1., learning outcomes are rarely defined as a priority action within strategies (Eurydice Report 2016). The lack of clarity regarding learning outcomes creates confusion and makes it difficult for educators to implement entrepreneurship educational programs.

Over half of the countries have very few or no guidelines for teaching methods

As one who teaches entrepreneurship in Hungarian high schools, I find it very challenging to know what methods are the best suited for entrepreneurship education and learning outcomes. Even though I also teach entrepreneurship at the university level and have been an entrepreneur for decades, effective teaching methods for teaching Hungarian high school students have only been acquired through my own experimentation. Imagine a high school teacher, who has no experience as an entrepreneur, trying to create an entire lesson plan that includes activities inside and outside of the classroom (Eurydice Report 2016).

Very few countries include practical entrepreneurial experiences as a regular and compulsory part of the curriculum

Offering practical entrepreneurial experiences is a core part of LLA. The organization of these outside activities and their integration into the learning plan is not a turnkey process. Not only do the students need to be clear on what will happen and what is expected, supporting individuals and companies also need to be clear on the details and deliverables. Once again, one can see the big challenges that high school teachers with little entrepreneurial experience will have without the proper support (Eurydice Report 2016).

Learning outcomes linked to entrepreneurship education are fragmented in most European countries; they are not comprehensive and lack progression between education levels

The lack of consensus regarding what constitutes legitimate learning outcomes for entrepreneurship education creates additional challenges for its adoption and execution (Eurydice Report 2016).

Almost half of the European countries grant autonomy to initial teacher education institutions for the introduction of entrepreneurship education

Monitoring the real progress on the country, regional, and school levels is an enormous task. Countries like Hungary grant autonomy to initial teacher institutions (ITE) in hopes that it will facilitate greater adoption and require fewer resources. This strategy rather creates lower adoption and requires greater resources because it is difficult to track large numbers independent institutions (Eurydice Report 2016).

The All Blacks versus Entrepreneurship Education in Europe

While high school entrepreneurship education remains a high priority of the E.U., its adoption in most countries has not met expectations. As a high school teacher of entrepreneurship in Hungary, I have witnessed first-hand both the opportunity and the challenges. The opportunity is clearly related to the fact that high school students overall are very capable of learning entrepreneurship and potentially becoming entrepreneurs themselves. The challenges, many of them outlined in the previous section, have yet to be properly addressed.

The All Blacks example was used to highlight an organization that has created a platform that empowers rugby players to consistently perform at the highest level. Some key aspects of this success are:

- Creates a fun, easy way for young children to get involved in the sport at a young age.
- Provides the right support and education for all key stakeholders such as school administrators, parents, teachers, students, and students.
- Creates constant collaboration and the sharing of best practices from the Small Blacks to the All Blacks.
- Clear definitions of teaching methods and learning outcomes. No fragmentation.
- Constant monitoring of progress on all levels.
- Continuously create opportunities for rugby players on all levels to compete and use these experiences to improve on all levels.

If the entrepreneurship education is to dramatically improve in Hungary, then a new approach needs to be taken. As entrepreneurship and sports bear many similarities, I believe the All Blacks do represent organization that entrepreneurship education in Europe can emulate.

Digital Platform Definition

We live in a world dominated by digital platforms. Uber created a way to match drivers and riders and Airbnb a way to match homeowners with renters. On a broader perspective, digital platforms have become scalable and cost-effective way to organize a wide range of human activities, including economic, social, and political interactions (Asadullah A., Faik I., Kankanhalli A. (2018).

Global education is being transformed by the likes of Udemy and Coursera that connects students with a huge selection of educational courses created by professors from all around the world. In the case of Entrepreneurship Education in Hungary, the platform would allow high school teachers and students to access an evolving set of course materials and contribute their own materials and feedback to the platform. An educational platform can provide a forum through where parties can collaborate on key aspects like learning outcome definitions, offer materials that are used and rated by an unlimited number of high schools, grant transparency to government agencies, and provide a way to significantly reduce costs by avoiding the usage of physical books and one off subscriptions made by individual high schools (Asadullah A., Faik I., Kankanhalli A. (2018).

Hypothesis: Coaching, Collaboration, and Competition

Hypothesis: A creation of a digital platform will facilitate coaching, collaboration, and competition that will significantly raise the quality of entrepreneurship education and dramatically boost the participation of Hungarian high schools.

5.3 Methodology

The True Entrepreneurs Platform (LLA) will be designed to cover the following three key areas:

Coaching
There are very few high schools in Hungary that can afford or even have access to an entrepreneurship teacher. I am currently donating my time to several high schools that otherwise would not have an entrepreneurship program. The All Blacks rightly recognized that schoolteachers typically have little or no experience with rugby and safety concerns. Their solution was to offer a simplified game with constant support. In a similar fashion, high school teachers in Hungary will predominantly have limited experience with entrepreneurship and no experience teaching it. LLA provides a free, easy, step by step approach to enable these teachers to create and sustain an entrepreneurship program at their respective high schools. The teachers must be coached before they can coach the students. The students then benefit from a system that gives them the freedom to experiment and learn from their own failures. This is similar to the All-Black methodology that emphasizes “learning through doing.”

Collaboration
It is commonplace for Hungarian high schools to act like islands, be secretive, and seek little interaction with other high schools. LLA will connect to each other and motivate high schools

to share their feedback on the course materials, their experiences teaching entrepreneurship, and additional materials that they found useful.

As a platform, LLA should collaborate with university programs to provide a clear path for young entrepreneurs making this transition. LLA can also enable the collaboration with agencies, local businesses, volunteers, donors, and program contributors by offering transparency into the program's activities.

Competition
As LLA continuously keeps the teachers, students, and partners on the same page, the next step is to create competition where students can learn from each other. As I mentioned in the abstract, high school football was a great motivator and a source of great pride. Competition raises the level of play substantially and the same is true for high school entrepreneurship.

5.4 Results

In May of 2020, I will have taught entrepreneurship to thirty students at the Péter Bornemisza High School for one academic year. During this year, I have created my own set of teaching materials and activities (based on my teaching experience) and received feedback. I have now started to teach entrepreneurship at the Fazekas Mihály Gimnázium High School, one of the top-rated high schools in Hungary. The Javne Lauder High School, another top high school, has committed to participate in the LLA Pitch Competition in April.

In order to grow the platform, I will give local high schools free access to my teaching materials. I will work directly with teachers to help them adopt LLA, develop their own entrepreneurship programs in their high schools, and deliver learning outcomes that are relevant to the Fourth Industrial Revolution. The ultimate goal to create a working platform that will be an attractive candidate for E.U. or government funding and resources.

5.5 Conclusions

The E.U. has made it clear that promoting entrepreneurship is vital to the future of the European economy. While a comprehensive framework (EntreComp) has been established, the adoption of entrepreneurship education by high schools in most E.U. member states continue to be disappointing. At the university level in Hungary, entrepreneurship is only offered to a limited number of students. A solution for this problem would need to be a plan that significantly increases both the quality of entrepreneurship education and the number of participating students in Hungary.

The All Black system is so successful because it involves children at a young age and then motivates and supports them all the way through high school, university, and perhaps to the professional level. The quality of the education and the participation rate always remains very high. In Hungary, the vast majority of students are introduced to entrepreneurship at the university level. To truly build a system for producing world class entrepreneurs, however, entrepreneurial education must start much earlier and more intensively. It is critical, however, that entrepreneurship is not seen as a competitor to the existing curricula of high schools, but rather a complement to it.

At the high school level in most E.U. member states, there are major challenges stemming from lack of coherence regarding learning outcomes to a lack of necessary resources and motivation

by high schools. Educators with no entrepreneurship experience must be given the necessary tools and motivation. The solution to boosting high school entrepreneurship education, therefore, is the creation of a digital platform that facilitates coaching, collaborating, and competition within and amongst high schools, as well as coordinates with university programs for guidance and future opportunities.

The real traction of high school entrepreneurship in Hungary requires a catalyst that is not being supplied by EntreComp. I will offer my teaching materials, experience, and expertise to Hungarian high schools for free to act as a catalyst that will provide them with the right tools to begin and sustain successful entrepreneurship programs. A few great examples of high school entrepreneurship can go a long way in changing the hearts of minds of parents, teachers, students, and school administrators.

6. Entrepreneurship in Hungarian High Schools and its Positive Impact on Problem Solving Skills

Jackson K., Konczos-Szombathelyi M. (2020b). Entrepreneurship in Hungarian High Schools and its Positive Impact on Problem Solving Skills. 14th International Technology, Education and Development Conference, Valencia, Spain: INTED 2020 Proceedings pp.5447-5453.

Published: 2020

Reference as: (Jackson K., Konczos-Szombathelyi M. 2020b)

Abstract

We are living in an age where the pace of digital disruption continues to accelerate, and its "creative destruction" is transforming entire industries. There is an urgency amongst all nations to foster innovative behavior that is critical to their long-term viability. The European Union, in recognition of this hard trend, drafted the "New Skills Agenda for Europe" in June of 2016 to ensure that its citizens have access to relevant training, skills, and support. The Entrepreneurship Competence Framework or "EntreComp" is a key component of this agenda and was designed to boost the entrepreneurial mindset of European citizens. The big challenge for the E.U. and all nations, however, is how to move beyond the creation of frameworks and legislation in favor or implementing Entrepreneurship programs in a meaningful and comprehensive way (Entrepreneurship in Education 2015).

The European Commission in its Entrepreneurship Action Plan (2004) made it clear that learning Entrepreneurship should begin in high school, yet the realization of this plan has been frustratingly slow. Why? One of the greatest impediments to teaching high school Entrepreneurship is that its definitions vary widely (Shepherd, 2015). While EntreComp does help to create common ground for Entrepreneurship in education within the E.U., it is still confusing and complicated for high school teachers that do not have an entrepreneurial background. We have launched the Lean Learn Academy (LLA) in Hungary in English to facilitate collaboration and competition amongst high schools and to create a digital platform that empowers local high school teachers to teach Entrepreneurship based on understandable methods developed by their peers.

LLA's research study currently involves three Hungarian high schools and focuses on measuring the impact of Entrepreneurship education on problem solving abilities, a skill in high demand in the global job market (Anderson & Anderson 1995). Students participate in numerous, group based, problem-solving challenges and then individually assessed during the academic year. A key part of our program has been to continuously expose students to visiting business professionals, arrange company visits, and utilize real use cases. So far, we have witnessed a strong correlation between participation in high school Entrepreneurship and the development of problem-solving skills, where our focus thus far has been primarily on opportunity recognition.

In the bigger educational picture, universities stand to benefit greatly from an influx of students who are already experienced entrepreneurs and hungry for even bigger challenges. Students who learn Entrepreneurship are by no means bound to becoming an entrepreneur as its supported skills are in big demand all over the world in a wide variety of career paths available in nearly every industry. It is time for academic institutions around the world to properly

support Entrepreneurship as a core discipline in all high schools to better prepare students for the jobs of tomorrow.

Keywords: Problem-solving ability, Innovative behavior, Opportunity recognition, Entrepreneurship education.

6.1 Introduction

The lives of Baby Boomers, Generation X, Generation Y (the Millennials), Generation Z, and future generations have been and will be increasingly affected by the rapid advancement and deployment of technology in all aspects of our lives. Industries must have the ability to adapt to the rapidly changing needs of the marketplace or face "creative destruction." The Austrian economist, Joseph Schumpeter, first coined the term "creative destruction" back in 1942 in his work entitled *Capitalism, Socialism, and Democracy* (*CSD*). Schumpeter described creative destruction as the inevitable evolution of capitalism that "revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating the new one" (p. 83, [italics in original]). In our digitally connected world, however, these structural economic changes from within are being accelerated by pressure from both internal and external forces to a degree never seen before in human history. In other words, no competitive nation on our planet has the luxury to think that the status quo will lead to economic success in the future.

6.2 The Educational State of Hungary

As an American who has been living in Hungary since 1997, I have had the privilege to witness extraordinary changes. Since the early 1990s, Hungary has received a significant stream of foreign direct investment (FDI) that has modernized production and enabled it to become integrated into the global economy (OECD Hungary Economic Snapshot 2019). The Organisation for Economic Co-operation and Development (OECD) Economic Survey from 2019 further states that:

> "The high reliance on foreign direct investment to drive growth has led to a regionally unbalanced growth pattern. The western and central regions – the main recipients of foreign investment – and Budapest area with its large positive agglomeration effects have grown faster than the rest of the country. The left-behind regions are characterised by low employment, a high number of social transfer recipients and poor integration into regional and national supply chains (OECD Economic Surveys: Hungary 2019, p.10)."

While FDI has enabled Hungary to evolve since the 1990s and avoid creative destruction, it is not without its consequences and there is no guarantee that it will continue in the future. In the case of Hungary, as well as other countries in the Central European region, there has been an over reliance on FDI at the expense of the creation of domestic companies. If all nations must compete today for their place in tomorrow's world, then the existence of a dynamic and relevant educational system is critical to produce and support tomorrow's entrepreneurs.

The OECD has created the Programme for International Student Assessment (PISA) that "measures 15-year-olds' ability to use their reading, mathematics and science knowledge and skills to meet real-life challenges.(OECD PISA)" The 2018 PISA was administered to 600,000 students from 79 different countries (OECD PISA). As this is such a diverse data set

characterized by a wide variety of school curriculums, the test does not measure factual knowledge, but rather a student's ability to apply what they have learned in school.

> "While Hungarian students showed slightly improved academic performance in 2018 when compared to three years earlier, the 2015 results were an all-time low and Hungary's results remain below the OECD average in all categories. Fellow regional countries like Croatia, Estonia, the Czech Republic, and Slovenia outperformed Hungary as Asian countries continue to remain strong as they build educational systems that will drive their global competitiveness. Despite having the world's largest economy and enormous resources, the 2018 PISA rankings also show that the American students perform at about the OECD average in reading and significantly worse in Math."

On the 2015, PISA report included "collaborative problem solving" for the first time based on the premise that:

> "In today's increasingly interconnected world, people are often required to collaborate in order to achieve their goals. But students still typically learn individually. Schools will need to become better at preparing students to live and work in a world in which most people will need to trust and collaborate with other people."

Hungarian students were again below the OECD average (472), where Singapore had the top result (561). While it must be noted that the OECD data offers a limited assessment of the Hungarian educational system, it does indicate that an educational divide exists and appears to be widening between nations.

On a personal note, my wife is Hungarian, and my three children all go to Hungarian schools. While I believe this educational system served my wife's generation well, I do not believe that it is preparing them or today's students for tomorrow's challenges. I see further evidence of this due to my experience as a teacher in Hungary at both the university and high school levels. As an American, I see a similar trend in the U.S.

6.3 The Global Skills Gap

As a professor who has taught entrepreneurship at the university level for many years, I consistently observe that only a few students have ever attempted to start a business. Even more interesting is that many of them have no practical work experience. My students regularly come from all over the world including countries such as the U.S., China, Germany, France, Egypt, Mexico, Denmark, Sweden, Brazil, India, and Hungary. While these are just my observations, it pushed me to question why entrepreneurship is not being systematically taught at the high school level.

The PwC's 22nd Annual Global CEO survey (2019) reported that four out five CEOs displayed concern about their employees' lack of essential skills and how it represents a threat to growth (PwC 2019). The CEOs in Japan and Central/Eastern Europe are the most worried at 95% and 89% respectively (PwC 2019). This concern is well founded as the World Economic Forum reported that:

> "At least 133 million new roles generated as a result of the new division of labour between humans, machines and algorithms may emerge globally by 2022, according to the World Economic Forum. There will also be strong demand for technical skills like

> programming and app development, along with skills that computers can't easily master such as creative thinking, problem-solving and negotiating." (World Economic Forum, Digital Skills Gap)

The Fourth Industrial Revolution is already ushering in a new era of "creative destruction" involving the deployment of advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics. According to the World Economic Forum, the top ten jobs skills required for 2020 are the following (World Economic Forum Top Ten Skills):

- Complex problem solving.
- Critical thinking.
- Creativity.
- People management.
- Co-ordinating with others.
- Emotional intelligence.
- Judgment and decision making.
- Service orientation.
- Negotiation.
- Cognitive flexibility.

The global skills gap is certainly not something that can easily be measured or agreed upon. What is important, however, is that private and public must recognize this gap exists and will only widen if educational systems at all levels do not address it.

6.4 The Hungarian Economic and Educational Outlook

According to the Central Statistical Office (KSH), Hungary's economy grew by a seasonally adjusted 4.8% in the third quarter of 2019, making it the highest amongst the 28 member states. While this is an impressive result and Hungary has enjoyed numerous years of economic growth, the European Commission acknowledged in its autumn European Economic Forecast that Hungary largely avoided the global slowdown due to a domestic construction boom and a revival of the automotive industry (foreign owned) (European Economic Forecast 2019). It further stated that a slowdown in construction growth and investment growth plunging from 17.0% in 2019, to just 2.1% in 2020, and 2.6% in 2021 (European Economic Forecast 2019).

Hungary's recent economic success should not be confused with a solution for its long-term economic viability and the domestic construction industry and more factory jobs will not light the way to prosperity. It is the transformation of its educational system that will educate tomorrow's entrepreneurs, create higher paying jobs, and attract capital from all over the world.

6.5 The Lean Learn Academy (LLA)

I founded the Lean Learn Academy (LLA) for me to learn how to help students learn better and begin developing the skills that tomorrow's job will require. The "True" in the name symbolizes our goal to motivate students to create companies that can benefit society. Together with a former entrepreneurship student of mine, we introduced the idea of starting a program at the Péter Bornemisza High School, the one he attended.

LLA began in early September of 2019 at the Péter Bornemisza High School and is a one-year program covering the following key areas and questions:

- Business Concept
    - What is the big idea?
    - What exactly are you selling?
    - How will you make money?
    - Who are you selling to?
    - How will your business be positioned?

- Organization
    - Who are the decision makers?
    - Who are your advisors?
    - Who are your key partners/suppliers?
    - What are your core business processes?
    - Are there any potential legal issues?

- Customer Relations
    - What is your network?
    - How will you market your product/service?
    - How will you sell/support your product or service?
    - What is your communication/PR strategy?
    - How will you create a strong brand?

- Operations
    - What are your financials?
    - How will you fund your business?
    - How will you produce and deliver your products/services?
    - How will you use technology to coordinate/control activities?
    - Where will your business operate from?

What I have learned through teaching entrepreneurship to high school students in 2019 is that their ability to recognize business opportunities is very limited. While these "digital natives" are very familiar with using technology, they are very unfamiliar with how and why these technologies were created. After a semester of intensively focusing on the Business Concept section outline above, I found that many students were still struggling, although a few displayed notable progress. The experience reminded me of high school sports where athletes must practice key aspects of the game again and again to become in order to more and more competitive.

Alvarez and Barney (2005) created a useful analogy when explaining the opportunity perception building process. They liken mountain climbing to a passive exercise and mountain building as one that requires undertaking an action that facilitates the creation of an innovative idea. During the 2019 Fall semester, groups of students were formed, ideas were created, feedback was received, and the ideas revised. This was the feedback loop in action. The process of trying and failing and trying and failing is one the is quite foreign to many high school students who are used to climbing mountains rather than building their own. In December of 2019, groups of high school students presented their business concept to fellow students, parents, teachers, and invited guests. It is now time to test the level of the student's problem-solving abilities and how it can be improved over the course of the Spring 2020 semester.

Hypothesis: Problem Solving and Opportunity Recognition Definition

For the purposes of this paper, we will define problem solving as the ability to respond to rapid changes, find various viable alternatives, maximize positive results, minimize negative consequences, and select the optimal solutions to problems (Barron & Harrington, 1981; Jabri, 1991; Kirton, 1976).

Opportunity recognition may be defined as "the formation of beliefs that can be translated into actions in order to understand the signals of change (new information on new conditions) and respond to these changes." (Kim, Choi, Sung, Park 2018)

Hypothesis: LLA significantly enhances the problem solving and opportunity recognition of Hungarian high school students.

6.6 Methodology

The global consulting company, McKinsey, developed its own problem-solving test (McKinsey PST) that must be passed before a first-round interview is granted. Unlike like standardized tests like the SAT, GRE, or the GMAT, this test challenges its takers to "1) do math accurately, 2) do it quickly, and (most importantly) interpret data CORRECTLY." (McKinsey)

An example of how the McKinsey PST works is the following:

1) Read a graphical chart (or the data spreadsheet that was used to create the chart);

2) Grasp what the "data is conclusively telling you" and separate from what the "data is suggesting (but not definitively so)";

3) Write a 1 - 2 sentence "headline" at the top of a PowerPoint slide state a logically correct conclusion.

IBM famously stated back in 2017 that "90% of the data in the world today has been created in the last two years alone, at 2.5 quintillion bytes of data a day." The ability to reach the right conclusions and to understand not just how to solve problems, but which ones are the most important and should be solved first.

6.7 Results

While it is clear that high school students are not ready to the McKinsey PST, a similar model (LLA PST) should be used for the assessment of problem solving and opportunity recognition. As a university professor, I regularly give open book, open note, open Internet exams. While this format may seem to be unusual for academia, it much better reflects how business professionals solve problems. Every student is challenged under a time limit to formulate an answer and support it with as many recent and relevant materials as possible. Each exam, therefore, represents the unique effort and interpretation of that student on that particular date and time.

Together with business professionals, many of whom have spoken in my classes, I am creating real business case studies accompanied by questions that require insight and interpretation.

These will be timed, 30-minute tests, where students will be able to use the Internet or any other available resources within a controlled environment. By controlled environment, this means supervised classrooms or computer labs.

Each test will be a unique case study with a thirty-minute time limit. The test will be also taken by its creators, and invited and relevant guests, who will provide detailed notes on how they interpreted the questions and crafted their answers. These answers will be integrated and used as a basis for the student.

Three tests will be given to my current, thirty Péter Bornemisza High School students (January, March, May of 2020.) These students have participated in LLA since September and I expect their January results to be better on average than students who did not participate in Fall program. I am also expecting their results to end in May on a higher level than those who are starting TEP in January.

I will begin in January with five students from the Mihály Fazekas High School, one of the top ranked high schools in Hungary. While this is a highly ranked school, I am expecting that January test results will be lower than Péter Bornemisza, but also expect the May results to be significantly better than the January results.

6.8 Conclusion

The success of all nations depends squarely on their abilities to prepare future generations for the Fourth Industrial Revolution and beyond. PwC analysis has identified the following three waves of automation that are likely to occur (PwC analysis):

- Wave 1 (to early 2020s): algorithmic
    - Relatively low job displacement

- Wave 2 (to late 2020s): augmentation
    - Technology matures and launched at scale

- Wave 3 (to mid-2030s): autonomy
    - Up to 30% of jobs could become automated

The key takeaway here is that the world has already changed all industries are being disrupted by the adoption of technology. While the Hungarian economy and employment currently benefits greatly from manufacturing, what will 2030 look like?

Hungary, like many nations, must make fundamental educational reforms to remain a competitive nation over the next decade. These reforms are never easy and see change as a foreign invasion. LLA is an educational initiative focused on empowering Hungarian students to develop the job skills that will help them to build the competitive companies of tomorrow and have the skills to land the high paying jobs that cannot be outsourced or automated. There is no time to waste.

7. The Impact and Urgency of Teaching Opportunity Recognition to High Schools Students

Jackson K., Konczos-Szombathelyi M. (2020). The Impact and Urgency of Teaching Opportunity Recognition to High School Students. 58th International Scientific Conference on Economic and Social Development, Book of Proceedings pp.5447-5453.

ABSTRACT

The coronavirus COVID-19 pandemic is a global health crisis and the greatest challenge the world has faced since World War II. This pandemic, however, represents far more than a health crisis, but also has the potential to inflict crippling social, economic, and political effects that will be felt for decades to come. All nations must now fully realize that the policies of the past will not produce economies benefits in the future. A system for the creation of high growth entreprises (HGEs) is essential, therefore, to drive economic growth and promote job creation. Education must play a key role in this process as entrepreneurs are the key drivers behind the evolution of HGEs. This means entrepreneurship must be taught in all high schools and embraced as a core discpline that will develop an entrepreneurial mindset in younger generations. While it is certain that only a small fraction of the population will become entrepreneurs, there must be the necessary "social electricity" from all parts of the economy to full embrace and promote entrepreneurship. Education must lead the way to creating a new class of entrepreneurs who will create tomorrow's HGEs.

Keywords: *entrepreneurship, uncertainty, entrepreneur training, opportunity recognition, opportunity creation*

7.1 Introduction

Joseph Schumpeter in his 1942 work, *Capitalism, Socialism, and Democracy* (*CSD*), describes Creative Destruction as a "process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (Schumpeter, 1942). Schumpeter argued that Creative Destruction drives a continuous flow of technical opportunities that is fueled by constant disruptions in markets, industries, national economies, and the world economy. At the heart of Schumpeterian Theory is his firm belief that the entrepreneur is the key driver of innovation, the realizer of profitable opportunities, the discoverer of better business combinations, the implementor of more efficient production processes, and the launcher of effective marketing strategies. According to Schumpeter, the competitiveness of a nation relies on the competitiveness of its firms, which depends on the competitiveness of its entrepreneurs.

Governments in developed nations predominately agree with Schumpeter and devote significant resources to promoting entrepreneurship (Shane, 2009; Acs, 2016). The European Union itself has devoted significant resources to entrepreneurship by creating the Entrepreneurship Competence Framework or "EntreComp" that is designed to boost the entrepreneurial mindset and activity of European citizens. There is a global public policy debate, however, that questions whether government supported entrepreneurship programs actually spawn the kind of startup companies that fuel innovation and create high paying jobs. Those on the other side of the Schumpeterian coin remain skeptical of a strong correlation between absolute entrepreneurship and economic growth and argue that "Encouraging more and more people to start businesses won't enhance economic growth or create a lot of jobs

because startup, in general aren't the source of our economic vitality or job creation" (Shane, 2009). One of the principal reasons for this failure stems from the fact that "when governments intervene to encourage the creation of new businesses, they stimulate more people to to start new companies disproportionately in competitive industries with lower barriers to entry and high rates of failure" (Shane, 2009). While research clearly supports that entrepreneurship drives economic growth, this is only true if the entrepreneurs themselves are able to avoid early exits (Santarelli, 2007). Entrepreneurs commonly make the mistake of choosing industries and markets that offer the easiest entry, yet do not represent the best startup opportunities (Johnson, 2005). The result for most nations is a situation where most of the benefits realized from entrepreneurship programs are derived from a small number of High Growth Enterprises (HGEs), whereas the vast majority of enterprises struggle to survive (Block, 2017).

The European Union (EU) fully recognizes the importance of HGEs and "their impact on job creation, industrial renewal and the leverage effect they can have on sectoral productivity or regional competitiveness" (JRC, 2020). According to the 2020 JRC Technical Report on HGEs, they make up 10.7% of the total number of EU enterprises across all sectors. While there is a consensus on the importance of HGEs, its definitions vary according to choices of growth indicators, growth measurements, time dimensions, and the processes through which firms grow (JRC, 2020).

The OECD defines HGEs as "enterprises with average annualised growth in the number employees greater than 20% per year, over a three-year period, and with ten or more employees at the beginning of the observation period," (JRC, 2020) while the Eurostat definition specifies that "HGEs are enterprises with at least 10 employees in the beginning of their growth and having average annualised growth in number of employees greater than 10% per annum, over a three year period. (Eurostat, 2016)." As one can see, both definitions define success in terms of the abilities of HGEs to significantly boost employment. It is also notable that HGEs across all EU nations are predominantly younger than average enterprises, proven innovators, and more present in knowledge intensive services than in manufacturing (JRC, 2020). This is consistent with the makeup of HGEs in other developed nations.

Based on these statistics, Schumpeter would likely recognize that entrepreneurs in the EU are creating HGEs that are innovating, driving economic growth, and boosting employment. Scott Shane would point out, however, that the HGEs in the EU on average only account for 10.7% of the total number of enterprises and that economic growth and jobs creation is a function of "encouraging high quality, high growth companies to be founded (Shane, 2009)." Overall, both Schumpeter and Shane would both agree that policy makers need to create a pipeline that steadily generates more HGEs year over year as their impact of economic growth and job creation is indisputable.

The EU's 2020 Entrepreneurship Action Plan indicates a troubling, long-standing downtrend in entrepreneurial activity where:

> *"since 2004, the share of people preferring self-employment to being an employee has dropped in 23 out of the 27 EU Member States. While three years ago for 45% of Europeans self-employment was their first choice, now this percentage is down to 37%. By contrast in the USA and China this proportion is much higher: 51% and 56% respectively. Moreover, when new enterprises are founded, they grow more slowly in the EU than in the USA or emerging countries, and fewer of them*

join the ranks of the world's largest firms" (EU Entrepreneurship Action Plan, 2020).

It clear that the EU and member state policy makers must find ways to boost economic growth and job creation. It is also clear that HGEs are key economic drivers, but they are not created without the support of a dynamic ecosystem. An HGE pipeline, therefore, must be one that extends the right support, education, motivation, and opportunities to those most capable of maximizing its benefits.

7.2 The HGE Pipeline

The flow through an HGE pipeline comes from a diverse set of individuals who identify with one or more of the following groups before becoming entrepreneurs.

The Unemployed

For policy makers, the prospect of turning unemployed individuals into successful entrepreneurs is very attractive. Not only do they become employed, but they create enterprises that employ others. The problem with this reasoning is that unemployed people often suffer from a lower opportunity cost of their time (Shane, 2009). "Desperate entrepreneurship," often involves a situation where an unemployed individual starts a business due to a lack of opportunities in the labor market" (Mühlböck, 2018). Perhaps starting a business is a better option than sitting at home and playing games. This is not an effective way to build a powerful HGE pipeline, yet it is commonly supported by many nations for reasons often more political than economic.

The research paper "Does self-employment reduce unemployment?" analyzed data from 23 OECD countries and concluded that "the results of this paper unequivocally suggest that public policy to generate jobs and reduce unemployment would be best served by focusing more on innovative and high-growth entrepreneurship than on inducing the unemployed into entering into self-employment" (Audretsch, 2001). As this data shows, incentivizing the unemployed to become self-employed may drive up the number of startups, but ones that significantly contribute to robust economic growth and job creation with be the exceptions rather than norm. As of June 2020, the unemployment rate in the Euro area was 7.8%, up from 7.7% in May (Eurostat, 2020). Policy makers now face the enormous challenge of addressing rising unemployment during a global pandemic that has inflicted serious economic damage. It will be tempting to hope that a portion of the unemployed can quickly be converted successful entrepreneurs. Unfortunately, the data proves otherwise, and nations will need to utilize other sources for their HGE pipelines.

Leap of Faith vs. Hybrid Entrepreneurship

Many entrepreneurs develop great ideas, quit their jobs, and start a business. While we hear a lot about the success stories, the reality is that there is a high frequency of new business failure (Shane, 2003). A way to reduce the risk of failure is to keep your day job while developing a business. A broad range of entrepreneurs, including Apple co-founder Steve Wozniak, worked for other firms while building their own (Raffiee, 2014). The significant takeawy for policy makers is the importance of directing support to those who have the best chance to succeed. Shoveling funds indiscriminately to those who want to be entrepreneurs is most likely to result

in wasted funds and higher unemployment. In a COVID 19 world, great care needs to be made to ensure that scarce funds are reaching the most capable hands.

Young People (Under 25 years old, Non-Students)

In June of 2020, there were 2.962 million unemployed people under the age of twenty-five in the EU, of whom 2.360 million were in the euro area (Eurostat, 2020). The youth unemployment rate was 16.8 % in the EU and 17.0 % in the euro area in June, up from 16.2 % and 16.5 % respectively in the previous month. COVID-19 (Eurostat, 2020). A recent research paper forecasts that "The youth unemployment rate will increase to 26%, and the number of young people not in education, employment and training (NEET) will increase from 4.7 to 6.7 million" (Tamasberger, 2020).

The EU faces the enormous challenge of addressing rising youth unemployment. Like with older, unemployed individuals, it is not reasonable to think that polices will be able to seamlessly transform the unemployed youth into vibrant entrepreneurs on their way to creating the next HGEs. This is not to say that those under twenty-five years old cannot create HGEs, but rather that the process that requires education and training. As it was mentioned before, the transition from being unemployed to becoming an entrepreneur is a bumpy road with a low-speed limit and requires the right support, mindset, and dedication.

Active Students (15-25 years of age)

Entrepreneurship education frequently stimulates lively debates as it involves a "rich and diverse pool of collaborative educators—academics, entrepreneurs, consultants, investors, full-time, part- time, academically qualified, and professionally qualified—with a common understanding that entrepreneurship education is important" (Neck, 2011). Even though entrepreneurship education is widely recognized as being important, in the EU "education does not offer the right foundation for an entrepreneurial career, difficult access to credits and markets, difficulty in transferring businesses, the fear of punitive sanctions in case of failure, and burdensome administrative procedures" (EU Entrepreneurship Action Plan, 2020).

The 2020 EU Entrepreneurship Action Plan further explains that "there is a widespread culture that does not recognise or reward entrepreneurial endeavours enough" and that "To make entrepreneurship the growth engine of our economy Europe needs a thorough, far-reaching cultural change (EU Entrepreneurship Action Plan, 2020)." This negative sentiment is in spite of positive data indicating that "Investing in entrepreneurship education is one of the highest return investments Europe can make. Surveys suggest that between 15% and 20% of students who participate in a mini-company programme in secondary school will later start their own company, a figure that is about three to five times that for the general population" (Jenner, 2012). The harsh reality is that far too few high schools and universities in the EU are making investments in entrepreneurship education and this negatively impacts HGE pipelines.

7.3 The Icelandic Sport Pipeline

Iceland, a nation of only 364,000 people, shocked the world when it qualified for the 2018 World Cup Finals. They were the smallest nation to qualify in the 88-year history of the tournament and this left many larger nations, with much deeper pockets, scratching their heads and wondering how Iceland was able to achieve such a remarkable feat. The reason for this achievement is that Iceland has built a sustainable pipeline for success.

Like entrepreneurship, merely participating in a sport does guarantee an elite status. It can be said, however, that Iceland's incredibly high sports participation rate, where 80% of sixth graders play in organized leagues, has taken on a "pedagogical role for children and adolescents as a gateway into society" (Þórlindsson, 1994). Icelandic football creates "social electricity" that galvanizes entire communities and creates collective energy (Durkheim, 1965). Despite its tiny population, Iceland harnesses this communal energy to motivate people at all stages of their sport pipeline. This creates a sense of identity and an atmosphere that "transports enthusiasm, increases individual well-being, unites citizens and enhances their level of communication and collective sentiments – as is common in religion" (Birrell, 1981; Durkheim, 1965). This sense of identity runs seamlessly through their pipeline, from young kids playing for the first time, to the parents, to the high schools, to the universities, to the elite few that were able to represent Iceland in the World Cup in 2018 cheered by fans doing the famous "thunderclap."

The Icelandic Sport Pipeline is the opposite of what we see in EU entrepreneurship. Despite the existence of comprehensive frameworks and action plans, member states herd entrepreneurs into disproportionately in competitive industries with lower barriers to entry and high rates of failure" (Shane, 2009). As we have discussed, the addition of more entrepreneurs can make an economy worse, not better. Please recall that the 2020 EU Entrepreneurship Action Plan specifically stated that "To make entrepreneurship the growth engine of our economy Europe needs a thorough, far-reaching cultural change." This cultural change, however, requires "social electricity," which means that the perception of entrepreneurship must change from one of ambivalence to one of inclusion (Figure 8).

Teaching entrepreneurship is now taking on even greater importance as "Researchers increasingly recognize that entrepreneurship may offer a significant part of the solution to poverty around the world" (Alvarez, 2015; Bruton, 2013). While the connections between entrepreneurship, economic growth, and poverty reduction require a lot more research and validation, it has been reported that "In general, the faster and more widespread economic growth in recent decades has enabled large numbers of people to move out of poverty such that extreme poverty has fallen to less than ten percent of world population" (Si, 2018). According to a World Bank June 2020 Global Economic Prospects report, "when compared with pre-crisis forecasts, COVID-19 could push 71 million people into extreme poverty in 2020 under the baseline scenario and 100 million under the downside scenario." This problem cannot be addressed by repackaging policies of the past.

How can the EU create an HGE pipeline driven by "social electricity" that can boost economic growth, create jobs, and potentially lower poverty? The first step is to teach opportunity recognition.

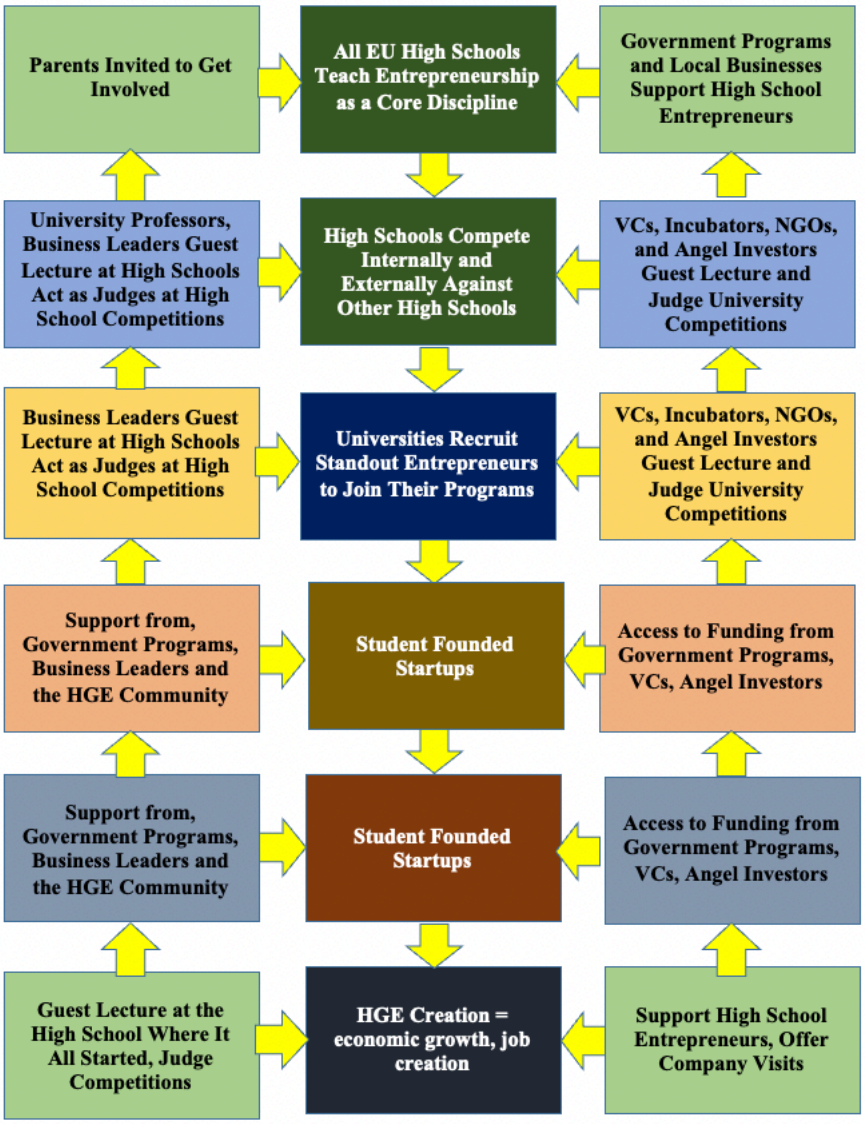

Figure 7: E.U. HGE Pipeline with Social Electricity

The Journey Begins with Opportunity Recognition

Entrepreneurship can be defined the study of opportunities (Shane, 2000) and entrepreneurial opportunities can be defined as "situations in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships (Casson, 1982; Shane, 2000). Over the past two decades, there has also been a debate regarding how opportunities are created. The Discovery Theory argues that the existence of market imperfections, such as technological changes, political and regulatory changes, social and demographical changes, and global pandemics that disrupt the competitive equilibrium (Shane, 2003). These disruptions, therefore, create opportunities to launch new products and services. This theory, however, relies on the fact that opportunities to produce new goods and services emanate from industries and markets that already exist (Kirzner, 1973). It furthers states that entrepreneurs take on a more passive role and only become activated when there is an opportunity to be exploited (Shane, 2003). As the name suggests, the Discovery Theory means that entrepreneurs are endlessly scanning the environment and searching for opportunities as if they are panning for gold.

The famous economist, Israel Kirzner, reasoned that the key distinction between entrepreneurs and non-entrepreneurs is "entrepreneurial alertness" (Kirzner, 1973). It is this alertness that enables certain individuals to dissect causal relationships, to harness the power of Big Data, to comprehend economic and social processes, to challenge the status quo, and to think counterintuitively (Gaglio, 2001; Shane, 2003). The Creation Theory, therefore, requires an active entrepreneur since opportunities are not created from pre-existing industries or markets. In other words, "entrepreneurship is not about "climbing mountains", but rather, about "building mountains of opportunities that are recognized, only after they have been exploited" (Alvarez, 2006). While search for opportunities plays a leading role in the Discovery Theory, the role of search does not hold a significant place in Creation Theory. The logic here is that entrepreneurs act when they see an opportunity but have little ability to anticipate whether one is about to be created. Given the level of uncertainty in our current world, this is truer than ever before.

The distinction between Discovery Theory and Creation Theory is very consequential for entrepreneurship education. While opportunities arise from information asymmetry, not everyone in society can see recognize these opportunities. It is a select few that can recognize a particular opportunity at a particular time (Kirzner, 1973). While Entrepreneurship education will not transform every student into the next Jeff Bezos or Elon Musk, it will help all students to not only better recognize opportunities, but to also develop the problem solving and critical thinking skills that are useful in nearly every occupation.

After teaching entrepreneurship to both high school and university for many years, I have realized that I overestimated their ability to recognize opportunities. This is not a poor reflection on these students, but rather the understanding that opportunity recognition, like playing a sport or the piano, takes repetition and practice. This is why we devoted an entire high school semester to opportunity recognition. By doing this, we wanted to answer the key question "Can opportunity recognition be taught?" If yes, then "How can we measure its effect on high school and does it justify having entrepreneurship as a core high school discipline?" These questions are of critical importance given the pressing need of EU nations to create High Growth Enterprises.

7.4 The Lean Learn Challenge

FEBRUARY 2020

As a part of the Lean Learn Academy, began teaching the Lean Learn Program (LLP) at the Bornemisza *Péter High School (BPG) in September of 2019. Classes were conducted in English and were held every Wednesday from 15:00 –17:00 in the school gymnasium. The focus of the Fall 2019 semester was on opportunity recognition, which was mainly facilitated by group work. Guest speakers were frequently brought in to not only speak, but to run activities based on their own business challenges. The program was run inspired by the Creation Theory rather than the Discovery Theory.*

In February of 2020, we convinced some of the entrepreneurship class to take the LLP Challenge (Figure 15) in order to individually assess their progress. One week before the LLP Challenge, each student was given the opportunity to ask their family, friends, neighbors, and all other interested parties about what business opportunities they were observing and what they thought were the most promising. In teaching opportunity recognition, it is critical that students learn how to recognize and utilize the resources available to them.

The LLP Challenge was given in the high school computer lab where each student had a maximum of two hours to complete the challenge. Use of the Internet was allowed, but not the use of live messaging or email.

The LLP Challenge

1. Describe your brainstorming and ideation process during the past week. While there are lots of problems that needs to be solved, how did you choose the one that offers the best opportunity?
2. Lay out your vision for a Minimum Viable Product (MVP) as the solution to this problem and discuss what features you chose to include and not include. Be as visual as possible.
3. How will you create your MVP at a minimal cost?
4. How will you test the MVP?
5. Validated learning involves the constant testing of an MVP using the "Build, Measure, Learn" process. What is your plan to maximize the number of interactions between your MVP and potential customers?
6. How will you define success and what are your milestones?
7. Why is NOW a great time to start this business?

The Adult LLP Test

To understand the level of opportunity recognition of the BPG students, we wanted to see how adults of various ages and backgrounds would perform on the same test under similar conditions. The first attempt to administer Adult LLP Challenges in early March was unsuccessful. The failure was a function of the global pandemic and a poor test format.

Starting in June of 2020, we created a Five Day Sprint that allowed each registered adult to take an opportunity recognition and minimum viable product (MVP) crash course to clarify, inspire, and motive them to take the same LLP Challenge the BPG students took in February. This format has proven to be far more successful and better received than just an email with the challenge questions. We have run eight sprints this summer and have been slowly collecting tests from a wide variety of individuals with diverse backgrounds (Table 8). More tests are coming constantly coming in and will continuously be added to our research.

Table 7: Adult Participant Background Data

Age	Country	Occupation	Entrepreneurship Course (Y/N)	Started a Business (Y/N)
53	NZ	Director at Metro Safety UK	N	Y
49	Hungary	Albermarle, Hungary	Y	Y
33	Russia	Executive MBA Corvinus, Trading Director at Normeston Trading SA	N	Y
32	Hungary	Customer Success Director Gravity R&D	Y	Y
47	NZ	Global Procurement Ricoh	N	N
28	Romania	Customer Service Operations Supervisor Exxon	N	N
22	USA	Yale Business School	Y	N
21	Hungary	Corvinus University Student	Y	N
54	Australia	Construction Director at Whitestar	N	Y
49	NZ	Self Employed Real Estate	N	Y

Source: own data.

LLP Evaluation

A LLP evaluation guide was created to make the scoring criteria clear for evaluators. The evaluation involves the following three main areas:

Opportunity Recognition

This section is worth 40% of the total score or 40 points and covers the following key areas:

- **Total addressable market**: Does the individual's target market(s) represent a significant and sustainable revenue opportunity? (1-10 points)
- **Beatable competition**: Are there reasonable barriers to entry for this target market(s)? (1-10 points)
- **Growth:** Is the individual's business scalable and displays the clear opportunity to grow and keep growing? (1-10 points)
- **Decision Making**: Does the individual make effective and strategic decisions regarding selecting the right problem and business opportunity? (1-10 points)

Building the Minimum Viable Product (MVP)

This section is worth 40% of the total score or 40 points and covers the following key areas:

- **Viable Solution**: Does the individual's MVP represent a viable and cost-effective solution for their identified opportunity? (1-10 points)
- **Testing the MVP:** Does the individual describe how they will test their MVP and receive valuable feedback? (1-10 points)
- **Success and Milestones:** Does the individual define success and outline key milestones? (1-10 points)
- **Why Now?** Timing is critical. Does the individual explain why now is a great time to start their business? (1-10 points)

Creativity
This section is worth 20% of the total score or 20 points and covers the following key areas:

- Variety of ideas and contexts (1-5 points)
- Variety of sources (1-5 points)
- Combining ideas (1-5 points)
- Communicating something new (1-5 points)

1	2	3	4	5	6	7	8	9	10
The individual **does not** identify a legitimate problem and **fails** to recognize an attractive business opportunity. The business opportunity presented **fails** on all points from the above criteria. There is **no** evidence of any real research.		The individual **identifies** a legitimate problem but **fails** to demonstrate why it is an attractive business opportunity. The business opportunity presented **fails** on most points from the above criteria. There is **little** evidence of any real research.		The individual **identifies** a legitimate problem and **somewhat** demonstrates why it is an attractive business opportunity. The business opportunity presented **does** match some of the above criteria. There is **some** evidence of some research done.		The individual **clearly** identifies a legitimate problem that represents a **good** business opportunity according to the criteria shown above. There is **evidence** of research done from a variety of different sources.		The individual displays an **exceptional** identification of a legitimate problem that represents a **strong** business opportunity according to the criteria shown above. There is **strong evidence** of comprehensive research done from a variety of different sources.	

Figure 7.1: Opportunity Recognition Evaluation Rubric

LLP Challenge Evaluators

All the challenges received from high school students and adults were randomly mixed and made anonymous. Two independent evaluators were chosen, and they scored all of the challenges according to the previously specified criteria.

An Rwg analysis was run to determine the subject matter interrater agreement. This analysis did indicate significant variance on certain individuals, while showing strong correlation amongst others. The strongest correlation was found in the Opportunity Recognition evaluation, which is the focal point of this paper. The Creativity evaluation showed the most variance and was therefore not used in the final analysis.

The addition of more independent evaluators, a larger sample size, the removal of outliers are steps that can significantly improve the quality of this research.

7.5 The Lean Learn Challenge Results

We took the average of the two evaluator's scores and then used them to rank all the participants in the following categories. It should also be noted that were an equal number of boys and girls participating in our program.

Average Scores of BPG Students vs. Adults for Opportunity Recognition

We took the average score from the evaluators and then used these scores to create an overall average. Our analysis found the following scores:

- BPG Students: **30.6**
- Adults: **29.5**

The overall score of the BPG students turned out to be higher than that of the adults who all completed the five-day sprint. We take this to be a positive indicator that the semester of opportunity recognition training significantly improved the level of the BPG students to approximately an adult level.

Average Scores of BPG Students vs. Adults for MVPs

Our analysis found the following scores:

- BPG Students: **25.375**
- Adults: **27.45**

The scores were again close between the two groups with the adults having the slight edge.

Average Scores of BPG Students vs. Adults for Opportunity Recognition + MVPs
Our analysis found the following scores:

- BPG Students: **56.5**
- Adults: **55**

We were pleased to see the BPG students scored slightly better than the adults further indicating that the impact of opportunity recognition training at the high school level can have a significant impact on high school students.

Improving the Research Results

Further ways to improve the research will be to give the challenge to high school students who have not taken the opportunity training course and to more high school students who have. Adding more adults of various backgrounds will benefit the research, along with the tesing of university students before and after opportunity recognition training.

7.6 Conclusion

In its July 25th, 2020, edition, The Economist wrote that "The pandemic has also exposed and accentuated inequities in the economic system. Those in white-collar jobs can work from home, but "essential" workers—the delivery drivers, the rubbish cleaners—must continue to work, and are therefore at greater risk of contracting covid-19, all the while for poor pay. Those in industries such as hospitality (disproportionately young, female and with black or brown skin) have borne the brunt of job losses" (Economist, July 2020). This level of market disequilibrium requires the help of entrepreneurs who are ready to build mountains rather than just climb them. Nations are searching for answers regarding how to create HGE pipelines to drive the economic growth and job creation that their people are demanding. The problem is that the policies of the past are being applied to a world that has changed dramatically just this year.

The greatest wealth of any nation is its future generations. Entrepreneurship education does not seek to turn every student into an entrepreneur, but rather to help younger generations to become better prepared to live in a world that is more like to become more uncertain than certain. The results of our research are a first step towards providing definite proof that entrepreneurship does have an impact and should be taught in all high school out of necessity rather than as an accommodation. Igniting the "social electricity" around entrepreneurship in Europe could do wonders for its future. There is a very real urgency to do so.

8. Recommendations for Higher Education

Based on my collective research and literature review, I have identified the following six main areas upon which to base my recommendations:

8.1 The Relevance of Higher Education

Peter Drucker, considered by many to be the "the man who invented management," remained a vocal critic of higher education until his death in 2005. Drucker consistently argued that the primary purpose of higher education is to produce enough "knowledge workers" to satisfy the "knowledge economy" and that positive gaps between the value and cost of higher education would lead to greater competition and ultimately disruption (Drucker, 1997). He also argued that this "value trap" gap was fueled by the rapid expansion of "Mickey Mouse" courses offering little to zero real world value. Today, taking courses that hold little real-world value is a risky proposition in a world where technology is driving automation in all industries.

In their recent journal article entitled "Employment 5.0: The Work of the future and future of work," authors Kolade and Owoseni describe the ongoing erosion of traditional forms of employment and recommend that "education and training at both basic and higher levels should be oriented more towards the production of entrepreneurial skilled worker, rather than turnout of graduate jobseekers who are more attuned to the re-quirements of a static labour market" (Kolade, 2022). With the creation of the Lean Learn Academy, I strongly argued that the production of the entrepreneurial skilled worker needs to start at the high school level and be further enhanced by higher education or vocational education training (VET).

My recommendations to higher education institutions regarding academic relevance is the following:

1. A.I. and automation are transforming global business faster than governments, education institutions, and businesses can notice. The skills of the future are constantly be redefined and all higher education institutions must constantly review and adapt their curriculums to ensure that their customers (the students) are prepared and able to take advantages of opportunities in the present and future. The data required for these adaptations is covered in recommendation 5.

2. Secondary and higher education need to collaborate with each other to facilitate the production of entrepreneurial skilled workers that are essential for the creation of high growth enterprises (HGEs) and a source of innovation in existing ones.

3. Higher education institutions must create and maintain a dialogue with both private and public organizations both domestically and internationally to understand what skills education focus on to avoid the creation of job skill gaps.

8.2 Blended Learning in Higher Education

Dr. Paul Privateer, a long-time scholar and "poststructuralist philosopher" argued in 1999 that higher education was far more focused on using technology for "restructuring" rather than "re-engineering." He felt that technology had the potential of transforming classrooms into innovative laboratories capable of keeping pace with a connected, data driven world (Privateer, 1999). Twenty years later, I believe that this remains largely the case as the adoption of

technology in higher education is more focused on activities outside of the classroom rather than inside it. Blended learning, by combining face-to face contact with online learning tools, is a highly effective way to engage students and facilitate superior learning outcomes.

Unlike my days when I was an undergraduate student, the vast majority of students of today have never known a day in their lives without access to technology and the Internet. They don't need to rely solely on books and lectures for their education. Education has moved from a time of information scarcity to one of abundance. This is where blended learning offers a great opportunity to enhance course lessons with recent materials and interactivity. While I do deliver lectures to all my university classes, each lecture is designed to create blended learning opportunities. One example is the use of Kahoot! games, which are an interactive way to engage students and reinforce their knowledge of a particular subject. Another way I create blended learning opportunities is through group work. All my lectures are designed for the purpose of introducing and supporting group activities that require students to collectively research and present together on a given topic. The group work is done mainly during class where I consult with each group on the validity of their ideas and their progress. All ideas must be approved by me to ensure the presentations represent a discovery of uses cases and ideas for most of the students. My interaction with groups is a great opportunity for me to interact with students on a more personal level and observe their individual strengths and weaknesses. The class goes from everyone listening to me, to collaborating in groups, to later presenting in front of the entire class while receiving feedback from both classmates and me. Superior learning outcomes come from that fact that students are motivated by the creation of their own ideas and the development of solutions to problems they have identified.

My recommendations to higher education institutions regarding blended learning is the following:

1. In a world that is changing rapidly, blended learning creates the connection between the lessons in and class and the relevance of these lesson out of the class. Higher education institutions should avoid the over-reliance on dated learning materials and use cases that hold little real-world value.

2. Higher education institutions should invest in better in-class technology to facilitate blended learning and create the sharing of "best practices" amongst all faculty members through workshops and scheduled in-class visits.

8.3 The Personalization of Higher Education

Personalized education involves customizing the learning experiences of each student based on their unique abilities, skills, interests, and limitations.

My mid-term and final exams are take-home exercises as I do not want to waste valuable class time on giving exams. All my exams allow students to choose their own direction based on their interest based on a topic and these exams are typically due in one week. The writing of these exams pushes students to do research from their own countries to ensure that the activity is relevant. I give each students personalized feedback on these exams, and I have found this exam method to produce exceptional learning outcomes.

I believe blended learning does help facilitate personalized learning as students are required to adapt and collaborate with other students on multiple occasions. It is this interaction and the

fact that every student must present at least once per semester that drives unique, personalized learning experiences.

My recommendations to higher education institutions regarding personalized learning is the following:

1. Higher education institutions must find a working balance between collecting data and in-class experiences to create personalized learning experiences.

2. Higher education institutions must avoid "once size fits all" learning experiences that fall into "value trap."

3. While personalized learning is often associated with collecting and analyzing data, there is no substitute was an interactive, in-class experience where students are forced to leave their "comfort zones."

8.4 Hybrid Learning in Higher Education

COVID-19 is a "once in a lifetime" opportunity to study the effects of global higher education moving suddenly to emergency remote teaching (ERT). The research in my journal article entitled "Holistic Online Learning in a Post COVID 19 World," provides evidence that distractions at home, a reduced educational support system, poor home environments[4], social isolation, and recurring technical difficulties were factors that negatively affected the mental and physical well-being of many students. Home environments, like university campuses, do affect learning outcomes. Another big lesson for higher education institutions is that ERT, or "getting online," is not an adequate substitute for in-class teaching. Effective online learning, rather, is the result of substantial time and investment by institutions and faculties that fully committed to the adoption of technology. There is no light switch, although hybrid learning is a way to ensure a smoother transition in the case of another pandemic or geo-political event.

In my second journal article entitled "The Influence of COVID-19 on Higher Education Student Sentiment - Prospects for the Spread of Distance Learning Technologies," free answer, survey data was collected at the beginning and end of the Spring 2021 semester, coded, and analyzed. The sentiments of students changed significantly during this difficult and brief period and these results paint a mixed picture of in-class and online learning. While many students positively viewed the flexibility, teaching methods, use of pedagogical technology, these same students also predominantly believe that online learning is not a good substitute for in-class learning when it comes to group activities, personal interaction, educational organization, and technical support.

In my working paper entitled "Student Burnout in Higher Education: From Lockdowns to Classrooms," survey data was similarly collected and analyzed. An interesting bifurcation was revealed where the students who experienced significant burnout symptoms during COVID-19 lockdowns were also the ones who did not suffer from burnout symptoms as they returned to the classroom in the Fall 2021 semester. The students who were more comfortable with remote learning, however, experienced a significant increase in burnout symptoms as they returned to the classroom. These results that indicate that higher institutions need to find a common ground

[4] The definition of a poor home environment is quite subjective, but can include poor lighting, uncomfortable temperatures, unsanitary conditions, pests, low quality furniture, and bad plumbing.

that best serves the needs of the largest number of students or shift away from "one size fits all" approaches.

During the dot-com bubble of the 1990s, many people thought that e-commerce would continue to grow and disrupt traditional retail shopping. As history tells us, this prediction did not come to fruition, and the terms "bricks and clicks," omnichannel, and O2O (online to offline) all remain highly relevant in today's world. It turns out that Gen Z still highly values in-store shopping experiences as an essential complement to online shopping as long it involves the consistent application of useful technology (Chang 2021, Baykal 2021, Alexander, 2021). Hybrid learning, also commonly referred to as blended learning, involves an education model where students split time between in-class and online learning. While COVID-19 has been incredibly disruptive to higher education and made in-class learning a lot more challenging, the silver lining is that it also provides compelling evidence that the best learning outcomes for the most students will come from a compromise between in-class and online learning. Like retail shopping, hybrid learning experiences require the consistent application of useful technology inside and outside of the classroom. As it is entirely possible that another pandemic is imminent, it is good policy to ensure that the ability to instantly boost the amount of online learning is readily available while maintaining learning outcomes.

There has been a steady stream of international, academic journal papers published since the beginning of COVID-19 that also recognize hybrid learning as practical way forward for higher education institutions. A study done in 2020 on 2,637 students in India, Turkey, and Costas Rica definitively concluded that "the future of face-face higher education is hybrid" (Benito et. al, 2021). Similar studies conducted during COVID-19 in Indonesia (Karma, 2020), South Africa (Mahaye, 2020), China (Li, 2021), United States (Singh, 2021), and Europe (Murphy, 2021) all support hybrid learning as the best path forward for higher education in terms of learning inclusion, outcomes, and lowering cost.

Before the COVID-19 pandemic, it was inconceivable that companies would allow their employees to spend a significant portion of the work week from home. My wife, who works for a major telecommunications company, went from full-time commuting to sometimes making an office appearance once a week. As the dust from COVID-19 continues to settle, a familiar situation begins to take shape. Like retail shopping and education, the optimal model or "goldilocks scenario" for maximizing productivity is a compromise between in-office and remote working. Another powerful stream of academic papers has been published since on the onset of COVID-19 arguing that work-from-home "WFH" will be a permanent, preferred, and more productive in the future for a growing number of companies and their employees (Savic, 2020, Kaushik, 2020, Chung, 2020). An Australian study concluded that hybrid learning in higher education enhances the employability of students by preparing them for a hybrid working world (Bennett, 2020). This study refers to this transition as the "virtuous circle effect" as it involves higher education adapting its practices to produce graduates better suited for the "new normal."

The degree to which the COVID-19 pandemic has permanently affected consumer behavior, higher education, and the workplace remains unknown. What is known is that is it highly unlikely that the extremes will become the norms. Shopping, learning, and/or working exclusively online are not viable solutions for most people just as shopping, learning, and/or working exclusively on-location are not either. I believe the goldilocks scenario will prevail in all these areas, but this scenario requires careful calibration constantly fueled by relevant data.

My recommendations to higher education institutions regarding hybrid learning are the following:

1. Acknowledge the permanent role of technology in higher education and that this role will only become more prominent.
2. Prepare faculty, students, and administrators for further instructional disruptions by requiring that all courses should have a minimum level of hybrid learning (i.e., 20%).
3. Apply technology seamlessly between in-class and online learning in an omnichannel like approach.
4. Identify academic disciplines that require different levels of hybrid learning.
5. Determine the appropriate balance of in-class and online learning for each academic discipline and regularly revise these levels based on recent and relevant data.
6. Quantify how much cost savings can be achieved using hybrid learning while always seeking to improve and never lower academic standards.
7. Recognize that adapting to the disruption accelerated by COVID-19 is mandatory and no longer optional.
8. For higher education institutions offering significant amounts of on-campus learning, hybrid learning is the goldilocks solution in terms of maximizing learning outcomes while minimizing costs.

8.5 Activity and Reflective Based Learning in Higher Education

The use of emergency remote teaching (ERT) during the COVID-19 pandemic resulted in significantly reduced learning outcomes for students in all levels of education. Also often referred to as "constructivism" and "student centric learning," activity-based learning (ABL) requires students to actively participate in the creation, implementation, and feedback of lessons. Whether online, in the classroom, or a hybrid of the two, activity-based learning (ABL) is essential for a relevant education in a rapidly changing, highly uncertain world. While ABL can be effectively delivered using online platforms, I believe that hybrid learning offers the best opportunity for educators to maximize its effect and there is ample precedent for this from the business world.

The Lean Learn Academy gave me a unique opportunity to witness the positive and significant impact that ABL had on high school students. In my conference paper entitled "The Impact and Urgency of Teaching Opportunity Recognition to High Schools Students," we demonstrated that the problem solving, and opportunity recognition skills of high school students can equal or surpass adults with significant age and work experiences advantages. As I have previously stated, ABL is used in all my classes and COVID-19 has only accelerated this usage. For example, consumer behavior has changed dramatically from early 2019 to the present. Recognizing the changes in consumer behavior and identifying future trends involves constant discussion and revision from professors, students, and business professionals. It is this activity that maintains the course relevance rather the usage of static course materials created for a much slower, stable world. We are already seeing the emerging differences between Gen Z and the next generation called Gen Alpha.

In all my classes, I invite companies to present real challenges they are facing. In the Fall 2022 semester, my Services Marketing Master's class worked on a Wizzair project, my Services Marketing undergraduate worked on a Viaplay project, and my Consumer Behavior class worked on a GreenGo project (car sharing platform). These projects typically last four weeks and involve periods of activity and reflection. Hybrid learning helps to both facilitate activity

and provide necessary space for reflection. I have found this combination to produce very good learning outcomes and maintain a close connection between the education in the classroom and its real-world value.

My recommendations to higher education institutions regarding ABL are the following:

1. Recognize that if the world has changed substantially since 2019, higher education pedagogy must change even more and be forward looking.
2. Give students the opportunity to participate in the creation, delivery, and feedback of course materials.
3. Continually measure and monitor the effectiveness of ABL delivered online and compare it to the learning achieved from in-class learning. Is there a gap? If, yes, how can this gap be quickly narrowed?
4. Educate with the understanding that students can learn as much from each other as from their professors and be dedicated to facilitating the transition from a professor centric to a more student centric education.
5. Consult regularly with industry professionals to ensure that the right education is being continuously based on the most relevant activities to avoid the higher education "value trap."
6. Use hybrid learning to enable both activity based and reflective learning.

8.6 Data is the "New Oil" in Higher Education

I conducted research at the beginning and end of the Spring 2021 and Fall 2021 semesters and was able to observe significant change in the overall sentiment and the from the same students during these semesters. In the future, I firmly believe that higher education institutions must be committed to collecting data far more frequently to make decisions that are the most reflective of the needs of their facilities, students, and the marketplace. This commitment requires adhering to the "Build, Measure, Learn" approach that is relevant far beyond entrepreneurship.

While the Porter's Five Forces Model has been a pillar of economic strategy for decades, it needs to be adjusted to be relevant in the modern day. In the Five Forces model (Figure 8), the four outer components are not directly connected to each other, but only to the competitive fly wheel in the center. The flywheel concept was first put forth in 2001 by Jim Collins (Collins, 2001) (Figure 8.1) and this model was later adapted by Amazon is how they can manage a highly diverse ecosystem (Figure 8.2), Amazon can connect and optimize these activity centers using Amazon Web Services in the core. Data has truly become the "new oil" and is the reason why the majority of the world's most valuable companies are digital platforms.

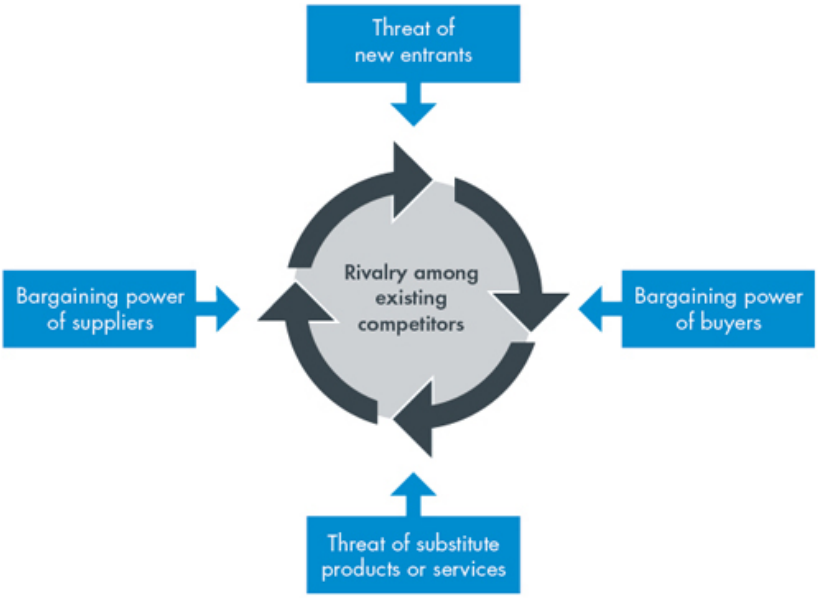

Figure 8: Porter's Five Forces
Source: (Porter, 1979)

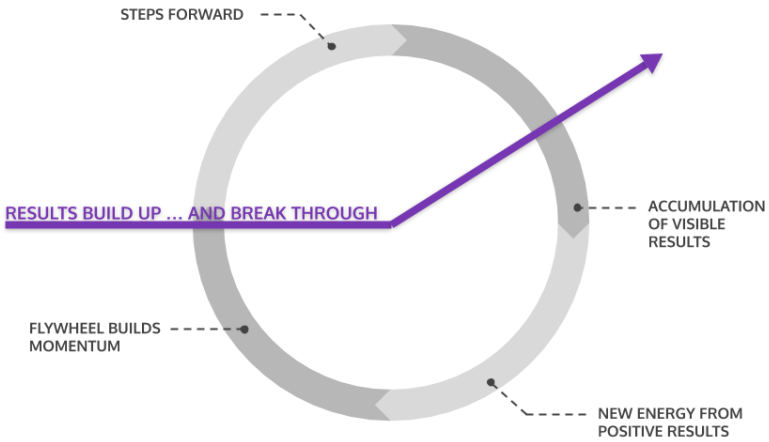

Figure 8.1: The Fly Wheel Model
Source: (Collins, 2001)

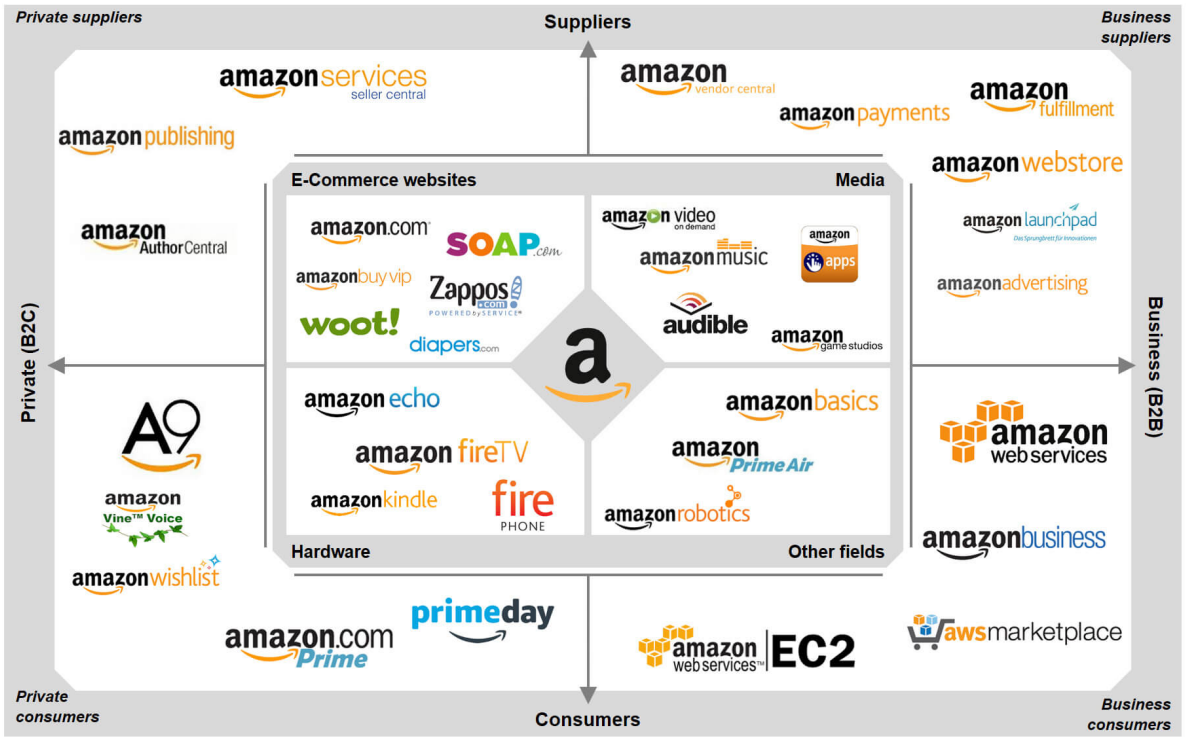

Figure 8.2: The Amazon Ecosystem
Source: (Wiedeman, 2021)

If we transition to higher education, then we can clearly see how complex university ecosystems can become (Figure 8.3).

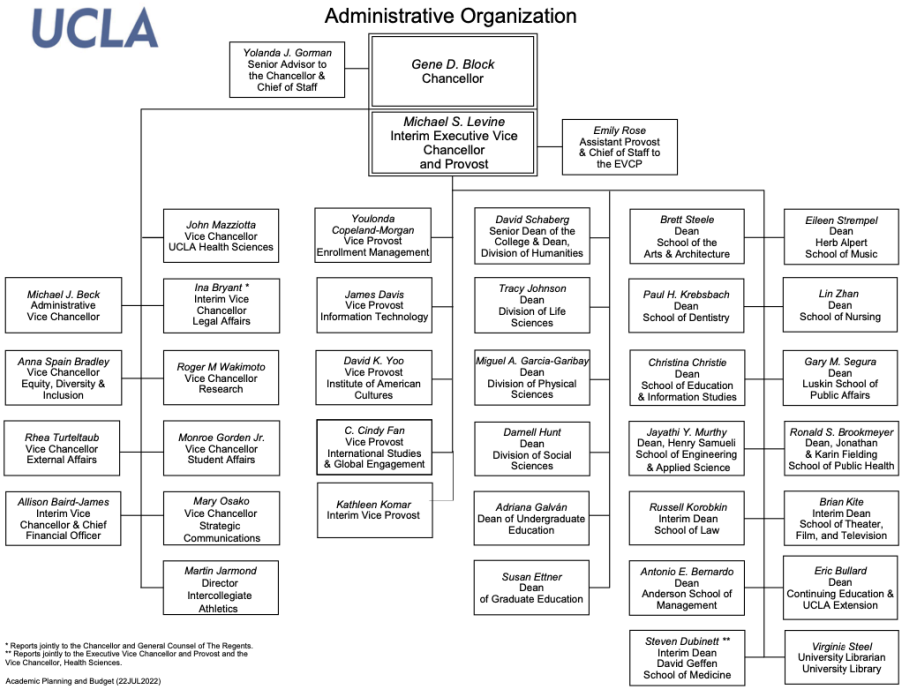

Figure 8.3: UCLA Administrative Organizational Chart
Source: (University of California, 2022)

The recent journal article, “Covid and the on higher education: The Essential Role of integrity and accountability,” (Blankenberger 2020) uses the ecological approach put forward by John Gaus (Gaus, 1947) to characterize the complex, interconnected landscape of higher education. Using Gaus’ ecological approach and the “Fly Wheel Model” put forth by Collins, I created the Higher Education Flywheel in Figure 8.4.

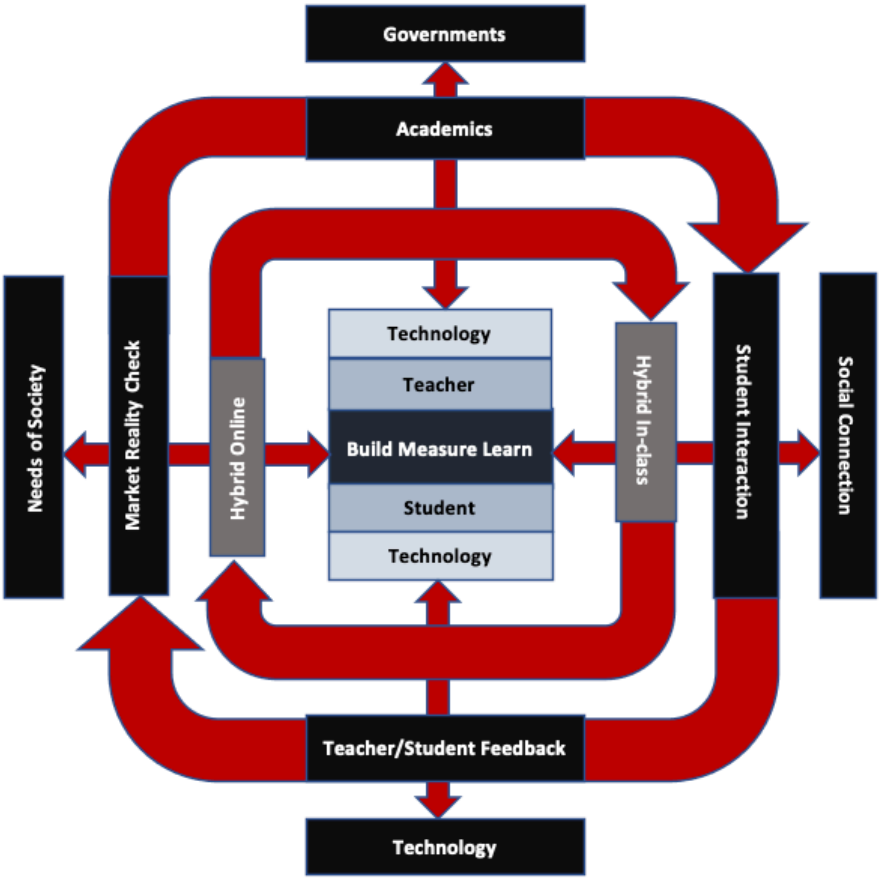

Figure 8.4: Higher Education Fly Wheel Model
Source: Own Compilation

As one can see, Figure 8.4 begins with faculty members and students adopting the “Build, Measure, Learn” mindset, which is based on activity based learning. The delivery of this education is then channeled through balance of in-class and online learning that is determined and revised based on data. I strongly believe that data should be collected at the beginning and end of each semester at a minimum. The educational activity channeling through hybrid learning then feeds interactions among students, teachers, business professionals, and faculty members and staff teaching other, related courses. The final layer involves the connection of this educational activity with the needs of society, government policies, social trends, and the evolution of education-related technology. All these interconnected, spinning fly wheels are fueled by activity and decisions that are fueled growing amounts of data.

My recommendations to higher education institutions regarding the creation of the higher education flywheel are the following:

1. Higher education institutions must collect data earlier and more often to ensure the rapid spinning of their respective flywheels.
2. Data should be continuously harnessed to spin the higher education flywheels faster and faster to facilitate personalized educational experiences for students, empower faculty to teach the most relevant subjects, and to harmonize administrative functions and eliminate cost drivers.
3. Higher education institutions should model themselves after digital platforms like Amazon, Apple, Google, Tencent, and Alibaba to create the flywheel effect across complicated organizational structures to facilitate collaboration, efficiencies, and innovation.
4. Create a culture that embraces the collection and sharing of data to maximize learning outcomes, lower costs, and increase job satisfaction amongst all faculties and staff.
5. Use the flywheel effect to build a bigger, better "tent" to connect and engage high schools, businesses, government agencies, and other key educational stakeholders.
6. Never be satisfied with the status quo.

9. Conclusion

While the COVID-19 pandemic closed the door on my high school entrepreneurship research, it opened the door to my research on higher education students during an unprecedented period of turmoil. The main purpose of my dissertation is to understand how significant the impact of COVID-19 was on higher education and estimate what its lasting effects will be. It should be noted that in my experience the Fall 2020 semester was a mix of in-class and online, the Spring 2021 semester was done entirely online, and the Fall 2021 semester was entirely done in classrooms. To understand and measure the pace of change during the early stages of the pandemic, I conducted surveys at the beginning and end of semesters. The data collection from four surveys (S.1, S.2, S.3, S.4)[5] allowed me to measure the change that occurred within the Spring 2021 and Fall 2021 semesters and the change that occurred between them.

The research for (**RQ1**) and (**RQ2**) can be found in journal article (**J.1**) (Chapter 2) entitled "Holistic Online Learning, in a Post COVID-19 World" and is summarized in Figure 9. This article conducted a quantitative analysis on the survey data collected at the BOS and EOS of the Spring 2021 semester. The research for (**RQ1**) can also be found in journal article (**J.2**) (Chapter 3) entitled "The Influence of COVID-19 on Sentiments of Higher Education Students – Prospects for the Spread of Distance Learning" and is summarized in Figure 9.1. This article conducted a qualitative analysis on the free answer data collected at the BOS and EOS of the Spring 2021 semester.

[5] [5] S.1 = Spring 2021 BOS Survey, S.2 = Spring 2021 EOS Survey, S.3 = Fall 2021 BOS Survey, S.4 = Fall 2021 EOS Survey

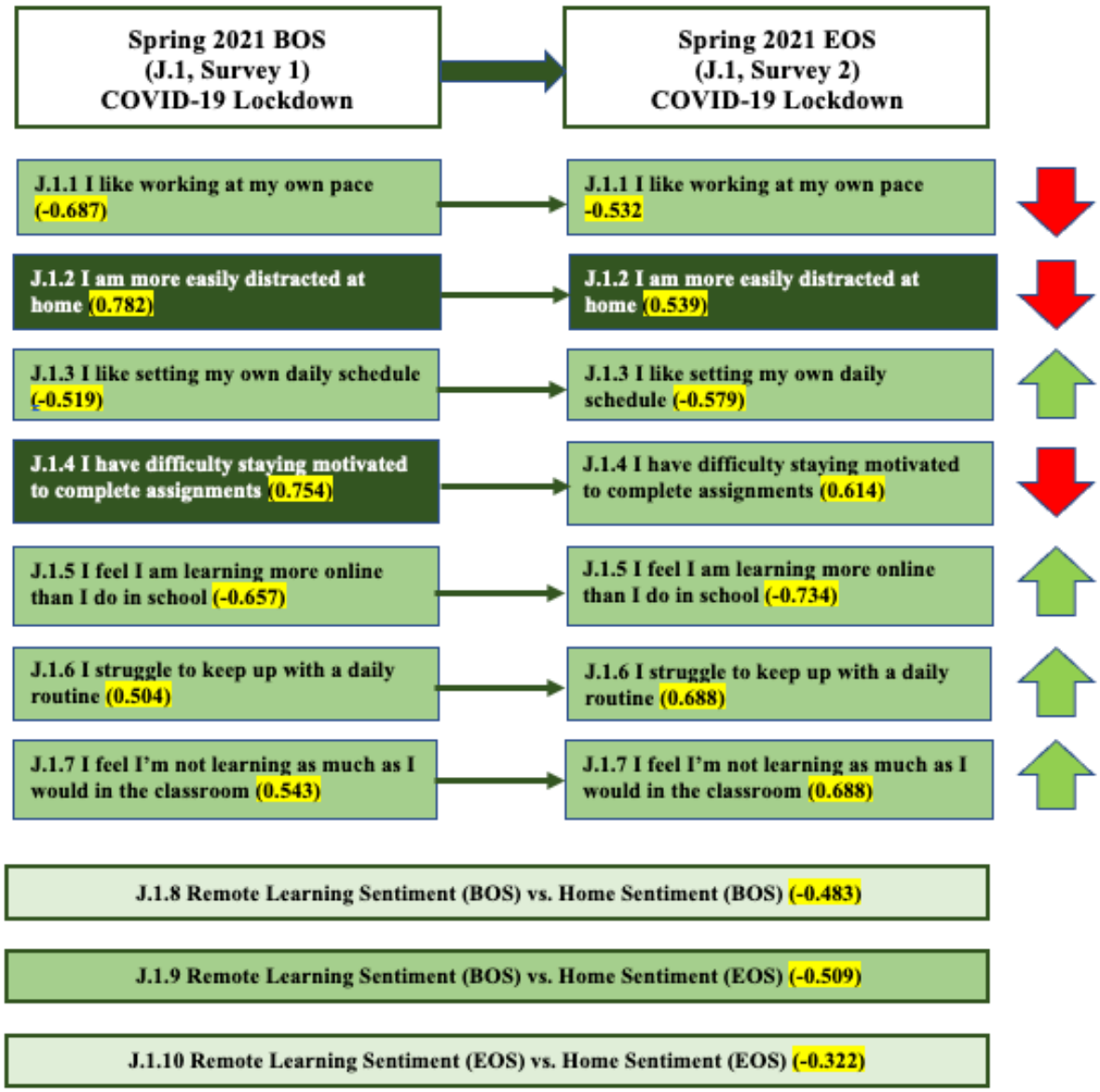

Figure 9[6]: Summary of the shifts to student learning sentiment from **J.1.**

9.1 **RQ1**: What was the impact of COVID-19 lockdowns and emergency remote teaching (ERT) on higher education students during the Spring 2021 semester?

When looking at the Spring 2021 BOS **J.1** data in Figure 9, it is evident that learning from home during a COVID-19 lockdown was significant shock for many students. Distractions at home were prevalent and many students struggled to maintain daily schedules and stay motived to complete assignments. These factors were certainly detrimental to learning outcomes.

The Spring BOS **J.2** data shown in Figure 9.1 corroborates the **J.1** findings and indicates that many students freely mentioned that they had trouble focusing while learning at home The ability to stay motivated was also frequently mentioned. Despite the challenging conditions at the beginning of the Spring 2021 BOS, students also had quite a few positive things to say

[6] BOS vs. EOS Home Environment Sentiment (Applied rotation method is oblimin.) Principal components analysis (PCA). Values greater than 0.75 (> 0.75) are "strong" and "dark green." Values from 0.50-0.75 are "moderate" and medium green. Values from 0.30-0.49 are "weak" factor loadings and are light green.

about learning from home. There were many students who appreciated the time saving, convenience, and cost saving of learning from home. Some students reported that they were getting more sleep and did not miss commuting back and forth to school. Other students liked the comforts of home and the ability to eat and drink whenever they wanted.

The Spring 2021 EOS **J.1** data indicates that distractions at home and staying motivated became less of a factor at the end of the semester but remained significant. Problems with setting daily schedules and routines became more pronounced at the end of the Spring 2021 semester reflecting that many students missed the structure and organization provided by attending school in-person.

The Spring EOS **J.2** data showed some significant changes from the BOS data. Positive mentions of the time savings, convenience, and cost savings of learning home from fell significantly during this semester. Fewer students positively mentioned their home environment, while mentions regarding the negative impact of online learning on personal lives remained unchanged.

Higher education institutions traditionally create physical spaces that are controlled and optimized for learning. This includes the infrastructure of the classrooms, meeting areas, and offices of faculty members and administrators. Professors can physically see their students in classrooms and know who is there and who isn't. This contrasts with online sessions where digital boxes using Zoom or Teams may or may not have a student behind them. During the rapid move to emergency remote teaching (ERT), the control of the learning environment was transferred to the students. Problems with home environments included distractions at home, poor Internet connections, slow computers, bad furniture and lightning, inadequate heating and cooling, and the list goes on and on. The learning outcomes of higher education students during the Spring 2021 semester were clearly negatively affected by the fact that learning environments that were no longer controlled by higher education institutions and many students did have the resources or motivation to maintain their own learning environments at home. Successful online teaching must include an understanding about the limitations of home environments and the factors that can negatively affect learning outcomes.

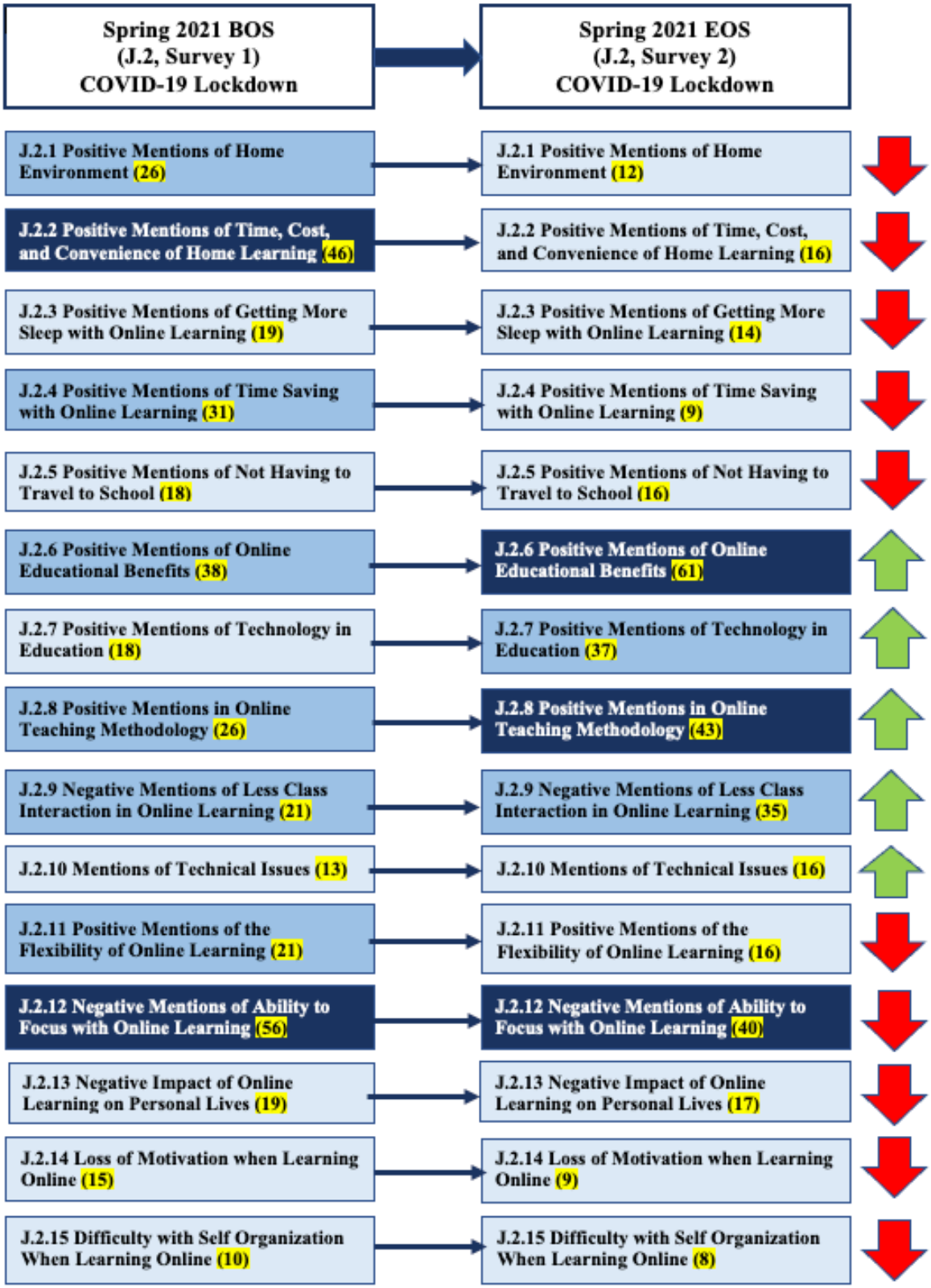

Figure 9.1[7]: Summary of the shifts to student learning sentiment from **J.2.**

[7] Students who participated in both BOS and EOS surveys, answering what are the top three things they like the most of online learning and what are the three biggest challenges of learning online (n=83). 0-20 mentions = weak, 21-40 mentions = moderate, 41+ = strong.

9.2 **RQ2**: How did online learning during the COVID-19 lockdowns affect the sentiments of higher education students towards the usage of technology in education and what is the significance of remote learning sentiment?

On one side, the Spring 2021 **J.1** shows that many students expressed an even stronger sentiment at the end of the semester that they were learning less online than in classrooms. Mentions of lower-class interactions fell during this semester but remained significant. On the other side, the Spring 2021 **J.2** data shows a significant rise in the number of positive mentions technology in education, online educational benefits, online teaching methodology, and online learning flexibility.

The **J.1** data also shows that remote learning sentiment was significantly and negatively correlated with home environment sentiment both in the Spring 2021 BOS and EOS. Students who had higher remote learning sentiments were less likely to experience problems with their home environments. This correlation will be affirmed later by the **J.3** Fall 2021 data.

Overall, a positive shift in student sentiment towards online learning can be observed. It is evident that teachers were able to teach more effectively online, and students became more able to learn effectively online during the Spring 2021 semester. It is reasonable to conclude that the remote learning sentiment for many students increased during the Spring 2021 semester. As it was mentioned in the recommendations, higher education institutions must recognize that COVID-19 facilitated change at a rapid pace and this change will be felt for many years to come as educators seek to define the elusive “new normal.”

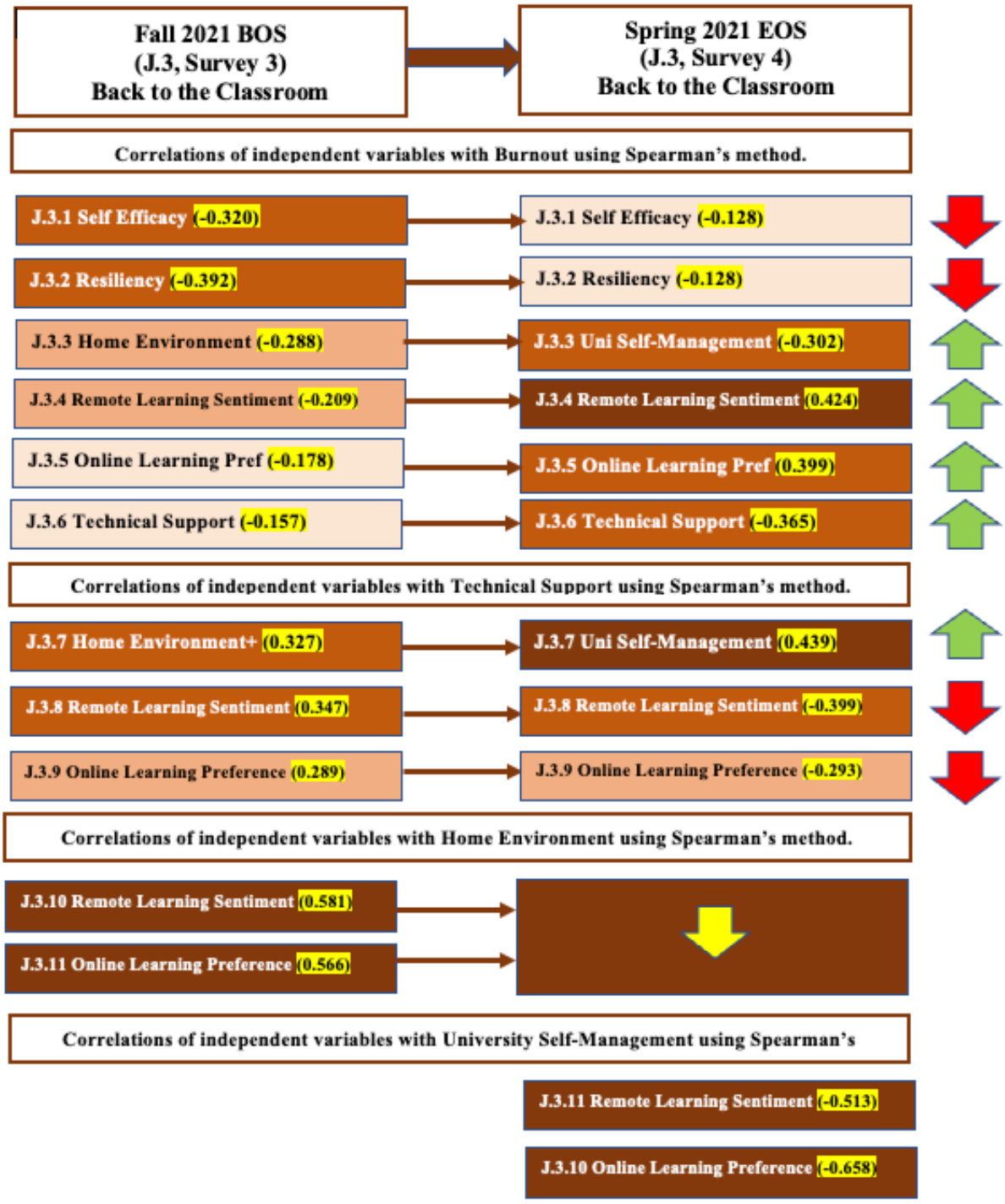

Figure 9.3[8]: Summary of the shifts in student burnout from **J.3.**

[8] To interpret the data, we will consider the effect size r = 0.10 to be small (light pink), r = 0.20 indicates a medium effect offering some explanation (medium pink), r = 0.30 indicates a large effect potentially powerful in the short and long term (darker pink), and r = 0.40 or greater is potentially an overestimate (dark pink).

9.3 **RQ3**: Did the return to the classroom during the Fall 2021 result in improved student learning sentiment and lower burnout for higher education students?

The Spring 2021 BOS **J.3** data (Chapter 4) in Figure 9.3 describes a semester where students returned to the classroom following a semester of total lockdown. In the Fall 2021 BOS, self-efficacy and resiliency were significantly, negatively correlated with burnout. This means that students with high self-efficacy and/or resiliency were less likely to experience burnout symptoms.

Consistent with the Spring 2021 research, remote learning sentiment in the Fall 2021 BOS is significantly, negatively correlated with home environment (+), meaning that the higher a student's remote learning sentiment the more likely they will positively view their home environments. Similarly, we can see a strong, negative correlation in the Fall 2021 BOS between online learning preference and home environment (+).

The Fall 2021 EOS J.3 data, however, tells a very different tale than the one presented in the Fall 2021 BOS. While self-efficacy and resiliency became less negatively correlated with burnout, remote learning sentiment went from negatively correlated to significantly, positively correlated to burnout. Online learning preferences also became positively correlated with burnout, while it was negatively correlated in the Fall 2021 BOS. As students returned to the familiarity of the classroom and a learning environment controlled by the university, their reliance on self-efficacy and resiliency lessened. It is very interesting to observe that those with higher remote learning sentiments went from being well adapted to online learning to becoming far more likely to experience burnout symptoms as they returned to the classroom.

The role of home environment was replaced by "university self-management" during the Fall 2021 semester. While higher education institutions lost control of their learning environments during the Spring 2021 semester, they were able to regain control in the Fall 2021 semester. It is also interesting to observe that the correlation between technical support and remote learning sentiment was positive in the Fall 2021 BOS and yet turned negative in the Fall 2021 EOS. This means those who have higher remote learning sentiments were more likely to have problem with technical support after returning to the classroom. The correlation between home environments and remote learning sentiment also went from being positively to negatively correlated between the Fall 2021 BOS and EOS indicating that those who were happy with online learning were not happy with "university self-management" and the services it provided.

The return to the classroom significantly lowered the likelihood of burnout symptoms for some students while simultaneously raising it in others. This represents the opposite of what the data showed in the Spring 2021 semester where those with higher remote learning sentiments were far more likely to view their home environment positively. As I mentioned in my recommendations, high education institutions must constantly gather data to be able to identify and respond to the diverse needs of their students.

9.4 The Big Picture

Peter Drucker once commented that "Knowledge has to be improved, challenged, and increased constantly, or it vanishes." While the COVID-19 pandemic has created unprecedented challenges, it has also forced higher education institutions to reevaluate the learning process and recognize that a return to a pre-pandemic status is not possible. As I have

mentioned in my recommendations (Chapter 8), manageable compromises needed to be made so that education can remain relevant with the needs of society at a competitive price.

9.5 Study Limitations and Future Work

An unfortunate limitation of my research is that the research topic addressed in my conference papers is not the same as the one addressed my my journal articles. Limitations found in my journal articles include the fact that I was the only one teaching these classes. Research collected from other instructors and academic disciplines would add diversity and reliability to my research. Larger sample sizes would have also added greater depth in my analysis. In **J.2**, the coding of the free answer responses of students required applying my judgement therefore includes a measure of bias. In **J.3**, I selected certain items from the Maslach Burnout Inventory (MBI) and the Connor–Davidson Resilience Scale were selected, while others were omitted. While I did this to ensure my surveys did not exceed a certain length, this selection resulted in a divergence from thoroughly tested models.

My future work is related to researching how higher education can be more personalized to account for students who have different learning capabilities, technical skills, levels of education, and cultural backgrounds. Creating and updating individual student burnout profiles is potentially a great way for higher education institutions to better understand each unique group of students and how to adjust education to maximize learning outcomes. More burnout research needs to be conducted to help shape and define this methodology. Research on hybrid and blended learning would also allow me to provide a framework to educators regarding how to create the right balance between online and offline and the optimal way to use technology inside and outside of the classroom. Finally, to conduct research about how to connect grade schools, high schools, higher education, and the private and public sectors so the needs of society are being addressed and supported by education on all levels.

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Appendix I

Holistic Online Learning in a Post COVID-19 World

Acta Polytechnica Hungarica

Kevin M. Jackson Márta Konczosné Szombathelyi
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Beginning of the Semester (BOS) and End of the Semester (EOS) Surveys

BOS Survey

Q1 – "What is your name?"
Q2 – "What is your age?"
Q3 – "What is your home city and country?
Q4 – "What is your home university?"
Q5 – "Which of the following best describes the focus of your academic studies?"

- Finance and Accounting
- Communications
- Business and Management
- Engineering
- Computer Science
- Other

Q6 – "How do you feel about remote learning?"

- Very Unhappy
- Unhappy
- Somewhat Happy
- Somewhat Happy
- Happy
- Very Happy

Q7 – "What are the top three things you like about online learning?" (Free Answer)
Q8 – "What are the biggest challenges of online learning?" (Free Answer)
Q9 – "After spending a lot of time learning online, please answer how strongly you agree or disagree with the following?"

- B_MS01 "I like working at my own pace."
- B_MS02 "I am getting more sleep."
- B_MS03 "I miss my friends."
- B_MS04 "I am more easily distracted at home than in the classroom."
- B_MS05 "I like setting my own daily schedule for schoolwork"
- B_MS06 "I miss my teachers."
- B_MS07 "I have difficulty staying motivated to complete my assignments."
- B_MS08 "I am less stressed about my schoolwork."
- B_MS09 "I miss participating in sports."
- B_MS010 "I feel I am learning more than I do in school."
- B_MS011 "It is easier to focus without the distractions of school."
- B_MS012 "It's hard to keep school and home separate - I can't escape!"
- B_MS013 "I sometimes have difficulty understanding online assignments."
- B_MS014 "It's nice to have a break from the stress of the school environment."
- B_MS015 "I miss participating in extracurricular activities."
- B_MS016 "I feel that I'm not learning as much as I would in the classroom."
- B_MS017 "I struggle to keep up with a daily routine."
- B_MS018 "Teachers are assigning too much homework for now."

Q10 – “Do you have a reliable internet connection at home to take part in remote learning and complete your assignments without interference or delay?” (Y/N)
Q11 – “Do you have access to a computer that is adequate for your needs, allowing you to take part in remote learning and complete your school assignments?” (Y/N)
Q12 – “In your home university, which of the following learning attributes apply to your previous online experience?”

- Live online lectures
- Pre-recorded online lectures
- Online group activities and presentations
- Interactive online learning games
- Personalized and individual feedback with professors
- Online multiple-choice testing
- Individual essay testing
- Other

Q13 – “What learning method is the one you have experienced the most during your university experience thus far?”

- Traditional Online Learning – Classroom centric
- Only online learning
- Hybrid learning: a combination of traditional and online
- Other

Q14 – “What learning method do you feel is the most effective for your education?”

- Traditional Online Learning – Classroom centric
- Only online learning
- Hybrid learning: a combination of traditional and online
- Other

Q15 – “Please tell us how you would improve university education experience in the future.” (Free Answer)

EOS Survey

Q1 – “What is your name?”
Q2 – “What is your home university?”
Q3 – “Do you have a reliable internet connection at home to take part in remote learning and complete your assignments without interference or delay?” (Y/N)
Q4 – “Do you have access to a computer that is adequate for your needs, allowing you to take part in remote learning and complete your school assignments?” (Y/N)
Q5 – “After spending a lot of time learning online, please answer how strongly you agree or disagree with the following?”

- E_MS01 “I like working at my own pace.”
- E_MS02 “I am getting more sleep.”
- E_MS03 “I miss my friends.”
- E_MS04 “I am more easily distracted at home than in the classroom.”
- E_MS05 “I like setting my own daily schedule for schoolwork.”
- E_MS06 “I miss my teachers.”
- E_MS07 “I have difficulty staying motivated to complete my assignments.”
- E_MS08 “I am less stressed about my schoolwork.”
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- E_MS016 “I feel that I'm not learning as much as I would in the classroom.”
- E_MS017 “I struggle to keep up with a daily routine.”
- E_MS018 “I miss the social environment at school.”

Q6 – “Reflecting back on this course, what are the top three things you like about your online learning experience?” (Free Answer)
Q7 – “Reflecting back on this course, what were the biggest challenges of your online learning experience?” (Free Answer)
Q8 – “Reflecting back on this course, did the usage of Voice Over lectures, managed on your time, help you to better understand course materials when using distance learning?”

- Not at all
- A little bit
- Does not add or detract
- Adds some value
- Adds a lot of value

Q9 – “Reflecting back on this course, did the usage of the virtual group activities (sharing resources, ideas) enhance distance learning?”

- No value
- Little value
- Does not add or detract
- Adds some value
- Adds a lot of value

Q10 – “Reflecting back on this course, did the usage of Kahoot games enhance your distance learning experience?”

- No value added
- Adds little value
- Does not add or detract
- Adds some value
- Adds a lot of value

Q11 – “Reflecting back on this course, did the usage of invited judges for final presentations add value to your online learning experience?”

- Not at all
- Somewhat
- Neutral
- Adds value
- Adds a lot of value
- No judge was used

Q12 – “Based on your experience in this class, how are you currently feeling about remote learning? “
A score of 1 is “not at all satisfied” and a score of 10 is “completely satisfied.” Drag the bar from left to right to find your score.
Q13 – “What learning method do you feel is the most effective for your education?”

- Traditional Online Learning – Classroom centric
- Only online learning
- Hybrid learning: a combination of traditional and online
- Other

Q14 – “Why did you select this learning method? Please describe the top three reasons for your selection.” (Free Answer)
Q15 – “Now that you have done entire semesters both in class and online, please select all of the statements below that you agree with.”

- Traditional in-class learning is outdated
- Traditional in-class learning is important for developing social skills
- Traditional in-class learning is long and boring
- Traditional in-class learning can never be replaced by online learning
- Traditional in-class learning is effective, but class times need to be shorter
- Traditional in-class learning really depends on the subject
- Traditional in-class learning really depends on the instructor
- Traditional in-class learning is more motivational
- Traditional in-class learning better facilitates collaboration
- Traditional in-class learning involves too much travel time

Q16 – “We are grateful to receive your honest input. Please provide any additional suggestions regarding how university education should be improved.” (Free Answer)

Appendix II

The Influence of COVID-19 on Higher Education Student Sentiment prospects for the spread of distance learning technologies

A. Students participating in BOS and EOS surveys were from the following countries:

Country	Frequency	Percent
Algeria	2	1.30
Azerbaijan	5	4.55
BURKINA FASO/France	1	0.91
Belgium	2	1.81
Cambodia	1	0.91
China	3	2.72
Finland	1	0.91
France	52	33.77
Germany	12	7.8
Hungary	6	3.90
Ireland	3	2.72
Italy	1	0.91
Kosovo	1	0.91
Kyrgyz Republic	1	0.91
Lebanon	1	0.91
Mexico	11	0.91
Morocco	3	2.72
Poland	1	0.91
Portugal	1	0.91
Romania	4	3.63
Russia	2	1.81
Spain	2	1.81
Switzerland	1	0.91
Syria	1	0.91
The Netherlands	1	0.91
Turkey	1	0.91

B. Beginning of the Semester (BOS) and End of the Semester (EOS) Surveys
BOS Survey

Q1 – "What is your name?"
Q2 – "What is your age?"
Q3 – "What is your home city and country?"
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- Other

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- Happy
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Q7 – “What are the top three things you like about online learning?” (Free Answer)
Q8 – “What are the biggest challenges of online learning?” (Free Answer)
Q9 – “After spending a lot of time learning online, please answer how strongly you agree or disagree with the following?”

- B_MS01 “I like working at my own pace.”
- B_MS02 “I am getting more sleep.”
- B_MS03 “I miss my friends.”
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- Other

Q15 – “Please tell us how you would improve university education experience in the future.” (Free Answer)

EOS Survey

Q1 – “What is your name?”
Q2 – “What is your home university?”
Q3 – “Do you have a reliable internet connection at home to take part in remote learning and complete your assignments without interference or delay?” (Y/N)

Q4 – “Do you have access to a computer that is adequate for your needs, allowing you to take part in remote learning and complete your school assignments?” (Y/N)
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- Traditional in-class learning really depends on the instructor
- Traditional in-class learning is more motivational
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- Traditional in-class learning involves too much travel time

Q16 – "We are grateful to receive your honest input. Please provide any additional suggestions regarding how university education should be improved." (Free Answer)

C. BOS/EOS Tables

Table 9. Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB BOS 1**	**SMM BOS 1**	**SMU BOS 1**	**ENT BOS 1**	**DM BOS 1**	**BOS 1 Total**
B_P_HO+	6	9	1	2	8	**26**
B_P_TCCB+	15	19	6	3	2	**46**
B_P_ED+	9	8	9	3	9	**38**
B_P_Time+	10	14	5	1	1	**31**
B_P_Conven+	2	0	2	0	0	**4**
B_P_Stress+	1	2	1	0	2	**6**
B_P_Sleep+	2	9	3	1	4	**19**
B_P_Trav+	9	0	2	0	7	**18**
B_P_Fam+	1	5	0	0	0	**6**
B_P_Covid+	1	1	0	1	1	**4**
B_P_EatDr+	2	10	0	3	0	**15**
B_P_Flex+	7	0	4	0	10	**21**
B_P_Distract+	4	0	1	0	1	**6**
B_P_Cost+	2	0	0	3	0	**5**
B_P_TeachMeth+	8	4	6	3	5	**26**
B_P_Tech+	3	6	3	0	6	**18**
B_P_NoLike	1	4	0	0	2	**7**
B_P_OppLearn+	0	2	0	2	0	**4**
Total	83	93	43	22	58	

Source: *own compilation*

Table 10. Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB BOS 1**	**SMM BOS 1**	**SMU BOS 1**	**ENT BOS 1**	**DM BOS 1**	**BOS 1 Total**
B_P_Soc-	14	6	3	2	2	**27**
B_P_TimeMan-	1	0	0	1	0	**2**
B_P_Focus-	10	15	8	0	23	**56**
B_P_Workload-	3	5	0	0	0	**8**

B_P_SelfOrg-	1	6	0	2	1	**10**
B_P_Motivate-	2	4	1	0	8	**15**
B_P_Technical-	4	5	1	0	3	**13**
B_P_Personal-	4	6	4	1	4	**19**
B_P_ClassInt-	3	9	4	1	4	**21**
B_P_EdQual-	3	6	0	0	1	**10**
B_P_Conven-	1	2	2	0	0	**5**
B_P_CommInfo-	1	4	1	0	0	**6**
B_P_Onlinetran-	1	1	1	2	0	**5**
B_P_Monotony-	1	1	2	1	2	**7**
B_P_Health-	1	1	1	2	1	**6**
B_P_Group-	10	10	5	3	8	**36**
Total	60	81	33	15	57	

Source: *own compilation*

Table 11. Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB BOS 1**	**SMM BOS 1**	**SMU BOS 1**	**ENT BOS 1**	**DM BOS 1**	**BOS 1 Total**
B_P_HYB+	8	11	5	1	4	**29**
B_P_INTERACT+	5	3	1	0	2	**11**
B_P_DISCUSS+	3	1	0	2	1	**7**
B_P_MOTIV+	1	0	0	0	0	**1**
B_P_Flex+	3	7	0	0	0	**10**
B_P_TECH+	3	3	1	2	0	**9**
B_P_Group +	3	1	0	0	0	**4**
B_P_Record+	2	1	0	0	0	**3**
B_P_ONL+	0	0	0	0	0	**0**
B_P_ONL-	1	0	1	0	1	**3**
B_P_TRAD+	1	0	0	1	2	**3**
B_P_TRAD-	1	0	3	0	0	**4**
B_P_Theory-	6	1	3	0	0	**10**
B_P_Pract+	6	1	0	0	0	**7**
B_P_Grades-	1	0	1	0	0	**2**
B_P_Eval+	3	2	0	0	0	**5**
B_P_Class-	1	0	0	0	0	**1**
Total	48	31	15	6	10	

Source: *own compilation*

Table 12. Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB EOS 1**	**SMM EOS 1**	**SMM EOS 1**	**ENT EOS 1**	**DM EOS 1**	**EOS 1 Total**
B_P_HO+	2	5	0	0	5	**12**
B_P_TCCB+	1	2	2	1	11	**16**
B_P_ED+	16	20	7	3	15	**61**
B_P_Time+	0	5	1	1	2	**9**
B_P_Conven+	0	0	1	0	2	**3**
B_P_Stress+	0	0	1	0	3	**4**
B_P_Sleep+	4	1	1	0	8	**14**
B_P_Trav+	4	4	2	1	5	**16**
B_P_Fam+	0	0	0	0	1	**1**
B_P_Covid+	1	3	0	0	0	**4**
B_P_EatDr+	0	6	0	0	1	**7**
B_P_Flex+	0	0	4	2	10	**16**
B_P_Distract+	1	0	1	0	1	**3**

B_P_Cost+	0	16	0	0	0	**16**
B_P_TeachMeth+	15	16	7	0	5	**43**
B_P_Tech+	12	1	3	2	9	**37**
B_P_NoLike	1	1	1	2	4	**9**
B_P_OppLearn+	1	1	1	0	1	**4**
Total	58	81	32	12	83	

Source: *own compilation*

Table 13. Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB EOS 1**	**SMM EOS 1**	**SMU EOS 1**	**ENT EOS 1**	**DM EOS 1**	**EOS 1 Total**
B_P_Soc-	3	1	0	0	3	**6**
B_P_TimeMan-	0	0	0	2	0	**2**
B_P_Focus-	8	8	7	2	15	**40**
B_P_Workload-	0	1	0	2	1	**4**
B_P_SelfOrg-	3	1	1	0	3	**8**
B_P_Motivate-	2	1	1	1	3	**9**
B_P_Technical-	8	7	0	0	1	**16**
B_P_Personal-	10	6	0	0	1	**17**
B_P_ClassInt-	6	13	4	2	10	**35**
B_P_EdQual-	2	1	0	1	4	**8**
B_P_Conven-	0	1	0	0	0	**1**
B_P_CommInfo-	2	7	1	1	2	**13**
B_P_Onlinetran-	3	2	2	1	1	**9**
B_P_Monotony-	0	0	0	0	0	**0**
B_P_Health-	0	0	2	0	1	**3**
B_P_Group-	11	10	5	2	8	**36**
Total	58	59	23	14	53	

Source: *own compilation*

Table 14: Students who participated in both BOS and EOS surveys (n=83)

Coding	**CB EOS 1**	**SMM EOS 1**	**SMM EOS 1**	**ENT EOS 1**	**DM EOS 1**	**EOS 1 Total**
B_P_HYB+	4	6	1	1	5	**16**
B_P_INTERACT+	3	5	0	2	3	**13**
B_P_DISCUSS+	2	4	0	1	0	**7**
B_P_MOTIV+	0	0	0	0	1	**1**
B_P_Flex+	0	1	0	0	0	**1**
B_P_TECH+	0	3	0	0	0	**3**
B_P_Group +	0	0	0	0	1	**1**
B_P_Record+	0	0	0	0	1	**1**
B_P_ONL+	0	0	0	0	0	**0**
B_P_ONL-	1	4	0	0	0	**5**
B_P_TRAD+	1	0	0	0	0	**1**
B_P_TRAD-	0	0	0	0	1	**1**
B_P_Theory-	2	1	0	0	1	**4**
B_P_Pract+	2	1	0	0	0	**3**
B_P_Grades-	0	0	0	0	0	**0**
B_P_Eval+	0	1	0	0	0	**1**
B_P_Class-	0	0	0	0	1	**1**
Total	15	26	1	4	14	

Source: *own compilation*

D. Students Who Participated in either one or Both Surveys

Table 15. Students who participated in either one or both surveys, answering what are the top three things they like the most of online learning. It should be noted that the sample size in greater by twenty students in the EOS when compared to the BOS (n=109 vs. n=129).

Coding	BOS 2 Total	EOS 2 Total	Change +/-
B_P_HO+	34	19	**-15**
B_P_TCCB+	52	22	**-30**
B_P_ED+	45	94	**+49**
B_P_Time+	38	13	**-25**
B_P_Conven+	20	4	**-16**
B_P_Stress+	4	8	**+4**
B_P_Sleep+	14	18	**+4**
B_P_Trav+	23	22	**-1**
B_P_Fam+	11	2	**-9**
B_P_Covid+	2	1	**-1**
B_P_EatDr+	12	4	**-8**
B_P_Flex+	30	30	**0**
B_P_Distract+	16	4	**-12**
B_P_Cost+	9	1	**-8**
B_P_TeachMeth+	25	57	**+32**
B_P_Tech+	10	60	**+40**
B_P_NoLike	9	18	**+9**
B_P_OppLearn+	4	4	**0**

Source: *own compilation*

Table 16: Students who participated in either one or both surveys, answering what are the top three challenges are with online learning (n=109 vs. n=129)

Coding	BOS 2 Total	EOS 2 Total	Change +/-
B_P_Soc-	28	9	**-19**
B_P_TimeMan-	3	3	**0**
B_P_Focus-	72	69	**-3**
B_P_Workload-	9	8	**-1**
B_P_SelfOrg-	19	12	**-7**
B_P_Motivate-	18	14	**-4**
B_P_Technical-	12	21	**+9**
B_P_Personal-	25	19	**-6**
B_P_ClassInt-	25	51	**+26**
B_P_EdQual-	10	16	**+6**
B_P_Conven-	10	1	**-9**
B_P_CommInfo-	7	16	**+9**
B_P_Onlinetran-	7	11	**+4**
B_P_Monotony-	8	0	**-8**
B_P_Health-	13	3	**-10**
B_P_Group-	36	44	**+8**

Source: *own compilation*

Table 17. Students who participated in either one or both surveys, offering their thoughts on how university education can be improved (n=109 vs. n=129).

Coding	BOS 2 Total	EOS 2 Total	Change +/-
B_P_HYB+	34	22	**-12**

B_P_INTERACT+	12	20	**+8**
B_P_DISCUSS+	7	13	**+6**
B_P_MOTIV+	1	3	**+2**
B_P_Flex+	14	1	**-13**
B_P_TECH+	10	3	**-7**
B_P_Group +	4	1	**-3**
B_P_Record+	4	2	**-2**
B_P_ONL+	1	1	**0**
B_P_ONL-	3	5	**+2**
B_P_TRAD+	3	3	**0**
B_P_TRAD-	7	3	**-4**
B_P_Theory-	11	4	**-7**
B_P_Pract+	8	2	**-6**
B_P_Grades-	1	0	**-1**
B_P_Eval+	6	4	**-2**
B_P_Class-	2	4	**+2**

Source: *own compilation*

E. Students Who Participated in One or More Surveys (Continued)

Table A. All students who participated in either one or both BOS and EOS surveys (n= 109)

Coding	CB BOS 2	SMM BOS 2	SMU BOS 2	ENT BOS 2	DM BOS 2	BOS 2 Total
B_P_HO+	7	10	3	2	12	**34**
B_P_TCCB+	17	20	8	3	4	**52**
B_P_ED+	11	8	11	3	12	**45**
B_P_Time+	12	15	7	1	3	**38**
B_P_Conven+	2	15	3	0	0	**20**
B_P_Stress+	1	0	1	0	2	**4**
B_P_Sleep+	2	0	4	0	8	**14**
B_P_Trav+	9	0	3	1	10	**23**
B_P_Fam+	1	10	0	0	0	**11**
B_P_Covid+	1	0	0	0	1	**2**
B_P_EatDr+	2	6	2	1	1	**12**
B_P_Flex+	9	1	5	3	12	**30**
B_P_Distract+	4	10	1	0	1	**16**
B_P_Cost+	2	0	7	0	0	**9**
B_P_TeachMeth+	10	0	7	3	5	**25**
B_P_Tech+	3	4	5	3	0	**10**
B_P_NoLike	1	6	0	0	2	**9**
B_P_OppLearn+	0	4	0	0	0	**4**

Source: *own compilation*

Table B. All students who participated in one of the BOS and EOS surveys EOS2 (n=129)

Coding	CB EOS 2	SMM EOS 1	SMM EOS 1	ENT EOS 2	DM EOS 2	EOS 2 Total
B_P_HO+	2	6	0	1	10	**19**
B_P_TCCB+	1	2	2	2	15	**22**
B_P_ED+	18	23	12	8	33	**94**
B_P_Time+	0	5	1	3	4	**13**

B_P_Conven+	0	0	1	0	3	**4**
B_P_Stress+	0	0	2	0	6	**8**
B_P_Sleep+	4	1	1	1	11	**18**
B_P_Trav+	4	5	2	2	9	**22**
B_P_Fam+	0	0	0	0	2	**2**
B_P_Covid+	1	0	0	0	0	**1**
B_P_EatDr+	0	3	0	0	1	**4**
B_P_Flex+	1	6	5	3	15	**30**
B_P_Distract+	1	0	1	0	1	**4**
B_P_Cost+	0	0	0	1	0	**1**
B_P_TeachMeth+	16	20	12	2	7	**57**
B_P_Tech+	13	18	6	8	21	**60**
B_P_NoLike	1	1	2	5	9	**18**
B_P_OppLearn+	1	1	1	0	1	**4**

Source: *own compilation*

Table C. All students who participated in one of the BOS and EOS surveys (n=109)

Coding	CB BOS 2	SMM BOS 2	SMU BOS 2	ENT BOS 2	DM BOS 2	BOS 2 Total
B_P_Soc-	15	6	3	2	2	**28**
B_P_TimeMan-	2	0	0	1	0	**3**
B_P_Focus-	10	15	10	0	37	**72**
B_P_Workload-	4	5	0	0	0	**9**
B_P_SelfOrg-	3	6	0	2	8	**19**
B_P_Motivate-	2	4	1	0	11	**18**
B_P_Technical-	4	5	3	0	0	**12**
B_P_Personal-	4	6	4	1	10	**25**
B_P_ClassInt-	5	10	4	1	5	**25**
B_P_EdQual-	3	6	0	0	1	**10**
B_P_Conven-	4	2	2	0	0	**10**
B_P_CommInfo-	1	4	1	0	1	**7**
B_P_Onlinetran-	2	1	2	2	0	**7**
B_P_Monotony-	2	1	2	1	2	**8**
B_P_Health-	1	1	2	2	7	**13**
B_P_Group-	10	10	5	3	8	**36**

Source: *own compilation*

Table D. All students who participated in one of the BOS and EOS surveys (n=129)

Coding	CB EOS 2	SMM EOS 2	SMU EOS 2	ENT EOS 2	DM EOS 2	EOS 2 Total
B_P_Soc-	3	1	1	0	4	**9**
B_P_TimeMan-	0	0	0	2	1	**3**
B_P_Focus-	8	11	13	2	35	**69**
B_P_Workload-	0	2	0	5	1	**8**
B_P_SelfOrg-	3	2	2	0	5	**12**
B_P_Motivate-	2	2	3	1	6	**14**
B_P_Technical-	10	7	1	2	1	**21**
B_P_Personal-	11	7	0	0	1	**19**
B_P_ClassInt-	6	15	8	3	19	**51**
B_P_EdQual-	2	1	0	4	9	**16**
B_P_Conven-	0	1	0	0	0	**1**
B_P_CommInfo-	4	7	1	2	2	**16**

B_P_Onlinetran-	3	3	2	2	1	**11**
B_P_Monotony-	0	0	0	0	0	**0**
B_P_Health-	0	0	2	0	1	**3**
B_P_Group-	13	12	7	2	10	**44**

Source: *own compilation*

Table E. All students who participated in one of the BOS and EOS surveys (n=109)

Coding	CB BOS 2	SMM BOS 2	SMU BOS 2	ENT BOS 2	DM BOS 2	BOS 2 Total
B_P_HYB+	9	12	7	1	5	**34**
B_P_INTERACT+	5	3	1	0	3	**12**
B_P_DISCUSS+	3	1	0	2	1	**7**
B_P_MOTIV+	1	0	0	0	0	**1**
B_P_Flex+	4	7	0	0	3	**14**
B_P_TECH+	4	3	1	2	0	**10**
B_P_Group +	3	1	0	0	0	**4**
B_P_Record+	3	1	0	0	0	**4**
B_P_ONL+	0	0	0	0	1	**1**
B_P_ONL-	1	0	1	0	1	**3**
B_P_TRAD+	1	0	0	1	1	**3**
B_P_TRAD-	1	0	3	1	2	**7**
B_P_Theory-	7	1	3	0	0	**11**
B_P_Pract+	7	1	0	0	0	**8**
B_P_Grades-	1	0	0	0	0	**1**
B_P_Eval+	3	2	1	0	0	**6**
B_P_Class-	1	1	0	0	0	**2**

Source: *own compilation*

Table F. All students who participated in one of the BOS and EOS surveys (n=129)

Coding	CB EOS 2	SMM EOS 2	SMU EOS 2	ENT EOS 2	DM EOS 2	EOS 2 Total
B_P_HYB+	5	6	1	2	8	**22**
B_P_INTERACT+	4	6	2	4	4	**20**
B_P_DISCUSS+	3	5	2	3	0	**13**
B_P_MOTIV+	0	0	0	1	2	**3**
B_P_Flex+	0	1	0	0	0	**1**
B_P_TECH+	0	3	0	0	0	**3**
B_P_Group +	0	0	0	0	1	**1**
B_P_Record+	0	1	0	0	1	**2**
B_P_ONL+	1	0	0	0	0	**1**
B_P_ONL-	1	4	0	0	0	**5**
B_P_TRAD+	0	0	1	1	1	**3**
B_P_TRAD-	2	0	0	0	1	**3**
B_P_Theory-	2	1	0	0	1	**4**
B_P_Pract+	0	1	0	1	0	**2**
B_P_Grades-	0	0	0	0	0	**0**
B_P_Eval+	0	2	2	0	0	**4**
B_P_Class-	0	1	0	0	3	**4**

Source: *own compilation*

Appendix III

Student Burnout in Higher Education: From Lockdowns to Classrooms

A. Breakdown of Fall 2021 Students by Home Country

Home Country	Number of Students	Percentage of the Total (n=97)
Germany	16	16.5%
France	14	14.43%
Azerbaijan	8	8.25%
Netherlands	7	7.22%
Portugal	7	7.22%
Hungary	7	7.22%
United States	5	5.20%
Italy	5	5.20%
Czech Republic	3	3.10%
Russia	3	3.10%
Belgium	3	3.10%
Mongolia	2	2.10%
Serbia	2	2.10%
Norway	2	2.10%
Moldova	2	2.10%
Sweden	1	1.03%
Kazakhstan	1	1.03%
Kyrgyzstan	1	1.03%
Greece	1	1.03%
India	1	1.03%
Pakistan	1	1.03%
Indonesia	1	1.03%
China	1	1.03%
Algeria	1	1.03%
Vietnam	1	1.03%
Tunisia	1	1.03%

B. Fall 2021 Semester Course Breakdown

Fall 2021 Courses	Number of Undergraduate Students	Number of Master's Students	Percentage of the Total (n=97)
Corvinus Consumer Behavior Undergraduate	26		26.8%
Corvinus Services Marketing Undergraduate	19		19.6%
Corvinus Services Marketing Masters		41	42.3%
Corvinus Entrepreneurship Undergraduate	8		8.25%
ESSCA Digital Management Undergraduate	3		3.1%
	56	**41**	**100%**

C. Distribution of ages from the Fall 2021 surveyed students.

Age	Number of Students	Percentage of the Total (n=97)
18	1	1.03%

19	0	0.0%
20	19	19.6%
21	12	12.4%
22	19	19.6%
23	18	18.56%
24	14	14.4%
25	7	7.22%
26	6	6.22%
27	1	1.03%
Total	**97**	**100%**

D. Abbreviations/Terminology

BOS = Beginning of the semester
EOS = End of the Semester
BUR = Burnout
RES = Resiliency
GSE = General Self Efficacy
OED = Online Education Technical Support
COV = A University's Responses to COVID-19
HME = Home Environment Sentiment (referring to COVID-19 lockdown periods)
HYB = Hybrid Learning

Remote Learning Sentiment: The amount a student favors online learning.

Home Environment Sentiment: How a student sees their home enivronment related to their ability to learn.

General Self Efficacy: "General self-efficacy is the belief in one's competence to cope with a broad range of stressful or challenging demands, whereas specific self-efficacy is constrained to a particular task at hand" (Schwarzer, 2005).

Resilience: "Resilience is the process and outcome of successfully adapting to difficult or challenging life experiences, especially through mental, emotional, and behavioral flexibility and adjustment to external and internal demands" (American Psychological Association).

University Self Management: The ability of a university to provide support to its students academically and administratively.

E. BOS/EOS Surveys

The following are the BOS and EOS surveys that were delivered during the Fall 2021 semester (BOS Survey, EOS Survey).

Q1: Please select the relevant course(s) and professor for the Fall 2021 semester.
- Corvinus Consumer Behaviour Professor Kevin Jackson
- Corvinus Services Marketing ISP Professor Kevin Jackson
- Corvinus Services Marketing Master's Professor Kevin Jackson
- Corvinus Entrepreneurs, Intrapreneurs, and Innovation Professor Kevin Jackson
- ESSCA Digital Management Professor Kevin Jackson

Q2: "What is your name?"
Q3: "What is your age?"
Q4: "What is your gender?"
Q5: "What is your home city and country?"
Q6: "What is your home university?"
Q7: Please check all of the relevant boxes regarding your education:
- Spring 2020 Semester: I was in high school
- Spring 2020 Semester: Enrolled in BA /BSC (undergraduate)
- Spring 2020 Semester: Enrolled in MA/MSC (master's)
- Spring 2020 Semester: Passive or not a student at this time

- Fall 2020 Semester: I was in high school
- Fall 2020 Semester: enrolled in BA /BSC (undergraduate)
- Fall 2020 Semester: Enrolled in MA/MSC (master's)
- Fall 2020 Semester: Passive or not a student at this time
- Spring 2021 Semester: I was in high school
- Spring 2021 Semester: Enrolled in BA /BSC (undergraduate)
- Spring 2021 Semester: Enrolled in MA/MSC (master's)
- Spring 2021 Semester: Passive or not a student at this time

Q8: Which of the following best describes your education in the Spring 2021 semester?

- Entirely Online
- Hybrid Learning (Partly in the classroom, partly online)
- Entirely in the classroom
- Other

Q9: Which of the following best describes the focus of your academic studies*

- Finance and Accounting
- Marketing Communications
- Business and Management
- Engineering
- Computer Science
- Political Science
- Other

Q10: How do you feel about remote learning using a scale of 1-5, where 1= Strongly Dislike and 5 = Strongly Support?

Q11: **BUR/EMO**: Based on your Spring 2021 educational experience, please rate the following items using a scale of 1-5, where 1= Not at all and 5 = Absolutely

- I felt emotionally drained/exhausted from my studies
- I felt I was working too hard on my studies
- Interacting with people all day now is really a strain for me
- Interacting with people all day now puts too much stress on me
- I felt I was able to help my student colleagues
- It was really hard to create a relaxed environment
- I feel as though I haven't accomplished worthwhile things

Q12: **RES**: Based on your Spring 2021 educational experience, please rate the following items from a scale of 1-5, where 1= Not at all and 5 = Absolutely

- I have the ability to change
- I can handle whatever comes my way
- I can see the humorous side of problems
- I feel that coping with stress strengthens me
- I can stay focused while under pressure
- I can bounce back quickly after an illness or hardship
- I can achieve my goals despite obstacles
- I am not easily discouraged by failure
- I view myself as a strong person
- I can handle unpleasant feelings

Q13: **GSE**: Based on your Spring 2021 educational experience, please rate the following items from a scale of 1-5, where 1= Not at all and 5 = Absolutely

- I can always manage to solve difficult problems if I try hard enough
- If someone opposes me, I can find the means and ways to get what I want
- It is easy for me to stick to my aims and accomplish my goals
- I am confident that I can deal efficiently with unexpected events
- Thanks to my resourcefulness, I know how to handle unforeseen situations
- I can solve most problems if I invest the necessary effort
- I can remain calm when facing difficulties due to my coping abilities
- When I am confronted with a problem, I can usually find several solutions
- If I am in trouble, I can usually think of a solution
- I can usually handle whatever comes my way

Q14: **OED**: Based on your Spring 2021 remote learning experience, please rate the following items from a scale of 1-5, where 1= Not at all and 5 = Absolutely

- I had a reliable internet connection at home for remote learning.
- I have an adequate computer for remote learning.
- I received the necessary technical support from my school for remote learning
- I felt comfortable using my digital devices at home.
- I took the transition to a digital work schedule with ease.
- Camera views from students make online classes more interactive
- The digital agenda has caused me many technical difficulties.
- I am enthusiastic about remote learning because it prepares me for the future.

Q15: **COV**: Based on your Spring 2021 educational experience, please rate the following items from a scale of 1-5, where 1= Not at all and 5 = Absolutely

- Have you been satisfied with your school's response to the coronavirus crisis?
- Are you concerned about contracting COVID-19 by attending class?
- Are you concerned about exposing an elderly or immunocompromised family member to the virus by bringing it home from class?
- I received timely updates and information regarding COVID 19.
- How well did your school prepare for COVID 19?

Q16: **HME**: Based on your Spring 2021 remote learning experience, please rate the following items from a scale of 1-5, where 1= Not at all and 5 = Absolutely

- I like working at my own pace
- I get more sleep when learning remotely
- I missed my friends
- I am more easily distracted at home than in the classroom
- I like setting my own daily schedule for schoolwork
- I missed my teachers
- I have difficulty staying motivated when learning remotely
- I am less stressed about my schoolwork when learning remotely
- I missed participating in sports
- It's hard to keep school and home separate - I can't escape!
- It's nice to have a break from the stress of the school environment
- I missed participating in extracurricular activities
- I struggled to keep up with a daily routine
- I missed the social environment at school

Q17: **HYB**: Based on your Spring 2021 educational experience using a scale from 1-5, please rate the following where 1= Strongly Disagree and 5 = Strongly Agree.

- I support more technology use in my fully in-person courses
- The use of Kahoot games enhance my educational experience
- Pre-recorded lectures enhance my educational experience
- I will take some of my courses in a fully online format in the future
- Guest lecturers and judges enhanced my remote learning experience.
- I will take some of my courses as a combination of in-person and online
- I really need Face to Face class discussion to learn.
- An online environment makes it easier for me to communicate with my instructor and fellow students.
- Face to Face learning and online learning are complementary to each other.
- My preferred learning method is online learning.
- My preferred learning method is traditional, Face to Face learning.
- My preferred learning method is a combination of Face to Face and online learning.

Q18: In your home university, which of the following learning attributes apply to your previous online experience? Multiple answers are possible.

- Live online lectures
- Pre-recorded online lectures
- Online group activities and presentations
- Interactive online learning games
- Personalized and individual feedback with professors
- Online multiple choice testing

- Individual essay testing

Q19: What learning method is the one you have experienced the most during your university experience thus far?

- Traditional Online Learning - Classroom centric
- Only online learning
- Hybrid learning: a combination of traditional and online

Q20: What are the top three things you like about online learning? Free answer.
Q21: What are the biggest challenges of online learning? Free answer.
Q22: I am grateful to receive your honest input. Please provide any additional suggestions regarding how university education should be improved.

F. Maslach Burnout Inventory

I. Emotional Exhaustion

I feel emotionally drained from my work
I feel used up at the end of the workday
I feel fatigued when I get up in the morning and have to face another day on the job Working with people all day is really a strain for me
I feel burned out from my work
I feel frustrated by my job
I feel I'm working too hard on my job
Working with people directly puts too much stress on me
I feel like I'm at the end of my rope

II. Personal Accomplishment

I can easily understand how my recipients feel about things
I deal very effectively with the problems of my recipients
I feel I treat some recipients as if they were impersonal objects
I don't really care what happens to some recipients.
I can easily create a relaxed environment with my recipients.
I have accomplished many worthwhile things in this job.
I feel I'm positively influencing other people's lives through my work
I feel very energetic

G. Connor-Davidson ResilienceScale

Item no. Description

1 **Able to adapt to change**
2 Close and secure relationships
3 Sometimes fate or God can help
4 **Can deal with whatever comes**
5 Past success gives confidence for new challenge
6 **See the humorous side of things**
7 **Coping with stress strengthens**
8 **Tend to bounce back after illness or hardship**
9 Things happen for a reason
10 Best effort no matter what
11 **You can achieve your goals**
12 When things look hopeless, I don't give up
13 Know where to turn for help
14 **Under pressure, focus and think clearly**
15 Prefer to take the lead in problem solving
16 **Not easily discouraged by failure**
17 **Think of self as strong person**
18 Make unpopular or difficult decisions
19 **Can handle unpleasant feelings**
20 Have to act on a hunch
21 Strong sense of purpose
22 In control of your life

23 I like challenges
24 You work to attain your goals
25 Pride in your achievements

H. The General Self-Efficacvy Scale (GSF)

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way.

I. Data Reliability

i. BOS Burnout Unidimensional Reliability (BUR)

Questions 2 and 5 removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,667
95% CI lower bound	0,549
95% CI upper bound	0,758

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_EMO1	0,649	0,34
BOS_EMO3	0,583	0,497
BOS_EMO4	0,618	0,416
BOS_EMO6	0,633	0,388
BOS_EMO7	0,591	0,47

ii. EOS Burnout Unidimensional Reliability (BUR)

Questions 2 and 5 removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,732
95% CI lower bound	0,636

95% CI upper bound	0,806

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
EOS_EMO1	0,762	0,297
EOS_EMO3	0,639	0,624
EOS_EMO4	0,647	0,594
EOS_EMO6	0,63	0,631
EOS_EMO7	0,733	0,374

iii. BOS Resiliency (RES)

Frequentist Scale Reliability Statistics

Estimate	**Cronbach's α**
Point estimate	0,784
95% CI lower bound	0,713
95% CI upper bound	0,84

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_RES1	0,773	0,379
BOS_RES2	0,759	0,506
BOS_RES3	0,775	0,389
BOS_RES4	0,778	0,353
BOS_RES5	0,762	0,479
BOS_RES6	0,767	0,44
BOS_RES7	0,762	0,49
BOS_RES8	0,77	0,416
BOS_RES9	0,745	0,615
BOS_RES10	0,758	0,506

iv. EOS Resiliency (RES)

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,81
95% CI lower bound	0,75
95% CI upper bound	0,859

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
EOS_RES1	0,812	0,28
EOS_RES2	0,775	0,682
EOS_RES3	0,803	0,413
EOS_RES4	0,805	0,396
EOS_RES5	0,789	0,531
EOS_RES6	0,806	0,396
EOS_RES7	0,786	0,585
EOS_RES8	0,779	0,605
EOS_RES9	0,78	0,617
EOS_RES10	0,796	0,463

v. BOS General Self Efficacy (GSE)

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,823
95% CI lower bound	0,766
95% CI upper bound	0,869

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_GSE1	0,813	0,46

BOS_GSE2	0,809	0,496
BOS_GSE3	0,811	0,476
BOS_GSE4	0,799	0,583
BOS_GSE5	0,801	0,565
BOS_GSE6	0,809	0,499
BOS_GSE7	0,828	0,381
BOS_GSE8	0,81	0,485
BOS_GSE9	0,808	0,502
BOS_GSE10	0,786	0,716

vi. EOS General Self Efficacy (GSE)

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,799
95% CI lower bound	0,735
95% CI upper bound	0,851

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	Cronbach's α	Item-rest correlation
EOS_GSE1	0,785	0,447
EOS_GSE2	0,8	0,329
EOS_GSE3	0,798	0,323
EOS_GSE4	0,771	0,556
EOS_GSE5	0,775	0,529
EOS_GSE6	0,78	0,502
EOS_GSE7	0,8	0,333
EOS_GSE8	0,766	0,599
EOS_GSE9	0,766	0,63
EOS_GSE10	0,774	0,539

vii. BOS Online Education Technology (OED)

Question 7 was removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,676
95% CI lower bound	0,568

95% CI upper bound	0,762

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_OED1	0,636	0,406
BOS_OED2	0,624	0,503
BOS_OED3	0,661	0,332
BOS_OED4	0,607	0,532
BOS_OED5	0,614	0,48
BOS_OED6	0,676	0,283
BOS_OED8	0,672	0,278

viii. EOS Online Education Technology (OED)

Question 7 was removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	**Cronbach's α**
Point estimate	0,659
95% CI lower bound	0,545
95% CI upper bound	0,749

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
EOS_OED1	0,611	0,408
EOS_OED2	0,639	0,322
EOS_OED3	0,63	0,354
EOS_OED4	0,63	0,346
EOS_OED5	0,575	0,529
EOS_OED6	0,6	0,468
EOS_OED8	0,671	0,23

ix. BOS University COVID-19 Response (COV)

Questions 2 and 3 were removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,698
95% CI lower bound	0,575
95% CI upper bound	0,789

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_COV1	0,55	0,558
BOS_COV4	0,81	0,356
BOS_COV5	0,429	0,658

x. EOS University COVID-19 Response (COV)

Questions 2 and 3 were removed due to a lack of significance.

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,69
95% CI lower bound	0,567
95% CI upper bound	0,783

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
EOS_COV1	0,604	0,5
EOS_COV4	0,748	0,399
EOS_COV5	0,44	0,647

xi. BOS Home Environment (HME)

Questions 2, 3, 6, 8, 9, 10, 11, 12 were removed due to a lack of significance

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,69
95% CI lower bound	0,584
95% CI upper bound	0,773

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	**Cronbach's α**	**Item-rest correlation**
BOS_HME1	0,648	0,44
BOS_HME4	0,695	0,322
BOS_HME5	0,647	0,429
BOS_HME7	0,53	0,659
BOS_HME13	0,655	0,415

Note. The following items were reverse scaled: BOS_HME4, BOS_HME7, BOS_HME13.

xii. EOS Home Environment (HME)

Questions 2, 8, 9, 11 were removed due to lack of significance.

Kaiser-Meyer-Olkin test

	MSA
Overall MSA	0,846
EOS_HME1	0,894
EOS_HME2	0,552
EOS_HME3	0,81
EOS_HME4	0,912
EOS_HME5	0,894
EOS_HME6	0,902
EOS_HME7	0,883
EOS_HME8	0,527
EOS_HME9	0,684
EOS_HME10	0,924
EOS_HME11	0,742
EOS_HME12	0,669

EOS_HME13	0,881
EOS_HME14	0,848

Chi-squared Test

	Value	df	p
Model	199,454	64	< .001

Component Loadings

	RC1	RC2	Uniqueness
EOS_HME1	0,777		0,377
EOS_HME2		0,559	0,685
EOS_HME3	0,713		0,458
EOS_HME4	0,789		0,377
EOS_HME5	0,709		0,475
EOS_HME6	0,824		0,324
EOS_HME7	0,855		0,262
EOS_HME8		0,641	0,587
EOS_HME9	0,424	0,41	0,674
EOS_HME10	0,724		0,478
EOS_HME11		0,709	0,317
EOS_HME12	0,454	0,612	0,453
EOS_HME13	0,771		0,408
EOS_HME14	0,751		0,423

Note. Applied rotation method is oblimin.

Unidimensional Reliability

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,903
95% CI lower bound	0,872
95% CI upper bound	0,928

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	Cronbach's α	Item-rest correlation

EOS_HME1	0,892	0,707
EOS_HME3	0,895	0,626
EOS_HME4	0,888	0,731
EOS_HME5	0,894	0,644
EOS_HME6	0,887	0,762
EOS_HME7	0,884	0,798
EOS_HME10	0,894	0,655
EOS_HME12	0,913	0,345
EOS_HME13	0,889	0,714
EOS_HME14	0,892	0,673

xiii. BOS Hybrid Learning

Questions 1, 2, 3, 5, 6, 8, 9, 12 were removed due to lack of significance.

Principal Component Analysis

Chi-squared Test

	Value	df	p
Model	114,569	43	< .001

Component Loadings

	Prefer online	Prefer hybrid	Uniqueness
BOS_HYB1		0,447	0,819
BOS_HYB2		0,534	0,732
BOS_HYB3		0,441	0,817
BOS_HYB4	0,727		0,266
BOS_HYB5		0,655	0,62
BOS_HYB6	0,415	0,516	0,415
BOS_HYB7	-0,889		0,277
BOS_HYB8			0,684
BOS_HYB9		0,615	0,533
BOS_HYB10	0,889		0,239
BOS_HYB11	-0,861		0,196
BOS_HYB12		0,591	0,426

Note. Applied rotation method is oblimin.

Unidimensional Reliability

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,892
95% CI lower bound	0,852
95% CI upper bound	0,922

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	Cronbach's α	Item-rest correlation
BOS_HYB4	0,883	0,71
BOS_HYB7	0,872	0,729
BOS_HYB10	0,848	0,793
BOS_HYB11	0,839	0,83

Note. The following items were reverse scaled: BOS_HYB7, BOS_HYB11.

Unidimensional Reliability

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0,753
95% CI lower bound	0,668
95% CI upper bound	0,82

Note. Of the observations, pairwise complete cases were used.

Frequentist Individual Item Reliability Statistics

	If item dropped	
Item	Cronbach's α	Item-rest correlation
BOS_HYB5	0,807	0,307
BOS_HYB6	0,658	0,614
BOS_HYB9	0,687	0,566
BOS_HYB12	0,584	0,733

J. BOS Student Burnout

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p
H1	0,15	0,023	0,003	0,764	0,023	1,14	2	99	0,324
H2	0,327	0,107	0,08	0,734	0,085	9,277	1	98	0,003
H3	0,386	0,149	0,114	0,72	0,042	4,81	1	97	0,031
H4	0,423	0,179	0,136	0,711	0,03	3,487	1	96	0,065

H1 - age and gender; h2 - age, gender + selfeff; H3 - age, gender, selffef + sentiment; H4 - age, gender, selfeff, sentiment + HO+

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
H1	Regression	1,332	2	0,666	1,14	0,324
	Residual	57,809	99	0,584		
	Total	59,141	101			
H2	Regression	6,331	3	2,11	3,916	0,011
	Residual	52,81	98	0,539		
	Total	59,141	101			
H3	Regression	8,826	4	2,206	4,254	0,003
	Residual	50,315	97	0,519		
	Total	59,141	101			
H4	Regression	10,59	5	2,118	4,188	0,002
	Residual	48,551	96	0,506		
	Total	59,141	101			

Note. Null model includes age, gender

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p	Collinearity Statistics	
							Tolerance[a]	VIF[a]
H1	(Intercept)	2,883	0,755		3,817	< .001		
	age	-0,016	0,034	-0,047	-0,469	0,64	1	1
	gender (female)	0,234	0,159		1,473	0,144		
H2	(Intercept)	3,984	0,811		4,915	< .001		

	age	0,011	0,034	0,034	0,34	0,735	0,94	1,07
	gender (female)	0,177	0,154		1,153	0,252		
	BOS_Selfeff	-0,444	0,146	-0,303	-3,046	0,003	0,94	1,07
H3	(Intercept)	4,377	0,815		5,369	< .001		
	age	0,014	0,033	0,043	0,436	0,664	0,93	1,071
	gender (female)	0,149	0,152		0,981	0,329		
	BOS_Selfeff	-0,444	0,143	-0,303	-3,108	0,002	0,94	1,07
	BOS_Sentiment_remote	-0,147	0,067	-0,206	-2,193	0,031	1	1,001
H4	(Intercept)	4,255	0,808		5,269	< .001		
	age	0,037	0,035	0,109	1,06	0,292	0,82	1,218
	gender (female)	0,146	0,15		0,975	0,332		
	BOS_Selfeff	-0,43	0,141	-0,293	-3,04	0,003	0,93	1,073
	BOS_Sentiment_remote	-0,061	0,081	-0,085	-0,751	0,454	0,67	1,495
	BOS_Hopositive	-0,215	0,115	-0,224	-1,867	0,065	0,6	1,675

Model Summary - BOS_Burnout

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p
H_1	0,417	0,174	0,14	0,71	0,067	7,892	1	97	0,006

age, gender, BOS_Selfeff, HO+

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	10,304	4	2,576	5,117	< .001
	Residual	48,837	97	0,503		
	Total	59,141	101			

Note. Null model includes age, gender, BOS_Selfeff

Coefficients

							Collinearity Statistics	
Model		Unstandardized	Standard Error	Standardized[a]	t	p	Tolerance[a]	VIF[a]
H_1	(Intercept)	4,118	0,785		5,247	< .001		

age	0,041	0,034	0,122	1,205	0,231	0,85	1,18
gender (female)	0,153	0,149		1,029	0,306		
BOS_Selfeff	-0,426	0,141	-0,291	-3,024	0,003	0,93	1,073
BOS_Hopositive	-0,265	0,094	-0,275	-2,809	0,006	0,89	1,122

EOS Student Burnout

Model Summary - EOS_Burnout

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p
H1	0,162	0,026	0,005	0,745	0,026	1,234	2	92	0,296
H2	0,193	0,037	0,006	0,745	0,011	1,05	1	91	0,308
H3	0,402	0,162	0,125	0,699	0,125	13,394	1	90	< .001
H4	0,469	0,22	0,176	0,678	0,058	6,587	1	89	0,012
H5	0,541	0,293	0,244	0,649	0,073	9,054	1	88	0,003

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
H1	Regression	1,371	2	0,685	1,234	0,296
	Residual	51,077	92	0,555		
	Total	52,448	94			
H2	Regression	1,953	3	0,651	1,173	0,324
	Residual	50,495	91	0,555		
	Total	52,448	94			
H3	Regression	8,494	4	2,124	4,348	0,003
	Residual	43,954	90	0,488		
	Total	52,448	94			
H4	Regression	11,523	5	2,305	5,012	< .001
	Residual	40,925	89	0,46		
	Total	52,448	94			
H5	Regression	15,341	6	2,557	6,064	< .001
	Residual	37,107	88	0,422		
	Total	52,448	94			

Note. Null model includes age, gender

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p	Collinearity Statistics	
							Tolerance[a]	VIF[a]
H1	(Intercept)	3,316	0,755		4,392	< .001		
	age	-0,051	0,034	-0,156	-1,508	0,135	1	1
	gender (female)	0,091	0,161		0,567	0,572		
H2	(Intercept)	3,706	0,845		4,384	< .001		
	age	-0,035	0,037	-0,109	-0,965	0,337	0,852	1,17
	gender (female)	0,056	0,165		0,341	0,734		
	EOS_Selfeff	-0,185	0,181	-0,117	-1,025	0,308	0,852	1,17
H3	(Intercept)	4,632	0,833		5,564	< .001		
	age	-0,029	0,035	-0,091	-0,854	0,396	0,85	1,18
	gender (female)	0,056	0,155		0,36	0,719		
	EOS_Selfeff	-0,135	0,17	-0,085	-0,796	0,428	0,847	1,18
	EOS_UniSelfManage	-0,32	0,087	-0,356	-3,66	< .001	0,986	1,01
H4	(Intercept)	5,313	0,85		6,249	< .001		
	age	-0,038	0,034	-0,117	-1,128	0,262	0,841	1,19
	gender (female)	0,046	0,15		0,306	0,761		
	EOS_Selfeff	0,018	0,175	0,011	0,103	0,918	0,742	1,35
	EOS_UniSelfManage	-0,189	0,099	-0,211	-1,916	0,059	0,726	1,38
	EOS_Technical	-0,38	0,148	-0,299	-2,567	0,012	0,645	1,55
H5	(Intercept)	3,94	0,933		4,221	< .001		
	age	-0,047	0,032	-0,146	-1,465	0,147	0,833	1,2
	gender (female)	0,044	0,144		0,305	0,761		
	EOS_Selfeff	-0,021	0,168	-0,013	-0,124	0,902	0,737	1,36
	EOS_UniSelfManage	-0,049	0,106	-0,054	-0,463	0,645	0,584	1,71
	EOS_Technical	-0,289	0,145	-0,228	-1,996	0,049	0,617	1,62
	EOS_Sentiment_remote	0,247	0,082	0,336	3,009	0,003	0,646	1,55

BOS Mediation

Direct effects

							95% Confide Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
BOS_Sentiment_remote	→	BOS_Burnout	-0,076	0,076	-1,003	0,316	-0,225	0,073
BOS_Selfeff	→	BOS_Burnout	-0,431	0,119	-3,634	< .001	-0,664	-0,199

Note. Robust standard errors, robust confidence intervals, DWLS estimator.

Indirect effects

					Estimate	Std. Error	z-value	p
BOS_Sentiment_remote	→	BOS_Hopositive	→	BOS_Burnout	-0,09	0,045	-1,992	0,046
BOS_Selfeff	→	BOS_Hopositive	→	BOS_Burnout	-0,015	0,024	-0,612	0,54

Note. Robust standard errors, robust confidence intervals, DWLS estimator.

Total effects

							95% Confide Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
BOS_Sentiment_remote	→	BOS_Burnout	-0,166	0,071	-2,358	0,018	-0,305	-0,028
BOS_Selfeff	→	BOS_Burnout	-0,446	0,119	-3,757	< .001	-0,679	-0,213

Note. Robust standard errors, robust confidence intervals, DWLS estimator.

EOS Mediation

Direct effects

							95% Conf
			Estimate	Std. Error	z-value	p	Lower
EOS_UniSelfManage	→	EOS_Burnout	-0,174	0,077	-2,272	0,023	-0,325

Note. Robust standard errors, robust confidence intervals, DWLS estimator.

Indirect effects

					Estimate	Std. Error	z-value
EOS_UniSelfManage	→	EOS_Sentiment_remote	→	EOS_Burnout	-0,151	0,057	-2,65

Note. Robust standard errors, robust confidence intervals, DWLS estimator.

Total effects

							95% Conf
			Estimate	Std. Error	z-value	p	Lower
EOS_UniSelfManage	→	EOS_Burnout	-0,325	0,074	-4,385	< .001	-0,471

Note. Robust standard errors, robust confidence intervals, DWLS estimator.