

Review

The Future of Higher Education: Identifying Current Educational Problems and Proposed Solutions

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Abstract: It is widely acknowledged that higher education is failing to meet the needs of students and employers, while educational costs and student debt are rapidly increasing. Our aim was to address these issues in an innovative fashion through a structured review combined with recommendations for best practices. Specifically, we aimed to identify and systemize failings of higher ed based on current scholarship, propose solutions, and identify institutions of higher education (IHEs) that have begun to successfully put these solutions in practice. Based on our literature review, this is the first time such a study has been conducted. We performed a structured literature review and identified four key failings in higher education: quality, relevance, access, and cost. From the reviewed literature we extracted a rubric to identify and evaluate twelve IHEs that are effectively applying new and innovative models that address these four problems. We conclude by recommending best practices for the successful redesign of IHEs. The overarching problem we identified was lack of student preparedness to succeed in a highly complex, competitive, and increasingly global, digital world—curricula lack relevance. IHEs are failing to teach the skills and tools needed for sustained success in the workplace: critical and creative thinking, problem-solving, co-operation, tolerance, and collaboration (which incidentally align with the skills and tools needed for effective citizenship) and when they do, they are not using evidence-based pedagogical strategies drawn from research on the science of learning. Additionally, IHEs are failing to provide accessible, high-quality, affordable postsecondary education. Financial and geographic inaccessibility, opaque admissions processes, attrition, poor attention to student health and well-being, lack of Indigenous inclusion, weak utilization of technology, and outmoded teaching methods and content contribute to the barriers to student success. The twelve IHEs we identified are geographically, economically, and pedagogically diverse, each serving as a model for the future of higher education. The novel contributions offered here are (i) a systematic review of higher education's failings as they impact students and employers, (ii) identification of specific programs and initiatives that can ameliorate these failings, and (iii) identification of IHEs that are engaging in best practices with respect to (i) and (ii).

Keywords: higher education; science of learning; pedagogy; best practices; educational costs; digital economy

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1. Introduction—What We Know

In the fall of 2022, a Google search of “what is wrong with higher education?” yielded 1.36 billion results. Articles bemoaning a broken system have appeared in *The Harvard Business Review*, *The Atlantic*, *The Chronicle of Higher Education*, *Forbes*, *The Wall Street Journal*, *Inside Higher Ed*, and *MacLeans*. Those of us who work within higher education as instructors and administrators, and students themselves, sense a recent shift in which institutions of higher education (IHEs)—colleges, universities, and professional schools—no longer seem up to the task of preparing students for employment, effective citizenship, or even navigating increasingly complex daily life. This was true even prepandemic. Saying the system is broken obscures what exactly is broken about it, and with all the hand-wringing about it, few have provided implementable, specific solutions to fix what is broken. We aim to change that by beginning an evidence-based conversation that addresses both sides of this issue.

In this introduction, we review what was commonly known prior to our research project. We then report the results of a systematic review that enlisted more than 3000 research articles, and conclude that four pressure points in current IHEs are paramount: lack of quality, relevance, access, and increasingly high costs. From our systematic review we constructed a rubric for evaluating institutional success on these four factors and their subfactors. In the final phase of the present study, we applied that rubric to IHEs worldwide to discover those who were best exemplifying meaningful change.

Quality: active learning. Our notion of the modern university is based on an 11th century Western European model [1,2], and not much has changed despite advances in the science of learning. Well before the 11th century Socrates argued that lectures, during which students sit passively and listen, are among the *worst* ways to learn, and yet even in top universities, students are lectured to rather than engaged with [3,4]. Learning is not a spectator sport: it requires active participation [5] and students in active learning classrooms are 50% more likely to succeed [6]. Evaluation is often relegated to multiple choice tests instead of debate, discussion, or written arguments, denying students the opportunity to demonstrate creative thinking, knowledge transfer, and induction. Exams practice students in activities of little value in the workplace, leading to overconfidence in their usable knowledge and skill, while denying formative feedback.

Students learn best when immersed in active learning environments in which they must respond actively, rather than serving as passive recipients of information [7,8]. For example, Piaget [9] recommended interactions with internal environments (i.e., information acquisition) and external environments (i.e., experiential learning). When Eric Mazur introduced the model of peer instruction in his Harvard physics courses he transformed his lecture hall to active learning sessions, and students showed superior retention of the material learned [3,10].

Relevance: critical thinking, creative problem-solving, and lifelong learning. As economies becomes increasingly global, and industries increasingly automated, employers and college graduates report a gross mismatch between what is taught in school and what is needed in the workplace, concluding that higher education lacks relevance [11,12]. Requirements for what employees need to know—and job descriptions themselves—change rapidly and quickly become outdated. Effective employees are mentally nimble, know how to teach themselves new skills and concepts on the job, and how to apply what they know in new contexts within a rapidly changing knowledge landscape. In short, our students need to be taught to become lifelong learners, to identify what they do not know and know how to learn it after graduation. Active learning curricula directly promote these skills. Some graduate university programs already carry this out in law, journalism, science, medicine, and engineering. Today, there are few professions that *do not* require their employees to be lifelong learners, yet undergraduate curricula have not caught up.

The fundamental paradox. We have known for millennia that students learn more, and the learning stays with them longer, when they discover the material for themselves. This active learning leads directly to a mindset of becoming critical thinkers, creative problem

solvers, and lifelong learners. So why are not more classrooms leveraging active learning? University administrators told us it is because lectures are cost-effective for institutions (they also require much less work by instructors). Lectures serve the interests of everyone but the students. (The late neuropsychologist Hans-Lukas Teuber used to tell his MIT students that “lectures are the fastest way to get material to pass from a professor to a student without going through the brains of either.”)

Why this matters. Ensuring that democracies maintain an informed electorate is an important outcome of education. The skills and tools needed for effective citizenship align with those needed for success in the workforce and should be both taught and practiced in IHEs: problem-solving, critical and creative thinking, tolerance, co-operation, and collaboration. Moreover, the biggest problems the world faces today—poverty, climate change, the unequal distribution of wealth and resources, institutional corruption, and military aggression—are not easy to solve, otherwise they would already have been solved. A new generation of thinkers, lifelong learners trained in compassionate problem-solving and an ability to work with others across disciplines, will be necessary to address these crucial issues.

Cost and access: beyond curricular reform. Even if curricular reforms are adopted, there exist barriers preventing most students from attending and succeeding in IHEs: access and cost [13]. Chief among complaints are costs (they have risen 145% faster than inflation [14]), reducing access to higher education for those who need it most: students in third world countries and in rural areas of first world countries.

What we do not know and hope to discover. Our primary research question was: *if we could reinvent higher education for the twenty-first century, what would it look like?* To address this question in all its facets, the present study comprised three phases: (1) through a structured literature review, identify and systemize failings of higher ed based on current scholarship, (2) propose solutions, based on these problems and the attendant literature review, and (3) identify institutions of higher education (IHEs) around the world that have begun to successfully put these solutions in practice.

2. Materials and Methods

We performed a structured literature search using six databases and two search engines in consultation with research librarians at 3 IHEs (see Supplementary Materials for list of databases, and Figure S1 for a flow chart). The reason for using this method was to ensure that we did not miss anything that might be relevant; the topic of higher education straddles several disciplinary boundaries including psychology, sociology, education, business economics, political science, and philosophy, and we did not want to allow any of our own experiences or biases to inadvertently limit selection.

The results of that search led to a structured literature review from which we extracted a list of best practices for IHEs (see SM). From that list we identified IHEs that engaged in those best practices (Table S1). Finally, we searched news reports, articles, and interviews with stakeholders to obtain more detailed information about those institutions, applying rubrics (Tables S2 and S3) to select the top one-third of those that employed best practices most successfully.

3. Results

Our literature search yielded 3000+ unique documents. After screening, we retained 172 works that we analyzed to extract current and best practices for curriculum development, pedagogical frameworks, implementing the science of learning, and new methodologies and innovations. Our analysis identified nine weaknesses in and limitations to widely accessible, high-quality, affordable postsecondary education: inequitable financial access, geographic inaccessibility, lack of admissions transparency, attrition and inequities in retention, poor student health and well-being, lack of Indigenous inclusion, weak

utilization of technology for pedagogical improvements, outmoded teaching methods and content, and lack of training in career-relevant skills.

3.1. IHE Weaknesses and Limitations

3.1.1. Inequitable Financial Access

Universities are too expensive for many people, and more than half of those Canadians who do attend incur average governmental debt of CAD 28,000 [15]. In many Canadian high schools, students of low SES backgrounds are identified and streamlined into non-academic programs, deterring them from higher education [16,17]. Costs, perceived value, peer group aspirations, and institutional discouragement present large obstacles.

3.1.2. Geographic Inaccessibility

Nearly two-thirds of recent high school graduates worldwide do not have access to higher education [18,19]. For example, 20% of Canadian high school students live more than 80 km from a university and are 42% less likely to attend, after accounting for family income, parental educational attainment, gender, and province [20].

3.1.3. Admissions Transparency

Admissions processes are opaque, making it difficult for applicants to understand how evaluation and selection processes function [21,22]. Underprivileged students who are admitted on a contextual basis often lack the proper resources within the educational institution to succeed once enrolled [23], indicating a need for better institutional support.

3.1.4. Attrition and Retention

64% of students in the U.S. who began a 4-year bachelor's degree program graduated within four years [24]. In Canada, only 73% of students in undergraduate programs complete their degree within 6 years, and only 69% pursuing certificate or associate degrees earn these credentials within 3 years [25]. Completion rates are disturbingly unequal, with drop-out rates increasing for aboriginal and rural populations [26] (see Figure 1).

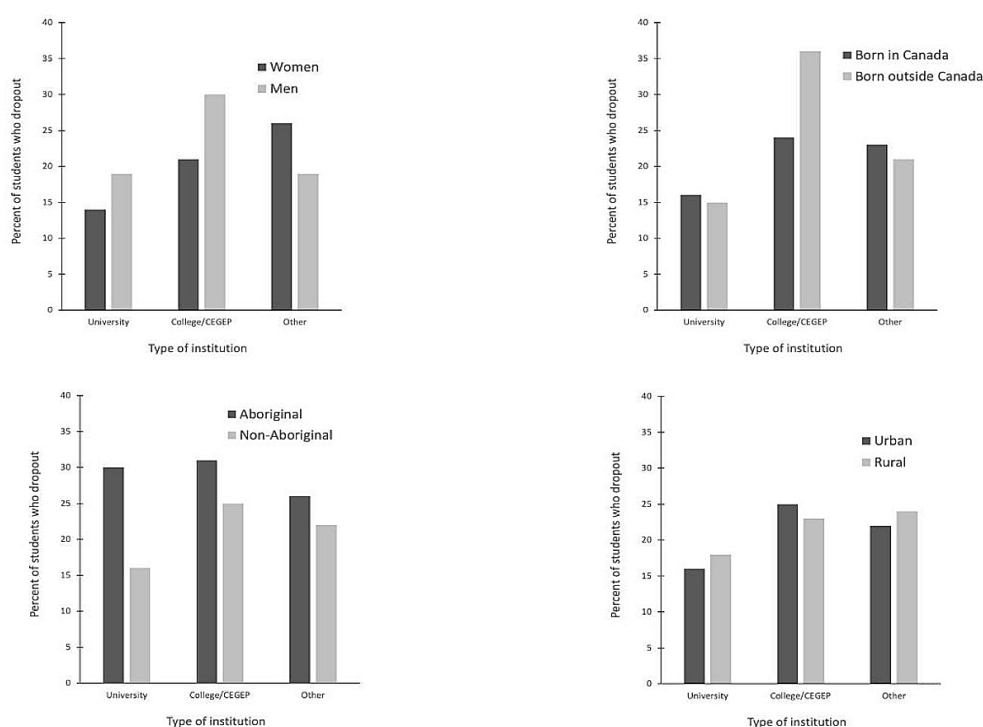


Figure 1. Disparities in dropout rates in Canadian higher education.

3.1.5. Student Health and Well-Being

University students are at high risk for psychological distress and mental disorders [27–29]. Twenty-six percent of Canadian postsecondary students report a professional diagnosis for one or more mental health conditions. Sixty percent report higher than average levels of stress, hopelessness, and overwhelming anxiety; half reported feeling depression severe enough that it was difficult to function at some point, and one in eight reported having seriously considered suicide [30]. Academic and financial stressors have a particularly negative impact on students' mental health [21,31]. Learning experiences and environments—classroom culture, course design, curriculum, teaching practices, assessment, assignments, physical spaces, and instructors—can have either a positive or a negative effect on student health and well-being, which in turn impacts deep learning [32–38]. Such chronic distress impairs information processing, attention, memory, decision-making, motivation, immune system function, and impulse control, reducing students' capacity to learn and participate [39,40]. Many academic institutions have introduced mental health strategies and wellness programs, yet there remains a lack of comprehensive, structured, and integrated proactive approaches to health and wellness [41]. Student involvement in the creation and promotion of mental health resources can help reduce the stigma that limit student use of these services [42].

3.1.6. Indigenous Inclusion

Although there exists cultural variability across tribes, the pedagogical practices of Indigenous peoples in Canada share several common features, many of which overlap with the “new” principles of the science of learning. These include recognizing the importance of culture, nature, hands-on activities, individualized instruction and assessment, multileveled questions, storytelling, group discussions, and experiential activities [43,44]. One way of integrating Indigenous peoples into reimagined IHEs is to explicitly acknowledge that we are using their traditional pedagogical techniques. This offers members of these communities ownership within IHEs to guide their own futures within a Canadian governmental organization, leading to further engagement in classrooms and better academic outcomes [43].

The Truth and Reconciliation Commission of Canada Report [45] and corresponding calls to action prompted many institutions to move toward reconciliation by extending earlier efforts that make space for Indigenous peoples and knowledge in higher education. Efforts manifested through commitments to hire more Indigenous faculty, recruit more Indigenous students, incorporate Indigenous content into existing courses or create entirely new ones, and strengthen relationships with local Indigenous communities. However, many of these efforts remain tokenistic, superficial, and respond only selectively to Indigenous concerns [46]. Any reimagining of what the 21st century university could and should be—in Canada, the US, Mexico, Australia, and many other countries with colonial pasts—must be considered within the frame of reconciliation, in consultation with and true respect for Indigenous peoples, and with the aim to cause no further harm.

3.1.7. Technology for Pedagogical Improvements

Major economic sectors such as banking, medicine, manufacturing, music, and publishing have been revolutionized by digital technology, but higher education has not. In early 2020, most IHEs were unable to adequately respond to the COVID-19 lockdown with remote instruction. This abrupt shift further highlighted the need to rethink our outdated and inflexible systems. In attempting to replicate in-person assessments in online settings, many institutions recognized that a change of medium required a change of design—focusing less on testing and thinking more about learning—a change long overdue.

3.1.8. Outmoded Teaching Methods and Content

Knowledge is more than the collection of information. Effective teaching should be transparent, codifiable, reproducible, communicable, and training should employ abstraction, deduction, induction, and generalization to arrive at logical conclusions, based upon evidence [47]. Knowledge creation necessitates mental tools of critical thinking. Such tools are found in science, to test hypotheses and theorize ways of understanding the world [48]. The techniques of arriving at true knowledge, not a mere collection of facts, develop over time (e.g., the invention of the telescope, the decoding of the human genome), and collective knowledge itself is dynamic and must be reactive to recent discoveries and explorations (e.g., the Copernican System replacing the Geocentric Model). The nature of knowledge and the rate at which it changes poses a current challenge to educators.

Experience is the foundation of learning; the way in which one learns becomes how one approaches life in general. Each new experience helps develop concepts that can be used in a wide variety of situations. Kolb's learning cycle [49] describes the process by which new experiences mold new concepts into working memory and thus become part of our knowledge bank. Learning requires concrete experience, reflective observation, abstract conceptualization, and active experimentation. Experiential learning significantly increases attention, satisfaction, retention, and relevance [50]. Learning by doing also increases neuroplasticity [51] and cognitive reserve.

3.1.9. Training Career-Relevant Skills

Current and future students can expect to change occupations and careers several times and many will end up in jobs and industries that do not exist today. Many employers find recent graduates lack the training required for workplace success, such as applying knowledge and skills in real-world settings, critical thinking skills, and written and oral communication skills [52]. Students agree—only about one-third think they will graduate with the training necessary to succeed in the workplace [53]. Graduates who had supportive relationships with professors and mentors, and deep learning and experiential opportunities, such as internships and long-term projects that mimic real work environments, are three times more likely to be engaged in their work, to be more productive, are less likely to be absent, have lower turnover, have fewer safety incidents, and earn higher salaries [54].

3.2. Exemplary Institutions

We identified twelve exemplary institutions demonstrating effective applications of current technological and pedagogical innovations to ensure accessibility, quality, and affordability: University of Technology Sydney, Minerva University, First Nations University, Paul Quinn College, College of the Atlantic, Hampshire College, Antioch College, Arizona State University, New School at Dawson College, Bryn Mawr University, Quest University, and Alverno College. We then applied rubrics (see Tables S2 and S3, and Figure S2) to evaluate each IHE along 9 factors identified through our literature review (Science of Learning Methods, Career-Prepared Graduates, Financial Accessibility, Indigenous Inclusion, Mental Health Resources, Admissions Transparency, Geographic Accessibility, Attrition and Retention, and Technological Infrastructure; see Supplemental Materials for more information about each IHE.)

In the following sections, we describe institutions that engage in each best practice. These descriptions are not an exhaustive list of each innovation offered by each institution, but rather a sample of the possibilities.

3.2.1. Use of the Science of Learning

Minerva University's courses are all designed from evidence-based principles and continually honed through professor and student feedback. Instructors employ active learning engagement techniques and most of the class hour engages students in structured discussion, debates, and collaborative problem-solving. Formative feedback is

based on rubrics for each learning objective; curricula employ cross-contextual and cross-disciplinary scaffolding. Minerva emphasizes the teaching of habits of mind and foundational concepts. These methods provide students the tools for lifelong learning. The approach increases student engagement, which in turn improves understanding, retention, and recall [13]. In 2022, the WURI consortium of university presidents named Minerva the most innovative university in the world [55].

Bryn Mawr College's 360° Course Clusters engage students in interactive, experiential learning across groups of related courses that extend beyond the classroom [56]. Activities include data gathering trips, artistic productions, and laboratory research. The program fosters a close and collaborative relationship between faculty and students, building a community of scholars and active learners around each cluster's deeper questions.

Quest University adopted an experimental Block Plan in which students are immersed in a single subject over 3.5 to 4 weeks. During each block, students select from among experiential activities (e.g., research, teaching, volunteering) to see how real-world organizations deal with issues related to questions the student pose [57]. Block Plan immersion creates a small and supportive learning community, and increases opportunities for feedback [58].

3.2.2. University Graduates and Career-Relevant Skills

University of Technology Sydney explicitly focused on providing students with the necessary skills to enter the modern workforce and thrive in professional settings. UTS's lifetime mentorship policy includes access to short courses, micro credentials, networking, and career advice. Coursework features academic debates and discussions of real-world issues relating to economics, politics, and social issues, and is relevant to majors and careers paths. Students report being educated on industry-relevant skills and prepared for real-world situations [59].

The "work college model" at Paul Quinn College requires all students living on campus to work from 10 to 15 h a week. Some students work on campus, others find off-campus employment through the corporate work program. Students thus obtain real-world experience while taking classes, graduating with both a work and an academic transcript. PQC emphasizes the importance of tailoring a liberal arts education towards preparing students for their careers, ensuring students understand how to create a path forward economically while also making sure they have the capacity to participate intellectually at the highest level [60].

Minerva University employs a dedicated Coaching and Talent Development team that offers one-on-one and group coaching, job search and graduate school advising, career management-related workshops, and professional development opportunities, and aims to train students for jobs that do not even exist yet [8]. Students gain a deep understanding of their motivations, interests, and strengths, determine how they can make meaningful contributions across sectors, learn how to articulate their value to potential employers or graduate and professional school programs, and explore different career possibilities. Minerva also teaches a novel approach to leadership: leadership means knowing when it is appropriate to work with others, when it is appropriate to lead, and when the best chance for a project's success is for someone else to be the leader. They further support career exploration by curating conversations with alumni, faculty members, and a global network of professionals and industry leaders.

Alverno College's Accelerate program is dedicated to helping professional adults shape their pre-existing passions into more relevant underpinnings and to funnel their interests into more specific topics. At the end of their program, students compile a portfolio to create a coherent and cohesive narrative around what they have learned and the fundamental skills they have acquired. This affords the students the unusual opportunity to enter the workplace with a picture of themselves that does not feel disparate, and a narrative about where they have been and where they want to go.

Recognizing that majors are not designed to help students learn how to solve problems, collaborate, gather resources, and ask the big transdisciplinary questions that have not been asked, Hampshire College eliminated them. Their interdisciplinary approach prepares students for life after graduation and (like Minerva) for the jobs in the future that may not exist yet. Hampshire's model was specifically designed to develop entrepreneurial skills that students will need after graduating [61].

After graduation, Antioch College offers students the opportunity to complete an additional co-op called a "launch" co-op to help propel students into their careers immediately following graduation. Students can complete this co-op in the same field as their major or outside of it. The college partners with employers who hold positions specifically for Antioch students.

3.2.3. Financial Accessibility

Here, we looked for schools that would allow students to complete a degree program without incurring an onerous debt. We defined unmanageable debt as greater than CAD 50,000 (equivalent to USD 37,000 and AUD 55,000 as of this writing) upon graduation (see Supplementary Materials for how we arrived at this).

Minerva University has lower-than-average cost, and a transparently stated cap on maximum debt at USD 22,000 after four years (actual average debt at graduation is much lower and most students receive financial aid). Based on research showing that students perform better when they have "skin in the game"—contributing to their educational costs—Minerva requires students to contribute at least USD 5000/year from family resources or from work-study opportunities that Minerva provides.

Paul Quinn College tuition is also below the national average and 100% of students are on financial aid. Their work college model guarantees students will graduate with less than USD 10,000 of debt. PQC addressed both affordability and career-preparedness by bringing work inside the college and regulating it to fit with each student's academic goals. They further reduced costs by eliminating textbooks.

Antioch College offers full-tuition scholarships and covers housing costs for any student that qualifies for a Pell Grant (Pell Grants are limited to USD 6495 annually and thus do not come close to covering full costs; [62]). All students receive some form of scholarship. The average debt at graduation is USD 7,333 [63]. Students are also guaranteed on-campus work during study terms and are offered both an international co-operative educational experience and postgraduate co-op opportunities.

3.2.4. Indigenous Inclusion and Transforming IHEs in Colonial Contexts

First Nations University is the first First Nations-controlled university in Canada and is a leader in Indigenous-based education. FNU incorporates Indigenous worldviews and knowledge into all aspects of the university. It aims to give First Nations, Métis, and other Indigenous learners the greatest opportunity to succeed in their education and strengthen their communities through their accomplishments. FNU is open to students of all backgrounds; thousands of non-Indigenous students attend its classes, allowing them to prepare to work in their chosen fields while building relationships with Indigenous people.

At the University of Technology Sydney, the Centre for the Advancement of Indigenous Knowledges is an Indigenous academic expertise center, with a core focus on Indigenous education research and Indigenous postgraduate support, while the Jumbunna Institute for Indigenous Education and Research aims to support the needs of Indigenous Australians. UTS is also embarking on a ground-breaking proposal to build Australia's first truly comprehensive Indigenous Residential College. Developed and led by the Indigenous leadership team at UTS and the Indigenous community, the college aims to remove the barriers, both real and perceived, that prevent Indigenous participation in higher education and the broader economy. Graduates of the college will have an

extensive support network to guide them in the next stage of their careers and provide lifelong mentorship.

The Journeys program at Dawson College is a one-year bridging pathway to provide First Nations, Inuit, and Métis students with a welcoming, supportive, and culturally relevant environment for learning at the postsecondary level. Journeys has a 75% retention rate, more than doubling the prevailing 30% rate prior to the program's introduction. Ninety-two percent of Journeys students are accepted into Dawson programs the following semester. Smaller class sizes, a supportive learning community, Indigenous content, and dedicated faculty attract students from across Quebec.

3.2.5. Student Health and Well-Being

Poor mental health is a major issue in higher education and many students drop out for emotional reasons [42,64]. Consistent with the finding that implementing student ideas fosters a more collaborative and trusted environment [42], student governance at College of the Atlantic is not separated from university administration. Students serve as voters on important committees and have weekly meetings to discuss school logistics and larger community issues. Students thus feel empowered and learn to guide discussions in ways that allow students and faculty to both be heard [65].

At UTS, mental health initiatives begin with properly trained staff who are encouraged to talk more about mental states. UTS offers Employee Assistance Programs such as the Managers Assistance Program to train staff to help supervisees and their colleagues. The Centre for Social Justice and Inclusion offers a range of programs, including mental health awareness and mental health first aid, along with training in unconscious bias, ability awareness, and diversity and inclusion. Faculty and staff are asked to notice any changes in student behavior, and to show care and concern. This helps destigmatize mental health issues, and encourages students to obtain professional help when they need it.

Minerva University provides a wide range of resources to support students in developing life skills, adjusting to new cultures and environments, and improving their mental health. While all staff at Minerva are responsible for contributing to the overall wellness of the community, dedicated Student Life staff play a special role in supporting these initiatives. The importance of student health and well-being is highlighted by the intentional inclusion of Self-Management and Wellness as one of the Integrated Learning Outcomes of every course. Students graduate with a clear sense of how to manage and prioritize their own health and well-being, fully prepared for postuniversity life. Additionally, their Counseling and Psychological Services provide individualized mental health services in an inclusive, compassionate, and culturally appropriate environment.

A partnership with University of Texas Southwestern Medical School provides students at Paul Quinn College mental health assessment and treatment on campus. Incoming student orientation addresses mental health and wellness, and all incoming students have a screening session with a mental health professional. There is also a focus on the prevention of mental health crises; changing the dialogue from mental illness to mental health frames counseling as a preventive measure, motivating individuals to seek professional help in times other than crises [65].

First Nations University offers Cultural and Traditional Services as support for students. The Elders' Offices work closely with the academic departments to infuse traditional learning into the classroom. Traditional learning is used in some classrooms by starting each class with a student-led smudging ceremony so that every individual is centered and grounded. Faculty prioritize spirituality, collective learning, and flat structure between professors and students to nurture everyone's whole being [66].

3.2.6. Admissions Transparency

At College of the Atlantic, the admissions requirements are clearly stated. Online interviews are encouraged but not mandatory, and standardized testing (e.g., SAT, ACT) is

optional. In addition to an essay and two short-answer questions, applicants are encouraged to showcase creative passions that may not be conveyed through standard applications. Each application is assessed by admission staff, faculty, and current students who take a holistic, context-based approach toward each student. Every year, College of the Atlantic publicly provides a common data set that transparently provides details on admissions statistics such as enrollment by racial/ethnic categories, high school requirements, number of students receiving loans and grants, and a complete ranking of the importance of various academic and non-academic factors in the decision-making process.

Admissions at Minerva University are entirely merit-based, redefining the concept of elite education. Since merit is distributed across geography, socioeconomic status, race, religion, and other factors, Minerva's student body shows exemplary diversity [67]. Additionally, Minerva looks for "spikey" kids—students who have some special talent or spike in their distribution of abilities. Currently the most selective school in the US, Minerva's long-term mission is to transform all of education, from high school to vocational school, two-year colleges, as well as top universities. To that end, Minerva partnered with Paul Quinn College, the United Negro College Fund, the Thurgood Marshall Fund, a secondary school and others to bring their ideas to a broader array of students, parents, and administrators.

At Paul Quinn College, admissions are test-optional and transparent: their website clearly lists the evaluation criteria used for each required component of the application. They clearly explain the rationale for their test-optional policy by underscoring the historical inequalities in standardized testing for students from lower socioeconomic backgrounds, Black and Brown students, and First-Generation students. Students who need to discontinue their studies for any reason can be readmitted if they were not permanently dismissed (a feature that first gained prominence in elite schools such as Stanford and MIT).

3.2.7. Geographic Accessibility

We sought to identify schools that removed geographic barriers to higher education by offering programs online, hybrid instruction, and/or multiple campuses. For example, the Urban Scholars Program at Paul Quinn College is an accelerated bachelor's degree program designed to be completed in 36 months in partnership with Minerva Project, from which Minerva University licensed its curriculum, pedagogical methodologies, and technology. The program is offered entirely online at an even lower cost than in-person degree programs.

Students at First Nations University can access its range of programs at any of its three campuses. The university also offers web-based classes, distance education, and community-based programs. These flexible learning environments allow students to complete their studies from locations near or within their home communities. For many, this allows connection to family and community while also providing a quality education.

By offering both synchronous and asynchronous online programs in addition to traditional on-campus programs, ASU reaches a wide population of students. They have several initiatives that are aimed at increasing global access to higher education. ASU is increasing availability of their knowledge resources through programs such as "Earned Admission," freshman-level courses are digitized and accessible through edX. Enrollees begin courses immediately, bypassing transcripts, applications, and fees, and then opt to pay for academic credit. As of 2019, at least 230,000 students from over 180 countries have participated [68].

Hampshire College is part of the Five College Consortium in western Massachusetts that also includes Amherst College, Mount Holyoke College, Smith College, and UMass Amherst. Students enrolled at each of the involved institutions can take courses at any of the participating campuses, participate in shared academic programs, use pooled library resources (one of the largest libraries in the country, with more than 9 million books), and have access to free bus transportation to any of the five colleges.

3.2.8. Attrition and Inequities in Retention

Paul Quinn College's graduation rate was 1% in 2007. As of 2019, the graduation rate had risen to 40% and the retention rate for first time students was 57% [69]. Their work college model alleviated many of the pressures caused by the cost of education. The college also works hard to help students adjust and feel comfortable in their first year. In the summer, students can complete a six-week program introducing them to life at the college, creating a supportive environment.

Bryn Mawr College's retention rate is 92%. In students' first year, several required components are aimed at increasing student success: all students take a first-year liberal arts seminar focused on reading and writing skills, participate in a one-year orientation program, and a ten-week wellness program.

At Arizona State University, traditional students have access to the First-Year Success Center and ASU Online students are each appointed a success coach. Success coaches help students stay on track towards earning their degree. The First-Year Success Center practices holistic coaching, where students are encouraged to identify personal strengths and weaknesses, positioning them to better succeed in their personal, academic, and work lives. Additionally, educators and course designers provide individualized learning platforms that help with student retention. ASU has more than 175 online degree and certificate programs that serve more than 46,000 undergraduate and graduate students and learners in Arizona and around the world. Students who were unsuccessful in traditional settings are now succeeding with this model [68].

Alverno College's "Accelerate Program" allows students to earn a bachelor's degree in 3 years or less while focusing on their career. Through Experiential Learning Modules, the Accelerate Program veers away from the traditional university path and allows for more specific, professional knowledge that aims to keep students focused and on-track. Coaches are faculty who have experience teaching adults. The faculty serve as a first point of contact, who can also provide one-on-one coaching, to work towards successful research-backed outcomes.

3.2.9. Technological Infrastructure

Technology is an equalizing platform that potentially puts students on the same footing. Using technology in live, synchronous seminars provides a front row seat for every student and an easy way for instructors to monitor student engagement. We found that technology-driven approaches are necessary but not sufficient in revolutionizing learning; a learner-centered approach must be used in concert with these new technologies [70,71]. The *technological infrastructure* does not exclusively refer to fast internet service, 100% Wi-Fi coverage on campus, or receipt of a laptop or tablet upon enrolment. We are referring to the use of technology to drive pedagogical improvement, for example, access to remote laboratories, databases, and archives, or various innovations that help students who face obstacles such as learning disabilities, mobility challenges, and sensory impairments.

UTS is one of Australia's leading universities of technology. It is known for fusing innovation, creativity, and technology in its industry-focused teaching and research to create consistent, engaging student experiences that seamlessly integrate interactive learning technologies. Students collaborate and work in teams together online, participate in interactive classes, and become better writers through feedback on their academic and reflective writing using their web-based tool AcaWriter. UTS Tech Lab is a multidisciplinary research facility that provides access to cutting-edge equipment, funding opportunities, and world-class research talent to support industry-led partnerships, while UTS Startups is the largest community of student-led start-ups in Australia.

Minerva University, in partnership with Minerva Project, developed a first-of-its-kind educational platform, called the Forum. Previously, online classrooms often resembled traditional lecture halls, preventing students from actively engaging with the material and each other. The Forum was designed to bring research from the science of learning

to the virtual classroom in ways that counter these limitations. The Forum was specifically structured around Minerva's curriculum to help students quickly think through new concepts, make and use associations, and effectively retain new knowledge. The seminar-style, small group platform features presentations, polls, and debates to keep students engaged. Every student can always be seen across the top of the screen, so there is no way to hide in the back of class.

At Arizona State University, technological platforms are used to leverage science of learning methods. ASU's personalized learning method recognizes that there are certain things everyone should know, but how those things are learned needs to be personalized and individualized around the way someone learns. Through adaptive learning platforms, ASU is improving outcomes in math, physics, chemistry, and economics [72]. The technology used at ASU, although innovative, plays an even bigger role in analytics than in delivering course content. Data and analytical tools are routinely used to make poorly performing departments aware of their downfalls. ASU's technological individualization of learning serves as an example of how technology can combat learning inequities in higher education.

4. Discussion

In this era of increased polarization, one thing everyone seems to agree on is that higher education is in crisis. We sought to turn this generalized sentiment into actionable specifics. Through our literature search we identified nine barriers to widely accessible, high-quality, affordable postsecondary education. These fell into two broad categories: (1) reasons students do not receive university degrees (access and cost) and (2) reasons students are unprepared for the real world after graduation (quality and relevance).

Previous systematic reviews have tended to examine problems one at a time. For example, Ibrahim et al. [73] examined mental health problems in university students. We also consider mental health, but within a wider context of overall university life. Collini [74] takes a largely philosophical and anecdotal to the purpose of Universities. We take an empirical approach, highlighting the disconnect between university pedagogy and career-relevant skills.

Feagin [75] addresses continuing racial barriers in higher education for Black students; we address discrimination in accessibility to higher education in a larger range of underrepresented communities, including Indigenous individuals. While Lin [76] focused on gender inequalities, Pidgeon [77] explores the challenges IHEs face in creating meaningful spaces for Indigenous peoples within predominately Euro-Western defined and ascribed structures, academic disciplines, policies, and practices. Bowen [78] and Yuan [79] rethink IHE in terms of digital and online content, while Weinstein [80] calls for teaching instructors the science of learning. Our novel contribution is considering the combination of all these factors together with infrastructure, technology, and pedagogy, among others, in proposing how to raise the bar for successful higher education. Few studies have addressed the significant effects these entwining issues have on students, institutions, and society, in combination. This knowledge synthesis project explored the myriad ways in which higher education is failing to serve the needs of both students and employers.

Another novel contribution is our work to identify IHEs that are modeling best practices. Emms, Laczik, and Dabbous [81] described five forward-looking higher education case studies (four from across the UK and one from the US). Clark [82] described five proactive European universities (nominated by colleagues as "somewhat innovative or entrepreneurial"), then ascertained, case by case, how they had gone about transforming themselves, and proposed five distinguishable pathways of transformation. Similarly, we highlight the success of 12 reimagined IHEs, ultimately finding them to be in Canada, the US, and Australia (although Minerva's rotation model brings students to San Francisco, Seoul, Hyderabad, Berlin, Buenos Aires, London, and Taipei). Unlike previous authors, our selection of IHEs was based on a structured literature search of current issues and trends in the higher education landscape. The 12 IHEs we identified through careful study

are succeeding along the dimensions that the research literature indicates are critical to removing barriers and creating value for all stakeholders. No single IHE received a perfect score on our rubric, yet taken together, they can light the way to further meaningful change. (UTS received a score of 100, but the value for Financial Accessibility was missing and therefore imputed based on values for all other factors; for a brief descriptive summary of each IHE, see SM.)

The closest publication we know of to what we have carried out here is the 2017 book by Kosslyn and Nelson, founders of Minerva University, *Building The Intentional University* [13]. That book charts Minerva's development and efforts to prepare students for jobs in an ever-changing digital and global economy [83]. The authors present a radically different, evidence-based, and innovative picture of what higher education can be, offering a playbook for how to better structure classroom sessions. By synthesizing previous research in the shortcomings of higher education and exploring a dozen success stories, we have been able to pioneer a holistic picture of both failure and success for IHEs in the twenty-first century. The educational institutions reviewed here each display several novel or unique educational practices or structures, regardless of existing, conventional rankings.

4.1. Implications for Policy, Practice, and Research

The theoretical and practical implications of this work converge in a single statement: we must be bold enough to reimagine education from the ground up, to fight the inertia of "this is the way we have always done it." We conclude that the old model does not, and cannot, overcome the challenges presented by the 21st century digital, global economy. To ensure students are prepared for life and work after graduation, IHEs should use the science of learning in the classroom and curricular development. As new technologies emerge, IHEs must consider the ways in which they can innovate and add benefit to their instructional methods. For example, there is growing evidence that experiential learning via VR-based technology may be effective, as the enhanced vividness and interactivity in a virtual environment may enhance both learning and retention [84]. Simple tools such as student-response devices ("clickers") encourage active student participation with anonymity, allowing students the freedom to make mistakes without fear of embarrassment; they also provide immediate feedback in large lecture classrooms, thus improving student-instructor interaction and encouraging reflection [71,85].

We found inaccessibility (in various forms) prevents many students from obtaining university degrees. University application processes are opaque and unnecessarily complicated. Even for those with the adequate resources and skills to navigate this process and gain admission, attending university is expensive. Students from rural areas and remote communities face additional geographical challenges. Solutions that address these problems include allowing students to remain in their communities and integrate their local works into the curriculum, partnerships with international institutions, exchange programs, and branch campuses.

While online education can overcome some barriers, unequal access to digital platforms poses another major issue [86]. Improving internet infrastructure is essential. Throughout the COVID-19 pandemic, internet meeting spaces took priority over physical spaces [87], exposing internet access inequities. This created particular hardships for economically disadvantaged and underrepresented minorities, especially Indigenous communities [88–90]. These obstacles, along with other historic and systemic barriers, also contribute to inequities in attrition and retention. Universities must work within the framework of Indigenous reconciliation, consulting meaningfully with Indigenous peoples and other underrepresented groups to ensure inclusion and authenticity. To do otherwise is to perpetuate colonialism by assuming that current leadership always "knows what is best" for members of underrepresented groups.

We also concluded that poor mental health outcomes are often related to underlying inequities in background and experience, making some students less prepared to deal

with the same challenges as their peers. An implication is that equitable education requires schools to teach self-care skills and offer mental health resources to ensure every student has those resources necessary to succeed [91]. When calculating how much time students will spend per credit unit to maintain a full schedule, administrators should allow time for participation in extracurricular activities, exercise, and down time to improve mental health and learning outcomes.

Several models that use mental health and wellness as a framework in higher education have been proposed and implemented by IHEs. However, further research is needed to assess the efficacy of these solutions. Course design and features such as social connection, participation, and flexibility have been shown to have an effect on wellness [37]. Based on these findings, and drawing from the wellness and course design literature, Dyjur et al. [92] proposed a framework for designing courses around mental health and wellness. Simon Fraser University in BC launched an initiative called “Well-being in Learning Environments.” (While the program is based on peer-reviewed research, its own effectiveness has not been tested to our knowledge.)

Alignment between various course elements is necessary to achieve a specific course’s goals [13,93]. We feel that faculty members must set aside their roles as simply lecturers and instead become the designers of learning environments that actively align course content, assessment, and delivery in an integrated and systematic way [94,95]. One implication is that course material and concepts should be introduced coherently across courses, affording students the opportunity to see a given issue or underlying principle from different disciplinary perspectives [13].

We also conclude that higher education must veer away from funneling students into more narrow disciplinary paths, robbing them of the opportunity to discover their values, assets, and interests. Open readmissions policies that allow students to take time off, without stigmatizing them, encourage students to explore other ways of learning. Many elite schools allow for open-ended stop-outs or a year abroad, but it is often the students at non-elite schools who need this most.

5. Conclusions

The purpose of this study was to characterize higher education practice in Canada and internationally, and to identify existing and emerging best practices that can allow for wide access to high-quality postsecondary education at low cost. We investigated key characteristics and weaknesses of higher education; promising methods, tools, and approaches commonly used by reimagined models; and highlighted lessons, opportunities, and challenges, as well as critical knowledge gaps in research and practice.

We identify several limitations with our work. Our mandate was to report on best practices for higher education. We did not attempt to rank institutions based on conventional outcome measures, such as mean salary upon graduation, proportion of students who are admitted to graduate programs, mental health, or even life satisfaction. We did so because data are often unreliable, inconsistent or unavailable, and because there is no standardize set of metrics that IHEs must report. It was beyond the scope of this review to address the role of Canadian and U.S. culture in contributing to systemic biases that lead to discrimination against people based on weight, gender, sexual identity, hearing and visual impairment, learning disabilities, and a host of other characteristics and qualities that present barriers to success for these individuals. Finally, we only looked at success stories. What might we learn if we looked at schools or programs or technologies that attempted to revolutionize higher education and failed? On the opposite end, we acknowledge there might be schools doing great things that are flying under the radar.

Despite these limitations, based on our review of 12 exemplary schools, 68 academic papers, and 36 other documents, we identified nine limitations to widely accessible, high-quality, affordable postsecondary education and recommend the corresponding best practices:

1. **Unequal financial access.** University administrators must work with government and non-government funders to reduce costs and debt, and/or offer paid work opportunities on campus and through partner organizations that are flexible and feasible in light of academic schedules and demands.
2. **Unequal geographic access.** Reimagined models can improve accessibility by offering parallel in-person, online, and hybrid programs with flexible scheduling options.
3. **Lack of admissions transparency.** Admissions processes should be standardized, transparent, and equitable.
4. **Attrition and inequities in retention.** We recommend that schools put programs in place to help first-year students succeed, such as individualized coaching, writing classes, and first-year seminars. Following best practices for other barriers listed here will also improve student retention.
5. **Student health and well-being.** Most campus health and well-being programs and policies focus on responding to mental health crises, rather than preventing such emergencies in the first place. Universities should take measures to reduce environmental stressors and promote protective factors in the university environment, adopting a proactive approach to how they are structured, their strategic goals, policies and practices, and their curriculum development and pedagogical framework to address the many challenges we know students and employees face.
6. **Difficulties transforming higher education in colonial contexts.** Efforts to hire and recruit more Indigenous faculty, enroll more Indigenous students, incorporate accurate Indigenous content into existing courses or create entirely new ones, and strengthen relationships with local Indigenous communities remain tokenistic and superficial. Reimagining higher education ought to be approached within the frame of genuine reconciliation, in respectful, welcoming consultation with Indigenous groups and with the aim of transforming past damages into new opportunity and growth.
7. **Weak utilization of technology.** Institutions that take advantage of technological (and pedagogical) innovations are best positioned to prepare students for skills and work in the digital economy. Technology can and should play a role in analytics, such as tracking engagement and learning in real time. Technology can and should be leveraged to provide access to high-quality and affordable learning opportunities, course content, and materials. However, new technologies are not going to transform how we learn, and must play a secondary or supportive role to pedagogical innovations.
8. **Outmoded teaching methods and content.** Institutions of higher education are continually challenged by the changing nature of knowledge. Educators must stay up to date on the newest research, and pedagogical and technological innovations across disciplines. The science of learning offers practices for educational institutions to put in place to foster a deep engagement with varying forms of knowledge.
9. **Graduates lack preparedness.** IHEs should provide students supportive relationships with professors and mentors, and deep learning and experiential opportunities, such as internships and long-term projects that mimic real work environments. These graduates will be more likely to be engaged in their work, more productive, more profitable, less likely to be absent, and have lower turnover and fewer safety incidents.

We also recommend several areas for future research. What might be the most effective way to train professors in applying science of learning principles and active learning? How can we best motivate entrenched institutions to adopt these practices? How can we best train students to work co-operatively with one another, to develop tolerance for viewpoints and experiences that may differ from their own, and to engage in civil discourse that is productive and not polarizing? More research remains on the measures that universities could take to reduce environmental stressors and promote protective factors in the university environment. Several models for improving health and well-being have

been proposed but research needs to be conducted to establish the efficacy of these models. Further research is needed on the effects of the block model on learning and long-term retention. Indeed, all new practices and policies must include impartial research investigating the effect of these strategies on student outcomes, access, quality, and cost. What do employers want from college graduates? We lack comprehensive and detailed studies on this. (Many employers do not know themselves.) We recommend studies that track various outcome measures for each of the above recommendations.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Figure S1: Flowchart of structured literature search; Table S1: Evaluation of 33 IHEs; Table S2: Rubric for evaluating IHEs; Table S3: IHEs scored and ranked by weighted evaluation factors; Figure S2: Overview of findings.

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