Socially Good AI Contributions for the Implementation of Sustainable Development in Mountain Communities Through an Inclusive Student-Engaged Learning Model

Tyler Lance Jaynes, Baktybek Abdrisaev, and Linda MacDonald Glenn

Abstract AI is increasingly becoming based upon Internet-dependent systems to handle the massive amounts of data it requires to function effectively regardless of the availability of stable Internet connectivity in every affected community. As such, sustainable development (SD) for rural and mountain communities will require more than just equitable access to broadband Internet connection. It must also include a thorough means whereby to ensure that affected communities gain the education and tools necessary to engage inclusively with new technological advances, whether they be focused on machine learning algorithms or community infrastructure, as they will be increasingly dependent upon the automational capabilities of AI. In this essay, an exploration will be conducted into the means whereby student-engaged learning (SEL) can effectively be utilized to provide targeted, inclusive education to rural and mountain communities regarding the implications of AI for SD.

T. L. Jaynes (✉)
Alden March Bioethics Institute at Albany Medical College, Albany, NY, USA

Department of Philosophy & Humanities, College of Humanities and Social Sciences, Utah Valley University, Orem, UT, USA
e-mail: jaynest@amc.edu

B. Abdrisaev
Department of History and Political Science, College of Humanities and Social Sciences, Utah Valley University, Orem, UT, USA
e-mail: abdrisba@uvu.edu

L. M. Glenn
Alden March Bioethics Institute at Albany Medical College, Albany, NY, USA

Center for Applied Values and Ethics in Advanced Technologies (CAVEAT), Crown College, University of California Santa Cruz, Santa Cruz, CA, USA
e-mail: lmglenn@ucsc.edu

F. Mazzi, L. Floridi (eds.), *The Ethics of Artificial Intelligence for the Sustainable Development Goals*, Philosophical Studies Series 152,
https://doi.org/10.1007/978-3-031-21147-8_15

Keywords Artificial intelligence · Bioethics · Inclusive student-engaged learning · Mountain communities · Non-traditional students · Sustainable development goals

1 Introduction

"Earth and sky, woods and fields, lakes and rivers, the mountain and the sea, are excellent schoolmasters, and teach of us more than we can ever learn from books" (Lubbock 1894, 70). "For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled" (Feynman 1988, 237). These two quotes encapsulate the spirit of this collaborative book, in the opinion of these authors, and emphasize the importance of a holistic perspective which recognizes that humanity is part of a larger interconnected system that creates and sustains our civic obligations to one another. Cognizance of this integration requires an incorporation of the natural landscape into our considerations for the development and use of new technologies because its recognition may seem trivial in the grander scheme of things. Socially good values should, therefore, include the environments wherein communities reside and the history that is attached to those immortal and evolving vistas that define their landscape. So too then are considerations for our natural world vital to a broader conversation on the means whereby artificial intelligence (AI) can play a role in the global attainment of the United Nations (UN) 2030 Agenda for Sustainable Development (hereafter "the 2030 Agenda"), as reflected in the 17 UN Sustainable Development Goals (SDGs) described in their 2015 resolution (UN General Assembly [UN GA] 2015).

In this chapter, we contend that community-based education on and with AI positively impacts the ability of mountain communities to achieve their attainment of the 2030 Agenda's Goals as a population that is uniquely adapted to harsh natural conditions (as defined by high elevations and microclimate generation). We will defend this stance with the use case of inclusive educational programs involving representatives of mountain communities—a subset of rural communities, as is generally understood—and how their success has led to a more robust response to the 2030 Agenda at home and abroad. Programs, when implemented under frameworks similar to those discussed herein, create learning conditions that satisfy the ethical requirements lauded by researchers internationally for socially good AI (Reidl 2019; Shneiderman 2020; Li 2021) in the eyes of these authors. They furthermore ensure that the outcomes of engaged and inclusive student learning, specific to the practical implementation of IoT and AI usage and development, are based on human-centered and socially good principles.

As a note, the implementation of similar programs will require more than the assurance of equitable and stable access to broadband Internet connection. Any replicated effort must also ensure that affected communities will inclusively engage with new technological advances through effective and affordable education and resources. These stipulations are necessary to iterate because of the volatile nature of AI development, which will inevitably result in increased communal dependence

on advanced systems' autonomous capabilities and a greater range of "smart" and interoperable devices (Jaynes 2021a, b, d) by communities that have greater familiarity and access to the tools driving these innovations.

2 History and Background

As other contributors to this volume argue, AI is increasingly becoming an area of focus for effective goal attainment in the 2030 Agenda because of the efficiency that results from its usage. Since AI is dependent upon the Internet of Things (IoT) to handle the massive amounts of data it requires to function effectively, one of the major ethical issues that arise for rural and mountain communities is reliable Internet access. Urban communities with fairly stable connectivity to IoT are thriving, but those who inhabit regions which are predominantly rural worldwide are being left behind (Durish 2020). In addition to a lack of access and connectivity instability (Su 2020, 58–59), the populations in many of these areas have yet to gain a basic understanding of how IoT is so drastically changing workflows and information distribution, among other topics, due to a lack of connections and training (Durish 2020; France-Presse 2021). If better-connected communities continue to neglect these populations, and the reported 37% of the human population that has never had the Internet (France-Presse 2021)—either deliberately or unintentionally—existing inequities and inequalities will only continue to expand exponentially as AI and IoT-based technologies gain in ability and sophistication.

A lack of awareness is significant because of the divides that exist from economic underdevelopment, unstable or unreliable access to IoT, and a dearth of proper education between areas with access and those with limited or no access. One can hardly be expected to attain an understanding of how a tool works if one's access to that tool is restricted or wholly out of reach because of the natural features that make up their place of residence. The digital divide is not growing simply because of Internet connectivity issues—many communities (mountainous and rural) and their residents do not, or cannot, have access to these information technology (IT) and information system (IS) architectures that maintain AI's effectiveness (Bissell 2004; Brescia and Daily 2007; Pick et al. 2015; Bürgin and Mayer 2020; Iqbal et al. 2021). IT and IS have been able to contribute to the economic development in mountainous areas through telemedicine, distance education, tourism promotion, and targeted marketing of local products when the architectures and infrastructures are provided (Brescia and Daily 2007; Price 2013). Yet the advance of modern communication technologies—including AI and the IT and IS supporting it—into the most remote parts of the mountainous world deepens the alienation of local communities present there from the national polity in part because assumptions are made regarding the "ease" whereby IoT operating knowledge is acquired (Starr 2004; Bürgin and Mayer 2020; Iqbal et al. 2021).

Other factors play into the struggle to grant IoT access to every member of the human species, such as naturally occurring dead zones in mountain ranges and

deserts that persist even with targeted cell tower installation, but none are as complex as the fundamental understanding of safe IoT usage and the rights held by individuals utilizing IoT-based and AI services. The reality remains that individuals are often at the mercy of corporations that often self-determine what these rights may be (as can be publicly seen in the lawsuits being levied against Google and its parent company, Apple, and the corporation formerly known as Facebook). Therefore, IoT and AI use based on widely accepted principles of "social good" for communities struggling to attain stable access presents an important priority for the implementation of the 2030 Agenda. Marr (2021) outlines the main requirements for an ethical application of AI within any institution as raising awareness through education, transparency, inclusiveness, and following established rules (to name a few); though similar statements have been iterated elsewhere (Reidl 2019; Shneiderman 2020; Li 2021).

3 Why Focus on Sustainable Development in Mountains?

Where mountainous communities are struggling to meet the Goals set out by the 2030 Agenda because of the unique circumstances generated by the land and natural conditions they live within (UN GA 2019), a targeted focus on these populations is absolutely necessary. As stated in the UN Secretary General report to the General Assembly from July 22, 2019, approximately 27% of the world's landmass is made up by mountainous regions, and 14% of the human population resides in these areas. Furthermore, the report states that:

> …mountains are key ecosystems that provide humanity with essential goods and services such as water, food, biodiversity and energy. However, mountain ecosystems are vulnerable to natural disasters, climate-related events and unsustainable resource use…Identifying new and sustainable livelihood opportunities and adopting practices that build the resilience of people and environments in mountain areas is an urgent requirement for achieving the Sustainable Development Goals. (UN GA 2019, 1)

A warming climate have dramatic impacts for regional water ecosystems, even if they are not actively perceived due to changes in regional atmospheric moisture capture and gradual adjustments to regional and international air currents. These gradual—albeit accelerated—changes result from the raised ambient temperature of natural features and systems (e.g., canyons, forests, lakes, seas, valley basins), or the impact of wind-channeling structures in flatland areas (e.g., dams, roadside windbreaks, sea walls, wind turbines, skyscrapers). These factors are leading to decreases in terminal water body size, drastic changes in water body nutrient density that have a chain effect on local biospheres, and fluctuations in the soil's ability to retain water—which has the compound effect of increasing the damage of landslides, impacting the ability of biomass to resist burning via growth in dead biomass and loss of natural defense mechanisms, and the prevention of rainfall from being fed into local water tables to supplement local vegetation (Wagner 2007; Suzuki 2011; Baxter and Butler 2020; Chen et al. 2020; Jara et al. 2021).

Beyond biosphere concerns, which include the reality that higher elevations experience warming at different rates than lower elevation areas (Wilkins et al. 2021), there are related concerns that a loss of terminal lake volume will contribute to declines in population health from those at the receiving end of dust storms that pass through dry lake and riverbeds (Baxter and Butler 2020; Romero 2021). This, of course, includes the impacts local ecosystems will face with the lack of moisture being provided by these terminal water bodies that may be highly region specific, as is the case for the Great Salt Lake and Aral Sea—among others—which directly impacts all communities that source their water resources from the tributaries feeding these terminal water bodies in a myriad of ways. Advances in climate monitoring via AI would greatly aid local communities relying on the streams, tributaries, and rivers feeding these terminal lake bodies in their efforts to allocate water rights and conserve water usage while balancing the needs of tribal populations, "immigrant" populations, and the agriculture that sustains their economies, but many projects emphasize on the needs of metropolitan areas or non-mountainous rural locales which are variably impoverished (Chien et al. 2012; Thapa and Sæbø 2014; Pick et al. 2015; Kumagai 2020).

As a result, mountain communities worldwide experience inordinate challenges with implementations of the SDGs. A recent study published by the Food and Agriculture Organization of the United Nations (FAO) adds further evidence to this claim. In mountainous regions of developing countries, issues of food insecurity, social isolation, environmental degradation, exposure to the risk of disasters and to the impacts of climate change, and limited access to basic services—especially in rural areas—are still prevalent and, under some circumstances, are increasing (Romeo et al. 2020).

3.1 Mountain-Focused IT and IS Specialization Initiatives

Globally, many mountain communities have been successfully bringing wealth into their locals through targeted specialization in IT and IS sectors—Silicon Valley being the primary example of this phenomenon in the USA. Other major technology centers worldwide can be found in the mountainous communities of Auckland, Bangalore (*Bengaluru*), Bogotá, Cape Town (*Kaapstad*, *iKapa*), Dublin, Kigali, Kuala Lumpur, Madrid, Mexico City, Munich (*München*), Nairobi, Salt Lake City, Santiago, São Paulo, Sydney, Taipei, Tokyo (*Tōkyō-to*, including *Tama-chihō*, *Izu-shotō*, and *Ogasawara-shichō*), and Vancouver (Giuliani and Ajadi 2019; Leskin 2019; López 2020).[1] Notwithstanding that cities in the Caribbean only start

[1] Data also collected from https://www.startupblink.com/ (accessed November 29, 2021) with results selected from the top 300 cities to provide a more international framing of "technology start-up-friendly" environments in mountainous regions. Respective rankings were as follows on the access date: Bangalore (10), Tokyo (15), São Paulo (20), Sydney (36), Munich (38), Taipei (41), Vancouver (42), Madrid (45), Mexico City (50), Dublin (51), Salt Lake City (55), Santiago

appearing in lower ranks on account of data gaps,[2] the trend remains that "tech-friendly" environments are primarily found in those areas with greater economic investment either towards direct start-up development, foreign-worker relocation, or literacy training for employees residing beyond a corporation's national borders (Chien et al. 2012; Thapa and Sæbø 2014; Pick et al. 2015; Kumagai 2020).

The concern here is that many of these hubs remain in the 136 nations (per the UN's list of recognized nations) that have yet to adopt governance frameworks or principles to handle AI. As of May 11, 2021, 32 countries and the EU have established initiatives to govern, legislate, and research means to responsibly handle the development, implementation, use, and termination of AI systems per the Organisation for Economic Co-operation and Development (OECD) AI initiative (2021).[3] This then implies that those nations which are still developing plans, or organizing funds to sponsor development initiatives, will inevitably have to ensure that their policies fall in line with those that are already established by nations that, by some accounts, are "preemptive." Realistically, these early-adopting nations are wealthy enough to invest in AI research that continues to push the "state-of-the-art" forward, and therefore force a baseline to be set ahead of international collaboration efforts that can be discussed or pursued. Assuming that this comes to pass, as it has with other related initiatives to govern the use of new technologies, there is a non-zero chance that neo-colonialist mentalities will vie for supremacy with de-colonialist frameworks that have been adopted by various nations through governmental reforms over the past century—thereby generating a hostile environment that makes international standardization efforts nigh impossible to pursue and transnationally compliant, socially good AI an unattainable service.

The recent motion by the UN Educational, Scientific and Cultural Organization (UNESCO) to adopt the "first global ethical framework for the use of [AI]" (Gaubert 2021) is a positive step forward to gain global consensus on how this group of technologies should be managed (UNESCO 2021). Yet similar issues exist in that UNESCO is not a body with universal legal authority. That is not to say that their recommendations will go unheard by the international community, but that a universal adoption of the draft recommendations will be difficult to implement for those nations that struggle to keep up with the myriad of ways AI is evolving. These uses include a great deal more than traditional data mining—which is easier to adapt towards for those in the IT and IS industries currently—and will likely include the use of AI in extended reality technologies that support the Metaverse (Jaynes 2021a, d), assistive bionic prosthetics that may challenge our current notions of legal

(70), Bogotá (77), Kuala Lumpur (80), Auckland (105), Nairobi (136), Cape Town (145), and Kigali (265).

[2] San Juan, Puerto Rico (347), is the first example, followed by Kingston, Jamaica (685), and Montego Bay, Jamaica (958), per the above site rankings.

[3] EU member states were not counted twice, though many have chartered independent actions to regulate AI before the EU Parliament's actions to develop a unified framework in April 2021. *See* https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1623335154975&uri=CELEX%3A52021PC0206

personhood and citizenship (Glenn 2018; Jaynes 2021b, c), and other "advanced" applications related to high technology. These will not only challenge our interpretation of what "ablement" entails for labor purposes, but also what fundamental rights should be extended to already able-bodied individuals and the limits of equality and inclusiveness (Glenn 2012; Jaynes 2021b, c). While not presently a great focus by the international community on account of the supporting infrastructural needs of these other applications, it cannot be denied that considerations of this nature are part of a socially good application of AI and should therefore be examined as these infrastructural needs are developed and deployed.

Furthermore, it should be stated that many mountainous communities are often ill-equipped to train AI engineers in environments similar to those that they will be exposed to in the workplace. High-tech start-ups are free to structure their work environments as their budgets and office space allow because of how new their institution is relative to the community they may inhabit. Universities, on the other hand, commonly have to retrofit buildings that they have housed for decades on budgets that are much more limited, or otherwise constrained by local building code restrictions that did not account for accelerated advances in communications technologies. Part of this is the direct result of the difficulties in drilling for fiber-optic connections in mountainous and island regions (Canevaro 2018; Engel-Smith 2021) and naturally occurring cell phone and Wi-Fi dead zones, but is exacerbated by the fact that communities living on tectonic fault lines are at threat to seismic and volcanic activity (outside of other potential issues like hurricanes and tsunamis). As such, these regions require particular consideration when discussing the development of AI regulation because they may not have technologically savvy populations that can articulate the needs of their communities.

3.2 Contributions of Education to the Implementation of the Agenda Based on Socially Good Principles

The State of Utah, along with 17 states in the USA, recently adopted legislation considering benefits and challenges of AI. What distinguished Utah S.B. 96 from those adopted in other states is that it "creates a deep technology talent initiative within higher education" (Utah State Legislature 2020). Although the University of Utah was able to serve as one of the earliest nodes to public Internet services in the USA (Tanner 2021), the recent push to promote the Silicon Slopes initiative (Pagano 2017; Campbell 2018; Clark 2020) has been rapidly displaying the inability of local universities to keep up with the demand for jobs that handle AI and socially good AI analysis (O'Toole 2021). In truth, many Utah campuses have been expanding in the past decade like many others across the nation. Yet the historical trend of Utah being a "labor export" state has resulted in an educational environment where expansions have been restricted to professions popular in other parts of the country, sports (to maintain PAC-12 status), or medicine (specifically expansions of Intermountain

Healthcare-related facilities) while being unable to address industries that have less of an impact on Utah's economy even as they saw rapid expansion (Campbell 2018; Tanner 2021).

The goal of reinvigorating AI-related education is not limited to the University of Utah or Utah Valley University (UVU). They include other schools serving mountainous communities, such as the University of California - Santa Cruz with their efforts to establish the Center for Applied Values and Ethics in Advanced Technologies (CAVEAT) and the Kyrgyz School of Data (among hundreds of similar initiatives). The challenge often remains, however, in being able to employ these newly trained workers in local communities when non-mountainous cities or nations develop favorable policies or work environments that cannot be adequately matched (Meisenzahl 2019; Rose 2020; Rosalsky 2021). Hence, the rationale for developing Utah S.B. 96 was to create a new pathway for local businesses and universities to secure emerging talent through direct-hire programs via educational training and other related projects (Utah State Legislature 2020).

The cooperation between UVU, located in Orem, Utah, and the International University of Kyrgyzstan (IUK) from Bishkek, the Kyrgyz Republic, presents an example of a joint, human-centered educational program to implement the 2030 Agenda with focus on sustainable mountain development (SMD) based on socially good principles (Reidl 2019; Shneiderman 2020; Li 2021), which is made apparent annually through a joint implementation of the UN GA resolution "International Year of Mountains, 2002" (UN GA 2003; Price and Kohler 2013). Historically, the program arose from a 1999 partnership between developed and developing mountain communities from the State of Utah and the Kyrgyz Republic, respectively (Abdrisaev et al. 2020a, b).

This partnership allowed for Utahns to share with their Kyrgyz partners unique local experiences in building one of the most successful economic models in the USA. Special emphasis was made on the role and contribution of educational institutions like UVU to that model, including with IoT use (Abdrisaev et al. 2005; Abdrisaev et al. 2011). As a next step in this direction and implementation of the 2002 UN GA resolution recommendation, UVU joined the FAO Mountain Partnership (MP) in 2006 as the first academic institution in North America (UN GA 2003, FAO MP n.d.-a). In turn, the Kyrgyz side provided to their Utahn partners their own knowledge and networking opportunities to pursue SMD at the UN—in particular by being one of the main initiators of the IYM celebration under the UN GA resolution (Price 2004, 3) and on a bilateral basis through the UVU faculty and students' involvement in the initiatives and programs of the Embassy of the Kyrgyz Republic to the USA.

For its part, UVU was established in 1941 as a trade school to serve the needs of local communities along the Wasatch Mountain range in the Rocky Mountain region. Through its dual-mission education, UVU today serves as an integrated community college and regional teaching university ("Vision 2030" 2020). 88% of UVU students are Utah residents (UVU Institutional Research Department 2019), and 80% of them are employed as they pursue their education whether locally or through tele-work that keeps them in-state (Whittney 2020). In line with the trend

of the student population in the USA and Europe (Hauschildt 2015), 30% of the UVU student body is represented by non-traditional or adult students (Ho-Wisniewski 2020). This category of students is usually in the range of 25 and 75 years of age while enhancing or changing careers. The majority of them also work full or part time and may support families or relatives (Pelletier 2010; Tuminez 2020; Whittney 2020). Adult students are designated as learners who experience social or educational disadvantages and may have interests and values which differ from their traditional peers (Wyatt 2011).

The joint partnership between UVU and the IUK within the FAO MP has created a means for both institutions to strengthen the socially good nature of their activities by involving faculty and students in several different ways across their respective campuses. For UVU's part, their involvement matches the institutional mission of the school (UVU 2020) while addressing many livelihood-related aspects of the local population. By engaging with students and faculty from the IUK, the UVU community has been able to share local experiences in SMD and related policy through UN-sanctioned activities that help to distinguish the unique cultural differences that exist between the Kyrgyz and Utahn populations.

4 Goals and Targets Related to SMD

Of particular note, the 2030 Agenda designated Goal Targets 6.6 ([to]…protect and restore water-related ecosystems), 15.1 (ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems), and 15.5 (reduce the degradation of natural habitats, halt the loss of biodiversity and…protect and prevent the extinction of threatened species) for SMD within their total framework of 17 SDGs and 169 Targets (UN GA 2015). The implementation of SMD globally is coordinated by the FAO MP, which has been in operation since 2003 as a subunit of the organization (FAO MP n.d.-a), for the express purpose of ensuring that the significance mountainous regions hold for global ecosystems and sustainable living are neither neglected nor forgotten. The UN GA resolution proclaiming 2002 the International Year of Mountains (IYM) further recommends that all stakeholders worldwide interested in the promotion of SMD to join the FAO MP (UN GA 2003). As a result of these targeted, coordinated efforts, the FAO MP now has more than 400 members, including intergovernmental organizations, mountain states, academic institutions, non-governmental entities, and others that do not necessarily exist in rural or mountainous regions (FAO MP n.d.-a; Abdrisaev et al. 2020a, b).

Beyond the Targets designated for SMD, we cannot ignore the importance SMD holds to the attainment of other Goals and Targets within the 2030 Agenda. These include those Targets found in Goals 1 (No Poverty), 4 (Quality Education), 5 (Gender Equality), 6 (Clean Water and Sanitation), 8 (Decent Work and Economic Growth), 9 (Industry, Innovation and Infrastructure), 10 (Reduced Inequalities), 11 (Sustainable Cities and Communities), and 15 (Life on Land) and Targets 2.3, 2.4, 3.9, 7.1, 7.b, 12.2, 12.4, 12.7, 12.8, 12.b, 13.1, 13.3, 13.b, 14.1, 14.2, 14.3, and 17.6

(UN GA 2015). By ensuring that mountainous communities can participate on a more equal playing field with flatlands-based urbanized and metropolitan areas through particular education with and on AI, we can enable comprehensive discourses on how best to manage regional resource collection and distribution while preventing substantial "brain drain" to areas of higher population density (Bausch et al. 2014; Khan and Somuncu 2019; Bürgin and Mayer 2020). Not only does this enable mountainous communities to gain income from jobs created within their unique livelihoods that would otherwise be sourced into other communities, but it also prevents the loss of workers skilled in agriculture, forestry, mining, and other mountain-specific industries that cannot always be found in non-mountainous regions, and locally related native population practices that can be better for sustainable living in the long term (Mukhopadhyay et al. 2020; Silversmith 2021; Spoon et al. 2021).

4.1 Inclusive Student-Engaged Learning as a Foundation for a Socially Good Implementation of SMD

Since 2011, UVU further enhanced its involvement with the IUK, the FAO MP, and other global mountain communities by developing a model in which students can play a major role in promoting SMD in the State of Utah and elsewhere through the student-engaged learning (SEL) model. The SEL model is based on four principles as described by Burch (2000) under a different acronym, being:

1. Students are asked to study real world problems.
2. Students investigate the presented problem as a group, in a collaborative way.
3. Teachers facilitate the students' self-learning.
4. Students are made responsible for their self-learning and implementation of the studied problem.

To ensure student involvement in SMD activities, the model has been developed as a co-curricular pedagogy. The extracurricular part was implemented through the Utah International Mountain Forum (UIMF), a coalition of student clubs, to encourage student interest and contributions to the UN activities which quite often extend over several semesters and therefore are difficult to be implemented through academic programs. Through the curricular part, faculty are able to contribute to the model by raising interest in SMD among students and encouraging them to become engaged with extracurricular activities on campus and in their home communities (Abdrisaev et al. 2020a, b).

Clubs are important for student learning outside of the classroom, providing them opportunities to work interdependently, in groups, through mentoring experiences led by faculty (Eccles and Barber 1999; Foubert and Urbanski 2006; Logan 2008). However, adult students usually are reluctant to be involved in any extracurricular activity, including clubs, due to their busy schedules (Dill and Henley 1998).

The UIMF, as per Wyatt (2011), allowed for adult students to join at times convenient to them in any of the coalition-partnered clubs. Joined with faculty advice, as per Timpson et al. (2014), interested students were then able to tie their individual experiences or interests with ongoing SMD activities locally and nationally.

The adapted SEL model also encourages adult students, as mature and responsible individuals, to contribute towards projects based on their own experiences or interests, implement them as group leaders, and then enjoy the recognition of the FAO MP (Timpson et al. 2014). As a result, the majority of SMD projects implemented by the UIMF are initiated by students—many of whom represent local mountain communities. Due to the requirement for clubs to self-fund activities (UVU 2020), the model also encouraged students, including adult learners, to raise and contribute funds for initiated SMD projects through the UIMF or other related forums.

Academic programs, and in particular general courses, until recently contributed to the developed model by allowing for faculty during classes to build ties with students—especially adult learners—and then incentivize them to join the UIMF (Abdrisaev et al. 2020a, b). Students at UVU, for example, can enroll in a three-credit course, "Globalization and SMD," which is currently the only course related to the SMD agenda at the university and taught during the spring semester. They learn theories and practices of SMD in Utah and globally, as well as skills to match their professional experiences and allow them to become club leaders to advocate for Utah practices in SMD at the UN and other institutions. Courses like this also have the benefit of allowing faculty concerned with varied aspects of SMD to contribute to the model by developing and teaching courses, which provide the students professional training on a wider range of 2030 Agenda Goal pursuits. The impact of these courses could be better focused or made more efficient by integrating them into certificates, minors, or majors on Sustainable Development (SD) alone or in tangent with other curricula internationally but has not been seriously considered to date.

Ultimately, the adapted SEL model ensures the inclusivity of student involvement within SMD activities—which is a key principle for ethically aligned AI design and socially good AI more generally as based on considerations for international human rights (Reidl 2019; Shneiderman 2020; Li 2021; Marr 2021; Jaynes 2021b, c). It also concurrently implements target 4.7, which aims to "…ensure that all learners acquire the knowledge and skills needed to promote SD, including, among others, through education for SD and sustainable lifestyles, human rights, gender equality…" (UN GA 2015). It is for this reason that we contend that an emphasis on SMD issues is important to the fulfillment of the entirety of the 2030 Agenda, as the attainment of Targets 6.6, 15.1, and 15.5 alone is not enough to display the importance of sustainable infrastructure and technology development in mountainous communities.

4.2 Examples of Socially Good SMD Advocacy and IoT Use Within the Adapted SEL Model

The first initiative from which UIMF started to advocate for SMD upon its founding was an observation of December 11th as the UN International Mountain Day (IMD). Since their first observation in 2010, the UIMF has observed the IMD every year. This event implements one more recommendation of the UN IYM resolution (UN GA 2003) and provides recognition from the FAO MP for its observation as a result. It has become an essential activity for the adapted SEL model as an on-campus, semester-based, UN-related activity that provides a variety of benefits based on socially good principles—especially for students and adult learners who cannot go to the UN due to time or financial constraints. Students gain via the UIMF being a part of UVU's club network; members are also able to gain a number of other experiences with IMD observations. These include the accumulation of advocacy experiences that require extended time frames to implement (specific to the UN), developing internal and external alliances for joint activities at home and abroad, raising awareness for other IMD observations, providing a venue for FAO MP recognition to SMD contributors, and opportunities to recruit new UIMF members (Abdrisaev et al. 2020a, b).

Since 2007, UVU and IUK have regularly co-hosted the "Women of the Mountains" conference (WOMC). WOMC is an international conference which serves to implement the third recommendation of the UN IYM resolution (UN GA 2003), which asked that all interested institutions support (financially or otherwise) the programs resulting from the IYM resolution. It was, and continues to be, held as a forum to follow up on the efforts resulting from the "Celebrating Mountain Women" conference hosted under the IYM umbrella in 2002 in Bhutan (Tshering 2002). The fourth WOMC was hosted independently by UIMF members educated through the SEL model under the FAO MP umbrella at the Orem UVU campus on October 7–10, 2015. More than 70 students, including those classified as non-traditional students, were involved in the preparation, invitation, and hosting of more than 120 participants for this event—including conference fundraising. These guests included diplomats, UN officials, scholars, and experts from both the USA Rocky Mountain and over 20 mountain states internationally beyond the Kyrgyz Republic. The UN highlighted the UIMF's role in hosting this WOMC as allowing participants "…to address the critical issues faced by women and children living in mountainous regions across the globe and provide a forum to discuss gender equality" (UN GA 2019, 10).

Based on experiences accumulated from IMD observations and hosting WOMC, UIMF members advocated (through the augmented SEL educational model) during various UN Economic and Social Council (ECOSOC) forums since 2016—in particular during sessions of the Commission on the Status of Women (CSW). It was an opportunity for them both to raise voices in support of women and girls from mountain communities worldwide and to report on Utah-specific experiences in building sustainable communities. Engaged UIMF members learned how building

partnerships with non-governmental organizations registered under the UN ECOSOC—such as the Russian Academy of Natural Sciences (RANS) and the Utah-China Friendship Improvement Sharing Hands Development and Cooperation—play an important role in effective advocacy at the UN. Each year, students co-host a parallel event with RANS at the UN. These have included the CSW62–65 and the High-Level Political Forum of ECOSOC for Sustainable Development in 2018. This collaboration has resulted in the augmented SEL model being recognized in various written statements from RANS (UN ECOSOC February 2018, UN ECOSOC November 2018, UN ECOSOC 2020).

The UIMF advocacy campaign has always relied on the use of a number of simple, affordable, and effective IoT tools and applications which have been contributed and developed by students. Since the launch of the student-designed and maintained website of the UIMF,[4] it has played a key role in displaying the effectiveness of the augmented SEL model. The website serves as a database to consolidate all relevant information of initiatives which members of the coalition have contributed to the advocacy campaign of SMD under the umbrella of the FAO MP. This includes information on roughly 350 student activities, which include student reflective essays, copies of activity agendas, task lists, posters, brochures, media links, and other such materials. Those files are often used as templates for future activities, provide institutional memory of past UIMF activities, and ensure both continuity and smooth transition of activities between semesters and the leadership of the UIMF. This contributes to the overall goal of the augmented SEL model to provide both maximum responsibility and credit to students for the implementation of SMD activities with minimum faculty involvement.

In addition, posted reflective essays serve as links to FAO MP informational media outlets and other national and international websites. Since 2011, UVU and the UIMF have been recognized 82 times (or about 10 times per year) on the FAO MP and other FAO news websites and 57 times (or about 7 times per year) in the monthly FAO MP newsletter "Peak to Peak" (FAO MP n.d.-c; Abdrisaev et al. 2020a, b). Posted student essays also provide links for official and personal social media outlets highlighting contributions of particular students to UIMF activities. As a result, the UIMF site has become a type of "e-referral" several students have been able to utilize in lieu of traditional letters of recommendation for certain jobs and internship positions (Abdrisaev et al. 2020a, b).

IoT is important for facilitating regular dialogue and networking between representatives of the State of Utah with counterparts in the Kyrgyz Republic (Abdrisaev et al. 2011) and elsewhere. Twelve years of IMD observations have allowed UIMF members to combine face-to-face and online joint observations with different partners. Two UIMF members with local hosts observed IMD on December 11, 2012, in Bishkek, Kyrgyzstan, during the international conference "Climate Change and Mountains" (Abdrisaev et al. 2020a, b). They also had an online conversation with the rest of the UIMF team, which observed the IMD at UVU campus in Orem, Utah

[4] Found at https://www.uvu.edu/utahimf/blog/index.html

(Abdrisaev et al. 2020a, b). UIMF leaders have been invited and contributed to IMD 2018 and IMD 2019 observations hosted by a group of mountain states led by the Permanent Mission of the Kyrgyz Republic to the UN. The IMD 2021 observation was hosted as a virtual event with a joint contribution from UIMF members and students from Osh Technological University in Osh, Kyrgyzstan. It served as a preparatory step for a joint visit and presentation of the Utah-Kyrgyz student delegation at the 66th session of the CSW in March 2022.

Furthermore, UIMF members successfully used IoT during the campaign organized by the FAO MP in the fall of 2015 to gather 5000 signatures among the FAO MP members to include mountain-related issues to the agenda of the UN Climate Change Conference (COP26) in Paris. Students, by using IoT, collected more than 1600 signatures both at UVU campus and from their partners at Osh Technological University, the Kyrgyz-Turkish University in Bishkek, and RANS in Moscow, Russia (Hackney 2015).

Given the success of UIMF activities as influenced by the augmented SEL model, efforts should therefore consciously incorporate IoT-based tools like AI as part of their broader academic program—including in any certificate, minor, or major that focuses on SD. This will allow for new and emerging tools developed by students or industry to further SMD advocacy and retain a socially good emphasis. Again, this recommendation is being made with respect to the pace whereby AI is evolving, finding new applications, and generating new socioeconomic and sociopolitical issues that require rapid attention (Jaynes 2021a, b, c, d). Given that non-traditional and employed students can provide unique perspectives into the ways AI ought to be implemented, audited, and governed by virtue of their varied life experience, we further assert that their input would be just as invaluable to guide AI in a socially good manner that is beneficial for SMD and the 2030 Agenda more broadly.

5 Recommendations and Conclusion

Though there are programs coming into being around the world that focus on AI ethics,[5] there are a number of other issues pertinent to socially good AI beyond auditing for system bias and stakeholder interest determination which require ethical scrutiny. As we have argued throughout this chapter, they include the instruction of populations that may not even have IoT access at present due to the natural features that make up their home landscape or literacy in the languages used to program AI systems. Furthermore, there is the reality that SDG attainment and maintenance is not solely an environmental concern—it is every much as human a concern as the protection of those rights granted to us by local and national governmental institutions, and therefore pertinent for socially good considerations.

[5] Such as those degrees and certificates offered by Cambridge's Leverhulme Centre for the Future of Intelligence (http://lcfi.ac.uk/master-ai-ethics/) and San Francisco State University's Lam Family College of Business (https://cob.sfsu.edu/management/certificate/ai-ethics)

As such, considerations for the sustainable implementation of AI must be prioritized as an item of curricular importance because no explicit means to incorporate AI into the SDGs is otherwise made apparent by the UN during its initial drafting of the Agenda (UN GA 2015).

To this end, we offer here the suggestion that curricula internationally adapt to include majors, minors, and certificates dedicated not only to AI ethics but also to SD in the lens of high technology. While some may argue that a specialization in AI is too severe for undergraduate education, it should be remembered that not all who engage in this level of postsecondary education are traditional students. Also, there is the reality that traditional IT and IS education is increasingly incorporating AI as a result of its dependence upon the infrastructure provided by these two disciplines. And since AI systems are already being used in SD projects internationally to aid in the optimization of industries such as agriculture, finance, fishing, forestry, and mining, there is little argument that other high-technology applications may also be utilized for SD realization on a global scale.

We further argue that the SEL model (whether adapted towards SD considerations or not) is an effective tool that will not lose its usefulness regardless of how higher education evolves and that it serves as a convenient system whereby socially good education can be engaged. Not only does the SEL model effectively enlist the classroom cooperation of traditional and non-traditional students, but it provides a venue for "young" and "old" alike (in body, spirit, or experience) to attach their worldviews and experiences to the material they are being taught. Furthermore, those engaged in SD advocacy can similarly utilize this productive environment to find avenues whereby they can effectively engage with SD advocates on a local (if not national or international) scale. Depending on the way in which institutions of higher learning implement the SEL model, it can also be an avenue wherein industry partners can also engage with locally educated students to secure talent and develop new generations of corporate leadership via tuition-supplemented mentorship programs or apprenticeships.

Of course, our focus here has been to show the SEL model's effectiveness for mountainous and rural populations—but that does not entail that this model is *only* effective for those populations. Our focus is merely the result of our concerns for how mountainous and other rural communities have unique concerns and challenges that often prevent them from being as engaged in technological adoption and development (beyond how natural landscape features are uniquely impacted by environmental challenges). Balancing the concerns of these communities is not a simple issue to address in the face of metropolitan economic disparities and mentalities that divide "developed" and "rural" areas in politics and economics. However, the same can be said for the mentalities that divide the Global North from the Global South or neo-colonialists from de-colonialists. Ultimately, socially good values impact every population of our species regardless of how we segregate ourselves—even if those values carry a different weight from one community to the next—because they are built on social mores and ethical frameworks that are in a constant state of evolution.

Nevertheless, the use of inclusive learning models like SEL will be important to ensure that AI can maintain a socially good status for SDG attainment and maintenance. Beyond aiding in the achievement of Goal 4, it will aid in the achievement of related Goals (specifically 5, 8, 10, and 17). Advocating for SMD in this context has a similar effect because considerations for mountainous and island communities are sparse throughout the SDGs and mostly limited to specific Targets within the Agenda. As such, the needs of these unique landscapes are often lost in major UN forums in favor of population areas that have greater densities or "development." After all, socially good values cannot neglect the needs of communities that depend on more central areas of commerce and social engagement. Indeed, it is this consideration for *all* peoples that justifies the development of notions that are globally good for society and not just the efforts of organizations like the Association of Southeast Asian Nations (ASEAN), EU, OECD, UNESCO, or independent governmental institutions. Hence, SDG attainment and maintenance will require input not only on the way the Goals should be achieved but also on the ways in which high technology (like AI) can be effectively implemented. To that end, inclusive education that engages local communities and encourages their unique input is similarly vital as high technology evolves.

Bibliography

Abdrisaev, Baktybek D., Zamira S. Djusupova, and Alexey I. Semyonov. 2005. Case Study: Kyrgyzstan's Experience in Promoting Open Source for National ICT Development. *Journal of Systemics, Cybernetics and Informatics* 3 (6): 19–22. http://www.iiisci.org/journal/sci/FullText.asp?var=&id=P848491.

Abdrisaev, Baktybek, R.E. Rusty Butler, Zamira Dzhusupova, and Asylbek Aidaraliev. 2011. Contributing to Sustainable Mountain Development by Facilitating Networking and Knowledge Sharing Through ICT – Collaboration Between Rocky Mountain States and Central Asia. *Journal of Systemics, Cybernetics and Informatics* 9 (7): 30–39. http://www.iiisci.org/journal/sci/FullText.asp?var=&id=SP228WP.

Abdrisaev, Baktybek, R.E. Rusty Butler, and Yanko Dzhukev. 2020a. Sustainable Mountain Development Advocacy Through Student Engaged Learning by Observing International Mountain Day: The Case of Utah Valley University. *Mountain Research and Development* 40 (4): D31–D38. https://doi.org/10.1659/MRD-JOURNAL-D-19-00070.1.

Abdrisaev, Baktybek, Rusty Butler, Lida V. Ivanitskaya, and R. Ildar. 2020b. Utyamyshev. Sustainable Mountain Development Promotion Through Education. *Bulletin of the Russian Academy of Natural Sciences* 2020 (2): 100–105. https://raen.info/upload/redactorfiles/maket_vestnik_2020_02.pdf. [Абдрисаев, Бактыбек, Расти Батлер, Иваницкая Л. Владимировна, и Утямышев И. Рустамович. Вестник Российской академии естественных наук 2020, № 2 (2020): 100–105.].

Bausch, Thomas, Madeleine Koch, and Alexander Veser, eds. 2014. *Coping with Demographic Change in the Alpine Regions: Actions and Strategies for Spatial and Regional Development*. Heidelberg, DE: Springer. https://doi.org/10.1007/978-3-642-54681-5.

Baxter, Bonnie K., and Jaimi K. Butler, eds. 2020. *Great Salt Lake Biology: A Terminal Lake in a Time of Change*. Cham, CH: Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-40352-2.

Bissell, Therese. 2004. The Digital Divide Dilemma: Preserving Native American Culture While Increasing Access to Information Technology on Reservations. *Journal of Law, Technology & Policy* 2004 (1): 129–150. http://illinoisjltp.com/journal/wp-content/uploads/2013/10/bissell.pdf.

Brescia, William, and Tony Daily. 2007. Economic Development and Technology-Skill Needs on American Indian Reservations. *American Indian Quarterly* 31 (1): 23–43. https://www.jstor.org/stable/4138893.

Burch, Kurt. 2000. A Primer on Problem-Based Learning for International Relations Courses. *International Studies Perspectives* 1 (1): 31–44. https://www.jstor.org/stable/44218105.

Bürgin, Reto, and Heike Mayer. 2020. Digital Periphery? A Community Case Study of Digitalization Efforts in Swiss Mountain Regions. In *Smart Village Technology: Concepts and Developments*, ed. Srikanta Patnaik, Siddhartha Sen, and Magdi S. Mahmoud, 67–98. Cham, CH: Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-37794-6_4.

Campbell, Wendy. 2018. The Impact of the Internet of Things (IoT) on the IT Security Infrastructure of Traditional Colleges and Universities in the State of Utah. In *The Internet of People, Things and Services: Workplace Transformations*, ed. Claire A. Simmers and Murugan Anandarajan, 132–153. New York: Routledge.

Canevaro, Mary A. 2018. 3 Challenges of Fiber Deployment and How to Improve the Process. *Alden*, September 18, 2018, https://info.aldensys.com/joint-use/3-challenges-of-fiber-deployment-and-how-to-improve-the-process

Chen, Haiyan, Yaning Chen, Dalong Li, and Weihong Li. 2020. Effect of Sub-Cloud Evaporation on Precipitation in the Tianshan Mountains (Central Asia) Under the Influence of Global Warming. *Hydrological Processes* 34 (26): 5557–5566. https://doi.org/10.1002/hyp.13969.

Chien, Nguyen D., Zhang K. Zhong, and Tran T. Giang. 2012. FDI and Economic Growth: Does WTO Accession and Law Matter Play Important Role in Attracting FDI? The Case of Viet Nam. *International Business Research* 5 (8): 214–227. https://doi.org/10.5539/ibr.v5n8p214.

Clark, Alyssa. 2020. Creating the Virtuous Organization. *Marriott Student Review* 3 (3): 12. https://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=1204&context=marriottstudentreview.

Dill, Patricia L., and Tracy B. Henley. 1998. Stressors of College: A Comparison of Traditional and Nontraditional Students. *The Journal of Psychology: Interdisciplinary and Applied* 132 (1): 25–32. https://doi.org/10.1080/00223989809599261.

Durish, Nicolas. 2020. *A Case Study in the Design and Development of a Community-Based Internet Assessment Initiative in Rigolet, Nunatsiavut, Canada*. MSc thesis, University of Guelph. https://hdl.handle.net/10214/21287.

Eccles, Jacquelynne S., and Bonnie L. Barber. 1999. Student Council, Volunteering, Basketball, or Marching Band: What Kind of Extracurricular Involvement Matters? *Journal of Adolescent Research* 14 (1): 10–43. https://doi.org/10.1177/0743558499141003.

Engel-Smith, Liora. 2021. In North Carolina's Mountains, Broadband Isn't a Given. *North Carolina Health News*, July 7, 2021, https://www.northcarolinahealthnews.org/2021/07/07/in-north-carolinas-mountains-broadband-isnt-a-given/

FAO Mountain Partnership. (n.d.-a). Members. *FAO*. https://www.fao.org/mountain-partnership/members/en/

———. (n.d.-b). Mountain Partnership: About. *FAO*. https://www.fao.org/mountain-partnership/about/en/

———. (n.d.-c). Mountain Partnership: Peak to Peak. *FAO*. https://www.fao.org/mountain-partnership/peak-to-peak/current-issue/en/

Feynman, Richard P. 1988. In *What Do You Care What Other People Think?: Further Adventures of a Curious Character*, ed. Ralph Leighton. New York: W.W. Norton & Co.

Foubert, John D., and Lauren A. Urbanski. 2006. Effects of Involvement in Clubs and Organizations on the Psychosocial Development of First-Year and Senior College Students. *Journal of Student Affairs Research and Practice (NASPA Journal)* 43 (1): 166–182. https://doi.org/10.2202/1949-6605.1576.

France-Presse, Agence. 2021. More Than a Third of World's Population Have Never Used Internet, Says UN. *The Guardian*, November 30, 2021. https://www.theguardian.com/technology/2021/nov/30/more-than-a-third-of-worlds-population-has-never-used-the-internet-says-un?CMP=oth_b-aplnews_d-1

Gaubert, Julie. 2021. UNESCO Member Countries Adopt First Global Agreement on the Ethics of Artificial Intelligence. *EuroNews*, updated November 26, 2021. https://www.euronews.com/next/2021/11/26/unesco-member-countries-adopt-first-global-agreement-on-the-ethics-of-artificial-intellige

Giuliani, Dario, and Sam Ajadi. 2019. 618 Active Tech Hubs: The Backbone of Africa's Tech Ecosystem. *GSMA*, July 10, 2019, https://www.gsma.com/mobilefordevelopment/blog/618-active-tech-hubs-the-backbone-of-africas-tech-ecosystem/

Glenn, Linda MacDonald. 2012. Case Study: Ethical and Legal Issues in Human Machine Mergers (or the Cyborgs Cometh). *Annals of Health Law* 21 (1): 175–180. https://lawecommons.luc.edu/cgi/viewcontent.cgi?article=1024&context=annals.

———. 2018. What Is a Person? In *Posthumanism: The Future of Homo sapiens*, ed. Michael Bess and Diana Walsh Pasulka, 1st ed., 229–246. Farmington Hills, MI: Macmillan Reference USA.

Hackney, Darian. 2015. Mitigating Climate Change Impact on Mountain Livelihoods Through Students Efforts. *Utah International Mountain Forum*, December 23, 2015. https://www.uvu.edu/utahimf/blog/1512climate_petition.html

Hauschildt, Kristina, Christoph Gwosć, Nicolai Netz, and Shweta Mishra. 2015. *Social and Economic Conditions of Student Life in Europe: EUROSTUDENT V 2012–2015 Synopsis of Indicators*. Bielefeld, DE: W. Bertelsmann Verlag.

Ho-Wisniewski, Evelyn. 2020. Non-Traditional Students Fall 2019. Orem, UT: Utah Valley University Institutional Research. https://www.uvu.edu/ir/docs/executive_briefings/student_demographics/fall_2019_non-traditional_students.pdf

Iqbal, Muhammad, Haji K. Khan, and Zaheer Abbas. 2021. Inequities and Challenges Faced by the Girl Students in Accessing the Information Communication Technology in the Mountainous Region of Pakistan. *Research Journal of Social Sciences and Economics Review* 2 (1): 488–496. https://doi.org/10.36902/rjsser-vol2-iss1-2021(488-496).

Jara, Francisco, Miguel Lagos-Zúñiga, Rodrigo Fuster, Cristian Mattar, and James McPhee. 2021. Snow Processes and Climate Sensitivity in an Arid Mountain Region, Northern Chile. *Atmosphere* 12 (4): 520. https://doi.org/10.3390/atmos12040520.

Jaynes, Tyler L. 2021a. The Question of Algorithmic Personhood and Being (Or: On the Tenuous Nature of Human Status and Humanity Tests in Virtual Spaces—Why All Souls Are 'Necessarily' Equal When Considered as Energy). *J-Multidisciplinary Scientific Journal* 4 (3): 452–475. https://doi.org/10.3390/j4030035.

———. 2021b. On Human Genome Manipulation and *Homo technicus*: The Legal Treatment of Non-Natural Human Subjects. *AI and Ethics* 1 (3): 331–345. https://doi.org/10.1007/s43681-021-00044-5.

———. 2021c. The Legal Ambiguity of Advanced Assistive Bionic Prosthetics: Where to Define the Limits of 'Enhanced Persons' in Medical Treatment. *Clinical Ethics* 16 (3): 171–182. https://doi.org/10.1177/14777509219942 77.

———. 2021d. 'I Am Not Your Robot:' The Metaphysical Challenge of Humanity's AIS Ownership. *AI & Society*. Online First 37: 1689. https://doi.org/10.1007/s00146-021-01266-1.

Khan, Ashfak Ahmad, and Mehmet Somuncu. 2019. Is Rural Out Migration Constructive for Sustainable Development? A Case of Mountain Community of Kıbrıscık, Turkey. *Journal of the Human and Social Science Researches* 8 (4): 3337–3352. https://doi.org/10.15869/itobiad.617221. ["Kırsal Alanlaından Dışarı Göç Sürdürülebilir Kalkınma İçin Değerli mı? Kıbrıscık Dağ Topluluğu Örneği, Türkiye." *İnsan ve Toplum Bilimleri Araştırmaları Dergisi* 8, no. 4 (2019): 3337–3352.].

Kumagai, Fumie. 2020. *Municipal Power and Population Decline in Japan: Goki-Shichido and Regional Variations*. Singapore, SG: Springer Nature Singapore. https://doi.org/10.1007/978-981-15-4234-3.

Leskin, Paige. 2019. The 50 Most High-Tech Cities in the World. *Business Insider*, updated April 2, 2019. https://www.businessinsider.com/most-innovative-cities-in-the-world-in-2018-2018-11

Li, Fei-Fei. 2021. America's Global Leadership in Human-Centered AI Can't Come from Industry Alone. *The Hill*, June 6, 2021. https://thehill.com/opinion/technology/561638-americas-global-leadership-in-human-centered-ai-cant-come-from-industry

Logan, Wendy L., and Janna L. Scarborough. 2008. Connections Through Clubs: Collaboration and Coordination of a Schoolwide Program. *Professional School Counseling* 12 (2): 157–161. https://doi.org/10.1177/2156759X0801200212.

López, Mariana. 2020. Top 10 Tech Hubs of Latin America in 2020. *Contxto*. https://contxto.com/en/news/top-tech-hubs-latin-america/

Lubbock, John. 1894. *The Use of Life*. London: MacMillan and Co.

Marr, Bernard. 2021. How Do We Use Artificial Intelligence Ethically? *Forbes*, September 10, 2021. https://www.forbes.com/sites/bernardmarr/2021/09/10/how-do-we-use-artificial-intelligence-ethically/?sh=6d87460079fd

Meisenzahl, Mary. 2019. The Most Incredible Perks Silicon Valley Workers Can Take Advantage of, from Free Rental Cars to Travel Stipends. *Business Insider*, September 15, 2019, https://www.businessinsider.com/perks-that-silicon-valley-workers-can-take-advantage-of-2019-9

Mukhopadhyay, Kausiki, Pallab Paul, and Indeesh Mukhopadhyay. 2020. The Politics of Knowledge Economy and Sustainability of Tribal Knowledge and Health in India. *International Journal of Business and Society* 21 (2): 955–976. https://doi.org/10.33736/ijbs.3305.2020.

O'Toole, Tom. 2021. Legacy Companies' Biggest AI Challenge Often Isn't What You Might Think. *Forbes*, September 15, 2021, https://www.forbes.com/sites/tomotoole/2021/09/15/legacy-companies-biggest-ai-challenge-often-isnt-what-you-might-think/?sh=590300436184

Organisation for Economic Co-operation and Development [OECD].AI. 2021. OECD.AI Policy Observatory: National AI Policies & Strategies. *EC/OECD*. https://oecd.ai/en/dashboards

Pagano, Wyatt. 2017. Where are the Women of Silicon Slopes? *Marriott Student Review* 1 (2): 11. https://scholarsarchive.byu.edu/marriottstudentreview/vol1/iss2/11.

Pelletier, Stephen G. 2010. Success for Adult Students. *Public Purpose* 12: 2–6. https://www.aascu.org/uploadedFiles/AASCU/Content/Root/MediaAndPublications/PublicPurposeMagazines/Issue/10fall_adultstudents.pdf.

Price, Martin F. 2004. Introduction: Sustainable Mountain Development from Rio to Bishkek and Beyond. In *Key Issues for Mountain Areas*, ed. Martin F. Price, Libor F. Jansky, and Andrei A. Iastenia, 1–19. New York: United Nations University Press.

Pick, James B., Avijit Sarkar, and Jeremy Johnson. 2015. United States Digital Divide: State Level Analysis of Spatial Clustering and Multivariate Determinants of ICT Utilization. *Socio-Economic Planning Sciences* 49: 16–32. https://doi.org/10.1016/j.seps.2014.09.001

Price, Martin F., and Thomas Kohler. 2013. Sustainable Mountain Development. In *Mountain Geography: Physical and Human Dimensions*, ed. Alton C. Byers, Donald A. Friend, Thomas Kohler, and Larry W. Price, 333–365. Los Angeles: University of California Press.

Reidl, Mark O. 2019. Human-Centered Artificial Intelligence and Machine Learning. *Human Behavior and Emerging Technologies* 1 (1): 33–36. https://doi.org/10.1002/hbe2.117.

Romeo, Rosalaura, Fabio Grita, Fabio Parisi, and Laura Russo, eds. 2020. *Vulnerability of Mountain Peoples to Food Insecurity: Updated Data and Analysis of Drivers*. Rome: FAO and UN Convention to Combat Desertification (UNCCD). https://www.fao.org/3/cb2409en/cb2409en.pdf.

Romero, Simon. 2021. Booming Utah's Weak Link: Surging Air Pollution. *The New York Times*, September 7, 2021. https://www.nytimes.com/2021/09/07/us/great-salt-lake-utah-air-quality.html

Rosalsky, Greg. 2021. Why Remote Work Might Not Revolutionize Where We Work. *NPR: Planet Money*, July 13, 2021. https://www.npr.org/sections/money/2021/07/13/1015286147/why-remote-work-might-not-revolutionize-where-we-work

Rose, Joel. 2020. Canada Wins, U.S. Loses In Global Fight For High-Tech Workers. *NPR*, January 27, 2020. https://www.npr.org/2020/01/27/799402801/canada-wins-u-s-loses-in-global-fight-for-high-tech-workers

Shneiderman, Ben. 2020. Bridging the Gap Between Ethics and Practice: Guidelines for Reliable, Safe, and Trustworthy Human-centered AI Systems. *ACM Transactions on Interactive Intelligent Systems* 10 (4): 26. https://doi.org/10.1145/3419764.

Silversmith, Shondiin. 2021. Indigenous Traditional Knowledge to be Included in US Efforts Against Climate Change for the First Time. *Arizona Mirror*, November 16, 2021. https://www.azmirror.com/2021/11/16/indigenous-traditional-knowledge-to-be-included-in-us-efforts-against-climate-change-for-first-time/

Spoon, Jeremy, Brittany Kruger, Richard Arnold, and M. Kate. 2021. Barcalow, and the Tribal Revegetation Committee (TRC). In *Tribal Revegetation Project Final Project Report: 92-Acre Area, Area 5 Radioactive Waste Management Complex, Nevada National Security Site, Nevada*. Portland, OR: Portland State University. https://doi.org/10.2172/1773633.

Starr, S. Frederick. 2004. Conflict and Peace in Mountain Societies. In *Key Issues for Mountain Areas*, ed. Martin F. Price, Libor F. Jansky, and Andrei A. Iastenia, 169–180. New York: United Nations University Press.

Su, Norman Makoto. 2020. Threats of the Rural: Writing and Designing with Affect. In *HCI Outdoors: Theory, Design, Methods and Applications*, ed. D. Scott McCrickard, Michael Jones, and Timothy L. Stelter, 51–79. Cham, CH: Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-45289-6_3.

Suzuki, Keisuke. 2011. Effects of Global Warming on Climate Conditions in the Japanese Alps Region. In *Planet Earth 2011: Global Warming Challenges and Opportunities for Policy and Practice*, ed. Elias G. Carayannis, 73–88. Rijeka, HR: InTech.

Tanner, Courtney. 2021. $15 Million to the University of Utah and $25 Million to Utah Valley University Will Expand Computer Science Programs. *The Salt Lake Tribune*, updated November 1, 2021. https://www.sltrib.com/news/education/2021/10/31/utah-universities-arent/

Thapa, Devinder, and Øystein Sæbø. 2014. Exploring the Link between ICT and Development in the Context of Developing Countries: A Literature Review. *The Electronic Journal of Information Systems in Developing Countries* 64 (1): 1–15. https://doi.org/10.1002/j.1681-4835.2014.tb00454.x.

Timpson, William M., Jeffrey M. Foley, Nathalie Kees, and Alina M. Waite, eds. 2014. *147 Practical Tips for Using Experiential Learning*. Madison, WI: Atwood Publishing.

Tshering, Phuntshok C. 2002. *Celebrating Mountain Women: A Report on a Global Gathering in Bhutan, October 2002*. Lalitpur, NP: International Centre for Integrated Mountain Development.

Tuminez, Astrid S. 2020. Guest Opinion: Stringent Completion Measures Don't Tell the Whole Story at Utah Universities. *Deseret News*, April 19 2020, https://www.deseret.com/opinion/2020/4/19/21224282/uvu-education-inclusivity-equality-growth-college-applications-graduation

UN ECOSOC. 2018. *Statement Submitted by Russian Academy of Natural Sciences, The Mountain Institute, Utah China Friendship Improvement Sharing Hands Development and Commerce, Non-Governmental Organizations in Consultative Status with the Economic and Social Council*, Statement by Non-Governmental Organization E/CN.6/2019/NGO/64 (19 November 2018). https://undocs.org/E/CN.6/2019/NGO/64

———. 2020. *Statement Submitted by Russian Academy of Natural Sciences, The Mountain Institute, Utah China Friendship Improvement Sharing Hands Development and Commerce, Non-Governmental Organizations in Consultative Status with the Economic and Social Council*, Statement by Non-Governmental Organization E/CN.6/2020/NGO/91 (30 November 2020). https://undocs.org/E/CN.6/2020/NGO/91

UN Educational, Scientific and Cultural Organization [UNESCO]. 2021. *Report of the Social and Human Sciences Commission (SHS) to the 41st UNESCO General Conference*, Annex, 41 C/37 (22 November 2021). https://unesdoc.unesco.org/ark:/48223/pf0000379920.page=14

UN GA. 2015. *Transforming Our world: The 2030 Agenda for Sustainable Development*, Resolution 70/1 (21 October 2015). https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

———. 2019. *Sustainable Mountain Development: Report of the Secretary-General*, 74/209 (22 July 2019). https://digitallibrary.un.org/record/3825219?ln=en

UN General Assembly [UN GA]. 2003. *International Year of Mountains, 2002,* Resolution 57/245 (30 January 2003). http://www.fao.org/fileadmin/user_upload/mountain_partnership/docs/A_RES_57_245.pdf

United Nations [UN] Economic and Social Council [ECOSOC]. 2018. *Statement Submitted by Russian Academy of Natural Sciences, The Mountain Institute, Utah China Friendship Improvement Sharing Hands Development and Commerce, Non-Governmental Organizations in Consultative Status with the Economic and Social Council*, Statement by Non-Governmental Organization E/CN.6/2018/NGO/37/Rev.1 (20 Feb 2018). https://undocs.org/E/CN.6/2018/NGO/37/Rev.1

Utah State Legislature. 2020. *Senate. Emerging Technology Talent Initiative*. S.B. 96, 63rd Legislature, General Sess. https://le.utah.gov/~2020/bills/static/SB0096.html

Utah Valley University [UVU] Institutional Research. 2020. 2020 Fact Book, Utah Valley University. *Utah Valley University* 2020. https://www.uvu.edu/ir/docs/info_about_uvu/fact_books/2020_factbook.pdf

Vision 2030. 2020. *Utah Valley University*. https://www.uvu.edu/vision2030/

Wagner, Frederic H. 2007. Global Warming Effects on Climactically-Imposed Ecological Gradients in the West. *Journal of Land, Resources, & Environmental Law* 27 (1): 109–121.

Whitney, John. 2020. *Socio-Economic Status for Students at UVU*. Orem, UT: Utah Valley University Institutional Research. https://www.uvu.edu/ir/docs/executive_briefings/student_demographics/2020_socio_economic_status.pdf.

Wilkins, Emily J., Hadia Akbar, Tara C. Saley, Rachel Hager, Colten M. Elkin, Patrick Belmont, Courtney G. Flint, and Jordan W. Smith. 2021. Climate Change and Utah Ski Resorts: Impacts, Perceptions, and Adaptation Strategies. *Mountain Research and Development* 41 (3): R12–R23. https://doi.org/10.1659/MRD-JOURNAL-D-20-00065.1.

Wyatt, Linda G. 2011. Nontraditional Student Engagement: Increasing Adult Student Success and Retention. *The Journal of Continuing Higher Education* 59 (1): 10–20. https://doi.org/10.1080/07377363.2011.544977.