Do You Have a SOLE? Research on Informal and Self-Directed Online Learning Environments

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Abstract

Web-based resources and technologies for informal and self-directed learning have proliferated during the past two decades. This chapter reviews some of the key research on informal and self-directed learning. Next, it explores different types of informal and self-directed online learning environments (SOLEs) (e.g., learning portals, shared online video, language learning, adventure learning, virtual learning, global change, etc.). An eight-part scheme for analyzing the

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quality of those resources is then detailed. Using this scheme, the researchers analyzed more than 300 Web resources for informal and self-directed learning. The results of this analysis are briefly recapped. In addition, results of several studies on the goals, achievements, preferences, and challenges of self-directed online learners are highlighted. This chapter also offers examples of individuals who have been using such resources to experience a life change of some type. These examples reveal that learning is currently being stretched from formal school-based situations to learning anywhere and at any time on the planet. It is intended that this paper provide a lens for understanding and evaluating informal online learning including the quality of such content, tools, and resources.

Keywords

Informal learning • E-learning • Online learning • Massive open online courses (MOOCs) • Motivation • Nontraditional learning • Open education • Open educational resources • Self-directed learning • SDL model • Self-directed online learning environments (SOLEs) • Videoconferencing • Web-based technology • Wikipedia

Introduction: What Wikipedia Started

Let's start with a story. As the first author begins writing this chapter, it is January 15, 2016. He starts his day in the usual way by exploring links from several emails to open access articles from various sources including the Chronicle of Higher Education, Inside Higher Ed, Campus Technology, eSchool News, eCampus News, Chief Learning Officer, and so on. One article from Inside Higher Ed that day immediately caught his attention. It is titled "Wikipedia at 15" (McLemee, 2016). The article maps out the evolution of Wikipedia over its first 15 years of existence from a few thousand pages to more than 5 million pages in English alone (Wikipedia, 2016). It is now a resource that is edited 10 million times every couple of months and is available in 280 languages (McLemee, 2016). He is highly absorbed in this article.

Why is he so intrigued? Well, he and his colleagues had conducted research on Wikipedia and a project within it called "Wikibooks" (Bonk, Lee, Kim, & Lin, 2009; Bonk, Lee, Kim, & Lin, 2010; Lin, Sajjapanroj, & Bonk, 2011; Sajjapanroj, Bonk, Lee, & Lin, 2008). Some of this research, in fact, had been sponsored by the Wikimedia Foundation which created Wikipedia. In addition, he had visited the headquarters of Wikipedia in San Francisco with his son Alex some 8 years earlier back on March 8, 2008 when it only had about a dozen employees (Bonk, 2009b). He thinks back and remembers the historical timeline of Wikipedia on one of the walls of their offices. As this timeline made evident, much had already happened during its first 7 years of existence. During that time, these rebels of the knowledge industry had revolutionized access to information, notions of expertise, the acceptability of information sharing, ideas related to the permanence of and ownership to

information, student research methods, peer review, quality standards related to information, and myriad other critical aspects of society. Now this information beacon called Wikipedia was more than twice as old. So much more had been accomplished since 2008 to help learners with their informal and self-directed learning (SDL) needs, preferences, and experiences.

Think back to January 16, 2001 when Wikipedia was first launched. It was not just the dawn of the new millennium but a beginning of a new age for finding information and data for one's personal learning quests. Wikipedia quickly became the place for the early phases in one's personal research projects and inquiry on most any topic one was puzzled about or seeking additional knowledge. Millions of volumes of Encyclopedia Britannica, which were already getting dusty, soon become museum pieces in homes and workplaces around the planet. We humans were becoming enamored with finding whatever information we needed just in time and at whatever location we found ourselves. And we no longer had to rely on an out-of-date printed book to find it. We increasingly were being fed online information that made us crave still more informal online learning. And that was just the start.

Less than 3 months later, Charles Vest, then president of MIT, announced the OpenCourseWare (OCW) project from MIT on April 4, 2001 (MIT News, 2001). His bold proclamation kick-started the race to see what organizations and institutions could provide access to the world's highest quality educational resources. Soon initiatives like the China Open Resources for Education (CORE) project would attempt to translate MIT content to Chinese. At the same time, people from emerging online entities like Academic Earth and the Open Educational Resources (OER) Commons would index some the most prominent and highest quality contents of the open education movement. Equally important, the Global Text Project would offer free books to those in Africa (Bonk, 2009b). For visual learners, EveryStockPhoto.com would index millions of freely licensed photos.

Clearly, while Wikipedia had provided some of the key ingredients of this new digital age, it was not operating alone. Thousands of websites and tools offered opportunities to explore the Web for one's particular learning needs. As a sign of the evolution of the open education movement, there now are calls to turn employee work experience and informal learning into certificates or even degrees that employers would recognize (Blumenstyk, 2015). Platforms such as "Degreed" are emerging to help companies, universities, and organizations keep track of what their employees are engaging in and learning online (Young, 2015). Without a doubt, we have entered a new era of learning.

From Wikipedia to Videopedia

It is possible that within a couple of years, anyone who wants will receive credit for watching a series of TED talks or videos from a MOOC or the Khan Academy. Already Degreed has sprung up to do exactly that (Young, 2015). According to Bersin (2016), over two billion people now have smartphones that are video-

enabled. Bersin also notes that video on these smartphones accounts for some 64% of Internet traffic. Small wonder that informal learning from instructional videos via Lynda.com, the Khan Academy, Big Think, Udemy, and other entities operating in the learning industry is quite common. With such free and open shared online video, those in the workforce can decide what, when, where, and how they want to learn (Milne, 2015). Suffice to say, the age of Wikipedia has quietly led to the birth of "Videopedia."

As is clear, informal learning resources and tools are exploding online. Education is increasingly becoming free and open. In fact, Cross (2007) contends that over 80% of human learning today is informal. More recently, he points out that informal learning avenues increase in importance when the skill requirements of one's job change frequently due to organizational and technological innovations (Cross, 2015). Cross notes that informal learning avenues are vital when employees decide to retire at later ages or when the mandatory retirement age is increased. Such individuals need to keep learning. He is also correct in pointing out that there is no purely formal or purely informal learning situation. Students learn many things related to the content of the class when talking to peers and colleagues in the hallways before or after class as well as when exploring everyday resources. In particular, Cross documents many technological resources for exploration, conversation, collaboration and cocreation of documents, and overall knowledge sharing.

In extremely frank terms, Cross (2007) offers myriad examples of how such informal learning transpires, including a litany of freely available technology tools and resources to successfully accomplish one's informal learning goals. It is crucial to note that his examples primarily concern adult education, and, in particular, the corporate training space. Nevertheless, each of his arguments and ideas related to this age of informal learning apply to younger levels and learning situations. Of course, various societal and technological trends are not only dramatically increasing the opportunities for informal learning they are also elevating the importance of it.

Despite pervasive access to information about the world in Wikipedia, troves of shared online video sites which we labeled videopedia above, and thousands of free and open access courses and knowledge artifacts, most still people look to traditional schools, college campuses, and corporate and government training centers as the prime vehicles for learning. Fortunately, Cross (2015) who helped coin the word "e-Learning," fleshed out some of his ideas about this new age of informal and SDL in a book titled "Real Learning" just before passing away on November 6, 2015.

In response to such trends, we formed a research group, initially called the "Extreme Learning" team and now titled the "Self-directed Online Learning Environments" (SOLE) research team at Indiana University (IU). As detailed in this chapter, the SOLE team has attempted to document how people learn and teach online with technology in nontraditional or unusual ways. We are curious how education takes place in casual informal situations as well as how formal learning stretches beyond schools and universities to more extreme learning environments such as that taking place on trains, planes, mountain tops, and boats, and in war zones. Extreme learning is a new concept that stretches ideas or perspectives about

when, how, where, and with whom learning takes place. As such, it is vital to begin to document and understand its potential.

Tapping into Informal Resources

Informal and more extreme forms of learning can be tapped into by instructors across educational sectors. For some instructors, these are modest shifts or adaptions such as when they add supplemental resources or blended learning opportunities to their courses. They might tinker with the learning process by adding shared online video resources from places like TED, YouTube, or the Khan Academy. Online dictionaries and encyclopedias and other "referenceware" like Wikipedia offer learners an opportunity to seek answers to their questions before consulting an expert or more formal resources and courses. Our research shows that the availability of such open educational resources (OER) enhance learner identify and self-confidence as a learner (Bonk, Lee, Kou, Xu, & Sheu, 2015).

In addition to open educational content, learning is being extended and transformed in many other ways. Instructors revamp their classes by incorporating guest experts from around the globe using Web and videoconferencing (Lee, 2007, 2010; Lee & Bonk, 2013; Lee & Hutton, 2007) as well as by adding cross-class collaborations with wikis activities and projects (Bonk et al., 2009, 2010). They might also extend their classes with collaborative documents like Google Docs, NowComment, or MeetingWords. Such instructors are beginning to transform their courses by using emerging technologies to experiment with and perhaps later establish entirely new ways to teach and to learn. At the same time, learners might use online technologies for online study groups, online work teams, or Web-based data collection to significantly alter how, when, and where they learn.

Still other educators find even more transformative ways to use technology. They push the edges of teaching and learning by tracking scientific discoveries as they occur in the Indian Ocean or when the largest colossal squid ever caught is thawed on the Discovery Channel to live audiences around the globe (Bonk, 2009b). Such educators might also connect their students to blog posts of explorers and live camera feeds during their polar expeditions as well as to guest experts in faraway lands via Web conferencing to interpret such events. Those in the area of language learning might embed different online tools for learning a new language including ones to practice conversational skills with a native speaker.

We are interested in making sense of the vast array of learning resources and tools that are available today to augment, extend, and perhaps even transform the learning process. Our focus, however, will be on activities that are less formal and instructor designed or directed. As we will detail in this chapter, we have catalogued and evaluated hundreds of informal online learning resources, tools, and projects. These include resources related to online language learning, social change and global education, adventure learning and environmental education, online portals for learning different subject areas, and shared online resources like the Khan Academy. Also included are different forms of virtual education from K-12 content to that occurring

in higher education to that related to professional development and retooling of those long into their careers or now searching for new ones. In addition to this content analysis, we are also surveying and interviewing people with a set of questions about their learning or teaching experiences with technology (Bonk & Lee, 2016; Bonk et al., 2015; Song & Bonk, 2016). In collecting this data, we are attempting to document moments in their informal and SDL situations with Web-based technology wherein they experienced an "empowerment moment" or key event that changed their lives in one or more significant ways (e.g., a career change) (Bonk, Lee, Kou, et al., 2015). At the same time, we are surveying and interviewing those teaching in such environments to better understand how such tools can be better employed and extended.

There are numerous goals for this research. First, by cataloguing hundreds of ways in which informal and nontraditional Web-based learning has impacted people across ages, gender, ethnicities, and cultures, we hope to inspire others to continue to learn across their lifespan. Another key goal is to create a repository for individuals around the planet to tell their stories of life change with Web-based technologies. In addition to evaluating the quality of informal learning Web resources, projects, and tools using different analysis schemes and checklists, we plan to employ surveys, interviews, and focus group sessions to better understand self-directed online learning environments (SOLEs) and individual pursuits within them. In the following sections, we define informal and SDL and then detail some of the research to date in each of these areas.

Informal Learning

Informal learning is often described in comparison with formal learning. Livingstone (1999) defined informal learning as the type of learning activity that "occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies" (p. 53). When defining informal learning, many scholars acknowledge that learner self-directedness is involved, at some point, in the process of informal learning (Dabbaugh & Kitsantas, 2012; Livingstone, 1999; Marsick & Volpe, 1999; Marsick & Watkins, 2001). Based on such views, Schugurensky (2000) developed a taxonomy which lists SDL as the first form of informal learning. Such a framework clearly signals that informal learning is driven by an individual's interests or motivations. From this perspective, it is the learner who generally determines what, when, where, and how to learn.

In terms of research, Livingstone (1999) administered a country-wide survey in Canada to investigate the informal learning activities as reported by the current Canadian adult population. His findings suggest that over 95% Canadian adults are involved in informal learning activities. The informal learning pursuits of these adults seemed to focus more on professional development and skills needed in daily life, including computer skills related to employment, communication skills, home renovations and cooking skills, and general knowledge about health issues. Livingstone (1999) also discovered that involvement in informal learning activities

is not affected by the level of schooling an individual has received. People lacking diplomas are as likely to engage in informal learning as those with a high school diploma, community college education, or even a university degree.

The OER Research Hub (2015) distributed a survey to subscribers of ten popular OER providers. Among these subscribers, more than 44% of them were primarily utilizing these resources to assist their informal learning. An analysis of this group of informal learners indicated that a majority of them were employed full-time and had some kind of educational qualification. These informal learners were attracted by the low or negligible cost of OER. They made selections of OER based on their particular needs and learning objectives. Interestingly, about 25% respondents reported that they intended to attend formal education after using OER. And they continued to use OER even after attending a formal educational setting.

Self-Directed Learning

As Web resources have expanded, so too have calls for self-directed learning (SDL). The emergence of Web-based forms of learning has given learners wide access to useful learning content. As such, learners have more power over decisions about what to learn, when to learn, and how much to learn (Garrison, 1997). Adult learning often demonstrates various degrees of self-directedness (Merriam, 2001). According to adult learning expert Malcolm Knowles:

> In its broadest meaning, self-directed learning describes a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identify human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (Knowles, 1975, p. 18)

As witnessed in the media and in trend reports in education, such SDL opportunities have multiplied in this age of free and open education. The expansion of such open online resources forces one to ponder what Knowles might have added to the above definition as well as consider the research that he might have staked out if he were alive today.

From a humanistic perspective, SDL encompasses the learner's personal attributes – the capacity to be self-directed (Hiemstra, 1994; Owen, 2002). SDL capacity has been found to correlate with a learner's academic success (Merriam, 2001). Results from the field of medical education have tended to support this notion. Avdal (2013), for instance, discovered a moderate positive relation between nursing students' SDL skills and their academic grades. El-Gilany and Abusaad (2013) also found that a higher level of SDL readiness has a positive impact on Saudi undergraduate nursing students' academic achievement. Similarly, Li, Tancredi, Patrick, and West (2010) surveyed 46 pediatric training programs in the United States about their students' SDL experiences. After analyzing the learner's confidence in and attitudes toward SDL, their learning style, and propensity toward lifelong learning,

the researchers concluded that learner-level factors were more closely related to the achievement of SDL goals than program-level factors. Examples of learner-level factors include progress tracking behavior, propensity toward lifelong learning, prior experience with SDL, and confidence in SDL.

SDL is believed to happen in both formal and informal settings (Hiemstra, 1994). According to Hiemstra (1994), SDL appears as different formats of activities, such as independent reading, reflective writing, learning in a study group, online discussion with peer learners, internships, and so forth. As already noted, in this age of open education, the tools and resources for such activities have proliferated (Bonk, 2009b). Self-directed learners do not always follow a highly systematic learning plan; instead, their learning process is influenced by the learner's preferred learning approaches or styles as well as one's prior experiences (Caffarella, 1988). The level of self-direction and, in effect, learner autonomy, in an SDL process also varies among learners.

In terms of technology-driven environments, Kop's (2011) investigation of a massive open online course (MOOC) indicates that some people are attracted to environments offering many opportunities for SDL, whereas some others prefer more coordination and guidance from the course organizer. As alternative forms of educational delivery such as MOOCs and open education materialize and become more heavily utilized (Bonk, Lee, Reeves, & Reynolds, 2015; Lee, Bonk, Reynolds, & Reeves, 2015), it is vital to research the SDL preferences, experiences, and results of individuals using these open educational contents and resources. That is a major part of the mission of the SOLE research team here at IU.

Self-Directed Learning Models

Such a mission stems from the fact that online tools and resources have begun to foster environments rich in informal learning opportunities. Given this emergence, it becomes highly important to understand and measure different aspects of self-directed and informal learning taking place. Fortunately, several scholars have developed models to illustrate the SDL process. Among the leading scholars is Garrison (1997) from the University of Calgary who proposed three dimensions of SDL process. The first dimension of his model is self-management. It includes the goal-setting process and the management of learning resources and supports. The second dimension of Garrison's model is self-monitoring, which concerns the planning of the learning tasks based on personal goals and the management of learning strategies. The third and final dimension of this model relates to motivation. Motivation not only plays an important role in the initiation of learning, but also assists learners with maintaining their efforts toward the goals that they have identified for their own learning. Again, each of these dimensions – goal-setting, self-monitoring, and motivation – are vital in informal and self-directed online environments.

Nearly two decades ago, Garrison's (1997) three-dimensional model was validated in a study among 119 Egyptian undergraduate students (Abd-El-Fattah, 2010). As part of that study, the "Self-Directed Learning Aptitude Scale" was developed to

measure students' readiness for SDL. Results of the questionnaire suggested that self-management factors significantly predicted self-monitoring, while motivation was a mediator between these two constructs. Importantly, self-management was the strongest predictor of student academic achievement, followed by self-monitoring.

Bullock (2013) applied Garrison's (1997) model to examine the SDL experience of teacher candidates in a technology integration course. He observed evidences of student self-management and self-monitoring. Another important finding that he uncovered was that task motivation (i.e., being motivated by the perceived pragmatic value of the target knowledge and skills) was found to play a vital role in student perceptions of their SDL success. However, this type of motivation was easily interrupted by external pressures, such as the lack of access to the necessary resources.

A decade after the introduction of Garrison's (1997) SDL model, Song and Hill (2007) introduced an SDL framework for online learning contexts. In accordance with the prevailing research literature, this model considers SDL as both a learning process as well as a set of personal attributes. In addition, the learning context is incorporated into the model to emphasize the importance of environmental factors. Personal attributes of Song and Hill's (2007) model include learner's motivation, sense of responsibility for their own learning, use of resources, and cognitive strategies. According to Song and Hill (2007), SDL processes are comprised of the planning, monitoring, and evaluating of one's learning. Based on a continuum of the level of learner autonomy, an SDL learning experience varies from pure instructor lecturing to an entirely independent self-study. Lastly, the context of SDL concerns the key instructional design elements such as the structure and nature of the learning tasks and the resources provided to the learners. It also concerns the support elements in the format of instructor feedback and peer collaboration and communication (Song & Hill, 2007).

The three elements of Song and Hill's (2007) model are related to each other in a highly interactive manner. Consequently, a successful SDL experience relies on the learner's ability to motivate oneself for SDL and to make use of proper resources and strategies. In return, the cumulative experience with SDL can improve one's capability for planning, monitoring, and evaluating his/her own learning. The learning context not only has an influence on the SDL process but also impacts the learner's motivation and his/her choice of resources and strategies.

Although SDL can occur in both formal as well as informal learning settings (Hiemstra, 1994), self-direction seems more critical for learners engaging in different types of informal learning. Such informal learners must define their goals, locate relevant resources, and manage their overall learning progress as well as their particular outcomes, often without any external support (Kop, 2011). That stands in stark contrast to the formal classroom where the instructor is responsible for many, if not most, of these functions.

The following section explores a few brief examples of how this plays out in real life. In the end, it is such real world stories of success while engaged in self-directed and informal learning that can perhaps provide a glimpse of the future of SDL education and shed light on the role of instructional designers and educators in this

decidedly open learning world. It is safe to predict that new models will arise during the coming decade to better explain the psychological, technological, and instructional factors involved in successful self-directed online environments. The SOLE research team at IU intends to be part of such efforts.

Informal and Self-Directed Learning Examples

It is important to discuss the roots of the SOLE project. A decade ago, the first author became inspired by Friedman's (2005) book, *The World is Flat*. Instead of documenting the many trends reshaping education around the world, Friedman was focused on the transformation of the business world. In response, Bonk (2009b) attempted to extend Friedman's ideas with a detailed set of 10 parallel technology trends that were changing opportunities to learn across educational sectors and age levels. Mobile, digital, online, collaborative, virtual, blended, synchronous, and other forms of learning were opening up education to countless millions of people who previously lacked such opportunities. At the same time, these changes were enhancing and supplementing the learning possibilities of those who already had significant educational access.

With each passing month, it became more obvious that the open learning world was pervasive and growing. Bonk's resulting book, *The World Is Open: How Web Technology Is Revolutionizing Education* (Bonk, 2009b), offered a detailed overview of the free and open online learning world. What became evident to him when collecting data for that book was that while a wealth of learning technologies were emerging, it was the stories of life change that were the most significant and vital to document. After discussing various technologies for learning documented in his book for several years, Bonk decided to capture stories of people who were designing and developing each technology discussed as well as the life narratives and anecdotes of those impacted by the innovations. Each story was a personal account of how one takes advantage of learning technologies to gain new skills and competencies and, ultimately, change one's life.

Take, for example, Wendy Ermold, a researcher and field technician for the University of Washington Polar Science Center (Bonk, 2009a). Wendy conducts research in Greenland and in other northern locations on this planet. Learning is nevertheless possible even when in such remote places far away from traditional schools and universities. Wendy informed us that when out on the icebreakers or remote islands, she listens to lectures and also reviews various open educational resources she has found using podcasting technology. Such content often comes from MIT OCW as well as from Stanford, Seattle Pacific University, and Missouri State University. Each resource is used to update her knowledge of physics and other content areas. As such free and open educational resources expand, there are vast new opportunities to personalize and cater the situation to a particular learning need or learner preference.

Then there is the amazing story of Bridey Fennell as documented in *The World is Open* book (Bonk, 2009b). Bridey completed four Indiana University High School

(IUHS) courses while enjoying a 5-month sailboat journey with her parents and two sisters. During this time, they traveled from Arcaju, Brazil to Charleston, South Carolina. Fortunately, ship dock captains and retired teachers proctored her exams when in port, and she could practice her French lessons in real-world situations on different French-speaking islands in the Caribbean. At the same time, her sister Caitlin posted updates about their daily activities to her blog while elementary students in the Chicago area monitored their journey and corresponded with her.

Such learning experiences are no longer that unusual. Two years after the above story, Michael Perham and Zac Sunderland each blogged and shared online videos of their record-setting solo sailing journeys around the globe (Bonk, 2009a). Amazingly, they each completed their high profile and risky adventures in the summer of 2009 at the tender age of 17. Anyone online could track their daily experiences and post comments in their blogs for them to respond to. It is important to point out that Sutherland was learning his high school lessons while on the boat using satellite and other technologies.

Fast forward 6 years to 2015 and shared online video had become even more prevalent among informal learners. A prime example is the case of 10-year-old Shubham Jaglan from New Dehli, India (NDTV, 2015). This youngster argued that he learned to play golf not only from extensive practice of his swings on the sugar cane fields near his house in India, but also by watching online golf videos of Tiger Woods (Chopra, 2015). This demonstrates the intense power of informal and self-directed online learning. Someone can go from a virtual unknown in his own village in India to the world's stage as an accomplished junior athlete in golf. Accordingly, Bandura (1997) argues that humans learn from observing the behavior of others and reflecting on their actions and how they are reinforced. As young Jaglan states, "Tiger Woods was the one I used to watch and then practice what he does on the greens, on the fields. He's been my role model since and I'm glad that people call me that and have such high expectations of me. I am working hard to prove it every day."

While such stories are certainly in the minority, hundreds of millions of people are now learning using some type of online tool, resource, or activity on a daily basis. The Web offers new hope for a degree, education, hobby, or personal lifelong learning option. Unfortunately, there are few, if any, research projects detailing the opportunities of OER, OCW, and new learning technologies (Farrow, de los Arcos, Pitt, & Weller, 2015). We intend to capture stories of people who are learning or teaching languages online, learning or teaching in virtual worlds, learning or teaching about environmental education, and so on. So much is possible. What quickly becomes apparent to anyone currently touched by education – or wishing to pursue it – is that learning no longer is primarily the domain of schools, colleges, universities, and corporate training environments. As noted earlier, upwards of 80% or 90% of learning is nontraditional or informal (Cross, 2007). Yet, there is little documentation of such learning whether it is casual informal learning from Wikipedia, the Khan Academy, and YouTube or that which is more extreme. As we seek the far edges of such learning, we label it extreme learning as experienced by Wendy Ermold, Bridey Fennell, Michael Perham, and Shubham Jaglan, mentioned above. Of course, it is

important to better understand what extreme learning actually is. We provide a definition along with some examples below.

Informal and Extreme Learning

While a definition of informal learning was provided earlier, for the purposes of this chapter, we define "informal learning" as a self-directed activity that takes place at any time one wishes and could be part of one's school work, family life, leisure pursuits, or work activities. In this chapter, we are mainly concerned with informal learning on the Web or with learning technology. Such activities often will involve brief sojourns online to find an important piece of information such as how to diagnose and deal with a health-related problem, the train schedules of a foreign city or country one plans to visit, or a comparison chart of the features of different smartphones or tablet computers.

At the far edges of informal learning is what we refer to as "extreme learning." While extreme learning can relate to both physical and cyber learning, for the purposes of this chapter, we will refer to extreme learning as activities that involve learning with technology in unusual or unique ways, including that which occurs on boats, planes, trains, or buses, as well as when hiking, running, and walking (Bonk, 2009a). With appropriate Web access, one's teachers, guides, and mentors can now appear just as easily from the tropics as from arctic regions. One can also take part in online social change causes while running across the Sahara Desert such as in the Impossible2Possible project (http://impossible2possible.com/i2p). While some refer to this type of learning as informal or nontraditional learning, we call it "extreme learning." Another instance is when those in war zones in Iraq or Afghanistan are spending their free time online working on their MBA or other online degree programs.

As indicated earlier, the "Extreme Learning" research team (now the SOLE research team) at Indiana University emerged in 2011 to explore how people learn or teach with technology in atypical ways and unusual places, such as from planes, trains, boats, mountain tops, islands, icebergs, space stations, parks, monuments, and war zones. We also were interested in museum-based learning as well as what learning is possible from religious missions, submarines, camps, research stations (e.g., Antarctica), outdoor classrooms, grocery stores, zoos, cafes, bookstores, nursing homes, hospital beds, and shopping malls. Not done? In addition to that, extreme learning can include learning from involvement in virtual worlds, online communities or groups, webinars, webcam experiences, text messaging, mobile devices (Buckner & Kim, 2011; Kim, 2009; Kim et al., 2011), virtual schools, OER and OCW, open universities, and free universities or courses. Simply put, as most anyone reading this chapter has experienced, the world is opening across all ages and educational sectors.

Not all informal and SDL is so unique and risky. We are also interested in documenting more sedate and passive forms of informal learning including watching an online video in Lynda.com, TED, LinkTV, CurrentTV, or YouTube (Bonk, 2011).

Through open educational Web resources, those stuck behind prison walls, injured and in a hospital bed, or unemployed and unable to pay for college tuition can learn to be more productive members of society. For people who are in transition from one career to another, OCW and OER can arouse new interests and confidence (Iiyoshi & Kumar, 2008). For instance, retired individuals can now learn a new hobby as well as offer their educational ideas and mentoring services to anyone interested in a particular topic in which they are an expert.

Informal and Self-Directed Learning Research Needs

What is clear by now is that the forms of learning delivery and opportunities to learn have exploded during the past decade. Thousands of Web tools, resources, and activities allow one to learn on demand and just when needed. The resources available for online language learning, basic skill rehearsal, global education, social change, adventure, and environmental education have accelerated during the past few years. Educators are advocating the need for global education activities and curricula in order to properly prepare children for the twenty-first century (Lee, 2007, 2010; Lee & Hutton, 2007; Longview Foundation, 2008; Merryfield, 2007, 2008; Merryfield & Kasai, 2009; Riel, 1993). Why then are the vast majority of learning studies still conducted in isolated classroom settings or in online or blended learning classroom settings, instead of looking at how individuals typically learn, which is in informal and SDL pursuits?

A concerted effort is now required to explore many of these informal and nontraditional learning pursuits. First, the scope of such Web resources, tools, and activities needs to be better understood. Just what is available? There is no resource or project today that serves as a gateway for casual informal learning and SDL.

Second, there is a need to grasp the quality of these informal and SDL websites and other resources. One mechanism for assessing and documenting quality indicators is to evaluate these resources using some set of criteria (Kim, Jung, Altuwaijri, Wang, & Bonk, 2014). Making such rating schemes available will help learners, instructors, and government agencies better understand what is possible.

Third, understanding the types of learning activities that commonly occur within different types of informal or more extreme learning is needed. As assorted forms of learning are compiled, people can more thoughtfully reflect on the potential skills and competencies that different resources make possible.

Fourth, as part of understanding the learning outcomes or potential, there is a need to capture case studies of individuals whose lives have been altered or significantly changed from casual informal as well as more extreme learning or teaching pursuits. As indicated, such stories might include those obtaining their MBAs while in war zones, teenagers traversing the globe solo while being home schooled, penguin researchers sharing their findings via satellite, and people in hospitals exploring open educational resources and finding new career options.

During the past few years, our research has begun to investigate the above questions. We have generated an expanded list of informal as well as more extreme

learning resources and technologies. More than 300 of these resources have been evaluated for eight distinct criteria (see Kim et al., 2014). Nevertheless, much more needs to be done.

Despite all the hope and possibilities for open education and open learning (Iiyoshi & Kumar, 2008), minimal is known about new learning formats and delivery mechanisms for open education. Questions arise about the tools and systems that might prove attractive to informal or nontraditional learners. In particular, areas such as outdoor, environmental, and adventure learning bring unique learning opportunities that were seldom possible before (Doering & Veletsianos, 2008).

As adventure learning becomes more widely available and embraced, there is a need to know more about the quality, use, scalability, and maintainability of these new resources (Veletsianos & Klanthous, 2009). Issues arise related to accessing these contents and understanding how learners might use them to augment, enhance, or accelerate their learning. Just how are lives impacted? Are there life changing or empowerment moments that can be captured, demonstrated, explained, and perhaps replicated or extended? If informal and nontraditional learning routes found in outdoor and adventure learning foster new forms of learning as well as increase internal desire and motivation to learn, there is a pressing need to know the reasons why.

At the same time, scant information exists about those using technology tools and resources to teach in unusual or nontraditional ways. Thousands of online educators are offering their services for free online to help others around the world learn languages, vocabulary, geography, mathematics, and many science-related disciplines. In addition, such instructors can now find residence in a boat, car, dogsled, or café from which to send information to those in K-12 educational settings; activities which Aaron Doering and his colleagues at the University of Minnesota call "Adventure Learning" (AL) (Doering, 2006; Doering & Veletsianos, 2008). It is here that exciting and content-rich curriculum materials can be developed in progress whether it is 40° below zero in the Artic north or eclipsing 120 F in the desert heat (Miller, Veletsianos, & Doering, 2008; Veletsianos & Klanthous, 2009).

The SOLE research team is exploring the motivations of those involved in such quests. Are there particular instructional formats that are most conducive to learning from such adventures, especially when outside traditional educational institutions or when incompatible with long-held standards related to effective instruction? How are such online experts and their materials accessed? How is curriculum created around learning adventures? And why do so many individuals create content or offer their instructional services online for free or nominal cost? Do they simply wish to have others follow along during their quests or is there an educational mission?

In addition to adventure learning, online language learning websites have been proliferating in recent years (Kong, 2009). Websites, such as Livemocha and Babbel provide free and rich language learning content, training activities, and multimedia support in multiple languages. Importantly, users are interacting with the content and providing their feedback and reflection via a variety of social networking tools within these websites. Yet, a number of scholars (Kartal & Uzun, 2010; Warschauer

& Kern, 2000; Kong, 2009; Liu et al., 2008) point to a disconnection between the stated learning philosophy at such language learning sites and what language learners, teachers, and stakeholders are expecting from such resources.

Despite the life-altering possibilities, as noted earlier, minimal research exists on informal and self-directed online learning and even less on forms of extreme learning. As such, there is a need to capture snapshots as well as longer views of human growth resulting from such learning resources, tools, and experiences.

SOLE Team Research to Date

Research on self-directed and informal learning will not be easy. Many initial steps or subtasks need to be undertaken. As a means to begin, our team undertook a comprehensive inventory of informal learning websites (Kim et al., 2014). As indicated earlier, we recorded, categorized, and rated more than 300 such online resources, projects, and tools. Criteria for inclusion in this study included any learning or teaching resource involving technology that did not involve traditional schooling approaches.

Initially, we conducted a thorough content analysis of informal and extreme learning websites. That research phase was designed to reveal the essential characteristics of successful online resources and technology tools that are important resources for SDL. Based on our analysis of 305 informal learning websites collected by the "Self-Directed Online Learning Environments (SOLE) Research Team" at Indiana University (IU) (Kim et al., 2014), these sites were placed into six categories: (1) online language learning, (2) adventure learning and environmental education, (3) social change and global education, (4) virtual education, (5) learning portals, and (6) shared online video. Each of the six categories is briefly explained below.

1. **Language learning resources:** these resources use technology-aided language learning with an integration of sound, voice interaction, text, video, and animation.
2. **Outdoor and adventure learning:** this category is a hybrid online educational environment that provides students with opportunities to explore real-world issues through authentic learning experiences.
3. **Social change/global resources:** these resources seek to educate and inform people about issues and needs relating to social change.
4. **Virtual education:** refers to learning environments managed by organizations and institutions where teachers and students are separated by time or space, or both.
5. **Learning portals:** refers to centralized learning centers or repositories that contain an aggregation of educational information on a topic, often current or continually updated.

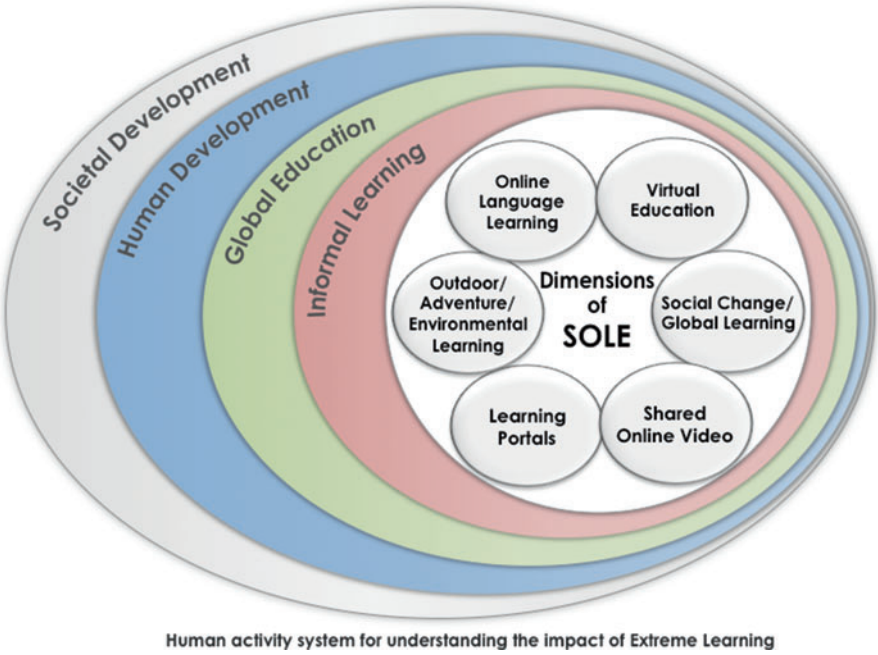

Fig. 1 A visual representation of the dimensions and impact of the SOLE research team

6. **Shared online video:** includes any educational video resource (YouTube, TED talks, or other Web-streamed videos) that can be accessed, watched, and shared online.

Figure 1 provides a visual representation of these six categories of research of the SOLE team from the standpoint of societal and lifelong learning.

Each website was analyzed by the SOLE research team according to eight criteria which was developed through synthesizing the literature, expertise, and specialist's reviews: (1) content richness, (2) functionality of technology, (3) extent of technology integration, (4) novelty of technology, (5) uniqueness of learning environment/learning, (6) potential for learning, (7) potential for life changing, and (8) scalability of audience (Jung, Kim, Wang, & Bonk, 2011; Kim et al., 2014). Ratings on a five-point scale from one (low) to five (high) were made on each website based on the eight criteria (see "Appendix A").

Sample of Websites and Online Resources by Extreme Learning Category

As indicated, the SOLE research team evaluated more than 300 informal and extreme learning websites and resources. These websites were organized into six

key categories detailed above and depicted in Fig. 1. A small sample of some of these websites is provided below.

1. **Online Language Learning Sites:** Babbel, Livemocha, ChinesePod, English Central, BBC-Languages, Mixxer, SpanishPod, Voxopop, Ling, Vocab Sushi, InterPals.
2. **Outdoor/Adventure Learning:** Polar Husky, Earthducation, the Last Ocean Project, Impossible2Possible, Roadtrip Nation, Explo.tv, Explorers Web, Nautilus Live.
3. **Social Change/Global Education:** The Flat Classroom Project, Link TV, Soliya, ePals, iEARN, Free Rice, MGDFive.com, Infinite Family, Omnium Extension Projects.
4. **Virtual Education:** Encyclopedia of Life, Khan Academy, British Library Turning the Pages, Curriki, MERLOT, Connexions, Open Yale, Wolfram Alpha, MIT OCW, Sophia, Peer 2 Peer University, About.com, Squidoo, Smithsonian.
5. **Learning Portals:** Jane Austin, Einstein, Shakespeare, Charles Darwin, Jane Goodall Institute, Edgar Alan Poe.
6. **Shared Online Video:** Link TV, TED, Book TV, Current TV, YouTube EDU, School Tube, Big Think, Fora. TV, Clip Chef, Wonder How To, Howcast, TV Lesson, MIT World, Academic Earth, BBC Video Nation, CNN Presents, History for Music Lovers.

Highly ranked websites were selected for more detailed analysis in an attempt to reveal how these online resources offer experiential, engaging, effective, and enhancing learning experience to encourage learning and empowerment. In terms of categories, virtual education was ranked the highest. Such a finding was not too surprising given the need for online learning to be content-rich, scalable, and make a learning impact. Online learning can lead to life-changing events including new careers, interests, and passions. During this project, members of the SOLE team attempted to evaluate the quality of a wide range of online learning resources, projects, and activities from the casual informal to the highly extreme forms of learning. Given pervasive clamor about online learning quality, the evaluation criteria we designed may prove usable to informal and extreme learning project and website funders, developers, and users (see "Appendix A").

In addition to the evaluation criteria, there is a need to create a highly functional and easy-to-navigate website with hundreds of informal and extreme learning resources. When complete, users may become more fully aware of the wide range of learning formats and options available today. We initially intended for the "Extreme Learning" website (http://www.extreme-learning.org/) to become a free and open resource connecting millions of potential learners and teachers around the planet. No such resource presently exists.

As noted earlier, in addition to a content analysis (Kim et al., 2014), the SOLE research team conducted a series of surveys of educators and learners involved in informal and extreme learning pursuits (Bonk & Lee, 2016; Bonk, Lee, Kou, et al., 2015; Song & Bonk, 2016). These surveys provide insight into how learners access

and use such resources. Just what are their goals, motivations, experiences, and challenges? As part of these efforts, the types of materials, tools, and resources they are searching for were targeted. In addition, our research documented the successes as well as obstacles to their use. These may vary for those involved in adventure learning, online language learning, environmental education, virtual education, and global collaboration. Follow-up interviews and focus groups should lend greater insight into this emerging area called extreme learning.

Tracking Life Change from Open Education

Millions of people around the planet still lack access to education. Countless more who have had access want additional education since they are not content with their present job situation. At the dawn of the twenty-first century, emerging technologies for learning have the potential to change all that. Countless individuals are learning today in ways they never thought possible. As they do, these same learners are finding new careers and professional interests (Bonk, Lee, Kou, et al., 2015). They are in the midst of life changing experiences through innovative use of online technology tools and open educational resources.

As noted, we have already conducted several studies looking at learner self-directed online learning preferences, goals, successes, and challenges when using OER and MOOCs (Bonk & Lee, 2016; Bonk, Lee, Kou, & Sheu, 2013; Bonk, Lee, Kou, et al., 2015; Kou & Bonk, 2013; Sheu, Lee, Bonk, & Kou, 2013; Song & Bonk, 2016). One study explored the learning preferences, goals, achievements, challenges, and possibilities for life change of a group of 159 MOOC participants. They were enrolled in a MOOC on online teaching sponsored by CourseSites by Blackboard (Bonk & Lee, 2016; Bonk et al., 2013). These self-directed learners were primarily interested in foreign language, health, historical, cultural, and environmental information. The resources that they used to find such information not only included online courses and MOOCs, Wikipedia, and YouTube, but also such popular Web resources such as Facebook, Ask.com., TED talks, Lynda.com, Khan Academy, Yahoo Answers, eHow, The New York Times, Wolfram Alpha, and WebMD. They were learning for personal enjoyment and personal choice. As such, they took great pleasure in knowing that they did not have to rely on others when a particular learning need arose. Instead, they had the freedom and opportunity to simply find the information that they needed online. Interestingly, most of the study participants (more than 90%) indicated that they had experienced some type of life change from their informal and SDL pursuits (Note that similar results were also found in Song & Bonk, 2016).

This study resulted in several suggestions for instructional designers. First of all, self-directed learners want choice, control, and freedom to learn. They also want to experience some fun in the process. As such, instructional designers should build in options and alternatives into informal and self-directed online environments and

experiences. Second, these self-directed learners want a chance to reflect on their personal learning growth. As such, instructional designers can embed such opportunities with discussion forums and collaboration tools wherein participants can reflect and interact with others on their self-directed and informal learning pursuits. Third, those designing or developing Web resources or courses for informal or SDL need to realize that with the abundance of educationally valuable information on the Web to select from, there is a mounting need for scaffolded instructional aids and other guidance in finding, filtering, and selecting high quality content (Kop & Fournier, 2010). As an example, there are now useful lists of MOOC courses and resources found at Class Central, TechnoDuet, OER Commons, Canvas, Coursera, the MOOC List, Open Culture, and elsewhere. Those are just a few of the findings; see Bonk and Lee (2016) for additional results from this particular study.

Another of our recent research projects investigated the experiences of those who subscribe to the monthly e-newsletter of MIT OCW which had more than 150,000 subscribers at the time of the study. From that pool, there were 1,429 individuals who completed our survey, of which 613 people completed the open-ended survey items (Bonk et al., 2015).

Like the Blackboard study, these individuals were seeking self-improvement, satisfying an inner curiosity, and helping others out. And they were less concerned with obtaining a badge, certificate, or degree completion (Bonk, Lee, Kou, et al., 2015). Once a badge or some type of assessment mechanism was put in place, many of the survey respondents wanted out; from their point of view, self-directed online learning was no longer personally fulfilling or fun. Success came from their personal freedom that they felt to explore as well as from the abundance of educational resources and choices in front of them today. Not surprisingly, many of these individuals found their Web explorations much more fun than typical schooling. They felt in control of their learning quests, whether it was to fix their plumbing or swimming pool at home or learning the Korean language in order to stop by the local Korean restaurant and order food in the native tongue of the servers. In terms of general context or learning situation, there was no one device or ideal setting for their informal and SDL.

In this study, there were also many new forms of growth trajectories. Some people took a MOOC or began to explore OCW in order to move up in the workplace with a new set of skills. Others were preparing to go back to school and needed to update their knowledge of a particular topic or domain in order to gain entrance. Still others wanted to start a new business after retirement and needed essential skills in marketing, Web design, or budgeting. Not too surprisingly, science, math, and foreign language skills were particularly popular for those exploring MIT OCW. The challenges were also somewhat predictable including issues of time management, difficulty in identifying quality free and open educational resources, and fees associated with the use of such technology tools and resources.

Once again, a large percentage of the participants (i.e., 75%) felt some type of life changing experience from their informal and SDL pursuits. As learning resources

expand to heights never before experienced by humankind, the supports related to accessing and utilizing such resources extend from beyond peers, friends, colleagues, experts, and teachers or instructors to people one has never met and likely never will (see Bonk, Lee, Kou, et al., 2015, for more details). What is unique here is that one's learning supports or forms of assistance are now available 24 × 7 from strangers who simply want to help others learn something in an area in which they have some interest, experience, or expertise.

These studies are just a start. What is already clear is that self-directed online learning has major personal as well as societal consequences. As noted throughout this chapter, it is now vitally important to find new ways to collect the all-too-often hidden data that can reveal insights into how people learn in informal and more unconventional learning conditions (e.g., learning in trains, cafes, war zones, etc.). The learning venues and resources of today continue to stretch well beyond what anyone would have thought possible a few short decades ago.

As the new learning resources continue to arise, people are learning from open educational materials and from open source technologies often without being cognizant of it. For example, some educators are documenting how people in developing parts of the world can access the content and learning modules or information pieces that they need when they need it. Such efforts include working with rural farmers in India to help them plan crop plantings and irrigation systems or patterns via mobile technologies and MOOCs (Venkataraman & Kanwar, 2015). Others are developing MOOCs and open education materials to help those who have dropped out of secondary school to complete their degree such as those in the Philippines (Bandalaria & Alfonso, 2015) and disadvantaged youth in Rwanda or Kenya (O'Neal, 2013). MOOCs are also being promoted as a tool for elevating access to higher education in Africa (Richards & Diallo, 2015) or helping refugees and migrants arriving in Europe obtain access to high quality education (Camera, 2016; Coursera, 2016). And they can provide vital historical and cultural knowledge about indigenous populations such as aboriginal youth in remote parts of Australia as well as Maori populations of New Zealand (Hartnett, Brown, & Wilson, 2015). At the same time, the World Bank Institute is currently exploring how MOOCs and open education can provide economies of scale in terms of up-to-date information and skills related to family planning and nutrition, entrepreneurship and starting a small business, and climate change (Jagannathan, 2015). Emerging from all of these examples is the fact that MOOCs offer interesting and all-too-often unexamined possibilities for self-directed and informal learning.

Conclusions

What is clear from our research is that the human species is in the midst of a momentous migration to different forms of environments for its learning needs; much of is it now informal, self-directed, and online, not top down, face-to-face, or formal. Some might refer to these new forms of learning as self-directed online learning environments or SOLEs. In this age of information abundance, SOLEs are

vital since humans are highly curious creatures and want to find out how stuff works. The emergence of Wikipedia and OCW from MIT 15 years ago was just a start. Today, millions of individuals are no longer primarily seeking some type of course credit, transcript mark, certificate, badge, degree, or other external learning indicator or credential. Instead, they want to learn how to find or fix something or enhance a small aspect of their current job-related skills and competencies.

A surprising number of people in our studies are eschewing extrinsic motivators and, instead, deciding to pursue their personal learning goals and passions. Simply put, they are not seeking nor expecting a piece of paper noting their accomplishments at the end. What is perhaps the most interesting and significant finding from our research is that many self-directed learners are not engaging in these behaviors simply for themselves. On the contrary, they hope to obtain personal growth and some aspect of professional development not simply to boost their career prospects, but to help others and society at large.

What is also highly apparent from our studies thus far is that informal and SDL environments address many audiences and include many stakeholders. Among these audiences include policy makers crafting bold projects and initiatives with new forms of funding intended for the coming decades of digitally rich forms of learning. Also impacted are learners seeking innovative degree programs, instructors wanting to enliven their teaching, digital scholars envisioning ways to share their expertise in large-scale ways, and researchers and educators hoping to better understand the mix of resources that can positively enhance human learning. Imagine the new careers and, accordingly, the contributions that thousands of people could make with such informal learning gateways.

Next Steps

There are many research avenues for future informal learning and self-directed online learning scholars. In fact, as informal learning gains the limelight over more formal and traditional forms of instruction, dozens of research questions arise. For instance, how can people be trained to be more self-directed? This is a question in which many people are already asking today. But where will this training come from? Are there useful guidelines or instructional scaffolds that can be put into place? And how might instructors and institutions of learning encourage informal and SDL? Are there age or grade levels when SDL is more vital in terms of not only when it is more easily nurtured but also when and where in one's learning trajectory it is more apparent?

The research can be targeted in a vast array of ways. For instance, one might compare SDL across cultures or geographic regions. More specifically, those raised in East Asia in a more Confucianist-oriented educational climate might need more training and scaffolding to take advantage of self-directed online learning than those

from western cultures. Alternatively, research might explore how different technologies can support self-directed and informal learning habits. For instance, do those who rely more often on mobile devices for their learning exhibit greater SDL skill than those where mobile is less pervasive? Might environments rich in mobile and ubiquitous learning opportunities foster greater informal and SDL? Research might also explore the types of instructional supports needed in a more open and informal learning age.

Our next steps might also include assembling the stories of life change from open education into accessible resources and outlets. Specific contexts from different stories might be meta-tagged and made searchable. Direct comments or quotes from each story might then be used to inspire others to similar learning quests and journeys. Teachers might be able to use them to illustrate cultural differences and similarities in student learning needs and opportunities as well as in educational systems in general. By collecting and cataloguing stories of life change in various areas or categories of informal and SDL, researchers will eventually begin to reveal insights into the ways people utilize such learning resources and tools.

Suffice to say, the coming decade and perhaps the entire twenty-first century will be filled with research on the types of learning that this age of information abundance now affords. We cannot spend it just repeating the experiments conducted during the past century. But we cannot ignore them either. That makes for both an interesting as well as a highly challenging time in education. Wikipedia may be 15, but it is likely the next 15 years which will truly be transformative for all sectors of education. Without a doubt, there is much exciting and pivotal research that will unfold in the near future.

It is vital to understand the far edges of learning taking place on this planet given that what is informal or extreme learning today might find its way into formal and highly common forms of learning in the near future. As Web-based technologies are continuing to push the limits of learning and education far beyond those early days of Wikipedia and learning portals, it is time to make sense of the more open and informal education opportunities in front of each of us. This is an age where global economics have become markedly flatter and human learning is simultaneously becoming much more open, free, and personally accessible. Now is the time to conduct research in such self-directed online learning environments. Ask yourself, do you have a SOLE? If not, will you get one before it is too late?

Appendix A

Extreme learning Website coding scheme.

No.	Criteria	Definition	1 (Low)	2	3 (Medium)	4	5 (High)
1.	**Content richness**	This criterion deals with how much information the website, resource, or project contains on the topic chosen, how adequately it fulfills the purpose of learning, and whether the information is credible and up-to-date or not.	The website, resource, or project doesn't contain much information on the topic chosen, and doesn't adequately fulfill the purpose of learning. The information is not credible or is out-of-date. There are few resources providing access to learning content; it may appeal to different learning preferences or styles.	–	The website, resource, or project contains less information on the topic chosen and fulfills the purpose of learning to some extent. The information is somewhat credible or is up-to-date. There are some resources providing access to learning content; it may appeal to different learning preferences or styles.	–	The website, resource, or project contains much information on the topic chosen and adequately fulfills the purpose of learning. The information is credible and up-to-date. There are a wide range of resources providing access to learning content; it may appeal to different learning preferences or styles.
2.	**Functionality of technology**	This criterion deals with the ease of access, navigation, and use of the website, resource, or project and whether it contains effective and appropriately employed technology to serve the stated learning purpose.	The website, resource, or project is difficult to access, navigate, and use and contains ineffective technology for the stated learning purposes of potential users.	–	The website, resource, or project is relatively intuitive or easy to access, navigate, and use and contains somewhat effective and appropriately employed technology to serve the stated learning purposes of potential users.	–	The website, resource, or project is extremely intuitive and easy to access, navigate, and use and contains highly effective and appropriately employed technology to serve the stated learning purposes of potential users.
3.	**Extent of technology integration**	This criterion deals with the range, amount, and types of technologies employed including issues of interaction, collaboration, and information collection, contribution, and community through such technology.	The website, resource, or project contains few technologies for learning. Technology tools are not interactive, collaborative, or participatory and do not promote communication or sense of community. User	–	The website, resource, or project contains some range of technologies for learning. Technology tools are moderately interactive and collaborative and might enhance information exchange or user	–	The website, resource, or project contains a wide range and amount of technologies for learning. Technology tools are highly interactive and collaborative and can greatly promote information collection and

(*continued*)

No.	Criteria	Definition	1 (Low)	2	3 (Medium)	4	5 (High)
			contribution is limited or nonexistent.		communication and contribution.		dissemination as well as user communication and contribution.
4.	**Novelty of technology (Coolness factor #1)**	This criterion deals with whether the website, resource, or project contains emerging, unusual, or novel technologies.	There is no experimentation with emerging, unusual, or novel technologies for learning and the technologies which are used are out-of-date.	–	There is some experimentation with emerging, unusual, or novel technologies for learning which might motivate or engage potential users/learners.	–	There is extensive experimentation with emerging, unusual, or novel technologies for learning, some of which is quite exciting, motivating, or appealing for potential users/learners.
5.	**Uniqueness of learning environment/ learning (Coolness factor #2)**	The website, resource, or project serves the purpose of learning in a nontraditional, unique, or extreme learning environment, which is highly different from traditional classroom settings.	The website, resource, or project is just a replication of formal or traditional school-based learning. The learning is essentially what the user or learner might experience in a traditional teaching or training situation. The website, resource, or project might be rather plain or unappealing to the potential learner or user; it is one of dozens of such sites.	–	The website, resource, or project is somewhat unique or different from traditional learning. There are learning opportunities that are somewhat novel or hard to find in formal or traditional settings. The website, resource, or project makes an attempt to connect people to each other as well as to novel resources and activities and current information not easily found in books or other traditional learning resources. There is also some room for creative expression of the users.	–	The website, resource, or project is unique or different. There are learning opportunities that are novel or hard to find in formal or traditional settings. The website, resource, or project connects people to each other as well as to novel resources and activities and current information is not easily found in books or other traditional learning resources. There is also extensive room for creative expression of the users.

(*continued*)

No.	Criteria	Definition	1 (Low)	2	3 (Medium)	4	5 (High)
6.	**Potential for learning**	This criterion deals with whether the website, resource, or project enables and provides learning activities or learning opportunities for the target audience to achieve the intended learning goals. There might be many markers, targets, or goals for such learning as well as celebration of those who have completed one or more learning-related units, activities, or segments. Such markers might come in the forms of self-tests, discussions, reviews, interactions, etc., or various rich media resources. The paths for learning are varied and extensive.	The website, resource, or project enables and provides few learning activities or opportunities for the target audience to achieve the intended learning goals. There are extremely limited markers, targets, or goals for such learning and limited acknowledgment related to those who have completed one or more learning-related units, activities, or segments (i.e., self-tests, discussions, reviews, interactions, etc., or various rich media resources). The paths for each learner may be not unique. There may be few ways to socially network or collaborate with others at the website, resource, or project.	–	The website, resource, or project enables and provides some learning activities or learning opportunities for target audience to achieve some intended learning goals. There might be some markers, targets, or goals for such learning as well as celebration of those who have completed one or more learning-related units, activities, or segments (i.e., self-tests, discussions, reviews, interactions, etc., or various rich media resources). The paths for each learner may be somewhat unique. There may also be some ways to socially network or collaborate with others at the website, resource, or project.	–	The website, resource, or project enables and provides the potential for learning activities or learning opportunities for the target audience to achieve most or all of the intended learning goals. There might be markers, targets, or goals for such learning as well as celebration of those who have completed one or more learning-related units, activities, or segments (i.e., self-tests, discussions, reviews, interactions, etc., or various rich media resources). The paths for each learner may be highly unique. There may also be ways to socially network or collaborate with others at the website, resource, or project.
7.	**Potential for life changing**	This criterion deals with whether the website, resource, or project influences or improves the quality of life and extends or changes the perspective	The website, resource, or project does not offer much in the way of improving or influencing the quality of life or the perspective of the world for the intended	–	The website, resource, or project somewhat influences or improves the quality of life and the perspective of the world for intended audience. People	–	The website, resource, or project significantly influences or improves the quality of life and extends or changes the perspective of the world for the

(*continued*)

No.	Criteria	Definition	1 (Low)	2	3 (Medium)	4	5 (High)
		of the world for the intended audience. As part of this, there is potential for individuals to experience life changing or empowerment moments from the use of the website, resource, or project.	audience. The impact is quite narrow or limited. Users might not gain anything beyond basic skills.		are somewhat empowered to learn in ways that change their lives or broaden their outlook, perspectives, or knowledge and competencies. They can connect to other people or to knowledge and information in some ways that they might not have felt or experienced previously.		intended audience. People are empowered to learn in ways that change their lives or broaden their outlook, perspectives, or knowledge and competencies. They can connect to other people or to knowledge and information in many ways previously unseen or seldom experienced.
8.	**Scalability of audience**	This criterion deals with the potential impact of the website, resource, or project including the possibility to broaden the size and scope of its potential intended audience.	The website, resource, or project has a narrow focus or does not have wide appeal or potential impact. The intended or actual audience is quite limited.	–	The website, resource, or project has the potential to impact many people or a somewhat wide audience. It might have relevance to several different audiences or types of users.	–	The website, resource, or project has high possibility to impact a broad audience or large scale and scope from one or more educational sectors (e.g., K-12, higher education, corporate, government, nonprofit, or informal).

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