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Preface

Many questions remain unanswered in the field of self-directed learning, and some of the most persistent and important are addressed in this issue of IJSDL. David Sackett, a well-known pioneer of evidence-based medicine, famously summed up one of the major reasons that development of self-directed learners is increasingly being recognized as an urgent need:

Half of what you'll learn in medical school will be shown to be either dead wrong or out of date within five years of your graduation; the trouble is that nobody can tell you which half -- so the most important thing to learn is how to learn on your own. (Cited in Daily & Landis, 2014, p. 2066)

Dr. Sackett's comment could be applied to almost any professional preparation program or occupation, and to many other areas of life as well. Information and technology are proliferating so rapidly that lifelong, self-directed learning is imperative for everyone. This issue includes two articles related to SDL in the health professions, one that examines and categorizes internet resources, and one that explores some fine points related to self-efficacy. We hope you find them helpful.

After extensive review of the literature and drawing from Premkumar's research and experience in medical education, Morrison and Premkumar offer thoughtful and well-documented strategies for promoting self-directed learning in medical preparation programs in the first article in this issue.

In a yearlong study, Kim and her coauthors analyzed 305 informal learning websites and virtual education websites available at no cost to individual learners. The research was designed to reveal the essential characteristics of successful online resources and technology tools that are important resources for self-directed learning. The websites were categorized and then evaluated based on criteria refined in the study, providing a helpful resource for self-directed learners and those who want to assist others in pursuing SDL.

Ponton, Carr, and Wiggers explored the specific area of persistence in a novel pursuit in the face of failed efforts at mastery. Their research was designed to determine if perseverance in performances without a history of success appear to be due to beliefs of self-efficacy in the performance itself or to beliefs of self-efficacy to learn the performance.

Payne, Rocks, and Schaffner examined learner self-direction and self-determination over the course of academic preparation programs in nursing and athletic training, noting some differences in outcomes between the two programs.

Lucy Madsen Guglielmino, Editor

Reference

Daily, J. A., & Landis, B. J. (2014) The journey to becoming an adult learner: From dependent to self-directed learning. *Journal of the American College of Cardiology*, 64 (19), 2066-2068. Retrieved from <http://content.onlinejacc.org/article.aspx?articleID=921687>

International Journal of Self-Directed Learning

Volume 11, Number 1, Spring 2014

CONTENTS

<i>Preface</i>	ii
<i>Practical Strategies to Promote Self-Directed Learning in the Medical Curriculum</i>	
Dirk Morrison and Kalyani Premkumar	1
<i>Analyzing The Human Learning And Development Potential Of Websites Available For Informal Learning</i>	
Minkyong Kim, Eulho Jung, Abdullah Altuwaijri, Yurong Wang, and Curt Bonk	12
<i>Self-Efficacy to Do or Self-Efficacy to Learn to Do: A Study Related to Perseverance</i>	
Michael K. Ponton, Paul B. Carr, and Nancy R. Wiggers	29
<i>Self-Direction in Learning and Academic Motivation Development in Undergraduate Health Profession Students</i>	
Shelley S. Payne, Joan Rocks, and Barbara Schaffner	41

**ANALYZING THE HUMAN LEARNING AND DEVELOPMENT
POTENTIAL OF WEBSITES AVAILABLE FOR INFORMAL
LEARNING**

**Minkyong Kim, Eulho Jung, Abdullah Altuwaijri, Yurong Wang,
and Curt Bonk**

The advancement of learning technology in recent decades has broadened the possibilities for online learning in both formal and informal settings. This research was designed to reveal the essential characteristics of successful online resources and technology tools that are important resources for self-directed learning. Over the span of a year, a team of researchers collected and analyzed 305 informal learning websites and virtual education websites available at no cost to individual learners. The websites were categorized into the following six subject domains: language learning, outdoor and adventure learning, social change and global learning, virtual education, learning portals, and shared online video. Content analysis was employed to evaluate the 305 websites using eight evaluation criteria: content richness, functionality of technology, extent of technology integration, novelty of technology, uniqueness of learning environment/learning, potential for learning, potential for life-changing impact, and scalability of the audience. The six categories or types of informal learning were then compared by applying the eight criteria.

Cross (2007) contends that more than 80% of learning is informal. He notes that informal learning is the unofficial, unscheduled, and non-traditional way most people learn to succeed personally as well as professionally. For all of us, learning is a lifelong activity—one that does not end. In 2013, OECD Secretary-General Angel Gurría emphasized the importance of lifelong learning in the following statement: “Too many people are being left behind today... with effective education and life-long learning everyone can develop [his or her] full potential. The benefits are clear, not only for individuals, but also for societies and for the economy” (OECD, para 3).

Educators are increasingly called on to properly prepare learners for the digital learning skills required to succeed in a more global twenty-first century (Lee, 2006; Lee & Bonk, 2013; Merryfield, 2007, 2008; Merryfield & Kasai, 2009). Song and Hill (2007), for instance, stated that faculty members are actively utilizing Open Educational

Resources (OER) and cloud computing with the goal of encouraging informal and self-directed learning, which is increasingly becoming part of everyday life.

Kop and Fournier (2010) explored the challenges and opportunities of self-directed learners in a massive open online course (MOOC). They pointed out how emerging Web technologies have altered the educational landscape by providing learners with choices as to their learning paths. This emerging trend calls for additional research, as the tools and resources have shifted the emphasis of learning from a linear teacher-centered model to learner-centered one, wherein people increasingly select the tools, resources, and means of communication and collaboration in learning. In the same vein, learning technologists and other educators need to better understand the nature of open and online learning environments in order to encourage learners' autonomy. They concluded by emphasizing the fact that learners need sophisticated tools and resources to evaluate the utility of information available for facilitating self-directed learning.

As part of this massive increase in OER, global collaboration and interaction in online communities is also taking on greater importance than ever before. To address the new skills and competencies deemed necessary, several reports suggest that innovative activities and curricula can connect learners around the world in unique and educationally meaningful ways (Longview Foundation, 2008; Riel, 1993). Such global education curricula can also take advantage of informal online learning tools and resources. When they do, they can set in motion lifelong learning pursuits.

Online resources provide a valuable asset for self-directed learners, giving them wide access to useful learning content. With the emergence of the Web, informal learning is now at the fingertips of a wide variety of learners (Kop & Fournier, 2010). Learners in the pursuit of lifelong learning are empowered to determine what is worth learning and to use self-directed approaches for addressing a range of learning tasks (Garrison, 1997).

Clearly, during the past decade, the forms of learning delivery and opportunities to learn have exploded. For example, those who are incarcerated, injured and in a hospital bed, or unemployed and unable to pay for college tuition can learn to be more productive members of society. Others might be in transition from one career to another and find open educational resources (OER) and OpenCourseWare (OCW) made freely available by schools and higher education institutions around the planet highly valuable for achieving their learning goals (Iiyoshi & Kumar, 2008). Countless others who are undergoing a life change make use of informal and formal online learning resources. For instance, tens of thousands of people are earning degrees and certificates while performing military duties in war zones, such as Iraq and Afghanistan. One can also learn a foreign language online as well obtain a certificate or diploma for such learning. If basic skills in mathematics or reading are needed, there are dozens of freely available programs, tools, and shared online video resources. If the goals are environmental or geographic education, there are many ways for learners to enhance their appreciation and understanding of the limited resources of this planet. This plethora of online resources can, of course, be used in educational institutions, but they can also be accessed by individuals from the inside of a car, an airport concourse, a bookstore, café, or even a dogsled (Bonk, 2009; Doering, 2006; Miller, Veletsianos, & Doering, 2008).

It is evident that learning is increasingly informal and self-directed. We are living

in an age of open education where anyone can now learn anything from anyone else at any time (Bonk, 2009). Given the explosion of OER and free curriculum materials found online, the number of informal learners is likely to dramatically increase during coming decades (Cross, 2007); so will their demands for high quality and effective learning resources. Kop and Fournier (2010) and Song and Hill (2007) assert that there is also a need for enhanced supports for self-directed learners who utilize these informal online learning environments. As a first step, it is imperative to assess the quality of online resources so that informal and self-directed learners can find high quality resources to meet their learning needs.

The purpose of this study is to delineate the forms and types of informal learning that are now available online for self-directed learners and to develop and apply evaluative criteria for these learning sites, providing a valuable resource for both self-directed learners and those who attempt to assist them in locating quality resources.

Research Method

This research takes a grounded theory approach (Strauss & Corbin, 1990). The grounded theory method is centered on inductive reasoning—in contrast to the norms of traditional social science research. That is, we did not begin with a hypothesis, but with data collection in hopes of identifying a pattern in the data set. More specifically, this research underwent several stages of data collection and analyses. First, a team of over a dozen researchers from educational psychology, educational technology, and other related disciplines located, shared, reviewed, and evaluated potential informal learning sites over the course of a year in order to determine the current state of informal learning websites. Subsequently, a sub- group of four researchers rated 305 informal learning Web sites using an eight-part coding scheme. This coding scheme was developed by the entire research team of more than a dozen individuals using a set of technology features and instructional resource characteristics found in the research literature (Jung, Kim, Wang, & Bonk, 2011) (see Appendix A). The input and experiences of each member contributed to the creation and refinement of this instrument.

Members of this team used different methods for locating the various informal learning sites. They included personal subject-matter expertise, extensive Web searching, the scanning of books, reading blog posts and technical reports, and soliciting expert and colleague recommendations in order to develop an evolving list of informal learning websites. Based on a series of discussions, we compiled the resulting list of resources that are categorized into six areas. While each website was placed in only one of these six categories, there certainly is overlap in these dimensions. For instance, some social change resources also offer opportunities for virtual education, language education, or watching shared online video.

Despite the existence of overlap, we defined each of the six categories distinctly:

1. **Language learning** resources use technology-aided language learning with an integration of sound, voice interaction, text, video, and animation. It empowers self-paced interactive learning environments that enable learners to achieve learning outcomes without being restricted to place or time. Often, such environments involve numerous opportunities for participation users and

multiple methods for motivating their success. Online language learning often entails high levels of self-directed and reciprocal learning or supporting peer learning (see Ehsani & Knodt, 1998)

2. **Outdoor and adventure learning** is a hybrid online educational environment that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative online learning environments. Inquiry-based learning including teamwork, authentic data analysis, and project-based learning is encouraged (see Doering, 2006).
3. **Social change/global** resources seek to educate and inform people about issues and needs relating to social change, including poverty, hunger, AIDS, civics, the environment, etc. Technology is often used to create innovative ways to spread social good and access to learning worldwide. It is also used to empower and inspire people for the right cause.
4. **Virtual education** refers to learning environments where teacher and student are separated by time or space, or both. Course delivery can be through course management applications as well as various multimedia and Web 2.0 tools. Virtual education may be managed by organizations and institutions that have been created through alliances and partnerships to facilitate teaching and learning. Some virtual education websites provide learner services such as advising, learning assessment, and program planning (see Farrell & the Commonwealth of Learning, 2001). Our categorization and ratings are limited to virtual education resources that are available to individual learners at no cost.
5. **Learning portals** are centralized learning centers or repositories that contain an aggregation of educational information on a topic, often current or continually updated. Learners explore according to their own interest, time, and space. Learning portals support user and context learning, and are less centered on administration of that content and the results of the learning.
6. **Shared online video** includes any educational video (YouTube or other web-streamed videos) that can be watched or shared. Some such sites offer syndicated programming and professional documentaries or filmmaking, whereas others are supported by lay people. These sites often allow for interaction via comments and annotation. They often allow for downloading of content.

After synthesizing the literature, expertise, and specialists' reviews, we developed the final version of the evaluation criteria for such online informal learning resources. Those are: *content richness, functionality of technology, extent of technology integration, novelty of technology, uniqueness of learning environment/learning, potential for learning, potential for life-changing impact, and scalability of audience*. Table 1 provides definitions of evaluation criteria.

Table 1. *Definitions of Evaluation Criteria*

Criteria	Definition
Content Richness	This criterion indicates 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.
Functionality of Technology	This criterion indicates 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.
Extent of Technology Integration	This criterion indicates the range, amount, and types of technologies employed, including issues of interaction, collaboration, and information collection, contribution, and development of community.
Novelty of Technology	This criterion indicates whether the website, resource, or project contains emerging, unusual, or novel technologies.
Uniqueness of Learning Environment / Learning	This criterion indicates whether the website, resource, or project serves the purpose of learning in a non-traditional, unique, or extreme learning environment, which is highly different from traditional classroom settings.
Potential for Learning	This criterion indicates whether the website, resource, or project enables and provides learning activities or learning opportunities for the target audience to achieve the intended learning goals.
Potential for Life-Changing Impact	This criterion indicates whether the website, resource, or project influences or improves the quality of life and extends or changes the perspective on the world for the intended audience.
Scalability of Audience	This criterion indicates the potential impact of the website, resource, or project including the possibility to broaden the size and scope of its potential intended audience.

Ratings were developed for each informal learning website through multiple phases of evaluation based on the eight criteria above using a 5-point Likert scale (1 is low; 5 is high). Four internal raters independently rated each informal learning resource using these eight criteria. Cronbach's alpha was performed to determine the internal consistency among the four raters. The overall alpha coefficient for the four raters was acceptable at .744. Appendix A shows the coding schemes.

Result and Discussion

General Findings

Four raters evaluated 305 websites using the rating scheme listed in Appendix A. The websites evaluated included the six categories or types of informal learning which we identified: 63 language learning, 51 outdoor and adventure learning, 57 social change and global learning, 57 virtual education, 38 learning portals, and 39 shared online video sites. Out of 5 points possible, Table 2 indicates that the shared online video category received the highest rating (3.25) across the eight categories. The high overall score implies excellent potential for effective learning from the shared online video resources that were evaluated. The social change and global learning category received the lowest (2.68) rating, meaning that there is lack of high quality learning materials for social change and global learning despite this area's significance.

To identify common patterns in the quality of online learning resources, we listed the top 25 websites out of a total of 305 websites by their average scores (see Table 3). There were four in the Language Learning category, four in Outdoor and Adventure

Learning, one in Social Change and Global Learning, nine in Virtual Education, one in Learning Portals, and six in Shared Online Video. Most of the high-scoring websites received top ratings for the functionality of the technology and the extent of technology integration. Such results reveal the importance of proper design of informal learning technology resources for educational purposes. In addition, among the eight criteria, content richness (4.11), functionality of technology (4.32), and potential for learning (4.17) are the highest-rated dimensions across all the informal learning websites evaluated in this study (see Table 4).

Table 2. *Evaluation of Website Categories Based on Informal Learning Criteria* *

Criteria	Categories (Number of websites)						Average (Total 305)
	Language Learning (63)	Outdoor / Adventure learning (51)	Social Change / Global (57)	Virtual Education (57)	Learning Portals (38)	Shared Online Video (39)	
1. Content Richness	2.9	2.9	2.5	3.4	3.2	3.4	3.05
2. Functionality of Technology	3.1	2.9	2.6	3.2	2.8	3.4	3.01
3. Extent of Technology Integration	2.9	2.8	2.6	3.1	2.7	3.2	2.86
4. Novelty of Technology	2.7	2.6	2.4	2.8	2.5	3.0	2.66
5. Uniqueness of Learning Environment / Learning	2.8	3.7	2.8	2.9	2.6	3.2	3.00
6. Potential for Learning	3.1	3.3	2.8	3.4	2.9	3.4	3.15
7. Potential for Life Changing Impact	2.6	3.1	2.9	3.1	2.5	3.1	2.90
8. Scalability of Audience	3.1	2.8	2.7	3.3	3.0	3.4	3.04
Average	2.89	3.01	2.68	3.15	2.76	3.25	2.96

*Rated with Likert scale 1(low)-5(high)

Findings with Criteria

Additional analyses were conducted based on the eight criteria. Table 2 shows that virtual education ranked highest in terms of the richness of its content: it received a ranking of 3.4. This ranking indicates that these websites were up-to-date and contained extensive learning materials. Not surprisingly, it is reasonable that the virtual education websites contain the most credible and up-to-date knowledge considering that many of the virtual education websites that we evaluated were managed by accredited academic institutions and used for formal learning as well as being available at no cost to individual learners.

Outdoor and adventure learning received the highest score in terms of the uniqueness of the learning environment and learning (3.7). This implies that the Website offers a novel way of learning; such forms of learning are not easily found in books or in traditional classrooms (Doering, 2006). High scores in this criterion signal that many non-traditional, unique, or informal learning environments are now possible.

In addition to these findings, it was also quite interesting to discover that across all the sites rated, the novelty of technology was deemed quite low (2.66). This result implies that emerging and cutting-edge technologies are not often employed for nontraditional educational purposes. Such findings also indicate that well-known

informal learning websites and resources fail to employ cutting-edge technologies. The use of emerging technologies—for example, mobile access today—might be beneficial in increasing accessibility for the public, including both teachers and learners. For the social change and global learning category, a vast majority of websites that the research team analyzed were simply composed of images and text materials. Despite this high-quality content, using a wider variety of communication technologies and interactive Web applications would likely increase the appeal to informal online learners.

Findings and Discussion by Categories

Results for each category of informal learning are provided below.

Language learning. Given that functionality of technology received the highest rating for language learning websites that we evaluated, technology interactivity and support seems to be one of the most valued factors in language education. The ratings for each of the eight criteria for the language learning category did not fluctuate much and averaged 2.89 overall. In the language education websites, the highest score was in the potential for learning (3.1), whereas the lowest score was in the potential for life changing experiences (2.63). Four language learning websites were rated among the top websites, including BBC Learning English, ChinesePod, EnglishPod, and Livemocha.

Outdoor and adventure learning. We also explored many websites addressing outdoor and environmental learning. This category tied with virtual education for the highest average overall score (3.01). The highest rated individual category for outdoor and adventure learning was the uniqueness of the learning environment (3.65) and the lowest score was for the novelty of technology (2.57). Considering that adventure learning involves authentic exploration, such as expeditions to the Himalayas or the Amazon rain forest, these findings are not too surprising, given the rich, authentic, and meaningful learning environments found in adventure learning. Four adventure learning websites were selected as top rated, including Earthducation, Explore, Jon Bowermaster, and Nautilus Live.

Social change and global learning. Most of the scores in the social change and global learning category were below the average scores across all the websites (i.e., 2.96). The highest score for social change and global education was in the potential for life change (2.93), which, naturally, was expected. These findings were attributed to the distinctive nature of the social change and global learning category. One of the common features of social change websites is providing inspiration and motivation, rather than directly providing educational materials. Only one website was selected as a top-rated Website in this category: iCivics.

Virtual education. Taking into consideration that many open learning resources include websites that are freely available and open to the public, such as the popular MIT OpenCourseWare (OCW) project, the high score in potential for learning (3.39) and content richness (3.39) for virtual education websites was not too surprising. We believe that the low score for the novelty of technology (2.82) was directly related to the fundamental role of virtual education in schools and universities today; most educational institutions tend to be conservative by nature. Nine Virtual Education websites that made their materials available free for individual learners were selected as top-rated. These sites included Ed Tech talk, John Hopkins OpenCourseWare, Khan Academy, MIT OCW, MIT OCW Highlights for High School, NASA for Educators, Open University

UK-OpenLearn, Coursera, and the Smithsonian. Clearly, virtual education is attracting much attention and providing many resources today.

Learning portals. We also rated the Web resources that were essentially learning portals. The highest score for learning portals was in content richness (3.19). The lowest score for the learning portals category was related to the novelty of the technology (2.49). Only one learning portal was selected as a top-rated website: MERLOT—a portal specifically designed and revamped since the late 1990s for sharing, rating, and discussing high quality online resources for higher education.

Shared online video. Many online lectures and programs are delivered through video channels and many high production news broadcasts are now available on the Web for millions of potential viewers. Such shared online video had the highest overall score (3.25). In terms of specific dimensional ratings, the highest-rated element for this category was the functionality of technology (3.41) and the lowest score was for the novelty of the technology utilized (3.00). Six shared online video websites were selected as top-rated across all the sites that were analyzed. These sites included Academic Earth, Discovery News Video, Explo.tv, Link TV, National Geographic Education, and Wonder How To Videos.

Table 3. *Top 25 Rated Learning Websites*

Categories	Websites
Language Learning	<ul style="list-style-type: none"> ▪ Livemocha (http://www.livemocha.com/) ▪ BBC Learning English (http://www.bbc.co.uk/worldservice/learningenglish/) ▪ EnglishPod (http://englishpod.com/) ▪ ChinesePod (http://chinesepod.com/)
Outdoor / Adventure learning	<ul style="list-style-type: none"> ▪ Earthducation (http://lt.umn.edu/earthducation/) ▪ Jon Bowermaster (http://www.jonbowermaster.com/) ▪ Nautilus Live (http://www.nautiluslive.org/) ▪ Explore (http://www.explore.org/)
Social Change / Global Learning	<ul style="list-style-type: none"> ▪ iCivics (http://www.icivics.org/)
Virtual Education	<ul style="list-style-type: none"> ▪ MIT OpenCourseWare (OCW) (http://ocw.mit.edu) ▪ MIT OpenCourseWare (OCW) Highlights for High School (http://ocw.mit.edu/high-school) ▪ Khan Academy (http://www.khanacademy.org) ▪ Open University UK-OpenLearn (http://www.open.uk/openlearn/) ▪ Ed Tech talk (http://edtechtalk.com/) ▪ John Hopkins OpenCourseWare (http://ocw.jhsph.edu/) ▪ NASA for Educators (http://www.nasa.gov/audience/foreducators/index.html) ▪ Coursera (https://www.coursera.org/) ▪ Smithsonian (http://www.si.edu/)
Learning Portals	<ul style="list-style-type: none"> ▪ MERLOT (http://www.merlot.org/merlot/index.htm)
Shared Online Video	<ul style="list-style-type: none"> ▪ National Geographic Education (http://education.nationalgeographic.com/education/) ▪ Academic Earth (http://academicearth.org/) ▪ Discovery News Video (http://news.discovery.com/videos/) ▪ Wonder How To Videos (http://www.wonderhowto.com/) ▪ Explo.tv (http://www.exploratorium.edu/tv/index.php) ▪ Link TV (http://www.linktv.org/)

Table 4. *Top 25 Websites According to Informal Learning Criteria and Category*

Criteria	Categories (Number of websites)						Average (Top 25)
	Language Learning (4)	Outdoor / Adventure Learning (4)	Social Change / Global (1)	Virtual Education (9)	Learning Portals (1)	Shared Online Video (6)	
1. Content Richness	3.94	3.63	4.50	4.22	5.00	4.17	4.11
2. Functionality of Technology	4.56	4.25	4.50	4.47	4.00	4.00	4.32
3. Extent of Technology Integration	4.19	3.94	4.25	4.03	4.00	3.79	3.99
4. Novelty of Technology	3.81	3.56	4.00	3.53	3.25	3.63	3.61
5. Uniqueness of Learning Environment / Learning	3.69	4.44	4.00	3.58	3.25	3.96	3.83
6. Potential for Learning	4.00	4.19	3.00	4.33	4.00	4.25	4.17
7. Potential for Life Changing	3.63	3.94	3.00	3.86	3.75	3.71	3.76
8. Scalability of Audience	4.13	3.56	3.50	4.36	4.25	3.92	4.05
Average	3.99	3.94	3.84	4.05	3.94	3.93	3.98

Conclusions and Implications

Many interesting characteristics of informal learning resources emerged from our analyses. In addition, our new eight-part coding scheme proved valuable in better understanding the learning potential of Web tools, materials, and resources that push toward the edges of informal forms of human learning today. These criteria should prove helpful to others intending to conduct research in this fast emerging field.

There are numerous factors to consider when designing effective websites for informal learning. Such variables include content and technological richness as well as the scalability, novelty, and uniqueness of the technology and the learning activities intended to take place. The incorporation of novel and emerging technologies also plays a role in the design and use of highly interactive resources from online language learning websites as well as almost any learning portal available today.

It is not surprising that virtual education was the highest rated in terms of content richness, potential for learning, and scalability. That is what such alternative educational services and learning providers intend to do. With economic factors to consider, virtual school and higher education curricula are often designed for large audiences; just witness the rise of massive open online courses (MOOCs) during the past several years. Of course, as detailed in the press, there is much money being spent by for-profit as well as non-profit and government entities in this space today (Kaya, 2010). As evident in the media, there is more demand for virtual forms of education today than ever before (Allen & Seaman, 2010; Project Tomorrow & Blackboard, 2011; Watson et al., 2011). As this occurs, there is increasing recognition that both traditional (i.e., residential) and online education, for credit or simply for expansion of learning, play important roles today (Milliron, 2010) and benefit learners from different backgrounds and circumstances.

In addition to these virtual education findings, many of the other results were somewhat anticipated. For instance, it makes sense that language learning sites incorporated the widest range of technology tools; many of them offer premium accounts which raise significant revenues. While there are ongoing concerns about some of the instructional approaches embedded in such online language learning sites (Clark & Gruba, 2010), we found many of these sites relatively easy to navigate, understand, and use.

At the same time, the most unique ways in which technology was employed were evident in the outdoor and adventure learning websites and resources as well as in the social change and global learning sites. Such findings would intuitively be expected from the adventure learning category given the motivational and emotional attraction of an adventure as well as the currency of activities and events found there.

Those hoping for a new career might explore virtual education as a potential life-changing event. Badges, certificates, and even fully online degrees can be obtained today. Clearly, virtual education sites also offer the most in terms of both the range and amount of human learning experiences available. There are assorted learning options or paths once one enrolls in or browses through virtual education resources.

With the plethora of educational resources available online for free, it is essential to identify appropriate and high-quality learning resources to maximize the learning process. Those learning in a self-directed manner need tools and a framework to discern the quality and appropriateness of such resources. We admit that the tool we developed needs additional testing and empirical validation for further advancement. With informal and self-directed learners in mind, we hope that the tool will serve as a starting point for better understanding and appreciating informal as well as formal online learning resources and possibilities.

The results of this research will help expose lifelong learners, teachers, students, instructional designers, administrators, and other educational stakeholders to a wealth of learning resources and tools for both formal and informal education. The open educational world is expanding in many directions to offer unique learning paths and opportunities, from simple information gathering in Wikipedia to timely and engaging shared online videos that remediate or supplement learning (Khan, 2010; Pan et al., 2012) to high production news broadcasts. As we have seen, there are now highly engaging learning adventures from science stations in Antarctica to remote parts of the Arctic north (Associated Press, 2011; Carter, 2010). At the same time, there are learning portals, news resources, and other information and media for nearly every significant scientist, writer, politician, and musician throughout recorded history as well as for every species of life found on this planet (Managhan, 2011).

Those developing such portals and related websites need to better grasp the key technology integration factors and learning activities that can maximize users' learning. This awareness is increasingly pivotal for the learners around the planet; technologies will continue to appear each year that can advance formal as well as informal learning opportunities. At the same time, millions of additional people are obtaining access to the Web each month. They will undoubtedly be relying on such resources for their daily and lifelong learning needs, especially those learners who lack access to high quality formal education.

Given such trends, those using these informal learning tools and resources need to better grasp their learning potential. We will be collecting stories during the coming years that will serve as models or examples of the types of learning that are now possible in the twenty-first century. This project was just the first pass through hundreds of informal learning resources. It is one marker or indicator of learning now possible. Our next research phases will push and probe much more deeply into the motivational and human development possibilities that now lie within our grasp.

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ANALYZING WEBSITES FOR INFORMAL LEARNING

Appendix A. Informal Learning Web Site Coding Scheme

Criterion 1. Content Richness

This criterion indicates 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.

1 (Low)	2	3 (Medium)	4	5 (High)
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.

Criterion 2. Functionality of Technology

This criterion indicates 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.
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Criterion 3. Extent of Technology Integration

This criterion indicates 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 contribution is limited or nonexistent.	-	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 communication and contribution.	-	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 dissemination as well as user communication and contribution.
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Criterion 4. Novelty of Technology

This criterion indicates 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.
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ANALYZING WEBSITES FOR INFORMAL LEARNING

Criterion 5. Uniqueness of Learning Environment / Learning

This criterion indicates whether the website, resource, or project serves the purpose of learning in a non-traditional, unique, or extreme learning environment, which is highly different from traditional classroom settings.

<p>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 situations. 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.</p>	-	<p>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.</p>	-	<p>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.</p>
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Criterion 6. Potential for Learning

This criterion indicates whether the website, resource, or project enables and provides learning activities or learning opportunities for the target audience to achieve the intended learning goals.

<p>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.</p>	-	<p>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.</p>	-	<p>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.</p>
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ANALYZING WEBSITES FOR INFORMAL LEARNING

Criterion 7. Potential for Life-Changing Impact

This criterion indicates whether the website, resource, or project influences or improves the quality of life and extends or changes the perspective on the world for the intended audience.

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 audience. The impact is quite narrow or limited. Users might not gain anything beyond basic skills.	-	The Website, resource, or project somewhat influences or improves the quality of life and the perspective of the world for intended audience. People 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.	-	The Website, resource, or project significantly influences or improves the quality of life and extends or changes the perspective of the world for the 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.
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Criterion 8. Scalability of Audience

This criterion indicates 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, non-profit, or informal).
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