NMC Horizon Project

Innovating Language Education

An NMC Horizon Project Strategic Brief

NMC

Innovating Language Education

An NMC Horizon Project Strategic Brief

Introduction

This report was commissioned by the University of Hawaii at Manoa to inform strategic planning in the field of language education, specifically for the creation of the institution's new Language Flagship Technology Innovation Center (LFTIC). The project launched in August 2015 with the goal of providing input to the LFTIC team about sustainable technological innovations spurred by smart collaborations, deep research, and forward-thinking pedagogy. In the process, the NMC's research has underscored a critical need for more progressive approaches that foster continuous curiosity in world languages to bolster the United States' global competitiveness and promote improved language proficiency.

As such, *Innovating Language Education: An NMC Horizon Project Strategic Brief* should be considered a call to action for all language education leaders to apply similar models and strategies as explored throughout the report. LFTIC is well poised to be an incubator for these innovative approaches and programs.

call to action for more collaboration given the complexities of language education

The Need for Innovation

Seminal research conducted and published by the Language Flagship Program has already proven that the field of language education is ripe for innovation.[1] The increasingly global and mobile society has led educators and business professionals to acknowledge the essential role that language plays in establishing connections and leading a more productive workforce. Within the last decade, the Language Flagship Program has teamed up with six states, Hawaii, Ohio, Texas, Utah, Rhode Island, and Oregon, all of which recognize a need of foreign language proficiency within their communities to promote social and economical growth. In doing so, each states convened a panel of experts to map out the steps to encourage language learning. One key outcome was that the majority of states established sustainable learning centers that will continue to evolve and advance language proficiency for years to come.

In the Language Flagship paper, "What Business Wants: Language Needs in the 21st Century," the authors explore the results from the Language Summits and the Metro Language Series into a comprehensive article about the role language skills and cultural awareness plays in business.[2] The Language Flagship Program has demonstrated a well-rounded understanding of how language and culture influence businesses productivity, while forecasting future trends in education and industry that can be used to advance economic growth locally and internationally. The key takeaway from both summits is that leaders must cultivate new ways to approach language instruction within their respective communities to promote progress and success among aspiring members of the global workforce. Technology is a key enabler of this transformation, assisting both instructors in facilitating language learning and making helpful content perpetually available to students, wherever they are.[3]

The U.S. government has also demonstrated a commitment to bolstering capacity and proficiency in foreign language on a national scale. In October 2014, the Department of Education awarded more than $63 million in grants to higher education institutions with the goal of "[enhancing] its leadership role in world markets, global engagement, and scholarship"[4] through the development of special programs and a resource center. University of Hawaii at Manoa was one such recipient, with a track record in designing innovative programs, including the Project-Based Language Learning in Action Intensive Summer Institute, which trained educators on integrating deeper, more authentic learning approaches in their courses and programs.[5]

The NMC Horizon Project

The *NMC Horizon Project Strategic Brief* series and this edition draws from the NMC's nearly 15-year history of charting and analyzing emerging technology uptake across education through the

world-renowned NMC Horizon Project. NMC Horizon Project publications garner about five million downloads annually, with a readership spanning nearly 200 countries. For every edition, an environmental scanning process is used to surface the most timely and relevant research, reports, articles, and papers; through the NMC's Delphi-based crowdsourcing methodology, key trends, significant challenges, and important developments in technology are identified by panels of experts for their impact on teaching and learning in a five-year view.

In This Edition

For *Innovating Language Education: An NMC Horizon Project Strategic Brief*, an editorial board consisting of 16 thought leaders in U.S. language education was convened. This board reflects a diverse set of perspectives and backgrounds, including participants from government, university leadership, language program leadership, and instructional design. The main task of the board is to keep the pulse on the technological developments, pedagogies, and practices that are most relevant and beneficial to advancing innovation in language education.

As language education leaders determine the next steps for their field, it is important that they ground technological innovations in sound pedagogy and approaches. As such, the report opens with a summary of the top trends driving progress in teaching and learning across higher education, as well as the top challenges impeding real change — all recently identified by NMC Horizon Project panels of experts. There is an emphasis on cultivating and expanding access to deeper learning approaches the incorporate hands-on real-world experiences for students while leveraging the informal learning they already do with tools such as social media. Every trend and challenge also incorporates the unique implications and context for language education.

A subsequent section on developments in technology reveals the major digital tools and strategies that are poised to increases access to deeper learning experiences and promote language fluency. The areas covered include data-driven technologies to improve learning personalization and adaptability; online, hybrid, and mobile learning models that can make language learning more engaging and ubiquitous; and immersive technologies that enable more authentic exchanges between students, instructors, and native speakers, often transporting users into settings that simulate real-world experiences. Each development includes a number of examples of the technology or strategy in practice that language education leaders can emulate or adapt. Finally, the developments conclude with a list of suggested readings to provide more information on the subject matter. ?

The research culminates in a set of five recommendations that leverage the key innovations and pressing topics discussed in the brief. Proof of concepts showcase successful existing models that can serve as concrete examples of how each recommendation could be executed. Based on the findings of this brief, fostering an authentic curiosity in world languages is an important component of progressing the field. Each recommendation was developed with the aim of both boosting learner engagement in world languages and improving their proficiency throughout their schooling, and even as they advance in the workforce.

Trends and Challenges Impacting Language Education

In order to understand how emerging technologies can enhance language courses and programs, it is important that they be grounded in the trends that are driving positive changes across all disciplines, along with acknowledging the challenges impeding real transformation. In the past three years of the NMC Horizon Project, expert panels have surfaced two key trends and two significant challenges that have shaped innovative thinking in education; leaders in foreign language education must familiarize themselves with the following topics in order to ensure that new programs reflect the needs and expectations of contemporary students.

Proliferation of Open Educational Resources | *Trend*

Overview

According to UNESCO, open educational resources (OER) are "teaching, learning, and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions."[6] The use of OER is underlined by the belief that knowledge is a public good, and that everyone should have the opportunity to share, use, and re-use it freely.[7] A huge step for the OER movement was taken in 2011, when the Massachusetts Institute of Technology founded the MIT OpenCourseWare initiative, making their instructional materials for over 2,200 of its courses freely available online. Since then, OER has been gaining ground at campuses all over the world, including prestigious universities such as Carnegie Mellon University and Harvard University, which have launched their own open learning initiatives. A 2014 Babson Research Survey Group study of 2,144 faculty members in the US found that more than three-quarters expect to use OER in the future.[8]

Implications for Language Education

Dedicated OER initiatives that support world language instruction are just beginning to take root. In language education, this trend has cultivated a variety of programs that produce and disseminate OER for language learning. The Center for Open Educational Resources and Language Learning (COERLL) at the University of Texas at Austin (UT) is one of 16 National Foreign Language Resource Centers funded by the US Department of Education.[9] Since 2010, COERLL has been producing OER and engaging directly with UT language instructors as they implement these open access learning materials.[10] Last year the European Commission funded a three-year OER project called LangOER that focuses on developing OER and open educational practice in learning institutions throughout the EU. Composed of a vast, global network of stakeholders, LangOER aims to support the instruction of less used languages and to support policies and initiatives that overcome the barriers to OER uptake.[11]

Shift to Deeper Learning Approaches | *Trend*

Overview

There is a new emphasis in education institutions on deeper learning approaches, defined by the Alliance for Excellent Education as the delivery of rich core content to students in innovative ways that allow them to learn and then apply what they have learned.[12] Project-based learning (PBL),[13] challenge-based learning,[14] and similar methods foster these kinds of deeper, more active learning experiences. According to the Hewlett Foundation, emerging learning approaches are decidedly more student-centered, allowing learners to take control of how they engage with a subject.[15] Internships or apprenticeships, for example, embody this kind of hands-on, active learning. The

claim

aim is for students to connect the course material with their own lives through meaningful, real-world activities, such as solving a problem in their community.

Implications

This trend has already garnered support in foreign language programs at universities worldwide because of its benefits for enhancing self-directed learning — an important aspect of language education.[16] Researchers at National Research Tomsk State University led a PBL pilot for first and fifth year EFL students and found that it enabled students to "learn how to manage, control, and organize their activities and promotes a development of their personal competences related to motivational-axiological, volitional, pragmatist and reflexive spheres of activities."[17] What is unique to deeper learning in this field is that all of the activities must firmly focus on language acquisition. Just as in other disciplines, problem solving is a vital component of authentically absorbing and applying material, but this skill must be a means to improved language proficiency rather than being the final outcome.[18] Off-campus internships are also opportunities for students to apply new languages in real settings. The Language Flagship Program's Overseas Capstone program, launched in 2013, immerses students in the country of their target language so that they understand the region- and field-specific nuances and applications in areas such as corporate finance and microbiology.[19]

Blending Formal and Informal Learning | *Challenge*

Overview

Traditional approaches to instruction are still common in many institutions, and often stifle language learning as much as they foster it. The Internet has enabled people to inquire about almost anything using any connected device, which has resulted in a growing awareness that self-directed, spontaneous learning can complement learning that takes place within the classroom. Informal learning can take place in virtual environments in which learners interact with native speakers such as web-based simulations or massive open online courses (MOOCs), casual gatherings that are conducted in the target language, and other unofficial activities that provoke authentic learning. The challenge is establishing best practices at higher education institutions and workplaces for formalizing and recognizing informal experiences so that a person's accomplishments are presented in a credible, comprehensive manner. Open digital badges have emerged as one technological solution to validating and displaying informal learning experiences to the greater education community.[20]

Implications for Language Education

For language learners, informal experience in the target language is just as valuable, if not more, as experience gained in the classroom. In fact, interactions that inspire spontaneous production and authentic comprehension often take place outside of the classroom. The University of Otago, for example, offers university staff a wealth of resources to learn Māori including Café Reo, a regular informal gathering that occurs over lunch, which allows learners to practice new languages more authentically in a friendly, small group setting. Supported by formal coursework and weeklong immersion experiences, Café Reo composes an essential practical element of the comprehensive language instruction curriculum.[21] Researchers from the National Kaohsiung University of Applied Sciences in Taiwan found that informal language learning experiences can be simulated in virtual environments, specifically web-based, role-playing simulations; their results indicate that learners believe it was an effective method of interacting with native speakers and that it improved their motivation to learn the target language.[22] Recently, the Language Centre at the University of Warwick has integrated Mozilla's Open Badge infrastructure for their Online Intercultural Exchange in order to recognize the skillset required to collaborate effectively online with international peers.[23]

Personalizing Learning | *Challenge*

Overview

Personalized learning challenges the notion of a "one size fits all" education, which until recently was typical in US educational systems. Instead, this emerging style includes a wide variety of approaches to support self-directed learning that can be designed around each learner's goals.[24] Technology plays a vital role in personalized learning, as it extends learning beyond the physical limitations of the classroom through adaptive learning platforms and social media networks, resulting in new possibilities for content delivery.[25] There is some concern that the use of automated software for tutoring is of lesser quality than traditional college approaches, but acknowledging the importance of personalized learning is only half the challenge.[26] The other half is the lack of technology to foster scientific, data-driven approaches to effectively facilitate personalization. Many pundits wonder when and how language educators will challenge current pedagogies in order to generate and implement personalized learning strategies.

Implications for Language Education

The applications of personalization for language education have yet to be entirely surfaced, but there have been promising outcomes for other disciplines. Currently, learning environments such as Knewton and Smart Sparrow tailor content based on a student's level of understanding and personal interests. Through an automated process, the software adapts to a student's progress and preferred method of learning, resulting in deeper engagement with the course material.[27] Personalized learning is only beginning to gain traction for language learning. The University of Maine at Presque Isle's proficiency-based learning approach allows students to choose how they learn best and progress at their own speed, demonstrating their knowledge regardless of whether the learning takes place online, in the classroom, or through an internship.[28] While the standard of education remains the same, the methods and practices are tailored to meet individual needs with the idea that students who are self-motivated to learn can push the boundaries of their education further than ever before.[29] The biggest barrier to personalizing language education, however, is that scientific, data-driven approaches are still somewhat nascent in higher education. More research is needed in order to gauge its effectiveness on student learning and streamline its implementation.

Developments in Technology for Language Education

As technology continues to evolve, so does its role in advancing student-centered pedagogies and new ways of active learning. A growing host of devices, apps, online services, and software are pushing the boundaries of how students learn foreign language and how in-service educators receive ongoing professional development.[30] Language education leaders must be cognizant of these technological developments in order to curate the most effective approaches for contemporary and future learners. The following developments in technology are gaining traction in higher education, and present numerous opportunities to improve language-focused courses and programs that bolster student engagement and proficiency.

Data-Driven Technology

Over the past decade, companies such as Google, Amazon, Netflix, and Facebook have been tracking user/consumer behavior through data mining activities to better tailor advertisements and recommendations to each individual.[31] Data including what products or links people view, what they purchase, and whom they interact with has enabled these companies to improve the design of and experience on their platforms. These same strategies, when applied to the education sector, can provide instructors and institutions with invaluable insight into how well students are grasping and engaged with the material at hand. When taken a step further, this data can be used to adapt the learning environment and content therein in real time to better address individual student needs.

Learning Analytics

Learning analytics can be considered the educational application of big data, which is the process of gathering and analyzing massive amounts of detail about user interactions in online environments.[32] Universities are taking advantage of this new technology to to build better pedagogies, empower students to take an active part in their learning, target at-risk student populations, and assess factors affecting completion and student success.[33] Researchers at the University of British Colombia have been tracking student interactions with an intelligent language tutor "Chatbot" named Lucy, in order to understand the most common errors made at the individual and class levels.[34] This outcome exemplifies how analytics can help companies and institutions develop more effective learning technologies in language education. As universities look to automate and personalize content delivery for language learning, analytics will be an important factor when designing effective solutions.

Adaptive Learning Technology

The latest incarnation of learning analytics, and perhaps what is most compelling right now, is adaptive learning technologies — software and online platforms that adjust to individual students' needs as they learn.[35] There are two levels to adaptive learning technologies — the first platform reacts to individual user data and adapts instructional material accordingly, while the second leverages aggregated data across a large sample of users for insights into the design and adaptation of curricula. There have been promising applications of adaptive learning technologies for language education such as Busuu is an online platform that can customize language courses to individuals. The basis of this personalization is 1) establishing the current level of the student; 2) understanding the student's objective for learning it; 3) Getting to know their personal interests; 4) tracking the student's actual performance and usage; and 5) Adapting to the student's normal study time with reminders that build good habits. Busuu is explored later in this report in the context of how enhanced user experience can bolster language proficiency.

Data-Driven Technology in Practice

A number of existing projects and programs at universities demonstrate the power of adaptive learning technologies to provide a more personalized experience for students while providing instructors with a better sense of how students are responding to the materials and pedagogies at

hand. While not all of these examples have been deployed explicitly for language education, they can serve as relevant models.

Academic Activity Stream. In 2013, a patent was issued to the University of Phoenix for its adaptive learning platform "Academic Activity Stream" — a billion dollar investment. "Academic Activity Stream" is similar in appearance and functionality to social networks, ranking information for students based on their unique interests, performance history, and learning objectives.[36]

Asi se dice. McGraw-Hill and Cerego collaborate to launch *Asi se dice*, a new initiative that integrates adaptive learning styles into Spanish classrooms to track progress. The self-paced program is constructed of lesson plans ranging in subject and ensures mastery of a subject before advancement.[37]

Gradecraft. The University of Michigan created "Gradecraft," an online platform that encourages risk-taking and multiple pathways towards mastery as students progress through course material. The "Gradecraft" environment is gamified, enabling students to see how their choices directly impact how well they absorb and demonstrate their understanding of new material as they move from level to level.[38]

MyLab. Pearson teamed up with adaptive learning provider Knewton to provide thousands of science and business students at Arizona State University (ASU) with access to MyLab, adaptive services that detect patterns of students' successes and failures with the course material and provide them with guidance accordingly. The data collected depicts the amount of time students spend on specific elements of an online resource, such as video and text, in correlation with their exam performances and assignments. After discerning patterns in student behavior, MyLab recommends to each student tailored content that will further their knowledge of the subject.[39]

Partnership of the Center for Advanced Study of Language (CASL). At the University of Maryland, the CASL has partnered with technology company Voxy to conduct an empirical study that will identify what teaching methods will lead to the highest proficiency gains for individual leaners.[40]

Technology Assisted Language Learning (TALL). The GETS e-learning modules uses TALL, a tool created by Brigham Young University that delivers real-time, customized feedback to their students through a patented computer tracking program.[41]

WIZARD Adaptive Learning Course. WIZARD, and established company in language teaching and learning, partnered with Knewton to launch the WIZARD Plus App for Brazilian students. As students progress through the course, anonymized data is analyzed to figure out what each student knows and to recommend what they should study.[42]

Recommended Readings
The following readings are suggested materials for gaining a deeper understanding of data-driven technology and its implications for language education:

Can Data Analytics Make Teachers Better Educators?
go.nmc.org/cand
> (Thor Olavsrud, *CIO*, 28 Jul 2014.) This article explores how the automation inherent in data mining technologies can free up teachers and instructors to spend more time acting as guides and mentors and less time administering content delivery and analysis.

The Great Adaptive Learning Experiment
go.nmc.org/thegr
> (John K. Waters, *Campus Technology*, 16 April 2014.) Conclusions gathered from early adopters of adaptive learning technologies, including Arizona State University and Rio

Salado College, have contributed to a growing body of research in support of adaptive learning.

Learning to Adapt
go.nmc.org/learni

(Paul Fain, *Inside Higher Ed*, 13 June 2014.) With many large institutions experimenting with adaptive learning, the author explores different conceptions of the term, from personalized learning to data-driven courseware.

Rethinking Higher Ed: A Case for Adaptive Learning
go.nmc.org/rethi

(Tim Zimmer, *Forbes*, 22 October 2014.) A recent Gallup and Inside Higher Ed survey revealed that two out of three college and university presidents believes adaptive learning would positively impact higher education.

Online/Hybrid Learning

Over the past several years, perceptions of online learning have been shifting as more universities see it as a viable alternative to face-to-face learning. In early 2014, the United State's National Center for Education Statistics reported that one in ten students are enrolled exclusively in online courses;[43] studies conducted by the Babson Research Group reveal that 7.1 million Americans are engaged in online learning in some form.[44] The affordances of online learning are now well understood, and the flexibility, ease of access, and integration of sophisticated multimedia and technologies are high among the list of appeals. While effectiveness varies from course to course, it is clear there is a demand from students for more accessible learning opportunities, and hybrid learning — the combination of online and onsite instruction — is being explored by a number of foreign language departments. The flipped classroom, in particular, is one hybrid model that has been leveraged in a number of formal language programs. Online and hybrid learning have also become instrumental in delivering professional development for language instructors.

The digital age has signaled a massive transformation for language instruction, and many universities are incorporating online learning components and web-based tools to support teaching and learning. Through the Center of Applied Second Language Studies, the University of Oregon offers Ecopod, a yearlong online course that takes the form of a place-based augmented reality game for language learners. In each module, students are challenged to use the target language to solve problems and build community, and they can also design their narratives for language learning modules.[45] One German language instructor and researcher at Brigham Young University implemented a flipped classroom method to deliver grammar lessons with online video tutorials in order to use class time more effectively. Based on survey results from both teachers and students, the instructor found that the flipped classroom model led to positive outcomes such as improved student engagement and more time spent on language production.[46]

Online/Hybrid Learning Technologies in Practice

A number of existing projects and programs at universities demonstrate the power of online and hybrid learning models to support language learning and increase student engagement.

COERLL's Methods. At the University of Texas at Austin, the Center for Open Educational Resources for Language Learning has designed professional development modules for foreign language instructors at the high school and college levels. The online resource can be integrated into a classroom methods course or as a self-paced course for autonomous learners.[47]

"English as Foreign Language" MOOC. The University of Oregon has partnered with the US State Department on a two-part series of online learning modules for free MOOC provider, Coursera. The

courses allow educators to learn English-teaching strategies from recognized leaders in the field, and participate in a multimedia-rich, collaborative environment.[48]

The i2istudy System. Russian researchers explored the educational benefits of a web-based application for practicing foreign language skills with native speakers. This in-depth review of the system explores interactions of more than 40,000 users over six months, gamification as part of user retention, and effective system design in hybrid cloud infrastructure.[49]

Khan Academy. Founded in 2006, the educational non-profit has perpetuated its mission of providing "a free, world-class education for anyone, anywhere" through online micro-lecture videos. Khan Academy continuously delivers a stream of specialized and personalized content to learners of all ages. The results have been staggering, with the 80-person staff garnering 26 million registered students.[50]

Recommended Readings

The following readings are suggested materials for gaining a deeper understanding of the frontiers of data-driven technology and the implications for language education:

Can Foreign Language Immersion Be Taught Effectively Online?
go.nmc.org/canfo
> (Katrina Schwartz, *Mind/Shift*, April 2015.) A new pedagogy from Middlebury Interactive Languages uses videos of real conversations with people from all over the world to demonstrate that language and culture are inseparable. These real-world interactions are the basis of their online learning program.

A Catalyst For Change: Developing A Blended Training Model For The Liberal Arts Institution
go.nmc.org/Roll
> (Carrie Schulz et al., *The Academic Commons*, 2013.) Rollins College created a professional development program to assist faculty in redesigning existing courses as blended learning offerings.

Successfully Flipping the ESL Classroom for Learner Autonomy (PDF)
go.nmc.org/succe
> (Yu Jung Han, *NYS TESOL Journal*, January 2015.) An ESL instructor designed an innovative methodology that uses the flipped classroom approach to encourage learner training and autonomy. They measured the impact of the novel pedagogy on a group of adult learners in during five-week summer intensive language course and found it to be a very effective model for language learning.

Mobile Learning

As smartphones and tablets become more capable and user interfaces more natural, old methods of computing seem place-bound and much less intuitive. People increasingly expect to be connected to the Internet and the rich tapestry of knowledge it contains wherever they go. According to Gartner, by 2018, 50% of users will access online activities first through tablets or smartphones.[51] The unprecedented evolution of these devices and the apps that run on them has opened the door to myriad uses for education. Learning institutions all over the world are adopting apps into their curricula and modifying websites, educational materials, resources, and tools so they are optimized for mobile devices. The significance for teaching and learning languages (commonly referred in literature to as "mobile-assisted language learning" (MALL)) is that these devices have the potential to facilitate almost any educational experience, allowing learners to organize virtual video meetings with peers all over the world, use specialized software

and tools, and collaborate on shared documents or projects in the cloud, among many other activities.

Research conducted by London Metropolitan University's Centre for Languages and Linguistics & Area Studies on MALL found that collaborative and social learning, learner empowerment, and personalized learning as critical outcomes of mobile device usage.[52] In a world where interactions are increasingly virtual and digital resources are on the rise, mobiles are arguably the most effective way to constantly engage in language education. For most students, learning new languages is not the sole purpose of enrolling in higher education; they are often science, engineering, and humanities majors who recognize that becoming fluent in critical languages paves the way for more opportunities in the global workforce. Researchers at University of Hradec Kralove in the Czech Republic conducted a study on MALL for engineering students, and found that they preferred mobile learning to online learning, because of the ease of access that portables afford. About 80% of the students specifically rely on their smartphones, and nearly all students agreed that mobile devices and apps are extremely beneficial for engineering activities performed in foreign languages, including creating animations, simulations, modeling, and videoconferencing.

Mobile Learning in Practice

There is already a tremendous amount of research initiatives underway at universities to investigate the specific ways in which mobile technology can improve language fluency, in addition to mobile applications in development. The following projects represent a subset:

Institution Wide Language Program. The majority of students studying Italian in the Institution Wide Language Program at Coventry University use their smartphones to accelerate language learning both formally and informally, especially in areas such as translation, spelling, and meaning.[53]

Mobile Assisted Language Learning (MALL) at University of Akron. As pressure for students to understand a basic knowledge of the English language is rising in China, so is research to develop mobile apps that facilitate more productive and efficient learning. A Chinese researcher at University of Akron tested his newly developed vocabulary app on his students and reported a significant improvement in the vocabulary of students using the app versus those who did not.[54]

MASELTOV: Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and social Network Services. This multi-partner European project was just completed in May; it explored the potential of mobile services for promoting integration and cultural diversity in Europe. The partnership developed prototypes and models for innovative anytime, anywhere support and social computing services on smartphones for immigrants from outside the EU, including assistance with language learning.[55]

Mobile Learning from a Pedagogical Perspective. In Sweden, Dalarna University is developing a language application for their Russian for Beginners course that will be accessible to all students, regardless of which mobile device they choose. Their goal is to scale the model they create to other language courses and university programs.[56]

Recommended Readings

The following readings are suggested materials for gaining a deeper understanding of mobile learning and its implications for language education:

Best Apps to Learn Foreign Language
go.nmc.org/besta
> (Ted Ranosa, *Tech Times*, 14 May 2015.) With the rise of mobile phone apps, learning a language has never been so accessible or entertaining. From Duolingo's gamified

language learning style to the social networking app Busuu, and everything in between, language learners have their pick of language and learning styles to choose from.

The Impact of Mobiles on Language Learning on the Part of EFL University Students
go.nmc.org/theim

> (Azad Ali Muhammed, *Procedia - Social and Behavioral Sciences, Vol. 136*, 9 July 2014.) An increasing number of university students are using mobile apps to help them learn languages. Studies indicate that students attempting to learn another language can advance their skills in key areas including speaking, grammar, and reading — from any Internet-connected mobile.

Learning the Duolingo: How One App Speaks Volumes for Language Learning
go.nmc.org/duoli

> (Shane Hickey, *The Guardian*, 8 March 2015.) Duolingo is setting the stage for educational mobile phone apps by combining language learning with gamification and easy access. Although its intended outcome is not to create 100% proficiency, it engages a wide variety of people looking to supplement formal learning with entertainment for free.

Immersive Technology

Traditionally, teachers relied heavily on lectures to explain a concept and illustrate its use in real-world situations. The growing use of immersive technologies such as games, virtual reality, augmented reality, and telepresence, is enabling educators to expose students to concrete applications of the subject matter.[57] The integration of gaming elements and mechanics into learning environments supports deeper engagement and increased motivation from students.[58] Virtual worlds also offer a venue for immersive learning experiences by providing a place where communities can interact in customized settings. Similarly, applications of augmented reality, which is the layering of information over 3D space,[59] are opening up new opportunities for engagement, comprehension, and practice. Telepresence and video conferencing technologies are also powerful ways for learners to collaborate with peers in "face-to-face" meetings, regardless of their physical proximity.[60] The latest research indicates that immersive learning environments bolster student engagement and accelerate knowledge and skill acquisition.[61] In recent years, gamification, telepresence, and virtual realities have circumvented the physical limitations of classrooms to connect students with the target language, in ways unseen before the advent of immersive technology.

In the context of language learning, immersive technologies can help higher education institutions overcome economic and geographical restrictions that keep students from participating in authentic learning situations.[62] To achieve native-like fluency, students must be exposed to the native language.[63] The University of Colorado Boulder has developed a "Virtual Immersion Experience" (VIE) in which French students research all the essentials for a trip using French apps. Research demonstrates that students both enjoy the VIE and display an increase in vocabulary recognition and production.[64] An abundance of resources have been allocated towards advancing virtual world technology platforms, including but not limited to Facebook's recent acquisition of the Oculus Rift Headset and Microsoft's investment in Hololens; these investments forecast future expansion of this technology. Gamification is another way in which immersive technology is gaining traction in university classrooms and programs. Positive feedback from students in the form of enthusiasm, engagement, and deeper learning indicates significant possibilities for gamified learning in language education.

Immersive Technology in Practice

There are now a host of innovative communication tools that allow students to have exchanges with native speakers in authentic settings. Just a few examples are described below.

Explorez. Educators at the University of Victoria have begun research on the effectiveness of their game, Explorez, a platform in which students are immersed into an augmented reality where they can advance by utilizing their knowledge of French, both written and orally. Positive feedback from students in both enjoyment and practicality shows possibilities for more gamified learning in the future.[65]

Learn Immersive. The goal of Learn Immersive is use virtual reality headsets to transport people into regions in which their target language is primarily spoken. Students attend 3D virtual field trips to listen to native conversations about the scenes they are watching. Currently, this technology is not been used in schools but shows promise for educational purposes.[5]

The Metaverse Assembled. Second Life, a popular virtual world platform, is already being used to facilitate sections of an introductory Chinese class at Monash University. Researchers are interested in the prevalence of foreign language anxiety within classrooms and conclude that overall students experience lower levels of stress in virtual worlds than traditional classrooms.[66]

The Mixxer. Dickinson University created a new platform to facilitate authentic language exchanges, known as the Mixxer. The Mixxer is a social networking site that uses Skype to connect language learners to proficient speakers.[67]

Recommended Readings

The following readings are suggested materials for gaining a deeper understanding of immersive technology and its implications for language education:

Emerging Technologies Games in Language Learning: Opportunities and Challenges (PDF)
go.nmc.org/emermsu
> (Robert Goodwin Jones, *Language Learning & Technology 18(2),* June 2014.) With the rise in popularity of educational gaming, teachers need to be aware of the possibilities games can bring to language learning and how these games can promote self-initiated learning opportunities from students.

Michigan State Tests Telepresence Robots for Online Students
go.nmc.org/msubot
> (Leila Meyer, *Campus Technology*, 24 February 2015.) By freeing online students from a fixed viewpoint in the classroom, Michigan State University's telepresence robots empower those students to interact and participate equally with those physically present.

Technology Provides Foreign – Language Immersion at a Distance
go.nmc.org/langimm
> (Danya Perez-Hernandez, *The Chronicle of Higher Education*, 5 May 2014.) Professors at Virginia Commonwealth University are bringing foreign languages to life in their classrooms through teletandem, a technique that immerses students into a realistic speaking environment by connecting them with native speakers and fostering conversations that would otherwise be impossible.

Recommendations

The University of Hawaii Manoa contracted with the NMC to research innovation in language education, with the goal of identifying promising developments that could be applied to language courses and programs across the United States. Of particular interest were successful models in practice that could serve as proofs of concept, as well as new ideas that could further boost the U.S.'s global competitiveness in this area. These are five recommendations that address the need to both foster learners' interest in world languages and bolster their working proficiency.

Recommendation 1: Integrate Design Thinking into Curriculum

The Importance

Design thinking challenges learners to engage in critical reflection processes in order to develop human-centered solutions for global issues such as sustainability, healthcare, and public safety among other considerations.[68] For foreign language educators, this teaching strategy offers an avenue for fostering deeper engagement by prompting students to work together in the target language toward concrete goals. The design thinking approach imparts to students a new understanding about their personal way of thinking and compels them to analyze their own ideas and activities that reinforce their language comprehension and involvement the learning process.[69]

Proof of Concept

In 2004, Stanford University founded the d.school, a program that trains graduates to confront current global challenges, and then formulate and implement solutions based on authentic experiences. The curriculum of the d.school pushes students to think past their natural biases in order to effectively solve problems with a team of diverse collaborators — a valuable skill that employers seek in new hires. Student innovators that have mastered the d.school's design thinking approach have founded Embrace, a social enterprise that provides low-cost infant warmers to vulnerable children, and SwipeSense, a venture company that promotes physician's hand hygiene.[70]

Though still new to the world language field, the first endeavors to bring design thinking into language instruction are showing positive results. Professors at the University of Aizu in Japan have studied the impact of design thinking in an EFL context to see if the approach would encourage the production of original content. They prepared a six-week web design project for computer science majors, in which students were expected to analyze content, engage in systematic thinking, and criticize design decisions using English. Based on their findings, the researchers concluded that their method effectively explored how design thinking could be useful for fostering higher order thinking and delivering content-level instruction in a language education curriculum.[71]

Call to Action

As the foundation of a language curriculum, design thinking brings learners together on matters of real consequence while strengthening their capacities to collaborate and critically reflect on ideas, no matter what language they are using. Language education programs should draw on social, economic, and political issues rooted in the culture of the target language in order to help students forge connections that go beyond grammar, vocabulary, and syntax. An innovative curriculum will incorporate design thinking practices and tools that are currently in use at institutions all over the world and adapt them for language-learning classrooms and programs.[72]

Recommendation 2: Build Smart Partnerships

The Importance
Advancing the field of language education and improving global competitiveness is a larger task than a single institution can accomplish alone. There is need for government, administration, and practitioners to work together to advance positive education trends and solve pressing challenges. Another intersecting trend is business's growing expectations to hire graduates that can adapt to their needs immediately, requiring that students develop real-world skills before leaving school. A 2015 study conducted by the Association of American Colleges and Universities revealed employers' beliefs that the recent graduates they encountered have not been adequately prepared for the workforce.[73] To bridge this gap, companies are partnering with education institutions to impart in-demand skills and establish focused partnerships between academia, government, and business that drive innovation in how foreign language is prioritized and taught.

Proof of Concept
STARTALK is a seasoned joint initiative of the University of Maryland's National Foreign Language Center and the National Security Agency to improve the quality of instruction and provide innovative learning experiences for K-12 students in critical languages including Arabic, Chinese, and Persian Farsi through a standards-based and thematically organized curriculum in which teachers act as partners with students in a learner-centered classroom.[74] A vital measure of effective language education is the impact on student attitude; especially during a student's formative years, there is the potential to spark or hamper lifelong curiosity and engagement. Researchers at Western Michigan University reported that American K-12 students participating in STARTALK enjoyed speaking, reading, and writing in Arabic, and planned to continue studying the language.[75]

While smart collaborations in language education are not new, partnerships that focus specifically on leveraging emerging technologies are sparse. Fortunately, language education leaders can emulate progressive models in other disciplines. For example, through funding from the National Science Foundation, Indiana University is spearheading a partnership between a dozen universities to build cloud-based supercomputing and data storage tools called Jetstream for science and engineering research.[76] This initiative will expand access to data analysis resources for students and researchers on demand, making them readily available on their mobile devices. Similar partnerships in language education could ultimately make engaging content in the form of rich media and discussion networks more ubiquitous to learners.

Finally, if companies are to hire graduates that fulfill in-demand skill sets, many have realized that they need to actively participate in their schooling.[77] For example, when BMW established new operations in South Carolina, they needed to find local talent. The corporation invested millions in Clemson University, helping them launch International Center for Automotive Research, attracting students and professionals interested in automotive engineering.[78] Companies looking to hire people that are multilingual can similarly invest in students' education by supporting and co-designing university programs. IBM, for example, is working with 28 universities to train IT specialists in big data and analytics, providing free software and tools.[79]

Call to Action
Leaders in government, academia, and business must work together to foster marked progress in language education. Smart partnerships can promote the integration of emerging tools that increase content availability, learner engagement, and opportunities to connect with authentic learning experiences. Beyond generating better performance in language proficiency, high-profile partnerships, such as those described above, make a powerful statement to the public that language education is a major national priority worthy of both institutions' and students' focus.

Recommendation 3: Enhance the User Experience

The Importance

While user experience (UX) encompasses many features, scholars agree that it boils down to one main outcome: ease of human interaction with technology.[80] Clean, engaging web designs have proven to be useful in educational contexts. Mobile apps in the consumer sector offer valuable insights for designing effective online learning environments, especially when looking at their gamified and collaborative features that stimulate progress and interaction with other learners.

Proof of Concept

Popular, mobile-centric, free language apps such as Duolingo and Busuu have raised the bar for user interfaces. The impact of these tools is evident in the droves of people that have signed up voluntarily to use them; combined, the apps count more than 150 million registered users.[81 82] Web testers have touted the usability of Duolingo for its visual appeal, a minimalist design peppered with colorful icons, including its trademark — a bright-eyed green bird. The gamified platform has also been highlighted as a motivational feature; the interface tracks learning streaks with little flame icons that accumulate with each day of sequential use, giving users a sense of satisfaction that carries over to the next level.[83]

Research shows that this enhanced engagement has a positive impact on learning outcomes; an early independent study by New York University revealed that 34 hours of working through Duolingo's bite-sized lessons — exercises that include listening, speaking, translation, multiple choice challenges —was equivalent to a semester of foreign language at a university.[84] The Busuu app is also based on an inherently interactive feature — a robust social network similar to Facebook in which language learners can connect with peers to exchange messages and feedback in the target language.[85] The accessibility of Busuu has led to its uptake in emerging markets such as China, Turkey, and Colombia, where people are learning languages to get better jobs and improve their financial situation.[86]

Call to Action

Educators and developers should design digital tools for foreign language instruction that are built with UX as a key consideration; that is, educational web applications should be inviting and responsive, with features that have been proven to encourage progress and motivation such as gaming elements or social networks. The next generation of language education tools should cater to learners who are growing more accustomed to learning via their mobile device, wherever they may be.

Recommendation 4: Foster More Authentic Exchanges Through Collaborative Tools

The Importance

It is now clear more than ever that language learners benefit from authentic interactions in the target language in natural settings.[87] With immersive technologies on the rise, these situations are easier to simulate and customize for any world language. The key is to design educational experiences that mimic real-world situations using state-of-the-art technologies and tools to engage native speakers and instructors from around the globe, within a classroom or program.

Proof of Concept

George Mason University and three other public universities in Virginia are using telepresence technology to facilitate global courses for other universities. Collaborating through the V4 Consortium, professors from George Mason are teaching Korean, Chinese, and Persian language courses to students at James Madison University.[88] Students participating in the shared courses reported that the interactions between participants on the screen and those in the classroom are nearly seamless; it is possible to see and hear everything in the shared environments.[89]

At Yale University, a collaboration between the Department of Linguistics and the Beinecke Rare Book and Manuscript Library is allowing aspiring professional linguists to conduct fieldwork with native speakers over authentic cultural materials. Equipped with historical texts ranging from grocery lists to family histories, students are using Skype to connect with native speakers of Cherokee to learn nuances of the language not typically covered in standard grammar books. Learners revealed that the use of the authentic materials has led to the discovery of personal anecdotes and cultural information that have enriched their comprehension of the Cherokee language. The long-term project has included the launch of a website, Transcribe Cherokee, that allows any member of Yale's academic community to transcribe collection materials online.[90]

Call to Action

An innovative language program should narrow physical distances between language learners and the cultural experiences they need to master a world language. Ideally, students would be able to study abroad in order to complete tangible goals such as finding their way around a new city, communicating their needs over the phone, and fulfilling the appropriate social conventions in the target language. Today's technologies have the ability to bring the study abroad experience into the classroom, but the key is to make interactions with native speakers the cornerstone of these educational encounters. An effective instructional model will simulate the study abroad experience by connecting with native speakers on topics and materials that are rooted in the target culture and have real world applications for learners.

Recommendation 5: Adopt Data-Driven Approaches

The Importance
Tests and papers are no longer the sole mediums for understanding a student's subject comprehension. Thanks to rapid advancements in technology and the emergence of big data, universities can accrue vast amounts data, giving way to analytics that reveal valuable insights about how to improve personalize learning for students.[91] The goal then is to build better pedagogies, empower students to take active part in their learning, target at-risk student populations, and assess factors affecting completion and student success.

Proof of Concept
University of Wisconsin–Milwaukee's U-Pace system is founded on mastery-based learning and amplified assistance in an online learning environment that ensures students do not proceed beyond a lesson without mastering the content. Recorded information, such as test scores, attempts at quizzes, and elapsed time between each attempt, signals to teachers the students who are in need of further assistance and in what areas. Both the content mastery and amplified assistance features leverage recorded data for each student to support personalized learning methods that give students greater control of their learning and provide individual feedback to help them advance.[92]

The Iowa Community College Online Consortium's eAnalytics system is also using data analytics to provide key information to educators about their students in hopes of increasing retention and mastery of content rates. eAnalytics uses data, including late submissions, delayed online activity, and grade summaries that enable instructors to identify at-risk students and provide support to improve their performance. Results show a significant increase in the retention and mastery of a courses concept for low-income students, an indicator of success for the new program.[93]

Duolingo, an electronic tool for language learning, has already begun implementing data-driven approaches into their applications. One significant finding was the confusion surrounding the world "it" for Spanish natives wanting to learn English. Using this data, they were able to restructure their course by moving this concept to a later section, operating under the idea that more difficult concepts should be taught only after a basic understanding of the language occurs.[94]

Call to Action
Language builds upon itself gradually over time, and technology that can track multiple sources of data, including test scores, online behaviors, discussion forum interactions, and delayed responses can help educators better understand student needs and places where their lessons and pedagogies should be improved. While data-driven approaches can help an instructor get a better sense of a class's knowledge comprehension and language proficiency, institutional leaders must strategize about how entire language departments can make use of enabling technologies. In order to effect change on a larger scale, there is also a need for subsequent collaborations between U.S. universities where insights about the data are shared so that more tailored, effective language courses and programs can be developed across the country, with measures of success standardized.

Editorial Board

End Notes

[1] http://www.thelanguageflagship.org/content/discourse

[2] https://www.thelanguageflagship.org/media/docs/reports/what_business_wants_report_final_7_09.pdf (PDF)

[3] http://www.actfl.org/news/position-statements/role-technology-language-learning

[4] http://www.ed.gov/news/press-releases/more-633-million-awarded-colleges-and-universities-strengthen-global-competitiveness-through-international-studies-and-world-language-training

[5] http://nflrc.hawaii.edu/events/view/74/

[6] http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/English_Paris_OER_Declaration.pdf (PDF)

[7] http://www.hewlett.org/programs/education/open-educational-resources

[8] http://www.onlinelearningsurvey.com/reports/openingthecurriculum2014.pdf (PDF)

[9] http://www.coerll.utexas.edu/coerll/about

[10] https://www.coerll.utexas.edu/coerll/sites/coerll.utexas.edu.coerll/files/voices-for-openness-in-ll.pdf (PDF_

[11] http://langoer.eun.org/

[12] http://all4ed.org/issues/deeper-learning/

[13] http://bie.org/about/what_pbl

[14] https://www.challengebasedlearning.org/pages/about-cbl

[15] http://www.hewlett.org/programs/education/deeper-learning/what-deeper-learning

[16] http://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=1409&context=ij-sotl

[17] http://ac.els-cdn.com/S1877042814055967/1-s2.0-S1877042814055967-main.pdf?_tid=4d967a50-609b-11e5-b2a3-00000aacb35d&acdnat=1442865764_32ffc27663da265bb1952d6d059aea63

[18] https://gianfrancoconti.wordpress.com/2015/06/26/eight-must-dos-of-project-based-learning/

[19] https://www.thelanguageflagship.org/media/docs/discourse/fall_2013.pdf (PDF)

[20] https://openbadges.coerll.utexas.edu/

[21] http://maori.otago.ac.nz/reo-tikanga-treaty/language-learning-options

[22] http://www.macrothink.org/journal/index.php/ijele/article/download/5932/4791

[23] https://altc.alt.ac.uk/blog/2015/02/open-badges-supporting-intercultural-language-learning-in-a-mooc/

[24] http://edglossary.org/personalized-learning/

[25] http://www.dreambox.com/personalized-learning

[26] https://www.insidehighered.com/news/2014/06/13/profits-lead-way-adaptive-learning-becomes-more-popular

[27] http://www.educationdive.com/news/adaptive-learning-the-best-approaches-weve-seen-so-far/187875/

[28] http://www.umpi.edu/personalized/

[29] https://www.utsystem.edu/news/2014/11/03/university-texas-system-makes-bold-move-competency-based-education

[30] http://www.theguardian.com/teacher-network/teacher-blog/2014/may/12/technology-language-teaching-learning-pedagogy

[31] http://www.computerworld.com/article/2929384/cloud-computing/google-cloud-strategy-focuses-on-analyzing-big-data.html

[32] http://www.theguardian.com/education/2014/mar/26/learning-analytics-student-progress

[33] http://circlcenter.org/educational-data-mining-learning-analytics/

[34] http://www.academia.edu/5496546/Using_Learning_Analytics_to_Understand_the_Design_of_an_Intelligent_Language_Tutor_Chatbot_Lucy

[35] http://educationgrowthadvisors.com/gatesfoundation

[36] http://www.phoenix.edu/news/releases/2013/01/university-of-phoenix-online-platform-receives-patent-from-united-states-patent-and-trademark-office.html

[37] http://thejournal.com/articles/2015/02/19/adaptive-learning-partnership-to-focus-on-improved-language-instruction.aspx

[38] https://www.gradecraft.com/

[39] http://www.pearsonmylabandmastering.com/northamerica/

[40] http://www.casl.umd.edu/sites/default/files/CASL-Voxy-Partnership-FINAL.pdf (PDF)

[41] http://www.getslearning.com/html/GETS_advantage.htm

[42] https://www.knewton.com/about/press/wizard-introduces-first-knewton-powered-adaptive-learning-course-brazil/

[43] http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014023

[44] http://www.onlinelearningsurvey.com/highered.html

[45] https://casls.uoregon.edu/student-programs/residential-immersion/

[46] http://www.csctfl.org/documents/2015Report/Chapter%202.pdf

[47] https://coerll.utexas.edu/methods/

[48] http://blog.coursera.org/post/82121982520/teachers-teaching-teachers-us-dept-of-state-and

[49] http://www.researchgate.net/publication/277139567_Online_e-learning_application_for_practicing_foreign_language_skills_with_native_speakers

[50] https://www.khanacademy.org/

[51] http://www.gartner.com/newsroom/id/2939217

[52] https://www.llas.ac.uk/resources/paper/6238#toc_1

[53] http://www.academia.edu/10191305/Technological_diversity_A_case_study_into_language_learners_mobile_technology_use_inside_and_outside_the_classroom

[54] http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128762

[55] http://www.maseltov.eu/

[56] http://www.du.se/en/NGL/Developmentprojects/Previous-projects/Mobile-learning-from-a-pedagogical-perspective/

[57] http://www.gartner.com/it-glossary/immersive-learning-environments-iles

[58] http://www.theedublogger.com/2015/01/20/gaming-in-education-gamification/

[59] http://mashable.com/category/augmented-reality/

[60] http://www.theguardian.com/teacher-network/teacher-blog/2014/may/12/technology-language-teaching-learning-pedagogy

[61] http://lisapeyton.com/living-and-learning-potential-of-immersive-technologies-in-education/

[62] http://www.gizmag.com/learn-immersive-language-virtual-reality/35128/

[63] http://www.thepolyglotdream.com/nativefluency/

[64] http://fltmag.com/tapping-tablets-to-foster-global-linguistic-and-cultural-competence/

[65] http://www.sciencedirect.com/science/article/pii/S1877042815009441#

[66] https://journals.tdl.org/jvwr/index.php/jvwr/article/view/7027/6306

[67] http://er.educause.edu/articles/2013/10/the-mixxer

[68] http://www.whatisdesignthinking.org/

[69] https://rafangel.wordpress.com/pensamiento-de-diseno/

[70] http://www.smithsonianmag.com/innovation/how-are-universities-grooming-next-great-innovators-180955792/?no-ist

[71] http://www.academia.edu/3480186/Roy_D._and_Brine_J._2013_._Design_Thinking_in_EFL_Context_Studying_the_Potential_for_Language_Teaching_and_Learning._The_International_Journal_of_Design_Education_Volume_6_Issue_2_pp.1-21

[72] http://notosh.com/lab/design-thinking-tools-to-help-make-thinking-visible-nesta-diy/

[73] https://www.insidehighered.com/news/2015/01/20/study-finds-big-gaps-between-student-and-employer-perceptions

[74] https://startalk.umd.edu

[75] http://www.ncolctl.org/files/quality-of-startalk.pdf (PDF)

[76] http://news.iu.edu/releases/iu/2014/11/jetstream-nsf-grant.shtml

[77] http://www.skilledup.com/insights/getting-real-in-the-real-world-latest-in-university-business-partnerships

[78] http://cuicar.com/

[79] https://www-03.ibm.com/press/us/en/pressrelease/44031.wss

[80] http://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=6486&context=etd

[81] http://venturebeat.com/2015/06/10/100m-users-strong-duolingo-raises-45m-led-by-google-at-a-470m-valuation-to-grow-language-learning-platform/

[82] https://blog.busuu.com/busuu-now-has-50-million-users-worldwide/

[83] http://blog.testbirds.com/app-review-duolingo/

[84] http://static.duolingo.com/s3/DuolingoReport_Final.pdf

[85] http://tech.co/busuu-social-network-help-you-learn-language-2015-02

[86] http://www.telegraph.co.uk/sponsored/business/small-business-benefits/11253901/busuu-app-speaks-language-of-growth.html

[87] http://www.frontiersjournal.com/issues/vol4/vol4-04_Pelligrino.htm

[88] http://4va.gmu.edu/shared-courses/

[89] https://newsdesk.gmu.edu/2014/08/speaking-tongues-high-tech-4-va-makes-language-learning-accessible-across-virginia/

[90] http://news.yale.edu/2015/05/28/class-uses-historic-cherokee-archive-skype-hone-skills-linguistic-fieldwork

[91] http://www.digitalpromise.org/blog/entry/realizing-the-opportunity-for-big-data-in-education

[92] http://www4.uwm.edu/upace/about.html

[93] http://nextgenlearning.org/grantee/iowa-community-college-online-consortium

[94] http://cloudtweaks.com/2014/10/language-learning-propelled-big-data/