Four facets of needs assessment and analysis for the design of online learning systems.

Jeremy McLaughlin  
Meg Turley  
Ryan Lucchesi  
Christine Keen &  
Miguel Ramlatchan

mramlatc@odu.edu  
Old Dominion University

Abstract:

As instructional systems designers, we need to consider and take a holistic systems approach when designing our solutions. This review analyzes and synthesizes the literature from four specific online learning contexts: K-12, trade training and industrial education, higher education, and corporate training. The characteristics, social structures, environments, and expectations of each of these cultures are very different. This review will summarize the research related to each context, discuss best practices, and areas for future research.

Introduction

As instructional designers, systems designers, and technology leaders, we need to consider and take a systems approach when designing our solutions. However, a system that works well in one organization or context may not be effective in another. This review analyzes and synthesizes the literature from four specific online learning contexts: K-12 education, higher education, career and technical training, and corporate training. The client characteristics, social structures, environments, and expectations of each of these cultures are very different. While a thorough needs assessment and analysis is critical in any instructional systems design scenario, it is equally critical to understand that assessment models that work well in one of these contexts may not work well in another. This review will present and summarize the latest research and findings related to systematic needs assessment in each online context, discuss the current state of best practice, and suggest areas of future research and areas for future collaboration.

Culturally situated systems design can be operationally defined as instructional systems created specifically for the authentic contextual needs of the learners. Situated learning is the applied theory that learning is inextricably linked to the culture, context, and environment that utilizes that knowledge (Brown et al., 1989). A needs assessment is the first step towards designing an instructional system and a need is the gap or discrepancy between an existing result and a desired result (Altschuld & Watkins, 2014; Kaufman, 1972). A system is the organized effort of an organization or entity to achieve a common goal (von Bartalanffy, 1972). The systemic idea of a bounded organization or network that has interconnected layers and subsystems that work toward an achievable goal is an integral aspect of a successful needs assessment. When these concepts are combined in online learning, distance learning, or e-learning, this gap is the learning or training objectives of the course or program and the
instructional system is the means to achieve these objectives. Designing for culturally situated contexts will enhance the effectiveness of our instructional systems.

In addition to identifying the results based gaps, a needs assessment and analysis also determines the type of human performance intervention required to address that gap. In the case of instructional design interventions, the needs assessment and analysis defines the instructional problems, identifies goals, analyzes the learners, and leads to specific learning objectives (Dick, et al. 2001; Morrison et al. 2019). Needs assessment models that consider microsystems (individuals), macrosystems (organizations), and megasystems (society), are particularly suited to transformative change and positive impact (Leigh et al., 2000). In addition to the layers of impacted systems, it is important to also consider the layers of stakeholders within each system. For example, a thorough needs assessment should consider the needs of the level one clients, the level two service providers, and the level three service provider support infrastructures (Altschuld & Kumar, 2010). Other needs assessment models from the field of human performance technology and improvement also implement a structure that considers individual change and well as change of the overall system or organization of individuals (Gilbert, 1978; Rummelr & Branche, 1995; Wedman 2014). While these models (and newer models that trace their evolution to these foundational models) can be used to study an organization, the facilitator risks a failed needs assessment if they do not consider the culturally situated context of that assessment. For instance, a needs assessment in an online K-12 context would have to consider the layer one students, the layer two teachers, as well as the layer three administrators. The uniqueness of these stakeholders and their needs will differ in significant ways from layer one adult students, layer two instructors, and layer three faculty, staff, and administrators in e-learning higher education environments. The layer one adult learners, layer two instructors and trainers, and layer three support systems in online career and technical training institutions will also require a different focus. In addition to K-12, higher education, and technical and career training scenarios are corporate training needs. The layer one working adult learners in this context do not need a degree or industry recognized certification but do need to advance their knowledge, skills, and abilities to maintain or immediately benefit their careers. These adult learners, as well as the layer two trainers and layer three support systems, will have different needs as compared to other instructional systems.

K-12 & Technology

With more than $726 Billion spent on public K-12 education in the United States (Snyder, de Brey, & Dillow, 2019), the need that each piece of technology fills should be seriously considered before the first dollar is spent. The difficulty lies in the lack of preparedness of administrators and district coordinators to conduct rigorous technology focused classroom needs assessments. Typical school administrators are former classroom teachers and have rigorous training in pedagogy; school administration preparation and licensure programs typically neglect instruction on needs assessment generally and technology needs assessment in particular. Technology is after all a tool and not a teaching style and should receive special attention as to how it is used.

Few students take online and blended courses because this method of instruction is preferred by the learner, but because online courses afford students an opportunity to take classes that are not otherwise offered at their school or to fulfill some other student need (Picciano, Seaman, Shea, & Swan, 2012). Credit recovery is one such opportunity that technology supports,
providing inexpensive second opportunities for students who have failed a class. A study of ninth grade students in 17 Chicago public high schools who had previously failed Algebra 1 found that students who participated in online credit recovery had significantly poorer outcomes than their peers who participated in face-to-face remediation classes (Heppen et al., 2017). Only 66% of the students in the online recovery course ultimately received credit for the class as opposed to a 78% pass rate for students in the face-to-face classes. If credit recovery is the more pressing goal and not cost reduction as discussed in Picciano (2012), a needs assessment should be done to consider if technology is a viable answer to solving this particular problem.

Results like this are not surprising in light of how little technology instruction is involved in teacher preparation programs (Admiraal et al., 2017). Teachers are often forced to find out what technology does and does not work in the field. Reactive implementation of technology can be costly, time consuming, and demoralizing for students, the teachers who are trying to help them, and the administrators who hold accountability for the interventions enacted in their schools.

Technology needs assessment may be one solution to closing student performance gaps and relieving teacher stress and anxiety around technology use in the classroom. Unfortunately, many technology integration plans initially focus on which tools will be used and not how the tool will be used, even when implementation is a primary concern of educators (Gülbahar, 2007). Needs assessment that involves all stakeholders, from students to administrators and families could shed light on the disconnect between the desires of teachers to educate 21st century students and the ability of students to be educated with appropriate accessible 21st century tools.

**Training Trade and Industrial Education**

With many education programs moving online, it is important to assess how the transition from in-class learning to online environments will change for both students and teachers. In career and technical education (formerly referred to vocational education), programs are designed to provide learning opportunities with a focus on occupational endeavors (Carver & Kosloski, 2015). Trade and industrial education is one aspect of career and technical education that relies on the use of industry technology and equipment to prepare students for the workforce. The technology and equipment can be very expensive and is often difficult to keep current. Education systems are under increasing pressure to reduce costs while maintaining or improving outcomes for students, and in order to improve educational productivity many districts are turning to online learning (Bakia, et al., 2012). In programs within trade and industrial education, several factors need to be considered before moving to such an online platform. Culturally, these courses have been held in the traditional classroom environment. The issue with this perspective is that technology improves so rapidly that schools have a difficult time keeping up with the demands in industry. Due to the scarcity of resources as well as cost pressure, the increased need for this type of training cannot be feasibly taught in the classroom alone (Belaya, 2018). This is where needs assessment can play a critical role in the success of the in-class to online transition.

A needs assessment is designed to better separate the perceived need and the actual need. Groups tend to jump prematurely to solutions before identifying and prioritizing needs or delving into what really underlies them (Altschuld & Kumar, 2010). For this reason, following a needs assessment model can be critical to finding a long-term solution. The online environment needs to be able to give students the ability to understand skilled-based objectives, and students need to feel that they are getting what they need from the course. Teachers and students must understand
the working of the online learning environment and understand how to incorporate skills-based learning and create a learning community in the online environment. Safety must also be considered if there is a need to practice those skills outside the online environment. This section of our review will look at each of these from a needs assessment perspective to better understand how programs can transition to an online environment while providing the skills necessary for the job.

One needs assessment issue in online training for trade and industrial education is how to move skilled based training to the online environment. Many programs in trade and industrial education require practicing skills that may be difficult to learn online. There is limited literature on the impact the delivery method has on experiential or skilled-based learning (Arbaugh, et al., 2013). Since trade and industrial education is skilled based, a needs assessment may help discover ways to implement this type of delivery method without losing the practical application that these programs provide. Another consideration could be how moving to an online environment could benefit the workforce after completing a trade and industrial program. Research suggests employers of trade and industrial education graduates could benefit from students learning better computer skills. For example, employers in manufacturing say prospective employees do not have the skill set required to perform necessary functions such as math and computer abilities (Robertson & Aquino, 2016). A needs assessment could work to bridge this gap by providing online solutions that not only teach the workforce skills associated with a student’s chosen field, but also provide valuable computer skills that can decrease the skills gap employers are seeing.

Another issue where needs assessment is critical to trade and industrial education is teacher preparedness to teach skilled based learning online and accessibility for students in the online environment. Creating a meaningful and successful learning experience for students in an online environment is key to a program’s success (Lane, 2013; Frass et al., 2017). For teachers, it is important to build a community of learners from the very beginning of the course to enhance learning outcomes (Yuan & Kim, 2014). A needs assessment would be able to identify what resources and programs may be available to assist teachers new to online teaching in ways to create this sense of community for their students. For students, accessibility must be assessed to ensure students have access to online resources. Research suggests that in order to be successful in the online environment, both teachers and students have to make a joint effort to create an online community (Sun & Chen, 2016). Assessing and understanding the needs of both teachers and students is critical to establishing an online community that promotes the same value as in the classroom.

Safety would have to be a consideration when looking at how to implement online learning for these types of education programs. Since much of the curriculum is skilled based, would students be working on any tasks outside the classroom that may introduce safety issues? An example of this would be culinary arts where students are learning a cooking technique and then practice their skill in their own home. Secondary school resources such as pupil spending, class size, teachers and quality of content of curriculum are factors that could influence safety and health for students (Shendell et al., 2018). If a student becomes injured while attending an online class, how would it be handled? A needs assessment would be able to identify safety risks that come with moving this type of curriculum online so schools can be cognizant of these risks and make sure students and their families understand those risks if skills are to be practiced outside of the classroom.
There is not a lot of research on moving trade and industrial education to online environments, but a needs assessment could be beneficial in helping schools identify if there is any possibility or benefit to looking into online learning. Trade and industrial education can be very expensive for school districts due to the amount of equipment and resources needed, assessing alternatives that may be more cost effective could assist schools in ways to implement some form of online learning while still upholding the rigor of the coursework and provide a safe environment for students to practice their skills.

**Higher Education Curriculum and Faculty Development**

Needs assessment is a systematic process for analyzing a process and finding where the process is lacking. The areas that are lacking are known as “gaps” and they define where the organization or process currently stands and where it should be. These defined areas are identified as the need to be addressed. In higher education, needs assessment can be involved in many different ways. Higher education is such a vast world that assessing needs can be done in many different areas (Grant, 2002). When discerning these areas, higher education can be branched into areas of curriculum planning, individual problems, student progress, accountability for the university population, safety needs, and the online learning sector are only a few of these areas (Grant, 2002). It is not enough to do a needs assessment on “higher education,” the specific field needs to be identified, research why it is lacking, and then conduct the assessment. Everything works in unison to create an effective higher education experience (Grant, 2002). It should be cautioned that, while needs assessment provides a detailed process, some of the rigidity can render out the creativity that is needed in the world of higher education. Education, in general, possesses both elements of art and science and limiting it down to nothing more than a tool would do be doing it a disservice (Grant, 2002). Among the many ways that needs assessment can fit into higher education, two crucial areas that it can have a profound impact on is curriculum development and faculty development.

Needs assessment has a key role in the world of higher education. Higher education is most effective when it is consistently evolving to hone professional development (Grant, 2002). The main purpose of needs assessment in this realm is to provide assistance in educational planning without falling into a trap of narrow vision (Grant, 2002). A crucial portion of educational planning comes through curriculum development (Grier, 2005). As a base need, it is important to understand that curriculum development creates an organized path, in a way, closing the “gap” that the students possess in their current knowledge of a topic and where they need to be by the end of the course (Williams, 2019). Since curriculum documents are not easily created the assessment helps in outlining how to evolve the lesson in the university setting. An example of this shows how assessing the need is embedded in its framework (Williams, 2019). Analyzing the curriculum could yield that students may benefit from breaking down larger learning goals into smaller, more precise, goals to better translate the overarching concept (Williams, 2019). This need could be translated as understanding various parts of the forest to understand how it works coming together as opposed to trying to understand the whole forest from beginning to end.

Addressing needs in curriculum will continue make sure that the content does not become stale. In a way, curriculum needs will never fully be addressed because the lesson will always have new requirements with current sources being updated and new sources emerging (Williams,
Information gathering tools can be used to obtain data, this could involve surveying students, consulting with faculty, analyzing assignments, and student observations (Benesch, 1996). The logic for performing this analysis is that by identifying various elements of the situation, professors can continue to change and update their curriculum so that their students succeed (Benesch, 1996). Another benefit that accompanies consistent needs assessment in curriculum is the advancement of scholarly research in a particular field (Wang & Ashcroft, 2012). These studies promote interest and display other institutions and their methods for handling their needs assessments in expanding and revamping curriculum.

Needs assessment plays another significant role in higher education in the realm of faculty development. Developing curriculum is an important aspect to higher education but faculty need to continue to grow as well. The aim of faculty development is to promote advancement in their field of expertise and foster understanding of where the state of their field currently stands (Bahar-Horenstein et al., 2014). Environments evolve and new curriculum must be developed to stay current, however, that does not work without faculty piloting the program to impart those lessons to students. Encouraging faculty to respond to the various forms of needs assessment can be a challenging effort (Bahar-Horenstein et al., 2014). There can be an ego element involved in which professors fight against the need to admit that, as time passes, a gap can begin to develop between their possessed knowledge and the current state of their field (Bahar-Horenstein et al., 2014). Professors can be extremely protective of their responsibilities and authority over the subjects that they teach. If the needs assessment is not with proper considerations toward faculty, the process could be seen as gathering information to show that the professor is not living up to the standards of their universities (Bahar-Horenstein et al., 2014).

With proper care taken, many avenues exist for institutions to meet these needs for their faculty. These gap-closers can come in the form of seminars, continuing education, opportunities for faculty to conduct their own research, and in-house programs devoted to the betterment of faculty (Bahar-Horenstein et al., 2014). For instance, the University of Florida conducted a study in which they provided different types of opportunities ranging from various trainings, administration, and leadership skills. Results of the study were depicted in faculty outlook by which areas that faculty were proficient in, and which areas they believed to be low priority. The results imply that faculty may not consider an area of study important when they have knowledge of it, even when it should still be considered important (Bahar-Horenstein et al., 2014). Interviews were held to investigate thoughts that poor experiences in development from the past had skewed many views on the validity seeing faculty development as a need (Bahar-Horenstein et al., 2014). The end result for University of Florida was quite positive. The university shared the results of their needs assessment, along with the methods taken, with the rest of the school and this sparked further professional dialog in which faculty could continue to develop in more effective ways (Bahar-Horenstein et al., 2014).

Needs assessment is an important component of higher education. Even though curriculum development and faculty development were the two main components observed in this review, the fact is that needs assessment can help an educational institution provide the necessary training, planning, and implementation strategies necessary to resolve gaps in the organization (Nugraha et al., 2018). Needs assessment plans identify important objectives and sets goals for the institution to accomplish to continue to evolve in a way that is appropriate. It can be easy to think that it is okay to skip the needs assessment and go straight into implementation of what one thinks is necessary, but this is a fallacy many people buy into (Cento, 2019). In the long run, significant amounts of money and time will be wasted by paying
attention to areas that are not necessarily the problem. A key problem with supplying information being used to all individuals involved, leads to the institution developing faculty or keying in on curriculum not relevant to a specific gap (Centor, 2019). When time and money are interchangeable colleges, universities, trade schools, and other areas of the educational realm can increase their efficiency by applying the right tools to the right situations.

**Corporate Online Training**

Driven by cost efficiency, the globalization of business, and advancements in learning technologies, online learning has been widely adopted by corporations. Studies show that 98% of all U.S. companies have implemented some type of online distance training technology (Bose, 2017). Despite the wide adoption of online training in corporations, the determination of success for online programs has been largely focused on return on investment (Keen & Berge, 2014; Strother, 2002). For many corporate distance training programs, dropout rates remain high for voluntary courses and evaluation of training transfer is lacking (Derouin et al., 2005; Park & Choi, 2009). This would suggest that corporate online training programs are not always being designed in a way that serves the organization or its employees.

Needs assessment in online corporate training can facilitate better program planning, decision making and training design. The instructional design process, for example, which takes a systematic approach to training design, implementation, and evaluation, advocates needs assessment as the first step in the design process (Dick & Carey, 1977). Needs assessment can help justify and identify both organizational and individual needs (Watkins et al., 2013) to deliver efficient and effective online training programs.

In this section of Four Facets of Needs Assessment and Analysis for the Design of Online Learning Systems, we examine literature that looks at two aspects of needs assessment in online corporate training. The first reviews needs assessment research that demonstrates the value of aligning online training programs with an organization’s strategic and environmental goals. The second looks at a less-explored body of literature that focuses on the use of needs assessment in identifying and addressing the learning needs of corporate learners with varying skills, backgrounds, and levels of motivation in a corporate distance learning environment.

**Using Needs Assessment to Align Online Corporate Training with Organizational Goals**

Needs assessment addresses three important areas: organizational, environmental, and the performer analysis (Rothwell, 1999). Organizational analysis looks to understand the vision, mission, values, and strategies of an organization. The environmental aspect of needs assessment looks at the workplace, the resources, procedures, and tools. Needs assessment applied to the performer or worker seeks to understand the knowledge, skill, and motivation of the employee (Watkins, et al., 2013). Needs assessment systematically focused on all elements can potentially align a corporate online training program with all aspects of an organization.

With the maturation of online corporate learning, much has been written about the need to align corporate strategy and online corporate training. Extensive work by Watkins and Kaufman demonstrate how needs assessment can be used in this process. Watkins, Kaufman, and Odunlami (2013) provide an important connection between all aspects of needs assessment, the
strategic planning process, and online corporate training. In context, the strategic planning process focuses on guiding an organization toward delivering results. Organizations should assess what they wish to accomplish and determine what initiatives will help them deliver on those goals. Online training may be just one of those initiatives. Before investing time and resources in an online training program, organizations should conduct a needs assessment to determine what gaps online training can close.

Unfortunately, for many organizations, the promise of scalability and cost efficiencies hurried investments in online training technologies before organizations were ready (Borotis & Poulymenakou, 2004). Little or no needs assessment was done before technology implementation, which has led to multiple problems that have hampered corporate online training effectiveness (Derouin et al., 2005).

For organizations that have already made the technology investment without the initial research, scaling needs assessment to address narrowly defined aspects of organizational, environmental, and performer needs can assist in advancing an online corporate training program. As an example, companies could use a framework like a model developed by Borotis and Poulymenakou (2004) to direct their needs assessment efforts. Borotis and Poulymenakou (2004) in their research identified seven key components that should be analyzed to ensure organizational effectiveness and readiness in corporate online training programs.

1. Business Readiness – the link between organizational business priorities and characteristics to online training efforts

2. Technology Readiness – technical infrastructure

3. Content Readiness – understanding how content will work in the technology stack

4. Training Process Readiness – the ability to create, design and evaluate content in the online framework

5. Culture Readiness – organizational culture preparedness to accept online training

6. Human Resource Readiness – the ability of employees (learners) to function and navigate available training technologies

7. Financial Readiness – organizational resources in implementing and maintaining a system

Because the Borotis and Poulymenakou framework crosses many aspects of needs assessment components, organization, environment, and performer, their work is one example of an approach that can be used to help an organization understand where specific gaps exist in an online corporate training program.

**Addressing Learner Needs in Online Corporate Training**

There exists a large body of research done specific to the use of needs assessment in addressing performance gaps in employee knowledge and skills. Work by Gilbert, Rummler and
Brache, Rossett, Kaufman and many other pioneers all provide guidance on the use of needs assessments to find and solve performance gaps for individuals and small groups (Leigh, Watkins, Platt & Kaufman, 2000). While not extensive, this initial literature review shows, however, that little has been written on needs assessment as it relates to addressing worker performance gaps in skills and knowledge for a heterogeneous employee population in online corporate training delivery.

Because of the quick adoption by corporations of online learning technologies, much of the focus in the development of online programs has been on the technology, ignoring the pedagogical issues needed for effective online learning (Ali, 2003; Park et al., 2009). Rather than understanding the needs of the learner, corporations have attempted to reverse engineer the technology, translating their existing instructor-led programs into online delivery (Wang, Vogel & Ran, 2011). Training to a one-size-fits all methodology has tainted the user experience which has led to high dropout rates, issues with training transfer, and overall dissatisfaction with online corporate training (Derouin et al., 2005).

The challenge for online corporate training programs is how to remain scalable, while still serving a heterogeneous population of learners. Normal learning interventions benefit from needs assessment at the individual performer or small group level (Rothwell, 1999), but can be difficult in designing self-directed online programs.

Granger and Bowman (2007) in their work on constructing knowledge in a distance learning environment, propose that addressing learner-centric needs can be done by focusing needs assessment and design on the online learning setting and allowing learners to create their own learning experience (Granger & Bowman, 2007). Granger and Bowman (2007) take a constructivist approach, advocating that the online ecosystem should be designed to allow learners to progressively build toward their own learning goals. To do this, it is important that companies understand the scope of their learning population and various learning preferences of that population. Needs assessment can assist in this process.

Wang, Vogel, and Ran (2010) take a similar view and believe that the success of an online workplace learning program requires a focus on aligning corporate interests with individual needs and work performance. Their work recognizes that employees are adult learners with distinct learning characteristics. They propose a Key Performance Indicator model that provides each employee with learning goals that align with corporate goals. Like Granger and Bowman, they believe that because adult learners are more apt to be self-directed, constructing an online training environment that offers a learner the ability to create their own learning experience is critical to program success.

In both research examples, application of a needs assessment at the organizational, environmental, and performer level can assist with the creation of a more learner-centric corporate online training offering that serves the interest of the firm and its employees.

Accelerating the Design of Corporate Online Training

Preliminary findings of this literature review demonstrate that there is a depth of research on broad application of needs assessment. Within the field of performance improvement, several models have been developed to assist the practitioner in aligning organizational, environmental and performance with training in general. We would advocate much more research is needed on two fronts specific to online corporate training. The first is recognizing and addressing learning needs of less-homogeneous corporate learners with varying skills, backgrounds, and levels of
motivation in online corporate training. The second centers around real-world application of needs assessment models to address a broad group of performers.

Summary

As systems designers and leaders, it is truly unfortunate when we see that the needs assessment and analysis phase of a systems design is often the phase glossed over the quickest, is stacked with assumptions, or rushed in an effort to reach a solution quickly. This review advocates change by focusing on the importance of that initial gap in results. Culturally situated needs assessment and analysis will be more effective than a generalized approach that does not specifically consider the context and distinctiveness of the learners. For example, when designing an online learning system it is essential to understand the motivation, available support, technology and Internet bandwidth availability, learning goals, and other needs of the learner. It is critical when conducting a needs assessment to consider the learning environment as a system of interrelated components and subsystems. For instance, considering different layers or levels within a larger system can help ensure that specific aspects of the system are not neglected by a needs assessment.

References


Lane, L. M. (2013). An open, online class to prepare faculty to teach online. The Journal of Educators Online, 10(1).


Watkins, R., Kaufman, R., & Odunlami, B. (2013). Strategic Planning and Needs Assessment in Distance Education. In M. Moore (Ed.), *Handbook of distance education* (pp. 470-484). Routledge

