# Virtual School Course Design

## Accommodating Students with Disabilities

*FEBRUARY 2018*

Written By
Mary F. Rice
University of New Mexico

MICHIGAN VIRTUAL LEARNING®
RESEARCH INSTITUTE

## About Michigan Virtual Learning Research Institute

In 2012, the Governor and Michigan Legislature passed legislation requiring *Michigan Virtual™,* formally *Michigan Virtual University®*, to establish a research center for online learning and innovation. Known as *Michigan Virtual Learning Research Institute®* (*MVLRI®*), this center is a natural extension of the work of *Michigan Virtual*. Established in 1998, *Michigan Virtual's* mission is to advance K-12 digital learning and teaching through research, practice, and partnerships. Toward that end, the core strategies of *MVLRI* are:

- Research – Expand the K-12 online and blended learning knowledge base through high quality, high impact research;
- Policy – Inform local, state, and national public education policy strategies that reinforce and support online and blended learning opportunities for the K-12 community;
- Innovation – Experiment with new technologies and online learning models to foster expanded learning opportunities for K-12 students; and
- Networks – Develop human and web-based applications and infrastructures for sharing information and implementing K-12 online and blended learning best practices.

*Michigan Virtual* dedicates a small number of staff members to *MVLRI* projects as well as augments its capacity through a fellows program drawing from state and national experts in K-12 online learning from K-12 schooling, higher education, and private industry. These experts work alongside *Michigan Virtual* staff to provide research, evaluation, and development expertise and support.

Suggested Citation: Rice, M. F. (2018). *Virtual school course design: Accommodating students with disabilities*. Lansing, MI: Michigan Virtual University. Retrieved from https://mvlri.org/research/publications/virtual-school-course-design-accommodating-students-disabilities/

## Introduction

This report documents online course designers' work as they designed courses that were accessible to all students, particularly those with disabilities. Online learning has gained tremendous momentum as a method of K-12 instructional delivery (Gemin, Pape, Vashaw, & Watson, 2015; Picciano, Seaman, & Day, 2015). In fact, Project Tomorrow (2014) reported that the percentage of traditional students taking at least one online course rose from 24% in 2006 to 50% in 2013. Unfortunately, The National Education Policy Center reported that one in 10 students enrolled in a virtual school has a disability, yet virtual schools—both those that have been initiated by states and those sponsored by corporations—invest little in this population (Molnar, Miron, Huerta, King-Rice, Cuban, Horvitz, & Rankin-Shafer, 2013). While online learning research has embraced personalization as the primary strategy for meeting the learning needs of all learners, some students require the individualization promised by the Individuals with Disabilities Act in Education (IDEA 2004). Negative outcomes for students with disabilities who enroll in online courses in virtual schools include high attrition and generally poor achievement (Franklin, Rice, East, & Mellard, 2015). These unacceptable outcomes are part of the generally low performance of at-risk students—the fastest growing segment of virtual student enrollments and the segment of which many students with disabilities are a part (Miron, 2016).

Some negative outcomes might be resolved with parent involvement in greater quantity and of higher quality (Borup, Stevens, & Waters, 2015; Waters, Menchaca, & Borup, 2014) and/or greater emphasis on the development of non-cognitive skills, such as self-regulation of learning in online settings (Rice & Carter, 2016). However, creating accessible instructional materials should also be a high priority, and instructional designers play a major role in their creation (Deshler, Rice, & Greer, 2014; Rice, 2017, Rice, 2018). The simple definition of accessibility is to make materials that everyone—regardless of disability—can access. Institutions that receive federal funding are required by Section 508 of the Rehabilitation Act of 1973 to make web materials optimally accessible, but with the acknowledgement that there are various financial and practical constraints (Jaeger, 2004, 2006, 2008). Further, industry has responded with products that are supposed to foster and communicate consensus through training, certification, and rubric-building procedures (Geonnoumis, 2015). Even so, some scholars argue that ultimately, accessibility is not merely a matter of attending to a checklist, but a matter of institutional vision (Mulliken & Djenno, 2017).

While many acknowledge that online learning—particularly participation in fully virtual schooling—holds considerable potential for increased access to different types of courses, credit recovery, and personalization, there is no guarantee that these benefits will be realized on their own (Barbour, Archambault, & DiPietro, 2013). Instead, courses must be made accessible to students through proactive course design. When courses are truly accessible, students with disabilities not only have the chance to enroll in online courses, but they also can learn from the content presented to them in the courses (Moore & Kearsley, 2011). During the course design process, accessibility is often approached by embracing orientations such as personalized learning (Drexler, in press), Universal Design for Learning (Rose, 2000), and/or an independent Section 508 audit (Jaeger, 2004). Key features of accessibility that can be included in course design under these three orientations are:

- Organization of content around objectives, goals, aims, and/or themes

- Presentation of content in multiple formats
- Strategic, incremental presentation of content
- User choices about when and how to engage with content
- Hypermedia support features for comprehension of text, image, and sound
- Information for users regarding upcoming content or points of difficulty
- User choices for products that demonstrate mastery
- Opportunities for collaboration with instructions and peers

While this list may not seem daunting at first glance, making accessible courses is easier said than done. Teachers, students, parents, and onsite mentors rely on course materials to learn or help someone else learn the content that has been promised in the course. Research with online instructors has found that they lean heavily—sometimes exclusively—on the course curriculum materials and resources provided to them by designers. In these cases, teachers report difficulties in seeing how to deliver individualized instruction as outlined in IDEA to students using those materials because the materials have not been designed to be accessible and/or because the design of the course prevents teachers from making changes or modifications for individual students (Rice & Carter, 2015; Carter & Rice, 2016).

Experts in course design, by contrast, have reported that they feel their work is to design a template of curriculum materials for a general population of students, but that teachers, parents, and on-site mentors must be the ones to individualize for students with special needs, even when other personalization features are embedded in the course (Rice, Mellard, Pace, & Carter, 2016). Thus, while online learning, with its promise of flexibility, holds potential to mitigate multiple dilemmas in providing high quality education to large numbers of students, new challenges are also introduced. One challenge is that taking a course online requires new or alternatively applied instructional design and delivery practices (Dick & Carey, 2005). Course materials would then be accessible and easier for all teachers and all students to use (Archambault & Crippen, 2009; Picciano & Seaman, 2008).

With these understandings in mind, the purpose of this inquiry was to examine the practices around accessibility of two teams of course designers as they wrote Algebra II courses in a large virtual school program. During the study, specific attention was given to barriers that course designers encountered for making content accessible and the strategies that members of the team employed as they worked. This technical report is intended to support the work of course design where instructional materials are made with attention to disability.

## Conceptual Framework

Understanding how course design work has been conceptualized is crucial to learning from the course designers who participated in this study. Paramount was the understanding that online learning is a phenomenon where one group of individuals plan the course and another group of individuals teach the course. In traditional settings, it has been recommended that curriculum planners, implementers, and evaluators should be the same person or group of people (Bullough, 1992; Clandinin, Connelly, & He, 1997; Danforth, 2015; Dewey, 2013; Olson, 1995). The new division of roles where course designers, technical design staff, and teachers do their work mostly independently has left gaps in understanding how to design effective courses (Adelstein & Barbour, 2016).

Another important concept is that course design for online work draws heavily on general principles of design, such as those in engineering and art, rather than being an activity rooted in social justice or equity; this is important when considering how to design courses where students with disabilities or other exceptionalities can be successful. For example, Johansson-Sköldberg, Woodilla, and Çetinkaya (2013) traced the history of design thinking. They argued that there were five hierarchical approaches to design. These are highlighted in Figure 1.

1. The conception of design as the mere creation of artifacts;
2. Design as a reflexive practice;
3. Design as a problem-solving activity;
4. Design as a way of reasoning and making sense of things; and
5. Design as the creation of meaning.

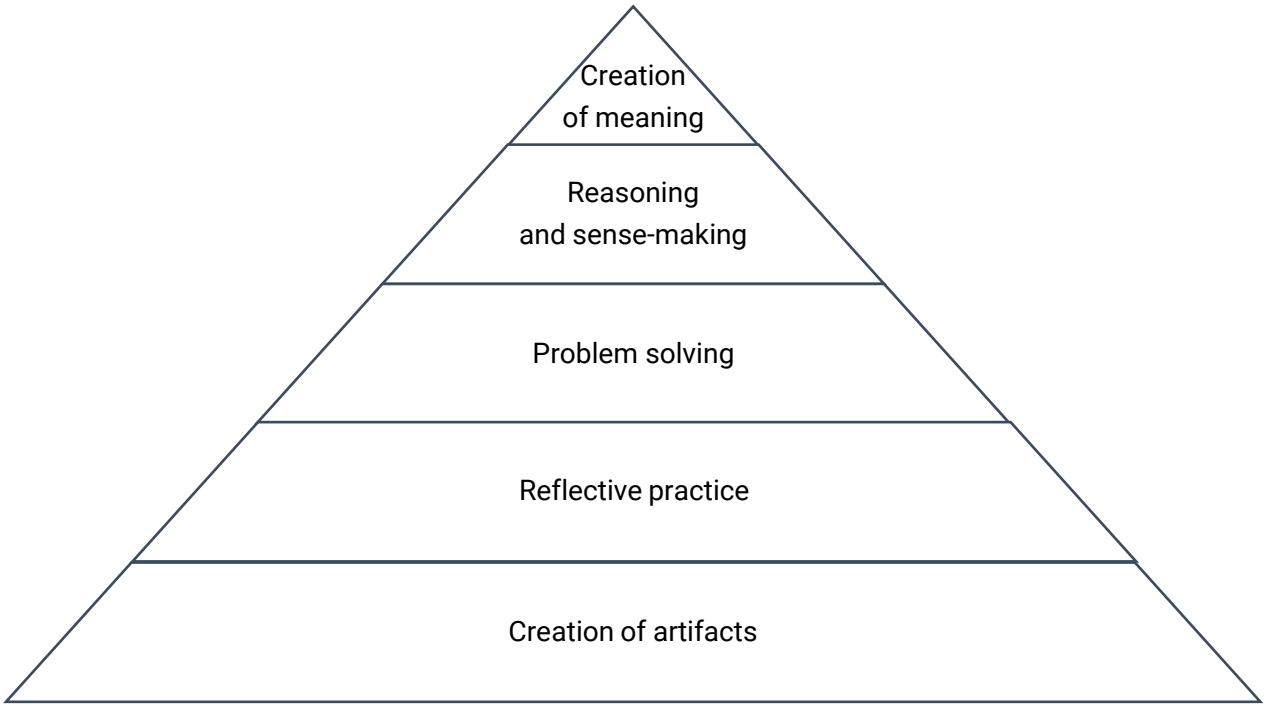


**Figure 1. Approaches to design**

Another critical understanding about course design as professional work is the idea that the task as well as the level of experience drives the way in which designers do their work. For example, 16 designers (eight of whom were regarded as experts based on the number of years in the field and eight of whom were considered novices) participated in a think-aloud activity for a fictional design task (Kim & Ryu, 2014). Researchers found that expert course designers focused heavily on problem framing while novices spent their time problem solving. However, the divide between framing and solving of problems may not be as simple when designers are attempting to consider the complexities of serving different learners with different needs.

It was also interesting to researchers that the novices tended to think about how much the users would enjoy their fictional products at the affective level. Alternatively, the experts in the study thought about the individual attributes of the product's design from a distance. The researchers characterized this difference as a tension between artifact empathy and person empathy, which suggested that different relationships to users and products activates different orientations to tasks and thus requires different literacies. In the case of the courses for the current study, the researcher considered that there were multiple types of diverse users of the course that the designers were going to design. These users included adults such as online teachers, on-site mentors, and parents who have a variety of skills for supporting children in online settings. In addition, the researcher expected that there would be students with ranges of experiences and commitment to the class; therefore, the researcher was looking for evidence that designers attended to these multiple levels of users.

In another study, Rapanta and Cantoni (2013) conducted an analysis of designer discourse (15 design meetings). They were interested in the role of relation to user as an element of designer empathy. In their findings, they noted that designers with more experience in the field were more likely to exhibit less interest in user needs. They also found the user-oriented discussion that took place was not grounded in knowledge or data regarding the learners for whom they were currently designing, but rather in their own experiences with online courses. In the case of students with disabilities, these findings favor course designers who have a disability that have also taken online courses.

As a response to their findings, Rapanta and Cantoni (2013) suggested design teams add user experience anticipation exercises to team meetings and spend more time constructing scenarios about how students and instructors might experience designs. Based on this understanding about users and the likelihood that relating to and understanding users was a focus that degraded with disciplinary experience, Rapanata and Cantoni invited further research on this topic: "Although e-learning designers try to empathise with learners and tutors, the extent to which they can do so effectively is in doubt" (p. 775).

## Methods and Strategies

This phenomenological study was carried out using several strategies common to ethnography (van Manen, 1990). Artifact collection and analysis were conducted over the course of approximately seven months. The participants in this study were members of two course design teams at a virtual school sponsored by a Midwestern state. A course design team consisted of a course designer and a course content specialist. Both teams were supervised by a course development manager. One course content specialist was a college professor who had experience teaching math at the college level and teaching math methods to prospective math teachers. The other was an experienced math content writer with a background in education and mathematics. All team members had five or more years of experience designing courses.

## Data Sources

Several sources of data informed this study, including recorded weekly meetings, instant message logs, course design documents, and resources for course design provided by the virtual school

where the course was being designed. In addition to these major data sources, several emails sent back and forth between the researcher and team members were collected.

### Recorded Weekly Meetings

The first major sources of data were the recorded Google Hangout meetings of both course design teams. These meetings ranged from 15 minutes to over 100 minutes sometimes. The course designers met with the course content specialists at least once a week to report on their progress and ask questions about content or structure of the courses. The course development manager supported the teams during these meetings as needed. During the meetings, the researcher spoke with the participants and answered their questions regarding resources for accessibility. Initially, the researcher tried to keep a low profile and muted her microphone or cut her video, but the team members wanted to see and hear her periodically. So, while she tried not to assume a role as a full member of the team, she did not assume invisibility either. During this study, approximately 40 meetings for each team were held, for a total of 80 meetings.

### Instant Message Logs

In addition to weekly meetings, there were three sets of logs generated within several Google Hangouts: one log for each of the two teams and a collective one. In these messages, team members asked questions about design, reported difficulties, sought advice, and checked on deadlines. They also shared resources for instructional materials. The researcher responded to messages when it was appropriate and sent resources that she thought were related to a group's current task. Over the course of the study, approximately 200 messages were exchanged.

### Course Design Documents

Each team had a set of documents outlining the objectives of the courses and mapping the progression of content through the courses. These were usually the focal documents of the weekly meetings. Members of both teams had access to each other's documents, as did the researcher. The researcher only viewed these design documents and did not add information to them.

### Course Design Resources Compiled During the Study

During the study, members of the design team shared resources with each other. These were in the form of links to web pages as well as other documents. Many of these, though perhaps not all, were shared with the researcher. Some examples of the resources the researcher accessed included OpenStax materials from Rice University when one team was identifying resources for teaching complex numbers. Another example was Wolfram Alpha, a computational engine available over the Internet. There were also numerous clips from Khan Academy and YouTube about various mathematical concepts. The examples named here are meant to show the range of types of resources; not all the resources have been included.

### Course Design Resources from the Virtual School

The virtual school where the study was conducted offered video and other resources in the form of articles and industry papers to course designers and course content specialists. These materials were provided in training programs initially, but then were also available to team members as they wished to review them. The materials reflected what the researcher considered very standard instructional design techniques (i.e., identify an objective, design an activity that matches the

objective, make sure that activities are engaging for students, and then evaluate outcomes). The school had an agreement to use Algebra II courses from another virtual school. They had been offering a version of the other school's course for several years. The course development manager indicated that the reason for building their own course was to reduce delivery costs and because school-level leaders requested a new course as part of a new course marketing model. The researcher viewed the materials from the course the school was currently using and occasionally referenced them in meetings. No materials among those offered from the institution focused specifically on disability.

## Data Analysis

Content analysis techniques were used to analyze data from multiple sources. Content analysis involves gathering a corpus or body of information and then organizing that information to identify themes, concepts, or key ideas. The goal of content analysis is to prepare the researcher to make inferences about large amounts of data (Hsieh & Shannon, 2005). Moreover, the type of content analysis in this current study was conventional. A conventional content analysis is generally used in describing a phenomenon (Hsieh & Shannon, 2005). Researchers use this type of design when existing theory or research literature on a phenomenon is limited. During the coding process, the researcher avoided using preconceived categories (Cho & Lee, 2014). Instead, she allowed categories and names for categories to emerge from the data. Another strategy that she used, which is typical for this type of analysis, was to immerse herself in the data to allow new insights to emerge. In this way, categories were developed inductively (Hanington, 2015). This was important since the goal of the study was not to find out whether the course met a researcher's definition of accessible, but how the course design teams conceptualized and implemented their vision of accessibility.

After the content analysis, data were coded using open and axial coding germane to grounded theory procedures commonly adopted in qualitative research (Charmaz, 2006). Next, data underwent an additional round of analysis to identify barriers and ensure that all possible strategies course designers might use had been identified.

## Findings

This study was a phenomenological inquiry into the literacies of accessibility as displayed by two online course design teams over the course of seven months as they worked to build an Algebra II course.

### Barriers to Accessible Course Design

Three types of barriers emerged during the data analysis process. These are highlighted in Figure 2.

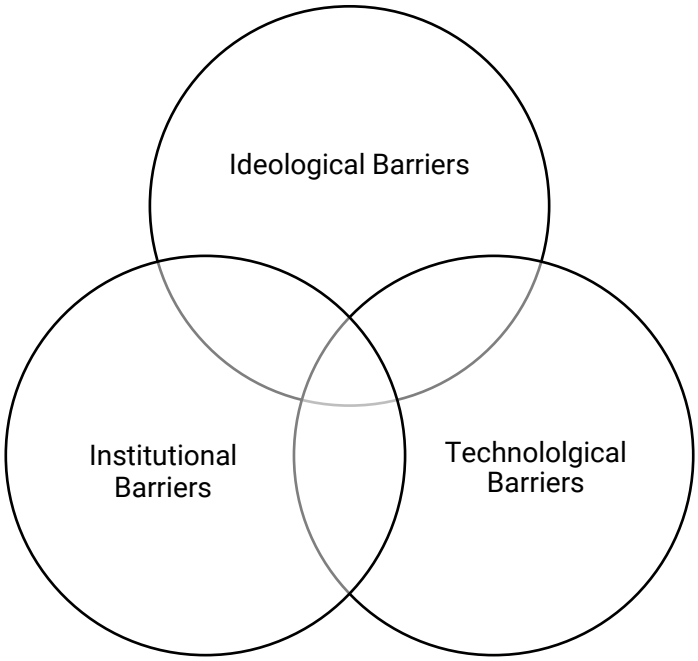


**Figure 2. Barriers to accessibility in the Algebra II online course design teams**

Some of these barriers were ideological or belief-based on the part of the team members. Other barriers emerged because of the nature of working within institutions. Finally, there were technological barriers that prevented accessibility. These barriers are depicted with small areas of overlap because of the phenomenological way in which the data were collected. In paying attention to the context, it was possible, for instance, to see how technological barriers may grow out of the fact that the institution provides or sponsors certain technologies and therefore contributes to a technological device or program being a barrier. Also, institutions both promote and exclude (officially or unofficially) certain ways of thinking. This was going to be especially true in a group of designers where some were the consistent, contracted employees of the organization and some were working as subcontractors. As the barriers are reported in these frames, overlap (where it was found to be sufficiently prominent) has been noted. These barriers were named as such because they presented substantial challenges to the course design process. As per the mission of the study, the words “barrier” and “challenge” do not imply that the ideas presented were insurmountable or ultimately prohibitive to accessibility. Nevertheless, the framing of barriers does articulate what circumstances gave the teams pause and caused them to engage strategically to determine how to make the courses fit their vision of accessible.

***Ideological Barriers***

The ideological or belief-based barriers faced by the teams were about math content and about the students with disabilities.

During discussions about how to write alternative text for graphs and images, both course designers asserted a belief that math is a mostly visual discipline and “saying the math aloud” can be

confusing or clunky. This made it difficult to conceptualize how to add linguistic information that would be helpful for students with visual impairments, but also for learners who merely preferred to learn by hearing or reading versus seeing. In other cases, moving between the visual and the verbal in mathematics simplified the math, but that presented issues with assessment. The notion of simplification through verbalization presented issues for how to write alternative text. In many cases, such as when working with functions, describing the graph provided all or most of the solution. Thus, whichever way math was conceptualized with regards to the relationship between the visual and the verbal, it was a barrier to the course design process. One course content specialist wrote the following message describing the challenge.

> The challenge is since they are translations of parent graphs, we need to avoid describing their distance from the origin, but focus more on the shape and points that they pass through. If you need me to write the alt text, just let me know. I will be happy to.

Another barrier was the conceptualization of who was taking the course. Further, the teams discussed the number of Algebra II students enrolled for credit recovery, those who enrolled for other reasons, and whether individuals who took the course would or would not have a deep interest in mathematics and desire to take more math. The designers considered why students with disabilities might be taking their courses. In addition, some members of the teams wondered whether and to what extent students with severe disabilities already had equipment or technology that would enable them to access instructional materials, regardless of how it was designed. During these times, the course content managers offered information about who was taking these courses and for what purposes.

From what the researcher could determine, there was no training for user empathy available in the instructional materials for instructional designers. However, the course design manager reported that the entire team was reading a book about design accessibility.

***Institutional Barriers***

In addition to ideological barriers, institutional pressures also presented challenges to accessible design.

The design teams strove to generate courses that met Quality Matters (QM) standards. The need to score well on the QM review was important to the teams because they sensed the way in which the institution saw its value. Sometimes, however, there was confusion about what QM required and whether the requirements ran counter to what would benefit diverse students. For example, one of the course content specialists believed that under the QM rubric, point deductions occurred when website links were added that led the user out of the course. However, often links were necessary to send students to a site for support or additional examples. In addition, the course content specialist indicated that she had read data from the virtual school indicating that students liked the links and visited them when they were provided. The overall course design manager indicated that the deductions would only occur when the link led to adult content. After some discussion and checking with QM, the course development manager was deemed correct. Afterward, there was discussion within this team about how to find the particular clip from YouTube and access it without the advertisements on the side that would cause deductions in the QM review.

Also, the designers were encouraged to use Open Educational Resources (OERs) since they are free and regarded to save time overall. However, as could be expected, many of these resources were not ready for immediate use or had other issues. One course content specialist described her impression of some of the materials.

> I definitely wish we had access to some more visually appealing videos, ones that show real life application or are more engaging versus just someone with a board. If they didn't take so long, I would make them; but I am a very slow video creator.

Even though they provided a starting point for course content specialists, OERs required heavy revising to fit the flow of the new course. Further, most of the examples offered for Algebra II concepts are abstract, rather than practical or real-world. Although the OERs were time-saving in some ways, they seemed to require additional time to revise for greater accessibility. This comment from the course design manager illustrates this challenge:

> We either have to write all the content ourselves and still make it accessible, or we use OER as a starting place and make that content accessible. OER will save us time nearly every time. OER has nothing to do with accessibility.

These circumstances speak to the larger conversation in the field of educational web course design where there is a lack of clarity and consensus about what constitutes sufficient effort to make courses 508 compliant (e.g., How do we know when we have done due diligence?). This is an on-going concern for institutions receiving monies from the federal government who are required to be compliant (Jaeger, 2004, 2006, 2008).

***Technological Barriers***

Although technologies are often thought of as enabling accessibility, this is not always the case.

For example, materials that are going to be read through screen readers must have alternative text. This text is not generated automatically. Someone must write it, which requires time and training. The amount of time in testing the ALT-Text or other accommodations, as well as repairing the minor glitches introduced when accessibility features are added, was a major barrier in this study. For example, the instructional designers had to run extra tests with the script of the problems to ensure that what a student saw on the screen was what the teams wanted them to see. Figure 3 is an example from the course illustrating the complexity of the display of the numbers.

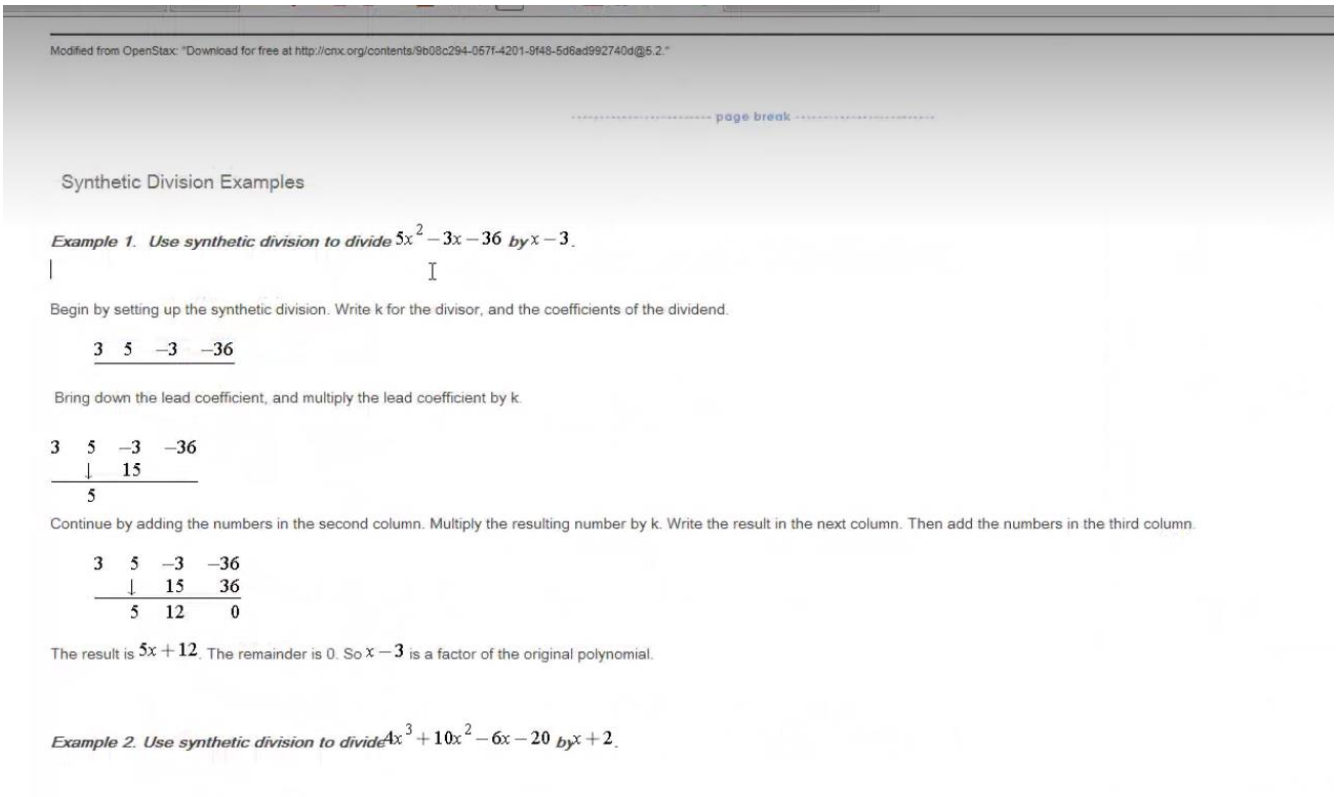


**Figure 3. Visual display complexity**

In this screenshot, one can see how demonstrating synthetic division requires number display that attends to direction, and arrows are needed to show users that the numbers will move.

To run complex visual displays, the HTML/XTML language is also complex, as illustrated in Figure 4.

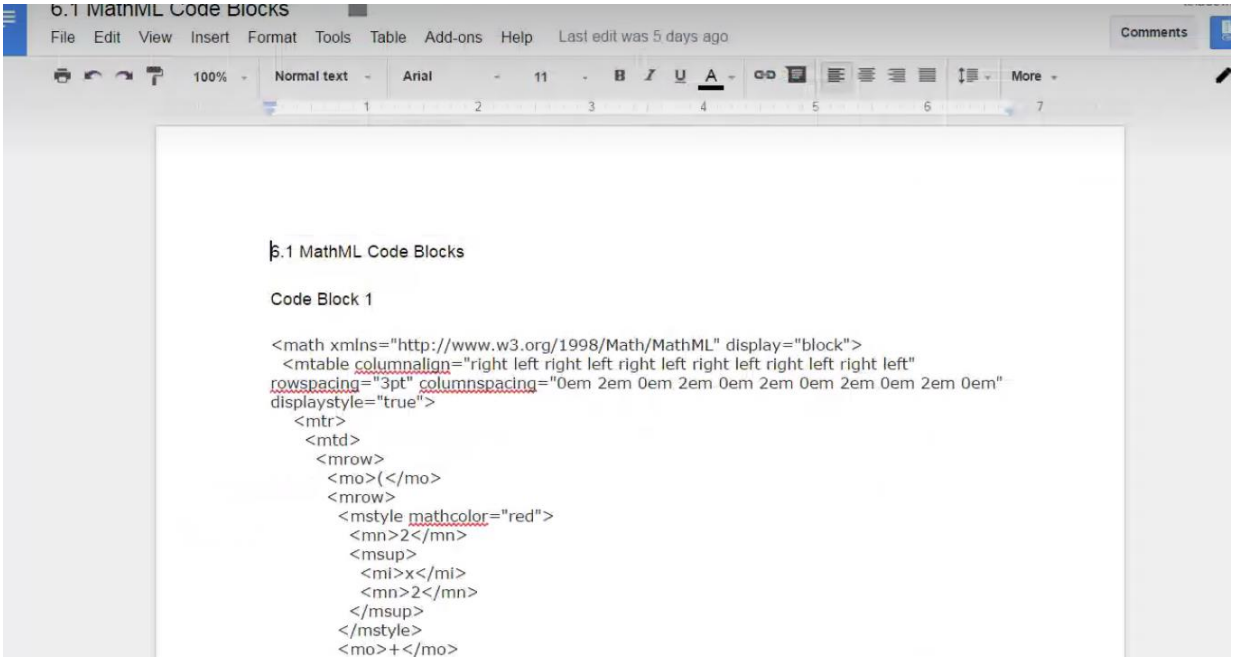


**Figure 4. Math coding blocks example**

Another complication occurred because even though designers were using SoftChalk, there were challenges when trying to interface SoftChalk with screen reading technologies. These challenges were especially likely to arise with complex equations, which was especially frustrating to teams since the documentation provided in SoftChalk's Volunteer Product Accessibility Tool (VPAT) indicated that the program was accessible. The teams found that free screen readers do not appear to read the alternative text tags produced within the program. The course design specialist overseeing the project indicated that substantial time was spent researching the problem and consulting with the company that created SoftChalk, but no resolution was reached. In the end, the course design specialist and consulting colleagues elected to trust the company's VPAT.

## Strategies for Overcoming Barriers to Accessibility

During this study, three types of strategies were identified. These strategies were employed for addressing barriers holistically rather than within the context of a single source (institutional, technological, ideological). These strategies may hold potential for helping course designers overcome the barriers they face in making content more accessible.

### *Content Organization*

The desire to pass the QM review and adhere to institutional goals and norms merged with the need to make accessible content as teams paid close attention to the objectives for each unit and lesson. The objectives and their clear and consistent articulation also reflect a value the institution has for demonstrating alignment to standards and are in accordance with what they believe about good instructional design. The objectives were written and re-written many times throughout the design process. The following is a conversation about the content specialist's work to understand the relationship between QM review and requirements for objectives.

> Course content specialist: There seems to be some confusion. I am getting different information from different people. Do we want the objectives to be written as guiding questions or statements?
>
> Course designer: We definitely need statements for QM, but we also put them in the lessons as questions. We believe they are more useful to students as questions because they provide them with a means of self-assessing as they progress through the lessons.
>
> Course content specialist: I am open to whatever the group wants to do if we are consistent. In regards to QM, questions are fine as long as the verbs are measurable. So, something like "Describe" and "How would you describe" would both work.
>
> Course designer: Questions are not fine in QM even if the verbs are measurable, based on our experience going through the QM review process. We have had to add the objective statements even though we have the statements posed as questions with measurable verbs. This has happened every time we did not have the objectives written as statements. So we have just moved toward including the statements as well as the questions.
>
> Course content specialist: We are using the standards as the unit objectives, and each is brought down to the applicable lesson; they include the measurable verb. We are also including only the part of the standard that the lesson covers; in some cases there are multiple objectives or concepts covered in one standard, so we are sure to only use the part of the standard that the lesson addresses. I list these in the unit overview so QM sees these at the beginning of every unit. The guiding questions are written in the lessons themselves to help guide the students and think about what they will learn in the lesson.

This interest in identifying objectives as incremental ideas for instructional delivery was also a prevalent element in the training materials that the members of the design teams were using. The researcher supposed that the goal was to see content pieced into very small tasks with clear objectives; accessibility could be bolstered by helping students know what they were supposed to learn and, therefore, helping them access the content. However, the course manager disagreed with this assessment, saying that the group never discussed how objectives related to accessibility.

***Content Presentation***

The course designers also paid close attention to the presentation of the content. One team worked carefully to incorporate thematic ideas from lesson to lesson that would create coherence. This team also changed the pronoun language in the materials to directly address the student (e.g., You will learn …) to simplify the other aspects of language (commands to do a task, action verbs, feedback, and more). The other team considered ways that they might introduce group work and project-based learning for some concepts. In addition, the course development manager stressed that content presentation in alternative formats and videos with captions were the primary strategies for increasing accessibility. The school also hired a separate contractor to write equations that would be compatible with the instructional delivery and learning management system. One of the course designers reported on one of these efforts.

> I ran the first set of the script through Blackboard math editor, then copied the Bb generated equation to [the] SC [SoftChalk] math editor, then it displayed correctly.

In the cases where videos had already been captioned or transcribed but were deemed inadequate, they were professionally captioned and or transcribed. This work was completed by a captioning service who was not involved in the study.

***Advocacy***

As the course designers worked, they became more interested in conceptualizing the learners as well as the environments in which students would work. One team began asking questions about what on-site mentors might know about supporting students and suggested training materials for them. As these seeds of interest grew to advocacy, the designers began to think of their work as a task not just where they wrote instructional materials, but where they made opportunities for students. These interests may have emerged through working with the course as well as during the book study they engaged in together.

## Discussion

The findings of this study suggest that course design work requires the negotiation of ideological, institutional, and technological barriers that threaten the accessibility of content. This accessibility is vital for the participation, persistence, and positive learning outcomes of students with disabilities enrolled in online courses. Further, there are implications for this work that resonate in the practice of designing and delivering online courses, the research on course design, and the policies that govern course design evaluation and monitoring.

### Addressing Ideological Barriers

Course designers benefit from as much understanding of their course audience as possible. Further, there may be a host of unexamined societal norms that include the supposition that a person with a disability should fend for themselves because there are so few individuals with certain disabilities that inadvertently permeate tasks like course design. If meeting the guidelines of Section 508 is important, however, it does not matter if one person needs audio support or if 1,000 do. Further, course designers were supported in their thinking that there were few students with disabilities in their courses by data. However, one reason the students might not be in a course is because that course is inaccessible. If full inclusion is a goal, then the training materials could be updated to provide information about accessibility in general, as well as how students with certain types of disabilities are accommodated.

### Addressing Institutional Barriers

Scoring high on QM reviews and attending to design directives takes a lot of time; much of this time is to ensure that teams are working efficiently and there is some standard for evaluation. The question is not whether there should be quality standards, but whether the QM (or any set) are the right standards to judge every goal. The course development manager cited additional standards used in the past and cross-walked standards in addition to those of QM. In applying the standards and gathering data on whether students are successful in the courses (including who is successful and under what circumstances), this and other institutions can make decisions about improvements to courses and improvements to standards.

### Addressing Technological Barriers

Although it may be easy for an organization to say that they have done due diligence when the software is not available, the willingness of the course designers to advocate for on-site mentor information could be carried into the software world. If large organizations are not demanding software that enables accessible content, there is no reason to believe that software companies will do it of their own accord. Working with these companies to identify accessibility needs and make personalization preferences known could make a difference over time.

## Conclusion

This study sought to describe the work of making courses accessible to students with disabilities. The findings highlight the barriers and opportunities the course design teams faced as they grappled with the complexity of creating accessible courses. Specifically, the descriptions here challenge the notion that accessibility is merely a matter of automation using programs or motivation within individuals and groups. Instead, accessibility is something that grows out of a constellation of institutional affordances and professional knowledge over time as a course comes to be. This study was phenomenological in nature, and therefore, no direct generalizability is implied in the findings.

Instead, this work offers the opportunity for resonance with other K-12 online programs who employ course designers, particularly if those designers work in teams. Administrators in these programs might ask themselves questions such as:

1. What materials are provided to course designers?
2. What do these materials imply about our orientation to accessibility?
3. What do we have to do to give designers the time they need to do their work well?
4. How can we ensure that we are constantly updating our technological infrastructure so that design reflects the best available resources for accessibility?
5. How can we make sure that course designers know who our learners are and what we think are important outcomes for them?

With the likelihood that online learning will continue to grow and design work will continue to fragment, rather than become more cohesive, supporting the literacies of course design is a promising pathway to courses that are both more accessible and enjoyable for students.

## References

Adelstein, D., & Barbour, M. K. (2016). Redesigning design: Field testing a revised design rubric based of iNACOL quality course standards. *International Journal of E-Learning & Distance Education*, *31*(2). Retrieved from http://www.ijede.ca/index.php/jde/article/view/976/1647

Archambault, L., & Crippen, K. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education*, *9*(1), 71-88.

Barbour, M., Archambault, L., & DiPietro, M. (2013). K–12 online distance education: Issues and frameworks. *American Journal of Distance Education*, *27*, 1-3.

Borup, J., Stevens, M. A., & Waters, L. H. (2015). Parent and student perceptions of parent engagement at a cyber charter high school. *Online Learning*, *19*(5), 69-91.

Bullough, R. V. (1992). Beginning teacher curriculum decision making, personal teaching metaphors, and teacher education. *Teaching and Teacher Education*, *8*(3), 239-252.

Carter, R. A., Jr. & Rice, M. (2016). Administrator work in leveraging technologies for students with disabilities in online coursework. *Journal of Special Education Technology, 31*(3), 137-146.

Cho, J. Y., & Lee, E. H. (2014). Reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. *The Qualitative Report*, *19*(32), 1.

Connelly, F. M., Clandinin, D. J., & He, M. F. (1997). Teachers' personal practical knowledge on the professional knowledge landscape. *Teaching and Teacher Education*, *13*(7), 665-674.

Danforth, S. (2015). Under the mentorship of John Dewey: Democratic lessons for inclusive Education. In *Foundations of Inclusive Education Research* (pp. 133-148). Bingley, UK: Emerald Group Publishing Limited.

Dewey, J. (2013). *The school and society and the child and the curriculum*. Chicago, IL; University of Chicago Press.

Dick, W. C. l., & Carey, J. (2005). *The systematic design of instruction*. New York, NY: Pearson Higher Education.

Drexler, W. (in press). Personal learning environments in K-12 setting. In R. Ferdig and K. Kennedy (Eds.) *Handbook of research on K-12 online and blended learning.* Pittsburgh, PA: ETC Press.

Franklin, T. O., Rice, M., East, T., & Mellard, D.F. (2015). *Enrollment, persistence, progress, and Achievement*: School Superintendent Forum Proceedings (Report No. 1). Lawrence,

KS: Center on Online Learning and Students with Disabilities, University of Kansas. http://www.centerononlinelearning.res.ku.edu/wp-content/uploads/2017/04/Superintendent_Topic_1_Summary_UpdatedNovember11.2015.pdf

Greer, D., Rice, M., & Deshler, D. (2014). Applying principles of text complexity to online learning environments. *Perspectives on Language and Literacy*, *40*(1), 9-14.

Hanington, B. (2015). Making methods work: 10 rules of thumb for design research. *Archives of Design Research*, *28*(1), 41-51.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277-1288.

Individuals with Disabilities Education Act (IDEA), 20 U.S.C. § 1400 (2004).

Jaeger, P. T. (2008). User-centered policy evaluations of section 508 of the rehabilitation act: Evaluating e-government web sites for accessibility for persons with disabilities. *Journal of Disability Policy Studies*, *19*(1), 24-33.

Jaeger, P. T. (2006). Assessing Section 508 compliance on federal e-government Web sites: A multi-method, user-centered evaluation of accessibility for persons with disabilities. *Government Information Quarterly*, *23*(2), 169-190.

Jaeger, P. T. (2004). Beyond Section 508: The spectrum of legal requirements for accessible e-government Web sites in the United States. *Journal of Government Information*, *30*(4), 518-533.

Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: past, present and possible futures. *Creativity and Innovation Management*, *22*(2), 121-146.

Kim, J., & Ryu, H. (2014). A design thinking rationality framework: framing and solving design problems in early concept generation. *Human–Computer Interaction*, *29*(5-6), 516-553.

Miron, G. (2016). *Review of the policy framework for online charter schools*. National Education Policy Center. Retrieved from http://nepc.colorado.edu/files/reviews/TTR%20Miron%20Online%20Charters_0.pdf

Molnar, A., Miron, G., Huerta, L., King Rice, J., Cuban, L., Horvitz, B., & Rankin Shafer, S. (2013). *Virtual schools in the US 2013: Politics, performance, policy, and research evidence*. Boulder, CO: National Education Policy Center. Retrieved from http://files.eric.ed.gov/fulltext/ED558723.pdf

Moore, M. G., & Kearsley, G. (2011). *Distance Education: A systems view of online learning*, Third Edition. Wadsworth Publishing Company. California, USA.

Mulliken, A., & Djenno, M. (2017). Faculty visions for teaching web accessibility within LIS curricula in the United States: A qualitative study. *The Library Quarterly*, *87*(1), 36-54.

Olson, M. R. (1995). Conceptualizing narrative authority: Implications for teacher education. *Teaching and teacher education*, *11*(2), 119-135.

Picciano, A. G., & Seaman, J. (2008). K-12 online learning: A 2008 follow-up of the survey of US school administrators. Newburyport, MA: Sloan Consortium.

Picciano, A. G., Seaman, J., & Day, S. L. (2015). Online learning in Illinois high schools: The voices of principals. In T. Heafner, R. Hartshorne, & T. Petty (Eds.), *Exploring the effectiveness of online education in K-12 environments* (pp. 1-18). Hershey, PA: IGI Global.

Rapanta, C., & Cantoni, L. (2014). Being in the users' shoes: Anticipating experience while designing online courses. *British Journal of Educational Technology*, *45*(5), 765-777.

Rehabilitation Act of 1973, as amended by § 508, 29 U.S.C. § 794(d) (1998).

Rice, M. (2018). Too many words, too little support. Vocabulary support in online science courses. *International Journal of Web-Based Learning and Teaching Technologies 13*(2).

Rice, M. (2017). Analyzing text cohesion in online learning environments: Implications for students with reading difficulties. *Bordón Revista de Pedagogía, 69*(3), 107-123.

Rice, M. F., & Carter Jr, R. A. (2016). Online teacher work to support self-regulation of learning in students with disabilities at a fully online state virtual school. *Online Learning*, *20*(4), 118-135.

Rice, M., & Carter, Jr., R. A. (2015). When we talk about compliance it's because we lived it: Online educators' experiences supporting students with disabilities. *Online Learning, 19*(5), 18-36.

Rice, M., Mellard, D., Pace, J., & Carter, Jr., R. A. (2016). Meeting the needs of students with disabilities in K-12 online learning: An analysis of the iNACOL Standards for Quality Online Courses. Lansing, MI: Michigan Virtual University. Retrieved from http://media.mivu.org/institute/pdf/MeetingNeeds3.pdf

Rose, D. (2000). Universal design for learning. *Journal of Special Education Technology*, *15*(4), 47-51.

van Manen, M. (1990). *Researching lived experience*. New York, NY: State University of New York Press.

Waters, L. H., Menchaca, M. P., & Borup, J. (2014). Parental involvement in K-12 online and blended learning. In *Handbook of research on K-12 online and blended learning* (pp. 303-323). Pittsburgh, PA: ETC Press.

3101 TECHNOLOGY BLVD., SUITE G • LANSING, MI 48910 • MICHIGANVIRTUAL.ORG • 888.532.5806

MICHIGAN™ VIRTUAL

MICHIGANVIRTUAL.ORG

MICHIGAN VIRTUAL LEARNING® RESEARCH INSTITUTE

MVLRI.ORG