

WHY DO WE FALL? USING EXPERIENCES OF FAILURE TO DESIGN CASE LIBRARIES

Andrew A. Tawfik, *Concordia University Chicago*

David H. Jonassen & C. Wayne Keene, *University of Missouri*

Instructional designers can support ill-structured problem solving through case libraries that detail domain-specific principles. In this design project, case libraries were employed in an undergraduate sales management course to contextualize knowledge and describe the ill-structured nature of how solutions are derived to solve authentic problems. Whereas many learning environments employ examples of model behavior (Jonassen, 2011), this instructional design was innovative in that the case libraries consisted of sales management failure experiences as the means to facilitate learning. The failure cases embedded within the learning environment engendered design tensions on multiple levels throughout the instructional design. Specifically, this article discusses the issues of engaging the subject matter expert (SME) to talk about failure cases and subsequent challenges to translate the experiences into meaningful learning resources for ill-structured problem solving. Other challenges included how to strategically design the learning environment so that the case library was available at the optimal time for the learners. The design case concludes with a reflection upon the process.

Andrew A. Tawfik is an assistant professor of Instructional Design and Technology at Concordia University Chicago where he serves as an instructor of educational technology. He earned his PhD in Learning Technologies from the University of Missouri. Tawfik's research interests include problem-based learning, case-based reasoning, case library instructional design, and computer-supported collaborative learning.

David H. Jonassen is Curators' Professor at the University of Missouri where he teaches in the areas of Learning Technologies and Educational Psychology. He has published thirty-five books and hundreds of articles, papers, and reports on cognitive tools, and problem solving. His current research focuses on problem solving, culminating in a book, *Learning to Solve Problems: A Handbook for Designing Problem-Solving Learning Environments*.

Charles W. Keene, MBA is an Assistant Teaching Professor in the Marketing Department at the University of Missouri. He earned his MBA from Fontbonne University in St. Louis, MO. Keene's professional background includes sales, management and retail positions. His teaching methods in these areas include problem based learning, case-based reasoning and instructor facilitated collaborative learning.

CONTEXT

The instructor, who served as the subject matter expert (SME), approached me (the instructional designer) regarding an instructional design that would promote critical thinking skills in his students for a junior-level sales management course. The SME was concerned because his students were in the third year of their major and were thus close to entering the job market. However, he was disappointed the students often focused on surface level issues during class discussions and assignments. He noted that students read sales management concepts from the textbook, but had difficulty applying the concepts when engaging in problem-solving tasks. Moreover, the SME was increasingly frustrated that the students often misunderstood how the concepts might be applied to solve contextualized ill-structured sales management problems. He specifically wanted to promote problem-solving skills such as analogical transfer and argumentation so students could draw connections as they progressed to more advanced topics throughout the semester. That is, students struggled with the transfer of solutions and recognition of similarities between problems that have the same basic structure (Klauer, 1989). As students solved new problems, the SME wanted students to engage in argumentation using justifications from various perspectives and an appropriate application of evidence.

Prior to our collaboration, the instructor often employed a case-based instruction approach within his course as a means to promote critical thinking skills. He would primarily accomplish this by assigning students a case study to analyze as a group throughout the week. The class time would be utilized to delve into the specifics of the assigned case as the instructor facilitated the discussion. Although the

Copyright © 2012 by the International Journal of Designs for Learning, a publication of the Association of Educational Communications and Technology. (AECT). Permission to make digital or hard copies of portions of this work for personal or classroom use is granted without fee provided that the copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page in print or the first screen in digital media. Copyrights for components of this work owned by others than IJDL or AECT must be honored. Abstracting with credit is permitted.

instructor perceived small learning gains in the critical thinking and analysis skills of his students throughout the discussions, he still noted a lack of analogical transfer when students were required to solve new ill-structured problems related to sales management.

DESIGN OVERVIEW

Ill-structured problem

The instructor approached me (the instructor designer) about what could be done to best support critical thinking in his sales management class. He especially wanted to leverage the experiences from his 20 years as a sales management supervisor as a way to model the type of reasoning expected in practice. After reviewing the literature of goal-based scenarios, I learned that Schank (1996) recommended that experiences be embedded strategically as a just-in-time resource within learning environments. I therefore decided we should insert the SME's experiences in the form of a case library learning environment (CLLE) so students could reference the experiences at specific times throughout the problem-solving activity.

The finalized learning environment was comprised of two primary elements: a novel ill-structured problem and a supporting case library. The ill-structured problem, presented in the center of the interface (see Figure 1), required the learners to solve an ill-structured sales management problem related to hiring and selection. The primary case—*Nick's Dilemma*—was originally derived from an authentic decision-making experience encountered by the SME 15 years ago. The problem detailed a potential interviewee that had an excellent work history and strong character references, but possessed a questionable criminal history. The applicant offered to pay any additional insurance costs that the firm might incur because of his criminal history. The SME and I included additional variables to confound the problem. For instance, the problem was constructed such that the individual intentionally left off his criminal history. In

addition, the hiring manager of the case was under pressure to quickly make a hire because of frequent turnover within the position. These factors required the learners to question the hiring justification throughout the decision making process.

After reading the ill-structured problem, the online learning environment prompted the learners to construct an argument that validated the hiring decision. Specifically, learners were required to construct a multifaceted argument that included an initial stance, counterargument, and rebuttal as prescribed by Nussbaum (2008). We chose argumentation as the academic activity "because embedding and fostering argumentative activities in learning environments promotes productive ways of thinking, conceptual change, and problem solving" (Jonassen and Kim, 2010, p. 439). As such, an argumentation activity was chosen over other assessment methods (e.g. multiple choice exam) because of the emphasis upon problem-solving skills such as evidence evaluation and contextualized decision-making.

Case Library

To support the students as they moved towards a resolution of the ill-structured problem, a case library was embedded on the right side of the learning environment under the "Stories" section. As the learner clicks on a case link, the learning environment navigates to a separate page that documented

The screenshot shows a web-based learning environment. At the top, the title '4420 Sales Management' is displayed in a large green font. Below the title, the date 'WEDNESDAY, SEPTEMBER 28, 2011' is shown. The main content area is titled 'Nick's Dilemma' and contains a paragraph of text describing a hiring scenario. To the right of the main text, there is a 'STORIES' section with a list of five links: 'Holly's Chance', 'Jesse's Search', 'Alex's Selection', 'Janice's Transition', and 'Chris' Choice'. The bottom of the screenshot shows the beginning of another paragraph: 'After going through the applicants, it becomes evident that it was difficult to find a great deal of qualified applicants'.

FIGURE 1. Learning environment.

4420 Sales Management

Hollys Chance

[\(Back to Assignment Screen\)](#)

After looking for two years, Jason finally found the right position that would allow him to transition from the factory floor to steel sales. In fact, he had always dreamed of working in steel sales after 10 years of making steel pipe. The move would require him to move from Pittsburgh to St. Louis, but he was ready to begin his sales career. After many years on the job market

STORIES

- [Holly's Chance](#)
- [Jesse's Search](#)
- [Alex's Selection](#)
- [Janice's Transition](#)
- [Chris' Choice](#)

FIGURE 2. Individual case page.

a case we generated from the SME's experience (see Figure 2). Whereas other instructional design strategies such as question scaffolds or multimedia videos were considered, we wanted to employ instructional strategies that leveraged previous experiences to model how individuals reason in practice.

The decision to employ a CLLE was primarily based upon the theory of case-based reasoning. Case-based reasoning theory argues experiences, often stored in the form of cases, encapsulate the interpretations and subsequent lessons learned (Schank, Berman, & Macpherson, 1999). The theory suggests that as knowledge and expertise increases, an individual is better able to assess the current problem, find previous cases relevant to the current problem, leverage that case to inform a solution, and update internal memory as one learns from the experience (Aamodt & Plaza, 1996). This recognition is based on the expert's ability to index ("tag") and classify previous experiences on deep structural levels of a case (Kolodner, 1992). Educational theorists have hypothesized that knowledge of practitioners is thus largely derived from accumulated problem-solving experiences stored as a "case library" within memory that allows for a deep understanding of new problems (Kolodner, Owensby, & Guzdial, 2004; Schank, 1999).

In a review of the case-based reasoning literature, I also learned that a powerful way to employ case-based reasoning in pedagogy is by reminding learners of relevant

problem-solving experiences through CLLE (Jonassen and Hernandez-Serrano, 2002). Case-based reasoning theorists have suggested that CLLE designs have provided experiential knowledge of practitioners when novices lack experience (Kolodner et al., 2004). As such, cases were embedded within the interface to expose the learner to reasoning expected at specific junctures during the problem-solving task. Based on the case-based reasoning literature, Jonassen (2011) has argued that CLLE designs "represent one of the most powerful forms of instructional support for ill-structured problems" (p. 21). This rationale became the overarching theory that drove the instructional design strategy of this project.

While some empirical research has documented the potential of CLLE designs to support problem-solving (Hernandez-Serrano & Jonassen, 2003), it was unclear as to what types of embedded narratives would be best suited for the learning environment. After reviewing the literature it became clear that failure cases had shown to be a powerful learning tool within various domains (Ziv, Ben-David, & Ziv, 2005). Schank's theory of failure-driven memory (1999) further suggested that failure requires an individual to amend erroneous assumptions about previous decisions, assessments, and actions. Researchers have also argued that failure stimulates practitioners to contemplate and reflect upon what other cases are applicable (Sitkin, 1992), better understand the conditions of future success (Shepherd, 2003), focus on the key factors that may be latent within the experience (Kolodner et al., 2004), and thus generate a more

complete mental model (Mathan & Koedinger, 2005). We therefore decided to design the case library with experiences of failure as the primary learning mechanism. However, the design decision to employ failure posed unique challenges throughout the instructional design procedure.

DESIGN PROCEDURE

Subject Matter Expert Interview

The design team of the case library consisted of two individuals: the instructional designer (the first author) and a SME (an instructor). To begin constructing the case libraries, I recorded an interview with a SME (the instructor) that possessed over 20 years of experience in sales management. As part of the interview, I began by asking the SME to recall various experiences of problem-solving within the field related to the sales management hiring principles. The SME leveraged his experiences of employment as a mill worker, steel salesman, and small business owner throughout our discussions.

One of the challenges I struggled with was how to elicit experiences from the SME in such a way that clearly relayed the concepts relevant to sales management. In the first interview, my initial goal was to allow the SME an arena for open discussion of the various failures he had experienced. The thought was that we could engender a robust case library if the SME was not limited by any protocol I imposed on him. However, as the interview progressed it soon became clear the SME had difficulty recalling the experience extemporaneously and would often go off topic. The main problem was that he was so focused on recalling experiences under pressure that he often overlooked the pedagogical connections to sales management principles. Specifically, our conversation did not provide rich descriptions of the context and did not delve deeply into the lessons learned from the

experience. After two poorly described narratives, the SME and I quickly decided to cut the initial meeting short and try again at a later time.

To avoid the previous mistakes, we made two primary changes prior to the following meeting that served as keys to the success of the instructional design. First, the SME agreed to reflect upon his experiences throughout the week and come to the next meeting with prepared notes about his experiences. The additional time served as a way to offload some of the pressure to think of cases “off the top of his head.” As a result of his reflection throughout the week, he came to our next meeting with much more clarity about the concepts he wanted to include within each case. We therefore were able to avoid the problem of running out of failure cases or going off topic.

The second change was the decision to abandon my strategy of an open and free discussion. Although I initially believed the open discussion approach would allow for broad and diverse discussions, the lack of structure imposed undue pressure on the SME. For the second meeting I decided to utilize an interview protocol adapted from Jonassen and Hernandez-Serrano (2002) (see Table 1). The protocol helped to outline specific questions (the “Questions” column) and their importance to case library instructional design at each stage (the “Goals” column). This proved beneficial for multiple reasons. First, the protocol helped to situate the discussions and ensure the experiences remained relevant to the task at hand. As such, the fatigue of describing multiple cases was somewhat mitigated. Another benefit was that the protocol afforded a discussion on various pedagogical levels that helped to make the case multi-faceted and ill-structured. For instance, the protocol prescribed a discussion of the situation constraints and solution justifications that I had previously overlooked using my open discussion approach.

QUESTIONS	GOAL
1. Please explain to me a failed story in regards to a hiring and selection strategy?	Problem-situation-topic indexes
2. What were the relevant concepts (indices) embedded within story you just described?	Problem-situation-topic indexes
3. What were the goals-subgoals-intentions to the context?	Problem-situation-topic indexes
4. What were the constraints of the context described?	Problem-situation-topic indexes
5. What solution was developed to solve the problem?	Appropriate solution indexes
6. What was the justification for the proposed solution?	Appropriate solution indexes
7. What acceptable, alternative solutions were suggested but not chosen?	Appropriate solution indexes
8. What unacceptable, alternative solutions were not chosen?	Appropriate solution indexes
9. Why was this solution unacceptable?	Appropriate outcome indexes
10. If failure, what repair strategies could have been employed?	Appropriate outcome indexes

TABLE 1. Interview Protocol for Failure Cases.

Talking about Failure

Educational theorists have noted the importance to reflect upon failure cases as an instructional strategy to prepare the learner for the ill-structured nature of problem-solving (Kolodner et al., 2004; Schank, 1999). I therefore chose to design the learning environment that used cases of failure to incite the learning process. However, this posed significant challenges throughout the instructional design process in terms of eliciting cases from the SME.

Research has suggested that experts often overlook various aspects of problem-solving descriptions due to expert automaticity (Clark, Feldon, van Merriënboer, Yates, & Early, 2008; Feldon, 2007). Despite the protocol, the SME would often tell a parsimonious version of an experience about how a sales manager hired the wrong person. The initial SME description would usually entail a quick introduction of the setting and then a brief discussion of the failure. The first iterations by the SME often left out structural details that were important for novices to understand. For instance, in the case of *Holly's Chance*, a protagonist has a difficult transition from a factory floor operator to a steel sales position. The SME initially discussed how the case detailed the differences in work cultures. However, he did not describe the specific deeper cultural issues such as production-oriented compared to sales-oriented work expectations. As such, there was a lack of a description that related to more in-depth topics such as the hiring procedures, domain-specific expectations, and work culture.

From an instructional design perspective, it was also difficult to engage the SME for long discussions of failure. At this stage I realized that it was important for the SME to retell the experience from different perspectives. Upon completion of the initial telling of the experience I would often ask the SME to retell the experience from the perspectives of the hiring manager, coworkers, or other individuals that emerged as important to the experience. As we discussed the various layers, new themes often emerged as drivers of the narrative. Had I passively listened to the initial SME description the design would most likely have resulted a collection of incomplete cases. That is, the case libraries would have lacked a comprehensive description of the ill-structured nature of problem-solving. The iterative approach whereby the SME would retell the experience was beneficial because it helped our discussion to align intersecting indices that investigated deeper contextual elements, perspectives, and stakeholders we had previously not examined.

Another important aspect of the case library construction process was simply asking the SME why he perceived the case to be a failure. For instance, one case entitled *Alex's Selection* describes an experience whereby Alex hires a family friend (Cameron) who has a degree in Philosophy. Rather than hire him for one job, Alex tries to hire Cameron to do multiple odd jobs around a new business venture. Initially,

I thought the lesson was about how important it was for managers to avoid hiring family friends that may not be qualified for a position (i.e., the Peter Principle). I believed this to be the case because the SME stressed elements such as the ease by which the Cameron was handed the job despite having a college degree that did not relate to the position. However, as I asked the SME why this was deemed a failure, he noted the case conveyed how important it was for new businesses to align one employee with one job and to not overwhelm employees with conflicting priorities. While other details were important sales management concepts, the SME had a different overarching index in mind for the case. Explicitly asking the SME to further reflect upon the experience (Table 1, #9) was an important element that I almost overlooked throughout the instructional design process. I believe the extra time for the SME to expound upon and summarize his ideas was an instrumental piece that helped to preclude faulty assumptions between the SME and myself.

Writing the Narrative

Upon completion of the interview, I listened to the recording to translate the narratives for the case library. I initially began by listening to the interview while documenting various surface level details about the case such as the character backgrounds, gender, and the workplace setting. At first, the initial drafts of the case were written in standard paragraph format. However, after reviewing the experience, I noticed that I had a difficulty in understanding the overall experience from the perspectives of the characters. I thus decided that employing a conversational approach provided a richer experience to the characters and thus better contextualized the case.

An important issue I noticed throughout the instructional design process was a lack of case-based reasoning as I progressed throughout the writing process. That is, I would focus on the narrative and story elements while overlooking the various indices I needed to embed within the case that would promote learning. This caused me to listen to the interview multiple times to ensure that I did not miss any key sales management concepts. Each time I would find myself keying in on a particular index and trying to retroactively reconstruct the case to accommodate the missing concepts.

This ad hoc and iterative approach caused the impetus of the case to shift as I integrated different indices in the case. For instance, in the case entitled *Chris' Choice*, an individual (Chris) is charged with hiring someone to fill a professor opening for a small liberal arts college (see Figure 3). Chris opts for a quick resolution by selecting the husband of another professor. This individual appears to be a great candidate because he possessed an extensive research background from a prestigious state university. In the first iterations, the case served as a lesson about hiring overqualified personnel. However, as I listened to the SME recording I

4420 Sales Management

Chris Choice

[\(Back to Assignment Screen\)](#)

Chris organized his thoughts before beginning his presentation. He had never been in charge of a search committee so he wanted to make a good impression to his superiors. He was now meeting with Ellie, the Vice President of Academic Affairs to go over Chris' recommendation for the new faculty position.

"Thank you for agreeing to meet with me to discuss the new faculty position within the sociology department. I think I found a situation that will allow us to get a top-tier professor at minimal cost. As you know, we've had

STORIES

- [Holly's Chance](#)
- [Jesse's Search](#)
- [Alex's Selection](#)
- [Janice's Transition](#)
- [Chris' Choice](#)

description (e.g., changing jobs within industries, new business struggles), wrong assumptions (e.g., ambiguity in verbiage; different roles require different skillsets), constraints (e.g., time demands, glass ceiling), social issues (social fit, employee morale), and overarching sales management lesson (e.g., hiring qualified workforce, job placement alignment). Moreover, this framework helped to ensure that I included all of the pedagogical elements within the case and did not indirectly divert the narrative towards unrelated indices. Upon reflection, a thorough cognitive task analysis upfront would have been more efficient and precluded the convoluted first drafts.

FIGURE 3. Chris' Choice case

soon found out that a significant element of the experience was how the professor disparaged other faculty members for not publishing. This concept of social fit within an organization should have been a significant driver during the initial stages of the case construction. I thus had to significantly restructure the case so characters such as university vice presidents and other faculty members were included earlier in the narrative to provide a richer description. This happened frequently as I listened to the case multiple times and new insights became apparent to me.

The ad hoc and piecemeal design approach often resulted in confusing and inconsistent first drafts of the case. To overcome this issue, I constructed a framework to organize my thoughts whereby I outlined the experience and related indices at the outset of the case design (see Figure 4). The framework generally consisted of the setting (e.g., steel mill, Fortune 500 Company), general problem

<p>Holly's Chance</p> <ol style="list-style-type: none"> 1. Steel mill 2. Changing industries 3. Changing jobs within an industry 4. Different roles require different skillsets 5. Production-oriented vs. sales-oriented 6. Personable 	<p>Janice's Transition</p> <ol style="list-style-type: none"> 1. Fortune 500 company 2. Glass ceiling 3. Hiring from within 4. Company vision 5. Employee morale 6. Workgroup 7. Intra-workgroup training
<p>Jesse's Search</p> <ol style="list-style-type: none"> 1. Steel mill 2. Job ad creation 3. Job ad strategic placement 4. Communicating relevant skillsets 5. Ambiguity in verbiage 6. Miscommunication 7. Time demands of job search 	<p>Chris' Choice</p> <ol style="list-style-type: none"> 1. Higher education 2. Hiring for convenience 3. Family hiring 4. Overqualified 5. Social fit 6. Career goals 7. Workgroup respect
<p>Alex's Selection</p> <ol style="list-style-type: none"> 1. New business 2. Energy management company 3. Time demands of entrepreneur 4. Market share 5. Job placement alignment 6. Hiring qualified workplace 7. College degree 	

FIGURE 4. Case indices breakdown.

Prototype

Prior to actual course implementation, I thought that a prototype was needed to uncover confusing aspects within the design. The prototype objective was to design a learning environment that was pedagogically simple, yet aesthetically pleasing. To accomplish this goal I began designing the information architecture using Adobe Dreamweaver. However, I soon realized that simultaneously designing the learning environment prototype while integrating the content resulted in tensions between pedagogy and usability. This in turn caused me to make pragmatic design decisions rather than implement features based on sound instructional design. In one such example, I embedded a failure case as a just-in-time learning resource (pedagogy), but failed to design any methods for the learner to navigate to other cases (usability problems).

I decided to completely restart the prototype process by focusing solely on the pedagogy as the primary driver of the instructional design. At this point it was beneficial to review the instructional design literature. Although no current design guidelines existed for case libraries, a related theory I relied on was that of goal-based scenarios (Schank, 1996). This instructional design method suggested that cases be embedded within a novel problem as a just-in-time resource at strategic points. Based on this instructional design framework, I began by experimenting with embedding links to the cases directly into relevant portions of the text (see Figure 5).

In the second phase of the prototype I decided to evaluate the design from a usability point of view. At this point it

expertise, but it was pretty clear that the sales aspect of the job wasn't a great fit. Let's go through some of these together and see if we can find someone with that right mix between **technical expertise and social skills**".

After going through the applicants, it becomes evident that it was difficult to find a great deal of qualified applicants.

"Oh man," Nick exclaims. "I didn't realize it would be this hard to find one person to fill a position. A lot of these people look really good on paper, but they just don't have the sales experience needed. They have decent schooling, but I want to make sure we bring in the right people. We could try to [retry posting a job ad in the St. Louis newspaper](#), but that costs us about \$1,500 per month. It's a risk shelling out all that money, but I think it's worth it if we get the right person rather than continuing to lose market share and have to constantly train new people. How about that list you have in front of you? Do you see any resumes that you like in particular?"

Sheila thumbs through some applicants. "Actually, here is one that seems pretty interesting. This individual, Lewis, has a decent GPA. It is about a 3.1 overall, but a 3.8 in classes related to his major. He also has **somewhat related experience** when he worked as a marketing intern for a children's hospital. Another option is try to [try to promote from within](#). That might

FIGURE 5. Embedded links.

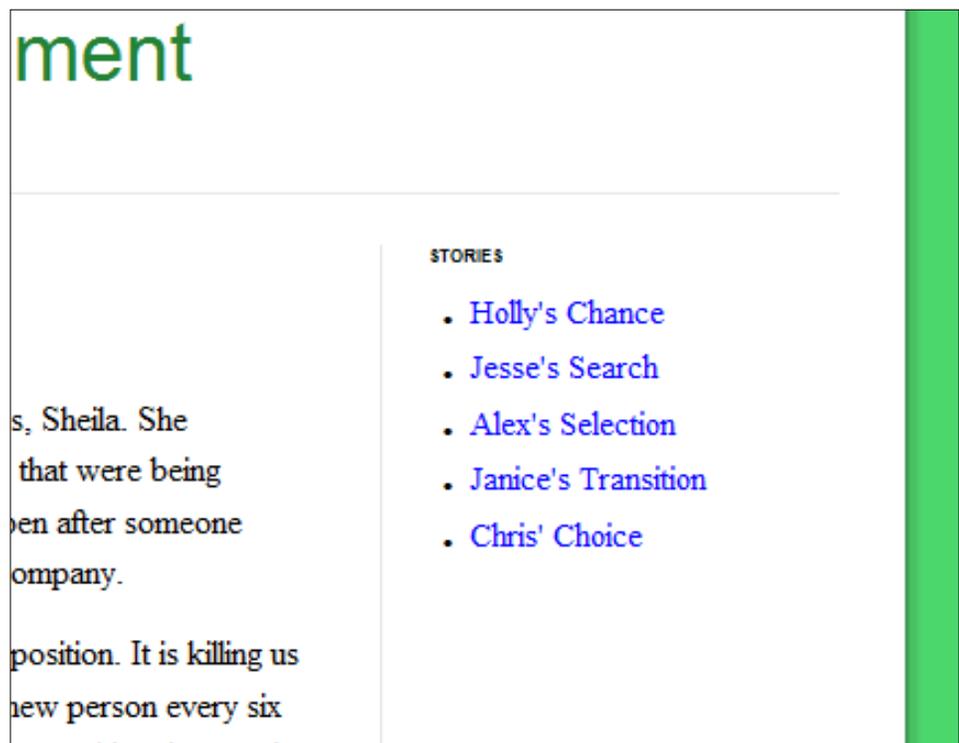


FIGURE 6. Case library menu.

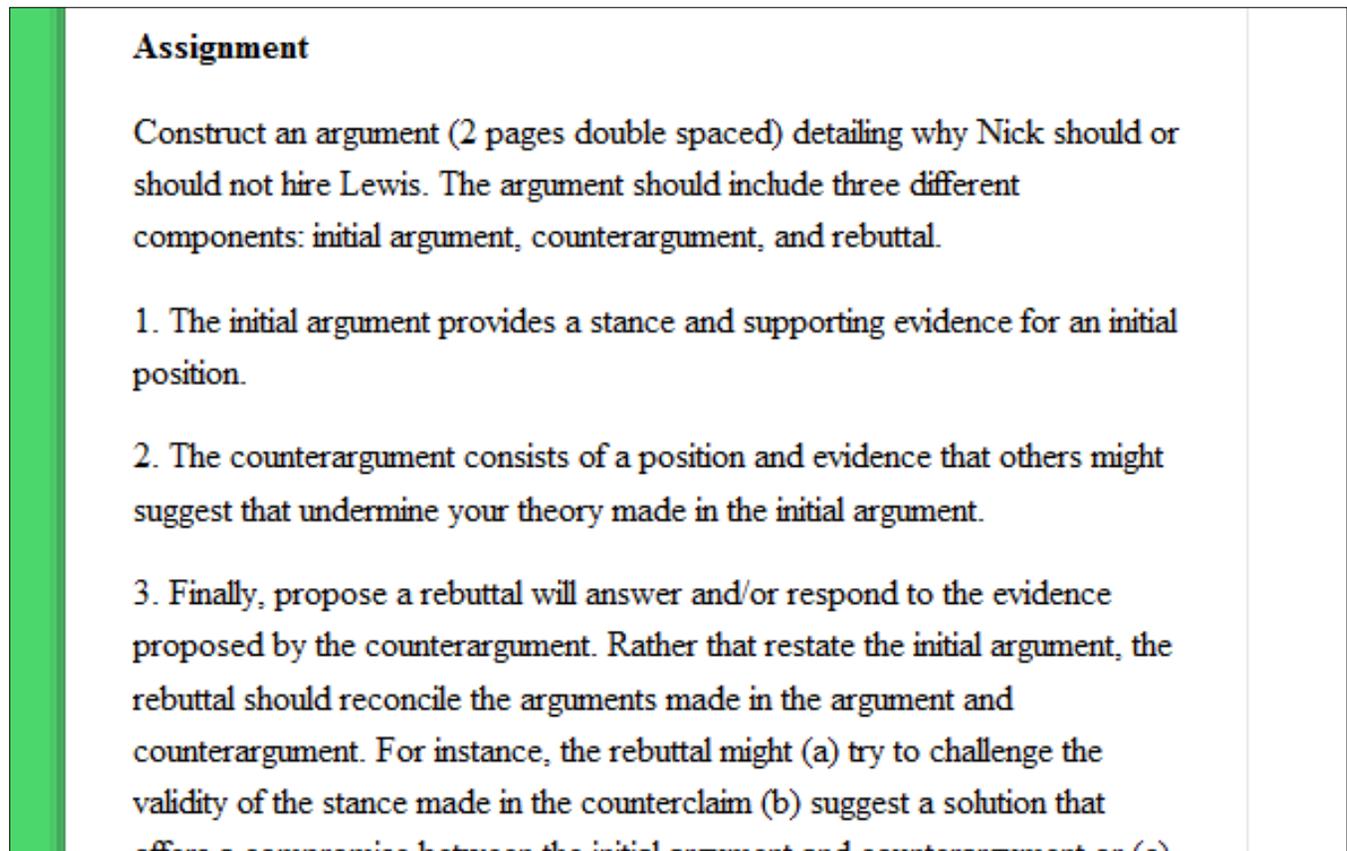
helped to envision scenarios whereby learners might use the learning environment (Bødker, 2000). While the designs of goal-based scenarios suggested that cases be embedded as a just-in-time resource (Schank, 1996), I felt as though the design posed a potential usability problem for the learner. For instance, if the learners attempted to reference a specific case at a later time, they would be required to exert additional cognitive effort and unnecessary clicks to find the correct case embedded within the text. I therefore reasoned that including the case library as a series of links easily accessible on the right hand portion of the interface would provide additional learner control and fluid navigation between the original problem and case libraries (see "Stories," Figure 6).

Evaluation

Throughout the instructional design development process my primary concern was that I had failed to embed the concepts conveyed by the SME. For evaluation of the design I was primarily focused on two aspects: proper representation of the experience and related indices. As such, I thought it was valuable to engage in member checking with the SME. Upon reviewing the case, he noted that all write-ups encapsulated the experience and conveyed the course concepts.

Because the SME and I were so ingrained in the process, I thought it was important to evaluate the initial design from an outside perspective. Identification of the appropriate test subject was difficult because I wanted the evaluator to be knowledgeable about the concepts, but not be so far removed from the student learning experience. At this stage it was helpful to employ the services of the Teacher's Assistant (TA) of the course in which the learning environment was to be implemented. Whereas the SME review was focused on accuracy of experiences and sales management concepts, the evaluation by the TA had a different scope. Her evaluation focused more on the readability, narrative elements of the case, and clarity of the argumentation task. This perspective was a key element in providing a strong balance to the review provided by the SME.

The TA was an especially important resource because she helped identify where explicit directions were needed for the students. For instance, the SME and I were so focused on the instructional design elements of the narrative and environment that we overlooked the fact that the argumentation essay was a new activity for the learners. Because students were more familiar with writing case reviews or answering short answers, she suggested embedding directions directly within the design for writing multifaceted arguments as required by the activity. We therefore adapted the



Assignment

Construct an argument (2 pages double spaced) detailing why Nick should or should not hire Lewis. The argument should include three different components: initial argument, counterargument, and rebuttal.

- 1. The initial argument provides a stance and supporting evidence for an initial position.**
- 2. The counterargument consists of a position and evidence that others might suggest that undermine your theory made in the initial argument.**
- 3. Finally, propose a rebuttal will answer and/or respond to the evidence proposed by the counterargument. Rather that restate the initial argument, the rebuttal should reconcile the arguments made in the argument and counterargument. For instance, the rebuttal might (a) try to challenge the validity of the stance made in the counterclaim (b) suggest a solution that offers a compromise between the initial argument and counterargument or (c)**

FIGURE 7. Embedded argumentation directions.

argumentation guidelines from Nussbaum (2008) at the end of the problem (see Figure 7) so students could reference the guidelines as needed. Moreover, the SME constructed an example argumentation essay from a previous case that we embedded within the learning environment for student reference (see Figure 8). A decision to include both items within the instructional design helped to ensure that students were clear as to the task expectations upon interacting with the learning environment.

DISCUSSION

Positives

From an instructional design perspective there were many positive aspects as well as opportunities for improvement. One positive aspect included translating previous experiences for the purposes of learning domain-specific principles. Rather than reuse the textbook, a case library instructional design allowed us to better convey sales management principles in a contextualized format. I believe a CLLE was an instructional design solution appropriately applied to the analogical reasoning issues identified by the instructor (Kolodner et al., 2004; Jonassen, 2011). From a usability perspective, another positive aspect included simple navigation while employing a minimalist aesthetic design throughout the learning environment. I was also pleased that I included testing the design from multiple perspectives prior to implementation.

Opportunities for Improvement in Future Designs

Although the instructional design included positive elements, future iterations of the learning environment will employ various changes based upon the challenges encountered along the way. The first change will be to employ a focus group of subject matter experts. While the SME utilized in this design had a great deal of expertise, his experiences were primarily drawn from the fields of steel production and new business ownership. Additional experiences from other fields might better engender a more robust case library and subsequent analogical transfer.

I believe that one of the most important instructional design changes is to include more preparation prior to the SME interviews. As noted in the design case, the SME was forced to think of cases extemporaneously throughout the initial interview. This resulted in cases that had little pedagogical value because the discussions often delved off-topic. I found the instructional design process to be much more effective when the SME was given a task prior to our interview. In hindsight, the SME needed time to reflect upon his experiences throughout the week and be able to deliberate about the cases' pedagogical value as they related to the objectives of the instructional design project.

The open-ended approach employed during the initial interview is another aspect that I will abandon in future case library designs. It was not until that I came prepared with the interview protocol from Jonassen and Hernandez-Serrano (2002) that we were able to include a more thorough contextual description such as constraints, alternative solutions,

<p>Argumentation Example</p> <p>Initial Argument:</p> <p>As Terri Ann recently noticed, it is clear that Jason Benjamin's sales performance and work ethic has changed for the worst compared to that of his first eleven with Rudolph Manufacturing. After spending time talking with Jason and understanding his concerns, management should threaten him with giving his accounts to the younger and eager sales people if his work ethic and behavior do not change. I believe there are two reasons Jason's performance has slipped over the past four years. He may be plateauing which has caused him to go in to the maintenance stage of his career or he may be completely disengaged and preparing himself for retirement. Jason could be plateauing because he is bored by his simple</p>	<p>STORIES</p> <ul style="list-style-type: none"> • Holly's Chance • Jesse's Search • Alex's Selection • Janice's Transition • Chris' Choice
---	--

FIGURE 8. Example argumentation text.

and causal reasoning. The semi-structured interview allowed the subject matter to expound on his experiences while also providing a framework to elicit the relevant pedagogical content.

Another opportunity for improvement relates to the translation process from the interview into the case library. Throughout the design I found myself replaying the recordings multiple times to ensure that I did not overlook any important aspects of the case. A formal cognitive task analysis upfront would have precluded a great deal of early drafts throughout the writing process. Moreover, I should have also asked the SME to review the cognitive task analysis prior to writing the cases. I believe this would have avoided initially constructing cases that overlooked essential pedagogical indices.

Lastly, a more systematic usability evaluation should have been included during the design process. In retrospect, I merely identified some obvious navigational issues as an afterthought throughout the usability evaluation. A review of the usability literature for protocols such as the one prescribed by Zaharias and Poylymenakou (2009) would have allowed me to thoroughly evaluate the instructional design in terms of navigation, learnability, accessibility, consistency, and visual design. Employing a user-centered approach would also have allowed me to assess using various user perspectives throughout the design rather than rely so heavily upon my individual usability evaluation.

STAKEHOLDER ASSESSMENT

The CLLE was shown to be a success on multiple levels. Because the SME also served as the instructor of the course, he conveyed to me that the learners referenced the case library throughout class discussions. Specifically, the SME noted students engaged in more causal reasoning as students discussed various meanings within the cases and reasons for failure. The student discussions also showed a proclivity to discuss deeper level issues from various perspectives. That is, class discussions examined perspectives of the hiring manager, employees, and interviewee as opposed to just one perspective. The SME was particularly excited about the possibilities of using case libraries in other areas of the course where the textbook was ineffective or where the domain principles were difficult to convey the ill-structured nature using a lecture format.

After the students had engaged in the learning environment, I met with them to discuss their experiences and elicit feedback for future instructional designs. The students also reported positive perceptions of the case library. When I asked the class to provide feedback on the learning environment, students suggested that they could relate to the characters and experiences described within the learning environment. They also noted that reading about failure caused them to

further reflect upon the experience and contemplate why a case resulted in a particular outcome.

REFERENCES

- Aamodt, A., & Plaza, E. (1996). Case-based reasoning: Foundational issues, methodological variations, and systems approaches. *Artificial Intelligence Communications*, 7(1), 39-59.
- Bødker, S. (2000). Scenarios in user-centred design - Setting the stage for reflection and action. *Interacting with Computers*, 13(1), 61-75. [http://dx.doi.org/10.1016/S0953-5438\(00\)00024-2](http://dx.doi.org/10.1016/S0953-5438(00)00024-2)
- Clark, R., Feldon, D., van Merriënboer, J., Yates, K., & Early, S. (2008). Cognitive task analysis. In J. M. Spector, M. D. Merrill, J. van Merriënboer, & M. Driscoll (Eds.), *Handbook of Research on Educational Communications and Technology* (3rd ed., pp. 659-670). New York, NY: Routledge.
- Feldon, D. F. (2007). Cognitive load and classroom teaching: The double edged sword of automaticity. *Educational Psychologist*, 42(3), 123-137.
- Hernandez-Serrano, J., & Jonassen, D. (2003). The effects of case libraries on problem solving. *Journal of Computer Assisted Learning*, 19(1), 103-114.
- Jonassen, D. (2011). *Learning to solve problems: A handbook for designing problem solving learning environments* (1st ed.). New York, NY: Routledge.
- Jonassen, D., & Hernandez-Serrano, J. (2002). Case-based reasoning and instructional design: Using stories to support problem solving. *Educational Technology Research and Development*, 50(2), 65-77.
- Jonassen, D., & Kim, B. (2010). Arguing to learn and learning to argue: Design justifications and guidelines. *Educational Technology Research and Development*, 58, 439-457. doi:10.1007/s11423-009-9143-8
- Klauer, K. J. (1989). Teaching for analogical transfer as a means of improving problem-solving, thinking and learning. *Instructional Science*, 18(3), 179-192. doi:10.1007/BF00053358
- Kolodner, J. L. (1992). An introduction to case-based reasoning. *Artificial Intelligence Review*, 6(1), 3-34. <http://dx.doi.org/10.1007/BF00155578>
- Kolodner, J. L., Owensby, J., & Guzdial, M. (2004). Case-based learning aids. In D. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology: A Project of the Association for Educational Communications and Technology* (2nd ed., pp. 829-861). Mahwah, NJ: Lawrence Erlbaum.
- Mathan, S., & Koedinger, K. (2005). Fostering the intelligent novice: Learning from errors with metacognitive tutoring. *Educational Psychologist*, 40(4), 257-265.
- Nussbaum, M. (2008). Collaborative discourse, argumentation, and learning: Preface and literature review. *Contemporary Educational Psychology*, 33(3), 345-359. <http://dx.doi.org/10.1016/j.cedpsych.2008.06.001>
- Schank, R. (1996). Goal-based scenarios: Case-based reasoning meets learning by doing. In D. Leake (Ed.), *Case-Based Reasoning: Experiences, Lessons & Future Directions* (pp. 295-347). Cambridge, MA: MIT Press.

Schank, R. (1999). *Dynamic memory revisited* (2nd ed.). New York, NY: Cambridge University Press.

Schank, R., Berman, T., & Macpherson, K. (1999). Learning by doing. In C. M. Reigeluth (Ed.), *Instructional-Design Theories and Models: A new Paradigm of Instructional Theory* (1st ed., Vol. 2, pp. 241-261). Hillsdale, NJ: Lawrence Erlbaum Associates.

Shepherd, D. A. (2003). Learning from business failure: Propositions of grief recovery for the self-employed. *The Academy of Management Review*, 28(2), 318-328. doi:10.2307/30040715

Sitkin, S. B. (1992). Learning through failure: The strategy of small losses. *Research in Organizational Behavior*, 14, 231-231.

Zaharias, P., & Poylymenakou, A. (2009). Developing a usability evaluation method for e-learning applications: Beyond functional usability. *International Journal of Human-Computer Interaction*, 25(1), 75-98.

Ziv, A., Ben-David, S., & Ziv, M. (2005). Simulation based medical education: An opportunity to learn from errors. *Medical Teacher*, 27(3), 193-199.