

Transforming Online Learning through Narrative and Student Agency

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ABSTRACT

Efforts to improve online learning have focused primarily on the technology platform for delivering educational content and supporting student discourse. In this paper we describe an alternative approach that invokes two powerful forces behind human learning: narrative and agency. Each of these constructs and their potential impacts on learning is reviewed, and the design of a large-enrollment online undergraduate course that leverages these elements is described. A study of student learning and engagement was conducted using surveys and an analysis of student projects on 96 students enrolled in the new course. Surveys were also administered to 129 students taking a traditional online course in other departments to provide a comparison data set. Results of this study indicated significant benefits of employing narrative and increasing student choice on interest and perceived relevance of the course material, critical thinking, and the acquisition of design skills. We conclude by discussing the implications of these results on the design of online instructional environments generally, and call for the increased adoption of interactive storytelling elements into web-based learning platforms.

Keywords

Online learning, Narrative, Agency, Undergraduate education, Emerging media

Introduction

As access to broadband technologies increases worldwide, online educational platforms continue to spread across all variety of learning environments, particularly within colleges and universities. In the US in 2009, more than 5.6 million students were enrolled in at least one online course in the fall term, an increase of nearly a million students from the previous year. This outpaces by far the growth of overall enrollment in higher education (Allen & Seaman, 2010). With the rapid growth of online learning has come increased attention to ways of improving the mechanisms of delivery. Efforts thus far have focused primarily on tools for communication (student-instructor, student-student, etc.) and enhancing the technologies for carrying out course activities (demonstrations, assessments, etc.). Recent research has reported on online design initiatives including new tools for supporting student collaboration (van Joolingen, de Jong, Lazonder, Savelsbergh, & Manlove, 2005), small group discussion (Suthers, Vatrappu, Medina, Joseph, & Dwyer, 2008), and scaffolding student questions (Yu, 2009). Technological advances have also made it possible to augment online courses with high resolution lecture recordings, video conferencing capabilities, and virtual interactions in environments such as Second Life.

While these are all potentially useful developments for improving online education, we see them largely as attempts to replicate face-to-face instruction and traditional classroom-style practices. The disadvantage of this approach is the propensity to neglect the unique affordances of online platforms for promoting learning and cognition. In other words, we may be better served by inventing new forms of instruction that exploit what online platforms do particularly well, rather than continuing “best we can” approximations of tried and true classroom pedagogies (see Mishra (2002) for similar lines of argumentation). For example, the spatial features of interactive simulations that can be displayed on computers and often delivered online have special properties for learning difficult concepts in science (Lindgren & Schwartz, 2009). Another learning affordance of online technologies is their capacity to deliver personalized interactive experiences. Two constructs in particular that characterize these experiences are narrative and agency. Narrative is the causal sequence of events that defines the experience—the expression of what happened in story form. Agency is the power of the individual to choose what happens next. Together, these two constructs create an experience that is both self-determined and purposeful. The capacity of digital technologies to produce dynamic content and create detailed records of user pathways through this content makes them uniquely suited to support these two elements (see Murray, 1997; Manovich, 2001).

Our objective is to investigate the effects of an online course where narrative and student agency are prominent design features. For the purposes of this initial design study we will not attempt to parse out the individual effects of these elements, rather we will explore whether or not the two in tandem have a demonstrable impact. Our hypothesis

is that the inclusion of these elements will lead to substantial improvement in student learning and engagement compared to traditional online course instruction. We begin with an examination of the research literature on how narrative and agency each influence learning. Next, we describe the design of an online course where each student becomes the protagonist in a story about acquiring their dream job working for an eccentric billionaire. Approximately 100 students enrolled in the initial run of the course, and results from student surveys and an analysis of student projects will be presented. We conclude with a discussion of design implications and future applications.

Narrative and Learning

The narrative form and its relationship to learning has captured the interest of learning theorists working from a variety of disciplinary backgrounds including cognitive science, computer science, and neuroscience (e.g., Meehan, 1977; Minsky, 1985; Schank, 1995; Young & Saver, 2001; Mar, 2004; Jahn, 2004; Ryan, 2010). As an intuitive form of communication that is used from parent to child even before higher order language skills such as reading and writing are obtained, its usefulness for learning about the world is obvious (Nelson, 1989). For instance, Bruner (1991) discusses the fundamental nature of storytelling as a cognitive device for organizing human experiences and perception. He explains that narrative cognition and discourse are linked in a complex way, noting that “as with all prosthetic devices, each enables and gives form to the other, just as the structure of language and the structure of thought eventually become inextricable” (p. 5). Despite this difficulty of separation, he proceeds to identify ten features of narrative that assist in the construction of knowledge, each with an explanation identifying how those features aid in cognition. Of particular interest to cognitive scientists is the feature of *hermeneutic composability*, in which particular narrative events must be “constituted in the light of the overall narrative” (p. 8) and then interpreted by a human’s knowledge processing system such that they exist as a whole with the other narrative elements (characters, actions, and environments).

Graesser and colleagues (1994) further studied the ways in which readers of narrative texts generate inferences and construct a *situation model* (Morrow, Bower, & Greenspan, 1988; see also Wilson et al., 1993), or a mental representation of the narrative, in order to comprehend those texts based on existing knowledge. Their work identifies not only the textual level of inferences employed during sentence comprehension, but also the deeper thread of thinking done when a reader examines cause and effect relationships, character motives, and the global message (i.e., point) of a story. The importance of this holistic understanding of stories even for young children is clear in an analysis of popular “teach your child to read” books such as Engelmann, Haddox, and Bruner’s *Teach your child to read in 100 easy lessons* (1983). Here, early lessons stress not only sound recognition, enunciation, and writing, but also character identification, motive identification, and plot recognition. The latter three elements are assessed through the child’s reading the sentences and then looking at a picture depicting those sentences and answering questions about the story and the picture.

Given the importance of causal pattern and structure in narrative communication, it makes sense that computational systems can augment narrative learning systems in interesting and useful ways. For example, one might construct a narrative learning system that calls upon a repertoire of various plot structures that are particularly well suited for different learning objectives. An example of this is a system that returns “quest”-type plots with particular geographic locations used within the story in order to explore geography or history lessons in an embedded context. Narrative backbones for computer simulations and video games have also been developed based on generative heuristic questions adapted from studies of narrative (McDaniel, Fiore, & Nicholson, 2010). Other computational narrative systems; such as automated story generators, agents, story database systems, and interactive fiction systems; are detailed by Mateas and Sengers (2003) under the theoretical framework of narrative intelligence.

Student Agency

A second element of online learning environments that we explore in our design is the degree of agency allotted to students enrolled in the course. We can define agency as “the capability of individual human beings to make choices and act on these choices in a way that makes a difference in their lives” (Martin, 2004, p. 135). Epic debates have been waged in sociology and philosophy on the relative influence of agency vs. the “structure” of social systems in determining human behavior (e.g., Hays, 2004), but we are concerned here specifically with the question of whether instructional environments that empower students to make consequential choices enhances learning compared to

those that allow for less agentic action. Some researchers have examined agency as an individual trait and have described its role in student learning styles and its interaction with online instruction (e.g., Greener, 2010), however, the focus in this paper is on agency and choice as something that can be elicited generally through interface and environment design.

The notion of agency as contributing to cognitive processes involved in learning comes primarily from the Piagetian notion of constructivism (Piaget, 1967) where knowledge is seen as “constructed” through a process of taking actions in one’s environment and making adjustments to existing knowledge structures based on the outcome of those actions. The implication is that the most transformative learning experiences will be those that are directed by the learner’s own endeavors and curiosities. Bandura (2001) highlights the role of agency in the self-regulation of learning: “The core features of agency enable people to play a part in their self-development, adaptation, and self-renewal with changing times” (p. 2). Giving students the sense that they have control and the power to affect their own learning is one of the great challenges of contemporary education.

Agency can shape both the process and the outcomes of student learning. The most notable effect on the process of learning is that the sense of personal agency typically has a strong motivational component (Ford, 1992; McCombs & Marzano, 1990). People are more driven to achieve the agendas they set for themselves. Feelings of agency will often lead people to work harder and to persevere when confronted with challenges. An important motivational component of human agency is *perceived self-efficacy* (Bandura, 1982). Not only does agency come with the will to achieve, but also the belief that one *can* achieve. As for the outcomes of learning, agency and self-regulation can produce learning experiences and knowledge that a learner perceives to be more self-relevant (Wolters, 1998; Zimmerman, 2001). This is important because it may affect the likelihood that the learned information is retrieved or is transferred to applicable contexts. Personal relevance may also make it easier for a learner to situate new learning within existing knowledge structures by making connections to previous experience. The overall result is learning that is more flexible and adaptive because it was conceived under the conditions of specific personal needs and aspirations.

Eliciting a sense of agency in educational environments, particularly in formal contexts such as a university, is not a trivial undertaking. Empowering and managing the variable learning pursuits of each student in a large class is not a reasonable burden to place on an instructor. Agency is not the same as freedom; one cannot expect that students will naturally embark upon meaningful and achievable learning inquiries simply by reducing oversight and lessening the restrictions on student activity. There are, however, techniques for amplifying student agency that have found success even within traditional educational settings. One is the use of questioning and engaging students in a dialog that forces them to defend (and hopefully understand) a set of arguments, often referred to as the Socratic Method (e.g., Gose, 2009). An instructional approach referred to as *problem-based learning* (Hmelo-Silver, 2004) similarly puts a student in an active role by presenting them with an ill-structured problem that must be solved through the student’s ingenuity and initiative. Finally, there have been recent efforts to include more elements from informal education, such as *free-choice learning* (Falk & Dierking, 2002) in formal educational experiences, where students can make decisions about what, where, and with whom to learn. It is this latter element of *choice* that fuels the design of the online course described below. A large part of agentic learning is the ability to make meaningful choices that impact our learning, and some have suggested that looking at the products of these choices can serve as valuable tools for assessment (Schwartz & Arena, 2009).

Computer technologies present new opportunities for drawing out and leveraging student agency. One of the ways that technology accomplishes this is by personalizing the learning experience, allowing the student to work at their own pace and being responsive to individual needs, such as found in intelligent tutoring systems (Corbett, Koedinger, & Anderson, 1997). Other technologies create agency by putting students in the role of a teacher (Biswas, Leelawong, Schwartz, & Vye, 2005) or by serving as embodied communicative partner (Lee, Stiehl, Toscano, & Breazeal, 2009). Here we attempt to facilitate student agency by presenting students with consequential choices and adapting both the course curriculum and assessment to accommodate those choices.

Course Design and Rationale

In order to build a viable curriculum around sustained student choice and the unfolding of a narrative backstory, we opted to design a survey course that explores the field of digital media. Our course, named “Adventures in Emerging

Media” (AEM), was designed as a junior-level elective with no pre-requisites. We hoped to attract both digital media majors as well as students outside the department interested in learning more about the field.

We designated seven weeks of the 16-week course as “branching” weeks in which students could choose the learning modules they wished to participate in for that week. Each learning module was designed and delivered by an instructor with expertise on the assigned topic. Most of the modules were anchored by video recorded multimedia presentations where the instructor spoke directly to the camera or over a media-rich slide presentation. The remaining nine weeks of the course were used to present content on topics we felt were fundamental and should be taken by all students (e.g., understanding how to design for immersion) or to engage in common activities important to the course (e.g., performing a peer-review of class projects or taking course exams). Overall, there were 26 different learning modules created for the course.

During the first two weeks of the course, students uploaded an original project of their choice along with a hypothetical job application for a corporate position at an organization run by fictional media mogul Nelson Von-Berners. The student job application and Von-Berners storyline served as the narrative backdrop of our course. Von-Berners was scripted as a whimsical inventor who is a bit scatterbrained, but who also clearly fits the professor character archetype suitable for the humorous story we wanted to tell. Key story components were released to students at four points in the semester including at the very beginning of the course and the very end of the course. Each narrative fragment consisted of an animation that featured Von-Berners giving instructions or encouragement from various exotic locations (his office in Greece, a jeep ride in Dubai, and even during putting practice on the surface of the moon). It was important that these story pieces be compelling, so we invested in the creation of four cartoon-style animations created in Adobe Flash and using professional voiceover actors. By releasing the story in segments rather than all at once through an extended cut scene, we hoped to harness some of the same motivational effects as contemporary, story-driven videogames that are crafted in the same fashion.

In terms of learning content, rather than focusing on a particular tool or technology for each week (e.g., Final Cut Pro), we identified a sequence of modules assigned to particular weeks that would lead the student through various paradigms that frame emerging media in particular ways. For example, one week was designated the “history” week and focused on historical developments in ideas and technologies that impacted the field of digital media. Similarly, a “conceptual” week (Figure 1) allowed students to engage in that week’s materials through exploring creativity, algorithmic design, or audience analysis (Figure 2). In the second half of the course, modules covered applied skills that students could use for the second round of original digital creations submitted at the end of the course.

The course ran atop our own Learning Management System that we developed using Internet scripting and database technologies (PHP and MySQL). This ensured that we could embed assessment instruments such as pre- and post-semester surveys as seamlessly as possible while also allowing students to take examinations that targeted only the modules they had selected for a particular week. Students completed midterm and final examinations; their applied projects were graded by an instructor based on a rubric developed for this purpose.

A Study of Student Engagement and Learning

Methods

A review of research on online instruction found that most studies are descriptive and exploratory accounts of a particular platform’s features (Tallent-Runnels et al., 2006). Those studies that do attempt to quantify an online platform’s effects tended to do so by focusing on one feature of the platform and constructing measures to specifically evaluate that feature. For example, Stanley (2006) examined the use of assignments or quizzes as a means of weekly assessment in two online university public health courses. To compare these approaches the author looked at scores on exams and administered a short survey that asked students how they felt about the online assessments. In the current study we sought to compare the effects of more macro-level design decisions, namely giving students an agentic role in a pervasive course narrative compared to the more traditional approach of positioning students as recipients of knowledge transfer. Implementing our narrative- and agency-driven design involved multiple features—module choice, adaptive exams, story reinforcing animations, etc. Evaluating the full effects of this approach demanded a broad range of measures that touched on all aspects of the student learning experience. Our intent was not to validate the inclusion of isolated features of online courses, but rather to examine

whether the adoption of a novel design *scheme* showed promise for widespread improvements in student learning and engagement.



Figure 1: Example of student choice feature (course menu system and sample week)

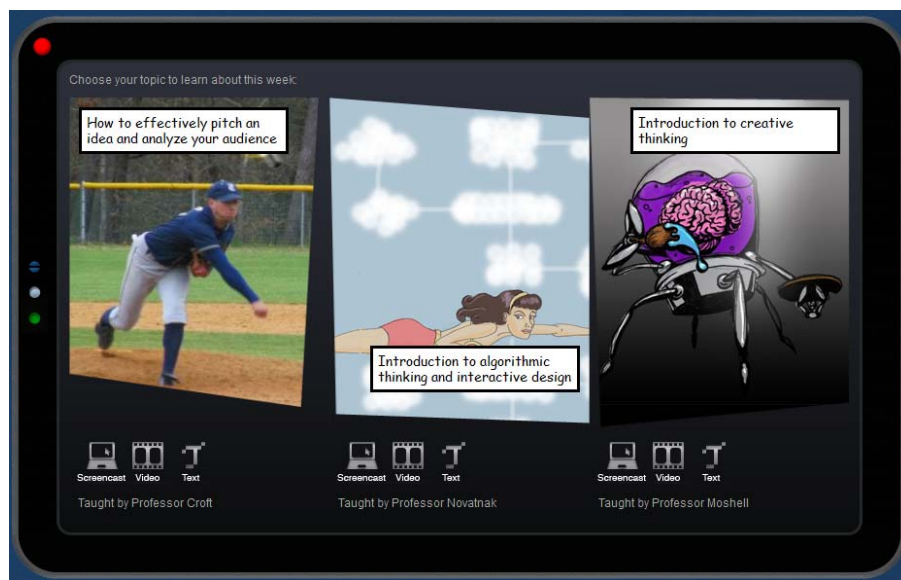


Figure 2: Example of student choice (learning content selection module)

Participants

Data was collected from student projects, examinations, surveys, and the online activity of 96 students enrolled in the first offering of the AEM course. Most of these students were in either in their 3rd or 4th year of an undergraduate degree program; 37% of students were female. Eighty of these students were declared “Digital Media” majors, while the remainder of these students came from other departments within the university seeking elective credit. This study also included students from 3 other large online courses taught at the same university. A total of 129 students from these courses completed the post-survey. These students represented over 20 different academic majors within the university; of the students reporting their gender, 58% indicated that they were female.

Engagement Surveys

Surveys inquiring about student interest and engagement with course topics were administered both prior to instruction and immediately after the course had ended. The surveys probed several areas including perceptions of the difficulty and importance of course topics, the kinds of skills that students believed they were acquiring by participating in the course, and the types of thinking skills and mental activities involved in the course. The latter of these questions were modified from the 2010 National Survey of Student Engagement (NSSE). The other questions were developed through consultation with experts on online course assessments, and although the wide range of topics covered in the survey meant that it did not lend itself to a split-half analysis, we adhered closely to guidelines for increasing the reliability of our survey instrument (e.g., Bordens & Abbott, 2011). All surveys were delivered as a web form using the AEM course management system. Survey results were stored in secure database and exported to spreadsheet format for analysis.

Many of items on the survey were fairly general questions that could be asked of almost any online course. Thus, a subset of questions from the AEM survey was administered to 3 other large online courses taught at the university during the same semester. We were interested in whether or not the unique attributes of the AEM course would show different patterns of engagement compared to a variety of other courses taught in the traditional manner of online instruction. All three of the comparison courses were taught using the Blackboard CMS. These courses were selected because they represented a range of university departments (2 in Arts and Humanities and 1 in Engineering and Computer Science) and because they had a similar number of enrolled students and a comparable “survey of topics” course structure. Students in each comparison course were emailed a unique web link so that they could complete their survey via the same online system as the AEM students.

Creative Projects

Survey questions that asked the AEM students to rate their own competence on a set of emerging media skills, before and after the course, offer some limited insight into the kind and quantity of learning that students experienced. In order to gain a more direct measure of learning, however, we examined changes in the quality of students’ creative work over the course of the semester. In Week 2 students were asked to make an original digital media creation as part of the interview for their “dream job.” For the final project in the course students were again asked to submit an original digital creation that leveraged the skills they had acquired during the previous several weeks. In both cases the specifications for the project were fairly open-ended; students had the option of creating any number of different media objects such as a webpage, an interactive story, a game design, a product logo, etc. Following the cautions of Nitko (1996) regarding ambiguity about course project assignments, we followed Romero and Haughton’s (2010) *Course Improvement Matrix* and gave students a detailed rubric so that there were clear guidelines about what elements needed to be included. The rubric consisted of 5 broad categories that pertain to the fundamental design goals for digital media: technical competence, interactivity and engagement, aesthetics and artistic design, message and consideration of audience, and professionalism. In order to assess learning within the student projects we assigned a score on a 0 to 4 point scale for each of the 5 categories. The categories were general enough that student projects could reasonably be scored regardless of the creative medium used, and most importantly the rubric does not emphasize the level of effort put into the creation—a well-crafted digital project made quickly still had the potential to score high in all five areas. One could argue that students will naturally spend more time and energy on a final project than on one assigned at the beginning of the semester, and we did not want to bias our evaluation of competence in emerging media design skills.

Results

Engagement Surveys

A total of 200 unique students participated in these surveys; 71 of these students were from the AEM course and 129 were from one of the three comparison courses. The completion rate for the AEM students was especially high because the survey was integrated with the course platform, giving us direct lines of communication with these students (and the opportunity for multiple reminders). The number of students in each of the comparison courses completing at least one survey depended on the total number of students enrolled, ranging from 130 to 225.

AEM Course Features. A subset of post-survey questions was given only of the AEM students. Two of these questions asked students directly about the primary design features of the course: agency and narrative. Students were asked to indicate the degree to which they felt having the ability to choose learning modules was a positive feature of the course. Over two thirds of these students rated this feature as extremely positive. Less than 10 percent of students rated this features as somewhat positive or not positive. When asked about the “dream job” narrative, nearly 70 percent of students rated the course as being mostly positive or extremely positive. Two additional questions asked about specific components of the course that supported the narrative and agency features. One question asked about the adaptive exams, which facilitated student choice by limiting the assessments to the chosen modules. The other question asked about the periodic animations which were the primary means of bolstering the course narrative. These components showed similar patterns of positive responses, particularly the adaptive examinations which received a 69% extremely positive rating. Table 1 shows the full distribution of responses on the AEM course features.

Table 1. Student Response to Questions on AEM Course Features

Course Feature	Number of Responses (N)	Extremely Positive	Mostly Positive	Somewhat Positive	Not Positive
1. Agency: Ability to Choose Course Modules	71	67%	24%	3%	6%
1.1. Adaptive Exams	71	69%	20%	5%	6%
2. Narrative: Pursuing Your Dream Job	71	31%	38%	24%	7%
2. 1 Animations	71	31%	34%	25%	10%

Student Perceptions. In the post-survey we had all students in the study respond, on a scale from 1 to 7, to a set of 11 statements about their perceptions of the course and its ability to engage them in learning (e.g., “I’ve learned interesting things in this course that I did not know previously”). The variability of student responses to these questions was generally quite high, such that there were not many meaningful differences between the AEM and comparison courses. This is not surprising given the differences in instructor, content, etc. across the 4 courses in this study. There was, however, a clear and consistent pattern in the responses to the statement: “This course has affected the way that I think about my career goals.” The responses from the AEM students on this post-survey question was significantly higher compared to the comparison courses, $F(1, 198) = 20.14, p < .001$ (See Figure 3). This result strongly suggests that the course narrative—pursuing one’s dream job—permeated student thinking about the course and its impact on their learning.

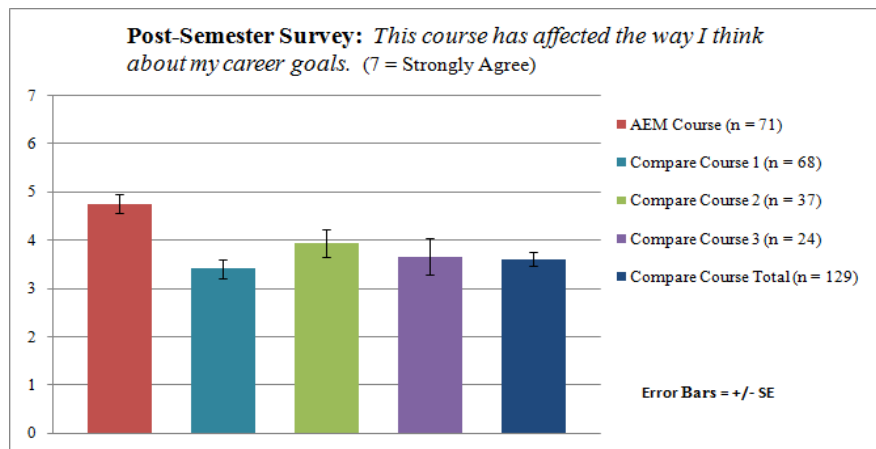


Figure 3: Average student responses to survey question about career impact

Involved Mental Activities. An especially insightful set of student responses came from questions asking students to report on the degree to which they felt the course elicited certain types of mental activities outlined in the 2010 NSSE survey: Memorization, Analysis, Synthesis, Making Judgments, and Application. We believe that these activities speak to the strength of the agency manipulation as some of these activities can be thought of as more passive than others. For example, memorization is certainly an important part of knowledge acquisition, but it often

is not sufficient to produce the robust learning sought after in contemporary education (e.g., Evensen & Hmelo, 2000). Table 2 shows student frequency reports for three of these activities: Memorizing, Analyzing, and Applying. The distribution of these responses differs significantly for the AEM course compared to students in the other 3 courses as indicated by the results of Pearson Chi-Squared tests. Students in the AEM course reported less memorization, with 42% responding very much or quite a bit compared to 61% in the comparison courses. In contrast, 65% of AEM students responded very much or quite a bit when asked how much they engaged in analysis, compared to 49% for the comparison courses. The strongest difference came for application where 72% of students in the AEM course reported the highest levels compared to only 39% for the comparison courses. By converting these ratings to a numerical score (1 through 4) and performing an ANOVA we found a significant effect of condition on students' perceived levels of application, $F(1, 198) = 22.25, p < .001$. By giving students the opportunity to choose their learning modules and work on assignments and projects that interested them, we hoped to provide an engaging learning experience that would have a more substantial impact on a student's understanding and skills in this domain. Attainment of this objective is supported by the student perceptions that they performed more critical analysis and applied learning, and less rote memorization.

Table 2. Student Reports of Mental Activities Involved in their Online Course

Mental Activity	Condition	Number of Responses (N)	Very Much	Quite a Bit	Some	Very Little	X ²	p
Memorizing	AEM	71	20%	22%	41%	17%	10.89	.012*
	Comparison	129	29%	32%	19%	20%		
Analyzing	AEM	71	21%	44%	28%	7%	9.86	.020*
	Comparison	129	25%	24%	34%	17%		
Applying	AEM	71	30%	42%	20%	8%	21.85	<.001**
	Comparison	129	15%	24%	31%	30%		

* $p < .05$, ** $p < .005$.

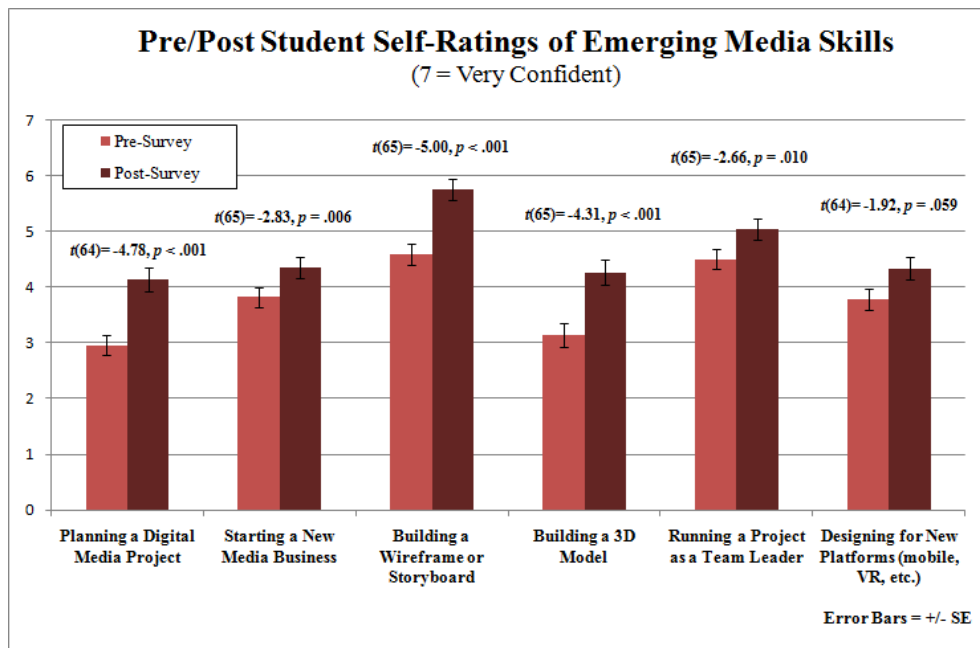


Figure 4. Comparison of average pre and post confidence ratings on 6 skill areas by AEM students

Skill Development. The final component of the survey questions that we will discuss here are a set of questions administered only to the AEM students concerning their perceived skill levels in 17 areas related to emerging media. Both prior to instruction and after the course was complete, we asked students to rate their own competency, on a 1 to 7 scale, in areas ranging from social media to design project planning to using 3D modeling software. The sample average was higher for the post-survey responses on 14 out of 17 skill areas, and for these 5 skill areas there was a statistically significant effect favoring the post-survey as indicated by a paired-sample t-test: creating wireframes, creating 3D models, project planning methodologies, media business plan development, and project leadership skills.

Figure 4 shows the average pre and post ratings for these 5 skill areas plus one additional area that had a marginally significant effect. It is not entirely surprising that judgments of competency would improve from the beginning of the course to the end of a course, but it indicates that the students had a broad perception of overall learning. It is worth noting that students were only required to do a subset of course modules, so the fact that several of the related skill areas are showing average improvements for *all* students in the course suggests that many students may have exerted their agency by selecting additional modules beyond those that were required to enhance their learning.

Creative Projects

For a more direct measure of student learning—the blind assessment of pre and post digital projects—we again conducted a paired sample t-test on each of the 5 project competencies. There were a total of 65 students with matched pre and post projects available for assessment. Figure 5 shows highly significant improvements for all 5 of the competency areas. Again, while it may not be surprising to see improvements over the course of a semester-long class, the comprehensive gains on these fairly general and potentially transferable skill areas indicates a potent overall learning effect in this important domain of digital media design.

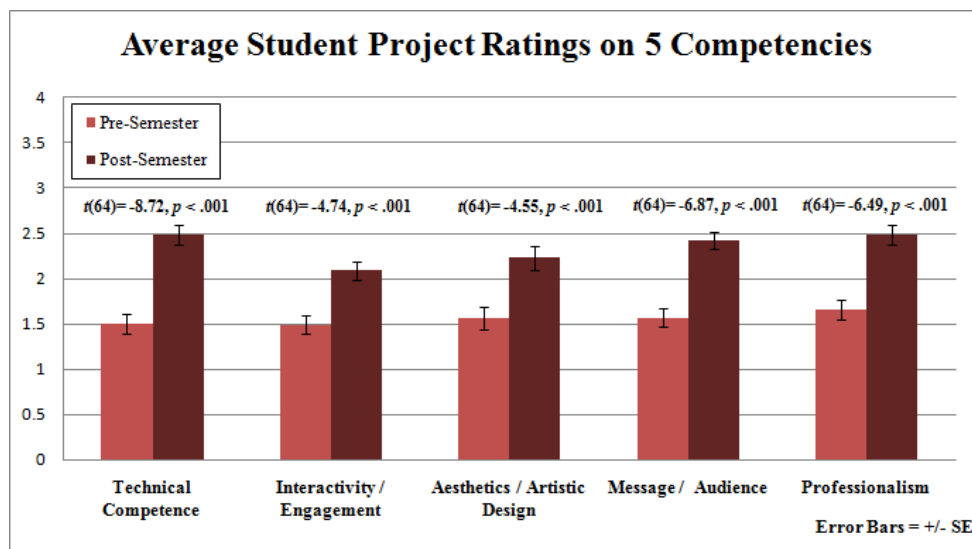


Figure 5. Comparison of average ratings of pre and post digital projects on 5 competency dimensions

Implications and Future Applications

The data collected in this study support the notion that designing online instruction with explicit elements of narrative and student agency aids student learning and strengthens their engagement in the course. This is evident at the most basic level by strong student enthusiasm for additional course features that support these elements, such as the story animations and the ability to choose their learning modules. Student comments collected at the completion of the course also indicate a highly positive response, such as the following remarks from one student:

“What I liked most about the course was the vast amounts of topics to learn from—the ability to choose what you learn from and do assignments on what you know or would like to get better at.”

Evidence for positive effects on student learning came from various sources such as student reports of higher levels of critical thinking compared to other online courses, reports of improved skills in the target domain, and increased ratings of design and development skills pre to post on the students’ original digital media creations. Comparisons with other courses should be interpreted with caution given the inherent differences in instruction and course content, however, a great deal of effort was made to select comparison courses that were also surveys of interesting topics and with instructors that had a reputation for strong online teaching. Taken together, results described here demonstrate that the explicit integration of narrative and consideration of student agency can have a positive impact on online instruction.

From a theoretical perspective, these findings suggest that narrative and agency have complementary influences on processes of learning and engagement, and it lends support to the vision of interactive digital environments as nurturing human thinking and creative expression (Murray, 1997). The current study design does not allow for a precise explication of the interaction between narrative and agency, however. Additional research is needed to determine whether, for example, a strong narrative has the potential to overshadow the effects of individual choices or make people feel that these choices are less of their own. More research on narrative and agency individually is also needed, such as identifying the specific elements of narrative (e.g., plot, character, or environment) or the kinds of stories that are best suited for particular types of learning. Likewise, there are additional questions about agency that could be asked such as how consequential the choices students are given need to be. For example, should students be allowed to make decisions that could put them on a sub-optimal path or even failure?

As they pertain specifically to online learning, the findings of this study offer more general support to the idea that online instruction designs should try to leverage the psychological affordances of remote and personalized learning platforms, rather than attempting to replicate traditional classroom practices. Agency and narrative are both key elements in the practice of interactive digital storytelling which has been shown to have benefits for learning for a range of age groups and educational contexts (e.g., Bers & Cassell, 1998). We hope that this work will encourage more attempts at creatively implementing interactive storytelling practices into online instruction.

In future research we will be investigating whether these engagement and learning effects can be enhanced further through additional interactive features. Specifically, we intend to look at whether the highly effective reward and incentive features of contemporary gaming systems and virtual worlds (Castronova, 2006) can be integrated into an online university course. The prevalence of online instruction will only continue to spread across all forms of education. It is important that we continue to push forward with designs that leverage both the unique affordances of contemporary media technologies and established principles of human learning and cognition.

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