

# Using Folklore, Fables, and Storytelling as a Pedagogical Tool in Assessment Exams

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## Abstract

Fable-based learning, folklore-based learning, and narrative pedagogy are terms used to represent the use of storytelling for learning complex topics. These learning tools build on narrative theory via our understanding of the role of metaphor and metaphorical reasoning in the learning process. Narrative theory postulates that humans are natural storytellers and interpret the world through narrative. Academic examples of narrative-based learning abound in mathematics, science, business, psychology, and computer information systems. Outcomes of this teaching tool may include overcoming resistance to learning, increased learning, enjoyment, openness to new beliefs and perspectives, and increased learner engagement. We observe that the application of narrative-based learning is currently limited to teaching and lecturing. We propose extending narrative-based learning to the assessment phase of pedagogy. The assessment phase is a knowledge-verification process where learning is measured through exams or assignments. We explore how storytelling can be used in the design of assessment exams and give two examples of multiple-choice exams that uses narrative-based learning principles in a Management of Information Systems course and a Production and Operations Management course. Students were accepting of the exam format and found the exam enjoyable. A subset of students preferred this type of exam to traditional exams. Some students report test anxiety decreased. We propose that storytelling in assessment exams have the potential to reduce test anxiety, increase enjoyment, increase cognitive fluidity, and increase perceived realism or relevance of the learning objectives. We invite other researchers to explore this domain.

Keywords: assessment exam, folklore-based learning, management information systems, narrative theory, metaphoric reasoning

## 1. INTRODUCTION

In the Chinese folkloric tale of the *Romance of the Three Kingdoms*, three heroes attempt to overcome the oppressive ruling government by recruiting Chinese soldiers from local villages. The three heroes disagree regarding how many soldiers to recruit from each village, as each village has soldiers of differing strengths, costs, and availability. A celestial, wise man gives the

three heroes a magical tablet to help solve the problem given the constraints. Through the use of storytelling and metaphoric devices, such as the aforementioned folklore, the story introduces the learner to a case where discrete mathematics can be understood as a solution to what is a resource maximization problem. This method of teaching is called folklore- or fable-based learning. This particular Chinese folklore is used in a three-course series of MOOCs by Dr.

Stuckey and Dr. Ho Man Lee regarding modeling for discrete optimization (<https://www.coursera.org/learn/basic-modeling>). They also used the Chinese folklore as motivation in the homework assignments. We found the disarming nature of folklore a compelling and worthy educational tool worthy of investigation.

A fable is a fictitious short story with a moral or learning objective and may involve heroes, animals, or legends. The Grasshopper and the Ant is a classic **Aesop's** fable that teaches the value of steady, hard work to prepare for lean times. Folklores are traditional beliefs and stories of a community or culture. Legends are traditional stories regarded as historical but unauthenticated. These are subgenres of narratives (see Figure 1). Given a near-universal appeal, it is little wonder that storytelling has been adapted to the academic environment.

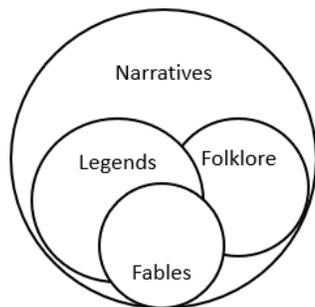


Figure 1. Types of narratives used in pedagogy

Storytelling has been utilized as a pedagogical tool in business, management, math, and information systems (IS). Austin, Nolan, and **O'Donnell** (2016) use storytelling in *The Adventures of an IT Leader*. The protagonist, CIO Jim Barton, faces problems running the **company's** IT department, such as managing technology needs, security, relationships with vendors, and employees. The storytelling format makes the book enjoyable to read, particularly for non-IS business students who may be uninformed about or fearful of technology yet required to take an IS course in a college of business.

Dr. Eliyahu Goldratt (2016) wrote a fictitious novel called *The Goal: A process of Ongoing Improvement* that has been used in some Operations Management courses. The storyline is of a manufacturing plant manager who overcomes a series of problems to improve the output of his plant. Through the story, the reader experiences production problems and their associated pains, observes the thought

processes of the protagonist, and observes the results of the application of the Theory of Constraints to resolve the given production problems. Whereas the learning objective of the book is to educate the reader regarding the Theory of Constraints, Dr. Goldratt chose a novel instead of a text-book format as, in his opinion, the complexity of the content is more understandable, relatable, and applicable when conveyed in a narrative (2016). As readers, we too found that *The Goal* was a very enjoyable way to learn principles of operations management from Dr. Goldratt and we have used his book when teaching Operations Management courses.

Pan et al. (2006) use another famous **Chinese's** folklore called the Monkey King. They use the storyline with a multimedia learning system to motivate students to learn about visualizing fourth dimensional mathematical objectives. They report that the folklore helps increase motivation to learn and helps with the visualization of complex mathematical objects.

Our paper extends prior research in folklore-based learning by asking the research question of how storytelling can be used in the assessment phase of pedagogy.

## 2. LITERATURE REVIEW

Assessment is a process of determining whether learners have achieved the **instructor's** desired learning goals. An academic learning process starts with an instructor forming specific learning objectives, determining the mode of delivery and content, fostering a learning environment (e.g., delivering a lecture, reading assignment, case study, hands-on activity, service learning, etc.), and assessing the attainment of learning via assessment tools (e.g., exams, assignments, etc.). Finally, the instructor reflects on the learning and improves the process. Angelo (1999) argues that quality assessments foster continuous improvement and results in a higher-quality learning environment for the student.

Multiple choice exams are arguably the most popular assessment tool in academia (Xu, Kauer, & Tupy, 2016). Yet, these exams have several notable limitations. Students prefer free response exams over multiple choice exams as a more accurate reflection of their abilities (Newble, Baxter, & Elmslie, 1979). According to Brassil and Couch (2019), multiple choice responses provide limited insight into the degree to which students believe the answer options. Further, the rote mode of learning such that a

student can carefully read the answer, and select the correct answer, even without retaining the knowledge, misses the point of assessment by providing a false positive. Multiple choice exams may only assess lower-cognitive recall rather than measure the higher-order thought intrinsic to the nuances of problem solving in homework assignments or essays or projects.

### Narrative Theory

Pedagogy is a process designed to foster new beliefs or new knowledge within the student. According to Narrative theory, humans are natural storytellers who understand and interpret experience as ongoing narratives (Fisher, 1984). Narrative theory builds on three principles: transportation, identification, and realism. Transportation explains how a narrative can influence a **reader's** belief by integrating attention, imagery, and feelings that occur in response to a narrative (Green & Brock, 2000). Narratives can aid that cognitive process. Identification is the action by the reader to adopt the perspective of a character (Busselle & Bilandzic, 2009). Realism is defined as a judgment of authenticity from the **reader's** point of view. Table 1 summarizes the theoretical view points and findings of prior research regarding folklore-based learning.

Table 1. Research regarding folklore-based learning

Research Conclusions	Authors
Narrative theory states humans are natural storytellers and interpret experience through narrative.	Fisher (1984)
Students preferred folklore-based learning over traditional lecture. Struggling <b>students'</b> performance increased more with folklore-based learning.	Lee, Lee, and Lau (2006)
Students enjoy storytelling in mathematics and teachers find it an effective instructional tool.	Zazkis and Liljedahl (2009)

Zazkis and Liljedahl (2009) categorize storytelling according to goals: to introduce a topic, to explain a concept, to ask questions that make the students reflect and think, or to introduce an activity. Hopfer (2012) expresses five key outcomes from storytelling as a

knowledge-transfer tool: 1) ability to overcome resistance in the reader, 2) engage less involved audiences, 3) reach audiences that lack specific knowledge, 4) make complex information understandable, and 5) culturally ground the message to the target audience. We next explore the deeper cognitive processes that underlie transportation, identification, and realism by exploring how human cognition relies on metaphors, and an appreciative system of sense-making, to accept and utilize new knowledge.

### The Role of Metaphor in Learning

Humans comprehend the world from two different perspectives: 1) from within the world, and 2) being surrounded by the world. Psychologist McGilchrist characterizes this dichotomy by describing the divided brain, i.e., right and left hemispheres (McGilchrist, 2019) This divided brain provides a context for understanding memory, cognition, re-cognition, abstraction, tacit knowing, learning, and imagination. A metaphor is a representation of or symbolic of something else, particularly something abstract (e.g., allegory, parable, analogy, emblem, etc.). Of interest is **McGilchrist's** assertion that metaphorical understanding is essential to the internalization of a phenomenon into tacit systems of knowledge. We know something because we experience through metaphorical internalization. Metaphor is the fulcrum that balances and integrates our objective and subjective comprehension of new phenomena to reconcile new phenomena against extant explanatory models of the world around us. Thus, metaphor, to which we ascribe the compelling components of the fictive narrative mechanics upon which fables rely, is a relatively timeless teaching device. It centers on coping strategies to engage that which is unfamiliar (Goldstein, 2005).

McGilchrist **suggests that the brain's right hemisphere contextualizes experience with our sensory systems. The left hemisphere serves as a comparison engine that categorizes and encodes experience into abstraction. Memory is constantly classified and categorized against metaphoric pictures available for further recall by means of association in context, sensory assessment, and analogical reasoning. Thus, the brain's right hemisphere operates experientially in the present and the brain's left hemisphere assesses sensory input from the right brain and searches for recognition through a catalog of related metaphors. In this sense, a story is disarming because the process of associating the hard facts of new phenomenon places greater**

cognitive load for the metaphor-processing left brain.

From McGilchrist's observations, the brain's right hemisphere filters and frames experience in parallel to recognition and thus allows for extant models to be verified. Narratives can be used to reinforce the lesson over time where the story is **metaphorically "attached" to the "hard" lesson**. These two sense-making engines, the brain's left and right hemispheres, are cooperative and intraoperative in a constant metaphor-matching process. This is a process of recognition (a repeated reconsideration of new data against old) that forms the basis of recall and the ability to act competently against this recall in new situations. Recognition may be expedited and made more familiar when storytelling is utilizing in earlier stages of comprehension.

Metaphor Fuels Processes of Appreciation  
Geoffrey Vickers (1983) characterizes the system of comprehending from the right- and left-brain partnership as one of appreciation. Appreciation is also a reconciliatory process which includes the social dimension of reasoning from new experience and comparing the new experience to extant models to establish veracity. This is a knowledge-building process but one that is also grounded in social shaping. This leaves room for the crafting of fables and folklore as they are often grounded in a culture, a context, and laden with value and ethical assumptions. If a fable is meant to be both disarming and relatable, then the narrative in a story must resonate with the learning for whom the story was designed. The universality of themes in the narrative would assume that the ethical precepts in the fable are resonant across cultures and quasi-universal in nature.

The appreciative system conditions the comprehension of new experiences and is open for potential modification as a result of the encounter with new experience. Metaphorical and allegorical device deployed in storytelling **targets the learner's appreciative system**. Education is goal-seeking. There are lesson plans designed to produce learning outcomes **against goals, but the learner's appreciative system is the medium within which that lesson plan and pedagogy will take root**.

Such systems are not honed and shaped independently of the communities in which the learner resides. These communities promulgate and reinforce common knowledge, norms, and routines that are acculturating in nature. The learner possesses a world-view grounded in the

communities which have shaped them. Regardless of our description of a technical rationality that might dominate the world of education, business, and the professions, the rationality under which the learner operates at any given time is a complex amalgam that goes **beyond binary descriptions such as "technical" or "reflective."** Rather, the metaphors operating within fables serve as a tool to resonate within a **learner's appreciative system**, and the modes of rationality favored therein, to encourage incremental comprehension. Metaphors serve as a learning tool by disarming natural reactions to the unfamiliar when referents in our abstract mental models have difficulty in finding a match to new experience.

#### Principles of narrative learning

Narrative learning involves many of the same principles in any good storytelling. The key is to align the elements of the story with the **teacher's** learning objectives. Zazkis and Liljedahl (2009) identify seven principles to consider when creating a story for learning: plot, conflict, imagery, human meaning, sense of wonder, humor, and patterns. These same principles can be followed when writing a story for an exam.

Given the benefits of narrative learning, we propose extending the same principles to the assessment phase of learning. Following a learning phase, the instructor wishes to assess whether learning has occurred. The most common assessment tool used in academics is the multiple choice exam (Xu et al., 2016). We explore the potential benefits of using a narrative learning paradigm to multiple choice exams. We developed a story plot and inserted exam questions throughout the story. The following research questions are investigated.

1. Can storytelling be used to assess knowledge attainment?
2. What would an assessment exam which uses storytelling look like?
3. What are the potential benefits of an assessment exam using storytelling?
4. What constraints might exist with this type of assessment?

### 3. METHOD AND IMPLEMENTATION

When designing an exam, an instructor can write one long story and insert exam questions throughout the story (Figure 2). Each exam question could be a challenge or conflict that the main character needs to resolve. The advantages of a long storyline may include the

following: 1) the exam taker may feel immersed into a plot, 2) more complex plots can be presented, 3) and the single plot may foster a perception that the student is not taking an exam but interacting with a story.

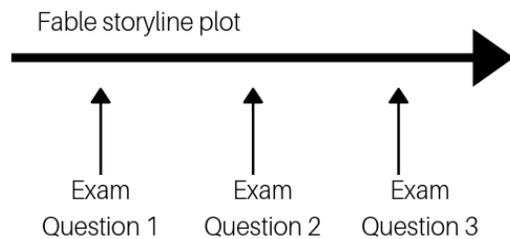


Figure 2. Integrating exam questions into a single, long plot.

An alternative method could be to create a different short story for each question (Figure 3). Each question becomes a very short story, like a mini-business case, not related to the other stories or exam questions. This method is easier to write as the author **doesn't** need to be consistent between stories. This method also allows the exam questions to be delivered in any question order.

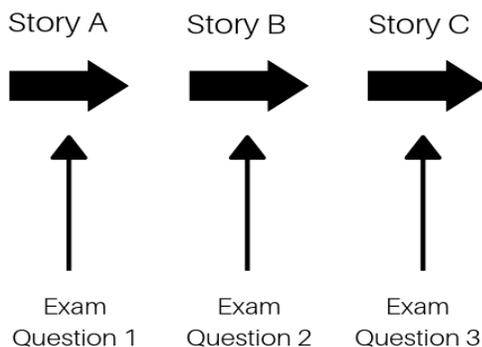


Figure 3. Each exam question could be a mini story not related to the others.

We chose to follow the first method of writing one long story with multiple questions related to the plot because a longer plot is more congruent with the principles of folklore-based learning. We followed a seven-step process for creating the assessment:

1. Define the learning objectives
2. Write questions for each of the learning objectives. Consider Bloom's Taxonomy of Higher Cognitive Thinking to vary the types of questions across the different cognitive levels (Bloom, 1956).
3. Write an introduction that describes the setting and main characters of the story.
4. Add exam questions and possible answer choices to the story.

5. Write prose around the questions to integrate the exam question into the plot. Use the exam questions as problems that the main characters in the story must solve.
6. Review the story against Zazkis and Liljedahl (2009) six principles of teaching through storytelling
7. Edit the story as needed.
8. Deploy the exam through an online learning management system.

#### Learning objectives

Before the assessment, the teacher should clearly define the specific learning objectives. Specific learning objectives are different than course learning objectives (CLO). CLOs are larger, broad capabilities the students will accomplish after the course is completed. A course may have four to six course learning objectives. An example of a course learning objective could be **"...transform web application design instructions into integrated HTML, CSS, and JavaScript code."** Specific learning objectives are quantized, fundamental units of knowledge that the learner needs to accomplish which collectively achieve the course learning objectives. Examples could be **"...demonstrate the use of class selectors when adding CSS styling to a div or paragraph"** or **"...create and link an external stylesheet to multiple web pages."** A course may have a hundred specific learning objectives which are mapped or aggregate into the course learning objectives. The teacher assesses specific learning objectives through an exam or assignment. One question on an exam could assess one specific learning objective.

For this research study, specific learning objectives were determined by the instructors of a Management Information Systems (MIS) course and a Production and Operations (P&O) course. See Appendix A and B for the exams.

#### Plots

The story was written in second person so that the reader (student taking the exam) could insert themselves as the main character. For the MIS exam, the student assumes the role of a business executive in a fictitious company. The CEO of the company presents various business problems to several executives. The supporting characters ask questions related to the specific learning objectives of the exam. The student answers the questions. Knowledge of the principles of MIS is required to answer the questions. For the P&O exam, the student is magically transported back in time to meet the

legendary George Washington. The student assist George Washington and his Continental army using knowledge of linear programming and other P&O topics.

#### Storyline and exam integration

The exam questions need to be integrated into the storyline. One way is to have supporting characters ask questions of the main character. The student answers the questions posed by the supporting characters. An example is as follows.

You work for a consulting company called IBG, Inc. Your CEO calls you into a meeting with many other executives to discuss problems and solutions to the **company's** efforts. David starts by saying, "**Thank** you for coming. I was on the plane yesterday from Asia and read in a magazine article by Tom Friedman on how Toshiba uses UPS to do repairs for Toshiba customers. Toshiba customers make a request for a laptop to be repaired. UPS picks up the laptop and takes it to a UPS warehouse where UPS employees fix the laptop and return it to the Toshiba customer without a Toshiba employee touching the product. This has costs and speed advantages for Toshiba. I think Friedman called this brown sourcing. "

You laugh and quickly stop yourself.

David says to you, "**What?** Do you have something to **say?**"

You reply, "**I'm** sorry. I **didn't** mean to laugh. Permit me to correct the term. **It's** not brown sourcing. Friedman called the process \_\_\_\_\_ "

Question 1. What term describes the process David is referring to (according to Tom Friedman's The World Is Flat)?

- A. Offshoring
- B. Insourcing
- C. Informing
- D. Open sourcing

David replies, "**Thanks** for correcting me. I appreciate it and am not above correcting. **Let's** move on."

#### Deployment

The MIS exam was given to 40 undergraduate students in a college of business. The course was delivered online. Deployment was through a learning management system with automatic grading. The Blackboard learning system does not have a mechanism for writing text between

exam questions, so the prose related to each question was included in the question text. The questions were ordered in sequence according to the plot. The research purpose of deploying the MIS exam was solely to demonstrate its use and work out any logistical problem, which there were not any. The P&O exam was given to 33 students. A post-exam survey was administered to measure **students'** perceptions (See Appendix C).

#### 4. RESULTS

Students who took the P&O exam (n = 33) were ask perception questions on dimensions of the following: enjoyment (hedonics), ease of recall, metaphoric learning, test anxiety, relatability, and preference for format (Appendix C). Of the students, 22 agreed or strongly agreed that the story was enjoyable (mean 3.8/5 Likert scale, n=33). Most students do not have a preference on the type of exam (mean 3.5/5 Likert scale). A subset of students reported a strong preference as indicated by selecting "**strongly agree**" to "**I** wish more of my tests were presented like the George Washington [**folklore**]" (n= 8/33). Two students expressed a strong preference against the folklore exam ("**strongly disagree**", n=2/33). None of the students reported test anxiety increasing and 11 of the 33 students reported test anxiety decreased. The story did not add confusion to the exam process. The George Washington narrative neither helped nor hindered recall (3.4/5 Likert scale), perhaps because the narrative was only introduced at exam time. Using a story during learning and exam time may benefit **student's** recall.

#### 5. DISCUSSION

Folklore-based learning can be an effective and fun method of presenting content for learning. The instructor crafts a story with embedded problems to be solved. The learner explores the problems and solutions through the main characters of the story. There are many examples of using narrative and folklore-based learning to replace a traditional lecture-based pedagogy. We extend the use of narratives into the assessment phase of pedagogy. The purpose of this research was to identify the uses and principles of narrative learning, discuss how to apply those principles into assessment exams, and demonstrate two examples of the said exam.

We refer the reader to Zazkis and Liljedahl (2009) who present a detailed how-to guide for writing learning stories: plot, conflict, imagery, human meaning, sense of wonder, humor, and

patterns. The same skills can be applied to writing a narrative exam.

As researchers and educators, we reflect on the needs that led to creating our narrative exams. Each year, faculty teaching the MIS and P&O courses write a post-semester reflection as part of our processes of assessment and continuous improvement. As a procedure to track assessment for our **program's** ABET accreditation, an analysis of those reflections led to the following conclusions. The MIS course was habitually rated low by students and not valued by other college of business faculty. Students did not value the content and frequently reported boredom with the course. This boredom and lack of engagement had impacts on learning retention. Further, the course was mainly textbook-based where students read chapters in a **publisher's** textbook, attended lectures, and were assessed via traditional multiple-choice exams.

In response, we redesigned the course content to be more relevant to **student's** needs, particularly those more relevant to the tasks they would encounter in the first five years of their post-graduate employment. The learning objectives were also redesigned to align with the other courses in the **college's** core curriculum. We abandoned the **publisher's** textbook and were not satisfied with other publisher alternatives. We also wanted more hands-on and experiential problem solving. As part of the changes, we adopted the Harvard Business Case, *The Adventures of an IT Leader*, which is an example of narrative learning (Austin et al., 2016). This case was successful at engaging students, holding their interest, and in removing some barriers and resistance to learning. As a natural extension, we designed a narrative exam. While success of the new MIS course cannot be solely causally assigned to narrative learning and assessment, those were important and prominent tools that helped improve the course. Regarding the narrative exam, one student commented, "**That** was the most fun exam I have ever **taken!**"

A second, narrative exam was created for the P&O course, including a post-exam survey. The folklore-based exam used in P&O course demonstrated that students accept the alternative exam format, did not find the change confusing, and enjoyed the exam. A subset of students preferred the folklore-based exam over a traditional exam. Some students report reduced test anxiety.

#### Potential advantages

The potential advantages to using narrative exams may be similar to those already attributed to folklore-based learning: increased cognitive focus and engagement (Green & Brock, 2000), increased perceptions of realism and application of the knowledge (Davidhizar & Lonser, 2003; Goldratt & Cox, 2016), and intuitively answering the students question of "**why** do I need to know **this?**" or "**how** would anyone use **this?**" We propose this type of exam may increase retention of knowledge because narratives and metaphors may increase salience (McGilchrist, 2019). Increased salience, according to the metaphorical connections made possible through storytelling and narrative, can be linked to increased recall. Storytelling in an exam may increase the hedonic response in the learning and assessment processes. The stories are disarming because they use familiar characters and themes (Robbins, 2006).

Returning to Narrative theory, humans are natural storytellers and learn through interpreting experiences. Narrative exams appeal to our affinity for stories. Stories can be leveraged to reduce resistance to learning and help the learner interpret experiences in the story to their own problem-solving experiences. The learner can identify with the characters in the story as they solve problems and, concomitantly, as the learner solves problems on the assessment exam. Through the process of metaphorical comprehension, stories increase retention of knowledge because the information has increased salience where this increase in salience is linked to memory (McGilchrist, 2019). This further aids in **learners'** perception that a new topic is less boring, more challenging, and more stimulating (Lee, Lee, & Lau, 2006).

In this section, we proposed potential benefits of narrative exams leaning on the existing literature regarding the known benefits of folklore-based learning. While we present preliminary results, these claims are yet to be substantiated and we encourage researchers to explore this potential and to quantify the benefits.

#### Potential challenges

Some challenges exist with narrative learning which may translate to assessment. The process is time consuming. Writing a story is an additional task after defining the learning objectives and writing the exam questions. **Storytelling may not be among the instructor's** strengths, particularly in a STEM field where the **instructor's background may not have**

emphasized these skills. New skills may need to be learned and practiced. New partnerships with those who are stronger at storytelling and writing may be needed.

When using narrative exams, instructors should consider impacts on anti-cheating mechanisms. Unfortunately, cheating is common in adult education. Multiple choice exams lend themselves to cheating because students can easily share questions and answers, particularly in online courses. However, this is not a new problem. Two possible methods for anti-cheating are: 1) to randomize the questions and, 2) randomize the order of the answers. With narrative exams, the questions cannot be randomized because doing so would break the flow of the single-plot story. Randomizing the order of the answers is still possible. Many content learning systems provide this feature.

The aim of this paper is to stimulate a new area of research. The contributions are the idea of a single-plot narrative used in an assessment exam, two examples of said exams, and a theoretical foundation using Narrative theory and metaphoric learning. We also discuss the potential challenges to using this approach and provide resources for instructors/researchers who wish to develop their own narrative assessments (i.e., Zazkis & Liljedahl, 2009).

#### Future study

Future areas for research may include the determination of the hedonic reactions of a narrative exam compared to traditional exams. Studies have shown that students quickly forget the knowledge learned in their courses. Can students retain and recall knowledge longer after a narrative exam? A mid-term offered as a narrative exam can be reevaluated as a final exam and compared to the results of traditional examination. Further related research questions are the following: Do students have greater focus and cognitive engagement during a narrative exam? Do our observed student perceptions regarding narrative exams generalize? Do students perceive problem solving through narrative exams as more applicable to the real-world? Can learning outcomes be improved with narrative exams in a manner that is commensurate with folklore-based learning? As exams are often associated with high anxiety, can narrative exams reduce anxiety and for whom? Because some students report that they are not good test takers, might narrative exams be perceived as more natural to real-world problem solving and help those who

struggle with traditional examination methods? Future offerings of the MIS and P&O courses can compare a narrative exam to a traditional multiple-choice exam to explore these research questions.

## 6. CONCLUSION

There are many positive benefits to learning already demonstrated by using folklore-based learning. We encourage instructors to use more storytelling in learning. We encourage instructors to experiment with narrative exams. We further encourage researchers to explore perceptions of and causal relationships to learning afforded by narrative assessment strategies. The cognitive fit that metaphor-driven fables and folklores provide offers a compelling new direction to assist our learners.

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## Appendix A: Example of a Narrative Exam

The following example is of an exam that uses storytelling. This exam was deployed in the management of information systems introductory course (MIS).

### Learning Objectives

This exam assesses the following learning objectives relevant to the MIS course:

1. Students will be able to identify technology-based flatteners according to Tom Friedman.
2. Students will be able to distinguish types of collaborative writing technologies and workflows.
3. Students will be able to define the following terms B2B, B2C, B2G, C2C, or C2B.
4. Students will be able to recognize the application of a knowledge management system, knowledge discovery process, and of artificial intelligence in business.
5. Students will be able to recommend a technology for a given business need based on our in-class student technology presentations. Note: As a separate assignment, students researched various technology and then gave a five-minute presentation on the potential business application. This learning objective and related exam questions assess that learning was retained after the technology presentation assignments.

The answer to each question is identified with an asterisk.

### Beginning of Exam

Read the following story and answer the related questions as if you were in the story.

You work for a consulting company called IBG, Inc. Your CEO calls you into a meeting with many other executives to discuss problems and solutions to the **company's** efforts. David starts by saying, "Thank you for coming. I was on the plane yesterday from Asia and read in a magazine article by Tom Friedman on how Toshiba has UPS does repairs for Toshiba customers. Toshiba customers request a laptop to be repaired. UPS picks up the laptop and takes it to a UPS warehouse where UPS employees fix the laptop and return it to the Toshiba customer without a Toshiba employee touching the product. This has costs advantages for Toshiba. I think Friedman called this brown sourcing. "

You laugh and quickly stop yourself.

David says to you, "What? Do you have something to say?"

You reply, "I'm sorry. I **didn't** mean to laugh. Permit me to correct the term. **It's** not brown sourcing. Friedman called the process \_\_\_\_\_"

Question 1. What term describes the process David is referring to (according to Tom **Friedman's** The World Is Flat)?

- A. Offshoring
- B. Insourcing \*
- C. Informing
- D. Open sourcing

David replies, "Thanks for correcting me. I appreciate it and am not above correcting. **Let's** move on." He continues, "We need to write a business plan with our partners in Asia. Because they are in another time zone, we **can't** feasibly do conference calls to discuss the proposal. Instead, I want us to organize a team of writers and send the documents back and forth. Each person on the team will take a turn writing the proposal and then pass it on to the next person. Only one person at a time will be writing but I **don't** see any option. "

Question 2. Which of the following describes **David's** suggested method of writing?

- A. Asynchronous writing \*
- B. Synchronous writing

David commented "I don't see any option, "referring to how to write where people each take turns. Joe asks, "But with everyone taking turns writing how will we know who made what changes and additions? I did this in college and it was a nightmare. I'd write a paragraph only to have someone else accidentally delete it and we didn't know. "

You offer a suggestion, "There is a feature in MS Word that can identify every author's contributions to the paper. It highlights any deletions or additions and who make the change. We can accept or reject people's changes when we are all done taking turns writing." Joe asks, "That sounds cool! What feature is it?"

Question 3. You answer Joe's question of 'What feature is it?' with the following response:

- A. Track Changes \*
- B. Insert Comments
- C. Compare Documents
- D. Restricted Editing

To the idea of how to organize a team of collaborative writers, you also suggest "Instead of taking turns writing, we could employ a different strategy. I learned in my CIDM3330 class that there are alternative strategies for organizing teams. For example, Jane is an awesome editor and grammaticist. Joe is very good with illustrations. Huyn is a good writer even though English is his second language and he knows the conditions in Asia so he can write about that. David knows the conditions in the US and can be a writer too. I can be a reviewer that reviews everyone's contributions because I use to be a peer-reviewer for a publication and it's my strength. This was everyone contributes based on their strengths rather than everyone doing every task."

David says, "I like that idea. I knew we hired a good person when we got you. What do you call that collaborative writing strategy?"

Question 4. You respond with, "According to the Lowry et al., paper (2009) that I read that strategy of writing is called \_\_\_\_\_."

- A. Reactive writing
- B. Parallel writing
- C. Sequential writing
- D. Group single-author writing
- E. Stratified-division writing \*

In the executive meeting, you just outlined some strategies for collaborative writing. David responds with "I like the idea." Joe response with "I like the idea to. I really like illustrations and graphic design but I don't like writing. But what do we do next? What are the tasks we do and in what order?"

You go to the whiteboard and write down seven common activities of collaborative writing and put them in the order of operation.

Question 5. According to the Lower et al paper (2009), put the following collaborative writing activities in order of which comes first, which comes second, etc., and which comes last.

- A. Brainstorming \*[Answers are in list order]
- B. Converging
- C. Outlining
- D. Drafting
- E. Reviewing
- F. Revising
- G. Copyediting

With the collaborative writing team organized the executive meeting moves to another topic.

Joe asks "David, with your meeting in Asia, is the Yoshi firm a B2B, B2C, B2G, C2C, or C2B?"

David replies "Yoshi firm primarily does B2B."

The new secretary fresh out of college leans over to you and quietly asks "What is B2B?"

Question 6. You respond with the following statement that defines the term "B2B"

- A. **Businesses are Yoshi's primary customers \***
- B. **Consumers are Yoshi's primary customers**
- C. **Governments are Yoshi's primary customers**
- D. Consumers selling to businesses

David, "Ok folks, we need to talk about our online marketing. We spent \$1000 on Pay Per Click advertising and unfortunately it **didn't** produce good results. Any other **ideas?**"

Joe "I have an idea. Instead of paying for clicks we can pay for when prospects actually signup for a free trial of our product. Paying for the clicks just means someone saw our website but **didn't** actually do anything. This alternative allows us to only pay for when a prospect actually does something we want them to, like request a free sample of our product or sign up for one month trial. Website will advertise for us and **we'll** pay them for results not just visitors who browse. "

David, "Is it more or less expensive than Pay Per Click? We only paid 55 cents per **click.**"

Joe, "55 cents is cheap, but the results were cheaper, after \$1000 we only had one new customer. With this alternative, we do pay more, perhaps \$5 to \$10 per signup, but we get real prospects, not just curiosity seekers. And, with a lifetime value of each customer at \$400, spending \$5 to acquire new customers is a drop in the bucket. But I **don't** remember what this alternative to Pay Per Click is **called?**"

Question 7. You answer **Joe's** question with which of the following:

- A. Article Marketing
- B. Pay Per Action \*
- C. Pay Per Impression
- D. Pay Per Click
- E. Search Engine Optimization
- F. Back-linking strategies

David, "Ok, so we need to help human resources communicate the new health insurance policies. Rather than sending 100 emails to all the employees what other ideas can we do to help the HR department disseminate information? "

Beth says "I remember in my MIS course at college that we had a topic like this. Let me remember. I forget the name of the thing, but it allows many authors to add content to a website. And all the company employees can visit the internal website to have their health insurance questions answers. We can even have comments areas for employees to ask questions. The human resource personnel can be authorized to add content to the site and the other employees can read and post comments and questions. HR people can write little articles and post them to help our employees know how to sign up for insurance, know how to take care of themselves, etc. If I can only remember what that was **called?**"

David, "HR is not technical. They **don't** have to know how to program a website do **they?**"

Beth, "No, not at all. We even did this in our course and you all know **I'm** not technical at all, but I **don't** remember the name of **it?**"

David, "Sounds great! Who knows what Beth is talking **about?**"

Question 8. **What's** the term that answers **David's** question?

- A. Knowledge management systems \*
- B. Knowledge Discovery Process
- C. Artificial Intelligence
- D. Insourcing

David asks a follow-up question about collaborating with the colleagues in Asia, "We need to synchronize all the project files, photos, proposal documents, financial documents, etc. with our counterparts in Asia. I **don't** want to be emailing the documents back and forth because **that's** a sure way to lose a document or have it leak to the public. Any **suggestions?**"

Joe whispers, "I email my bank statements all the time without any **problem.**" You kick him under the table.

You respond to David with "I have a suggestion. We can use a free software service that encrypts our files and stores them online. The company gives us free storage online for 2Gigs and we can buy more storage if we need **it.**"

David asks, "But how does that help **us?**"

You continue, "When you download this software onto your computer it creates a special folder. Anything you put in that folder will be automatically synchronized with any computer that you share that folder with. You can even have it share and synchronize with your phone or **iPad.**"

Joe exclaims, "But I'm an Android-tablet guy, not a Mac **user!**"

You continue, "It works and synchronizes your files with a PC, Mac, and many types of mobile devices, including iPhones and tablets. So, when I make add a project file to the folder, everyone on the team automatically gets the new file. If someone edits an Excel spreadsheet, the updated file is automatically synchronized with everyone. That way we keep all our project files in one folder and synchronized with the entire team. I saw a technology presentation on this method of collaboration and now use it frequently **myself.**"

David smiles proudly and asks "Sounds good. **What's** the name of the **technology?**"

Question 9. According to the technology presentations seen in class, what is the name of the technology David is referring to?

- A. DropBox \*
- B. Prezi
- C. Team Speak
- D. SmartThink
- E. CCleaner
- F. Monkey on Your Back
- G. Sage Act
- H. Smart Thinking
- I. **Windows' One Drive**

To finish the meeting, David plugs his laptop into a projector, "I'll show you the prototype that our Asian counterparts have **built.**" He fiddles with his Windows computer. His computer becomes unresponsive, takes a long time to open an internet browser, and David starts murmuring under his breath "Darn, stupid computer. Always slow. Why **can't** you **work?**" not realizing everyone can hear and see his frustration. You suspect he has problems with his Windows Registry and old programs causing his computer to be slow and unruly. You type a quick email to David on your iPad and recommend one of the following free software to help David tune up his computer.

Question 10. According to the technology presentations seen in class, what is the name of the technology that will help David?

- A. DropBox
- B. Prezi
- C. Team Speak
- D. SmartThink
- E. CCleaner \*
- F. Monkey on Your Back
- G. Sage Act
- H. Smart Thinking

I. **Windows' One Drive**

Because of technical problems with **David's** computer, he defers the time to Joe. Joe gives an amazing presentation on the sales in Asia. The presentation is novel and inspiring, in part because he does not use MS Powerpoint. His alternative has stunning graphics and zooms into parts of the graphic, which displays his content. He even had an embedded video play. Everyone is impressed. As he sits down next to you, you ask Joe, "**Awesome** presentation. What did you use to create **that?**"

Joe responds "**I** used a free service on the internet called **...**" Bang! Crash! Just then someone drops several books and you **didn't** hear what Joe said.

Question 11. According to the technology presentations seen in class, which technology did Joe use?

- A. DropBox
- B. Prezi \*
- C. Team Speak
- D. SmartThink
- E. CCleaner
- F. Monkey on Your Back
- G. Sage Act
- H. Smart Thinking
- I. **Windows' One Drive**

END OF EXAM

## Appendix B: Example of the George Washington Folklore Exam

This exam was deployed in a Productions and Operations course in a college of business. The learning objectives are to define various production terms, read and calculate values from a profit and lost statements related to productions/operations, and use linear programming to solve production problems.

### BEGIN EXAM

You are on university campus and sit under a tree enjoying the nice Fall weather. You have a laptop to **do your homework but decide to take a small nap. It's been a busy week. When you wake up, you are still under a tree but campus is gone. There is nothing but fields, hills, and more trees. The air is a bit more brisk and humid. "I don't think I'm in [City name] anymore," you say to yourself. Just then a man in old-time cloths and a musket challenges you, "Hey, who are you and what are you doing in General Washington's camp?" You slowly get up and explain that you are not sure. Seeing your strange cloths and laptop, he is suspicious and orders you to follow him to see General Washington. Everywhere you look around you see authentic gear and people from the American Revolution. Intuitively you know that something magical has happened.**

You are escorted to a large tent with two guards outside. The sentry and you are admitted into the tent. The sentry explains how he found you. General Washington is a commanding figure and you cannot help but smile. General Washington

I know a thing or two about productions and operation. I own a plantation in Virginia. If you are **telling the truth, you can answer a few questions. Tell me. What is direct labor? "** General Washington proceeds to ask you to define some terms related to productions and operations.

**Question 1. Answer General Washington's questions by matching the following terms to the appropriate definitions.**

Direct labor: cost of labor involved in producing a product or giving a service.

Unit cost: is the total cost incurred by a company to produce one item of a particular product or service; does include variable costs and fixed costs incurred in the production process, but not include the sales process.

COGS: aggregate costs related to producing a sold product or giving a service delivered, includes cost of materials and cost of direct labor.

Overhead: costs that are not directly related to the production of goods or delivery of services (e.g., selling, administrative expenses, marketing and advertising costs, payroll tax expenses for non-production employees, legal and accounting fees, office supplies, etc.

Work in progress: Unfinished goods. The value of the material and direct labor for a product that is not yet completed, not ready for sale, e.g., a partially build wagon.

Operations: manufacturing processes that transform resources into products (finished goods)

Supply chain: processes that move materials to and from the firm

Efficiency: doing something at the lowest cost

Effectiveness: doing the right thing to create the most value

**"Gentlemen," He says to his officers, "I believe our guest is telling the truth. I am an excellent judge of character and will attest for the correctness of the answers."** Turning to you General Washington continues, **"I don't know how you got here but perhaps you can give us some aid while you are here."** You agree to help to the best of your ability.

**"We have some capture documents from a Torri spy. We have some invoices, profit and lost statement. Perhaps you can help my quartermaster decipher some of the documents for useful information. Excuse me while I attend to other matters. "**

The quatermasters name is Horatio Warren. You recall that a quartermaster is responsible for all the purchasing, requisition, and distribution of supplies and provisions for the army. Horatio explain that they intercepted an enemy supply of guns and ammunition that were being transported to the British Army. Upon investigating, the driver had secret documents in his position. **"We are trying to figure the**

gross profit margin so we can determine the sophistication of their supply chain.” You review the profit and loss statement and calculate a gross profit margin.

Question 2. Given the profit and loss statement below, what is the gross profit margin? Enter a whole number, no decimals, no percent sign, no dollar sign or other symbols. For example, if you calculated a margin of 10%, just enter 10 into the box below. [Answer = 2000]

Profit and Loss Statement of Tory Alliance

Total Revenue	£	10,000
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Cost of Goods Sold	£	2,000
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Gross Profit	£	8,000
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Operating Expenses

Bribes	£	100
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Rent	£	10
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Total Operating Expenses	£	110
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Operating Profit (EBIT)	£	7,890
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Interest Expense	£	100
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Income before taxes (EBT)	£	7,790
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British Taxes	£	2,000
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Net Income	£	5,790
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# Outstanding Shares	£	10,000
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Earnings Per Share (EPS)	£	0.58
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Horatio asks, “We are trying to figure the gross profit margin so we can determine the sophistication of their production operation.” You review the profit and loss statement and calculate a gross profit margin.

Question 3. Give the profit and loss statement, what is the amount spent on activities directly related to products that were sold? Enter a whole number, no decimals or symbols. [Answer = 80]

**You offer that it might help to compare the American’s unit cost to that of this enemy’s supplier.** Perhaps the American army can learn if their manufacturing techniques are more efficient than the enemy’s. **The quartermaster agrees. Together you look through the documents and find the total number of muskets made and sold last quarter by the enemy supplier was 1200.** The COGS for muskets was £ 3900 British Pounds during the same time period.

Question 4. Given the data presented, what is the unit cost for each musket in British Pounds? Enter only a number with no monetary symbols. Decimals are permitted. [Answer = 3.25]

"Wow!" exclaimed Horatio, "That's less than our unit cost. I wonder how they are producing muskets so cheaply. "

Horatio pulls a letter from his pocket. "I have a cousin Henry who is a patriot. He wrote me this letter asking for advice. Perhaps you can help us? He has 80 acres to plant crops. He wants to plant cotton and/or wheat to maximize his profits. He will donate the profits to our cause and support of this army. I want to tell him how to earn the most amount of profit. He must plant all 80 acres. He has a budget of £ 500 pounds. He only has enough cotton seed to plant 30 acres of cotton. He must plant a whole acre of one crop, no partial acres. Can you help? "

You withdraw the laptop from your backpack and Horatio looks on curiously. After a few minutes of data entry, you give him the answer to his cousin's question.

[Use Excel Solver to find an optimal solution given the set objective and constraints. Download and open the file Exam1.xlsx Worksheet Cotton. Then answer the following questions.]

**Question 5: Given the cousin's problem, what is the set objective?**

- A. to minimize costs
- B. to maximize profits [correct]
- C. to set a value of
- D. He has a budget of £ 500 pounds.
- E. He must plant a whole acre of one crop, no partial acres

**Question 6: Given the cousin's problem, what is the By Changing Variables?**

- A. He has 80 acres to plant crops
- B. He wants to know how many acres of cotton and/or wheat to plant to maximize his profits. [correct]
- C. He must plant all 80 acres.
- D. He has a budget of £ 500 pounds
- E. He only has enough cotton seed to plant 30 acres of cotton
- F. He must plant a whole acre of one crop, no partial acres.

Question 7. Given the cousin's problem, what are the constraints? Select all the appropriate constraints.

- A. He wants to know how many acres of cotton and/or wheat to plant to maximize his profits
- B. He must plant all 80 acres. [correct]
- C. He will donate the profits to our cause and support of this army
- D. I have a cousin Henry who is a patriot
- E. He only has enough cotton seed to plant 30 acres of cotton [correct]
- F. He must plant a whole acre of one crop, no partial acres. [correct]
- G. He has a budget of £ 500 pounds [correct]

Question 8. What is the recommended number of acres to plant cotton? [Answer = 80]

Question 9. What is the recommended number of acres to plant wheat? [Answer = 50]

Question 10. What is the total profit that can be earned by the cousin given the constraints? Enter a whole number with no decimals, no symbols. [Answer = 300]

Horatio thank you and starts to write a letter to his cousin with your recommendations.

Your attention becomes distracted when you overhear a heated debate between the officers and General Washington. You pause your work with the quartermaster to listen.

General Marquis de Lafayette animatedly says "The British under General Burgoyne are marching South from Canada to split the States. This is a grave threat. They will arrive at Saratoga and cross the Hudson River in 10 days. We need to stop their advance at the Hudson river near Bemis Heights. "

General Anthony Wayne responds, "We don't have any significant forces in that area. Our nearest forces are in Albany, Salem, and Fort Plain. Fort Plain has cannons with the strongest firepower. We

should send orders for them to immediate march with 50 cannons towards Bemis Heights. Taking Bemis Heights will give the advantage of high ground and maximum our strength. "

General Henry Knox fervently argues, "No. We should send General Gates from Albany. He has 1000 soldiers on foot. We need a large quantity of cheap soldiers. That will give us the maximum strength. "

General Lafayette shouts, "No. We must send cavalry soldiers from Salem. We have 200 cavalry. They can move the fastest and fight on horseback. They will give us the greatest strength. "

General Washington calmly replies, "Gentlemen. We need to be unified in our decision. We need to maximize the strength of army in order to stop General Burgoyne's British forces. We need to decide how many soldiers from Fort Plain, Albany, and or Salem to send. But we also need to be conscious of the cost associated with move our armies. We do not have unlimited funds to transport these soldiers. Our men are starving and ill-equipped. Every penny counts."

You boldly walk over to General Washington and say "Perhaps I can help. I've been trained in linear programming that can help find optimal solutions given constraints. I just need a bit more information." General Washington signals for you to proceed. You ask for the relative strength of each Continental army at Fort Plain, Albany, and Salem. You ask for the quantity of soldiers at each location. You ask for any constraints that need to be satisfied. From your various questions, the General provides you with the relevant information. You plug the data into your laptop and provide General Washington with a recommendation on how to deploy his soldiers.

[Use Excel Solver to find an optimal solution given the set objective and constraints. Download and open the file Exam1.xlsx Worksheet Washington. Then answer the following questions. ]

Three Continental armies are within 8 days march of Bemis Heights where General Washington wants the combined armies to confront General Burgoyne. The Continental armies are located at Albany, Salem, and Fort Plain. How many foot soldiers, cavalry, and/or artillery batteries should be deployed to stop General Burgoyne? General Washington wants the strongest army possible. However, you cannot deploy more soldiers than there are available from each location. There is a total available budget of £ 1,300 pounds to transport the soldiers. No partial units allowed. Using the relative strengths given to you by General Washington, you establish hit points for foot soldiers, cavalry, and artillery.

[See the Excel file Exam1.xlsx Worksheet Washington for details. Find the optimum solution given the set objective and constraints. Answer the following questions regarding the General's problem.]

**Question 11: Given the General's problem, what is the set objective?**

- A. to maximize the strength of the army [correct]
- B. to minimize the cost
- C. to set a value of
- D. to minimize the number of foot solders deployed

**Question 12: Given the General's problem, what is the By Changing Variable(s)?**

- A. Three Continental armies are within 8 days march of Bemis Heights where General Washington wants the combined armies to confront General Burgoyne.
- B. How many foot soldiers, cavalry, and/or artillery batteries should be deployed to stop General Burgoyne? [correct]
- C. However, you cannot deploy more soldiers than there are available from each location.
- D. There is a total available budget of £ 1,300 pounds to transport the soldiers.
- E. No partial units allowed

**Question 13: Given the General's problem, what are the constraints? Select all the appropriate constraints.**

- A. There is a total available budget of £ 1,300 pounds to transport the soldiers. [correct]
- B. General Washington wants the strongest army possible

- C. How many foot soldiers, cavalry, and/or artillery batteries should be deployed to stop General Burgoyne?
- D. No partial units allowed [correct]
- E. However, you cannot deploy more soldiers than there are available from each location. [correct]

Question 14: What is the recommended number of foot soldiers to deploy from Albany? [[Answer = 150]

Question 15: What is the recommended number of cavalry to deploy from Salem? [Answer = 200]

Question 16: What is the recommended number of artillery batteries to deploy from Fort Plain? [Answer = 0]

You ask General Washington if you can borrow something to write with. He hands you his personal quill feather pen. You write down your recommendations and describe the strength of the resulting **army. General Lafayette is interested in the concept of "hit points." You smile to yourself and think, "See mom, D&D wasn't a waste of time after all."** General Washington thanks you with a sturdy handshake and expresses confidence in your answers. General Knox offers to draft the orders and the generals return to their strategic planning.

It is now late, and you are **escorted out of General Washington's tent. Just before leaving, you look back at the noble General.** He catches your eyes and nods his head. You see appreciation in his countenance.

**You are assigned to bunk with the quartermaster and, exhausted from the day's adventures,** quickly fall asleep. When you awake, it is light outside and you are sitting under the same tree as before. You **see campus buildings as they should be. You think to yourself, "Did I dream that? Of course, I did. Meeting General Washington"** and chuckle. As you start to put your laptop into your backpack you pull out a quill pen.

Question 17: Regarding the General's problem, what is the total army strength (in hit points) given the set objective and constraints? Enter a whole number with no decimals, no symbols. [Answer = 4750]

The End.

END OF EXAM

Appendix C: Survey Questions

Person

1. I enjoyed George Washington Fable
2. The George Washington Fable is enjoyable as narrative story
3. I don't enjoy George Washington Fable as it isn't serious (reverse coded)

Narrative

4. The exam used George Washington as a character in a narrative story
5. I can better recall a concept when it is delivered using a narrative story
6. The George Washington story was confusing (reverse coded)
7. The George Washington Story did not help me remember the material (reverse coded)

Metaphor

8. The George Washington Fable is a comparative story (a metaphor)
9. Comparative stories (metaphors) like the George Washington Fable helped me recall the concepts on the test
10. The George Washington Fable helped me relate to concepts in the examined material
11. The George Washington Fable does not help me because I cannot remember it (reverse coded)

Folklore

12. George Washington is considered a hero and great leader in American culture
13. Stories about George Washington are folklore because he was a great leader
14. Because I am familiar with George Washington the George Washington Fable helped me recall the concepts on the test
15. I believe everything I read about George Washington

Anxiety

16. The George Washington Fable reduced my test anxiety
17. Although I understand the story it is not possible to travel in time back to George Washington, the story made me feel at unease (reverse coded)
18. The George Washington Fable increased my test anxiety (reverse coded)

Context

19. I could relate to the linear programming question because the exam used muskets from the time of George Washington
20. The exam was progressively relatable as it used George Washington Fable throughout the exam
21. Because George Washington Fable was not believable, the questions were out of context for the exam (reverse coded)

Preference

22. I wish more of my tests were presented like the George Washington Fable
23. The George Washington Fable was not a useful way to present the material (reverse coded)