

An Experiment to Evaluate the Effect of Narrative Delivery in Military Training

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ABSTRACT

The use of serious games in military training has now become commonplace. However, unlike most commercial entertainment games, explicit “storylines” (as portrayed in, for example, cut scene inserts) are rarely used to introduce games-based training simulations. A storyline constitutes an information-rich framework for the structuring of learning content delivery, networked episodes, tasks and activities. It follows a narrative and pedagogical outline with reference to key questions, learning tasks, activities, resources, media and cooperative interactions. A game-based simulation study was undertaken using undergraduate Defence Technical Officer and Engineer Entry Scheme students from the UK universities of Birmingham and Aston. Based around cultural awareness training, a core scenario and narrative were developed to teach participants how to interact with a fictional civilian population.

The experimental aim was to investigate if the method of narrative delivery had a direct impact on the student’s learning performance. Using one of three delivery styles (“passive”, “semi-active” and “active”), the narrative took the form of (a) a paper brief, (b) a (military) instructor-led presentation, (c) a short paper brief followed by an interactive but predominantly scripted first-person (FP) simulation scenario, and (d) a fully interactive FP scenario. Participants were then exposed to a similar FP scenario in which they had 20 minutes to achieve the objective of intercepting an insurgent. In addition, subjective measures of participant learning style were obtained to investigate whether or not different styles might have some bearing on the impact of specific narrative delivery method.

This paper presents the early findings of this study, which is sponsored by the UK’s Defence Science and Technology Laboratory (dstl).

ABOUT THE AUTHORS

Mark Lewis, lecturer in Defence Simulation for Cranfield University at Defence Academy of the UK. For the last 3 years he has been lecturing a variety of military and civilian students on the use of M&S within the military environment and provides advice to MoD M&S adopters on specification, design and operation. He has worked on the UK Training Transformation Concept Capability Demonstrator programme and was the M&S lead for the UK MoD Lightning II Program. He has commendations from the MoD Chief of Defence Material and Chief Scientific Advisor. Mark received his MSc in Defence Simulation and Modelling whilst serving in the Royal Navy.

Professor Robert (Bob) Stone, Director of the Human Interface Technologies Team, University of Birmingham. A Chartered Psychologist, Bob joined academia in 2003, after a long and successful career in defence, robotics, surgical simulation and Virtual Reality (VR). He was originally involved in defence human factors research with British Aerospace, including underwater technology projects for the offshore oil and gas industry, the nuclear industry, NASA and the European Space Agency. Bob was the Research Director of the UK’s Human Factors Integration Defence Technology Centre, with notable successes developing simulation and VR training systems for submarine safety and telerobotics for counter-IED activities. More recently, Bob’s research has focused on military healthcare applications, supported by the Royal Centre for Defence Medicine. He has received numerous awards, including, uniquely, three from the Institute of Ergonomics & Human Factors, and the MoD Chief Scientific Adviser’s Commendation in 2011 for his contribution to science and technology in defence.

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INTRODUCTION

The contents of the Strategic Defence and Security Review (SDSR) 2010 stated that the United Kingdom (UK) Ministry of Defence (MoD) needed to make a step change in training using Commercial Off The Shelf (COTS) and Off The Shelf (OTS) products. To support this step change in training and education, dstl (Defence Science and Technology Laboratory), launched a Novel Systems for Defence Training and Evaluation Challenge under the auspices of the [MoD Centre for Defence Enterprise \(CDE\)](#) (dstl 2012). Challenge 4 - *Narrative and Gameplay in Simulations* – defined 2 exploratory tasks:

1. Explore the role of storyline or narrative in gaming transfer.
2. Develop new ways to approach the problem, design experiments and/or tools to assess the gaming transfer from narrative / storytelling.

The use of serious games technologies in military training has now become commonplace, with one of the biggest products to be exploited being Bohemia Interactive Simulations Virtual BattleSpace 2 (VBS2), a derivative of the Armed Assault (aka Arma) game. However, unlike most commercial entertainment games, explicit “storylines” (as portrayed in, for example, cut scene inserts or mission packs) are rarely used to introduce games-based training simulations. A storyline constitutes a narrative framework for the structuring of learning contents, networked episodes, tasks and activities. It follows a narrative and pedagogical outline with reference to key questions, learning tasks, activities, resources, media and cooperative interactions.

An early and exploratory game-based simulation study was undertaken by Cranfield University at the UK Defence Academy and the University of Birmingham Human Interface Technologies Team. Based around cultural awareness training, a core scenario and narrative were developed to teach participants how to interact with a fictional civilian population. The work included the design of an experiment to investigate:

- The different styles and method of narrative and narrative delivery.
- How they may affect learning and the delivery of training in a defence environment.

The CDE funds novel, high risk, high potential-benefit research therefore the main focus on this work was the design and initial conduct of an experiment to inform both tasks and further research.

LITERATURE REVIEW

A literature review was carried out, the aim of which was to understand, what is narrative in games design? What does it mean and how does one design it? What factors impact the way in which we learn and do games-based simulations meet the learning styles of the military audience?

The term “narrative” means different things to different people. The US and UK Oxford dictionaries, for example, differ slightly in their definitions:

*“A **narrative** (or **story**) is any account of connected events, presented to a reader or listener in a sequence of written or spoken words, or in a sequence of (moving) pictures”.* US Oxford dictionary

“A representation of a particular situation or process in such a way as to reflect or conform to an overarching set of aims or values”. UK Oxford English dictionary

The US definition tends towards the traditional idea of a scripted story in a book or film whereas the UK definition relates more to the whole “story”, whether as part of a script or in the form of descriptions (visible, verbal, acoustic) of the relevant external aspects. A more representative definition is provided by Fludernik (2009) defines narrative as:

“A representation of a possible world in a linguistic and/or visual medium, at whose centre there are one or several protagonists of an anthropomorphic nature who are existentially anchored in a temporal and spatial sense and who (mostly) perform goal-directed actions (action and plot structure)”.

This definition was more relevant to this experiment, as it contains descriptors of the world and talks of one or more characters and the interactions between them in order to meet a final outcome.

What is Narrative in Video Games?

These definitions are still rather traditional, but how do their users apply these concepts in a Serious Game? Dickey (2011), in her research on the impact of narrative in a game-based learning environment, summarises narrative as ubiquitous in human reasoning, allowing humans to assign meaning to their experiences. Polinghorne (1990) suggests humans use narrative not only to frame thought, but also to guide actions. Dickey goes on to say that according to Robinson and Hawpe (1986), narrative is a type of causal thinking in which the narrative (cognitive) schema identifies categories (protagonist, situation, conflict, outcome, etc) and relevant types of relationships (temporal, motivational and procedural). Thinking within a narrative framework requires one to integrate experiences (which do not necessarily occur in narrative form) into a plausible storyline. Dickey suggests that plausibility in a game narrative is established through the interplay between characters, events and the environment. The context and setting, in the form of the narrative “backstory” (described later), establish boundaries of what is plausible by outlining the parameters for what is acceptable within the context of the game. Players make conjectures about overcoming obstacles and their problem solving strategies are based upon what they perceive as plausible within these boundaries. Discovery and trial and error play a role in this process; however, the narrative provides a cognitive framework for problem solving by establishing what is plausible for constructing causal relationships.

Are videogames similar enough to traditional narratives that they should be studied in the same way? To begin, it makes sense to admit that some portions of videogame narratives are exactly like traditional books; the player reads them without interaction, except, perhaps, to turn the ‘page’. Some narrative segments in videogames are exactly like movies; the player watches them without doing anything except pausing and playing. A movie creates a fictional world that one can see and hear, but viewers are locked into a “guided tour” that the filmmakers have scheduled for the viewer, and viewers can never deviate from that tour.

In a videogame on the other hand, the player is presented with a world that can be accessed largely at their own discretion. Holleman suggests videogames that are too linear (much like the guided tours of movies) are often deprecated by critics and gamers. The desire for some amount of freedom within the videogame shows that it is, specifically, this elaborately constructed world which makes videogames not just unique, but also enjoyable. Ultimately, the world of the game is also simply by its nature a narrative element. While narrative in games commonly follows standard forms like the 3-act play structure, games have the luxury and challenge of not having to force a linear path, like books or movies.

Narrative Elements and Structures in Video Games

It helps at this point to break down the elements and structures of narrative normally used in video games. In terms of elements this can be done by looking at the setting, characters and challenge (Holleman).

Setting. The setting is the world (real or imaginary, large or small) in which a game takes place, this is where the fundamental principles of game design and game narrative come together.

Character(s). Characters in a game, as in films and books, are the people (or animals, aliens, etc) that the player usually interacts with. The convention is that the player is usually portraying the character around whom the narrative is centered. Some might argue that books and films are equally good at conveying these experiences if the author or director is sufficiently talented. That argument might be true, but there are two ways in which videogames use character—as a narrative element—in a unique and compelling way. Firstly in a videogame characters can be customized (one can give a character a name, or an avatar an identity). In Massively Multiplayer Online (MMO) games this means the original

developers may only create a limited number of Non-Player Characters (NPCs). Secondly they are ‘useful’ and therefore, as in real life, they are missed if they “die” i.e. one can achieve a challenge if one has assistance, but if the character is dead then this will not happen.

Challenge. The fundamental tenant of a game is challenge (i.e. the need to overcome difficulty in order to achieve a task). It can be difficult in other media (video, books) to express the difficulty and drama of an action when both the viewer or reader and the writers know that all the characters are going to survive because of their actors' real world contracts (this is particularly true in television). But even in that all-must-survive scenario, videogames have no trouble conveying difficulty. Many games kill the main protagonists when the player fails. When the player finally does succeed, after many restarts, they are alive and well but the fearsome power of the enemy is unforgettable.

However, probably the biggest difference between traditional narratives (i.e. films and books vs. videogames) is in the different structures available to game designers by the interactive nature of a game. Again the structure can be broken down into meaningful elements. During this research, four structures, shown visually in figure 1 (Smith 2013) were found to be useful:

- **Linear narrative.** Primarily used in games with a set level structure that the player progresses through, receiving a cut scene between levels.
- **Branching Narrative.** This form provides a new branch for each decision made in the game. Many games developed based on this strategy do so by tying together video clips based on the route the player takes through the narrative. This structure can become very large and complex very quickly, and most players only see a small portion of the content. (Andrews & Baber 2012, 2014).
- **Parallel Narrative Model.** Here the player makes a “choice” that leads them to a new path, although the choice is false as the narrative always eventually brings them back to the same core linear path.
- **Open World Model.** This provides narrative around nodes in an open world. The nodes can be approached at any time, but, depending upon their current skill level, they may or may not open new storylines for the player.

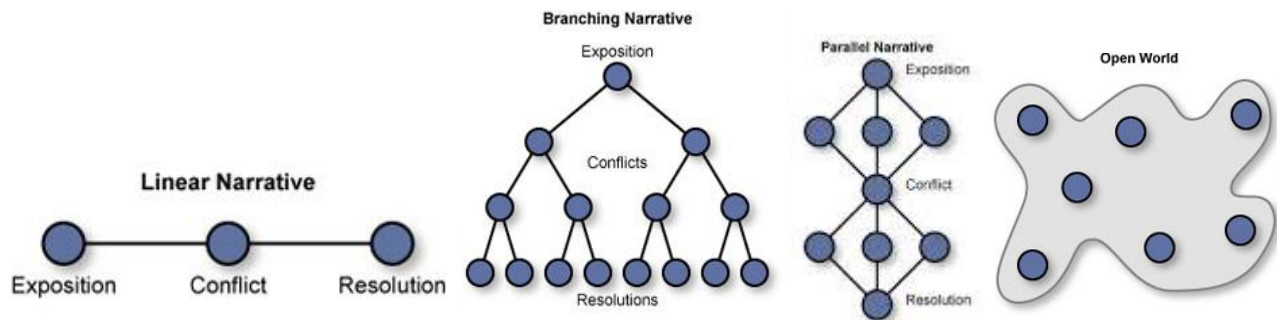


Figure 1. Game Narrative Structures (Smith 2013)

An additional element, especially evident in games, is the backstory. Its purpose is to provide the dramatic context for the game (McIntosh 2010). The backstory may be as simple as a couple of paragraphs on the outside of the product packaging which detail the central conflict and main character, or it may be as complex as a full-action video presented at the beginning of the game, supported with a host of manuals, player guides, maps, and other materials. Backstories are usually short sections of narrative interspersed and revealed during the course of gameplay. They may take many different forms including:

- a radio broadcast,
- a journal entry,
- a story delivered by an NPC, or even
- a full motion video.

The purpose of the backstory is to further the story line, reinforce the mood and tone of game and supply the player with necessary information in order to complete the tasks and objectives. It may also present flashbacks, parallel action, foreshadowing, and cliff-hangers (Crawford 2003; Hancock 2002; Onder 2002).

In entertainment games this backstory is typically presented when a player has completed some action that advances the game play i.e. as a reward, a break in the action, a briefing on the next stage. The backstory may also be used to introduce

new elements, twists, or perspectives to the story. It can also be used as a save/advancement point – guaranteeing that, on restart, the player will restart from this new position.

Instructional Objectives and Game Characteristics

As the present experiment set out to investigate whether or not the delivery of narrative impacts learning when using games, it also helped to understand the relationship between Instructional Objectives and game characteristics. Dickey (2006) suggests that the benefit of integrating narrative into a learning environment is that it provides opportunities for reflection, evaluation, illustration, exemplification, and inquiry (Colne 2003; Eisner 1998). Given that fact, typically narrative plays a more prominent role in role-playing games (RPGs), action games and adventure games than in first-person shooter games, sports games, and racing games. This may be an issue since the most prominent serious game used by the UK MoD (VBS2) is based on a first-person shooter style.

Dr Peter Smith (2013) of the ADL Co-Lab in Florida suggests that the current generation of learning games have come a long way since the early 1980s, but despite the evolution they are still considered subpar by many due to the lack of development guidelines, and underprepared designers. Jacob Habgood (2005) of the University of Nottingham's Learning Science Research Institute agreed, labeling them as "Chocolate-Covered Broccoli" due to their poor marriage of games and learning. His suggestion to solve this is a tighter integration between game mechanics and the learning content - something he describes as Intrinsic Integration. Dr. Robert Hays (2005) shares this view in his game-based research literature review as illustrated in figure 2. Smith goes on to suggest that both Habgood (2005) and Hays understood that, for good learning outcomes to occur, gaming characteristic or features are needed to support instructional objectives completely.

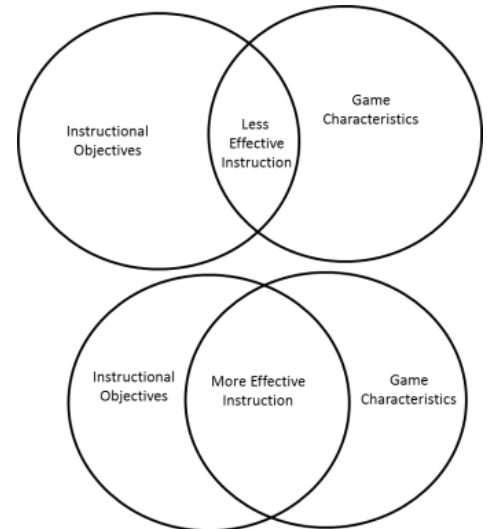


Figure 2. Relationship between Instructional Objectives and Game Characteristics

A Serious Game needs game mechanics that support both gameplay and learning at the same time. Game mechanics are “mechanisms through which players make meaningful choices and arrive at a meaningful play experience.” Salen (2004).

Problems of Narrative in Games

In 2013, whilst speaking at a panel event at the University of South Carolina, film director Steven Spielberg suggested that even games with elaborate cutscenes and interstitials face problems with narrative. He went on to say: “[In a film....] you watch, and you get kind of involved with what the story is, and you hate the bad guy because he murders people in an airport and stuff like that”. But in a game: “all of a sudden it’s time to take the controller”, Spielberg said, “and the second you get the controller something turns off in the heart. And it becomes a sport.”

In a training delivery environment it is important to understand the effect these different elements, structures and challenges have on game design decisions:

1. Which elements can be 'played' (with alternative routes through the story)?
2. Which elements have to be 'fixed' (not only to provide consistency in the experience of the game for different players but also to align with training requirements)?
3. If a game can have different routes, then is it possible that different people might respond differently to the delivery methods and choices available to them?

To that end it made it important to this work to see what research there was on learning styles and any correlation to type of delivery methods (structures etc) that can be reasonably employed in a serious game.

LEARNING STYLES

There is still ongoing debate about the value of learning styles and the effects it may or may not have on how we deliver training, education and teaching to improve learning (Hays 2005; Berns 2013). However even if these differences are small,

or have a minor effect on the way in which we prefer to receive information in order to learn, it may well have an effect on the delivery method of the narrative.

The authors' experience of teaching military students has identified what appear to be different preferences for learning between military students and non-military students. But is this to do with personality or learning style and does it have an impact on the value of narrative? Why is this important? There is evidence to suggest games help learning (Korteling, Helsdingen, Sluimer, Emmerik, & Kappé, 2011), but in many of the practical elements of the teaching the first author is involved in, if one tries to incorporate an element of "fun" into the experience, the students (and military students especially) see it as 'playing' and a waste of time. Normally and quite pointedly some will ask "What was the point of that?", or "You could have just told us that.....".

Hence, as well as evaluating the impact of narrative delivery techniques, the current research set out to investigate if there was merit in investigating any links between learning / personality styles in addition to an appropriate method of delivery. There is certainly much discussion on the merit, applicability and use of the numerous methods for assessing learning styles amongst academics and researchers. A full evaluation was outside the scope of this project. However, based on research team experience and time constraints, the two methods considered for the experiment were the Honey & Mumford Learning Styles Questionnaire (H&M LSQ) (Honey & Mumford 1982) and the Myers-Briggs Type Indicators (MBTI) (Briggs 1998). Both styles suggest similar attributes and learning preferences, as summarised in table 1.

In reviewing the available material on assessment methods Lt Cdr Moraski (USN) (2001) and Maj Garren (US Army) (2005) suggests that four MBTI personality types usually become effective leaders. These are ISTJ, ESTJ, ENTJ, and INTJ (as depicted by the first letter in the MBTI column of table 1) and they account for roughly 78% of middle grade to flag rank officers in the United States military.

It is worth noting that all of these personality types include thinking and judging (TJ). These four types, however, make up only 30% of the general population. MBTI suggests Thinkers and Judgers prefer logically organized presentations and feedback related to their work and well-structured instruction with clearly defined assignments, goals, and milestones. So does freedom of choice, abstract and non-explicit rules and experiential learning deliver the learning styles expected by military personnel and those usually delivered in games and Serious Games? It should be noted that this is based on research of officers and therefore all test subject in this experiment were limited to officers.

Table 1. Comparison of MBTI & HM LSQ

MBTI	LSQ
Extraverts: like activity and group work	Activists: Self discovery, trial and error, working with others, doing rather than thinking and feeling.
Introverts: opportunities for internal processing	
Sensors: concrete learning experiences and clearly defined expectations	Reflectors: Observe & review. All information to analyse
Intuitors: conceptual understanding	
Thinkers: logically organised presentations and feedback related to their work	Theorists: Understand the why and how things fit together, logic and clarity
Judgers: like well-structured instruction with clearly defined assignments, goals and milestones	
Perceivers: choice and flexibility in their assignments and dislike having to observe rigid timelines.	Pragmatists: Put ideas into practice

MBTI is restricted for use by certified MBTI administrators and has an associated cost per assessment, but more significantly for this study it takes more time to complete (approx. 2 hours per student).

Therefore, for the experiments described herein the team chose the H&M LSQ because it is ideal as an initial introduction for people who have not previously given much consideration to how they learn. It is also useful if time is at a premium - the questionnaire takes less time to complete and score. It also helps people stay focused - there are fewer suggestions for action to choose between. The wording is concise and better suited to a more diverse audience. This questionnaire was given to the students at the start of the experiment.

THE EXPERIMENT CONTEXT

The experiment was based around delivery of pre-deployment cultural awareness training, usually given to officers as they lead patrols and interactions with local village elders. This gave a reason for the participants to interact conversationally with characters in the simulation and allowed the team to look at different narrative structures, whilst remaining realistic enough to not require modification to normal military behavior in this environment by the participants.

A United Nations (UN) mission was suggested by the military subject matter expert (SME) support for the study, given that it meant normal doctrine Training and Tactics, Techniques and Procedures (TTP's) could be altered to ensure sufficient abstraction from current operations. In order to achieve that, the following ground rules & assumptions were made:

- Develop a scenario that could confront UK military personnel in the future.
- Ensure that the scenario was sufficiently different from current operations. By doing this, it avoided the need to apply for ethical approval from the MoD Research Ethics Committee (MoDREC).
- Develop a story that, whilst plausible, does not require the use of actual MoD Doctrine of TTPs.

As the experiments were based around a typical style of military lesson, it was important to ensure that the participants would accept the Intended Learning Outcomes (ILO). These were described as the participants having:

- Learned the approved procedures and cultural conventions for operating in country.
- Demonstrated sufficient cultural awareness to be able to lead foot patrols and engage with local civilians.

NARRATIVE DEVELOPMENT PROCESS

As the context of this research is the use of narrative in training, it was decided that the narrative had to be realistic enough to engage the participants. Narrative delivered from the perspective of the learner i.e. the Patrol Commander and person who will interact with local civilians. This required the creation of a Setting (culture and cultural conventions), Characters (both player and non-player) and a Challenge (objective). It also required the development on an initial linear narrative script.

Therefore based on the initial research and taking into account the idea that different people learn in different ways, the team decided on 3 methods of delivery.

- **Passive.** The participant has no active role in the scenario and, very much like a film, the narrative is passed directly to them. We believed this method of delivery would suit Theorists who want to understand and Reflectors who like to observe and review.
- **Semi-Active.** In this method of delivery the participants have limited interaction; they are given cues that have to be followed in order to receive the narrative, and this was thought to support Theorists and Reflectors.
- **Active.** Here the participants are actively involved in the narrative, and the decisions they make will directly affect their path through the scenario. We believed this method of delivery would suit Pragmatists and Activists who like putting ideas into practices and self-discovery, trial and error.

With the experimental aim being to investigate whether or not the method of narrative delivery had a direct impact on the student's ability to learn, using one of three delivery styles described, the narrative delivery method took the form of:

- a paper brief,
- a (military) instructor-led presentation,
- a short paper brief followed by an interactive but predominantly scripted first person simulation scenario, and
- a fully interactive fFP scenario.

All of the participants were then exposed to a similar FP scenario in which they had 20 minutes to achieve the objective of intercepting an insurgent. This gave an experimental construct as shown in figure 3 which also shows an in game representation. At the end of the experiment the participants were given a short questionnaire asking them about their experience.

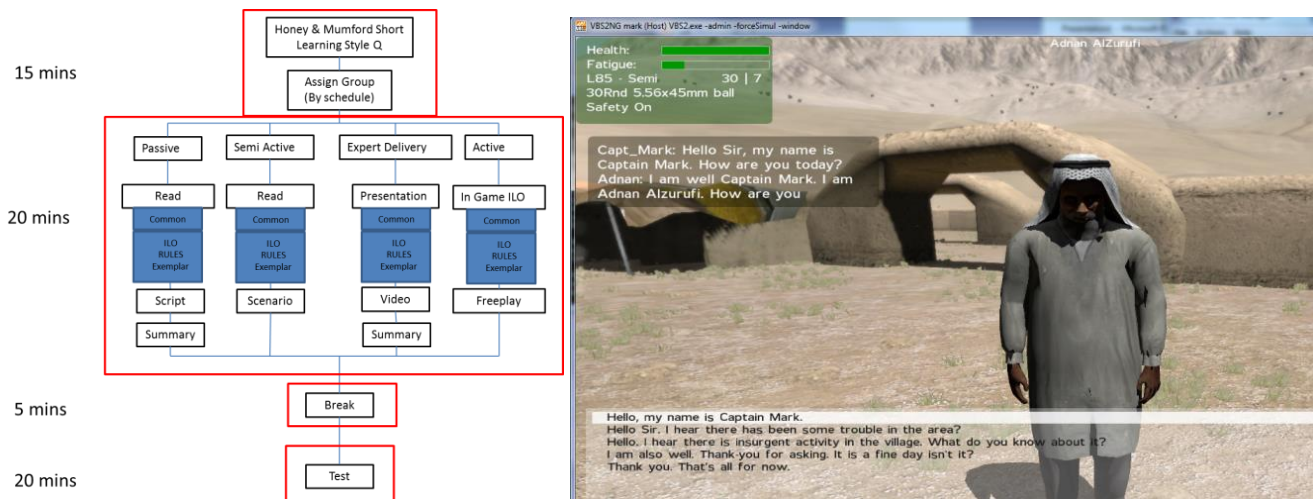


Figure 3. Experiment Construct & In Game Representation

Script Development

Development of the initial script took 2 days in total and involved the authors of this report, a colleague who happens to also be a fiction writer and a military SME. This combination of contributors helped to ensure that, whilst fictitious, the script and scenarios described would be believable by a military audience. The simple linear script was relatively easy to write as it only required a single pathway through the narrative for the patrol commander (this could then be delivered in a conventional manner). In order to develop a more interactive narrative that allowed the player to make mistakes and learn, a branching script had to be developed with rules that the participant could conceivably learn, but also gives them a number of opportunities to recover the situation.

Whilst the first three delivery methods only required a simple linear script to be developed, the Active Delivery method required a branching script that allowed the student some degree of autonomy for choice. This meant developing rules for passage through the script that would lead the participant through the various branches.

Branch script rules

In order to develop the branch script (example shown in figure 4) it was decided that the branch (where used) would have 4 options. This number was chosen based on the idea that Working Memory has a capacity of 4 chunks (Cowan 2001; Gobet 2004). In order to do this, the branch was developed along the lines of the participant being able to ask questions that were:

- **Positive**, this type of question takes the player through the original linear narrative i.e.,
"Hello Sir, my name is Capt Reynolds. Can I ask how you are today"
- **Neutral Positive**, this will cause the player to drop down from the original linear narrative, however they can return to the Positive path within 1 question i.e.
"Hello, my name is Capt Reynolds"
- **Neutral Negative**, this line of questioning will cause the player to drop below the Neutral positive line, they can only return to the Positive path by asking continuous positive questions (normally within 2 questions). A participant can only ask a neutral negative up to 3 times before failing i.e.
"Good day to you Sir, I was wondering if we may ask about the trouble in this area?"
- **Fail**. Automatic failure to follow conventions, NPC will no longer interact with you i.e.
"Hello, we believe you may be able to help us with information regarding the insurgent activity in the area"

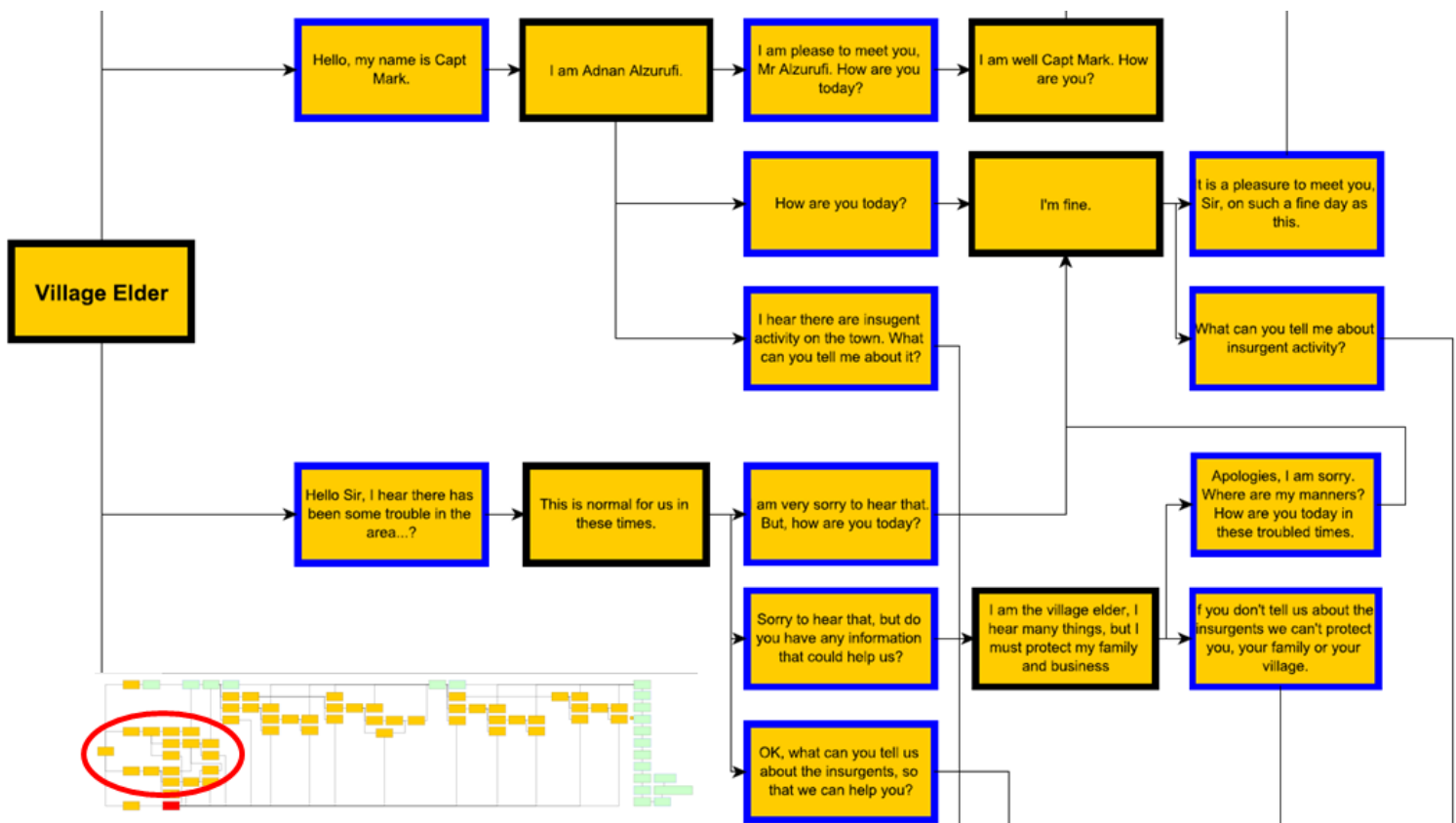


Figure 4. Example Branch Script

ANALYSIS & OBSERVATIONS

The experimental population comprised 28 engineering students for the UK MOD Defence Technical Officer and Engineer Entry Scheme (DTOEES). All the participants were volunteers, and the cohort consisted of individuals from each of the three UK military services (Royal Navy, Army and Royal Air Force) and the Civil Service Engineering Scheme (Government Civilians). Due to time constraints it was not possible to pre-select the delivery method based on results of the LSQ. A post experiment analysis of the participants' backgrounds, gender and learning styles can be summarized as follows:

- **Service.** There seemed to be no obvious effect of Service on performance.
- **Gender.** A balanced distribution by gender would allow for a better comparison. However, there seemed to be no obvious effect of gender on performance.
- **Learning Style.** A more nuanced LSQ could demarcate participants more rigorously, with active assignment of delivery method to learning styles. Although all of the students were engineers, there was no significant individual or combination that stood out as shown in table 2, although the sample size of 28 was possibly too small.

Table 2. Learning Style Comparison

Dimension				
Single	Theorist =3	Pragmatist =2	Activist =1	Reflector = 1
Two	Theorist / Reflector = 6;		Pragmatist / Activist = 3	
Three	Theorist / Pragmatist / Reflector = 5			

One of the three main cultural rules given to the participants in the lesson was that the first thing they had to do was find the village elder and talk to him. If his location wasn't obvious on arrival in the village, then following the cultural introduction they were to ask where he was. Quite deliberately and obviously in the test case a NPC was located on the left hand side of the main road so the participant could achieve this as shown in figure 5.

This NPC was called Zalmi Arenja and shown in bullet 2 of figure 5.

The proportion of participants in each training condition who performed these two initial tasks correctly are detailed in table 3.

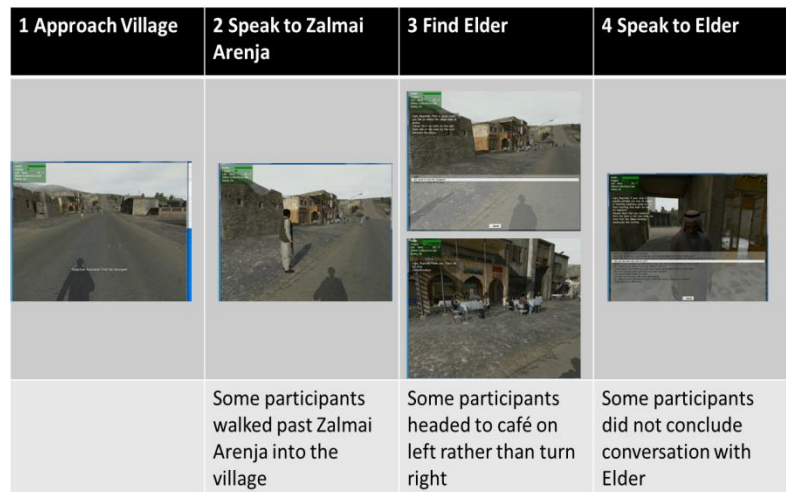


Figure 5. Initial Tasks during Test Game and some recorded outcomes

Similar performance across conditions suggests that the participants approach to these initial tasks might reflect directly on their approach to “playing FPS games”, i.e., rushing to the centre of the village and ignoring important cues en route.

Table 3. Proportion of participants completing initial tasks correctly.

	Speak to Zalmi Arenja	Find Elder immediately	Mean no. Total Qns asked to Village Elder
Active	0.7	0.7	11
Expert	0.6	0.7	11
Passive	0.5	0.8	13
Semi-Active	0.6	0.6	13

While there is not a significant difference in the mean number (11 or 13) of total questions asked to the village elder, it is interesting to note that the Passive and Semi-Active conditions had slightly more questions asked.

From the 10 questions in the post-trial questionnaire the participants responded positively to the experience. There was no significant difference across conditions.

CONCLUSION

The fundamental research issue that underpinned this study was how to explore the role and impact of storyline and narrative in gaming-based transfer of training. As funded by MoD CDE, this work was focused and limited to the initial design and assessment of an experimental method and supporting tools for use in exploring these issues. In other words, to conduct a proof-of-principle scoping study.

The authors believe this preliminary experiment and analysis show that the methodology (albeit with some refinement) is sound enough to conduct further user trials. Refinements already identified include pre-trial experience questionnaires and sorting students by learning preference with appropriate control groups and the use of other narrative delivery methods including short stories and films.

Whilst this element of the research has been completed the authors are continuing to refine the experimental design and are hoping to run a revised set of experiments later in the year learning from this initial trial.

ACKNOWLEDGEMENTS

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REFERENCES

- Andrews, D. Baber, C. et al. (2012). Creating and using interactive narratives: reading and writing branching comics. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, New York, NY, USA, 1703-1712. Retrieved March 15, 2014 from <http://doi.acm.org/10.1145/2207676.2208298>.
- Andrews, D. Baber, C. et al. (2014) Visualizing Interactive Narratives: Employing a Branching Comic to Tell a Story and Show its Readings. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. ACM.
- Berns G. S., et al. (2013) Brain Connectivity, 3(6): 590-600. doi:10.1089/brain.2013.0166.
- Briggs Myers, I., (1998). *Introduction to Type* (6th ed.), Mountain View, CA: CPP, Inc.
- Bruner, J., (1990). *Acts of meaning*, Cambridge, MA: Harvard University Press.
- Conle, C., (2003). An anatomy of narrative curricula. *Educational Researcher*, 32 (3), 3–15.
- Cowan, N., (2001), The magical number 4 in short-term memory: a reconsideration of mental storage capacity, *Behavioural Brain Science*, 24, 87-114;
- Crawford, C., (2003). *Chris Crawford on game design*. Indianapolis, IN: New Riders Publishing.
- Dickey, M. D., (2006). Game design narrative for learning: Appropriating adventure game design narrative devices and techniques for the design of interactive learning environments. *Educational Technology Research and Development*, 54(3), 245–263. <http://link.springer.com/article/10.1007%2Fs11423-006-8806-y>
- Dickey, M. D., (2011). Murder on Grimm Isle: The impact of game narrative design in an educational game-based learning environment. *British Journal of Educational Technology*, 42, 456–469.
- Dstl, (2012) *Novel Systems for Defence Training and Evaluation*. Retrieved March 15 2014 from http://webarchive.nationalarchives.gov.uk/20140410091116/http://www.science.mod.uk/events/event_detail.aspx?eventid=186
- Eisner, E. W., (1998). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. New Jersey: Prentice Hall.
- Fludernik, M., (2009). *An Introduction to Narratology*, Routledge.
- Garren, L. (2005). *Correlation among the Army officer combat identifier, personality, and career satisfaction* (MSc Dissertation). Army Command and General Staff College, Ft Leavenworth, KS., www.dtic.mil/get-tr-doc/pdf?AD=ADA436671
- Gobet, F. Clarkson, G., (2004). Chunks in expert memory: evidence for the magical number four...or is it two?, *Memory*, 12, 732-747.
- Habgood, M., Ainsworth, S., Benford, S., (2005). Endogenous fantasy and learning in digital games. *Simulation & Gaming*, 36(4), 483-498.
- Habgood, J., (2005). Zombie Division: intrinsic integration in digital learning games. *Cognitive Science Research Paper- University of Sussex CSRP*, 576, 45.
- Hays, R. T., (2005). The effectiveness of instructional games: A literature review and discussion, DTIC Document.
- Hancock, H., (2002). Better game design through cutscenes. *Gamasutra*. Retrieved March 15, 2014 from http://www.gamasutra.com/view/feature/131410/better_game_design_through_.php?print=1
- Holleman P, *Narrative In Games*. The Game Design Forum Retrieved March 21, 2014, from http://thegamedesignforum.com/features/narrative_in_games.html
- Honey, P. & Mumford, A., (1982) *Manual of Learning Styles* London: P Honey
- Korteling, J.E, Helsdingen, A.S., Sluimer, R.R., Emmerik, M.L., Kappé, B., (2011). Transfer of Gaming: transfer of training in serious gaming. Report TNO-DV B142, Soesterberg TNO Behavioural and Societal Sciences.
- McIntosh, B., Cohn, R., Grace, C., (2010). Nonlinear Narrative in Games: Theory and Practice. Retrieved March 15, 2014 from http://www.gamecareerguide.com/features/882/nonlinear_narrative_in_games_.php?page=1
- Moraski, J. M., (2001) *Leadership: The Personality Factor* (MSc Dissertation). USMC Command and Staff College, Quantico, VA., <http://www.dtic.mil/dtic/tr/fulltext/u2/a401567.pdf>
- Onder, B., (2002). Storytelling in level-based game design. In F. D. Laramée (Ed.), *Game design perspectives*. (pp. 273–277). Hingham, MA: Charles River Media.
- Polkinghorne, D. E., (1988). *Narrative knowing and the human sciences*, Albany: State University of New York Press.
- Robinson, J. A. & Hawpe, L., (1986). Narrative thinking as a heuristic process. In T. R. Sarbin (Ed.), *Narrative psychology: the storied nature of human conduct* (pp. 3–21). New York: Praeger.
- Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*: The MIT Press.
- Smith, P., (2013) *Transmedia, Flow, and Narrative in Simulations*. *NATO Series Games Lecture Series*.
- Spielberg, S., (2013) Lucas Spielberg Storytelling in Games its not going to be Shakespeare. Retrieved March 21, 2014 from <http://www.theverge.com/2013/6/13/4427444/lucas-spielberg-storytelling-in-games-its-not-going-to-be-shakespeare-usc>