Case Study: Branching Narrative Storytelling to Improve Construction Site Safety Performance

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SUMMARY

This study evaluates the effectiveness of a novel approach often seen in gaming, (branching narrative storytelling) for safety training within the Construction Industry, seeking to determine the impact on safety performance for a Principal Contractor. Branching narrative storytelling is structured in such a manner whereby the audience choose how the story progresses, exploring decision making on the context of construction site situations and challenges. The case study has established that a branching narrative storytelling approach deployed for training in the workplace has achieved an improvement in safety performance through a reduction of falling object incidents.

KEYWORDS

Construction, safety, storytelling

Introduction

The UK Construction Industry is worth over £100bn and employs over 2.4 million people (Rhodes, 2019). The nature of the work is inherently often hazardous (Haslam et al., 2005). The industry remains one of the highest risk industries within the UK where the fatality injury rate is 2.10 per 100,00 workers (HSE, 2023). In the year 2022/23 Construction Industry fatalities were 33% of all work-related fatalities in Great Britain (45 out of 135 number) (HSE, 2023).

The Construction Industry is complex with many different contracting organisations working together for limited periods of time to deliver successful projects. Delivering safety is a significant challenge (HSE, 2019). The temporary nature of arrangements can present a challenge for safety leadership in the consistency of safety management (Stiles et al., 2018a), and for engaging the workforce in safety (Zohar, 2002). Sub-contractor workforce may come from different organisations, often small (5 people or less), and often engaged in specialist work (e.g. working at height, electrical installation etc.). Companies employing fewer than 100 people have a tendency for higher accident rates, indicative of poor safety performance (Vickers et al., 2003). Projects and priorities change during their execution, with contractors leaving and joining, hampering clear management and communication of safety. Subsequently it can be difficult for the Principal Contractor to implement effective interventions due to the mixed messages received by the workforce regarding priorities (Briscoe and Dainty, 2005). This results in variable application of safety processes within pockets of a construction project (Stiles et al., 2012).

Safety performance within the industry has reached a plateau over a number of years despite continued investment in safety. There are anecdotal examples of new safety interventions adopted,

yet there have been very few studies to evaluate the effectiveness of such interventions. This study evaluates the effectiveness of one such intervention, based on storytelling.

Storytelling: What is branching narrative storytelling?

Storytelling is recognised as a powerful communication approach with relevance for the application of safety (McHugh and Klockner, 2020). Linear storytelling is the most common approach but there are others. A branching narrative story is non-linear whereby the audience choose how the story progresses, an approach core to choose your own adventure books, an approach often seen in gaming (Riedl and Young, 2006). The medium Whilst not a new concept, these styles of narratives have received limited empirical attention (Jenkins, 2014).

The main difference between linear and branching narratives is that the later can have multiple endings caused by the different choices made by the audience. For the purposes of this study, the learner first encounters an introductory film clip, and then reaches a decision point. At this decision point, the story then branches off in one of two directions based on the consequences of the learner's decision.

Studies have found that branching narratives are enjoyable to engage with, which subsequently makes individuals more willing to receive the information and more likely to continue engaging with the narrative (Moyer-Guse and Nabi, 2010). Reported benefits and the relevance of these for safety applications are summarised in Table 1.

Table:1 Benefits of interactive (branching) narratives in relation to safety

Benefits of interactive narratives	**Reference**	**Relevance to safety**
Increased learner engagement	Green and Brock (2000)	Engagement increases retention of information, increased recall of safety related messages, and motivates positive attitudes which are needed for individual safety.
Better knowledge retention from experiential and participative approach	Hand and Varan (2008)	
Emotional connection with story learning outcomes	Hand and Varan (2008); Green and Brock (2000)	Raises awareness around the personal consequences of unsafe behaviour. Increases memory and recall of the story for a longer time.
Opportunity for counterfactuals i.e. imagining what could have happened	Kahneman and Miller (1986); Roese and Hur (1997)	
Immediate feedback around decisions and consequences	Cho, Shen and Wilson (2012)	
Character identification	Tal-Or and Cohen (2010)	Alignment with characters for ongoing decision making with better safety outcomes.
Behavioural and attitudinal change	Singhal and Rogers (1999); Cohen (2001)	Greater sense of responsibility and ownership for personal action/lack of action in relation to safety in workplace situations.

Counterfactuals are imagined alternatives to reality, or a mental simulation of 'what could have gone wrong' which is important to safety; where greater understanding of the scenarios that have potential to cause harm and the consequences of personal action/lack of action is a cornerstone of

risk perception. Kahneman and Miller (1986) found that counterfactual thinking can amplify the emotional response to an event, again an important factor with risk perception. Counterfactual thinking is more common with negative outcomes (Roese and Hur, 1997), which could be especially effective when a learner makes a choice that leads to a negative safety outcome for a character within the story.
There have been some studies into interactive (branching) narratives within a healthcare setting. These studies have found that where individuals can identify with characters and align their personal goals with the characters goals, it contributed to attitudinal and behavioural change (Cohen 2001). Identification has also been linked to changes in decision making. Generally, when the learner can project themselves into the story or when they feel they understand the character, making decisions on the actions that they would make in the same situation. This has been found to lead to attitudinal change (Cho, Shen, and Wilson 2012) likely due to the increased sense of responsibility for story outcomes based on personal choices/decisions within the story.

With a greater understanding of the reported benefits associated with branching narrative storytelling, it was considered appropriate to apply these principles beyond entertainment and gaming into a workplace setting. Therefore, taking a branching narrative approach to safety training provides opportunity to adopt an established method of engagement into the workplace, especially where training objectives are to explore personal and group choices for specific risk scenarios.

Case Study: A Branching Narrative Storytelling Training Intervention

A case study approach was taken for the trial of the training intervention with one Principal Contractor from within the Construction Industry. The Principal Contractor organisation turns over £1.3 billion per year and employs 4051 people, further extended by the supply chain organisations. Their safety performance is above industry average with an accident frequency rate of 0.06. Following a review of accident data the Principal Contractor identified that falling objects were found to pose a significant risk to the business. This is no surprise as the latest statistics identify the number of fatal injuries caused from people being struck my moving objects (including objects falling from height) is 20% of all fatal accidents (HSE, 2023).

The organisation recognised the need to identify an innovative solution that would attract greater levels of engagement and deliver lasting behavioural change concerning the prevention of falling objects, ultimately to achieve improve safety performance. The Principal Contractor commissioned the development of the ‘Choose the Safe Path™’ training intervention through a specialist health and safety consultancy.

Methodology for development of branching narrative storytelling resources

The content of the training programme was developed by Gateway Consultants (HSW) Ltd. Gateway produced a short film based on a branching narrative approach. This takes a single videobased scenario and examines the multiple decision points preceding an incident (or a non-incident if all the correct choices are made). The whole story was made up of a total of 17 film clips/scenes and 6 decision points. However, as a learner attending the training, they would follow a specific pathway of choice and therefore view 8 film clips and participate in 4 decision points on their journey through the story. Figure 1 shows the branching narrative elements and the flow between the 17 video clips and the decision points through the story.

The content for each scene was developed by Gateway (experienced working within construction sector) with consultation from the Principal Contractor team, into a storyboard. The films were produced from the storyboard, with filming undertaken on one of the Principal Contractors active construction projects.

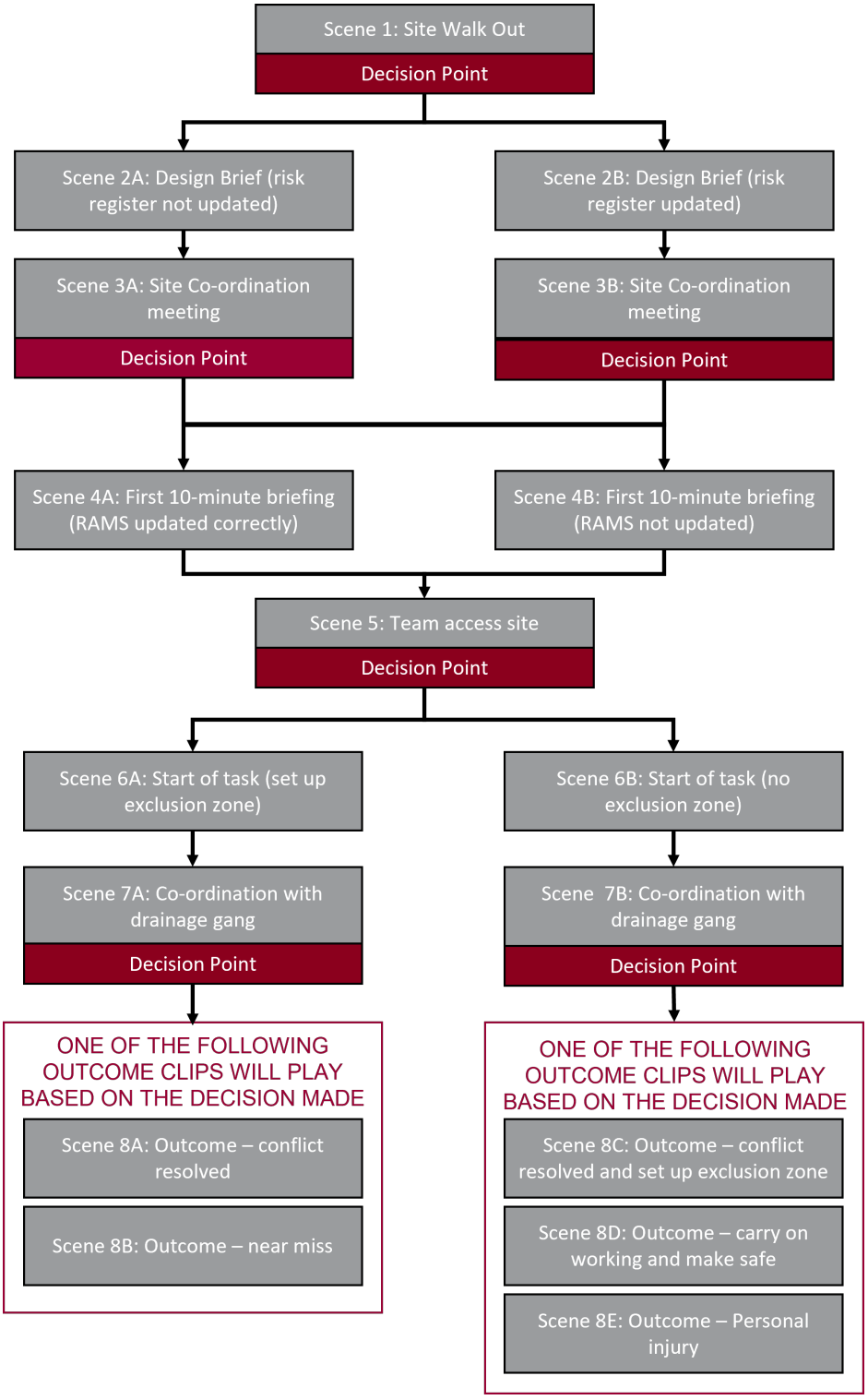

Figure 1: Overview of the branching narrative for the falling objects storyline.

Once the film was produced further development work was needed to provide access to the facilitator team to the training resources. Gateway designed a web-based platform where the training resources were hosted. The resources that were provided included:

- 17 video clips played via a specific software to enable the decision points and chosen pathway through the story.

- Access to play (and replay) the interactive video – video optimisation streaming content.
- Access to a video-based tutorial for facilitators (how to use the training platform).
- Facility to record attendance at training sessions.
- Supporting materials available to utilise and download for activities within specific briefing sessions e.g. true or false quiz.
- Access to knowledge-based assessment for comprehension check of learners post training.
- QR code collated feedback on the training delivery and training experience.
- Access to analytics and reports of usage of the training in real time.

The design of the training platform was to provide a 'one-stop-shop' for the facilitators, making it easy for them to deliver the training, as well as providing an intervention to achieve enhanced audience engagement and interaction. Once the training platform was produced, secure access was given to facilitators to utilise the training content across their construction projects.

Methodology for delivering branching narrative storytelling as a training intervention

The training session was delivered by the health and safety advisors/managers from the Principal Contractor across their construction projects (where there was a risk from falling objects identified). This was co-ordinated by the Principal Contractor. Each session was scheduled to last up to one hour duration. The structure of each session is listed below.

- Welcome and introduction
- Play falling objects film and promote decision and identified decision points
- Open discussion on outcomes of the story
- If negative outcomes, revisit the film to identify opportunities for making different choices
- Summarise key learning points
- Learners' complete knowledge comprehension check on prevention of falling objects
- Learners provide training course feedback

The facilitator would utilise the training platform to support the delivery of the training session.

Results

The training was launched in January 2022. A total of 56 individuals were enrolled on the training platform to carry out the training sessions across their projects. Table 2 shows the number of sessions held over a two-year period between January 2022 and December 2023. The first year saw a higher number of sessions delivered with a reduction of sessions in year two, which the Principal Contractor anticipated due to many of the target audience already having received the training in year one. The continuation of the training is required to meet the ongoing changes of subcontractors engaged to work on individual projects.

Table 2: Number of training sessions delivered

Year	**2022**	**2023**	**Total**
Number of sessions held	100	15	115
Number of learners attending training session	678	106	784

In 2021 the company had 21 incidents relating to falling objects. The training intervention was adopted throughout 2022 and by the end of 2022 the number of falling object incidents had reduced to 12. Over the 12-month period the company identified a 57% reduction of incident numbers following the deployment of this approach. This continued in 2023 with the same number of

incidents involving falling objects – 12 – maintain the reduction of falling object incidents since 2021.

Comprehension Checks

At the end of the training session questions were asked to gauge the level of understanding of the key elements of Company's Prevention of Falling Objects Guidance document. The data shows that the majority of attendees provided correct answers to the comprehension questions at the end of the session, indicating of the effectiveness of this type of training solution.

Learner Feedback

Attendees provided feedback following each training session. The learners were asked to rate the training they had received. In response to the question "Would you recommend the training to others?" the feedback was 95% yes, and 5% maybe. Figure 2 shows learner feedback from across all sessions held in 2022 and 2023.

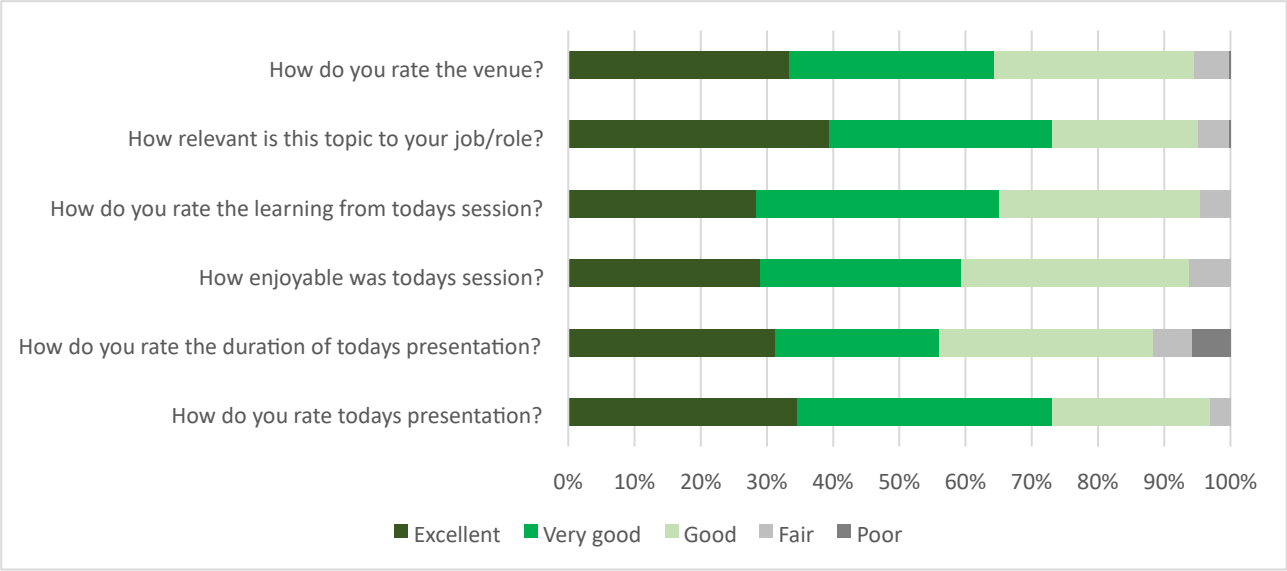

Figure 2: Learner feedback from training sessions

Engagement was strong from the very beginning with learners showing a keen interest and participation throughout. An example of comments received from learners in response to the question 'what are the most useful things that you have learned?' are listed below.

"Good to see the different ways people understand the risks and think it apt to manage/control them."

"That there are a number of opportunities to make a right decision to prevent a dangerous outcome."

"Always consider the outcome of unforeseen situations that may arise due to management of change."

"How the video can be a powerful tool in explaining the dangers associated with working at height. It conveys a more relatable scenario to operatives that just explaining it without a visual aid."

"Good use of visual representations allowing for participation for all levels." **Discussion**

This study has taken a branching narrative storytelling approach and deployed this within the construction sector focused on improving safety awareness to prevent falling objects. The study has

found that learners report positively post training about their learning experience. Learners rated the learning from the training session as 95% good to excellent (28% excellent, 37% very good and 30% good). This aligns to studies in other sectors which found that when individuals are involved in decision making and actively see the outcomes of their decisions as they are played out, benefits include increased levels of engagement (Moyer-Guse and Nabi, 2010, Green and Brock, 2000) and emotional connection (Hand and Varan, 2008, Green and Brock, 2000).

The study also found that understanding of key messages from within the training was high with the majority of learners getting correct answers to the knowledge comprehension questions completed at the end of the training session. This finding complements other studies (Hand and Varan, 2008) that report better knowledge retention from an experiential and participative approach to training delivery. It would be worthwhile exploring in further studies to determine the longevity of the knowledge retention and whether there is a fade over time. Further studies could follow up with learners to assess the longer-term retention rates for specific periods of time post attendance at the training session.

The importance of counterfactuals was recognised by learners in their person feedback statements where they identify the importance of a chain of events which may (or may not) lead to harm or hazardous situations occurring. The importance of character identification was also evident with comments such as "*Ensuring I don't pass time pressures on to my supervisors, manage change at source and ensure time is given to planning and review"*.

The impact of this training intervention on safety statistics was also positive with a 57% reduction of falling object incidents between 1-24 months following the deployment of the training intervention. This data indicates that the branching narrative approach included within a facilitated training session can contribute to improvements in safety performance assessed by a reduction in incidents.

Conclusions

It is concluded that branching narrative storytelling can be deployed to make positive improvements for safety performance. Whilst this has been deployed within a construction company, the benefits form this approach could extend to other industries. This is a single case study and therefore it is recommended for further studies to be undertaken to evaluate the impacts from taking a film-based branching narrative storytelling approach, adopting transferable learning from the gaming sector.

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