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The Effect of Storytelling on Emotionalisation and Memorisation of E-learning Content in Adult Education

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This study addresses a research gap in adult education by employing a multi-method design to investigate the effect of storytelling on emotionalisation and memorisation. In a between-subjects experimental design ($N = 36$ working-age adults), an e-learning lesson on data protection was provided under two conditions, including either storytelling content or non-storytelling content. Emotionalisation was assessed using skin conductance response (SCR) and facial expression analysis (FEA), while memorisation was evaluated via free recall and recognition tests, complemented by perceived learning difficulty and situational interest. The storytelling group demonstrated significantly higher free recall of details but lower free recall of the topics themselves. Perceived learning difficulty was significantly lower in the storytelling group. While storytelling elicited less intense physiological arousal, there was a tendency towards more positive emotional valence and greater emotional expression in the storytelling condition, particularly with longer stimuli. These findings suggest that, in adult e-learning, storytelling specifically improves episodic memory and perceived learning difficulty, rather than general recall, especially for longer content.

Keywords: storytelling, e-learning, personnel development, organisational learning, psychophysiological measurement

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Vpliv pripovedovanja zgodb na čustveno vživljanje in zapomnitev vsebin spletnega učenja v izobraževanju odraslih

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Ta študija zapolnjuje raziskovalno vrzel v izobraževanju odraslih z uporabo pristopa več metod za preučevanje vpliva pripovedovanja zgodb na čustveno vživljanje in zapomnitev. V medsubjektnem eksperimentalnem načrtu (N = 36 odraslih v delovni starosti) smo izpeljali spletno učno uro o varstvu podatkov v dveh različnih primerih okoliščin: z vsebino, ki vključuje pripovedovanje zgodb oziroma brez nje. Čustveno vživljanje je bilo ocenjeno z merjenjem kožne prevodnosti in analizo izraza obraza, medtem ko je bila zapomnitev ocenjena s testi prostega priklica in prepoznavanja, dopolnjenimi z zaznano težavnostjo učenja in s situacijskim zanimanjem. Pri sodelujočih v skupini s pripovedovanjem zgodb se je pokazal znatno višji prosti priklic podrobnosti, vendar nižji prosti priklic samih tem. Zaznana težavnost učenja je bila v skupini s pripovedovanjem zgodb znatno nižja. Čeprav je pripovedovanje zgodb povzročilo manj intenzivno fiziološko vzdraženost, je bila ob pripovedovanju zgodb opazna težnja k pozitivnejši čustveni valenci in večjemu čustvenemu izražanju, zlasti pri daljših dražljajih. Ti izsledki kažejo, da pri spletnem učenju odraslih pripovedovanje zgodb izboljša predvsem epizodni spomin in zaznano težavnost učenja, ne pa splošnega priklica, še posebej pri daljših vsebinah.

Ključne besede: pripovedovanje zgodb, spletno učenje, razvoj strokovnih delavcev, organizacijsko učenje, psihofiziološko merjenje

Introduction

Krieger et al. (2020) note that the amount of information in continuing vocational training has increased while information has simultaneously become more accessible. At the same time, accumulated knowledge has a short shelf life, creating a growing need for solutions that facilitate continuous learning. E-learning represents one possible response to this challenge.

The primary objective of corporate e-learning is to improve employees' job performance (Angelis, 2017). Recent reports (e.g., LinkedIn, 2025) confirm the importance of continuous learning for employee development, aligning with the view of lifelong learning as a core human capability (Mallon et al., 2024).

Learning can be understood as the interaction of information processing and storage. Schnotz and Kürschner (2007) distinguish between comprehension in working memory and memory as the storage of information in long-term memory, with retrieval playing a crucial role in activating stored knowledge during learning processes. Aligned with Sangrà et al. (2012), this study defines e-learning as technology-supported instruction, encompassing both electronic media use (Rey, 2009) and digital support for learning processes (Ehlers, 2011). Industry reports indicate that e-learning, particularly blended learning and microlearning, is increasingly prioritised for internal skills development, with over 80% of companies in the German-speaking market utilising digital platforms (mmb, 2024; Siepmann, 2023a, 2023b).

Story and Storytelling

Although the term '*narrative*' is also commonly used, in business contexts it is more frequently referred to as '*storytelling*'. Norlyk et al. (2014, p. 106) define storytelling in a business context as "the conscious attempt to produce, promote or change a story". Similarly, Ettl-Huber (2014) conceptualises storytelling in organisational settings as the deliberate use of stories to achieve specific communication goals. Both definitions emphasise the intentional and goal-oriented use of stories, which is particularly relevant in educational and organisational contexts.

Since research often evaluates non-narrative stimuli, the definition of 'story' (the result of storytelling) is particularly relevant. It is defined as a chronological sequence of causally linked events involving a change of state (Martínez & Scheffel, 2019; Prince, 1973).

This study analyses stimuli based on four core narrative elements: theme, plot, characters, and staging. The theme represents the fundamental

idea underlying a storytelling text (Lahn & Meister, 2016). The plot connects events through causal relations, as illustrated by Forster's (1927, p. 130) example: "The king died, and then the queen died of grief". Characters function as carriers of action and meaning within the plot (Fludernik, 2013; Lahn & Meister, 2016). Staging translates the plot into space and time, with temporal structures shaping the order, duration and pace of events (Lahn & Meister, 2016). These elements provide the analytical framework for examining storytelling-based e-learning content in the present study.

E-learning and Storytelling

Storytelling is frequently cited as a knowledge transfer method in corporate learning contexts, alongside formats such as process descriptions, best practices and checklists (Graf et al., 2017). Previous research suggests that storytelling can support knowledge transfer and competence development within organisations, for example by enriching information security e-learning with narrative elements (Arsenijević et al., 2016). However, calls for more systematic research into the effectiveness of storytelling in e-learning have already been articulated (Caminotti & Gray, 2012).

Storytelling can positively affect recipient interest and engagement across diverse fields. In educational settings, students report higher situational interest with narrative texts (Arya & Maul, 2012; Golke & Wittwer, 2024). These benefits extend to journalism (Ameseder, 2019), science journalism (Ameseder et al., 2025), and science communication (Norris et al., 2005), where storytelling elicits greater situational interest than non-narrative structures. Consequently, storytelling demonstrates strong potential for capturing attention and fostering initial engagement with content.

Empirical findings on cognitive processing remain mixed, as increased interest does not always translate into improved learning outcomes. Some evidence suggests storytelling enhances comprehension in learning software applications (Darejeh et al., 2021), primary school education (Browning & Hohenstein, 2013), and science journalism (Ameseder et al., 2025). Additionally, Frey's (2014) overview article indicates that narrative formats can reduce perceived difficulty by making content easier to imagine.

Conversely, other research challenges these benefits. Studies with university students from different study programs found that narratives provided no comprehension advantage and could lead to overestimating understanding (Golke et al., 2019). In health education, non-storytelling texts led to greater knowledge gain (Zebregs et al., 2015), and in adventure games, strong

storytelling elements did not improve learning outcomes (Adams et al., 2012).

While storytelling effectively fosters interest and shapes attitudes, its effects on learning outcomes remain inconsistent. Therefore, examining the mechanisms of narrative involvement in adult education –specifically emotionalisation and memorisation –is essential.

Effects of Storytelling on Emotionalisation and Memorisation

From a theoretical perspective, emotionalisation represents a promising starting point, as emotions are closely linked to narrative processing and may facilitate subsequent cognitive outcomes such as memorisation.

Accordingly, van Krieken et al. (2015) showed that participants who read a storytelling newspaper article about a crime felt emotionally closer to the event and more strongly immersed in the situation. Similarly, Morris et al. (2019) demonstrated that presenting environmental contributions in the form of a story generated higher emotional arousal and increased motivation to engage in pro-environmental behaviour. Voutilainen et al. (2014) found that ambivalent stories aroused their participants more than sad or funny stories. These findings suggest that storytelling has a strong potential to evoke emotional responses and foster narrative involvement.

However, Frey (2014) identified only a few studies explicitly addressing emotionalisation, with emotional responses typically measured via self-report after exposure. Similarly, only 14 out of 107 studies in the meta-analysis by Ettl-Huber et al. (2019) examined emotionalisation. This indicates a lack of research on the role of emotionalisation in storytelling research in learning contexts.

In learning research, emotions are viewed not as isolated outcomes but as facilitating factors influencing other learning dimensions. Hascher and Brandenberger (2018) describe emotions as carriers affecting processes such as interest, comprehension and memorisation. Accordingly, situational interest is considered a sub-process of emotionalisation. Meta-analytic evidence suggests that emotional design can positively impact retention, comprehension and transfer (Brom et al., 2018). However, emotional effects induced solely through design features (e.g., extensive use of colours) do not consistently support learning and may even be detrimental (Guo et al., 2022). Endres et al. (2024) found that emotional audiovisual design in instructional videos hindered sustained learning when not embedded in a narrative frame.

The successive and interrelated organisation of events in narrative structures enables recipients to emotionally engage with characters, situations and developments (Avraamidou & Osborne, 2009). Breithaupt (2022) distinguishes

between two phases of memorisation: a reception phase, in which the core emotion of a story is condensed, and a reproduction phase, in which emotions serve as anchors for reconstructing content. Emotionalisation may therefore support memorisation by structuring and stabilising memory representations.

Thus, memorisation can be understood as a downstream outcome of emotionalised learning processes. Storytelling may also facilitate the recall, as one event readily activates the next in memory (Ogborn et al., 1996). Empirical evidence strongly supports its benefits for memory performance. In a meta-analysis of 93 studies, Mar et al. (2021) found higher memorisation and comprehension for narrative formats than for expository texts. Likewise, Machill et al. (2007) demonstrated improved retention when television news was presented in a narrative structure, while Norris et al. (2005) found that storytelling enhanced recall and comprehensibility of scientific content. Negrete (2002) reported that scientific information was more likely to be remembered when central to the story's development. Similarly, Ginting et al. (2024) found significantly higher knowledge retention among students exposed to videos narrated in a storytelling style, while Noorshadi et al. (2025) reported higher learning outcomes for digital storytelling formats, independent of demographic factors.

However, the effects of storytelling on memorisation are not uniform and depend on individual and contextual factors. Wolfe and Mienko (2007) found that prior knowledge moderated learning outcomes: participants with intermediate prior knowledge benefited most from storytelling texts, whereas those with higher prior knowledge showed better recall with expository texts. This aligns with the so-called expertise reversal effect, whereby instructional formats affect learners differently depending on expertise (Sweller et al., 2011). Wolfe and Woodwyk (2010) found that readers of expository texts utilised relevant prior knowledge more extensively and recalled more content than readers of storytelling texts, despite forming weaker text-base representations. Additionally, some studies (e.g., Adams et al., 2012; Golke et al., 2019) do not support the general conclusion that storytelling improves learning performance in general. These findings highlight the need for a differentiated examination of memorisation effects.

As memorisation is a central objective of personnel development and adult education, it serves as a key outcome variable in this study. Emotions may facilitate learning processes (Frenzel et al., 2020). Accordingly, emotionalisation is examined as a central mechanism through which storytelling may influence memorisation of e-learning content. Additionally, situational interest and perceived learning difficulty are considered closely related aspects of narrative involvement.

Research Problem, Research Question and Hypotheses

The research question of this study is: *What effect does storytelling have on the emotionalisation and memorisation of e-learning content in adult education?* This question addresses the research gap in adult education regarding the emotional impact of storytelling and the mixed findings on memorisation.

Emotions can be conceptualised along the dimensions of arousal and valence (Posner et al., 2005), which is why two hypotheses concerning emotions were developed. In addition, two hypotheses address memorisation and its relationship with emotionalisation. Finally, two dimensions of narrative involvement (perceived learning difficulty and situational interest) are included as exploratory factors to facilitate interpretation of the primary factors.

H_1: *E-learning content with storytelling leads to significantly higher arousal than e-learning content without storytelling.*

H_2: *E-learning content with storytelling leads to significantly more positive emotional valence than e-learning content without storytelling.*

H_3: *Learners memorise significantly more information from e-learning content with storytelling than from e-learning content without storytelling.*

H_4: *There is a significant positive correlation between emotionalisation and memorisation.*

H_5: *Perceived learning difficulty is significantly lower in e-learning courses with storytelling than in courses without storytelling.*

H_6: *Situational interest is significantly higher in e-learning courses with storytelling than in courses without storytelling.*

Method

An experimental setting with a between-subjects design with one factor (lesson style: storytelling vs. non-storytelling) was chosen to answer the research question.

Participants

A sample of 36 working-age adults (M_{age} = 36.58, SD = 11.83; 20 male, 16 female) was recruited from the second author's social network in Austria. Participants were balanced across groups by educational level (Nine participants in the storytelling group and 10 in the non-storytelling group had a bachelor's degree or less).

Instruments

Since impact research in the context of storytelling is mainly based on self-reports, the present study combines psychophysiological measures, memory tests, and a short questionnaire.

Emotionalisation

While skin conductance is an indicator of sympathetic arousal (Caruelle et al., 2019), facial expressions can indicate the valence of emotions (Höfling et al., 2020).

Arousal was measured via *skin conductance response* (SCR) using a Shimmer 3 "GSR device" and the iMotions software (v10.0). Data related to the SCRs (frequency, duration, and amplitude) were extracted using the built-in algorithm ("GSR Peak Detection").

Emotional valence and expressivity were assessed via *facial expression analysis* (FEA) using the webcam data (1280 × 720 pixels) and the iMotions AFFDEX toolkit (v5.1). The threshold for categorising emotions as present or absent was set at 30. The percentage of time that neutral, positive and negative emotions were expressed, was analysed.

Both systems have demonstrated reliability and validity (Fortune et al., 2020; Kulke et al., 2020). Construct validity is supported as SCR reflects sympathetic arousal (Caruelle et al., 2019) and FEA captures emotional valence (Höfling et al., 2020). Additionally, reliability was ensured through standardised electrode placement and controlled recording conditions.

Memorisation

Memorisation included oral free recall (retrieval) and written recognition (encoding) (Lang, 2006). Free recall was scored with a predefined rubric covering main topics, subtopics, and details, ensuring content validity based on course objectives. Three scores were calculated: (1) sum of recalled main topics plus recalled subtopics (max. 10 points); (2) sum of recalled details (max. 14 points); (3) sum of total recall (max. 24 points). One point was awarded for each topic or detailed information (partially) recalled. Face validity was ensured by using an open-ended question that reflects real-world memory retrieval.

Recognition was measured with three multiple-choice items, each corresponding to one of the three main course topics. Item difficulty and discrimination indicated acceptable reliability for a small heterogeneous set (see Table 1). Content validity was ensured by designing items to cover all major topics, based on course objectives and expert review.

Construct validity of both measures was supported by theoretical rationale: free recall measures retrieval processes, while recognition indicates encoding (Lang, 2006).

Table 1

Item difficulty and discrimination indices of multiple-choice items

Topic	Item difficulty			Discrimination index		
	Total	Narrative	Inverted	Total (*N* = 36)	Narrative (*N* = 18)	Inverted (*N* = 18)
1	.87	.83	.90	.25	.19	.34
2	.81	.74	.87	.30	.29	.47
3	.90	.96	.84	.16	.19	.54

Note. Discrimination index = point-biserial correlation

Perceived Learning Difficulty and Situational Interest

Perceived learning difficulty and situational interest were measured as cognitive-emotional dimensions of narrative involvement using single-item scales to minimise respondent burden. Perceived learning difficulty was assessed with a single 5-point item adapted from Schmeck et al. (2015), asking how easy it was to learn from the e-learning course (reverse-coded). Single-item scales have demonstrated construct validity in differentiating cognitive load and instructional demands (Schuessler et al., 2025; Sweller et al., 2011). Situational interest was measured with a 4-point item asking how interested participants were during the e-learning course. Both items show high face validity and directly align with the intended constructs. Construct validity was supported by corrected item-total correlations against multi-item scales (Ameseder et al., 2025): $r(459) = .72$, $p < .01$ (perceived task difficulty) and $r(459) = .76$, $p < .01$ (situational interest).

Finally, demographic data (age, gender, and highest level of education) were collected.

Procedure

A pre-test with participants who were not included in the final sample was conducted in advance to ensure the comprehensibility of the items and smooth running of the procedure. During the actual data collection phase, participants were briefed on the procedure (blinded to the storytelling focus) and assigned to groups via parallelisation for age and gender. Psychophysiological

measurements were recorded throughout the e-learning phase.

The lesson contained only visual and textual elements on the topic of data protection. It was developed specifically for this study by the authors in ovos play (ovos media gmbh; https://ovosplay.com) based on information from anddata.de. As visual and textual materials are easier and less expensive to produce than audio or video materials, it was considered expedient to use these forms in this study to ensure ecological validity. The lesson covered three sub-topics with short stimuli (health data, banking secrecy and communication data; 36–45 words), and four sub-topics with long stimuli (personal data, data access, data storage and data destruction; 82–199 words). See Figure 1 for a stimulus example.

Figure 1

Example of storytelling (left) and non-storytelling stimuli (right)

Note. Original in German; English translation by the authors.

The core message, length, arguments, and conclusions were identical across both stimulus versions, and the LIX readability index (Björnsson, 1983) was harmonized.

Participants were assigned to either a storytelling or non-storytelling group and completed the self-paced e-learning phase (maximum 10 minutes). They then filled out a questionnaire, followed by an oral free recall test, a recognition test, and demographic questions, before providing informed consent and being debriefed.

Data Analysis

Data from participants with no SCRs across the entire e-learning content (9) were considered a measurement error and excluded solely from arousal analysis.

Following Kolmogorov-Smirnov normality checks, data were analysed in IBM SPSS (v 29.0.0.0) using t-tests or Mann-Whitney U tests, with medians (*Mdn*) and mean ranks (M_{Rank}) reported for non-parametric comparisons.

All FEA data, the self-reported data, the free recall scores of the main topics and the recognition test scores were not normally distributed. However, the free recall scores of the sub-topics and the total recall score could be assumed to be normally distributed. See Table 2 for the SCR data.

Table 2

Results of Kolmogorov-Smirnov tests for SCR data

Measure	Total course	Short stimuli	Long stimuli
SCRs per minute	> .05	< .05	> .05
SCR amplitude	> .05	> .05	< .05
SCR duration	< .05	> .05	< .05

Note. The smaller *p*-value from each of the two groups is reported.

Effect size Cohen's *d* was calculated for t-tests, and *r* for Mann-Whitney U tests. Results were interpreted according to Cohen (1988).

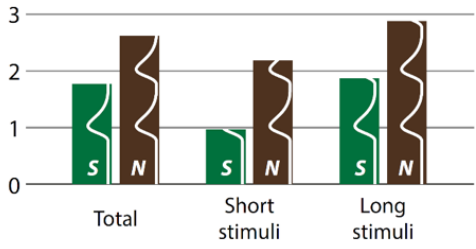
Results

Emotionalisation

SCRs per minute, which indicate arousal, were lower in the storytelling condition, although the difference was not statistically significant, $t(20.26) = -1.15$, $p = .26$. Similarly, there was no significant difference when focusing only on short stimuli ($U = 102.00$, $p = .62$) or on long stimuli ($t(19.23) = -1.14$, $p = .27$). However, the small effect sizes suggest a tendency in the opposite direction to that hypothesised ($d = -.43$, 95% CI [-1.20, .33] for total e-learning content; $r = .10$ for short stimuli; $d = -.43$, 95% CI [-1.19, .34] for long stimuli). See Table 3 and Figure 2 for details.

Figure 2

SCRs per minute compared by groups



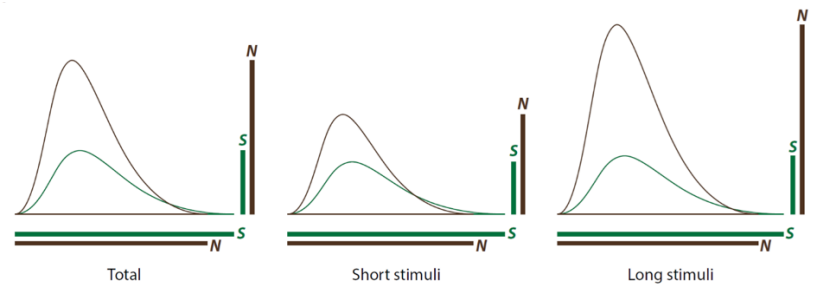
Note. Storytelling (*S*) in green, non-storytelling (*N*) in brown. For total and long stimuli, the mean is reported, for short stimuli, the median is reported.

There was also no significant difference between the average *SCR duration* in the storytelling and the non-storytelling conditions, $U = 77.00$, $p = .52$. Similarly, there was no significant difference when considering only the short or the long stimuli, $t(18) = 1.55$, $p = .14$, and $U = 60.00$, $p = .35$, respectively. Small effect sizes for total e-learning content ($r = -.13$) and for the long stimuli ($r = -.20$) and an intermediate effect size for small stimuli ($d = .69$, 95% CI [-.22, 1.59]) indicate a trend in the hypothesised direction. In the storytelling group, SCRs tended to last longer. See Table 3 and Figure 3 for details.

The mean *SCR amplitude* was significantly lower in the storytelling group than in the non-storytelling group, $t(14.19) = -2.57$, $p = .02$. Similar results were found for the short stimuli, although this difference was not significant, $t(9.38) = -1.70$, $p = .12$, and for the long stimuli, where the difference approached significance, $U = 113.00$, $p = .06$. Intermediate effect sizes for short stimuli ($d = -.76$, 95% CI [-1.66, .16]) and long stimuli ($r = .38$) and a large effect size for total e-learning content ($d = -.95$, 95% CI [-1.75, -.15]) suggest an effect in the opposite direction to that hypothesised. When participants in the storytelling group were aroused, it tended to be less intense than when participants in the non-storytelling group were aroused. See Table 3 and Figure 3 for details.

Figure 3

SCR duration and amplitude by group



Note. Storytelling (*S*) in green, non-storytelling (*N*) in brown; SCR duration: median for total and long stimuli, mean for short stimuli; SCR amplitude: median for long stimuli, mean for total and short stimuli

Table 3

SCR frequency, duration, and amplitude

	Total	Short stimuli	Long stimuli
SCRs per minute			
Storytelling	1.77 (1.29)[a]	.96 (13.15)[b]	1.87 (1.45)[a]
Non-storytelling	2.62 (2.39)[a]	2.18 (14.79)[b]	2.88 (2.96)[a]
SCR duration			
Storytelling	2,990.08ms (15.08)[b]	2,962.51ms (639.89)[a]	3,089.83ms (14.50)[b]
Non-storytelling	2,631.22ms (13.00)[b]	2,532.56ms (604.49)[a]	2,743.67ms (11.62)[b]
SCR amplitude			
Storytelling	216.70 µ S (90.35)[a]	178.17 µ S (43.07)[a]	198.58 µ S (10.08)[b]
Non-storytelling	523.54 µ S (437.49)[a]	339.48 µ S (296.16)[a]	644.73 µ S (15.69)[b]

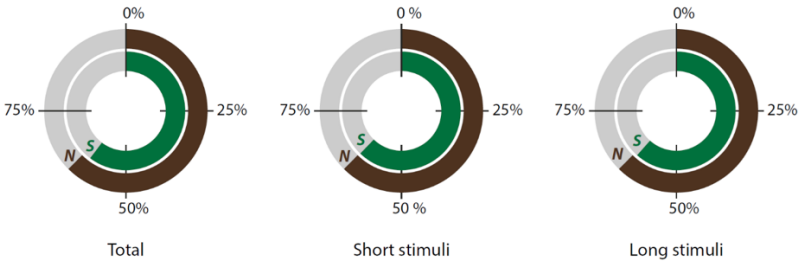
Note. a = Mean (Standard Deviation), b = Median (Mean Rank).

The facial expression analysis (FEA) showed a high percentage of time with *neutral facial expressions* in both groups.

While a small effect (r = .16) suggested a tendency toward greater emotional expression in the storytelling group, the difference was non-significant (U = 192.50, p = .34). There was virtually no difference for short stimuli, U = 184.00, p = .50, while the difference was slightly more pronounced for long stimuli, U = 208.00, p = .15. A small effect size (r = .24) indicates a tendency in the hypothesised direction. Consequently, H_1 is not supported. See Table 4 and Figure 4 for details.

Figure 4

Neutral facial expressions by group



Note. Storytelling (***S***) in green, non-storytelling (***N***) in brown; median for total, short and long stimuli.

Emotional valence was slightly more positive in the storytelling condition. While not significant (U = 116.00, p = .15), the small effect size (r = -.26) followed the hypothesised direction (more positive valence in the storytelling group). For short stimuli, there was no meaningful difference (U = 178.50, p = .61), whereas for long stimuli, the storytelling group again showed slightly more positive valence (U = 109.00, p < .10), with an effect size indicating an almost intermediate trend (r = -.30) in the hypothesised direction. See Table 4 for details.

While the data suggest that storytelling in longer e-learning content may increase positive emotional valence, H_2 cannot be fully accepted.

Table 4

Neutral facial expressions and emotional valence

	Total	Short stimuli	Long stimuli
Neutral expressions			
Storytelling	60.29% (16.81)	62.22% (17.28)	61.55% (15.94)
Non-storytelling	62.41% (20.19)	62.45% (19.72)	62.43% (21.06)
Valence			
Storytelling	.00% (21.06)	.00% (17.58)	.00% (21.44)
Non-storytelling	.00% (15.94)	.00% (19.42)	.00% (15.56)

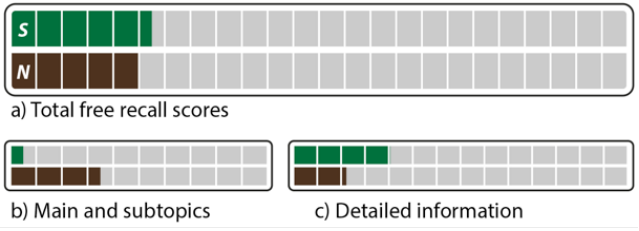
Note. Median (Mean Rank) is reported.

Memorisation

Total free recall scores did not significantly differ between the storytelling and non-storytelling groups, $U = 142.00$, $p = .54$. However, recall of *main and subtopics* was significantly lower in the storytelling condition, $U = 229.50$, $p = .03$, whereas recall of detailed information was significantly higher, $t(34) = 3.18$, $p < .01$. Thus, recall of main and subtopics suggests an effect opposite to the hypothesised direction with an intermediate effect size ($r = .36$), while recall of details suggests an effect in the hypothesised direction with a large effect size ($d = 1.06$, 95% CI [0.35, 1.75]). See Table 5 and Figure 5 for details.

Figure 5

Free recall scores compared by groups



Note. Storytelling (*S*) in green, non-storytelling (*N*) in brown; median for total scores and main and subtopics, mean for detailed information.

Table 5

Free recall scores

	Total	Topics	Details
Storytelling	5.50 (19.61)[b]	.50 (14.75)[b]	4.06 (1.59)[a]
Non-storytelling	5.00 (17.39)[b]	2.50 (22.25)[b]	2.22 (1.87)[a]

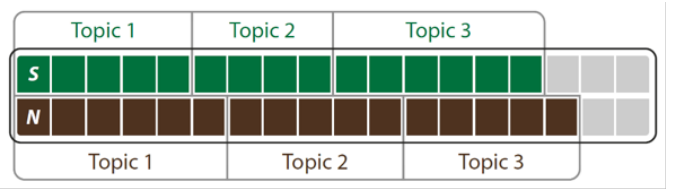
Note. a = Mean (Standard Deviation), b = Median (Mean Rank).

There was no significant difference in *total recognition test scores* between the storytelling and the non-storytelling conditions, $U = 193.00$, $p = .34$. Multiple-choice scores were also analysed separately for short stimuli, long stimuli, and each main topic. No significant differences emerged from main topic 1 (*data protection incidents; short stimuli*), $U = 195.50$, $p = .29$, or for *long stimuli* overall (main topics 2 and 3), $U = 174.00$, $p = .72$. However, for main topic 2 (*handling of personal data*), scores were significantly lower in the storytelling condition, $U = 234.00$, $p = .02$, with an intermediate effect size ($r = .40$)

in the opposite direction of that hypothesised. Closer inspection showed little difference between groups for correct options, but participants in the storytelling group selected distractor options more often (*Mdn* = 1.00) than those in the non-storytelling group (*Mdn* = .00), $U = 96.00$, $p = .04$. In contrast, for topic 3 (*data protection practices*), scores were significantly higher in the storytelling condition, $U = 80.50$, $p < .01$, with an intermediate effect size ($r = .49$) in the hypothesised direction. See Table 6 and Figure 6 for details.

Figure 6

Correct answers of the recognition test



Note. Storytelling (*S*) in green, non-storytelling (*N*) in brown; median for total score and individual topics

Due to contradictory results, H_3 cannot be accepted. However, the data suggest that differences mainly occur in long stimuli.

Table 6

Recognition test scores

	Total	**Short** (T1)	**Long** (T2 + T3)	**Topic 2**	**Topic 3**
Storytelling	15.00 (16.78)	5.00 (16.64)	10.00 (17.83)	4.00 (14.50)	6.00 (23.03)
Non-storytelling	16.00 (20.22)	6.00 (20.36)	11.00 (19.17)	5.00 (22.50)	5.00 (13.97)

Note. Median (Mean Rank) is reported.

Correlation

Perceived learning difficulty correlated positively with SCR amplitude, and its correlation with SCR duration approached significance, suggesting that stronger physiological arousal reflected more cognitively demanding learning experiences. Neutral facial expressions also correlated significantly with recall of the main topic and subtopics. See Table 7 for details. Overall, the data do not support H_4.

Most variables correlated with self-reported situational interest (see Table 8).

Table 7

Correlations between emotional indicators and recall, retention and self-reports.

	SCR duration	SCR amplitude	FEA neutral	FEA valence
Learning difficulty	$r(25) = -.35$, $p = .08$ [non-parametric]	$r(25) = .42$, $p = .03$		
Recall details				$r(34) = .31$, $p = .06$
Recall topics			$r(34) = .50$, $p < .01$	

Note. Only results with $p < .10$ and $r > .20/r < -.20$ are reported.

Table 8

Correlations with situational interest

Learning difficulty	$r(34) = -.44$, $p = .01$
Total recall	$r(34) = .45$, $p = .01$
Recall (details)	$r(34) = .31$, $p = .07$ / $r(34) = .34$, $p = .04$ [non-parametric]
SCRs per minute	$r(25) = -.51$, $p = .01$
SCR amplitude	$r(25) = -.51$, $p = .01$
FEA neutral	$r(34) = -.29$, $p = .08$ [non-parametric]

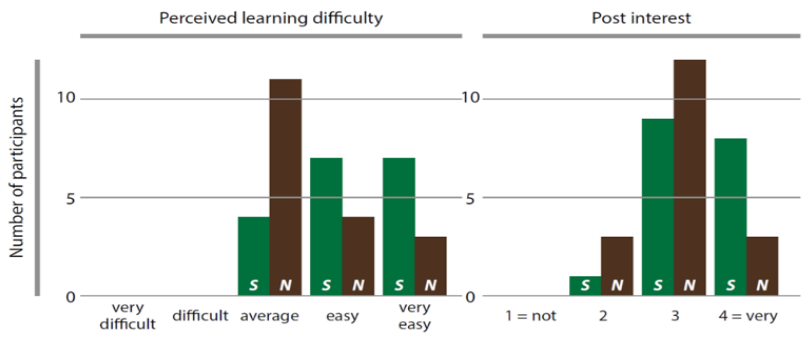
Note. Only results with $p < .10$ and $r > .20/r < -.20$ are reported.

Perceived Learning Difficulty and Situational Interest

Perceived learning difficulty was significantly lower in the storytelling group ($Mdn = 2$, $M_{Rank} = 14.81$) than in the non-storytelling group ($Mdn = 3$, $M_{Rank} = 22.19$), $U = 228.50$, $p = .03$, indicating an effect in the hypothesised direction with an intermediate effect size ($r = .37$). Accordingly, the data support H_5 (see Figure 7). The difference in *situational interest* between the storytelling condition ($Mdn = 3.00$, $M_{Rank} = 21.42$) and the non-storytelling condition ($Mdn = 3.00$, $M_{Rank} = 15.58$) approached significance, $U = 109.50$, $p < .10$. The intermediate effect size ($r = -.31$) suggests that storytelling courses tend to elicit greater situational interest (see Figure 7). Thus, the data provide some support for H_6.

Figure 7

Perceived learning difficulty and situational interest in the course compared by groups



Note. Storytelling (*S*) in green, non-storytelling (*N*) in brown. Answer options translated from German.

Discussion and Conclusions

This study investigated the impact of storytelling impact on emotionalisation and memorisation in adult e-learning ($N = 36$), using a multi-method between-subjects approach. Findings suggest that storytelling did not increase physiological arousal but tended to foster more positive emotional valence for longer stimuli, as well as reducing perceived learning difficulty. However, storytelling did not consistently improve memory but shifted retention patterns by enhancing the recall of detailed information while decreasing recall of topics. Thus, narrative structures may specifically benefit episodic memory and processing fluency in adult education, rather than serving as a general aid to memorisation.

Emotionalisation was operationalised via the dimensions of arousal and valence. Arousal was measured using skin conductance responses (SCRs), with amplitude, frequency and duration serving as indicators. The data did not support the assumption that storytelling reliably increases arousal. Neither SCRs per minute nor SCR duration differed significantly between groups, and effect sizes were small and inconsistent. SCR amplitude was significantly lower in the storytelling condition, indicating that when arousal occurred, it tended to be less intense than in the non-storytelling condition. This effect contradicts the simple assumption that storytelling increases arousal, and it does not align with the findings of Ameseder and Ettl-Huber (2022), who reported a higher SCR count for storytelling stimuli than for non-storytelling stimuli. As SCRs reflect

both mental effort and emotional arousal (Caruelle et al., 2019), the current results can mean that storytelling made processing smoother and less demanding rather than increasing activation. This interpretation is consistent with the significant decrease in perceived learning difficulty observed in the storytelling condition. Furthermore, neuroscientific evidence suggests that emotional activity is negatively associated with mental effort during multimedia learning (Guo et al., 2022). In other words, storytelling may reduce stress-related or effort-related arousal without necessarily reducing emotional engagement. The meta-analysis by Brom et al. (2018) further confirms that emotional design elements, such as anthropomorphisms or pleasant colours, consistently reduce perceptions of difficulty. Facial expression analysis likewise did not show significant differences, but small trends suggested more emotional expression and slightly more positive valence in the storytelling condition, particularly for longer stimuli. Thus, effects of storytelling on emotionalisation may be subtle in text-and-image e-learning formats and may depend on stimulus length. However, the results are consistent with those of Hascher and Brandenberger (2018), who found that positive and negative emotions can facilitate or hinder learning, respectively.

The role of stimulus length is an important factor in interpreting the emotionalisation findings. Narrative involvement typically requires sufficient time for situational framing, causal linking, and introducing and developing characters meaningfully. Short stimuli may allow for only minimal narrative cues and may therefore be insufficient to produce measurable shifts in emotional processing, especially when the medium is restricted to text and static images. By contrast, the observed tendency toward more positive valence in longer stimuli suggests that narrative framing may become affectively meaningful once a minimal narrative arc is established. This aligns with the finding that narrative frames are essential for maintaining situational interest and fostering learning during longer instructional sessions (Endres et al., 2024), and with the finding of Ameseder et al. (2025) that situational interest only surpasses that for non-narrative texts after a certain amount of time. This is also consistent with the finding that emotional effects are more likely to occur when emotionalisation is embedded within meaningful narrative structures (Brom et al., 2018).

Memorisation was measured after completion of the course in terms of free recall and recognition. Free recall was differentiated into the recall of main topics, subtopics, and detailed information to isolate the effects on semantic (general topics) and episodic memory (details). The findings reinforce the need to move beyond global assumptions that storytelling universally improves learning outcomes. In the free recall task, total recall did not differ

significantly between conditions. However, the pattern of results differed across recall components; participants in the storytelling condition recalled significantly more detailed information, whereas recall of main topics and subtopics was significantly lower than in the non-storytelling condition. This finding is in line with the results of Früh and Frey (2014), who found that narrative documentary films were more effective for remembering details than the analytical-argumentative versions of the same films. Storytelling may therefore strengthen episodic or detail-oriented memory traces (Tulving, 1972) while not necessarily supporting the extraction or retrieval of higher-level structure. Similarly, Ginting et al. (2024) demonstrated that videos narrated in a storytelling style led to higher short-term retention scores compared to traditional lecture formats. A plausible mechanism is that narrative sequencing and concrete situational cues provide retrieval hooks for specific details – consistent with the idea that one event can cue the next in memory (Ogborn et al., 1996) – whereas expository formats may highlight categorical structure and thus better support the recall of main points. From an instructional perspective, this implies that storytelling may be useful when the learning goal involves remembering concrete cases, examples, or situationally embedded information, but it may require additional structuring devices when the goal is to retain overarching categories, rules, or abstract principles.

Recognition performance further illustrates that the effects of storytelling are not uniform across content. Total recognition scores did not differ significantly between groups, and analyses by stimulus length and topic revealed conflicting patterns: topic 3 (long stimuli) yielded better recognition in the storytelling condition, while topic 2 (long stimuli) produced the opposite result and for topic 1 (short stimuli) there was no difference. All distractor options for topic 2 were people (who were more prominent in the storytelling stimuli), whereas the correct answers were pieces of personal data. It is possible that this contributed to a higher proportion of distractors being selected by the storytelling group. The topic-specific differences, combined with the observation that participants in the storytelling condition selected distractor options more often for topic 2, highlight an important design implication. Storytelling may increase the salience or plausibility of certain narrative-consistent details, which can support memory when the encoded cues align with the tested information, but it can also increase susceptibility to plausible distractors when narrative coherence competes with informational precision. However, the specific stories on topic 2 may also have resulted in a seductive details effect, where participants were distracted by story elements. Thus, storytelling may enhance memorisation selectively, depending on how tightly the narrative elements are coupled to

the instructional targets and how clearly key propositions are marked.

The hypothesis that emotionalisation and memorisation are positively correlated was not supported in a general sense. Instead, the correlational results indicate a more complex relationship that depends on the operationalization of both constructs. Higher emotionalisation was linked to better recall of detailed information but to lower recall of main topics and subtopics. This pattern is consistent with the idea that emotion may function as an anchor for reconstructing vivid, situationally embedded information, while it does not necessarily foster the abstraction or organisation required for higher-level recall. Moreover, the positive correlation between SCR amplitude and perceived learning difficulty suggests that stronger physiological arousal in this setting may partly reflect effortful processing or stress rather than emotional engagement. The strong correlations involving situational interest provide additional context. Interest was positively associated with total recall and negatively associated with physiological indicators such as SCRs per minute and SCR amplitude. This suggests that, in this study, interest may reflect a more cognitively rewarding form of engagement that supports learning without being accompanied by heightened physiological arousal. The significant reduction in perceived learning difficulty and the trend-level increase in situational interest suggest that storytelling may improve learners' subjective experience of e-learning, even when objective learning gains are mixed. This is consistent with evidence that informative narratives systematically increase situational interest, even if they do not directly enhance text comprehension (Golke & Wittwer, 2024). The reduction of perceived learning difficulty (which is related to cognitive load and processing fluency) and the increase in situational interest are consistent with the findings of Ameseder and Ettl-Huber (2022) and Ameseder et al. (2025).

From an adult education and personnel development perspective, this is an important finding. Adult learners often balance learning with work demands, and perceived difficulty can influence persistence and willingness to engage with training materials. Storytelling may therefore offer value by making content feel more approachable and by supporting engagement, even if it does not automatically maximise overall memorisation. At the same time, the mixed results for memorisation highlight that storytelling should not be considered a universal instructional solution. It may be most effective when matched to the intended learning outcomes and accompanied by explicit indications of structure. A practical implication is a hybrid approach: narrative elements can be used to contextualise content, increase relevance, and support detail recall, while summaries, headings, checklists, or advance organizers can ensure that main topics and abstract principles remain salient.

Limitations include a modest, non-random sample (especially for psychophysiological measures characterized by substantial inter-individual variability) and a laboratory setting with static stimuli, which may constrain generalisability to naturalistic environments. Methodologically, the exclusion of SCR non-responders, the use of single-item scales, the confounding of stimulus length with topic, and the focus on a single domain (data protection) warrant cautious interpretation.

Future research should examine how the effects of storytelling vary as a function of medium richness, narrative intensity, stimulus length, topic type, and the presence of explicit instructional structure. Testing delayed retention would help clarify longer-term memorisation effects, while incorporating individual differences (e.g., prior knowledge) could reveal expertise-related moderation patterns. Further work should also disentangle emotionalisation stemming from narrative framing versus emotional design features and clarify under which conditions emotions support sustained learning rather than interfere with it. Methodologically, studies should employ larger and more diverse samples, more ecologically valid e-learning settings, and independent manipulations of content length and complexity. Finally, given the dual role of SCRs in reflecting both emotional arousal and mental effort, future studies should control for cognitive load and integrate additional physiological or behavioural measures to more clearly isolate emotional and cognitive demands.

Ethical Statement

The research was conducted in accordance with the ethical guidelines for empirical research. The study was approved by the Vice Rector for Research and Innovation of the University of Applied Sciences Burgenland.

Data Availability Statement

Research data were deposited at the Repository of the University of Applied Sciences Burgenland (link: https://doi.org/10.57739/4040).

Disclosure Statement

The authors have no conflict of interest to declare.

When preparing this article, the authors used ChatGPT's deep research function (OpenAI, San Francisco, USA) on 13, 14, and 31 December 2025 with the prompts that are available in the data repository (link: https://doi.

org/10.57739/4040), for the purpose of literature research. Additionally, DeepL Write (DeepL SE, Cologne, Germany) was used between 5 November 2023 and 4 April 2026 for the purpose of refining the text. The authors subsequently reviewed and edited the output as necessary and accept full responsibility for the content and integrity of the publication.

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