Evaluation Report

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Evaluation Report

The selected artifact for evaluation is an e-learning learning object (LO) created with Articulate Storyline. This artifact (see Appendix A) is a self-paced, asynchronous lesson created for adult military linguists studying German. This grammar module, taking approximately 20 minutes to complete, is part of a larger blended curriculum that involves asynchronous prework and live, synchronous instruction. The objective of this course, which spans over 12 weeks, is for learners to attain German proficiency comparable to ILR level 1 (Interagency Language Roundtable, n.d.).

Learning Theories

Input Processing

As a grammar lesson, this LO naturally lends itself to grammar learning theory, particularly to Input Processing—a methodology that guides learners through input-based activities, teaching grammar as a concept instead of a set of abstract rules. VanPatten (2003), the originator of this learning theory, claims that language acquisition happens naturally with exposure to input—any language learners hear or read.

Input Processing outlines several language processing principles, like "the lexical preference principle" (Rasuki, 2017, p. 2), according to which learners pay attention to lexical meaning *first* and grammatical form *last*. For example, in the sentence "The dog walked home yesterday," learners of English will process "yesterday" *first* and the "-ed" ending in "walked" *last*, because "yesterday" holds more meaning that something happened in the past than an abstract verb ending. Following its principles, Input Processing proposes an instructional strategy in the form of structured input activities. According to this learning theory, input (perceived language) precedes output (produced language), and grammar is best taught through activities that manipulate input. These activities highlight the meaning embedded within the grammar

concept and draw the learner's attention to make a connection between the form and its meaning (VanPatten, 2003).

At its core, this theory focuses on learners' comprehension of the meaning of grammatical forms (form-meaning connections). According to VanPatten (2003), the first step to acquiring a grammar concept is to comprehend it. That said, VanPatten does not deny that comprehension alone does not lead to proficiency. To become proficient, learners must practice production with others. For this reason, synchronous class time is most valuable for production practice. So, where does this leave structured input activities that teach *comprehension* before *production*? Because comprehension precedes production, a blended learning environment with asynchronous comprehension practice (structured input), coupled with live production (structured output), is optimal for language acquisition, and an individual, self-paced grammar lesson, like the selected LO, is an ideal setting for structured input activities, focusing on comprehension of grammar alone (VanPatten, 2017).

The present LO aligns closely with VanPatten's theory by guiding learners through a set of structured input activities. The goal of the lesson is for the learners to make a form-meaning connection before they are expected to *use* this grammar concept. This asynchronous module helps reserve precious class time for production practice.

Constructivist Social Learning

This LO is prework for a synchronous, live session during which learners are to engage with others in output activities that bridge the gap between comprehension of the grammar and its application. In line with constructivist social learning theory, according to which people learn best by co-constructing knowledge through social interaction, I have included open-ended activities where learners share their thoughts on their learning (Driscoll & Burner, 2022). These

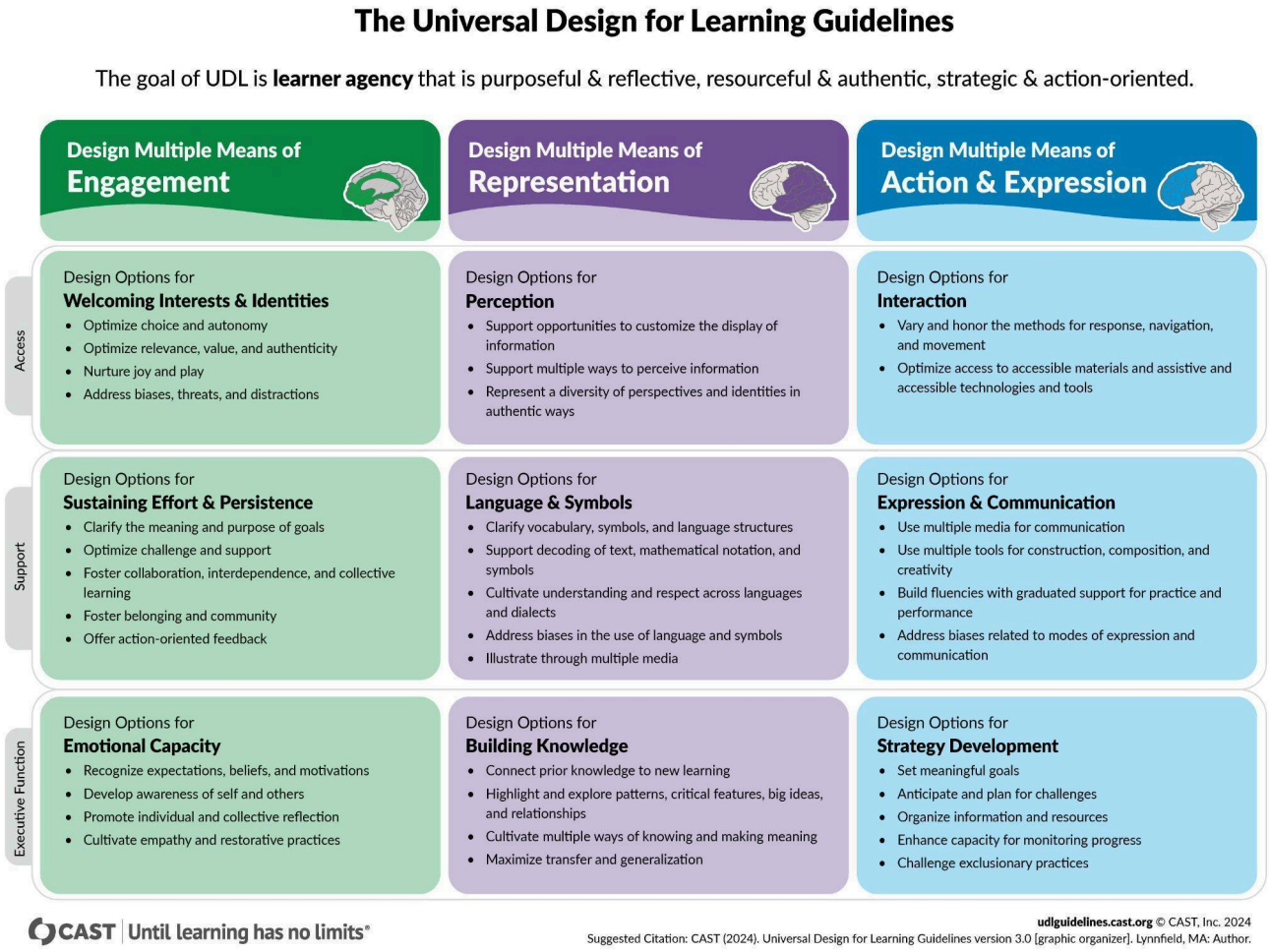
activities promote critical thinking with prompts asking learners to reflect on the strategies they use to complete the various exercises, and learners' responses will be shared in group discussions. This way, learners will co-construct a powerful form-meaning connection in preparation for production practice.

Instructional Design Model: UDL

The design of the selected LO is rooted in the principles of Universal Design for Learning (UDL) as displayed in Figure 1 below.

Figure 1

UDL Learning Guidelines



Note. UDL Guidelines. Reprinted from *CAST 2024 Universal Design for Learning Guidelines* [Infographic], by CAST, 2024, CAST (https://udlguidelines.cast.org/more/downloads/). Copyright 2024 by CAST.

The LO is grounded in the three principles of UDL and their associated guidelines. The main purpose of UDL is to create an inclusive learning environment by removing barriers to learning (CAST, 2024). To support the first UDL principle of multiple means of representation (CAST, 2024), I enabled toggling accessible text and keyboard shortcuts, provided audio recordings for all onscreen text, and included scaffolds. Additionally, I chose to focus the topic on a cognate identical to the English word (the preposition "in") to remove barriers to learning. I also activated learners' prior knowledge and used simple vocabulary that is mostly familiar to the learners. This way, I focused instruction on construct-relevant content to avoid processing disruptions (Siegel, 2024b).

The second principle highlights the importance of multiple means of action and expression (CAST, 2024). To support this, I enabled learners to freely navigate to and from any slide and created activity choice boards allowing learners to skip ahead (Siegel, 2024b). Additionally, the stop-and-think activities allow learners to choose the modality for their responses: audio, text, or video, and the optional scaffolds in the form of vocabulary and grammar cheat sheets provide graduated support for learners (CAST, 2024).

The third principle emphasizes the importance of multiple means of engagement (CAST, 2024). To support this, I included two activity choice boards and a final slide where learners choose the ending. To support engagement, I took the target group's identity into consideration and framed the lesson as a day in a life of a German soldier, using example sentences from the learners' daily and professional lives, thus enhancing the relevance of the lesson (Siegel, 2024b).

Methodology

The selected LO is an e-learning lesson created in Articulate Storyline and as such, it is subject to usability pitfalls, particularly in the categories of navigation, learnability, user satisfaction, and visual design (Alshehri et al., 2019). To ensure that the lesson is usable, and thus conducive to learning, I emphasized testing its usability to help direct learners' attention to the topic to-be-learned instead of the structure of the lesson (Burch, 2021). To complete this hybrid qualitative-quantitative evaluation, I chose an industry-standard usability measurement instrument: five think-aloud interviews (Nielsen, 2000) with adult learners who have knowledge of the subject matter (German). I used the convenience sampling method to source participants by contacting four friends who had studied German in the past or are currently learning German. The fifth participant was solicited via the instructional design forum on Reddit. All interviews happened over the span of two weeks. During the think-aloud interviews, users worked through five scenarios, or sets of tasks, that were aggregated using Farrell's (2017) methodology, from a series of problem statements and their derivative tasks. Farrell's (2017) method supports users working through open-ended scenarios instead of predetermined tasks, which helps the observer log emerging issues users encounter naturally (see Appendix B).

Throughout the scenarios, qualitative data was collected by identifying major issues and points of confusion. Also aligned with the initial plan, and following each scenario, a quantitative measurement instrument was incorporated by employing the Single Easy Question (SEQ) method (Laubheimer, 2018), assessing users' perceived ease of use of each scenario by requiring users to rank it on a scale of 1 (easy) to 5 (difficult). Lastly, to gain high-level insight into the system's usability, I administered another standard usability evaluation instrument: the System Usability Scale (SUS) questionnaire (Budiu, 2023) to quantitatively measure users' perceived ease of use of the entire system. This questionnaire consists of 10 statements about the

overall usability of the LO, five of which are worded positively and five negatively, where users rank their agreement or disagreement on a five-point Likert scale (Budiu, 2023) (see Appendix C).

As mentioned, all users had prior knowledge of the subject matter (German). Consequently, the original protocol was modified to collect data on the effectiveness of the selected learning theory and associated instructional strategy. Upon reviewing the initial evaluation plan, the think-aloud interview form was reinforced by adding notation fields for recording observations of users' success in completing the various activities (see "Accuracy of German" fields in Appendix B), and by adding a field for recording users' articulation of them meeting the learning objective (see first question under "Wrap-Up" in Appendix B). In doing so, I not only ensured alignment to UDL (the ID model) but also to Input Processing (the main learning theory).

Data Analysis and Recommendations

Upon reinforcing the initial evaluation plan, it was modified to measure how well the LO addresses the selected learning theory and instructional design model supported by optimal usability.

Effectiveness of Learning Theory

The learning objective of the selected lesson is "to assess whether the preposition 'in' indicates location or direction" (see Appendix A, Slide 3). To measure its attainment, it was important to select users with a background in German, and with varying degrees of prior knowledge of the LO's specific topic (two-way prepositions) (see Table 1 below).

Table 1

Learning Theory Effectiveness Table

User	Prior Knowledge			Completion Success	
	Proficiency Level	Acc./Dat. Case	Two-way Prepositions	German Accuracy	Goal Attained
1	Intermediate	Familiar	Familiar	High	Yes
2	Beginner	Familiar	Not Familiar	High	Yes
3	Advanced	Familiar	Familiar	High	Yes
4	Beginner	Familiar	Not Familiar	High	Yes
5	Beginner	Not Familiar	Not Familiar	High	Yes

Despite being at different proficiency levels, most users were familiar with the accusative and dative cases (prerequisite knowledge), and all successfully completed the structured input activities with a high level of accuracy. Ultimately, all users could articulate their attainment of the learning objective when probed—evidence to the effectiveness of Input Processing.

Because this LO is part of the asynchronous component of a blended curriculum, the synchronous component that supports social learning could not be evaluated at this time.

Effectiveness of Instructional Design Supported by Overall Usability Metrics

To measure how well the LO addresses UDL principles whose main goal is to remove barriers to learning, I analyzed the system's usability according to users' task completion rate in relation to their prior knowledge of e-learning environments (Table 2) and the relationship between their task completion rate, perceived usability (through SEQ scores), and average issue severity by scenario (see Figure 2).

Based on Table 2, users can be divided into two main groups: e-learning creators (Users 2 and 3) and laymen (Users 1, 4, and 5). In the laymen group, all users completed Scenarios 1, 3, 4, and 5, but failed to complete Scenario 2. In the e-learning creator group, User 2 had the same task completion rate as the laymen while only User 3 was successful in completing all scenarios.

From this analysis, it is apparent that Scenario 2 poses serious barriers to learning and does not support UDL principles. In Scenario 2, learners engage with an embedded Padlet board that was significantly difficult to navigate and use. Additionally, its visual design had a great deal of extraneous elements, and user satisfaction was poor due to inability to complete the task. An explanation to why User 3 was able to complete Scenario 2 is that she was the only user who had experience both creating with and using Padlet. Thus, familiarity with Padlet—not e-learning creation experience—is a precursor to success in this scenario.

Table 2

Task Completion Rate by Scenario Table

	E-Learning Experience		Task Completion Rate				
User	Creator	Consumer	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
1	No	Yes	Yes	No	Yes	Yes	Yes
2	Yes	Yes	Yes	No	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	No	Yes	Yes	No	Yes	Yes	Yes
5	No	Yes	Yes	No	Yes	Yes	Yes

Figure 2 informs us regarding the correlation between task completion rate, perceived usability (SEQ score), and issue severity. While Scenarios 1, 3, 4, and 5 all have a 5/5 task completion rate, correlating with a high average SEQ score (4.15/5) and low average issue severity (1.74/5), Scenario 2 presents an opposite trend, confirming that it interferes with UDL-based design. Figure 3 is an additional representation displaying the large disparity in the average issue severity by type (navigation, learnability, satisfaction, and visual design) between Scenario 2 and all other scenarios.

Figure 2

Usability by Scenario Table

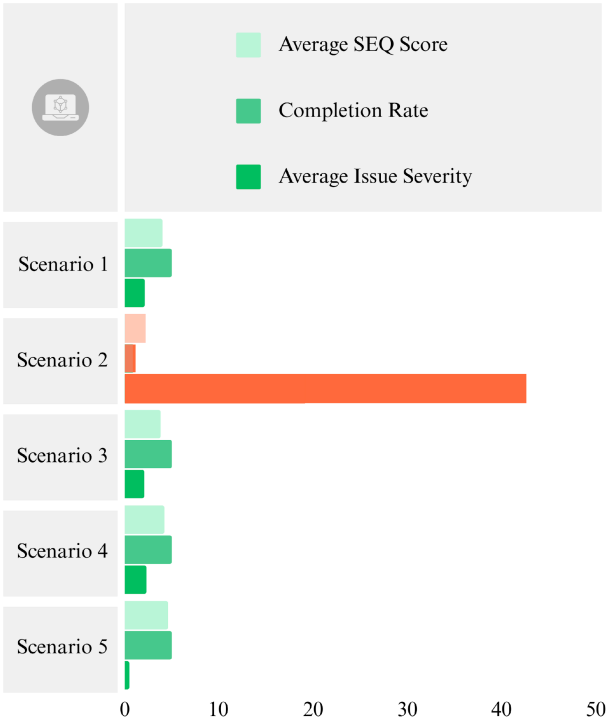


Figure 3

Average Issue Severity: Scenario 2 vs. All Other Scenarios

The synthesis in Figure 3 stems from analyzed data gathered during the think-aloud interviews by calculating issue severity following Rosemberg's (n.d.) method. To do so, I first coded the issues users encountered (see "Big Stucks" in Appendix B) by type: navigation learnability, satisfaction, and visual design (Alshehri, et al., 2019). Next, I implemented Rosemberg's (n.d.) issue severity calculation method by assigning each issue numeric scores for task criticality, impact, and frequency, and multiplied these variables by each other. Lastly, I multiplied the result by the issue's associated SEQ score (see Appendix D).

To calculate the system's SUS score of 74 (considered *fair* according to Sauro (2018)) and its confidence interval (+-14.242), I followed the steps outlined in Budiu's tutorial (2023) (see Appendix F). The confidence interval represents a broad range that places the potential SUS score between 59.758 and 88.242 (*worrisome* and *good* according to Sauro (2018)), meaning the SUS score can be confidently placed anywhere within this range. The uninformative broadness of the confidence interval is due to the small sample size (Lewis & Sauro, 2022). Because the SUS score's confidence interval is too broad to be informative, and both the SUS and SEQ measure perceived usability, it appears that the SUS questionnaire was redundant. Additionally, in contrast to the SUS score that reflects the overall user experience, the SEQ score measured perceived usability of individual scenarios, which helped pinpoint which scenarios were perceived as easy or difficult to use. Based on SEQ score analysis, Scenario 2 was significantly difficult for most users who found all other scenarios relatively easy. Although Scenario 2 meant to support UDL, it failed to do so due to its poor usability.

Issues and Recommendations

Upon reviewing the initial evaluation plan, I decided to add another step following analysis: systematic issue prioritization following Rosemberg's (n.d.) method. I generated possible solutions, calculated the effectiveness of each solution by adding up the number of

issues it addresses, and assigned a complexity score by which I divided the solution effectiveness to obtain each solution's return-on-investment (ROI) score (see Appendix E).

The following recommendations stem from prioritized solutions based on ROI (>1) and other considerations in descending order (see Table 3). Not all solutions are included in the recommendations because some issues' implementation would compromise the integrity of the lesson. For example, removing the "Stop-and-Think" activities would interfere with the implementation of the synchronous component of the course that is aligned to social learning theory. As a result, I only listed solutions to major or moderate issues.

Table 3

Solutions With an ROI Score Greater Than 1

Solution	Description	ROI
1	Remove "Stop-and-Think" altogether.	212.8
2	Replace "Stop-and-Think" slides with an exit ticket.	212.8
3	Make "Stop-and-Think" slide open-ended questions.	212.8
4	Make the audio play button more obvious by changing the button.	18.72
5	In "So, what now?" instead of numerals, display the option titles in the blocks, so it's obvious what users should do/choose.	10.12
6	Remove audio for all on-screen text and keep it only for the German examples.	8.64
7	In the "Click Here" layer for "Explicit Information," make the navigation more obvious for continuing to the next slide.	3.6
8	For all activities that require users to "submit" their answers, have a pop-up appear when users click submit saying "your answer has been saved and you'll find it in your log."	7.92
9	Make the cheat sheets more noticeable by changing where they are on the screen.	5.76

10	In "Image Matching," make the entire sentence clickable, not just the numbers.	2.88
11	In all "Choice Board" activities, make the feedback more noticeable by making it a pop-up and darken or blur the background.	2.88

Major Blockers

The solution below addresses the major blockers that arose in Scenario 2 that led to task non-completion.

Slides Titled "Stop-and-Think". These slides represent Scenario 2 that, according to Tables 1, 2, and 3, as well as Figures 2 and 3, presents severe usability issues in navigation, learnability, satisfaction, and visual design. Scenario 2 is a Padlet board, and its purpose is two-fold. First, it serves as a metacognitive exercise where learners verbalize reflections on their learning using text, audio, or video (supporting UDL principle of multiple means of action and expression (CAST, 2024)). Second, the responses serve as a basis for synchronous group discussion (in line with constructivist social learning theory). However, the embedded Padlet is not usable and poses significant barriers to learning. Therefore, I will remove the Padlet and replace it with open-ended questions. This way, learners' responses will still be recorded and shared in group discussions to support co-construction of knowledge.

Moderate Issues

The following are solutions addressing issues with a ROI score >1 that did not lead to task non-completion.

Slide Titled, "So, What Now?". To support learner choice and autonomy, (supporting UDL principle of multiple means of engagement (CAST, 2024)), the last slide presents four choices for ending the lesson: 1) finish, 2) start over, 3) learn more about the preposition "in,"

and 4) learn about similar prepositions. While users enjoyed having choice, they found the interface confusing. Currently, the choices are only revealed if a user clicks on a button. Users expressed a preference to view options without clicking. I will solve this issue by making the options immediately visible.

All Slides. Aligned with the UDL principle for multiple means of representation, (CAST, 2024), I included audios for all onscreen text. While users found this helpful, all expressed difficulty in recognizing the audio play button as such due to its shape. Additionally, once played, audio could not be paused, which was frustrating to users. To resolve these issues, I will first change the audio play button to a more obvious icon, and second, I will add a pause button and a trigger to automatically stop one audio from playing once another starts.

Slide Titled "Explicit Information A". This slide contains explanations and a layer with elaboration, which learners reveal by clicking a "Click Here" button. This layer covers the entire slide, and users have two options to navigate forward: a "Back" or "Next" button, confusing users about what to choose. To solve this, I will remove the "Back" button to allow learners to intuitively progress to the next slide.

Slides Titled "Image Matching" and all "Choice Board B" Activities. These slides include activities that have a "Submit" button. When integrated into an LMS, this button would record responses in the system. However, from a current user's perspective, nothing happens when they click "Submit," which users find confusing. To solve this issue, I will include pop-ups with feedback on their responses.

All Activity Slides under "Activity Choice Board A" and "Activity Choice Board B". These slides contain cheat sheets in the form of lightbox pop-ups with vocabulary or grammar information in all activity slides. While users unanimously agreed that the cheat sheets were

useful, one issue emerged; namely, that they were not noticeable. Because the scaffolds played a major role in supporting the attainment of the learning goal, I will make them more noticeable by moving them to the top left instead of the top right of the screen, mimicking default left-to-right top menu interface design.

Slide Titled "Image Matching". This slide requires learners to choose one of two sentences that accurately describes an image by clicking on a numbered button to the left of it. Users attempted to click on the sentence text multiple times before realizing they needed to click the corresponding button. This issue will be easily solved by making the entire sentence clickable.

Minor Issues

Various Slides. The solutions outlined above all have a ROI score of 1 or higher. Among my generated solutions, there were nine additional minor fixes with a ROI score of less than 1 (see Appendix E), like making the feedback pop-ups more noticeable on some slides, enlarging some images, and minor formatting suggestions. For economy's sake, I will only consider these fixes once the others have been addressed. Because these additional fixes are less impactful, the issues they might resolve do not pose significant barriers to learning.

Reflections

Through conducting a robust usability evaluation using a think-aloud protocol, I learned several lessons. First, while most of the data collection and analysis focused on usability, reviewing the initial evaluation plan and modifying it to also measure the effectiveness of the underlying learning theory, helped verify that the instructional approach was sound. Additionally, by ensuring optimal usability, the artifact maintains alignment with the selected ID model of UDL that calls for removing barriers to learning. By committing to smooth navigation,

intuitiveness, and pleasing design, excellent usability ensures that the learning environment is construct-relevant (Burch, 2021). The reinforced evaluation plan helped verify the soundness of both pedagogy and design.

Second, the incorporation of quantitative data collection in a largely qualitative study is helpful when done in a thoughtful manner. For this study, two quantitative instruments that measured users' perceived ease of use were implemented: SEQ and SUS. While the SEQ was embedded within the think-aloud protocol, the SUS questionnaire was administered upon its completion. The small sample size (five participants), though ideal for the think-aloud (Nielsen, 2000), was insufficient for calculating a reliable and meaningful SUS score. When calculating a SUS score, the bigger the sample size, the smaller the confidence interval tends to be; that is, the range within which the SUS score confidently lies. The present study's results indicated a confidence interval that ranged from poor to good. Another issue with the SUS score was that it related to the entire system, while the SEQ measured users' perceived ease of use for individual scenarios. In summary, of the two quantitative measures, only the SEQ was informative, rendering the SUS questionnaire redundant.

Third, when attempting to adhere to the guidelines of an ID model, it is important to design the learning environment in a way that does not compromise usability. For example, by adding audio for onscreen text without the option to pause it, instead of enhanced instruction, significant barriers to learning were created. Additionally, in adhering to one of the cornerstones of UDL that calls for allowing multiple means of action and expression (CAST, 2024), an embedded activity that supported this was added, but proved unusable—so much so that users could not complete it. Therefore, it is crucial to test the usability of an interface even when it

exemplifies the ID model the system is rooted in, to ensure that it improves the experience rather than detracts from it.

In conclusion, my main takeaway from this evaluation is that while grounding a learning environment in theory and methodology, it is crucial to consider each situation's unique parameters. While it is important to follow a tried-and-true system, as instructional designers, we must continuously adapt our approach to the distinct needs of each project in a way that strikes a balance between grounded design and optimal user experience.

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Appendix A

Storyline Module: A day in the life of a soldier in the Bundeswehr - two-way preposition "in" for location and direction

https://360.articulate.com/review/content/79d0495d-5be1-4fd0-ab9d-c2ae2e112673/review

Appendix B

Completed Qualitative and Quantitative Data Collection: Hybrid Think-Aloud Interview/SEQ Form with User Scenarios (Grouped Tasks)

Introduction
1. Greetings, introductions, and pleasantries
2. Build rapport by asking questions and relieving nervousness.
3. Collect participant data: demographic, profession, usage experience with platform, level of prerequisite knowledge about subject matter. a. Have you ever worked with lessons like this before? i. Yes, some experience, learning modules for certification b. What is your current level of German? i. Rates himself 5/10 in German. Used to be good in German, lived in Austria for two years, taught English. His wife speaks Spanish and interferes with German when he tries to speak it. Remembers sentence structure, thinks it would come back quickly. c. Are you familiar with accusative and dative cases? i. Google accusative recently. The accusative is the patient in a transitive verb sentence, the thing that is receiving the action. Dative has to do with where something is. d. Have you studied two-way prepositions before? i. Yes. Knew this but forgot it. The dative has to do with being in a static place and accusative is changes of state or movement across a barrier.
Session Kick-Off
1. Start the recording.
2. Give background on the artifact and answer any questions.
3. Briefly explain the think-aloud protocol and provide examples things users might say during the interview.
4. Put the participant at ease and ensure that they understand that honesty is very important. Tell them that someone else made the learning artifact so they won't feel like they're offending you by providing constructive feedback or voicing negative sentiments.
Session
SCENARIO 1

Please start the module and complete the first 5 slides. These slides are informative and don't require much interaction besides navigation, playing audio and/or reading. Please tell me what you're seeing and thinking.				
SEQ: How easy (5) or difficult (1) was it to complete this set of tasks?				
1	2	**3**	4	5
Why?				

- No way to pause the audio
- Audio is good quality
- Unclear where to start
- Audio timeline is very long and throws him off
- The "arrows" (audio play buttons)
- All audio on screen can play at once because it doesn't get muted when you start another string of audio
  - Wishes he could pause the audio
- Could have been more slick, easier to navigate
  - Not sure how to progress forward				

❗ **Fill out the following after completing the interview when you rewatch the recording.**				
Task complete?		● **Yes**	● No	
Accuracy of German		● Figured out which is accusative and dative based on context ● You were able to notice which case was used because you knew the articles (dative vs. accusative)		
Completion time		6:30-12:02		
Big "Stucks"		● Can't pause audio (all audio plays to completions and all strings on screen can play concurrently) ● Can't recognize play button ● Can't smoothly progress (Explicit Information II goes back to the previous slide instead of going "Next")		
SCENARIO 2				
Please navigate to the Stop and Think A slide and tell me what you see, think, and feel. Read the instructions and try to follow them logically. Tell me what makes sense and what is hard for you to complete.				
SEQ: How easy or difficult was it to complete this set of tasks?				
1	2	3	4	5

Why?		
- Could not understand the prompt due to the interface and was not able to respond to the prompt at all. - He cannot even tell he's being asked to do anything.		
❗ **Fill out the following after completing the interview when you rewatch the recording.**		
Task complete?	• Yes	• **No**
Accuracy of German	• N/A	
Completion time	14:00-17:05	
Big "Stucks"	• Can't find what to do first • Can't easily identify the instruction • Can't navigate easily • Can't locate the correct thread • Can't locate how to respond • Many distractions with the Padlet interface causing user to click on superfluous objects	
SCENARIO 3		
Please navigate to and complete Activity Choice Board A and B, as well as associated activities. Try to click on anything that looks clickable on screen. Try to work through these slides as you would without my help. Please describe in detail what you are doing and what you're having trouble with.		
SEQ: How easy or difficult was it to complete this set of tasks?		
1	2	**3**	4	5
Why?		
- Sentence matching- wasn't clear that it was matching		
❗ **Fill out the following after completing the interview when you rewatch the recording.**		
Task complete?	• **Yes**	• No

Accuracy of German	• ACB Location vs. Direction & Image Matching
	  ○ Able to complete accurately
	  ○ Remembered that the color red means accusative (this is a barrier to focusing on the context)
	  ○ Inferred from the meaning of the verbs	

Completion time	17:10-19:34
Big "Stucks"	• Could not understand that Sentence Matching was drag-and-drop

SCENARIO 4

Let's wrap up. Please complete the last three slides. These are unlike the others. Again, I want you to tell me in detail what you're perceiving and also how you're feeling about it. Don't hold back.

SEQ: How easy or difficult was it to complete this set of tasks?

1	2	**3**	4	5

Why?

- So, what now?
  - Wasn't clear on what to do not apparent he should click on the numbered boxes

❗ **Fill out the following after completing the interview when you rewatch the recording.**

Task complete?	• **Yes**	• No
Accuracy of German	Self-Assessment: checked all the boxes because it was apparent that he relied on all those cues to infer "in" for direction vs. location	
Completion time	20:30-22:37	
Big "Stucks"	• Can't recognize what the slide is for (So, what now?) • Can't recognize what to do next (So, what now? - that he's supposed to click on the boxes)	

SCENARIO 5

Now that you've completed the module, please navigate back to slides you found particularly interesting or want to revisit. Please tell me how you're navigating to them and why you are choosing this navigation method. Explain why you are choosing these specific slides to revisit.

SEQ: How easy or difficult was it to complete this set of tasks?

1	2	**3**	4	5

Why?

- Chose to go back to Choice Board A because the Stop-and-Thinks are a mess.
- Was not completely clear on the task.

❗ **Fill out the following after completing the interview when you rewatch the recording.**		
Task complete?	• **Yes**	• No
Completion time	24:12-end	
Big "Stucks"	• Can't remember which slides he had completed	
Wrap-Up		
1. Assess attainment of LOive: Can you tell how to use the preposition "in" for location vs. direction? a. Location would be used with the dative case because it's happening in one specific place. The direction (accusative) has to do with movement, and movement requires direction, based on the meaning of specific verbs. It's a change of state.		
2. Conclude the session.		
3. Stop the recording.		
4. Explain to the participant that they will be asked to complete the SUS questionnaire now. Stay on the call to ensure that they complete it right after the interview. Allow the users to turn off their cameras while they do so.		
5. Thank the participant and say goodbye.		

Note. Adapted from *Think-aloud usability evaluations* [PowerPoint slides], by LaToza, 2023. George Mason University.

Appendix C

Quantitative Data Collection: Post-Session SUS Questionnaire

1. I think that I would like to use this e-learning module or similar ones frequently.				
1	2	3	4	5
2. I found the system unnecessarily complex.				
1	2	3	4	5
3. I thought the system was easy to use.				
1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system.				
1	2	3	4	5
5. I found the various functions in this system well integrated.				
1	2	3	4	5
6. I thought there was too much inconsistency in this system.				
1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly.				
1	2	3	4	5
8. I found the system very cumbersome to use.				
1	2	3	4	5
9. I felt very confident using the system.				
1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system.				
1	2	3	4	5

Note. Adapted from *System usability scale (SUS)* [Video], by Budiu, 2023. Courtesy of Nielsen Norman Group.

Appendix D

Issue Severity Calculation with SEQ Score

ID	Type	Slide	Description	P1	P2	P3	P4	P5	Task Criticality	Impact	SEQ Difficulty	Frequency	Severity
Scenario 1											**4**		
1	Satisfaction	All	Cannot pause audio; all audio can play at once	x	x	x			2	3	1	0.6	3.6
2	Navigation	Welcome	Timeline on slide makes it seem like you should not move ahead	x					1	2	1	0.2	0.4
3	Learnability	Navigation/Objective	Audio icons look like bullet points or drop-downs	x	x				3	3	1	0.4	3.6
4	Navigation	Explicit Information ("Click Here" Slide)	"Click Here" was confusing; not sure how to progress	x	x				3	3	1	0.4	3.6
5	Satisfaction	Explicit Information ("Click Here" Slide)	Here, the acc. example appears first, whereas in the parent slide, the dat. appers first- so the inconsistency made it hard		x				1	2	1	0.2	0.4
6	Learnability	Explicit Information II	Cheat sheet is not noticeable		x			x	4	3	1	0.4	4.8
7	Satisfaction	Explicit Information ("Click Here" Slide)	Wasn't sure if the sliding action of the soldier had to do with the first sentence or second sentence			x			1	2	1	0.2	0.4
8	Navigation	All	Is not used to player PREV and NEXT buttons; is used to them being more noticeable on screen			x			1	1	1	0.2	0.2
Scenario 2											**2.2**		
9	Learnability	Stop-and-Think A	Cannot figure out what to do at all; doesn't know where to click	x	x				5	5	3.8	0.4	38
10	Navigation	Stop-and-Think A	Scroll bars are not noticeable	x	x	x	x		4	4	3.8	0.8	48.64
11	Visual Design	Stop-and-Think A	Too many distractions on screen; some elements are too big while others are too small	x	x			x	4	4	3.8	0.6	36.48
12	Satisfaction	Stop-and-Think A	Cannot complete task; does not understand the + is to add a post; "Reflect" doesn't make it clear what they should do	x	x		x	x	5	5	3.8	0.8	76
13	Satisfaction	Stop-and-Think A	Audio is distracting		x		x		3	3	3.8	0.4	13.68
Scenario 3											**3.8**		
14	Learnability	Sentence Matching	Confused about it being a matching activity	x					2	2	1.2	0.2	0.96
15	Visual Design	Image Matching	Images are too small		x				2	3	1.2	0.2	1.44
16	Learnability	Image Matching	Did not know to click on the squares with the numbers to mark the answers; tried clicking on the sentences themselves		x				4	3	1.2	0.2	2.88
17	Error	Image Matching	Correct answer feedback for 3rd sentence says the wrong number: 1 instead of 2. It also talks about the workshop instead of airport.		x				2	2	1.2	0.2	0.96
18	Learnability	Image Matching	Cheat sheets not noticeable		x			x	4	3	1.2	0.4	5.76
19	Satisfaction	Sentence Matching	When choosing the wrong answer, nothing tells you it's wrong, so you keep trying and failing		x				3	3	1.2	0.2	2.16
20	Satisfaction	Sentence Matching	Nothing happens when you submit the answers		x				3	3	1.2	0.2	2.16
21	Satisfaction	Ich gehe in...	Nothing happens when you submit the answers		x				3	3	1.2	0.2	2.16
22	Satisfaction	Location vs. Direction	When feedback pop-ups appear, user must click on "OK" before moving on to the next sentences. This is not clear and is frustrating. (Maybe gray out the rest of the screen when feedback appears)			x			2	3	1.2	0.2	1.44
23	Satisfaction	Image Matching	The feedback pop-ups are not very noticeable			x			3	2	1.2	0.2	1.4

													4
24	Satisfaction	Richtig oder falsch?	No feedback on affective activities			x			2	3	1.2	0.2	1.44
Scenario 4											**4.2**		
25	Learnability	So, what now?	Not obvious what they're asked to do	x					4	4	0.8	0.2	2.56
26	Satisfaction	So, what now?	Prefers to see the options revealed, not only numbers	x	x	x		x	3	4	0.8	0.8	7.68
27	Error	Explicit Information (both)	Two slides with identical name		x				2	2	0.8	0.2	0.64
28	Learnability	Navigation/Objective	Audio icons look like bullet points or drop-downs					x	3	3	0.8	0.2	1.44
Scenario 5											**4.6**		
29	Navigation	Choice Board A	Did not remember which slides were completed	x					2	3	0.4	0.2	0.48

Note. Adapted from *Turning Usability Testing Data Into Action* by C. Rosemberg, n.d., Toptal.

Appendix E

Solution ROI Calculation Based on Issue Severity

ID	Solution	Effectiveness	Complexity	ROI	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29
					3.6	0.4	3.6	3.6	0.4	4.8	0.4	0.2	38	48.6	36.5	76	13.7	0.96	1.44	2.88	0.96	5.76	2.16	2.16	2.16	1.44	1.44	1.44	2.56	7.56	0.64	1.44	0.48
1	Remove "Stop-and-Think" slides altogether.	212.8	1	212.8									x	x	x	x	x																
2	Replace "Stop-and-Think slides" with an exit ticket following "Self-Assessment."	212.8	2	106.4									x	x	x	x	x																
3	Make "Stop-and-Think" slides open-ended questions instead.	212.8	4	53.2									x	x	x	x	x																
4	In "So, what now?" instead of numerals, display the option titles in the blocks, so it's obvious what users should do/choose.	10.12	1	10.12																								x	x			
5	Change audio play button to make it more obvious that it's for playing audio.	18.72	2	9.36			x										x														x	
6	Remove audio for all on-screen text and keep it only for the German examples.	8.64	1	8.64	x		x																								x	
7	In the "Click Here" layer for "Explicit Information," make the navigation more obvious for continuing to the next slide.	3.6	1	3.6				x																								

8	For all activities that require users to "submit" their answers, have a pop-up appear when users click submit saying "your answer has been saved and you'll find it in your log."	7.92	3	2.64																		x	x	x			x				
9	Make the cheat sheets more noticeable by changing where they are on the screen.	5.76	3	1.92						x										x											
10	In "Image Matching," make the entire sentence clickable, not just the numbers.	2.88	2	1.44															2.88												
11	In all "Choice Board" activities, make the feedback more noticeable by making it a pop-up and darken or blur the background.	2.88	3	0.96																					1.44	1.44					
12	Correct the incorrect feedback for the third question in "Image Matching."	0.96	1	0.96																0.96											
13	Change audio play button so that audio can be paused.	3.6	4	0.9	3.6																										
14	In all "Choice Board" activities, make the feedback more noticeable by making it bigger.	2.88	4	0.72																					1.44	1.44					
15	Make sure that the "Explicit Information" slides have different names.	0.64	1	0.64																									0.64		

16	Make the images pop up bigger in "Image Matching."	1.44	3	0.48														1.44												
17	Make the images bigger in "Image Matching."	1.44	4	0.36														1.44												
18	In "Explicit Information," change the order of German examples to match the order in "Click Here" layer.	0.4	2	0.2					0.4																					
19	In the "Click Here" layer, make the sliding action more obviously related to the direction example and add animation to the location example.	0.4	3	0.133333							0.4																			

Note. Adapted from *Turning Usability Testing Data Into Action* by C. Rosemberg, n.d., Toptal.

Appendix F

System Usability Questionnaire Results Calculation

Question #	P1	P2	P3	P4	P5
1	2	3	3	4	4
2	2	3	4	4	2
3	2	2	3	4	2
4	4	3	4	4	2
5	2	2	2	4	3
6	1	3	3	4	4
7	2	4	3	4	3
8	2	2	4	4	4
9	2	3	3	4	3
10	1	3	3	4	1
Sum	20	28	32	40	28
Percentage	50	70	80	100	70
Average	74				
Standard Dev	16.24807681				
Confidence Interval	**74 ±14.242** (±19.2%) [59.758 – 88.242]				

Note. Adapted from *System usability scale (SUS)* [Video], by Budiu, 2023. Courtesy of Nielsen Norman Group.