Guidelines for translating text materials into eLearning courses - imparting learning techniques to text with interactive assets

Dongjie Xu
University of Central Lancashire
ME420, Media Factory,
University of Central Lancashire, Preston
dxu6@uclan.ac.uk

Janet Read
University of Central Lancashire
CM217, C&T Building,
University of Central Lancashire, Preston
jcread@uclan.ac.uk

This paper analyses what learning techniques can be adapted to translate text materials into interactive eLearning courses. Some translation guidelines are presented to assist course editors, regardless of whether they are the authors of the text materials or not, to accommodate their text tutorials in a dynamic online environment. These translation guidelines are underpinned by existing research outcomes and the development of an eLearning platform which has hosted at least 15 projects for online courses over the last 6 years.

1. INTRODUCTION

The pandemic that broke out in 2020 increased the pace of shifting education from offline to online (Gallagher and Palmer, 2020). Online courses are conducted through webinar and video conference approaches as well as on eLearning platforms that often leave learners to engage at their own pace.

Self-paced online courses are not a new concept. Moodle as a learning management system (LMS) was first released on 20 August 2002 and is still actively developed. The courses hosting platform, udemy.com, offers thousands of video courses. Six years ago, a LMS, Learnvoy, was developed in the Innovation Lab (iLab), at the University of Central Lancashire (UCLan); this has since hosted at least 15 eLearning projects.

Traditionally people have created their teaching materials in text, such as in PDF, e-book, prints and PowerPoint. Moving this material online requires knowledge of how to edit for eLearning. Simply pasting text online is not recommended, as learners tend to be multiskilling when reading online compared to reading prints (Baron, 2016). In other words, they are more likely to be distracted and skim the content, resulting in lower scores for deeper levels of comprehension. Inserting computer-based activities into text is one solution to maintain engagement and create a highly motivating learning environment (Clarke 2001).

Guidelines for novice educators to convert traditional materials into computer-based activities are not easily found. Articles found by the authors only provided general suggestions or came from a different perspective such as the structure of the course (Timm, 2018. Willers, 2016).

In this paper we describe guidelines that have emerged from our work using Learnvoy for eLearning projects. The guidelines are universal, as long as the platform provides similar assets.

2. LEARNING TECHNIQUES ADOPTED

2.1 Learning techniques

Table 1: Learning techniques grouped by utility from Dunlosky et al. (2013)

| TECHNIQUES          | UTILITY          |
|---------------------|------------------|
| Practice testing    | High             |
| Distributed practice| Moderate         |
| Interleaved practice| Low              |
| Elaborative         | Summarisation    |
| Self-explanation     | Highlighting     |
| The keyword mnemonic| Imagery use for text learning |
| Rereading           |                  |

Table 1: Learning techniques grouped by utility from Dunlosky et al. (2013)
When translating text for computer-based learning, the focal point should be on how people learn; namely, from the learner’s perspective. Dunlosky et al. (2013), evaluated the utility – effectiveness in a more lucid term, of ten learning techniques for paper-based learning (Table 1).

A study by Schugur et al. (2011) reveals that people do not transfer active reading skills like highlighting, from paper to eText/eReading. Biwer et al. (2020) also concluded that students rarely used effective strategies during self-study. On the other hand, as the research by Dunlosky indicates, the reason why those techniques are not effective is mainly due to the quality of the products from the techniques, not the techniques themselves. In other words, students don’t do these things well themselves. To assist the learner, a course editor, who has an overview of the context, can apply an effective learning technique at the right place to accelerate the pace of learning.

2.2 Remove the techniques that are difficult to implement by course editors

In considering which learning techniques can be ‘passed to’ the course editor to implement, we can rule out keyword mnemonics, re-reading, interleaved practice and distributed practice as these are best left in the learner’s control. For example, a keyword mnemonic is used when a learner associates a word to be learned with a familiar word to assist memory; the reason this works is that the mnemonic is familiar to the learner. A course editor can implement this technique, but it may not make sense to the learners as they are unlikely to have the same experience, knowledge, language, or cultural background.

After removing the four techniques listed above, we are left with these techniques (sorted from low utility to high utility) that can be considered to be useful to implement by a course editor:

- highlighting;
- summarisation;
- imagery use for text learning;
- elaborative interrogation;
- self-explanation;
- practice testing;

Note that several of these techniques can be applied to a single piece of text. E.g., keywords highlighted in a paragraph can be used for summarisation and imagery use for text learning. Elaborative interrogation (why facts make sense) and self-explanation (what facts mean to the learner), O’Reilly et al., 1998) are both about answering questions which can also be from the same text.

3. INTERACTIVE ASSETS FOR ONLINE COURSES

Interactive assets are the products that exist in an eLearning product that capitalise on the computational power of the product. High levels of interaction are known to raise motivation and engagement (Clarke 2001). Table 2 lists the interactive assets that have been used by the 15 projects that have used Learnvoy at UCLan

| Audio          | An audio clip          |
|----------------|------------------------|
| Animation      | A series of moving images          |
| Badge / Certificate | As a reward          |
| Decision Tree  | Choosing an option that may lead to a different path and ending. |
| Drop-down      | A combo box to pick an option          |
| File Upload    | Allow users to upload a file          |
| Fill the Blanks| Fill gaps by drag and drop or selection from combo boxes. |
| Gamification   | A small JavaScript game          |
| Grid Input     | A table of text input fields.          |
| Image          | Can be clicked          |
| Image Gallery  | A series of related images. |
| Interactive Video | Video with pause and a quiz from time to time |
| Likert Scale   | Score between two extremes |
| Multi-answer   | Users can choose more than one from a set of answers. |
| Multi-choice   | Users can choose one from a set of answers. |
| Multi-drop-down| This is like the matching left to right activity on paper. |
| Open-ended Question | Provides an input box after a question. |
| Score and Feedback | Assigns weight to questions and works out a score |
| Video          | Video of real people and scenes |

4. APPLY THE LEARNING TECHNIQUES, ALLOCATE THE INTERACTIVE ASSETS

Dr Gillian Rayner is the lead author of the Workbook “Compassionate Cognitive Behavioural Therapy (CBT) learning resource for people who Self-Injure (SI)”. Her workbook was translated into an online course using the guidelines in this paper.
In the following sections, a selection of paragraphs from Dr Rayner’s workbook are used to demonstrate the relationships between learning techniques and interactive assets.

4.1 Highlighting

Highlighting is extremely popular and easy to implement in learning. Although on its own, it was not ranked high in Dunlosky’s study, it is known to be efficient when combined with other learning techniques (Terada, 2021). In deciding what to highlight, keywords, phrases, terms and sentences of knowledge in the text are chosen as shown here:

“When we are distressed or experiencing very intense emotions, it can be extremely difficult to think clearly and make decisions about how best to support ourselves. At these times we can resort to using damaging and even self-destructive behaviours. Whilst these can feel helpful in the moment the benefits are usually only short term and can lead to the development of unhelpful long-term patterns. We will be exploring these in much more depth throughout the workbook.” (Rayner et al., 2019)

The highlighting crystallises the knowledge point of the paragraph which is that damaging and self-destructive behaviours lead to unhelpful long-term patterns.

4.2 Summarisation

After highlighting, the editor has found the knowledge point of the paragraph which is generally also its summary. Next we ask, from the list of the interactive assets, which can be used to elicit the same summary from learners? The key here is to encourage learners to think, not to tell them directly. As a course editor, one thing to bear in mind is that you don’t have to summarise each paragraph by yourself. Each title, heading, or bullet point could be a summary. When a summary is a brief narrative, the methods to manipulate it can lead to different interactive assets. Five methods have been used in the past projects: ‘use it as is’, ‘use as a question’, ‘use as an option in a question’, ‘ask learners to agree on it’, and ‘use keywords’.

4.2.1. Use it as it is

When using the summary ‘as it is’, Image from the assets list (Table 1) can be used (See example in Figure 1); this uses the learning technique: Imagery use for text learning.

4.2.2. Use as a question
Simple grammar skills turn the summary into a closed question, and we can then use multi-choice or drop-down to choose Yes or No. Figures 2 and 3 display the interfaces of using multi-choice and drop-down.

![Figure 2: Summarisation into Boolean question with multi-choice](image)

**Figure 2: Summarisation into Boolean question with multi-choice**

**Do damaging and self-destructive behaviours lead to unhelpful long-term patterns?**
- Yes
- No

4.2.3. Use as an option for a question
In this case a question needs to be created, together with extra options. Figure 4 is a screenshot of applying multi-answer to the question.

![Figure 4: Use a summary as an option for a question – multi-answer](image)

4.2.4. Ask learners to what level they agree on the summary
There are no correct answers when asking to what level learners agree with a summary. A Likert Scale can be employed for this (see Figure 5).

![Figure 5: Likert scale to get learners thinking](image)
4.2.5. Use the keywords/phrases in the summary
When multiple options are available, the Fill the Blanks asset can be more appealing to learners than multi-answers. Adding an image as the background can impart this activity with a feeling of a game. For instance, once “Damaging” and “Self-destructive” are extracted from the summary, and two opposite options “Positive thinking”, “Self-Soothing” and a background image are added, a simple drag-and-drop game can be created with the Fill the Blanks asset (Figure 6).

![Figure 6: Extract the keywords/phrases out from the summary for the Fill the Blank asset](image)

4.2.6. Multiple points in a summary, bullet points and items under the same subject.
If a summary consists of multiple concepts, each concept can be used as an option. In fact, items under the same subject, regardless of whether they are organised in bullet points or in a chunk of text, can be used as options for Multi-answer and Fill the Blanks. If you keep one point and invert the meaning of others, multi-choice can be used.

4.2.7. Points in sequence
When a summary has points in sequence which often appears in scenarios, case studies or role plays, the Decision Tree is another asset to choose which can be instantiated as a group of multi-choice questions that display one after another according to learners’ choices.

In the CBT workbook by Rayner et al., Session 9 includes six steps for problem solving (Rayner et al., 2019). Figure 7 shows how these are laid out.

1. Identify and describe the problem
   ...
6. Look back and evaluate the outcome

Each step is the heading of a section in sequence. Here the screenshot of the first step is presented with some key points highlighted in its section and adopted as options. The third option takes learners to the next step and the other two take them to a dead end.

![Figure 7: Decision Tree for summaries in sequence](image)

4.3 Imagery use for text learning
Imagery use aims to translate text into mental images. Course editors can provide the images to facilitate memory. The images can be derived from; Chapter titles, section headings etc, grouped items with explanations or examples, information, concepts in a storyline, or points, items harvested from Highlighting;

4.3.1. Chapter titles, section headings etc

![Figure 8: Compassionate kit bag](image)

Chapter titles, section headings etc. can be very brief. It is best to read their context before finding or creating an image. E.g., “Compassionate kit bag” is a title of a section in Rayner’s workbook. The context explains it as a mental, digital, or physical bag/box that carries items to soothe your feelings (Figure 8).

4.3.2 Grouped items with explanations or examples
It is a popular writing style that items under the same subject are grouped together. An image gallery is a good choice to visually present these items, with the click to popup having extra information to make it interactive. For instance, to embody the idea of a Compassionate Kit Bag, Rayner had a case study from “Angela” who carried a Compassionate Kit Bag for her scenarios. There were 10 items in her kit bag. Each item had a name and a reason for it being in the bag – this is perfect for an image gallery. E.g.,

“Rose oil which reminds me of the roses that are in my garden as a child. I would make my own ‘perfume’ from these during the summer and this smell help me feel happy and carefree. (Rayner et
al., 2019). Figure 9 illustrates an image gallery for the 10 items in grid layout.

**Figure 9: Image gallery for items under the same subject**

### 4.3.3 Concept explanations and storylines

If a concept explanation or storyline is discovered from the text material, an animation is a good choice as it is far more effective than a static image (Ploetzner et al., 2021). In a broader concept, video with a real scene and actors/actresses can be also classified as “Imagery use for text learning”.

### 4.3.4 Items harvested from Highlighting

Depending on how many items were identified from the highlighting, single image, image gallery, animation and video can be employed.

### 4.4 Elaborative Interrogation

Elaborative interrogation is about questioning why a statement makes sense. Depending on the size of the answer you require learners to submit, the Open-ended asset and the File Upload asset can be employed (Figure 10).

**Figure 10: The Open-ended asset for open-ended questions**

If a short answer is expected, text input is good enough. If a long answer is expected, you may ask learners to upload it as a file with a file upload asset (Figure 11).

**Figure 11: Upload answer as a file**

### 4.5 Self-explanation

Self-explanation is to explain learners’ understanding of the facts in the text and reflect on their prior knowledge, the questions asked will be open-ended too. As with Elaborative Interrogation, Text Input and File Upload can be employed or a multi-answer with text input can be used (Figure 12).

**Figure 12: Multi-answer for self-explanation**

Grid input can be used to lay out related questions in a grid (Figure 13).

**Figure 13: Grid input for self-explanation with sub-questions**

### 4.6 Practice testing

Practice testing is used to test learners at various points on the newly studied material. All the interactive assets on Table 2 can be used. Audio can be adopted when listening is required, and a Badge/Certificate may motivate learners. Interactive Video is a versatile tool for practice testing. A quiz can be displayed at the end of the video or popping up an interactive asset inside the video at any point.

Feedback can be given immediately after a question is answered, or after a whole test, providing no subjective marking is required. The Score and Feedback asset in Learnvue is designed to calculate the score from required assets and give feedback at the end of a test (Figure 14).

**Figure 14: Score and Feedback after test**
6 SUMMARY

Courses are moving online. This trend is increasing since the pandemic in early 2020. People who used to convey their teaching in text are facing a challenge to turn their text into interactive eLearning courses. Due to the difference between learning techniques people use online and on paper, copying the text and pasting into an eLearning platform is not enough. This paper describes a process by which text materials were translated for an interactive eLearning course and suggests some learning techniques to apply to text. It analyses what learning techniques can be adopted and shows how to employ them. A project that translated a CBT workbook (Rayner et al., 2019) into an online course is used as an example. Screenshots from an eLearning platform – Leanvoy are used to illustrate the Interactive assets. Interactive assets are not limited to the assets listed in this paper and can be various on different eLearning platforms. If an asset fits the purpose of a learning technique, it can be adopted.

7 FUTURE WORK

Although these guidelines are derived from the experience of the past 15 projects and underpinned by work from researchers such as Clarke (2001), Dunlosky et al. (2013), and Ploetzner et al. (2021), evaluations are still needed to verify the value of these guidelines. Therefore, the future work is to design experiments and gather data to measure the benefits of implementing these guidelines, and produce a map to crystallise the process of translating text materials into digital representations for teaching.

8 ACKNOWLEDGEMENTS

The author wishes to acknowledge the support from the colleagues in Innovation Lab led by Mr Danny Livingstone, Dr Gillian Rayner for giving permission to use her work for examples in this paper, and Dr Phil Hollifield for his reviews and comments.

9 REFERENCES

Baron, N.S. (2016). Do students lose depth in digital reading? [online] The Conversation. Available at: https://theconversation.com/do-students-lose-depth-in-digital-reading-61897 [Accessed 11 Mar. 2022].

Biwer, F., Egbrink, M.G.A. oude, Aalten, P. and Bruin, A.B.H. de (2020). Fostering Effective Learning Strategies in Higher Education – A Mixed-Methods Study. Journal of Applied Research in Memory and Cognition, 9(2), pp.186–203.

Clarke, A. (2001). Designing computer-based learning materials. Aldershot, Hampshire, England; Burlington, Vt: Gower, pp.1, 4–5.

Dunlosky, J., Rawson, K.A., Marsh, E.J., Nathan, M.J. and Willingham, D.T. (2013). Improving Students’ Learning With Effective Learning Techniques. Psychological Science in the Public Interest, [online] 14(1), pp.4–58. Available at: https://journals.sagepub.com/doi/abs/10.1177/1529100612453266 [Accessed 10 Mar. 2022].

Gallagher, S. and Palmer, J. (2020). The Pandemic Pushed Universities Online. the Change Was Long Overdue. [online] Harvard Business Review. Available at: https://hbr.org/2020/09/the-pandemic-pushed-universities-online-the-change-was-long-overdue.

O’Reilly, T., Symons, S. and MacLatchy-Gaudet, H. (1998). A Comparison of Self-Explanation and Elaborative Interrogation. Contemporary Educational Psychology, 23(4), pp.434–445.

Ploetzner, R., Berney, S. and Bétrancourt, M. (2021). When learning from animations is more successful than learning from static pictures: learning the specifics of change. Instructional Science, 49(4), pp.497–514.

Rayner, G., Bowling, G., Ashworth-Lord, A. and Laird, C. (2019). Compassionate Cognitive Behavioural Therapy (CBT) learning resource for people who Self-Injure (SI). [online] CBT Course. Available at: https://schm.uclan.ac.uk/course/compassionate-cbt-workbook/ [Accessed 12 Mar. 2022].

Schugar, J.T., Schugar, H. and Penny, C. (2011). A nook or a book: Comparing college students’ reading comprehension level, critical reading, and study skills. International Journal of Technology in Teaching and Learning, 7(2), pp.174–192.

Terada, Y. (2021). Highlighting Is Ineffective—Here’s How to Change That. [online] Edutopia. Available at: https://www.edutopia.org/article/highlighting-ineffective-heres-how-change [Accessed 13 Mar. 2022].

Timm, M. (2018). How to Turn Your Ebook into an Online Course. [online] teachable:blog. Available at: https://teachable.com/blog/ebook-online-course [Accessed 10 Mar. 2022].

Willers, A. (2016). How to Convert PDF into Online Training. [online] eLearning Industry. Available at: https://elearningindustry.com/convert-pdf-into-online-training [Accessed 10 Mar. 2022].