Umbrella Summary

Signaling in Training

A Summary of Workforce Research Evidence Relevant to the Child Welfare Field

What is signaling?

In a learning environment, signaling refers to cues that direct learners' attention to specific instructional content or that emphasize how the content is organized (van Gog, 2014). Signals can be verbal (oral or written) or visual (static or dynamic images or graphics). More commonly studied examples include:

▷ signals in written materials: underlining, italics, bold, highlighting, outlines, headings, overviews, and summaries

▷ signals in visual materials: arrows, circles, flashing, color coding, spotlighting (graying out some content), zooming in on key content, and gestures of pedagogical agents

When signals are used only in written text (i.e., without accompanying visuals), they tend to be for the purpose of highlighting organizational aspects of the content, to support development of coherent mental models (Schneider et al., 2018). When signals are used in visuals, they may also depict overall organization or function, such as when an entire system is depicted in a single graphic (e.g., de Koning et al., 2010). Alternatively, signaling in visuals may guide attention to more discrete pieces of information, such as highlighting a term or part of an image in a PowerPoint when it is mentioned in an accompanying audio (e.g., Jamet, 2014). This type of signaling is especially useful for helping learners more readily integrate information from multiple sources (e.g., text and pictures; Richter et al., 2016).

Why is signaling valuable?

Signaling is valuable because it has a strong effect on learners' retention (i.e., retaining information, such as through recall or recognition) and a moderate effect on transfer (application of learning in a new situation; Schneider et al., 2018). Note that because signaling has mostly been studied in conventional educational environments (not job training), this type of transfer is not about transferring knowledge and skills from training to on-the-job performance; instead, it typically involves things like applying a learned strategy to a novel problem (Schneider et al., 2018). Though many additional factors have been studied to see if the signaling effect is stronger or weaker in different circumstances, the bulk of the research shows that other factors (e.g., type of signal, system- vs. learner-paced) tend not to make a difference. For some factors (e.g., learners' prior knowledge and dynamic vs. static signals), the results are inconsistent across meta-analyses (Alpizar et al., 2020; Schneider et al., 2018). Thus, the most stable finding is the positive overall effect that signaling has on learning outcomes.

How does signaling work?

Signaling appears to work by reducing the cognitive demands involved in learning (known as cognitive load), which then improves learning outcomes (Xie et al., 2017). Learners who receive signaled instruction report lower perceived difficulty and less mental effort to learn, compared to those who do not receive signaling (Schneider et al., 2018; Xie et al., 2017). This reduction is associated with better retention and transfer. Further evidence of how learners direct their cognitive resources comes from eye tracking data, which show that when learners have signals, they spend more time looking at the most relevant material than those who do not have signals to direct their attention (Schneider et al., 2018). Thus, signaling appears to help learners make better use of their mental effort.

How should signaling be used in training?

It is strongly recommended that signaling be used in child welfare training. For written information, use formatting (e.g., bold, italics, font size) to clearly highlight the organization of the information and key concepts, and use overviews and summaries to underscore main points. For images or graphics, use simple visual signals (e.g., arrows, shading, circles) or labels to direct attention to key features of the image. In PowerPoint, the animation function is a very valuable and underused means of controlling attention, either by introducing a visual signal or by simply regulating when non-signaled content (text or visuals) is displayed. For example, animation can be used to slowly add content to a slide, one key concept at a time, to ensure that learners are always focused on the right content, versus, for example, reading the 5th bullet when their focus should be on the 2nd bullet or looking at the bottom part of a visual when they should be focused on the top part. Disconnects between what learners are hearing and seeing are likely to increase cognitive load and result in a poor use of their attention, and this is a common problem with multimedia training. Note that many of the types of animation in PowerPoint have the potential to be distracting and irrelevant (e.g., bouncing, swiveling, spinning), so it is probably best to keep it simple (e.g., appear, disappear) unless the motion aligns with the concept you want to convey (e.g., using the *expand* animation to show that something grows). If a lot of signaling is needed to control attention, look for ways to ensure that the signaling itself does not create excessive cognitive load. For example, in a dynamic (vs. static) medium, once the signal is no longer needed, it can be removed before introducing the next signal (e.g., if it is no longer needed, have the first arrow disappear before introducing the next arrow). This reduces visual clutter and, in essence, serves as a signal as well; it indicates to learners that they should stop directing their attention to that content.

QIC-WD Takeaways

► Signaling has a strong effect on learners' retention (i.e., retaining information, such as through recall or recognition) and a moderate effect on transfer (application of learning in a new situation).

► Signaling appears to work by reducing the cognitive demands (i.e., cognitive load) involved in learning, which then improves learning outcomes.

▶ When learners have signals, they spend more time looking at the most relevant material than those who do not have signals to direct their attention.
▶ It is strongly recommended that signaling be used in training.

References

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