
**Topic**

The main purpose of this study is to evaluate the usefulness of graphics within CAD computer program manuals in the learning process of the software application itself. Using the Cognitive load theory from Chandler & Sweller (1996), the authors compare three different ways first time learners learn a CAD software package using three different kinds of manuals, conventional, integrated, and juxtaposed.

**Research Hypotheses**

Following the development of the Cognitive load theory, the authors set up an experiment to replicate two of the three conditions stated by Chandler & Sweller (1996), using their conventional and integrated manuals, and introducing a new juxtaposed manual. The hypotheses tested were:

- When the learning material involves low interactivity between the elements (low intrinsic cognitive load), the total cognitive load remains low whatever the format of presentation (extraneous cognitive load). Therefore, there should be no difference in performance between groups using different materials.

- When the learning material involves high interactivity between the elements (high intrinsic cognitive load), the total cognitive load should be critical for learners using a conventional manual and a computer (high extraneous cognitive load due to split attention) but not for learners using a juxtaposed manual alone (a manual showing computer screen images and juxtaposed sections of instructions) or an integrated manual alone (a manual showing computer screen images with arrows connecting to the corresponding sections of instructions) because of the low extraneous cognitive load (no split attention effect).

So, for learning material that includes high interactivity between the elements:
- learners using an integrated manual alone during the instruction phase should learn faster and perform better on the test that those using a conventional written manual and a computer (a replication of the hypotheses of Chandler & Sweller (1996) and a test for split attention effect).

- learning using a juxtaposed manual alone (during the instruction phase should learn faster and perform better on the test that those using a conventional written manual and a computer (A test for the split attention effect).

- learners using an integrated manual alone during the instruction phase should learn faster and perform better on the test than those using a juxtaposed manual alone. (This test the existence of different levels of integration of the material and different levels of extraneous cognitive load).
**Methodology**

Thirty students were selected to participate in the experiment. The group was split into three small groups of 10 participants each. All the participants had some previous knowledge on computer but none had used CAD/CAM software before. Regarding materials, the authors used three different sets of manuals, one with each of the small groups, and each manual had eight sections, three with low element interactivity and five with high element interactivity. The test material consisted of a written questionnaire and practical test.

In the experiment, learners were first assigned to one of the three groups and had to learn to use the software using the corresponding manual (plus the computer depending on the group). Then, all the participants had to answer a written test without a computer. Finally, the participant had to pass a practical test on the computer.

**Findings**

1. Regarding the learning times, the group using conventional manuals spent almost twice the time than the other two groups using juxtaposed and integrated manuals.

2. The authors stated that, as expected, the results showed that there were no significant statistical differences between the performances of learners on written tasks with low element interactivity. In addition, contrary to expectations, there is no statistical difference either between the performances of learners on the high interactivity written task. Moreover, that there were not a significant differences in the performances of learners on the whole written task or on the whole practical task.

3. Learners reused their previous computer knowledge to face the unknown software, using alternative ways to get the same results, clicking “OK” or “cancel” when prompted to do so, and pressing the F1 key to get the help menu when they felt lost.

**Implications**

The main point in the paper was the fact that learning new software can be carried out without a computer by using a manual that includes screen images. Also, that in the learning process an individual relay on prior knowledge in order to acquire knew knowledge.

**Usefulness of the research**

I think this paper is useful because it corroborates that when learning something new, especially software applications, it is not an isolate knowledge but integrated and built upon previous similar experiences. Regarding the issue of computers, at least in this case, it is better not to combine learning a program from the manual and at the same time practice it in the computer.