

Lucid Learning: a Theory of Learning in Mentally Enriched Virtual Realities

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Abstract. This paper focuses on the question of how human learning is influenced when a learner is able to mentally create or enrich his or her learning environment in a Virtual Reality. A definition of this process called Lucid Learning as the acquisition of new skills through problem solving in a mentally created or enriched world in which the learner feels physically, socially and self-present is given and its phases *Brainstorming the World*, *Exploring the Mind* and *Building the Knowledge* are depicted.

Keywords: Lucid Learning · Virtual Reality · Neurofeedback · Lucid Dreaming · Learning Environment

1 Lucid Dreaming in VR

When thinking of the ultimate experience of presence in a virtual environment, Calleja depicts Virtual Reality (VR) as “lucid dreaming on demand” [1]. We are at a point where we can control our own movement in VR through our thoughts, using neurofeedback technology [2]. Through further research, possibilities of not only moving in but creating the whole virtual reality through the users thoughts will emerge. The use of a neurofeedback system linked to a Head Mounted Display could bring us to the next level of learning, where we will be learning in the virtual environment that feels like a lucid dream: Lucid Learning. The feeling of lucid dreaming refers to an experience similar to “dreaming while being conscious that one is dreaming” [3]. Thus, the feeling of lucid dreaming in this paper refers to a conscious experience within the process of creating an individual world using only your own thoughts.

First, we need to discover a way to create the feeling of lucid dreaming using VR in order to think about the effects on learning processes. For Calleja, the lucid dreaming VR experience is described as “a pay-per-act performance inside a virtual world so compelling it is challenging to distinguish it from reality itself” [1]. The concept which is addressed here is called presence, which is widely explained by the feeling of being there. Beyond the physical presence, Biocca depicts social and self-presence [4]. The process of trying to solve a problem (para-authentically or artificially represented by a physical component, a social actor or a modification of the self) through in VR visualized imagination is what will be called Lucid Learning. I define Lucid Learning as the acquisition of new skills through problem-solving in a mentally created or enriched world in which the learner feels physically, socially and self-present.

2 Stages of Lucid Learning

On the basis of constructivism with its understanding of forming knowledge inside the learner [5], constructionism as a learning-by-making [6] and imaginative learning as creative exploration of an environment [3], we can form an understanding of Lucid Learning by separating three steps which are initiated by feeding the learners brain with a problem. In the beginning, the learner deals with an issue by using a brainstorming process which results in mentally constructing or enriching an environment. This *Brainstorming the World* process can be referred to the learning-by-making approach of the constructivists [3].

Secondly, the learner explores this environment in a creative way (*Exploring the Mind*), using the capacities of imaginative learning [7]. In this phase, the learner performs a continuous try and error process with the aim of finding a valid solution to the problem. This is the hard part since it requires thinking about every single aspect of the given problem and may require help from outside, for example from a teacher or from tutorial software.

By doing so, the learner gets to the third and final step: the creation of new knowledge, coming from own thoughts in a mind-built or mind-enriched world over a given issue. This is the lived constructivists perspective: The only part that comes from the outside of the brain is the specific problem and the conditions. Every component of the problem-solving process itself (additional environment, actors, and methods) is created by the brain. By doing so, the new knowledge is something the learner could discover by himself during the process of *Building the Knowledge*. Note that this can be an iterative process, so the created knowledge may not be perfect at the first attempt but when enriched with further questions, it may develop and grow into its assumed form.

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