Beyond Learning Alone – How Other Learners Affect Self-Study in IVE

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Abstract
For most learners, appropriate learning environments selected for self-study (e.g., libraries) are helpful in sustaining self-regulated learning. In order to provide learners with appropriate self-study spaces, we examined an immersive virtual environment (IVE) for English phonemes acquisition practice. Social settings of learning environment sometimes yield positive effects, but sometimes not. To assess the influence of other learners being present in a space against learning behaviors towards the continuous skill development of learners, we have conducted several exploratory studies. In this paper, we shared preliminary study results, to discuss the influence of shared space with other learners in the IVE. After the 10-day self-regulated English practicing class, we observed positive influences on intrinsic motivational factors; however, persistent self-regulated learning effort did not necessarily result in such a shared learning space.

Author Keywords
IVE; Intrinsic Motivation; Self-Regulated Learning; English Phonemes Acquisition.

CSS Concepts
• Human-centered computing~Human computer interaction (HCI)~Interaction paradigms~Virtual reality;
Introduction

For most learners, selecting appropriate learning environment is important for sustaining self-regulated learning. Depending on learners’ preferences, such environments range from isolated spaces (e.g. a closed space in a library) to public spaces (e.g. a street for dancing practices). Literatures show that social environment in a learning space, i.e., existence of other people, sometimes yield positive effects [6]. However, people in a same space sometimes negatively impact psychological safety, in turn, pose challenging learning behaviors [1,4]. Similarly, while Immersive Virtual Environment (IVE) is expected to be an effective environment for distance learning, Meng-Yun et al. discussed that designers of IVE classrooms should consider the tradeoff between learning experience and social interactivity [3]. For example, an IVE full of friendly peers may be comfortable environment, but it may also hinder his/her challenging learning behaviors. Therefore, our research question is:

RQ: How does other learners being present in an IVE affect a learner’s self-regulated learning behaviors?

System

Figure 1 and Figure 2 show the overview of the IVE we developed. Specifically, the IVE is designed for phonemes acquisition practice. We used a voice recognition device (VRD)\(^1\) to measure a learner’s RPSs (see “Measures” the sidebar) and showed those to the learner as a feedback of his/her learning progress. Each participant wore a head-mounted display (HMD), through which the learner could observe the IVE and his/her own body from a first-person perspective. We

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\(^1\) Google Home; And Dialogflow, https://dialogflow.com/

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Preliminary studies-Measures

**Self-regulated learning efforts:** In order to estimate how a learning climate foster participants’ effort towards self-regulated phoneme acquisition, we calculated each session’s recorded phoneme ratio by a user over voice recognition system as a recorded phoneme score (RPS) for each phoneme item of forty-two-phoneme.

For example, if a unique word occurrence in a Session-X’s text including the phoneme ‘w’ was registered as 4 (i.e. ‘would’, ‘between’, ‘one’, ‘requires’), the situation observed as “User Alice’s RPS for the phoneme ‘w’ was 50 for a Session-X” means that Alice recorded 2 words included in the registered list in the Session-X over the system. The reasons why the rest of registered words not being recorded would not be affected from only the leaning climate but also the situation such as a voice recognition environment. However, we think the RPS can be a measure that is being reflected participant’s self-regulated learning efforts.
English text is displayed on the whiteboard in the IVE (in this case, ‘... affect our opinions and choices.’), a learner launches the VRD using a wake-up phrase and starts to read the text. By recognizing the short silence after the learner’s voices, for example, "affect our opinions," the VRD responds with a word "set" (1) and the IVE system shows the recognized phrase in the UI1 (2). Then, the learner continues to read the text “and choices” (3, 4). The learner can check his/her RPSs by pressing a button on the UI2 (5) and displaying a line graph (6). To figure out which phonemes need further practices, the learner sees the UI3 (7).

Preliminary studies
In this paper, we present two preliminary studies. In Study 1, we observed self-regulated learning in a solitary IVE as data for reference. And to examine characteristics of self-regulated learning behaviors in the shared learning space, in Study 2, we designed a shared IVE for small practice class. Each participant of these studies basically conducted a self-regulated reading practice for phoneme acquisition. Table 1 shows the overview of the two studies.

Study 1 – Solitary IVE. We recruited ten participants (five males and five females). We asked them to practice English phoneme alone in the IVE. The English texts displayed on the whiteboard changed automatically every six minutes. Participants completed the whole task in less than 60 minutes. Even though the displayed text changed automatically after every pre-determined time slot, natural use included taking short breaks at any point between task beginning and task end and was not limited to after participants finished reading each English text.

Study 2 – Shared IVE. Seven participants (five males and two females) were recruited for Study 2 and we asked them to practice in the shared IVE with other participants. One native speaker also participated in the IVE and played a role of an instructor. The class was held for ten days in total and the participants were asked to attend at least five days. On each day of participation, they could study maximumly three texts led by the instructor. The study included not only self-regulated readings but also shadowing practices. Since other participants were in the same IVE simultaneously and moreover their practicing voices were audible, the learning environment in the IVE was somewhat noisy.

Results
Due to the limited number of participants and the conditions of two studies being very different, we do not compare these studies statistically. In this paper, we present our thoughts based on the results of the experiments.

Intrinsic motivation[5] (see “Measures” the sidebar): Figure 4 shows the intrinsic motivation of the participants which was asked by a questionnaire during the post-session. We are interested in the higher level of perceived competence that the lower quartile of competence was higher in the shared IVE compared with the solitary IVE.

Self-regulated learning efforts (RPSs; see “Measures” the sidebar): Figure 5 shows the RPSs in the post-test for both studies. In the figure, we grouped the participants into three, two participants who took the lowest RPSs (lower2), two participants who took the highest RPSs (upper 2), and the rest
The interesting thing is that the RPSs of upper 2 in Study 2 was not higher than those in Study 1.

![Figure 5: Boxplot of the RPSs in the post-test.](image)

**Discussion and conclusion**

In this paper, we introduced the preliminary studies. We found that, if learners learned literally alone in the IVE, they had potential feelings of incompetence. In the small practice class in the IVE designed to facilitate immersive co-present experiences, the learning climate exerted from the other learners seems to have a good influence on intrinsic motivational factors. In the Study 2, almost all of the learners' perceived competence were positive. According to the Dunning–Kruger effect [2], people in groups, including those in the bottom and top quartiles, estimate their ability and performance as above average. We think people's above average feeling in groups might mitigate perceived incompetence, especially for people in the bottom quartiles. This could lead to a better learning experience that fosters long-term self-regulated learning, at least more so than solo learners having potentially feelings of incompetence.

Regarding how a learning climate could lead to positive learning efforts, the environment in which learners were surrounded by other learners was not necessarily better than the solo environment. The reasons why the shared IVE was not better for self-regulated learning are not clear from the preliminary studies, but one of the reasons might be related to the lower attentiveness of learners among other noisy learners.

Our next step is to consider how we can design an appropriate IVE for self-regulated learning that incorporate the strengths of both of a solitary environment and a shared environment.

**References**


