A MUVE in service of Teacher Professional Development: How engaging is teaching role-playing instruction in Second Life?

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The development of Internet-based, 3-D virtual worlds (VWs) indicates that shared graphical multi-user networking environments are fully functioning; they facilitate communication, gaming, online entertainment, marketing, e-commerce, as well as training and education. As far as VWs are able to represent a promising setting where online teacher learning communities in professional development programs can be supported, we created a learning environment in the virtual world of Second Life. It is appropriate for teaching role-playing instruction to primary and secondary school teachers and performing a case scenario from a rhapsody of the Odyssey, Homer’s epic poem, at the same time. Our empirical research was based on a quasi experimental design and on the criteria of quantitative method. The research sample was composed of thirty primary and secondary public or private school teachers from different learning subjects and disciplines. Quantitative analysis indicated that teaching in Second Life had a positive effect on the engagement of the experimental group. The affordances of the virtual world seem to deal successfully with issues, such as establishing and maintaining a collaborative climate, and exposing oneself in front of a group of unfamiliar people by performing a role-play.

Keywords engagement; role-playing instruction; teacher professional development; Second Life; virtual worlds

1. Introduction

1.1 Teacher Professional Development

In order to meet the learning needs of the 21st century student, policy makers and school boards are coming to realize the significance of the ICTs technologies in supporting fundamental educational shifts. But the success of any standards-based educational reforms, much needed by the students in order to acquire competencies crucial in our digital era, mainly depends on effective and efficient teacher professional development. Ongoing and targeted professional development courses or workshops should support and guide teachers in their efforts to develop innovative instructional strategies and to enhance student achievement. Teachers may enrich their instructional expertise through formal (e.g. courses, seminars, workshops) or informal (e.g. everyday discussions with colleagues) learning.

Professional development may unfold in various ways, such as co-teaching, mentoring and reflective discussions on student work, on assessment, on resource selection or on instructional design decisions, which take place in classrooms. But also, it may happen individually, through personal efforts, by conducting inquiry/action research [1], or by using online professional development tools [2-3].

Unfortunately, the current professional development forms are fragmented and seemingly they disregard of modern teacher learning theories, treating teachers as individual learners, but not as active participants in the practice of teaching and learning in multiple contexts, such as classrooms, school communities or professional development seminars. On the contrary, situative theorists argue that the learning outcomes relate to the contexts and activities in which people learn [4]. As a result the practitioners fail to be engaged and acculturated into these social practices deemed essential to their new, upgraded role [5].

Sociocultural theories emphasize the central role of context for creating different potentials for teacher learning, in disagreement with prior assumptions that the transfer of knowledge in the form of general and de-contextualized theories, methods and practices, may be applicable to any learning settings [6]. Different contexts may lead to different results. However, as [7] state: “Learning to teach was viewed as learning about teaching in one context (the teacher education program), observing and practicing teaching in another (the practicum), and, eventually, developing effective teaching behaviors in yet a third context (usually in the first years of teaching).” (p. 399).

Nevertheless, formal or informal practices, physical and social circumstances, routines, beliefs, experience, skills, values, and so many other things that constitute the concept of “context” of learning organizations, they greatly confine the effectiveness of a teacher professional development program [8].

Context, including school meetings, summer workshops, courses, visits to colleagues’ classrooms, has already been identified as a core element of the professional development design, among the others which are the content, the strategies, and the media used for the employment of the above elements [9]. Furthermore, collective participation and active learning have been acknowledged as decisive factors, which affect the efficiency and efficacy of a professional development program [1]. Through offering ample opportunities for interaction and sharing experiences between teachers in active learning communities, the concept of TPD (Teacher Professional Development) is perceived into a
new frame of reference, in which vision, motivation, understanding, practice, reflection, and community are prevalent [10]. Facilitating teacher engagement in professional development programs is a prerequisite for the accomplishment of the intended goals.

1.2 Engagement

Student engagement relates to school bonding or connectedness and to delinquent behavior, as a result of non-compliance to rules, norms and roles engendered by the society’s own institutions [11]. The meaning of engagement is complex and somewhat obscure because the concept is encountered in different research contexts (e.g. education, sociology, psychology) and it renders inconsistently adjacent notions [12].

Despite the variable terms of student engagement, there is a growing consensus among researchers on the main components of this concept, which are the feelings (affective or emotional factor), the thoughts and beliefs (cognitive factor) and the behaviors (behavioral factor) [13-17].

Emotional or affective engagement refers to indicators such as boredom, happiness, sadness, anxiety, feelings of belonging, and interactions with teacher and peers. Cognitive engagement is about self-regulated, reflective and meta-cognitive learning strategies, time invested on task, setting and pursuing personal goals. Behavioral engagement includes complying with rules and avoiding disruptive practices, attending the class, and collaborating with peers in school and school-related activities [18, 16].

According to a research review by [11] on features that may influence student engagement, personal factors, such as career aspirations and expectations, self-efficacy, self-esteem, and the state of the relationship with colleagues, they have considerable effect on the quality and the level of engagement. Furthermore, contextual factors, such as student perceived quality of a learners’ community, the adaptation and acculturation in that, the class and school size, the strictness of school regulations and the harshness of the school principals, they may influence student engagement, in the same vein.

Research findings document the positive impact of Student Engagement for decreasing deviant, antisocial behavior [19] that is highly associated with the academic performance [20], and dealing with depressed feelings [21]. The implementation of cooperative instructional techniques and the cultivation of mutual respect between teachers and learners have likely positive effect on learning engagement [22].

In teachers’ profession the reduced willingness to deal with problems in a dedicated manner and to exert effort in task, due to feelings of exhaustion, indifference or professional inefficacy, is widely known as “burnout” syndrome. Work engagement stands on the opposite side, which refers to the development of mental resilience in front of obstacles and negative attitudes, to the increased sense of self-efficacy, absorption, devotion and dedication to hard work, which is a source of energy, enthusiasm, inspiration, creativity and positive feedback [23].

1.3 Teacher Learning Communities and Virtual Worlds

Teacher engagement in activities implemented by professional development designers brings to the surface the critical role of the professional learning communities. Through the processes of social interaction, expertise sharing and meaning negotiation, teachers have the opportunity to acquire and evaluate beliefs and practices viewed from different perspectives or various contexts [24].

Looking through the prism of the situated cognition theories [25-26] one can easily perceive that teacher learning communities, formal or informal, have a direct and profound impact on quality and successful completion of teacher development programs. Advanced computing and networking infrastructure can enhance teacher collaboration, augment reflection on teaching practices and facilitate the creation of communities of practice [27].

Although the emerging network technologies can provide the online communities for professional development with breakthrough solutions, the impact on teacher learning seems yet to be poor or disputable, as a broad cultural shift does not follow up this progress, and, consequently, the main needs of the participants in such programs remain unmet [28].

Besides, the lack of familiarity with hardware and software technological issues, of adequate time for preparation and for adapting to the demands of the new technologies, and of access to reliable technological means or support, may discourage teacher educators from using computers in their learning activities [6]. In order to support effectively professional development practices, an online learning environment should adhere to some basic design principles, such as the connection of the learning experiences to the everyday life of the participants, the ample chances for interaction, reflective thinking and engagement, and, also, the convenient, broad, and sustainable access [29].

Many e-learning environments, following the constructivist approach, tend to be learner-centered and collaborative. However, the absence of face-to-face contact and interaction with peers and facilitators increase the sense of student isolation and may be a barrier to providing social and emotional support for learners, which is a critical factor for the formation of effective learning communities [30-31].

Virtual Worlds (VWs) may address these limitations. Participants, in the form of pictorial representations of themselves, known as “avatars”, may interact simultaneously in three-dimensional virtual environments that replicate more or less the real world. This interaction may be in many forms: making friends and joining groups, chatting,
walking - flying - or swimming together, developing and editing 3D objects with the use of built-in authoring tools, scripting, etc.

Membership in groups is based on common interests, goals and experiences. Spatial visualization and orientation, i.e. the ability to rotate and manipulate 3D objects, and to navigate 3D graphical environments, being aware of the position of the 3D objects and estimating the distance with respect to avatar’s position [32], can support the successful completion of individual or group activities, while increasing user satisfaction and improving the quality of work.

According to [30], the level of engagement in group activities is affected by the degree to which the group members have a sense of belonging, of familiarity with their colleagues, and of being there with them in a shared working place. By using text or voice communication tools, by enriching the verbal expression with non-verbal gestures, but mainly due to the visual user representations as avatars, which can be readily identified by neighbouring avatars, learners in virtual world environments probably are more engaged, sense more responsible in group learning tasks, and achieve better learning outcomes.

1.4 Role-playing instruction

Role-playing as an instructional strategy is widely used in various educational settings and disciplines, such as history, literature, socio-cultural studies, foreign languages, nursing and medicine [33-34]. Participants assume to address some specific real-world issues that have arisen in a simulated authentic collaborative environment according to a given factual or fictitious scenario, from the point of view of a person or a role that is different from their own reality. Based on preexisting knowledge and experience, they are motivated to develop further their interpersonal and social skills through a process of acting out, seeing the results of their action and reflecting upon that [35].

During role-playing teaching, students are called to execute instructions, which can be in predefined scripts, and, at the same time, to improvise to some extent behaviors that illustrate their personal value system and perspective on this topic. Learners, through this experiential learning, are encouraged to enrich their decision making or problem solving process by applying the new concepts encountered in the course [36].

As the online role-playing activities can increase students’ responsibility and sense of community, there is a rapidly growing research interest in role-playing instruction in virtual world environments, and, especially, in the educational potential of the virtual world of Second Life (SL).

2. Methodology

The current study was implemented in the middle of May 2009, in order to research the effect on the engagement of teachers, who are training in role-playing instruction in the virtual world of Second Life. Our research was based on a quasi experimental design and on the criteria of quantitative method. The research questions of this study were: a) Does the level of engagement differs when teachers are taught the role-playing instruction in the virtual world of Second Life and in traditional, physical settings? and b) Does the level of engagement differs between the two subgroups of E-Learners and non-E-Learners, who were taught the role-paying instruction in Second Life?

The research sample was composed of thirty Primary and Secondary public or private school teachers from different learning subjects and disciplines. The Second Life instruction was applied to two independent subgroups of the experimental group: a) a group of seven teachers attending the E-Learning postgraduate program in Department of Technology Education and Digital Systems (TED) in University of Piraeus, and b) a group of eight teachers who serve in public secondary schools in the prefecture of Argolis. The physical, face-to-face instruction was delivered to the control group: fifteen school teachers, who are teaching at secondary public schools in Argolis prefecture, too.

Two questionnaires were used for the data-collection, one 22-item before the learning intervention (pre-test), and a 44-item second one after it (post-test). Each indicator of the pretest was measured with two questions in the post-test. Therefore, for each indicator of the pre-test we calculated the average of the two relevant post-test questions.

Control group subjects were required to fill in paper and pencil questionnaires, whereas the experimental group questionnaires were distributed to subjects via the internet through the Google Spreadsheets application, as they were geographically dispersed. All items used a five-point Likert response scale ranging from "not at all true" to "completely true".

There are already many instruments for the measurement of student engagement (e.g. The Learning and Studying Strategies Inventory and The College Student Experiences Questionnaire [37]; Motivated Strategies for Learning Questionnaire (MSLQ), [38]; Rochester Assessment of Intellectual and Social Engagement [39]; Student Engagement Questionnaire, [40]. The construction of our two instruments was based on previous research and mainly on The Student Engagement in the Mathematics Classroom Scale [41]. Pre-test and post-test attempt to measure the following indicators of the three engagement factors: (a) affective engagement with 16 items: interest, boredom, achievement orientation, frustration, commitment, identification with peers, and usefulness, for the affective factor; (b) behavioral engagement with 14 items: following of rules, compliant behavior, effort, persistence, concentration, attention, questioning, communicating, and time commitment, for the behavioral factor; and (c) cognitive engagement with 14...
items: go beyond basic requirement, flexibility in problem solving, industry, resilience, memorization, integration, and justification, for the cognitive factor.

The overall reliability of the three-factorial pre-/post-tests was calculated using Cronbach’s Alpha. In our case values greater than .6 are taken to indicate an acceptable level of reliability [42]. Collected data were analyzed by the independent-samples t test and the paired-samples t test for comparisons between the means of the engagement factors of the experimental and control group, and within subjects to compare the difference between the means of variables in pre-/post-test, respectively. Values of P < 0.05 were considered significant.

The two research groups, control and experimental, and the two subgroups of the experimental group, i.e. the group of the students who attend the postgraduate program in E-Learning of the Technology Education and Digital Systems Department-TED (University of Piraeus) and the group of non-students of TED, were regarded as the independent samples.

For the needs of the program educational resources on collaborative learning and role-playing instructional technique have been developed, containing slides with text and images, and videos with presentations, dialogues and role performance from the rhapsody E of The Odyssey, Homer's epic poem. These learning objects were uploaded or linked with 3D objects in the virtual learning environment of Second Life.

The teaching procedure followed and the learning objects used for the control and experimental research groups in this study were exactly the same, in order to emerge the likely differences in the learning engagement caused due to the different context (physical classroom vs virtual world). The learning activities’ flow in the context of Second Life is depicted in Figure 1.

The design and implementation of the 3D virtual learning environment in Second Life based on the subjects needs and on a set of critical decisions about the parcel size, the prevalent design metaphor, safety and place security, place arrangement and functions, facilitating avatar orientation, information presentation mode, and about creating role-playing avatars [43].

3. Results

In our analysis the three engagement factors (affective, behavioral, and cognitive) were used as dependent variables, whereas each phase of measurement (i.e. pre- and post-tests), and the two research groups, control and experimental, were used as independent variables.

The results of pre- and post- measurements between the two research groups were tested for statistically significant differences in affective, behavioral, and cognitive engagement. Furthermore, we tested for the presence of statistically significant differences in affective, behavioral, and cognitive engagement between the control and the experimental group, and, also, between the two subgroups of the experimental group, i.e. the group of postgraduate E-Learners and the others.

Table 1 shows that in the pre-test reliability analysis alpha Cronbach was 0.748, indicating satisfying internal consistency [44]. Also, in the post-test reliability testing alpha Cronbach was 0.96, which is highly satisfying (Table 2).

Control and experimental group may be considered equivalent concerning the level of the overall engagement before the intervention, as an independent samples T-test at the 5% level of significance indicated statistically no significant difference [t= -1.592, p>0.05] in Table 3.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Pre-test reliability indices.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>Cronbach’s Alpha</td>
</tr>
<tr>
<td>all factors</td>
<td>0.748</td>
</tr>
<tr>
<td>affective engagement</td>
<td>0.601</td>
</tr>
<tr>
<td>behavioral engagement</td>
<td>0.654</td>
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<tr>
<td>cognitive engagement</td>
<td>0.715</td>
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<table>
<thead>
<tr>
<th>Table 2</th>
<th>Post-test reliability indices.</th>
</tr>
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<tr>
<td>Post-test</td>
<td>Cronbach’s Alpha</td>
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<td>all factors</td>
<td>0.967</td>
</tr>
<tr>
<td>affective engagement</td>
<td>0.944</td>
</tr>
<tr>
<td>behavioral engagement</td>
<td>0.909</td>
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<tr>
<td>cognitive engagement</td>
<td>0.874</td>
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</table>
As Table 4 shows, on the contrary, the effect on the overall and on each factor of learning engagement between control and experimental group after the intervention was dissimilar, as an independent samples t-test indicated statistically significant difference in favor of the experimental group \([t=5.477, p<0.05]\), \([t=5.440, p<0.05]\), \([t=4.596, p<0.05]\), \([t=5.013, p<0.05]\).

### Table 5 Paired Sample t-Test scores of control and experimental group between the pre- and post-measurements.

<table>
<thead>
<tr>
<th>pre-/post-test</th>
<th>research group</th>
<th>N</th>
<th>Post Mean</th>
<th>Pre Mean</th>
<th>Difference</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>all the factors</td>
<td>control</td>
<td>15</td>
<td>3.5851</td>
<td>4.2913</td>
<td>-0.70615</td>
<td>0.78928</td>
<td>-3.465</td>
<td>.004</td>
</tr>
<tr>
<td>affective</td>
<td>experimental</td>
<td>15</td>
<td>4.6377</td>
<td>4.1036</td>
<td>-0.53413</td>
<td>0.30645</td>
<td>6.750</td>
<td>.000</td>
</tr>
<tr>
<td>engagement</td>
<td>control</td>
<td>15</td>
<td>3.5458</td>
<td>4.3500</td>
<td>-0.80417</td>
<td>0.86114</td>
<td>3.617</td>
<td>.003</td>
</tr>
<tr>
<td>behavioral</td>
<td>experimental</td>
<td>15</td>
<td>4.7750</td>
<td>4.3583</td>
<td>-0.41667</td>
<td>0.27106</td>
<td>5.953</td>
<td>.000</td>
</tr>
<tr>
<td>cognitive</td>
<td>control</td>
<td>15</td>
<td>3.5905</td>
<td>4.2667</td>
<td>-0.67619</td>
<td>0.75248</td>
<td>3.480</td>
<td>.004</td>
</tr>
<tr>
<td>engagement</td>
<td>experimental</td>
<td>15</td>
<td>4.5619</td>
<td>3.8190</td>
<td>-0.74286</td>
<td>0.44998</td>
<td>6.394</td>
<td>.000</td>
</tr>
</tbody>
</table>

Also, as Table 6 shows, comparing the mean scores of pre- and post-test of the two subgroups of the experimental group, i.e. the postgraduate E-Learners (group 2, N=7) and the others (group 1, N=8), we found that there is a statistically significant difference in favor of the E-Learners \([t=-2.462, p<0.05]\).
Table 6  Independent Samples T-test (non-/ and E- Learners) pre- and post-test mean scores.

<table>
<thead>
<tr>
<th>pre-/post-test Engagement</th>
<th>research group</th>
<th>N</th>
<th>Mean Difference</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>all the factors</td>
<td>non E-Learning</td>
<td>8</td>
<td>.3780</td>
<td>.22470</td>
<td>-2.462</td>
<td>.029</td>
</tr>
<tr>
<td></td>
<td>E-Learning</td>
<td>7</td>
<td>.7126</td>
<td>.30092</td>
<td>.3780</td>
<td></td>
</tr>
<tr>
<td>affective</td>
<td>non E-Learning</td>
<td>8</td>
<td>.3125</td>
<td>.20863</td>
<td>1.694</td>
<td>.114</td>
</tr>
<tr>
<td></td>
<td>E-Learning</td>
<td>7</td>
<td>.5357</td>
<td>.29943</td>
<td>-1.3125</td>
<td></td>
</tr>
<tr>
<td>behavioral</td>
<td>non E-Learning</td>
<td>8</td>
<td>.4911</td>
<td>.31354</td>
<td>-2.843</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td>E-Learning</td>
<td>7</td>
<td>1.0306</td>
<td>.42027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cognitive</td>
<td>non E-Learning</td>
<td>8</td>
<td>.3304</td>
<td>.31700</td>
<td>-1.170</td>
<td>.263</td>
</tr>
<tr>
<td></td>
<td>E-Learning</td>
<td>7</td>
<td>.5714</td>
<td>.47559</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Conclusion

In the present study results suggested that the engagement level of the teacher educators, who have been taught role-playing instruction in the virtual world of Second Life, was significantly higher than teachers' taught in traditional face-to-face class, even though the two research groups were taught the same subject matter, in the same way, and by the same teacher.

Figure 1 shows that the two groups start from the same level of engagement, with the exception of the behavioral engagement, which was higher in the control group. However, after the intervention, in the case of the control group, the degree of engagement diminished significantly in all three factors which comprise the concept, i.e. affective, behavioral and cognitive, whereas, conversely, in the case of the experimental group, the level of engagement increased.

Furthermore, the E-Learner subgroup of the experimental group reported significantly higher point of overall engagement in comparison with the non E-Learners (Fig. 2). Apparently, their familiarity with the information and communication technologies (ICT) had a positive effect on engaging them in the learning activities in Second Life.

Seeking out the main reasons for the divergence of the two research groups on the engagement level, we became aware of some significant problems, which the control group subjects encountered in face-to-face interaction during class session. These difficulties may be summarised as follows: (a) in forming pairs, (b) in managing the learning material and in responding to the assignment, (c) in understanding and following the instructions, (d) in synchronizing their questions, as the facilitator should answer the same questions posed by other people in different times, (e) in concentrating on performing an activity, as their colleagues’ questions were expressed loudly before all of them. But the
most significant inabilities in control group were: (a) to establish and maintain a collaborative climate and (b) to expose themselves in front of a group of unfamiliar people by performing a role-play.

As opposed to the above, the affordances of the virtual world seem to cope successfully with such problems. Specifically, the learners could easily navigate the virtual learning environment and smoothly follow the learning process by recognizing from the position in place of their peer avatars what activity was being performed. Teaming up in pairs was made automatically according to the colour or the number of the student seats, and the movement to the places where the learners should do their assignments was not inconvenient. Participants’ individual questions could be answered readily through the use of instant messaging (IM) functionality of the system, without disturbing the others and disrupting the course. Learners felt more autonomous, as they mainly sought help from their peers than from the facilitator.

Among the limitations of the present study are the very limited sample size and, also, the fact that the participants were recruited through a process of direct selection by the researcher, referrals to the researcher from individuals familiar with the aims of the research, and, also, though self-selection, where interested participants contacted the researcher after receiving information about the study via a blog post. The subject recruitment, also, was based on the following criteria: (a) access to advanced computer hardware and software, (b) access to high-speed internet connection, and (c) good computer skills, including fast keyboard typing. The subject availability was limited because the study took place in the middle of May 2009, at the beginning of the summer exams and the teachers had to devote their time to school preparations. Therefore, it may have resulted in a biased sample. Due to the small sample size and the limited availability, we are unable to generalize our findings outside our study population.

The suitability and appropriateness of virtual worlds and massively multi-player online games (MMOGs) for addressing learning needs and organizational issues of the 21st century need to be further approved [45-47]. This leads us to suggest the following future research questions to be studied and illuminated: (a) how can the current Web 2.0 applications inter-operate correctly with the existing infrastructure of the virtual worlds? (b) how usable by the teachers and efficient are the authoring tools of the current virtual worlds? (c) what are the best design practices for the teacher professional development in virtual learning environments to achieve competitive advantage?

After all, despite the educational value of virtual worlds, which has yet to be proved, learning community will likely overcome any possible hesitation on their part to adopt this promising new technology, when it will be cost-effective enough to justify adoption in the face of alternative approaches.

References


