How Do Students 'Really' Interact with Virtual Worlds?
The Influence of Proper Induction for Virtual Interactions

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Abstract: Our ongoing research focuses on the ways that interactions affect learner engagement with a virtual world and, consequently, the educational activities that take place within it when a hybrid learning approach is used. It aims to form a complete taxonomy of the types of interactions that can lead to the development of engaging and interactive learning experiences. In this paper, we examine the impact that the orientation (induction) process has on learner engagement by observing a cohort of postgraduate students while using an OpenSim-based institutionally hosted virtual world. The results of our study highlight that educators and instructors need to plan their in-world learning activities very carefully and with a focus on interactions if engaging activities are what they want to offer their students. Additionally, it seems that student interactions with the content of the virtual world and the in-class student-to-student interactions have stronger impact on student engagement when hybrid methods are used. We confirm and further enhance our hypothesis investigating student feelings and thoughts about the interaction taking place within a virtual world when that is used in higher education.

1 INTRODUCTION

Computer supported education can be classified in four different ways (see Table 1). Virtual reality and virtual worlds, which were first introduced to the public in the 1980s and have continued to develop ever since, are cornerstones of "learning in technology" (Herbet et al., 2012; Schrader, 2008).

Table 1: The framework of Schrader (2008).

Relations of Technology with Education	
Learning about technology	Learning with technology
Technology as a topic	Technology as a tool
Learning from Technology	Learning in technology
Technology as a delivery mechanism	Technology as the context

In the literature (Frutos-Perez, 2010; Herbet et al., 2012), virtual worlds are defined as 2D or 3D computer generated environments that either depict parts of the physical world or imaginary sceneries. In these worlds, users are able to perform a wide range of interactions with the content of the world and other users (Dickey, 2005) such as: object creation (Allison et al., 2012; Dalgarno and Lee, 2010), object manipulation (Bredl et al., 2012; Dalgarno and Lee, 2010), terrain editing (Allison et al., 2012), navigation around the world (Allison et al., 2012; Dalgarno and Lee, 2010; Herbet et al., 2012; Hockey et al., 2010; Johnson et al., 2009), communication synchronously or asynchronously, either orally or via chat, and. finally, using avatar gestures and other forms of in-world visual interactions (Bredl et al., 2012; Carter, 2012; Dalgarno and Lee, 2010; Herbet et al., 2012; Hockey et al., 2010; Johnson et al., 2009).

These kinds of interactions are performed through the use of avatars (Allison et al., 2012; Bredl et al., 2012; Herbet et al., 2012; Johnson, Vorderstrasse and Shaw, 2009), that is, users' artificial figures (Conrad, 2010; Dickey, 2005). The fact that virtual worlds provide the necessary context for all those interactions mentioned, not to mention that they are increasingly providing more complex interactions, has led educators to use them extensively, taking into account all their educational potentials (Schrader, 2008). Content creation activities, exploratory, problem-based, collaborative, blended, and synchronous or asynchronous distance learning are only some of the few in world educational paradigms that have been extensively

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used and studied from many different perspectives (Carter, 2012; Dickey, 2005; Hockey et al., 2010; Vosinakis, Koutsabasis and Anastassakis, 2014). Despite some differentiations on recent researchers' foci (Dede, 1995; Minocha and Tingle, 2008; Veletsianos, 2009; Padrós, Romero and Usart, 2012), all of them have acknowledged Vygotsky's Social Constructivist Learning Theory (Vygotsky, 1978) to have great practical application on learning within virtual worlds. According to Social Constructivist Learning Theory (Vygotsky, 1978), students construct their cognitive structures through interactions, and engagement in any kind of activity that motivates them to learn. Thus, interacting within virtual worlds can be very beneficial for learners (Dalgarno and Lee, 2010). The author in (Jones, 2013) underlines that it is the learners' ability to affect, alter, and enhance, according to their needs, the content of the virtual world they learn in that enables them to construct their cognitive schemes and engage with the phenomena they study. Consequently, learning becomes more self-directed and student-centred (Anasol et al., 2012), whilst the educators get the role of designer, instructor, and supporter of activities that aim to engage students in learning (Anasol et al., 2012; Schrader, 2008).

The historic context of these studies derives from the plethora of research activities into Second Life since 2003 (including research at the University of Bedfordshire such as Shukla and Conrad (2011) or Christopoulos and Conrad (2012)) and subsequent research on OpenSim in view of the similarities and differences identified (Christopoulos and Conrad, 2013). We freely acknowledge that other interfaces such as textual virtual environments exist; however they are not in the focus of this study.

Several frameworks have been developed to aid educators define and conceptualise their new role and the potential utilisation of virtual worlds in educational contexts (Elliot et al., 2012).

Most of them focus on the interactivity of the worlds or the interactions that can be developed in order to cover students' learning needs. Camilleri et al. (2013) studied in-world interactions in detail aiming to explain how students learn in-world but disregarded the perspective of learning in the physical classroom, focusing on the viewpoint of distance-learning. Likewise, de Freitas et al. (2009), investigating the use of virtual worlds for distance learning, suggested a four dimensional framework for the evaluation of student learning experiences.

Those dimensions (see Table 2) are learners' dimension, pedagogic dimension, representational dimension, and contextual dimension. Even though in-world interactions were part of their study, the focus was not exclusively on that aspect, since they aimed to give a more holistic view of the affordances of distance education in virtual worlds.

Table 2: The framework of de Freitas et al. (2009).

Four Dimensional Framework	
Learner Specifics	Pedagogy
Profile Role Competencies	Associative Cognitive Social / Situative
Representation	Context
Fidelity Interactivity Immersion	Environment Access to learning Supporting resources

At this point a question, regarding the way in-world interactions are being developed in cases where learners are simultaneously co-present in the physical classroom and in the virtual world, arose.

Another interesting point of de Freita's et al. framework (de Freitas et al., 2009) is that it takes into consideration a "learner's dimension". Thus, the answer that will be provided through our study will supplement the aforementioned framework and analyse how engagement occurs as a synergy or component between the learner's personal choices and preconceptions, on the one hand, and the instructional designer's plans, on the other.

Childs (2010) who investigated the skills students acquire when they start using virtual worlds, formed a taxonomy of interactions related to the use of virtual words (see Table 3). He divided interactions into four categories: interacting with the world, interacting with others, interacting with the avatar, and finally finding and searching.

Table 3: Child's (2010) taxonomy of interactions.

Interacting with the world	Interacting with others
Motion Manoeuvring Way-finding Changing camera positions Mouselook (first-person)	Using local (public) chat Using private chat Using the minimap to find people and move to them
Interacting with the avatar	Finding & searching
Changing avatar appearance Creating folders to save appearances Animating the avatar	Creating a landmark Finding a landmark in the inventory Teleporting to a new location and back again

However, this taxonomy did not include the interactions between students and the content of the virtual world, nor the building and scripting skills students usually need to acquire, since this subject was out of the scope of his study. This issue is intended to be covered in this study.

Chafer and Childs (2008) identified the elements that affect a world's interactivity, that is, manipulability, reciprocation, and responsiveness. Addressing the same topic from a different angle, Steuer (1992) noted three alternative factors when examining interactivity: speed, range, and mapping of interactions. These two different frameworks can be helpful tools for educators who need to measure how interactive their existing virtual environments are. One of the few researchers looking at the educational use of virtual worlds both from the inside and from the outside, both in-world and in-class, is that of Levesque and Lelievre (2011). Specifically, they presented the outcome of their experiment on applying a hybrid approach, where students were simultaneously present in-class and in-world. They pointed out that students' virtual and physical co-location led to the development of a complex network of interactions both in-world and in-class, both among students and between students and the virtual environment. Although Levesque and Lelievre (2011) studied interactions quite extensively, they did not identify how interactions are linked to engagement. This is another issue that this study aims to investigate.

De Freitas et al., (2010) underline the need for further investigation of the potential and the affordances of hybrid spaces with simultaneous student physical and virtual presence. In addition, Elliott et al., (2012) point out a lack of a detailed taxonomy of all the interactions related to the use of virtual worlds in an educational context.

To sum up, this study aims to fill the gaps highlighted in the literature and provide educators' who aim to include the use of virtual worlds in their educational agenda with instructions on how to design and develop engaging and interactive learning activities. Even though learners' choices and preconceptions regarding the use of virtual worlds have been investigated extensively in the literature, the impact of the synergy between the learners' personal choices and the instructional designers' plans is blurred. Furthermore, the existing literature is mostly focusing on the in-world interactions aiming to create effective e-learning models, but it lacks detailed frameworks exploring the relationship between the interactions in hybrid-learning models and learner engagement with the learning material and the educational activities.

2 MATERIALS & METHODS

Primarily two research methods were used, observations and surveys. This was thought to be the most appropriate way to examine the subject under investigation since it would give a more thorough view of the phenomena, aid validity and diversity, and allow for the triangulation of the primary data. In other words, observations would allow us to record student actions and behaviour both in the physical classroom and in the virtual world, whilst surveys provide the opportunity to record student preferences.

In this paper we will examine the findings derived from the observatory study.

2.1 Observation

Research through observation may have several strengths (Cohen et al., 2011). However, there were three main aspects that indicated observation as the most suitable method for this study. Firstly, what is considered to be the most essential advantage of observation is the principles of "immediate awareness" and "direct cognition" — i.e. the opportunity given to a researcher to have a "direct look" at the actions that take place without having to rely on second-hand accounts — as described in (Cohen et al., 2011) that lead to the emergence of unique primary data. Secondly, it is a very flexible form of data collection that allows researchers to alter their focus, depending on the observed actions and behaviours. Finally, the method of observation allows the researcher to gather any necessary data, whilst the participants unimpeded follow their own agenda and priorities.

2.2 Experiment Structure & Sample

This research was conducted in a university based environment with a cohort of postgraduate students who volunteered to be part of this study during their weekly practical session. A university hosted virtual world, based on the OpenSimulator architecture, was used to allow students to explore and familiarize themselves with the Linden Scripting Language — an event driven programming paradigm — and also 3D modelling concepts.

The aforementioned cohort of students utilised the virtual world as an innovative tool to deal with, in the context of working and collaborating in groups with task division, similar to circumstances taking place in companies. Each group had to choose an emerging technology subject, research that subject, create a virtual showcase for its promotion,

and document all the aspects of their work. During these practical sessions students were simultaneously co-present in the physical classroom and in the virtual world (Table 4 – Table 6). For more information about the assignment setup the reader is directed to Christopoulos, Conrad and Shukla (2014).

Table 4: Observations' sample.

Observation	1	2	3	4	5	6
Students	17	15	16	11	13	10

Table 5: Sample's identity.

Observation	1	2	3	4	5	6
Male	10	8	9	5	8	6
Female	7	7	7	6	5	4

Table 6: Students' prior experience with Virtual worlds like Second Life/OpenSimulator.

None	7
Up to a week	5
Up to a month	2
More than six months but less than a year	1
More than one year	2

A narrative approach, as described in (Cohen et al., 2011), was considered to be the most suitable for the analysis of this data set. Through this approach, student behaviour, choices, and actions could be studied in the context in which they took place. Thus, narratives were in logical structures rather than in a chronological order.

2.3 Experiment's Overview & Setup

Many new users are either simply unable to acquire the navigation and operation mechanisms of virtual worlds, or refuse to do so because they consider this practice as a waste of time and effort, with no practical value (Childs, 2010). When a virtual world is to be used for educational purposes, time is essential to be devoted to the students' familiarisation with the world in order to enable them to form their avatar, and by extension their virtual identity, and also learn to interact fundamentally with the virtual environment, as reported by Childs (2010) and De Freitas et al. (2009). Additionally, De Freitas et al. (2009) note that the realisation of these procedures, which on the whole they call "orientation", requires that specific actions be undertaken under the supervision and assistance of the educator in charge.

Therefore, in this experiment the focus was on the impact that the orientation (induction) process has on learners' actions, interactions and engagement with the virtual world and the learning material.

It is worth mentioning that even though having different control groups (e.g. a cohort of student who would go through the orientation process whereas the second group would not) would be desirable, it was not feasible to establish this due to the students perceiving they might be disadvantaged as far as their learning experience is concerned.

3 RESULTS

A semi-structured observational checklist (Cohen et al., 2011) was used for the collection of primary data. This checklist included sixteen (16) focus points (F1-F16) regarding the interactions taking place in the physical classroom, when a virtual world is used, seventeen (17) focus points (F17-F34) regarding the interactions taking place in-world, not only among students but between the students and the virtual world as well, and, finally, six (6) focus points (F35-F40) regarding students' willingness to remain in the virtual world and, by extension, in the physical classroom. Any remarkable detail of the observation was noted in the open part of the checklist. Observations were taking place on a weekly basis and lasted six (6) weeks. Students were simultaneously co-present both in the physical (university) classroom and in the virtual world, whilst each practical session was lasting for 2 hours (12 hours in total). In order to observe all the participants for an equal amount of time, students' actions were observed in rotation for approximately 30 seconds until the completion of the practical session.

3.1 Actions & Interactions in the Physical Classroom

Aiming to group the observed data in a more efficient and meaningful way, following the principles of Grounded Theory (Cohen et al., 2011), the aforementioned focus points for the first fundamental category are grouped in three sub-categories (see Sections 3.1.1 – 3.1.3).

3.1.1 Students' in-Class Talking and Making Comments about the Virtual World

Students' communication in the physical classroom includes eight (8) focus points and their frequencies are illustrated in Table 7.

Table 7: Students' in-class talking and making comments about the virtual world.

Week	F1	F2	F3	F4	F5	F6	F7	F8
1	154	27	14	15	8	0	14	3
2	103	17	96	0	0	0	31	0
3	87	43	105	7	4	0	4	9
4	91	26	71	26	0	4	0	0
5	78	17	93	11	0	0	0	6
6	41	35	43	27	5	0	3	0

F1. Student talks to classmate about the project or the virtual world
F2. Student talks to classmate about something irrelevant to the project or the virtual world
F3. Student talks to tutor/demonstrator about the project or the virtual world
F4. Student talks to tutor/demonstrator about something irrelevant to the project or the virtual world
F5. Student makes a positive comment about the technology of the virtual world
F6. Student makes a negative comment about the technology of the virtual world
F7. Student makes a positive comment about the emotional experience of the virtual world
F8. Student makes a negative comment about the emotional experience of the virtual world

Even though students were usually discussing matters related to the virtual world, the focus was not always necessarily on their task or assignment. Building and scripting were fairly often the highlight of students' conversations although several times students were observed discussing the use of third party software to import 3D objects. Indeed, several times they were also observed discussing matters outside the scope of their project, though related to the use of the virtual world, such as its accessibility using portable devices (tablets) or the inclusion of this platform in other university classes. However, a few students were almost always detached from the classroom and, by extension their project and the virtual world, discussing completely irrelevant matters during the practical sessions.

Overall, during the first practical sessions it was observed that some students' negative preconceptions were quite strong, yet this gradually changed over time. In detail, most of the students were observed discussing positively the opportunity given to them to experience a completely different way to do programming and also get a hint of how 3D development works. On the other hand, some students were making negative comments about the technology mainly related to the quality of the graphics or the functionality of the scripting language claiming that, due to the lack of prior experience with such a programming language, they had to spend a considerable amount of time in order to familiarise themselves with it. As a result and as the submission deadline was due, they did not have enough time to produce something meaningful for their assignment. There were, however, also a few students who expressed a completely different opinion claiming that the use of the virtual world had nothing to offer, as this specific programming language is being used exclusively in such virtual environments.

Finally, while reaching the completion of this project, students were observed discussing matters not related to the virtual world focusing mainly on other aspects of their project. This, then brings into question the longevity of the intrinsic interest and/or attractiveness to virtual worlds that these students had outside of the class requirements.

3.1.2 Student Attitude towards the Use of the Virtual World

Students' attitude towards the use of the virtual world includes four (4) focus points and their frequencies are illustrated in Table 8.

F9. Student seems focused on his/her project
F10. Student seems to enjoy the project
F11. Student seems 'absent-minded'
F12. Student seems displeased using the virtual world

Table 8: Student attitude towards the use of the virtual world.

Week	F9	F10	F11	F12
1	17	29	0	29
2	147	68	0	17
3	113	49	9	3
4	154	57	0	27
5	126	39	0	41
6	136	57	0	19

Students experienced various feelings in a spectrum ranging from happiness and enjoyment to confusion, displeasure and disappointment. Each one of these feelings affected their interactions and engagement with the virtual world in diverse ways.

More often than not, they were quite focused and seemed to enjoy their time working within the virtual world regardless of their decision to work in groups or alone. However, the difficulty of manipulating virtual objects or non-functional scripts led to high levels of disappointment and affected engagement in two rather opposite ways, as some students opted to spend more time improving their work whilst others gave up. Quite rarely

students were observed being absent-minded but, at certain points, their conscious decision to not work on their own task but, instead, help their fellow-students with other tasks (usually not related to the virtual world) led most of them to be completely detached from it. Finally, a small portion of students were observed constantly performing actions not relevant to the virtual world or their project. It is worth mentioning that students who decided to work alone were slightly less engaged with the virtual world compared to those who were working in groups helping and influencing each other.

During the course of these observations it became apparent that the levels of engagement students had with the virtual world differed completely from the levels of engagement they had with the actual project/task. Specifically, most of them spent considerably more time finding scripts on the web and less time developing their own, as the former was one of the main reasons for using the virtual world. Nevertheless, what attracted their attention more and resulted in higher levels of engagement, primarily with the virtual world and consequently with their project, was the design and the development process of 3D objects.

A few students decided to design their 3D objects using third-party software and consequently import them in the virtual world. This is, indeed, an example of almost complete lack of engagement with the virtual world, while the focus was exclusively on achieving good results with regard to their assignment. In any case, higher levels of engagement, both with the virtual world and with the project, were observed after the third observation and that fact is an indication that higher levels of engagement were achieved as a result of the time spent in-world and the experience in the use of a virtual world.

3.1.3 Student Identity and Avatar Identity

The way students referred to their avatars while being in the physical classroom included four (4) focus points and their frequencies are illustrated in Table 9.

F13. Student refers to avatar in the first person / identifies with avatar (avatar as 'I')
F14. Student refers to avatar in the second person / addresses avatar directly (avatar as 'you')
F15. Student refers to avatar in the third person (avatar as 'him' or 'her')
F16. Student refers to avatar as object (avatar as 'it')

Table 9: Student identity and avatar identity.

Week	F13	F14	F15	F16
1	9	0	4	0
2	6	3	0	0
3	4	2	2	0
4	2	0	0	0
5	0	0	0	0
6	0	0	0	0

Figure 1: Snapshot from the avatars' appearance editing process in the orientation area.

Most of the students perceived avatars as the medium to mirror their physical identity including their gender, body shape and ethnicity or hair style. These changes ranged from the very basic to the more extended ones, with only a few students hiding their real identity by choosing to modify their avatars using either the opposite gender or a non-human shape (robots, aliens). Even though avatar modification was very intense during the first practical sessions, several students were observed modifying their avatars' appearance during the whole course of observations.

References to avatars were generally very infrequent and rare even during the first observations. Students were referring to avatars mainly in the first person and considerably less in the third, whilst even more infrequent were the references made to avatars as objects. Furthermore, most of the references made to avatars – or to students – were positive, with the only exception of a student who maintained an overall disruptive attitude both through the modification of his avatar and his behaviour, resulting, thus, in receiving negative comments from other students.

Figure 2: Overview of the sandbox next to the orientation building.

3.2 Actions & Interactions in the Virtual World

The aforementioned focus points for the second fundamental category concerning students' actions and interactions in the virtual world are grouped in four sub-categories (see Sections 3.2.1-3.2.4).

3.2.1 Students' in-World Talking and Making Comments about the Virtual World

Students' communication in the virtual world includes seven (7) focus points and their frequencies are illustrated in Table 10. The term 'chat' mentioned below refers exclusively to typewritten communication.

F17. Student chats with classmate about the project or the virtual world
F18. Student chats with student about something irrelevant to the project or the virtual world
F19. Student uses in chat phrases / words revealing enjoyment
F20. Student uses in chat words / phrases revealing exclamation
F21. Student uses in chat words/ phrases often used is social networks
F22. Student makes a negative comment about the technology of the virtual world
F23. Student makes a negative comment about the emotional experience of the virtual world

The use of the chat tool was very limited or almost non-existent for some students as they were observed having their chat window closed or minimised most of the time. Only a few students opted to use it in order to greet their fellow-students, mainly during the first observations, or to express their feelings about the avatars' appearance. Other than that, extensive use of the chat tool was observed only when it was absolutely necessary (distance communication while being in the virtual world, scripts testing). In addition, only a few times were students observed using social media slang.

Their unwillingness to use the chat-tool can be attributed either to the fact that they were physically co-located and, therefore, there was no essential need to communicate with others using the chat tool, or, as several students mentioned, when they were not co-located they could use Skype or any other VoIP tool for their communication needs. In fact, the lack of a VoIP tool that would be embedded to the virtual world was pointed out several times by most of the students.

Table 10: Students' in-world talking and making comments about the virtual world.

Week	F17	F18	F19	F20	F21	F22	F23
1	28	14	9	11	7	0	0
2	7	2	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0

3.2.2 Student Identity and Avatar Identity

The way students referred to their avatars while being in the virtual world included five (5) focus points. Their frequencies are illustrated in Table 11.

F24. Student modifies avatar appearance
F25. Student refers to avatar in the first person / identifies with avatar
F26. Student refers to avatar in the second person / addresses avatar directly
F27. Student refers to avatar in the third person
F28. Student refers to avatar as an object

Table 11: Student identity & avatar identity.

Week	F24	F25	F26	F27	F28
1	98	1	1	0	0
2	16	0	0	0	0
3	12	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0

The more engaged students were with the virtual world, the keener they became to make further, more complex and detailed modifications to their avatars' appearance. Indeed, modification of their avatars' appearance was the first type of interaction that most of the students had both with the virtual world and with each other. Interestingly, a considerable number of students were observed modifying their

avatars' appearance while located next to the corresponding area in the orientation building. As already mentioned, most of the students opted to modify their avatar in a way that it resembled their real appearance. Despite the fact that everyone was aware of their real identity, their willingness to role-play increased the levels of enjoyment that students could get from the ludic side of the virtual world and positively affected the levels of their engagement. A very small portion of students were observed not identifying themselves with their avatars at all as they treated them merely as a feature of the virtual world with minor or no importance. Finally, the references made to avatars using the chat tool were considerably limited.

3.2.3 In-World Nonverbal Communication

One of the alternative ways of communication that virtual worlds offer is nonverbal communication (avatar gestures and emoticons). Therefore, this category includes two (2) focus points, F29 and F30 and Table 12 presents their frequencies.

F29. Student uses avatar gestures
F30. Student uses emoticons

Figure 3: Information about the in-world nonverbal communication tools.

Table 12: In-world non-verbal communication.

Week	F29	F30
1	34	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0

Part of the orientation area had been dedicated to the creation and use of avatar gestures. Nevertheless, not all students were observed visiting the orientation area and that leads to the assumption that they were probably unaware of this tool. In addition, the decision of nearly all students to not use the non-verbal communication channels can also be attributed by the fact that they were physically co-located. Thus, very few students opted to use them and in most cases their animations were random and undetermined. Likewise, fairly rare was the use of emoticons, whilst none of the students were observed wearing animated objects.

3.2.4 Interactions with the World

Even though the main reason for using a virtual world was for teaching and learning purposes, the fact that students' attention can be distracted by other stimuli could not be disregarded, and, therefore, this category, consisted of four (4) focus points, including the various types of interactions that students had while being in the virtual world; Table 13 illustrates their frequencies.

F31. Student works on project
F32. Student performs actions irrelevant to the project
F33. Student explores classmate's virtual artefacts
F34. Student uses own virtual creations

Table 13: Interactions with the world.

Week	F31	F32	F33	F34
1	0	107	21	66
2	35	82	17	57
3	76	46	13	73
4	107	19	8	61
5	126	4	3	86
6	73	0	7	39

Interactions played an important role in student engagement, even though not all of them were equally intense. Specifically, very few students opted to create their own scripts; instead, the vast majority were observed using or modifying premade scripts which can be found on the web. Contrary to that, most of them spent a considerable amount of time designing their own 3D objects. The opportunities for exploration, especially during the first practical sessions, were considerably limited as the only content available in the virtual world were the orientation and sandbox areas. Students were observed visiting other students' workspaces mainly to get ideas for their work. At this point it should be mentioned that some students, in an attempt to prevent others from copying their ideas, decided to block the access points of their workspaces. This reduced the opportunities for interactions with other students and, therefore, with the content of the virtual world, despite the fact that the workspaces

were designed in a way that would enhance in-world interactions between students.

Almost all students went through the orientation process and spent a considerable amount of time using the objects, following the instructions and interacting with their fellow students and content of this area, The students who decided to go through this process adapted more readily to work and collaborate with others, whilst those who disregarded it, partially or completely, were observed struggling. Moreover, they were quite often addressing questions to the teaching team which could have been answered after having properly oriented themselves. Nevertheless, during the course of the observations, several students were observed visiting the orientation area after being advised to do so by their fellow students.

Finally, students would not opt to follow the rules that had been set 'unofficially' to maintain a stable virtual environment (e.g. building and scripting on the allocated areas). Thus, it is questionable whether engagement was affected by the fact that students truly believed that this tool had an educational impact or whether the virtual world was simply a place to have fun and work on the task assigned to them.

3.3 Students' Willingness to Remain in-World

The final sub-category, consisting of five (5) focus points, concerns students' willingness to use the virtual world for additional time while being physically located in the physical classroom (Table 14 illustrates their frequencies).

F35. Student 'logs-in' before the beginning of the practical session.
F36. Student 'logs-in' at the beginning of the practical session.
F37. Student 'logs-in' later than the beginning of the practical session.
F38. Student 'logs-out' before the end of the practical session.
F39. Student 'logs-out' right after the end of the practical session.
F40. Student stays in-world after the end of the practical session.

In most cases students would follow the schedule that had been set for the practical session, entering and leaving the virtual world just on time. Only a few students opted to remain online longer or go online beforehand and that happened just a few times during the whole course of the observations. However, it should be noted that their interactions were not always related to the virtual world or their task within it.

Table 14: Students' willingness to remain in-world longer than the expected.

Week	F35	F36	F37	F38	F39	F40
1	1	16	0	0	12	5
2	0	15	0	0	11	4
3	0	9	7	0	16	0
4	0	11	0	0	8	3
5	0	13	0	0	13	0
6	0	10	0	0	6	4

4 DISCUSSION

The impact that the orientation process had on learner engagement – while using a hybrid virtual learning approach – was clearly positive as it also enhanced the opportunities for interaction between the students and the virtual world. This is evidenced when considering focus points F9, F11, F24 and F31. Those who went through the orientation process were keener on interacting both with their fellow students and the virtual world, considering focus points F1, F17, F24 and F33, the same students used the in-world tools more intensively as seen in focus points F17-F34. They also found the whole process more enjoyable, constructive and rewarding, as observed in focus points F5-F8, F10-F11, F22-24, and F33-F34. On the other hand, those students who disregarded partially or even completely the existence of the orientation area, were almost constantly struggling to deal with the virtual world, and, by extension, their assignment as seen in F3, F6, F8, F23 (even though this can be attributed to the lack of information regarding the programming process) and F32. Likewise, students who followed the instructions regarding the avatar modification process – though with some exceptions – were usually having considerably more intense modifications on their avatars compared to others, as revealed in the F24 focus point. Nevertheless, the references made to avatars were overall limited most likely because of the fact that they did not consider them as a special feature of the virtual world but rather as a tool to work on their project. The opportunity given to students to be co-present both in the virtual world and in the physical classroom simultaneously resulted in a limited use of the chat-tool or any other nonverbal communication method in the virtual world, since this need was covered primarily in the physical classroom, as clearly

observed in F1-F4, F7-F8, F17-23, and F29-F30. Furthermore, most of the students were working on their task without being distracted or struggling due to the fact that they had all the necessary knowledge-base to deal with the tools of the virtual world and, by extension, their project as seen in F9, F11-F12 and F31-F34. Finally, students' willingness to stay in the virtual world and the physical classroom for extra time, for the whole course of the practical session or even longer than expected is also an important indication that confirms their engagement with the virtual world and their project as seen in F35-40.

Summarising the aforementioned focus-points and considering the stakeholders who have different interests and responsibilities to the use of virtual worlds, the following suggestions are given:

Instructional Designers should always ensure that a proper induction process will be provided to learners in order to help them understand quickly and deeply the mechanisms of the virtual world, as this is the key to increase the chances of having successful learning activities and the desired outcomes.

Educators should provide enough time to learners to undertake the orientation process for a proper induction and familiarisation with the virtual world and its tools.

Students should be encouraged to use and engage with this process as this will also help them to achieve better results – in terms of their assignment – and also work within the virtual world effortlessly.

Future Researchers, should focus on designing different setups of induction processes that will fit the personalities of different learners (in terms of their learning style) and their perspectives as well as the levels of education considering that this experiment conducted in university level students.

5 CONCLUSIONS

The orientation process contributed positively to students' smooth induction and that resulted in having meaningful and engaging interactions. Furthermore, students' simultaneous co-existence in both environments eliminated the drawbacks of each educational approach and broadened the network of interactions. It is, however, of vital importance that educators provide students with clear instructions and information about the existence and purpose of the in-world educational content and encourage their learners to use it.

As already discussed in the literature, many studies focus exclusively on interactions that take place within the virtual world where the environment provides the primary medium for communication and interaction (Childs, 2010; de Freitas et al., 2010; Herbet et al., 2012; Hockey et al., 2010; Johnson et al., 2009). Others have set the focus on the impact that avatars have on the in-world interactions (Allison et al., 2012; Bredl et al., 2012; Herbet et al., 2012; Johnson, Vorderstrasse and Shaw, 2009). Many frameworks have also been developed to classify the different ways of teaching and learning in virtual worlds (de Freitas et al., 2009; Schrader, 2008). Nevertheless, the main contribution of our study is that it examines interactions in conjunction with their impact to learners' engagement, in the context of using an orientation process to enhance learners' familiarity with the virtual world and boost the opportunities for more intense interactions and therefore, higher levels of engagement. Future work arising from this study might include:

- Development of virtual educational games to observe students' interactions mainly with other students in the context of a student competition.
- Development of artificial intelligent agents (Non-Person Characters) to observe students' interactions mainly with the content of the virtual world.
- Further identification of factors that make an orientation area successful.

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