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Designing the Self: the Transformation of the Relational Self-concept through Social Encounters in a Collaborative Virtual Environment

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Abstract

This paper describes the findings of a 3 month study on how social encounters mediated by an online collaborative virtual environment (Second Life) impacted on the relational self-concept of adolescents. The study gathered data from two groups of students as they took an Introduction to Design & Programming class. Students in group 1 undertook course activities conducted in the Second Life virtual environment, where they envisioned themselves as college students five years in the future and developed representational avatars based on that idea. Students in group 2 undertook the same course activities in a different order, without the Second Life component during the study period. Changes in self-concept were measured at the conclusion of the study period using the Relational Self-Concept Scale, a survey instrument that examines the impact that different social encounters within and around the school context have upon the formation of self-concept (Schott and Bellin, 2001a). The study found evidence that the Second Life experience of group 1 had a significant impact on the students' relational self-concept, specifically a positive change in how content they were with their social selves. This study provides evidence that the development of representational avatars and socializing in a virtual environment can change how adolescents think about themselves in reality.

Keywords: Virtual environments, avatars, social interaction, transformed self-concept

Background

A major developmental task for adolescents is to achieve a firm and unitary sense of who they are by exploring new identities. (Erikson, 1963; Harter, 1999; Marcia, 1993). To achieve identity is to "create a central perspective and direction, some working unity, out of the remnants of childhood and the hopes of anticipated adulthood" (Erikson, 1959, p. 14). The social interactionist perspective of adolescent development views the construction of self as one that involves multiple "public selves", each playfully presented according to the demands of the particular situation. This exploration of different perspectives allows them to "try on" different facets of who they will become (Harter, 1998).

Traditionally, peers, family, and the school environment have served as sounding boards for adolescents' explorations as they strive to achieve unity of identity. The recent rise of the Internet as a social milieu has greatly expanded the forums for identity experiments and feedback on the self. Tapscott (1998) called the youth of this age the "Net Generation", and argued that they were actively using the new medium offered by information communication technologies (ICT) to reach out beyond their immediate world, to experience and engage in play, learning, and social intercourse. Harter (1999) found evidence that as adolescents participate in larger relational contexts, the numbers of their "public selves" increase.

The use of the Internet enables adolescents to encounter a wide variety of people, offering them additional opportunities for self-discovery and self-validation (Huffaker & Calvert, 2005). Gergen (2000) argued that adolescents' easy access to technology had dramatically increased their social connectedness and pushed them into a bewildering

multiplicity of relationships, which may increase their doubts about their true self and decrease their self-concept unity.

Research on Internet use among adolescents has consistently found that the medium offers many opportunities for identity experiments (Katz & Rice, 2002; Stern, 2004; Subrahmanyam, Smahel, & Greenfield, 2006; Valkenburg, Schouten & Peter, 2005), and that it is common for adolescents to pretend to be someone other than who they really are (Calvert, 2002; Lenhart & Madden 2007, Maczewski, 2002). Although there is empirical evidence on the prevalence of adolescents' online identity experiments (Calvert, 2002; Lenhart et al., 2005; Maczewski, 2002; Valkenburg et al., 2005), research on the consequences of such experiments is scarce (Valkenburg &Peter, 2008). Prior to 2008, three studies investigated the relationships between online identity experiments (or online communication) and offline social competence, defined as the adolescents' ability to effectively form and manage offline interpersonal relationships. Two of these studies found that online communication was negatively related to offline social competence (Caplan, 2005; Engelberg & Sjöberg, 2004), while one found no significant relationship between those factors, but did find that adolescents' online identity experiments were negatively related to offline social competence (Harman, Hansen, Cochran & Lindsey, 2005).

Self-concept

In 1959 Carl Rogers published his theory of personality, which defined the "self" as a central construct. Rogers described the self as a social product, developing out of interpersonal relationships and striving for consistency (Purkey & Schmidt, 1987).

Roger's theory also developed the concept of personality congruence, where the self-concept as perceived within, and the social evaluations from without, closely match up and thus achieve an internal consistency. Because of previous experiences and their present perceptions, individuals may perceive themselves in ways significantly different from the ways others see them. This incongruence can be described as the difference between the actual self (I am) and the ideal self (I should be). Contemporary investigations of the self-concept posit that the eager desire to achieve an ideal self could involve "self-presentational promotion" strategies (Higgins, 1996). These strategies are motivated not only by the desire to change other people's beliefs about oneself, but also to change one's own beliefs about oneself (Schlenker et al, 1996).

Self-concept Unity or Clarity?

Researchers investigating the self-concept use the terms unity and clarity interchangeably, as demonstrated by Valkenburg and Peter in their 2008 study (p. 210): "To define self-concept unity, we use a construct developed by Campbell et al in 1996 referred to as self-concept clarity. Self-concept clarity is the extent to which adolescents' self-concept is clearly defined, internally consistent, and temporally stable (Campbell et al., 1996, p. 141)". In this paper we will use the term self-concept *unity*.

Possible Selves

Markus and Nurius (1986) theorized that the self-concept not only includes a person's view of oneself now, but also conceptions of future selves: who a person hopes to become, who the person expects to become, and who the person is afraid of becoming. All these potential future states, and the values attached to them, are reflected in the self-

concept as potentials for growth and change. Markus and Nurius suggest these *possible selves* act as both incentives that guide future behavior, and constraints reflecting the social environment. "Development can be seen as a process of acquiring and then achieving or resisting certain possible selves. Through the selection and construction of possible selves individuals can be viewed as active producers of their own development." (Kendall, Lerner, & Craighead, 1984; Lerner, 1982 in Markus & Nurius, 1986, p. 955). In 2005 Quinlan, Jaccard, and Blanton reviewed the research that examined the predictive utility of the possible self construct, and found that it can predict a wide range of adolescent behavior, including delinquency, school drop-out, academic achievement, health-promoting and health-risk behavior, and task competence. They found that the possible self construct could also predict important individual difference variables, such as self-esteem, optimism, and life-satisfaction.

Self-identification and self-presentation

Self-identification theory views people as active constructors of their social environment, driven by goals such as gaining respect or creating fear, and involving transactions between the self as actor and the audience in a particular setting (Schlenker, 1980). A set of "desired identity images" describe the type of person the actor believes is appropriate in a given social situation, and the impression that is created is carefully monitored by the actor to ensure that it facilitates the achievement of the salient goal (Schlenker, 1984). When the audience reactions indicate that this is a believable self-portrayal, evidence shows that people internalize their self-presentations, thus influencing their own view of themselves (Schlenker & Trudeau, 1990).

Online Identity Experiments and the Self-concept

The only study extant prior to 2008 which had investigated the relationship between online identity experiments and the self-concept found that "self-concept clarity was negatively associated with the communication motive, and with Internet activities such as interacting with strangers and having secret online screen names" (Matsuba, 2006, p. 283). Based on this evidence, Matsuba concluded that the Internet may be a critical tool in aiding lonely youths to communicate with others and explore different roles in their struggle to find an adult identity. In their 2008 study Valkenburg & Peter found evidence that engaging in online identity experiments had an indirect but positive effect on adolescents' social competencies, and no effect on their level of self-concept unity. They also found that lonely adolescents experimented more often with the online identities than their non-lonely peers, and concluded that the Internet may especially help lonely adolescents in their search for identity and struggle for connectedness.

Collaborative Virtual Environments

Researchers in the use of collaborative virtual environments (CVE) agree that this medium offers adolescents a new path to transformative identity experiments (e.g., Blascovich, 2001; Gonzales & Hancock, 2008; Merola, Pena & Hancock, 2006). The typical constraints upon self-definition and self-presentation such as age, race, gender, and body shape do not apply in the virtual world. Calvert (2002) found that the anonymity afforded by the virtual environment gave adolescents more flexibility in exploring their identity through language, role play, and the personae they assume.

A CVE has several characteristics that may actually encourage these identity experiments. First, the CVE experience is characterized by the use of representational avatars which can be highly customized to present a desired appearance. Body shape, skin color, hair and eye color, height, hair style and clothing: all are easily adjusted to create any desired look, or to meet the perceived desires of significant others. Second, CVE "in-world" communication often happens in online social communities which are not connected with those in real life. Such communities, in which social repercussions for offline life are reduced, may encourage identity experiments (O'Brian, 1999; Turkle, 1995).

In their 2007 CVE research Yee and Bailenson investigated the effects of the varied avatar appearance on the attitude of the real people they represent, and they found that their participants consistently made inferences about their expected dispositions from their avatar's appearance, and then conformed their attitudes and behavior to match, a phenomenon they referred to as the *Proteus Effect.* In their follow-up 2009 study looking for implications of the Proteus Effect on offline behavior, these researchers found some evidence that the Proteus Effect carries over into subsequent interactions, even in face-to-face situations. They suggested that an observable short-term behavioral difference in subsequent face-to-face interactions can be caused by experiences within a virtual environment (Yee et al., 2009).

The Relational Self-Concept

Schott and Bellin (2001a, p. 87) opined that "for knowledge of the self to be useful for educators and educational research, the manner in which the adolescent's

psychological interior is directly formed by the school environment needs to be understood". The researchers used the term *relational self-concept* to describe the dynamic mental structure that mediates and regulates interpersonal behaviors and processes, thus assisting individual functioning. In taking this perspective, Schott and Bellin rejected the view of the self as merely a social construction or looking-glass reflection, and instead viewed the self as "a psychological manifestation of the way social contact is organized and given meaning by individuals" (Ryan, 1991 in Schott & Bellin, 2001a, p. 88). This relational concept of the self represents individuals not as "bounded entities leading separate lives on independent trajectories" (Gergen, 1994, p. 212), but as beings whose self-image is "better understood as depending on ongoing feedback from within the context of relationships" (Seligman & Shanok, 1995, p. 543). Higgins' *self-digest* conceptualizes self-knowledge as "a summary of what the world is like in relation to oneself", with three different actual self-representations -- an *instrumental self*, a *monitored self*, and an *expectant self* (Higgins, 2005, p. 159). These self-regulatory functions are useful for describing how the relational concept of the self is influenced by the judgments, hopes, and desires of significant others in a social context.

To measure changes in self-concept, this study used the Relational Self-Concept Scale (RSCS) developed by Schott and Bellin in 2001. This survey instrument examines the impact that different social encounters within and around the school context have upon the formation of self-concept. The following six factors were identified by Schott and Bellin as subscales (2001a, p. 92):

1. <u>Social Scholastic</u> – *these items measure adolescents' competence to perform scholastic tasks in the context of the classroom.*

2. *Scholastic Performance – these items measure perceptions of academic performance (e.g., tests).*
3. *Peers – these items measure adolescents' interactions and feelings of social acceptance and competence within the school context.*
4. *Physical Appearance – these items measure bodily self both privately and in the presence of others.*
5. *Parents – these items measure the level and nature of adolescents' relationship with parents or guardians.*
6. *Possible Selves – these items measure whether adolescents wish to see a change in the nature of the relationship with peers and teachers.*

The Possible Selves subscale extends the temporal dimension of self-concept measurement, an innovation unique to the RSCS: "This factor makes a temporal distinction between self-evaluations that reflect the here-and-now and what Markus and Nurius (1986) term *possible selves*" (Schott & Bellin, 2001a, p. 92). In devising future-oriented item statements for this subscale, Schott and Bellin avoided making references to cultural conventions associated with adult life. The researchers maintain that this subscale "provides adolescents with an opportunity to evaluate whether they would like to alter aspects of their current status" (Schott & Bellin, 2001a, p. 98). They went on to state that "the Possible Selves subscale successfully demonstrated its ability to measure adolescents' self-evaluations concerning how content they were with different aspects of their current school life" (Schott & Bellin, 2001a, p. 98). This measure of being "content with the self" in relation to the future is related to the idea of congruence, where the

perceived self and the social evaluations received from others are internally consistent, resulting in a reduction of tension (Rogers, 1959).

The study context

The purpose of this study is to extend the research on the effect of adolescents' online identity experiments on self-concept into the CVE arena. Based on Yee's 2007 findings, we predicted that our adolescent student participants would infer their expected dispositions based on their avatar's appearance, and then conform their self-concept to the expected attitudes and behavior. Because this study asked the students to create an avatar which represented a possible self five years in the future, we predicted that this exploration of possible selves would help them further define their self-concept. We predicted that after the students explored the use of possible-self avatars for several months to represent themselves in CVE class activities and socializing, this experience of receiving reflected appraisals of possible selves from significant others would help them develop a new perception of themselves which would be closer to their ideal selves. This increase in congruity, or internal consistency, reflects an increase in self-concept unity, and should result in a significant positive change in the Possible Selves subscale score. Our predictions can be summarized in the hypothesis:

> **Adolescent identity experiments in a CVE would have a significant positive effect on their self-concept unity, as measured by the Possible Selves subscale score on the RSCS survey instrument.**

Methods

Sample

Participants in the study were students in a Introduction to Design and Programming (CST3C) course at a Hong Kong international secondary school. The students had been randomly assigned by the school administration into three class sections. Two of these sections were assigned to complete the design component of the curriculum first (Design-first group), and one section was assigned to complete the programming component first (Programming-first group). At the beginning of the course, all CST3C students were given the task of completing the RSCS survey. The Design-first group (n = 32) spent the three month study period doing most of their coursework activities in the Second Life CVE. The Programming-first group (n = 21) completed the study period without doing any coursework activities in the Second Life CVE. After the study period the two groups swapped to the other half of the curriculum, so that all students in the CST3C course will complete the same total set of activities.

At the end of the study period all of the CST3C course students were again tasked with completing the RSCS survey, using the double-blind method. One Design-first class section did not complete the survey before the data collection deadline, so their data was excluded from this study. Any participant who did not complete both the initial and ending surveys were removed from the study data. The final set of study data was n=12 for the experimental group, and n=17 for the control group. The participant group was primarily a class of students in their Junior year, with a mean age of 16.17, (SD = 0.93), range 15 to 17. Fourteen (48%) were girls. The majority of the sample were Hong Kong

Chinese (48.27%), with 17.24% Korean, 13.79% Japanese, 6.9% mainland Chinese, 3.45% Indian, 3.45% Caucasian, and 6.9% who identified themselves as Other Ethnic Group (mixed Asian). All participants were treated in accordance with the ethical standards of the American Psychological Association (APA) in the "Ethical Principles of Psychologists and Code of Conduct" (APA, 1992).

Measures

In order to detect our hypothesized positive effect of adolescents' identity experiments using the Second Life CVE on their self-concept unity, we used the Relational Self-Concept Survey, developed by Schott & Bellin in 2001. The RSCS requires adolescent respondents to evaluate the extent to which qualities describing other adolescents are indicative of their own qualities (Schott & Bellin, 2001b). An example of an RSCS item question is as follows: "*Some adolescents feel they do well in their school exams compared to others their age. These adolescents are…*". Item answers are presented on a five-point Likert scale as follows: "*Always like me, Mostly like me, Sometimes like me/Sometimes unlike me, Rarely like me, Never like me*". This method of self-report questioning is designed to connect to both the school context and the significant others associated with that context. The scale seeks to answer the question "When I am with X in Y situations, I am…?" rather than the more abstract and asocial concept of self asked by a question such as "Who am I?". The idea is to require participants to consider the impact others have upon the process of self-conceptualization (Schott & Bellin, 2001c). Each of the 36 item questions were followed by an Importance rating, as follows: "*This is something that is…*" with three possible answers: "*Important to me, Not important to me, Don't Know*". As Markus and Nurius noted about possible

selves: "secondary motivations are mediated by what the individual believes to be possible, and by the importance assigned to these possibilities" (Markus & Nurius, 1986, p. 960). Schott & Bellin report the internal consistency reliability for the RSCS to range between a Cronbach's alpha of 0.69 to 0.77 in their initial development tests, indicating that the question items within each scale are consistently measuring the same conceptual construct. The exploratory factor analysis and subsequent confirmatory hypothesis testing model further support the high construct validity of the RSCS. The six subscales of the RSCS were found to have no significant pair-wise correlations between them. Schott & Bellin stated that this level of independence among the RSCS subscales "disputes the notion that adolescents seek to unify various elements of the self to form a coherent picture of self-worth" (2001a, p. 97), an observation more in line with the contemporary social interactionist view of multiple public selves.

Each of the RSCS subscales has six items, except for the Possible Selves subscale, which has five. An example of an item question on the Possible Selves subscale is as follows: "*Some adolescents wish they could show others their age what they are really like.*", followed by five-point Likert scale answers and an Importance rating, the same question style as the other scales in the RSCS survey. This particular item may ask the single most salient question in the entire survey, in light of the study procedure asking the students to develop representational avatars. Schott & Bellin did a comparison of the Peers and Possible Selves subscales to see if a temporal distinction was being measured. "The Peers subscale reflects present self-image, while the Possible Selves subscale measures deviations from present image, in the sense that it challenges individuals to think about whether they would like to see a change in their peer relationships in the

future" (Schott & Bellin, 2001a, p. 96). They found a significant difference between adolescents' responses to future-oriented items and items devised to measure self-image in the present context. This significance indicates that the Possible Selves subscale successfully incorporates a temporal shift away from the present, and therefore measures how much change an adolescent would like to see in the relational self-concept of their *future* self.

Procedure

Introduction to Second Life and Imagine U : a possible future self

The Design-first students spent the three months of the study period doing classroom activities in the Second Life (SL) CVE, roughly divided into three units of study. They were introduced to the CVE with a presentation by the instructor, and the first assignment asked them to create a virtual identity to represent themselves at the "Imagine U" university, as follows:

> *For this journey into Virtual Reality, we will take a trip to a university called Imagine U. It's a 'virtual campus', where the students meet online, and attend classes as avatars which they design. At Imagine U, you are exactly 5 years older than you are now. What will you look like in 5 years? How will you dress? How will you act?*

Avatar creation and the development of the body self

Once the students had created Second Life avatar accounts and selected fairly generic male or female avatar body shapes and clothing, they spent some time in class

and for homework learning to manipulate the avatar body to explore the virtual world: learning to walk, going up steps, through doorways, navigating inside buildings, and how to touch, open, and pick up items. Students quickly realized that the avatar body in the virtual world follows the same rules as a body in the physical world: it cannot walk through walls, it is sometimes too tall to go under things, and only with care and practice can the avatar walk up a curved flight of steps without falling off. Much as a human infant in Piaget's Sensorimotor stage of cognitive development gains knowledge about its world through physical actions upon it (Piaget, 1954), this exploration of the virtual world helped the students form a "body self" associated with their representational avatar.

Designing the future possible self, and inferring the inner self

The next activity asked the students to modify the appearance of their avatar, and then take a "snapshot" of it to indicate a style or attitude. Students began to explore the myriad of choices for customizing the physical shape of their avatar, and trying on the many choices available for free clothing. The boys tended to express their future possible selves as large and muscular, and the girls found expression in sexy outfits and hair designs. Both genders delighted in the adoption of tattoos and ostentatious jewelry, things currently forbidden to their real adolescent selves. Although this study did not attempt to measure self-esteem, the researchers did notice an apparent correlation between student self-esteem and the height selected for their avatar: high self-esteem tended to express itself as very tall avatars. Once they had designed their physical future possible self, the students began the process of inferring an inner self. What sort of style or attitude will their possible self evince? This activity asked them to display this inner self to their peers, and then get feedback from them, as follows:

Post a snapshot of your avatar by using the Attach button to link it to your text post. Try to pose it in an interesting way (sitting, standing, or ??) in front of a background which appeals to you or says something about your avatar. The DESIGN of your avatar snapshot should show in three areas:

- *the look of your avatar (face, clothes, hair, body, etc)*
- *the pose (angle, body position, lighting)*
- *the background (where are you in SL? how does it relate to your avatar?)*

After you have posted, go look at other people's posts and use Reply to give them feedback about their Snapshot design. What about their design do you like or dislike? Why? What questions do you have?

See Figure 1 for an example of an avatar snapshot in SL produced by a student as a result of this activity. The representational avatar displays the student design of a heavily muscled adult body with tattoos, emerging like a phoenix from the flames. The avatar is also hovering high in mid-air (avatars can fly in SL, a dream-like experience), surrounded by glowing, falling snow, and is sporting a bizarre white-blonde hair style which would never be permitted by the parents of the actual 16-year old student in real life. All of these avatar characteristics are indicative of a future self-representation that is older, more adult, and a demonstration of a possible inferred inner self. Additionally, the attractiveness of the avatar and student-selected scene matches up with Epstein's basic function of a self-theory: to facilitate the maintenance of self-esteem. This activity was designed to help the students acquire an *instrumental self*, the actual self-knowledge

representing one's self-attributes in relation to the response they elicit from other people (Higgins, 2005).

Figure 1. An example snapshot of a representational avatar, posed by the student to indicate a style, or attitude.

Strengthening the association with the possible self

The next SL activity asked the students to fine-tune the design of their avatar face so that it was recognizable as an adult version of themselves. This activity was designed to strengthen the students' identification with the avatar as a representation of a future possible self. See Figure 2 for an example of the SL Avatar Appearance modification tools. Many of the students were highly successful in this task, producing avatars which were obviously derived from, and recognizable as, the student who it represented. See

Figure 3 for a generic example of the level of accurate facial representation achievable with avatar face design using the Second Life CVE. This activity was designed to help the students continue to acquire instrumental self-knowledge.

Figure 2. Example of the Second Life avatar appearance modification tools.

Figure 3. Example of a real face (left half), and its representational SL avatar (right half)

The moral self

The next activity asked the students to investigate and report on the Community Standards laid out in the Second Life Terms of Service CVE user agreement. The "Big Six" behaviors which can result in account suspension or banishment from Second Life are intolerance, harassment, assault, disclosure, indecency, and disturbing the peace. The students presented their findings in groups, with each student creating a snapshot of their avatars illustrating the behavior in question. See Figure 4 for an example snapshot produced by two students working together to illustrate the forbidden behavior of indecency (note the ironic juxtaposition of the innocent nudity of the angelic male avatar with the mimed horror feedback he receives from the female) This activity was chosen to assist the development of the "moral self" associated with their possible future self. Epstein defined the moral self thus: "He has become his own evaluator, feeling pleased with himself and loveworthy when he behaves according to his internalized standards, and guilt ridden and unworthy of love when he violates these standards. Thus, he has developed a moral self which appears to him to have an identity of its own as it is not under his conscious control" (Epstein, 1973, p.414). In Higgins' self-discrepancy theory this activity would help the students represent their imagined future selves relative to their desired positive reference points ("the person it is my responsibility to be"), or undesired negative reference points ("the person I must not be") (Higgins, 1996, p.1071). Understanding the external standpoint of Community Standards which mediates their social regulation is essential to the students' standards of self-evaluation, which Higgins postulates as the basis for the development of the *monitored self* (Higgins, 2005).

Figure 4. Two students used their SL avatars to create this snapshot illustrating the forbidden behavior of **indecency** in SL.

What will your future self enjoy?

A subsequent introductory activity asked the students to display a snapshot of their avatar having fun (i.e. "*what will your future self enjoy doing?"*), an important aspect of the development of the self-theory of a future possible self: Epstein's posited that "the most fundamental purpose of a self-theory is to optimize the pain / pleasure balance of an individual..." (Epstein, 1973, p.407). Reporting pleasure to their peers from engagement in virtual sports activities such as driving a race car or snowmobile, shooting baskets, or flying a hang glider also helped the students represent the personal preferences of their *expectant self* in relation to that activity (Higgins, 1996, 2005). Many of these activities

were competitive, allowing social comparisons of relative ability which indicate personal skills or talents. See Figure 5 for an example of this activity.

Figure 5. Two students test their relative competencies in racing virtual cars.

Distinctiveness within the group – a CVE field trip

The next introductory CVE activity was a virtual "field trip". Each avatar was issued with an identical virtual T-shirt, and the group gathered online on a Saturday meeting to tour four student-selected locations together. Accessing the CVE using their home computers, this activity gave the experimental group the opportunity to develop their self-descriptions based on the distinctiveness of a self-property relative to their peers. In the "group photo" of Figure 6, note how many of the students tried to make their expected-

self representation unique in the group social situation through the wearing of hats, sunglasses, a halo, or in one case a very large orange hairdo. During this activity the students were encouraged to explore the locations in small groups, which facilitates the development of joint attentional collaboration in the service of understanding how the virtual world works, and how to get along in it (Higgins, 2005).

Figure 6. A "group photo" of the experimental group on their CVE field trip.

Go forth and socialize

The final introductory activity asked the students to go someplace new in the virtual world, strike up an IM chat conversation with a stranger, and then report back to the

group with a conversational log and a snapshot. Because the assignment asked them to "stay in character", this activity was designed to give feedback to the student as to the current state of their virtual "actual self" in relation to their desired end-state. Any negative feedback received would indicate a discrepancy between their current state and their desired future possible self, and result in a tension which motivates change to reduce that discrepancy (Higgins, 1996). The social chat pictured in Figure 7 shows the student receiving compliments on her avatar appearance from a possible new significant other in a fairly intimate one-on-one chat in a social setting, and her reply that "it took me really really long to get it right".

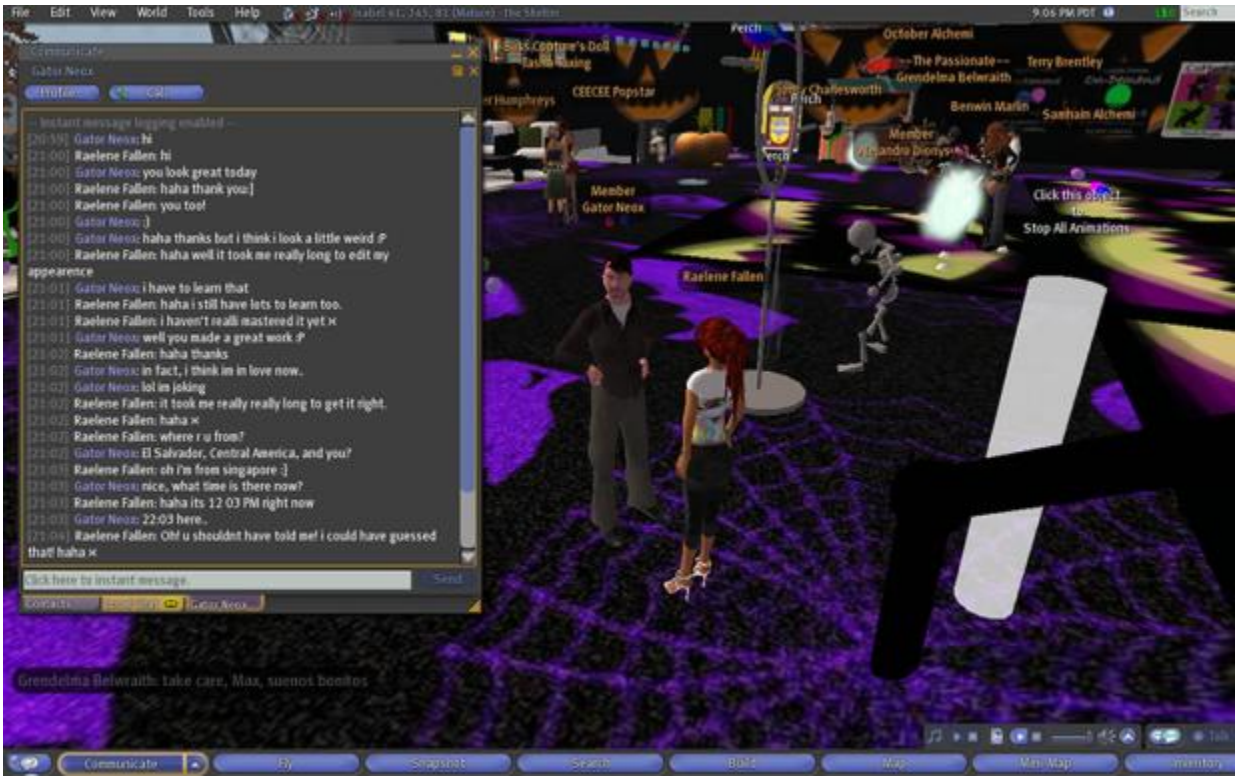

Figure 7. A social chat with a stranger to get feedback on the possible future self being constructed.

What will your future self wear?

In the second unit of study the students continued to flesh out their conceptualization of a future possible self through the design and implementation of clothing and tattoos for their avatar to wear. As in reality, the development and public display of these style choices evoked considerable feedback from their friends and peers. This further development of a public self congruent with a desired future possible self can be seen in the examples of the girl wearing the colorful and stylish tattoo in Figure 8, and the "Imagine yourself, dream yourself" T-shirt design being developed in Figure 9, and worn in the virtual world in Figure 10. This activity was designed to assist the development and display of self-presentational promotion of a desired self, which according to Schlenker (1996) can change not only their peers' beliefs about them, but also to change their own beliefs about themselves.

Figure 8. A student displays her colorful tattoo design on a the Second Life avatar which represents a future possible self.

Figure 9. A student T-shirt template with a future-oriented graphic design.

Figure 10. The student displays his design on his representational Second Life avatar.

What will your future self do for a living?

In the final unit the students proposed, designed, developed, and implemented their own businesses in the Second Life virtual world environment. This exploration of possible occupational roles their future selves might play in the world is a key step towards identity achievement (Erikson, 1959; Marcia, 1993). The CVE offers unparalleled opportunities for adolescents to explore a wide range of future possible selves in relation to occupation, which should help them to avoid the less-desirable Foreclosure identity status, and maximize the exploration of possible identities required in the Moratorium status on the path towards successful identity achievement (Marcia, 1993). Figure 11 shows the buildings and advertising signs that students developed as part of this learning activity.

Figure 11. Signs and buildings created by students to host their virtual business designs.

Time in CVE

The students experienced the Second Life CVE environment for approximately 15 hours per month in class over the three month study period, for a total of about 45 hours of experience in the CVE. In addition, about half the students reported the use of Second Life at home, for either working on assignments or socializing. Peer appraisals of avatar self-representations and related design choices were elicited at least weekly to provide feedback information to the students about their progress as they conceptualized and developed their representations of desired future possible selves. This feedback would be essential to Higgins' monitoring function of the actual-self as it looks for progress towards an ideal self (Higgins, 1996).

Coding

The RSCS survey was designed with a mix of negatively and positively worded items in five of the subscales, so the negatively worded items (3 in each subscale) had to be recoded in the positive direction. The Possible Selves subscale items were all worded negatively, and were not recoded.

Results

Table 1 provides a snapshot of the difference in the means of the test-retest data. None of the mean differences in the Programming-first (control) group reached a significant level. For the Design-first (experiment) group, the only mean difference that reached a significant level was the .367 difference on the Primary questions in the Possible Selves subscale.

	Programming-first (Control Group)		**Design-first (Experimental Group)**	
	Primary	Importance	Primary	Importance
Relations with Parents	.059	-.049	.042	-.139
Peer Relationship	.069	.020	.056	-.111
Physical Appearance	-.029	-.010	.111	-.042
Scholastic Performance	-.078	.029	-.222	-.097
Social Scholastic	-.020	-.010	.069	.097
Possible Selves	-.071	-.094	**.367***	-.200

*** p < 0.05**

Table 1. A summary of the difference in the means in the pre-post test data.

Table 2 displays the estimated marginal means of the Second Life effect on the Possible Selves variable. The experimental group shows a large increase over the study time period. To test the significance of this increase, a repeated measure 2 way ANOVA (group X pre-post timeframe) was conducted. The test served to investigate whether an interaction exists between the grouping and pre-post timeframe, which included the exposure to the Second Life virtual world activities. With the Possible Selves variable, a significant group interaction was reported: $F(1, 27) = 4.595$, $p = .041$. This result indicates the experimental and the control groups respond differently to the manipulation.

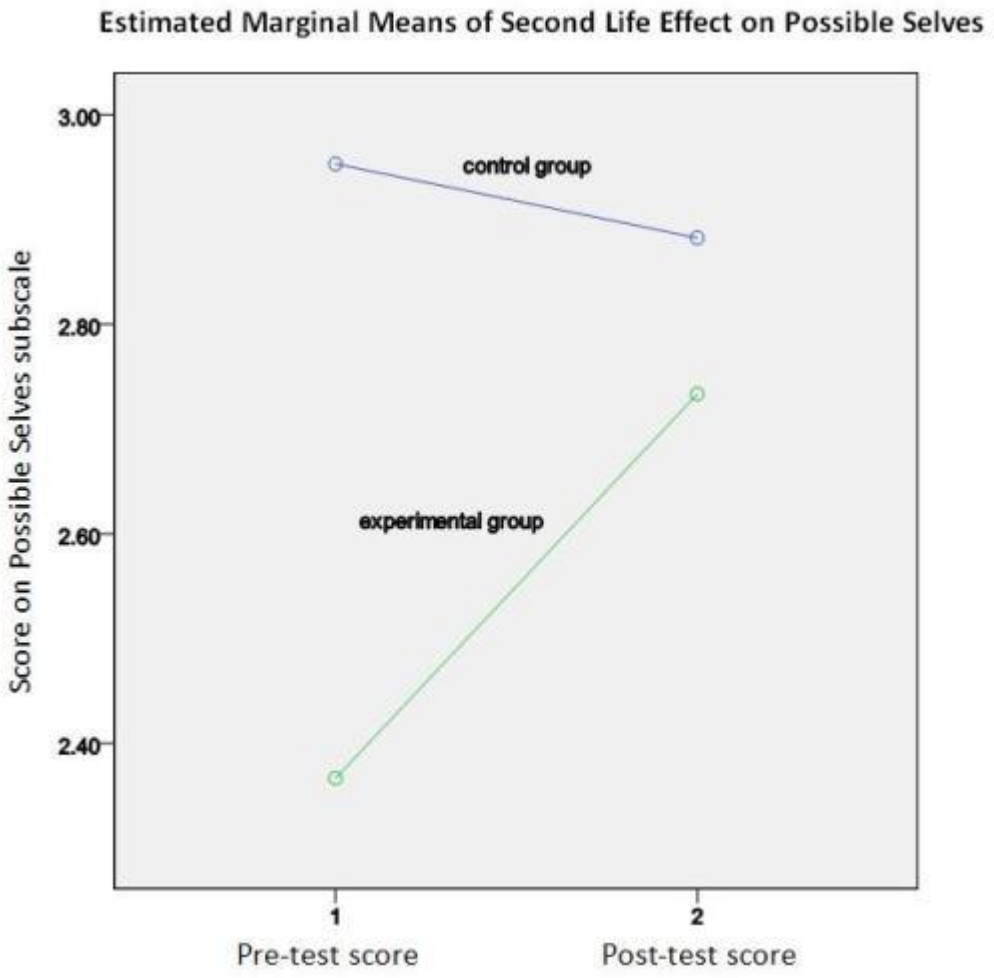

Table 2. A graph of the estimated marginal means of the Second Life effect on the Possible Selves variable.

Table 3 displays the SPSS output of the ANOVA test: the experimental group improved on the Possible Selves subscale, while no such improvement was noticed in the control group. No significant interactions were reported for other RSCS subscales. Because all of the Possible Selves questions were negatively worded, this result indicates a positive increase in the self-concept unity. This result supports our hypothesis that identity experiments in a CVE will result in a significant positive change in the self-concept unity,

operationally defined as the construct measured by the Possible Selves subscale of the RSCS survey.

Tests of Within-Subjects Effects

Measure: group X pre-post timeframe on Possible Selves subscale, primary variable

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
pre-post	Sphericity Assumed	.308	1	.308	2.107	.158
	Greenhouse-Geisser	.308	1.000	.308	2.107	.158
	Huynh-Feldt	.308	1.000	.308	2.107	.158
	Lower-bound	.308	1.000	.308	2.107	.158
group X pre-post	Sphericity Assumed	.672	1	.672	**4.595**	**.041**
	Greenhouse-Geisser	.672	1.000	.672	**4.595**	**.041**
	Huynh-Feldt	.672	1.000	.672	**4.595**	**.041**
	Lower-bound	.672	1.000	.672	**4.595**	**.041**
Error (prepost)	Sphericity Assumed	3.951	27	.146		
	Greenhouse-Geisser	3.951	27.000	.146		
	Huynh-Feldt	3.951	27.000	.146		
	Lower-bound	3.951	27.000	.146		

Table 3. SPSS analysis for a repeated measure 2 way ANOVA of the Possible Selves Primary item data. A significant group interaction was reported, $F(1, 27) = 4.595$, $p = .041$

Discussion

The primary aim of this study was to extend the research on the effect of adolescents' online identity experiments on self-concept into the CVE arena. The virtual environment technology affords a type of social contact that is unrivaled by mere faceless instant-message chatting, newsgroup posting, or email. Yee et al. (2009) have found evidence for what they term the Proteus effect: the participants in CVE experiments carried identity cues from their avatars out into the real world, where it affected their behavior. In this study we sought to extend Yee's research by giving our participants the freedom to design their own representational avatars, much longer periods of repeated exposure to the CVE (over months instead of minutes) with more casual, self-directed and spontaneous social experiences, and our outcome focus was on measuring change in self-concept, instead of behavioral changes. The CVE activities in this study were designed to facilitate the transformational development of the relational self-concept as self-theory, based on Epstein's three components (body self, inferred inner self, and a moral self) and Higgins's three self-regulatory functions (instrumental, monitored, and expectant). Higgins' theory of self-knowledge as a self digest is particularly well suited to describing how the self-concept can be influenced by social interaction with significant others in the world, both virtual and physical.

We chose to use the RSCS survey instrument to measure change in self-concept because it offered a psychometric measure of self which is linked directly to the social processes of the school environment, and therefore the results can be linked more effectively to educational outcomes. In addition, the RSCS developers Schott & Bellin propose that the Possible Selves subscale could provide educators with information that

will help them achieve optimal student outcomes by aiding the identification of adolescents with a negative view of the future (2001a, p. 98).

Our study sought to investigate how the creation and social use of an avatar designed to represent a possible future self can ultimately influence the self-concept. We did find evidence supporting our hypothesis that adolescent identity experiments in a CVE would have a significant positive effect on their self-concept unity, as measured by the Possible Selves subscale score on the RSCS survey instrument. We found a significant difference in the Possible Selves subscale score which indicates that the students' experience of developing possible future selves as representational avatars, and using them to socialize in a virtual environment, had resulted in increased contentment with their view of their social selves relative to the future. We interpret this increase in contentment as greater congruence between their perception of themselves based on the reflected appraisals of others, and the set of desired images that make up their ideal self. This decrease in disparity between the perceived self and the ideal self may be termed an increase in internal consistency, a key factor in Campbell's definition of self-concept unity (1996).

Another factor in the observed increase in contentment may be due to a particular affordance of CVE technology: the ability to very rapidly and accurately design and "try out" a series of representational avatars. This exploration of various choices can occur far more rapidly, and with a greater range of options, than is permissible in the typical real-world social context. Where the normal social reality would impose constraints on day-to-day adolescent choices such as hair styles, tattoos, or revealing attire, the CVE does not. This rapid exploration of desired images may function as a technology-

leveraged tool to speed progression in Marcia's identity moratorium status, on the path towards identity achievement (1993). The freedom to instantly morph the self-presentation to match the situational demands of virtual socializing may assuage frustrations and teen angst concerning perceived limitations on their development into adulthood.

Prior research in this field has consistently found that lonely youths use the Internet more for communication and identity experiments (Matsuba 2006; Valkenburg & Peter 2008). While both these studies agree that the Internet may be a critical tool in helping lonely adolescents in their search for identity, our results would support Valkenburg's conclusion that these youths benefit from this opportunity to practice social skills and relating to people, and weigh against Matsuba's suggestion that the Internet may be "hindering them in facing life in the 'real' world, and thus preventing them from developing an adult identity" (Matsuba, 2006, p. 283). Our evidence would indicate that socializing in a CVE offers adolescents a new opportunity to develop more effective self-presentation and the articulation of a set of desired images, or possible future selves. Previous research has shown that: self-presentation difficulties can result in shyness and social anxiety (Schlenker & Leary, 1982, p. 665); the motivation to develop alternative possible selves may be stronger in alienated youths (Higgins, 1996, p. 1077); and that adolescents who are not successful in constructing possible selves in the conventional domains of family, friends, or school are likely to seek alternative ways to define the self (Oyserman & Markus, 1990, p. 114). Taken together in the light of our study results, this would support the assertion that a CVE could be used to help lonely youths develop a more effective self-portrayal through the exploration of possible future selves.

There were some limitations to the study. The sample size is small and almost exclusively Asian students. Replication and extension of this study with a larger sample size in other cultural settings would provide additional perspectives with greater predictive validity. While the survey was conducted using the double-blind method to reduce subjective bias, there may be some self-report bias as the adolescent participants hesitated to reveal their innermost selves to scrutiny. Demand bias should be minimal, as all the CVE activities were presented as a normal part of introducing them to the Second Life environment for the purpose of an Introduction to Design and Programming course. Although the RSCS survey instrument achieved good reliability and validity scores in its development, one possible weakness may be that the Possible Selves subscale items are all at the end of the survey, and they are all negatively worded. The other five RSCS subscale items are randomly distributed throughout the survey, and half are worded positively, and half negatively. The Possible Selves subscale validity would probably benefit from the same treatment. To expand the reliability of this subscale, more question items could be developed and rigorously trialed for internal consistency.

Future directions for research in this field could include the development of a conceptual framework linking specific CVE activities with potential changes of the self-concept, enabling a greater understanding of the way that virtual socializing can affect, facilitate, and even guide the development of future possible selves.

The simulated proxemics (the way that people react to the close presence of others) in CVE social interactions may account for a level of emotional response (through amygdalar stimulation) that could play a role in the construction of desired possible selves. For example, rules of personal space and eye gaze aversion in virtual worlds have

been shown to follow well-known rules of nonverbal behavior (Yee, Bailenson, Urbanek, Chang & Merget, 2007). If future investigation finds that the social interactions in a virtual environment cause similar amygdalar stimulation as in the physical world, this would support the idea that an avatar representation in a CVE can be used to effectively explore future possible selves.

Conclusion

The incredible flexibility that a CVE avatar offers for the exploration of various self-presentations, combined with the simulation of face-to-face proxemics for "trialing" this possible self in social experiences with significant others, would seem to provide an effective tool for facilitating development of the adolescent self-concept. If educators can identify those adolescents who lack a way to conceptualize a plausible path towards an identity which includes academic achievement, and then effectively use a CVE to facilitate the transformation of the self-concept in relation to the world, they may able to mitigate some of the self-conceptual constraints that limit the potential for optimal outcomes.

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