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EMBODIMENT, EMBEDDEDNESS, AND EXPERIENCE: GAME-BASED LEARNING AND THE CONSTRUCTION OF IDENTITY

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The twenty-first century places new demands on student learning. New times call for new literacies. We witness keen interest in "serious games" and the use of games to enhance student learning. Against this backdrop, this paper[1] examines issues related to bringing game-based learning into classrooms. It is argued that the construction of students' identity and sense of self are important but mostly overlooked educational goals. It is also noted that immersive games, by virtue of three associated learning characteristics—embodiment, embeddedness, and experience—are well-suited to supporting identity construction goals because they orient learning toward performance competencies that are intentional and possess a high degree of personal agency. We advocate a pedagogy that involves dialectic interplay between game-play experience and classroom-based discussion and reflection. These ideas are illustrated through a research project on National Education in Singapore. The game we have developed, *Space Station Leonis*, is a hybrid that comprises two modes of play: simulation mode and role playing scenario mode. We show how the game has been designed to help students develop a sense of who they are and what they stand for in a classroom learning environment that seeks to facilitate development of their identity in relation to being and becoming a Singapore citizen.

Keywords: Game-based learning; identity; embodiment; embeddedness; experience; being and becoming; *Space Station Leonis*.

1. Introduction

In recent years, there has been resurgent interest in game-based learning. Unlike the earlier generation of multimedia games developed by software tools such as Authorware™ and Director™, present interest has focused on three-dimensional immersive games purchased either off-the-shelf (Squire, 2001) or developed by researchers themselves (Jenkins, Klopfer, Squire & Tan, 2003). Authors such as Prensky (2001, 2006), Aldrich (2005), Gee (2003, 2005c) and Shaffer (2006b) have written extensively about the potential benefits of using computer and video games

[1]This paper is an extended version of a keynote speech presented at the 8th International Conference on Intelligent Tutoring Systems held in Jhongli, Taiwan, in June 2006.

for learning. Notwithstanding, there remains widespread concern, even reservation, about the efficacy of game-based learning. This issue is multi-faceted and complex, and it needs to be addressed holistically. Concerns that revolve around violence depicted in video games, the concomitant promotion of aggressive behaviors, and the possibility of becoming addicted to games have validity. But there is a wide spectrum of games available, and responsible educators are unlikely to promote violent games. Gee (2004b) has authored an effective critique on what makes games a powerful learning tool, while Jenkins (Jenkins, no date) has sought to dampen fears about the dangers of playing video games. A careful reading of the literature suggests that there actually is agreement that no direct *causal* link has, as yet, been established between playing violent video games and aggressive behavior. Rather, current research suggests that playing violent video games can be a risk factor that increases the likelihood of aggressive behavior, but only when other risk factors are also present (Anderson, Gentile & Buckley, 2007). Hence, a balanced perspective based on deep understanding provides a basis for charting the path forward.

In light of the foregoing, the aims of the paper are:

- To examine issues related to the use of games in the context of 21st century learning.
- To draw attention to the importance of identity construction as an educational goal.
- To consider how the notions of embodiment, embeddedness, and experience are central to the development of a pedagogy oriented toward identity construction based on game play.
- To exemplify the above ideas through a research project that deals with National Education in Singapore schools.

Arising from a keynote talk, the paper is broad ranging and conceptual in nature. It seeks to point the way forward with respect to how games may be used as a powerful learning tool, within a context of experiential and dialogic learning.

Section 2 of the paper considers current thinking on 21st century learning and situates the topic of game-based learning within this context. Section 3 explores the notion of identity, explaining its importance in educational research today, reviewing different approaches to framing the construct of identity, and elaborating on how issues of identity are inseparable from classroom learning. Section 4 then highlights three salient characteristics of learning in immersive game environments, namely embodiment, embeddedness, and experience, while Section 5 explains how these characteristics place game-based learning on a foundation suited to the construction of identity as an educational objective. Section 6 exemplifies the foregoing ideas through a research project to develop identity in the context of National Education. Section 7 elaborates on the current status of the project and discusses issues that arise from the experience to date of attempting to bring games into classroom learning. Section 8 concludes the paper.

2. Game-Based Learning in the 21st Century

Howe & Strauss (2000) and Brown (2002) have highlighted how the growing-up experience, life style choices, and preferred modes of engagement of the millenials, or Gen *Y* students, are very different from those of the preceding Gen *X*. For millenials, school is only one source of learning; out-of-school learning and informal learning increasingly account for more of a millenial's overall education. Millenials tend to "grow up more quickly" due to earlier financial independence, often achieved through part-time work. They are creatures of the digital age, possessing the latest electronic gadgets such as cell phones and iPods, and are always "on" and always connected. Social networking through IT-mediated tools is a fact of life, and partial continuous attention is a habit. Such youth are often depicted as possessing drive, a strong sense of who they are, and a passion to succeed. Innovative and adaptive, they constantly reinvent themselves to stay ahead. They have been described as shape-shifting portfolio people by Gee (2004a) because of their constant pursuit of certificates and credentials with which they can "sell themselves" better.

New times, as suggested by Gee (2004a), call for new literacies. Lankshear and Knobel (2003) direct our attention to how the construct of literacy has evolved over time. Prior to the 1970s, the term "literacy" was hardly used. Instead, the focus was on reading and writing, reflecting an orientation toward the decoding and encoding of text. The 1970s, however, witnessed an increasing disaffection with this restricted focus. Freire's writing (1970/1993) suggested how mastery of reading and writing could be socially empowering. The shift to a post-industrial society in the more developed nations in the early 1970s revealed the general ineffectiveness of educational systems at that time, resulting in a widespread lack of functional literacy. Most significantly, this period also saw the development and increasing adoption of a sociocultural perspective within studies of language and the social sciences. This development helped spur the conceptual shift in the term *literacy* as one going beyond text and word. The *psychological* orientation embodied in research on reading (Just & Carpenter, 1986) and writing (Bereiter & Scardamalia, 1987), comprehension and composition, began to give way to a *sociological* orientation of literacy viewed in terms of lived practice. This pivotal shift recognizes how textual practices are always also social practices bound up with historical, social, institutional, and cultural relationships. Textual practices are always connected to social identities—to *being* particular kinds of people—and literacies are always embedded in Discourses (Gee, 2005a). Texts are integral parts of "lived, talked, enacted, value-and-belief-laden practices" carried out in specific places at specific times (Gee, Hull & Lankshear, 1996, p. 3). Thus, the *meaning* of text is inseparable from its use. Meaning can only be constructed in the situated context of use.

Academic achievement in the context of 21st century learning can be conceived of in terms of four parts: (1) digital-age literacy, (2) inventive thinking, (3) effective communication, and (4) high productivity (NCREL, 2003). Digital-age literacy includes (a) basic, scientific, economic, and technological literacies, (b) visual and

information literacies, and (c) multicultural literacy and global awareness. Inventive thinking includes (a) adaptability, managing complexity, and self-direction, (b) curiosity, creativity, and risk taking, and (c) higher-order thinking and sound reasoning. Effective communication includes (a) teaming, collaboration, and interpersonal skills, (b) personal, social, and civic responsibility, and (c) interactive communication. High productivity includes (a) the ability to prioritize, plan, and manage for results, (b) effective use of real-world tools, and (c) the ability to produce relevant high-quality products. The NCREL framework is strongly directed toward the development of 21st century skills and the cultivation of personal and social capital. The kind of education advocated seeks to empower individuals so that they are able to innovate with ideas, create economic value, work in teams, and attain to a high level of self-actualization. Unlike traditional assessment systems that emphasize the mastery of content, the NCREL criteria are closer in spirit to Green's (1997) three-dimensional model of literacy that encompasses (1) *operational* dimensions of skills reflecting mastery over tools, procedures, and techniques, (2) *cultural* aspects of performative competence within the context of social practice, and (3) *critical* elements accompanying awareness that all social practices are constructed and "selective," advantaging some perspectives and persons or class of persons while disadvantaging others.

The adoption of game-based learning is closely aligned to the skill-oriented, performative modes of behavior implicitly advocated by NCREL and by Green. In his critique of traditional schooling, Gee (2004b) articulates a large set of effective learning design principles that effective educational games embody. Some examples are:

- Learning is based on situated practice.
- There are lowered consequences for failure and taking risks.
- Learning is a form of extended engagement of self as an extension of an identity to which the player is committed.
- The learner can customize the game to suit his/her style of learning.
- The learning domain is a simplified subdomain of the real domain.
- Problems are ordered so the first ones to be solved in the game lead to fruitful generalizations about how to solve more complex problems later.
- Explicit information/instruction is given "on demand" and just-in-time.
- Learning is interactive (probing, assessing, and reprobing the world).
- There are multiple routes to solving a problem.
- There are intrinsic rewards within the game keyed to a player's level of expertise.
- The game operates at the outer edge of a player's "regime of competence".
- Basic skills are not separated from higher-order skills.
- The meaning of texts and symbols is situated in what one does; it is never purely verbal or textual.
- Meaning/knowledge is built up through various modalities.
- Meaning/knowledge is distributed between the player's mind, objects in the environment in the game world, and other players.

- Knowledge is dispersed as player's go online to get help and discuss strategy.
- Players become members of affinity groups dedicated to a particular game or type of game.
- The game constitutes a complex designed system, and the player orients his/her learning to issues of design and the understanding of complex systems.

Non-school sectors such as corporations and government have effectively utilized immersive games for training purposes. With a view toward getting away from the "fact fetish" (Shaffer, Squire, Halverson & Gee, 2005), we face, as educators and as researchers, a pressing challenge to engage in systematic study of how to harness the power of games for learning (Squire & Jenkins, 2003). However, this challenge is non-trivial. In seeking to introduce the use of computer games in classroom-based learning, we need to address the following issues:

(1) *What* should students be trying to learn?
Should teachers be trying to use games with standard curriculum subjects (e.g. English, mathematics, science, geography), non-standard curriculum subjects (e.g. music appreciation, sex education), or non-curriculum subjects (e.g. golf, handicrafts)?
(2) *How* should games be used?
Should students play games in the classroom or outside of the classroom? Should they play within or outside of official classroom teaching time?
(3) *Why* should games be used?
What exactly should drive the adoption of game-based learning? Is it to enhance motivation for "boring" subjects, to increase student engagement, or something else?
(4) How should we deal with *design issues*, both with respect to the game itself (Squire, 2006) as well as the design of the broader classroom-based learning environment so that game adoption can be scaled up and sustained?
(5) How do we help schoolteachers to assimilate and internalize suitable *pedagogies* for game-based learning?
(6) How do we evaluate the *effectiveness* of game-based learning, and what forms of assessment can we use?

We do not, at present, have good answers for the above questions. There is, therefore, a great need for systematic and sustained research in the field of game-based learning in order that the questions raised might be validly and reliably answered.

3. Identity and its Construction

In this section of the paper, we turn our attention to the issue of identity and its construction. As indicated in the previous section, effective educational games typically involve players adopting and developing an identity within the game space. Such players often interact further with one another outside of the game space,

either in online affinity groups or face-to-face, engaging in participatory learning and developing a sense of community that is driven by a common game-derived experience. We now probe the notion of identity and selfhood and seek to establish its relevance to the agenda of education.

3.1. *Probing the notions of identity and selfhood*

What do we mean by *identity*, and, as educators, why should we care? To cite Sfard and Prusak (2005):

> *These days, the term identity is prominent in both scholarly and public discourses. The time-honored notion is experiencing an obvious renaissance, with its comeback even more impressive than its original appearance. Once a part of specialized psychological vocabularies, it now enjoys the attention of researchers in a wide range of social and humanistic sciences . . . Educational research is no exception.*

The issue of identity revolves around the question "Who are you?" However, this question is posed in a much deeper sense than merely asking for a person's name. The construct of identity is predicated upon the existence of a *self* with an associated *selfhood*. Stevens (1996) suggests at least three facets of self that are pertinent to the present discussion. The first facet is the *embodied* self. It is a biological perspective that stresses the importance of agency and self-directedness possessed by embodied beings. The second facet is the *reflexive* self. This is an experiential perspective that foregrounds any sentient being's quest for meaning and meaningfulness in life. The third aspect is the *distributed* self. This facet adopts a social constructionist perspective and places emphasis on the role of culture and discourse in the making of self. All three facets are pertinent to the issues being addressed in this paper. Fundamentally, every sentient person may be construed of as being engaged in an *identity project*, the effort to achieve self-directed development and expression of self (Harré, 1983). This effort extends over each person's entire lifespan.

Attempts to frame identity as a construct have usually taken a narrative or biographical perspective. Giddens (1991), for example, defines *self-identity* as "the self as reflexively understood by the person in terms of her or his biography" (p. 53). Sfard and Prusak (2005) further assert that identities *are* stories (and, by implication, only stories) about persons. While narrative and biographical aspects of identity are clearly important, we are of the view that this construal is too limiting. Holland, Lachicotte, Skinner, and Cain (1998) address this weakness. They state: "People tell others who they are, but even more important, they tell themselves and then *try to act* as though they are who they say the are. These self-understandings, especially those with strong emotional resonance for the teller, are what we refer to as identities" (p. 3, italics added). This conception of identity is more complete

as it subsumes both narrative/biographical aspects of identity as well as performative/behavioral aspects. As Holland *et al.* argue, identity construction is always an unfinished work—hence always a work in process—developed through social practice. It does not come into being, take hold in lives, or remain vibrant without considerable social work in and for the person.

Our approach to the study of identity, following Holland *et al.* (1998), is process oriented and dual faceted. A process orientation foregrounds ongoing cultural production that entails an interlocking genesis of "identities, discourses, embodiments, and imagined worlds that inform each moment of joint production and are themselves transformed by that moment" (p. vii). Concurrently, this approach casts the study of identity in developmental as well as dialogic terms. These two facets are grounded in the socio-historial and cultural foundations established by Vygotsky (1978) and Bakhtin (1981) respectively, with both, in turn, situated in the broader context of activity theory (Wertsch, 1981). Thus, our conceptual framing subsumes the following dimensions: (1) *socio-historical*, emphasizing the role of development and appropriation rather than information processing and storage, (2) *socio-material*, emphasizing constant improvisation within ever-changing social and material conditions, (3) *socio-cultural*, emphasizing the influence of cultural differences on learning and development, and (4) *socio-linguistic*, emphasizing language as an instrumental tool for thought and action rather than as a bearer of fixed meaning. The dialogic nature of language-in-use makes the process intertextual, entailing the picking up of threads that traverse between media and contexts.

Roth (in press) proposes that the construct of identity be articulated in terms of the dialectic between two contrasting relations. The first relation is between "same" and "other", the second between "material body" and "person". These distinctions reinforce the importance of first-person actions in the construal of identity because there can be no third-person narrative without the concomitant act of *telling* that narrative. The first contrasting relation expresses the difference between being caught up in and practically understanding the world from which oneself is not distinguished (hence "sameness" with the world) and a being that experiences itself as an "other", separate from the world and its objects that are the targets of intentional and explanatory actions (hence Ricoeur's (1992) apt phrase of "oneself as another"). The second contrasting relation juxtaposes the material body of a human being against its personhood. Continuity in and accumulation of experience arises from the materiality of the human body, but personhood (or selfhood) emanates from relating to other beings intentionally, as persons (Gee, 2001).

It should be evident that the construct of identity is complex. To obtain a good grasp of a person's identity, it is necessary not only to study the developmental trajectory of an individual in socio-historical and cultural context but also to consider the dialectical tensions that arise between (1) the "sameness" and "otherness" of self on one hand, and (2) the self in terms of a first-person, material body and the self in terms of a third-person intentional agent, on the other.

3.2. *Multiple roles and identities*

Does a person have a single identity or multiple identities? The general consensus amongst authors is that identities are linked to roles. Thus, a single individual may have multiple identities arising from multiple roles he may be engaged in; for example, manager, father, marriage counsellor, and community leader. Roles, in turn, are linked to "ways of talk" or types of discourse. Gee (2005a) distinguishes between small 'd' discourse and big 'D' discourse. The former focuses on "language-in-use" while the latter additionally subsumes the gestures, actions, interactions, symbols, values, attitudes, beliefs, and emotions that inevitably come into play as part of situated enaction of talk in the context of real world activity. Thus, Gee (2001) views identity in terms of "being recognized as a certain 'kind of person,' in a given context" (p. 99).

From an analytic point of view, Gee (2001) also suggests that we can apply multiple identity lenses when attempting to analyze Discourses at work. There are four such lenses:

(1) *N-identity*: This is the *nature* perspective, referring to a state that one is in, developed from forces in nature; e.g. being an identical twin. N-identities inherently acquire their force as identities through the work of institutions, discourse, and/or affinity groups; i.e. through one or more of the other identity lenses.
(2) *I-identity*: This is an *institutional* perspective, referring to a position that one is in, authorized or imposed by authorities within the institution; e.g. being a university professor. A person identified as a university professor may experience this identity either as a "calling," suggesting the kinds of behavior and performance she may aspire to, or as an "imposition" that stipulates the behaviors and activities required of a person who bears such a title.
(3) *D-identity*: This is a *discursive* perspective, referring to one or more traits recognized in the discourse of a person with other "rational" individuals; e.g. being seen as a charismatic person. D-identities are based on social recognition and arise through acknowledged achievement of the individual or through ascription of the same by others.
(4) *A-identity*: This is an *affinity* perspective, referring to the experiences one shares by belonging to the practice of an affinity group; e.g. being a *Star Trek* fan. A-identities are based on distinctive experiences that arise from allegiance to, access to, and participation in specific practices of a clearly identifiable social group.

The identities above are predicated upon the existence of interpretive systems that underscore the recognition of any particular identity (Taylor, 1994). Such interpretive systems may be rooted in historically and culturally shaped norms, practices, and behaviors of different groups of people.

3.3. *Identity construction in education*

For teachers to be effective, they need to "know their students" (Roth, in press). But, how does one "know one's student?" Roth *et al.* (2004) suggest that we can know our students by seeking to understand how they see themselves, how others see them, as well as how they are constantly engaged in the process of making and remaking themselves through situated activity in the classroom.

While some may view the study of identity construction in the classroom as an esoteric exercise, Wortham's (2006) ethnographic study of several students in one particular classroom over an entire school year demonstrates that social identification is an inseparable and inextricable element of classroom teaching and learning processes that are deeply intertwined with academic learning. Indeed, social identification and academic learning are so intertwined as to be co-constitutive. It is not possible to cleanly separate out content learning from identity framing processes. As Wortham notes, "it has become clear that social identification, power relations, interpersonal struggles and other apparently non-academic processes also take place during the primary business of schooling" (p. 1). For example, the way that students are chosen in class to play certain roles, the specific roles they are asked to play, and teacher management of the enaction of those roles reveals tacit beliefs held by teachers about their students (and sometimes explicit assumptions as well).

Wortham illustrates how a seemingly innocuous discussion centering on the ways that humans differ from beasts in the context of a joint history and English class led to the stereotyping of two students, Maurice and Tyisha, as "beasts" of some kind: a cat in the case of Tyisha. This stereotyping reinforced the social identities of these students as outcasts in the class. In particular, Tyisha was socially identified as a "loud, black girl" while Maurice was socially identified as a "resistant black male." Such social identification does not arise over the course of one lesson or even one day. Rather, these models of identity, "either an explicit account of what some people are like, or a tacit account that analysts can infer based on people's systematic behavior toward others" (Wortham, 2006) emerge historically, locally, and interactionally over multiple timescales, with specific identities not being entirely predictable from local models. Unwittingly, Tyisha and Maurice became *participant examples*—where participating in the event of giving an example also makes one become a character in the example—in a classroom-based social identification process that enmeshed their academic learning with how they were perceived as individuals.

It is thus impossible to avoid issues related to identity construction and social identification in the classroom. Educators who are sensitive to the social processes surrounding identity construction will be better placed to assist students in developing their full potential and to avoid engaging in actions that may harm students' self-worth. Ultimately, issues of identity and social identification begin to interface with the politics of recognition and self-respect (Taylor, 1994). While we seek to respect the authenticity of the kind of person each student wishes to be, it might be argued that, as educators, we must also help children "make themselves." Appiah

(in Taylor, 1994) argues that it is inevitable that we do so according to our own (adult) values because children do not begin with values all their own. This issue is especially pertinent to the research project that we describe in Section 6.

4. Three Characteristics of Learning in Immersive Game Environments

How is a person's construction of identity mediated by immersive game environments? In this section of the paper, we highlight three salient characteristics of immersive game-based learning environments that fundamentally alter what it is typically like to learn in school. These three characteristics are (1) embodiment, (2) embeddedness, and (3) experience. In the subsections below, we elaborate on these characteristics in turn and highlight the shift in epistemological focus that they entail. Section 5 then establishes the connection between these three characteristics and the construction of identity in the context of game play.

4.1. *Embodiment*

Western philosophical tradition has continued to view *mind* as being distinct from *body*. This tradition stems from Descartes' famous phrase *cogito ergo sum* ("I think therefore I am"). It effectively posited the existence of a separate facility of mentation. This facility does not adhere to physical laws, and it is distinct from a person's material body that does. Since the early to mid-1990's, however, various authors, for example, Damasio (1994) and Varela, Thompson, and Rosch (1991), have challenged the veracity of such a conception. Damasio argues that the brain is very body-minded. Indeed, it is possible to have body without mind, but not mind without body.

Our ability to function cognitively, and the very manner in which human cognition functions, is firmly grounded in the specific embodiment that we, as humans, possess. Over 30 years ago, Nagel (1974) argued that we can never really know what it is like to be a bat even if we wished to. Just as a bat's "knowledge" is uniquely constrained by its specific brain–body, so too human knowledge, as we know it, is uniquely constrained by our human brain–body. More than just brain–body differences, human knowledge further depends on being situated in a material world inseparable from our bodies and on our language and social history. The development of human perception–conception is structurally coupled and tightly bound to the nature of the material world (Edelman, 1992; Varela *et al.*, 1991). Clancey (1997) argues that perception and conception are actually one integrated process. Our experience of the color of objects in the world is a particularly compelling example of the way in which embodiment leads to a unique human experience of color, bearing in mind that color is actually not an inherent property of objects (Varela *et al.*, 1991).

Unlike computational modes of thinking that prevail in classical cognitive science (Johnson-Laird, 1988), Lakoff and Johnson (1999) argue that human reasoning

is not disembodied; rather, it arises from the nature of our brains, our bodies, and bodily experience. Our reasoning ability needs to be considered in more evolutionary terms that build upon forms of perceptual and motor inference possessed by "lower" animals. Unlike the view of thinking as attention-directed conscious mental activity advocated by human information processing psychology, Lakoff and Johnson further argue that human reasoning is mostly unconscious, largely metaphorical and imaginative, and emotionally engaged. Even forms of knowledge customarily seen as being highly objective, such as mathematics, are derived from spatial characteristics of our experience in a three-dimensional world (Lakoff & Núñez, 2000).

The appeal of the computer metaphor as a model for human thinking and problem solving arises from the unlimited computational power of a Universal Turing machine. While this metaphor has led to productive work in knowledge representation, artificial intelligence, and "computational intelligence," it is essential to recognize that it remains, in the final analysis, a metaphor: a tool for thought. Regrettably, constant repetition of this model has led people to overlook the fact that models are but tools. They represent the attempt by humans to provide some coherent description of phenomena. Clearly, the models are not the phenomena themselves. In scientific work, we customarily distinguish between *predictive* and *explanatory* models (Dubin, 1978). Just as a predictive model (say, a regression equation) of tomorrow's weather is obviously not a description of that weather, so too an explanatory model of tomorrow's weather is not necessarily a description of *how* tomorrow's weather occurs. Unfortunately, explanatory models are often taken as being synonymous to "truth." Instead of being viewed as explanatory devices, theories become entrenched as truth and irrefutable dogma. Consequently, many lay people today believe that their "minds" process information, and this information is stored in and retrieved from their memory. They take these ideas to be "truth" rather than theory.

According to Stillings *et al.* (1995), cognitive science is predicated upon four foundational assumptions: (1) information processes are contentful and purposeful, (2) information processes are representational, (3) information processes can be described formally, and (4) cognitive science is a basic science. This set of assumptions is consistent with Descartes' thesis that human thinking is mediated by "internal representations." Thus, an electronic calculator can encode an internal representation of the numbers 3 and 4. When the operand multiplication is applied, the calculator yields an internal representation of the number 12 which is then represented on its display as "12". The only reason why this computational "ability" of a calculator is of value to us, as humans, is that in the knowledge domain of arithmetic, multiplying the number 3 by the number 4 yields the number 12. Thus, although the computational process is entirely rule driven, the material outputs possess semantic validity. Were this not so, the electronic calculator as we know it would be useless.

Would we, however, think that the electronic calculator "knows" or has a sense of what it means (to us) to multiply 3 by 4? Surely not. Is this *sense* of number

that we possess a crucial element of human cognition? Clearly so. Where would this sense of number come from? The computational model has no answer to this question because, as is evident from assumption (1) in the foregoing paragraph, information processes are *assumed* to be contentful, i.e. meaningful, from the very outset. However, this assertion is inconsistent with what we know about children's learning. The world does not present itself as neatly ordered, named, and meaningful at birth. A key element of human learning is to construct that coherence, through action, interaction, and thought, in the context of historico-developmental, sociocultural, and situated activity that eventually also includes the use of language (Edelman, 1989, 1992; Hayakawa & Hayakawa, 1990).

Human meaning making processes are inherently grounded in embodiment. Meanings, central to human intentionality, cannot be "captured" in representations. There is a common belief that the meanings of words can be found in a dictionary. However, this is a fallacy because all that one will find in a dictionary is carbon on paper (in the manner that documents are printed today on laser printers). A computational model foregrounds "mind" and its putative information processing at the expense of body and the material basis of our cognition. Such computational models are solipsistic and emphasize thinking as being "all in the head" with little need for the body.

Disembodied cognition leads to notions of memory as a store of knowledge and learning as a process of transmitting and/or acquiring knowledge. However, Frederic Bartlett (1932), a pioneer in studies of what we today call "memory," entitled his book "Remembering", signifying a conception of memory as process rather than as store. In similar vein, Rosenfield (1988) argues against the "invention" of the conception of memory as store based on advances in our understanding of the brain that puts "mind" back in nature (Bateson, 1979). An embodied view of cognition leads to different epistemological entailments with respect to knowledge. Rather than seeing knowledge as an object, something to be transmitted by teaching and acquired through learning, the embodied perspective is more consonant with participatory and collaborative modes of learning where knowledge is viewed in terms of the capacity for intelligent behavior rather than the possession of any mental "thing" (Rogoff, 1993).

Embodied cognition and its entailments are key to pedagogical design for game-based learning in immersive environments. This issue is further taken up in Section 5.

4.2. *Embeddedness*

Adopting an embodied perspective of cognition, our understanding of human learning shifts from a narrow "in-the-mind" focus to a broader "person-in-the-world" focus. Students, as embodied persons in the world possess a clear sense of being, of location in a sociomaterial world in space–time. There is a sense of self and personhood, as discussed in Section 3.1, and a sense that one *is*. This sense of *being*

as argued by Heidegger (1953/1996), reflects an entity that "shows up" within the context of practical engagement. Being-in-the-world is predicated upon embodied beings in the world that act intentionally. Being-in-the-world further opens up the possibility of "being there": a sense of personal *presence* in some place at some time and the possibility of *co-presence* with co-located others. This feeling of the mutual presence of another is part of our everyday experience. However, it also transfers to technology-mediated experiences in immersive virtual environments, for example, C–VISions (Chee & Hooi, 2002) and Second Life (http://secondlife.com), giving rise to the phenomenon of telepresence.

Students in game-based learning environments experience a sense of being and of selfhood by virtue of being materially/virtually embedded in that world. Consequently, learning can take place through enaction. Intelligent behaviors in the immersive world are what ultimately count. Thus, the criterion of successful learning is performative, driven by goal-directedness, intentionality, and strong personal agency. This mode of learning represents a significant departure from traditional modes of classroom learning that seek to impart knowledge and assess the acquisition of knowledge. In environments that support embedding, *behaviors* that subsume knowledge are what count, not knowledge per se. Just as we value surgeons for their ability to perform surgeries successfully based on sound knowledge-in-practice, so too learning in environments that require the demonstration of knowledge-in-action represent a more authentic, more meaningful, and more powerful mode of learning. Thus, embeddedness supports "person-*in*-the-world" learning.

4.3. *Experience*

Learning environments that support embodiment and embeddedness yield experience as a natural side-product. Kolb's (1984) experiential learning cycle (reconstructed in Figure 1) illustrates how active experimentation in the world, yielding concrete experience, leads to reflective observation and, over multiple cycles, the formation of more abstract concepts. These concepts are continually re-tested through application to the material world, leading either to confirmation of existing understanding or expectation failure (Schank, 2002). In the latter case, reflection will lead to concept modification and/or refinement as appropriate. Hence, a student's knowledge is always in flux and remains a constant work-in-progress, open to being disproved and corrected.

A key strength of Kolb's model is that it portrays a student as an embodied, active agent embedded in a material world, constantly learning by doing, observing the outcomes of his actions, testing his hypotheses about the world, and reflecting further on his own understanding. This perspective is better aligned to developmental approaches to learning. It frames learning in terms of iterative attunement to the experienced world which may include other learners as well. Thus, the model is more authentic and more inclusive compared to cognition-as-mentation models.

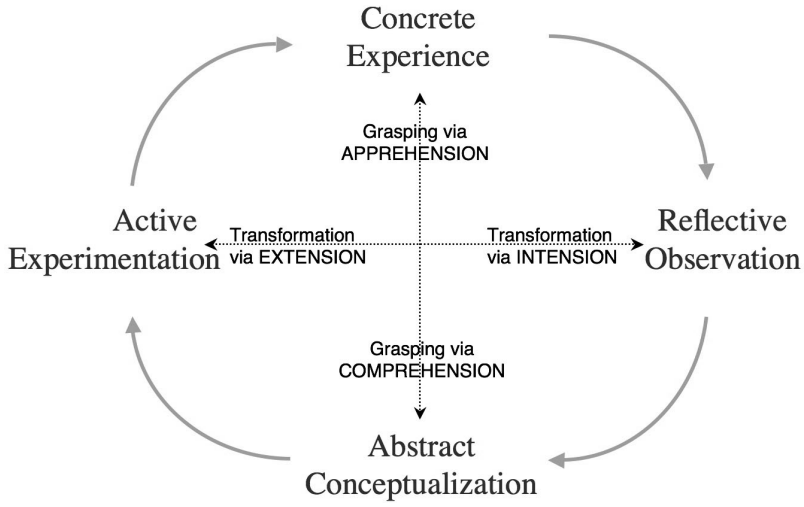

Fig. 1. Kolb's experiential learning cycle.

5. Embodiment, Embeddedness, Experience, and Identity in Game Play

Turkle's (1995) seminal book *Life on the Screen* explored issues related to the construction of online identity in the early days of the Internet when MUDs and MOOs prevailed. Writing in that context, she argues that "[w]hen we step through the screen into virtual communities, we reconstruct our identities on the other side of the looking glass. This reconstruction is our cultural work in progress" (p. 177). Note that the operative preposition is not *on* the screen but rather *through* the screen. This sense of being, of living out a (virtual) life on the other side of the screen, entails our involvement as fully embodied persons, embedded in a world via which experiences materialize. In immersive game settings, identity re/construction (i.e. construction and ongoing reconstruction) is even more prevalent and intense, compared to text-based online communities, because 3D immersive spaces support enaction and the execution of performative behaviors. This is especially so in role playing games where players enact their trajectory through the game space in the first person. Massively multiplayer online role playing games further augment the sense of presence and realism by supporting real time interaction and communication with other non-co-located players. Thus, like Alice stepping through the looking glass, game players may take on a new persona, visually represented by an avatar, in order to develop their virtual selves. Even when players are engaged in games other than role playing games, there is still an implied character and role that they play. In a strategy and simulation game such as *Sim City*, players take on the role of city mayor. Instead of seeing themselves directly in the game interface, the representation of self is implicit, supported by a third-person point of view, with players having access to controls that govern how the city develops and evolves.

Gee (2005b) argues that game-based learning entails learning in a *semiotic domain*: an interaction space that allows players to recognize the coherent content of the game (i.e. what playing the game is all about) through the meanings of objects represented in that space and the relations between those objects. In such a domain, students learn to experience—see and act on—the world in new ways. They also gain the potential to join and collaborate with new *affinity groups*—groups of people with a common interest—outside of the game space. In so doing, students develop resources for future learning and problem solving in the semiotic domain to which the game is related. They also learn to situate meanings through embodied experiences and to reflect on their own learning.

Gee (2003, 2005c) explains that there are three distinct identities that we need to distinguish between in the context of game play. First, there is a *virtual identity* that represents the character one is playing in the game, whether shown in the first person or not. Virtual characters in a role playing game will have an associated repertoire of actions that they are capable of enacting, e.g. jumping, waving, provided by the game developer. Second, a player always also possesses a *real world identity*, that is, the person as he or she is known in the real world. Third, there is a *projective identity* that represents the projection of the real world person, with his or her goals and intentions, onto the game character. This projection yields a so-called *blended character* constituted in part by the real world player's own motives and in part by the repertoire of actions that the game character is able to enact, consistent with the virtual identity. Thus, the in-game "person" being enacted is always a mixture, driven on the one hand by what the gamer wishes to do and achieve and constrained on the other by what actions have been programmed as do-able by the character. The conflation between real world player and virtual persona as they jointly enact a trajectory of experience through the game space creates a strong sense of projection into the game world, a sense of *being* (first-person embodiment) in the world as well as a sense of "being there" (embeddedness) *in* the world. This tripartite interplay of identities—virtual, real world, and projective—creates a powerful context for learning because of its dual active and reflexive characteristics.

6. The National Education Research Project

The Learning Sciences Lab of the National Institute of Education, Singapore, has been engaged in the design and development of a game to help foster improved learning outcomes in the domain of National Education. In the context of Singapore, a key objective of National Education is to instill students with a deep sense of citizenship and civic responsibility grounded in a keen grasp of Singapore's unique challenges, constraints, and vulnerabilities. Through iteratively cycling between game-based learning and more contemplative reflection, it is hoped that students will develop critical awareness of issues related to self in relation to nation and personal identity in relation to national identity.

The issue of whether there is a unique national identity in Singapore is one that continues to be hotly debated (Lim, 2006). A lack of consensus on the issue has not prevented the Ministry of Education from articulating the objective of National Education in Singapore schools, namely the development of (a) national cohesion, (b) the instinct for survival, and (c) confidence in the future by:

- fostering a sense of identity, pride, and self-respect in Singaporeans
- knowing the Singapore story: how Singapore succeeded against the odds to become a nation
- understanding Singapore's unique challenges, constraints, and vulnerabilities
- instilling the core values of preserving Singapore's way of life and the will to prevail to ensure continued success and well-being

Space Station Leonis is a game developed to help improve the quality of learning outcomes in the teaching and learning of National Education. Traditionally taught using methods such as telling, in-class role playing, and occasionally project work, and typically assessed using multiple choice questions, the teaching of National Education, especially with regard to instilling values and shaping attitudes, can surely be improved.

A recent report in the local English newspaper, *The Straits Times* (Chua, 2007), highlighted the fact that, based on a survey conducted by Singapore's Information Development Authority, 58 percent of children aged between 10 and 14 years in Singapore play online games. This finding suggests that there could be ready take-up of games as a tool for learning in Singapore schools.

Space Station Leonis is a hybrid simulation-cum-role playing game. The game has been designed as a single player game owing to limitations of bandwidth to support realtime in-class playing (at the time of writing.) The game lobby shown at the start of the game establishes the setting and context for ensuing game play (see Figure 2). A game simulation of the Singapore milieu allows students to directly explore the consequences of different strategies and policies related to, for example, racial harmony, water supply, economic well-being, and total defence. In role playing scenario mode, students are able to project themselves, in embodied and embedded fashion, into the game world to experience, first-hand, phenomena such as racial riots, water shortage, trans-national terrorism, and civil defence. Using a computer game thus allows students to live out such experiences in a manner that can effectively shape their attitudes, values, and beliefs (see Figure 3), as well as their affective dispositions toward the nation. Hence, the game can also help students to explore who they are and what they stand for, paving the way for the development of their personal identity with respect to National Education issues.

Based on the foregoing discussion, we developed the objectives of our National Education game. These are:

(1) To deepen students' understanding of Singapore's unique challenges, constraints, and vulnerabilities.

Fig. 2. Game lobby screen of *Space Station Leonis*.

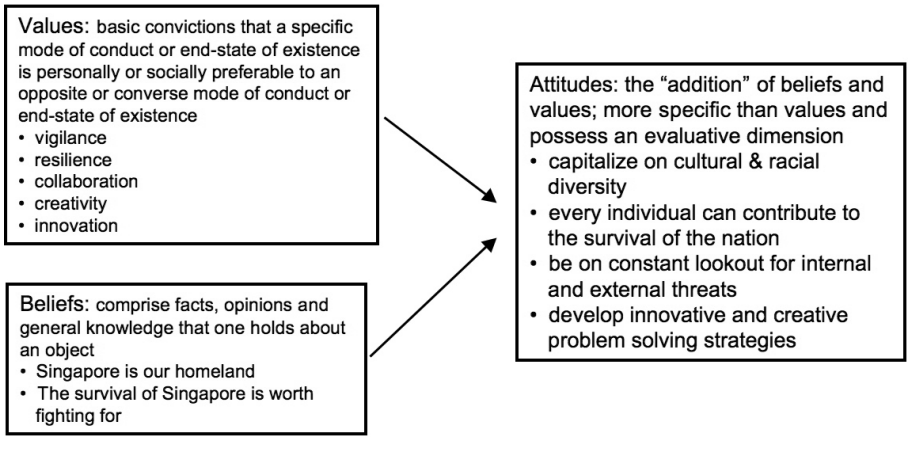

Fig. 3. Sample of target values, beliefs, and manifested attitudes.

(2) To strengthen students' awareness of the importance and rationale for key national policies that shape the nature of civic society.
(3) To develop sensitive and balanced attitudes toward issues of national importance.

6.1. *Conceptual framework*

Figure 4 shows the conceptual framework that guides our research. As illustrated, student learning has two main facets—material and social—with the whole learning

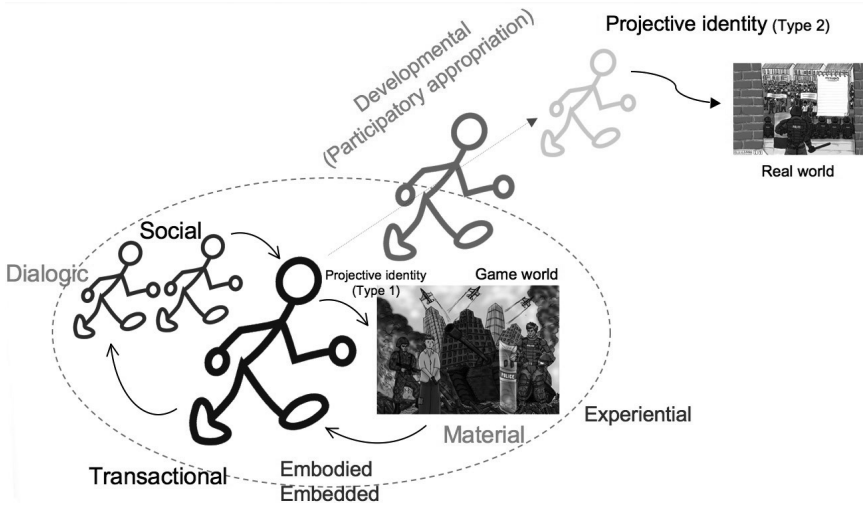

Fig. 4. Conceptual framework for game-based learning research.

experience placed on a developmental trajectory over time. Students imbibe their understandings and ways of behaving through a social learning process, that of participatory appropriation (Rogoff, 1993, 2003). This conceptual framing is cultural and developmental in orientation, eschewing cognitivism (Still & Costall, 1991) and favoring a view of learning as *being and becoming*; that is, learning to be and to become a certain kind of person.

The *material* basis of learning is realized through game play as the student interacts with and in the virtual world of the game. By virtue of embodiment and embeddedness as discussed in Section 5, the student's learning is highly experiential, based on the projection of self into the virtual world. As is widely known, the intensity of engagement during game play detracts from reflective thinking. Hence, our pedagogical approach provides for complementary teacher-facilitated classroom based sessions where students are guided to discuss the actions they took, the decisions they made, and the overarching strategies they pursued in the game space, and to reflect on and share what these mean in relation to National Education themes and messages. To this end, a set of complementary curriculum materials has been developed for teachers and students to use. A guidebook developed for teachers provides suggestions on how they can draw connections between National Education issues foregrounded in the game and historical events that are core to the challenges faced by Singapore and that are deeply embedded in the psyche of every Singaporean. The classroom learning space is *dialogic* in nature, underpinned by social and collaborative modes of learning. Students' learning interactions, both within the game as well as with one another, are transactional in the sense of Dewey's pragmatist philosophy (Bredo, 1994).

Over time, as students continue their participation in this cyclic material–social learning space, it is hoped that they will begin to internalize the values and beliefs

that the game was designed to instill. These values and beliefs may in turn become manifested through attitudes discernible in material actions and behavior in the real world.

The assessment of learning outcomes in a learning environment for National Education poses considerable challenges. Given the orientation toward learning to be and to become a certain kind of person with an appropriate associated identity, the litmus test of effective learning can only be observed in real life conditions; e.g. how a student would react and respond in times of water shortage or when there is a terrorist attack on a train station. The Type 2 projective identity shown in Figure 4 refers to this projective behavior of students into the real world, and it is to be distinguished from the Type 1 projective identity into the game world that was discussed in Section 5.

In a schooling context, we do not have the privilege of running such student assessments. Hence, we have devised other means of evaluation, such as transfer scenarios, to elicit how students would behave in crisis situations. Such scenarios are undoubtedly not true substitutes for real crises. Nonetheless, they may be adequate for us, as researchers, to probe the less obvious manifestations of the effects of our classroom learning intervention. By getting students to write and speak (through interviews) extensively about their likely behaviors, it will be possible, by qualitative means, to further assess the strengths and limitations of our learning innovation.

6.2. *Game design issues*

In this section, we elaborate on three important game design issues: (1) adoption of space colony game setting and focus on meta-themes, (2) game mode interweaving, and (3) curriculum time constraints.

The adoption of a space colony game setting did not occur by accident. Several alternative game settings were explored, and the space colony setting was eventually deemed the most suitable. The initial conceptualization of the game revolved around a Singapore-like setting that would also help to achieve one of the National Education objectives: to help children know the Singapore story (see Section 6). However, this idea quickly ran into difficulty. Some educators we consulted argued that making the setting Singapore-like, and hence creating an account that is not "historically accurate," would confuse students. In addition, issues related to the portrayal of key events in Singapore's history, such as racial riots, and the need for historical accuracy or otherwise arose. (Note that there are always competing accounts of history, given that history does not consist merely of a set of undisputed facts.) In view of these tensions and in consultation with the government body overseeing National Education, a decision was made to situate the game in a fictitious 23rd century space colony setting. This game setting has the advantages of (1) side-stepping entanglements related to history and its portrayal in the game, (2) shifting the concern away from historical specifics so that the game design could concentrate on conveying important National Education meta-themes (e.g. "Singapore is our home and is worth defending;" "We must maintain equitable treatment

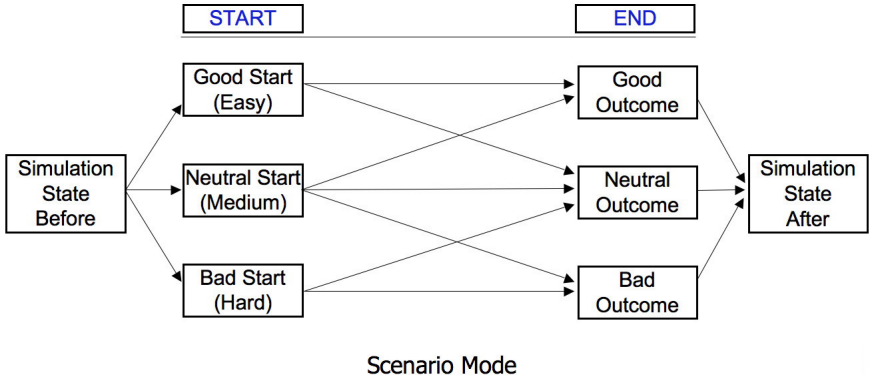

Fig. 5. Interweaving of simulation and scenario mode game play.

for all races and religions"), (3) freeing the game design from the shackles of having "one right answer," thereby opening up greater creative space for game design, and (4) avoiding the almost-certain problem of turning students off playing the game because of National Education's potential connotations of propaganda in students' minds.

Given that the game has a hybrid design, comprising alternating segments of simulation game play and role playing scenario game play, it was essential that some way be found to create a coherent narrative thread that would link the entire game. To deal with this issue, we designed the game sequences such that a student's performance in each segment would affect the state of the world when the game transitions to the next segment. This interweaving between simulation and scenario modes of game play is depicted in Figure 5. Performing badly in a simulation segment, for example, will lead to a bad start in the ensuing role playing scenario. But playing well in the scenario will "upgrade" the player to an improved state, the "neutral outcome," that the player will find in the simulation world when he or she re-enters that world.

Playing the game in the context of school, with its fixed curriculum periods and time slots, also imposes constraints on game design. While we have planned for simulation mode game play extending over multiple class periods, role playing segments have generally been designed not to exceed a single class period. Thus, we have provided functions to support saving and (subsequent) loading of the game in simulation mode. These functions ensure continuity of game play and will help preserve accumulated momentum in game play.

6.3. *Simulation mode example*

To concretize what is meant by simulation mode and role playing scenario mode game play, this subsection of the paper and the next provide a brief example. In simulation mode, students assume the role of President of the space colony on Leonis space station. As discussed in Section 5, this entails a third-person perspective on

Fig. 6. Example screenshot of the game in simulation mode.

the game world. As President, students need to establish the long-term viability of the colony, ensuring first that basic housing, health, and schooling needs are met to sustain immigrants to the colony who are initially mainly from Earth. Over time, however, immigrants from nearby Mars as well as other planets and space colonies begin to populate Leonis, leading to distinct sub-populations with different vested interests and allegiances to surrounding political powers. This development leads to tensions between the sub-populations that need to be managed by the President. It also leads, in time, to the emergence of security issues and, ultimately, defence concerns as the surrounding powers attempt to use the colony as a proxy for their battles. What should the President do? Students decide by playing the game. The simulation game space is complex and fairly open-ended, with many possible trajectories that students can take through the conceptual game space. Notwithstanding, the game simulation is balanced so that key action–consequence causal relationships eventually become apparent. The game experience then provides the context for meaningful discussion and reflection to take place, facilitated by the teacher in class. Figure 6 is a screen snapshot showing the game in simulation mode.

6.4. *Role playing scenario mode example*

In scenario mode segments, students adopt the embodied and embedded first-person perspective. They have the option to choose one of two characters "through whose eyes" they will experience the events in that scenario. (Scenario 1 is an exception to

this rule. Students are obliged to play the only character available. The reason for this is that this scenario also partly fulfils a game play tutorial function.) Our game design allows for students to play both characters, time and teacher permitting, so as to help them acquire multiple perspectives on the same set of events. When students play the game, different designs are possible. They can either be assigned to stick to a main protagonist character, thus facilitating research into identity construction, or they can be asked to switch roles to broaden their perspectives on a complex set of events with inherent tensions and conflicts of interest. The scenario dialogs are designed such that they embed multiple critical decision points for the game player to deal with. These decision points "force" players to commit to certain actions that influence the unfolding of the game script. Due to the realism and complexity of the situations presented, there is typically no "right answer." Instead, the decision making points are designed to draw out the implicit values and beliefs of the player. These are manifested by the action that a player chooses at each decision point. As an example, the player may be asked, in a situation of food scarcity, whether she will share her food with an elderly person in the group who is in dire need. Making such a decision tests the player's attitude concerning the tension between self preservation and the survival of other members of the community.

Figure 7 is an example screenshot of the game's role playing scenario mode. It shows three main characters, Stahl, Marisa, and Jason (in the foreground of the screenshot with backs facing the reader) who, as students, have assembled in

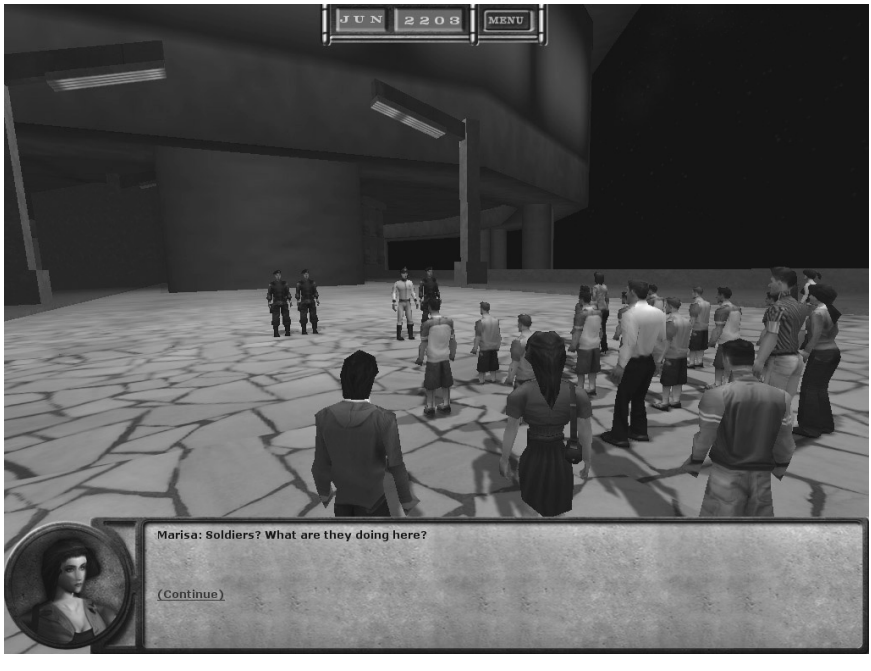

Fig. 7. Example screenshot of the game in role playing scenario mode.

the school quadrangle because the emergency alarm has suddenly sounded. To their surprise, they are met by an Armed Forces Captain of the Earth colonial power who announces an impending attack by Mars Rebel Forces and who instructs everyone to evacuate to an underground shelter. (This scene is allegorical and makes reference to the Japanese invasion of Singapore in 1942.) The scene sets the stage for students to experience, first-hand, issues related to allegiance to surrounding political powers, the development of an independent national identity, and the need for control over self-destiny.

7. Discussion

Space Station Leonis is a substantial game. We estimate that it will require about 16 hours to play the game in its entirety, when development is completed. The overriding goal is to improve the quality of learning outcomes based on classroom learning that incorporates use of the game. Achieving this goal is not simple. Schoolteachers often balk at the amount of time required for this form of learning that is process oriented and experience rich. The tension between achieving effective student learning outcomes and achieving teaching efficiency with respect to time needed poses a challenge to the adoption of innovations that also require changed practices. This challenge is one that we are continually addressing through teacher professional development. We seek to help teachers understand that the innovation is not just about achieving existing goals in a more engaging way but, more fundamentally, to transform teaching and learning practices, and often goals as well, such that they become aligned with sought after new literacies and 21st century learning outcomes.

The National Education research project illustrates one approach to the use of games in education. It is oriented toward authentic and engaged learning, and it seeks to address the unique goals of National Education in terms of students learning to be and to become citizens with core values that will help ensure national survival. Clearly, there can be other approaches. In seeking to determine what works "best," educators need to be sure about what the learning goals are. Only then can they apply a pedagogy, encompassing technology, that creates the best likelihood of achieving effective outcomes. In short, a game is a means to an end; so teachers must be clear what the desired end is from the outset.

Given the widespread interest in game-based learning today, we need clarity about what games to use for what purpose and when, why, and how to use them. It is essential for educators to recognize that games are not a unitary thing. The term subsumes many different game genres, e.g. card games, board games, strategy games, racing games, shooting games, role playing games, etc., with each genre quite distinct from the others. At the same time, there are immersive and non-immersive games, as well as different technologies used to develop games, e.g. Shockwave, Flash, and various game engines. These factors illustrate the range of possibilities subsumed by the word "game." Therefore, it is not meaningful to ask whether games

are "good" or "bad" for learning. They can be good, or bad, or anything in between. We must grapple with the specifics when trying to evaluate the effectiveness of any game used for learning.

Many educational game developers attempt to graft the game form onto traditional content oriented learning goals. Thus, a game may place students inside a cave and require them to correctly respond to a number of multiplication problems before which an entrance to the next cave appears. Such a design would reflect poor appreciation of pedagogy and demonstrate a lack of understanding of the power of games for learning. Part of this difficulty arises from the uncritical pursuit of traditional learning objectives in the face of new technologies with new affordances.

Any design of "serious games" inevitably carries, usually implicitly, a set of values and beliefs with respect to learning goals and the broader educational agenda. These values and beliefs are manifested through what the game seeks to convey via its design. Games are often a rhetorical medium. This raises the issue of the kinds of media literacy schoolchildren need when working with games as well as other forms of rich media that are prevalent today (Bradley, 2006; Jenkins, Clinton, Purushotma, Ronbinson & Weigel, 2006). There has been concern, expressed in some quarters, about whether the game *Space Station Leonis* can only be used in the context of a fairly well-controlled school/state culture. We do not believe this to be the case. The game itself, as we have designed it, primarily serves to instantiate situations where National Education themes and issues can be crystallized and foregrounded, thereby creating an authentic and meaningful context for classroom teaching and learning. Thus, the development of values, beliefs, and attitudes arises predominantly from a discussive and reflective social learning process, much as it has always been. We therefore do not believe that our game is in any way culture specific. It may be context specific to some extent, but not culture specific in the sense previously stated.

Educational games need to be designed in a manner that is guided by a deep understanding of pedagogy. Learning technologies are not "good" in and of themselves. The challenge is one of design, ensuring that technologies are harnessed in a way that ensures goodness of fit with intended learning goals. Pedagogies that promote the development of epistemic frames (Shaffer, 2006a) and that seek student outcomes integrating skills, knowledge, identity, values, and epistemology (Shaffer, 2006b) point a way forward with respect to how computer and video games can be made powerful for student learning and personal meaning making.

Finally, rigorous and authentic assessment of student learning outcomes is vital. Game-based learning research needs to be empirically validated using both quantitative and qualitative research methods. Thick descriptions of student learning processes complemented with rich narratives of and reflections on students' evolving identity will help provide us with understanding that extends beyond simplistic black or white conclusions.

8. Conclusion

In this paper, we have sought to highlight the importance of issues related to personal identity and students' construction of identity in education. Developing our students, helping them to achieve a sense of who they are and what they stand for, has always been a fundamental but often neglected goal of education. Twenty-first century educational goals together with the technology of games suggest ways to develop innovative pedagogies that address this need in the context of schooling.

We have argued that three characteristics of learning in immersive game environments—embodiment, embeddedness, and experience—lend themselves naturally to forms of learning that value process skills, performance, and intelligent behaviors: demonstrations of knowledge-in-use in contrast to traditional content acquisition goals. An embodied view of human cognition has significant implications not only for what it means to learn, but also for how learning needs to be supported and what learning outcomes are valued. The emphasis on performative behaviors as manifestations of learning align with current views on 21st century academic achievement and is consistent with the enGauge framework of NCREL referred to in Section 2.

We have shared our research project on National Education as one particular instantiation of what it might mean to design, develop, and deploy immersive games to enhance student learning. It should be evident that the theoretical underpinnings of this work, situated in historico-developmental and sociocultural perspectives, differ markedly from conventional content learning goals and assessment methods. Our work, as an endeavor in learning design, is not intended to show a single best way forward in game-based learning, but we hope that it exemplifies a promising approach. Multiple designs will always be possible. Empirical evaluation will reveal which methods are better than others and for what purpose.

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