Becoming citizens through game-based learning: A values-driven, process approach to citizenship education

Yam San Chee, Nanyang Technological University, Singapore
Swee Kin Loke, Nanyang Technological University, Singapore
Ek Ming Tan, Nanyang Technological University, Singapore

Abstract

In this paper, we share a model of game-based learning for use in the context of classroom learning in school. The model is based on the dialectic interaction between game play and dialogic engagement with peers and teacher on one hand and a developmental trajectory of competence-through-performance on the other. It is instantiated in the context of a learning program related to citizenship education using the computer game Space Station Leonis. We argue for the importance of values in all learning, based upon a theory of becoming citizens that is founded on process philosophy. We relate values to dispositions, as articulated manifestations of values, and describe how the Leonis learning program helps to achieve dispositional shifts befitting citizenship education in a globalized and multi-cultural world.

Keywords: becoming, citizenship education, dispositions, game-based learning, identity, process philosophy, Space Station Leonis, values.

Introduction

Educators face an increasingly difficult challenge in nurturing students who will develop to become civic-minded, active, and productive citizens. Effective citizenship education is particularly vital today due to the forces of globalization and multiculturalism that impact the lives of citizens worldwide (Banks, 2008). As societies become more cosmopolitan (Appiah, 2007), better understanding between nations and cultures is urgently needed in order to avoid ideological, racial, and cultural conflicts.
In the context of schools, citizenship education is the usual means through which students’ values, dispositions, beliefs, and attitudes are nurtured to realize the goals of active rather than passive citizenship. According to Selwyn (2002), passive citizenship is the product of an education that seeks to develop knowledge, understandings, and behaviors of citizenship, while active citizenship augments the passive model with an ability to critique, debate, and propose alternative models of the structures and processes of democracy.

Effective education for becoming citizens does not consist merely of being told what one ought to do and to be. Neither does it primarily revolve around learning about the birth of a nation and its consequent development. Rather, effective citizenship education needs to focus on students’ being and becoming: on how they understand themselves as persons—their identity and being—and on their developmental trajectories of becoming, projected into the future.

In this paper, we report on a pedagogical innovation involving the use of a computer game, Space Station Leonis, to foster values and dispositions that, we hope, will help lead to beliefs, attitudes, and actions that are more inclusive, thoughtful, and critically considered. We argue for the centrality of values in all human knowing. We also adopt a process worldview in framing our theoretical approach to understanding and to influencing the developmental trajectory of human learning. Key to this process perspective is the element of experience that arises out of “that which is lived” (Mesle, 2008, p.43). This perspective, grounded in process philosophy (Rescher, 2000; Whitehead, 1978), avoids the dualism of Descartes: namely, that minds think and do not exist in space, while bodies do not think and exist in space. Instead, it posits that in as much as we cannot understand ourselves (including our minds) without understanding the world of which we are a part, neither can we understand the world without understanding ourselves as a part of it (Bateson, 1979; Mesle, 2008).

In the next section of this paper, we make the argument that values are central to all human knowing, and we make the connection between values and values education. We then locate the importance of values within the broader context of the metaphysics of process philosophy. Next, we describe the background and context of the research study that revolves around the Leonis learning program, comprising the use of the computer game Space Station Leonis, associated curriculum materials, and classroom activity structures and participation.
frameworks. We then focus on our survey data of student dispositions gathered from a pre-test and post-test survey instrument. We present the data analysis and results on dispositional shifts arising from participation in the Leonis learning program, then discuss our findings and conclude the paper.

Centrality of values

There is widespread belief, especially amongst laypersons, that facts and values are fundamentally separate from and independent of each other. Given the influence of modernism and the advent of the physical sciences, ‘facts’ are seen as ‘real’, ‘objective’, and ‘proven’, and hence are universal. ‘Facts’ are esteemed above ‘values’, which are often viewed as ‘fuzzy’, ‘subjective’, and ‘unprovable’. Consequently, it is common to find that many schoolteachers, students, and parents esteeming factual learning as a concrete accomplishment on the part of students while according values education second place, treating it as something desirable but less important. This difference in valuation is reflected, for example, in the different number of curricular hours committed to ‘hard’ subjects such as science and mathematics compared to ‘soft’ subjects such as civics, citizenship education, and literature. The situation is exacerbated in schools by the teaching of subjects, such as science and mathematics, in a manner that strongly assumes, or implies, that the ‘facts’ of these subjects are completely objective and value-free.

The idea that facts are independent of values is a myth. This notion of the independence of axiology, the study of values, from ontology, the study of the things that are, that is, the separation of value and fact is completely rejected by Whitehead in particular (Leue, 2005) and by process philosophy in general. As Putnam (2002) indicates, understanding how normative judgments are presupposed in all reasoning is important in all of life. Hence, we find that the construction of theory in science is driven by the value of parsimony. The construction of theory in mathematics is driven by the value of elegance. Reasoning about epistemology is significantly influenced by the values of consistency, coherence, applicability, and adequacy (Mesle, 2008). And as Ferré (1996) argues, “our values precede our theories in real life and lead us in their construction (or approval). Even in the sciences, we have become aware of the degree to which expectations, including such factors as hopes and career commitments, influence what we notice within the total range of the presented data. Attention is selective. We should expect, therefore, that our values will have a role in
suggesting possible fruitful lines of thought. In addition, these values will play a decisive role in influencing us on how long to hang on to a theory, model, or worldview threatened by problems” (p.14). Thus, values are inseparable from all our thinking and all our being. Indeed, they are inseparable from all our professional practices.

Values are equally important in the domain of citizenship education. In fact, they are vital. They directly influence the kind of person that one seeks to become, based on a vision of the kind of projected social environment one views as being preferred. Values undergird the dispositions of individual, leading them to act, and to prefer to act, in certain ways rather than others. In this sense, values are instrumental: if there is a desirable goal, they motivate and activate the means to reach it.

From the perspective of process philosophy, Rescher (2008) argues that the processes and patterns of process that characterize us personally—our doings and undergoings, either individually or patterned into talents, skills, capabilities, traits, dispositions, habits, inclinations, and tendencies to action and inaction—are what characteristically define a person as the individual that he or she is. Character is shaped by dispositions that, when translated into action, manifest as repeated decisions that become habits of mind and purpose. The self that has these habits is known in the flow of experiences, decisions, and actions that are taken by the individual (Mesle, 2008).

Once we conceptualize the core "self" of a person as a unified manifold of actual and potential process—of action and capacities, tendencies, and dispositions to action (both physical and psychical)—then we secure a concept of personhood that renders the self or ego experientially accessible, based on the understanding that experiencing is simply constitutive of such processes.

The Ministry of Education, Singapore, has articulated a set of desired outcomes of education (Singapore Ministry of Education, 2008). The Ministry states that “Education is about nurturing the whole child. . . . The foundation of a person is his values. From these spring his outlook on life and his goals in life” (italics added). Specific outcomes desired of post-secondary and tertiary education students include the following:
be morally upright, be culturally rooted yet understanding and respecting differences, be responsible to family, community and country
• believe in principles of multi-racialism and meritocracy, appreciate the national constraints but see the opportunities
• be willing to strive, take pride in work, value working with others
• be able to think, reason, and deal confidently with the future, have courage and conviction in facing adversity
• think global, but be rooted to Singapore

It should evident that the said outcomes above are strongly oriented to being certain kinds of people. But, as we shall see in the next section, being is more appropriately approached from the perspective of becoming from a process viewpoint. Much has been written about civics, moral education, and citizenship education within the Singapore school system. For example, Chew (1998) argues that civics and moral education takes the form of citizenship training in schools that aims to ‘transmit’ national values for economic and political socialization. Tan and Chew (2004) argue that civics and moral education is more a matter of training students to ‘absorb’ pragmatic values deemed important for Singapore to achieve social cohesion and economic success rather than moral education as the development of intrinsic commitment to and habituation in the practice of values defended on autonomous moral considerations rather than mere national expediency. While the critique of a highly pragmatic approach to educational philosophy in Singapore may be well known, two issues are particularly noteworthy. The first issue is the clear suggestion that the pragmatic agenda overrides the interest of an authentic moral education. The second issue is that the authors adopt the language of human information processing (‘transmit’, ‘absorb’) in making their arguments.

We choose to adopt a developmental and process-oriented approach to learning and eschew the assumptions of objectivist, transmissive learning. In the next section of the paper, therefore, we briefly outline the process approach to learning that focuses on learning as becoming (Semetsky, 2006).

The process approach and becoming

Process philosophy is a longstanding tradition that emphasizes Becoming and changing over static Being. It is characterized by an attempt to reconcile the diverse intuitions—ethical,
religious, scientific, and aesthetic—found in human experience into a coherent holistic scheme (Hustwit, 2007). From the perspective of process philosophy, the world is ultimately composed not of ‘things’ but of events and processes. As explained by Mesle (2008), “[e]verything that is actual becomes and perishes. Becoming is the ultimate fact underlying all others” (p. 79). Furthermore, “[t]he universe is a vast web or field of microevents” (p. 95). Citing Whitehead (1978), he states that “the actual world is a process, and the process is the becoming of actual entities” (p. 22).

The philosophy of Being rather than Becoming has, however, dominated Western thought. Plato established the primacy of Being when he argued that this world of change is merely a shadow copy of a realm of unchanging forms (Mesle, 2008). Since the time of Aristotle, Western metaphysics has consequently had a marked bias in favor of things or substances rather than processes (Rescher, 2008).

While substance metaphysics and modern science have posited that the world is made up of material objects, Whitehead (1978), however, argues that “organism” is a better term for things that exist. Whereas matter is self-sustaining, externally related, valueless, passive, and without an intrinsic principle of motion, organisms are interdependent, internally and externally related, value-laden, active, and intrinsically active. Consistent with the latter perspective, Edelman (1992) shows in his Darwin III simulation of a simple autonomous agent that the agent never achieves a stable repertoire of behavior without the encoding of value.

Process philosophers, like modern physicists, reject the Newtonian view that time and space exist as a fixed background or framework separate from the events that happen within them, as if time and space form a bottle around us that would still exist even if all events disappeared. Time simply is the passage—the becoming and perishing—of events (Mesle, 2008). At the microlevel, what is usually deemed a physical thing, a stable perduring object, is itself no more than a statistical pattern—a stability wave in a surging sea of process. The so-called enduring "things" that we are so well acquainted with come about through the emergence of stabilities in statistical fluctuations. Thus, processes are not the machinations of stable things; rather, things are the stability-patterns of variable processes (Rescher, 2008).
According to Whitehead (1978), “how an actual entity becomes constitutes what that actual entity is; . . . Its ‘being’ is constituted by its ‘becoming.’ This is the ‘principle of process.’” (p. 23). Each actual entity begins with an “initial aim”: the causal force of the past, combined with ‘God’s presentation’ of the relevant possibilities and a “lure” toward some possibility rather than others (what we have referred to as “dispositions” above: a tendency to act in a certain way based on certain value). The aim at tomorrow’s needs, representing an instrumental orientation toward the future, is often what creates satisfaction in the present. Anticipation of satisfaction for tomorrow’s achievement feels good today (Mesle, 2008).

Ferré (1996) argues that “[w]hat needs to be remembered is that experience is not neutral. It is not a sensory mirror of a value-free world of mere objects. Experience is instead shot through with intuitions of value, both intrinsic and instrumental. We find data of experience inseparable from interests and aversions, hopes and fears, joys and pains, sorrows, satisfactions, and obligations. Normal experience is full of vague intuitions of importance, drawing our attention toward some features rather than others. Such intuitions change with added experience; they are corrigible and educable” (p. 13, italics added).

Whitehead’s philosophy, referred to as a ‘philosophy of organism’, is a philosophy of universal life. . . . Values are essential to this notion of existence and to the understanding of it (Leue, 2005). To cite Whitehead (1926, p. 100):

“Value is inherent in actuality itself. To be an actual entity is to have a self-interest. This self-interest is a feeling of self-valuation; it is an emotional tone. The value of other things, not one’s self, is the derivative value of elements contributing to this ultimate self-interest. This self-interest is the interest of what one’s existence, as in that epochal occasion, comes to. It is the ultimate enjoyment of being actual.”

Thus, actuality is linked to a value reaction of selection and rejection, approach and withdrawal, liking and disliking. Value is necessary to every physical thing in order for it to exist because it can be a separate thing and have a definite character only by reacting selectively to its causal antecedents. Otherwise, all things would be alike, and there would be no definite character (Leue, 2005). Values are thus essential in the becoming of a citizen. They undergird dispositions, the tendencies to act in certain ways that are preferred. We
refrain, therefore, from essentializing persons as (fixed) objects with variable attributes. Instead, we view persons as ongoing process: always in the process of becoming and always constituted in and by the flow of the experiences of life.

The Leonis learning program

The Leonis learning program is a school-based pedagogical innovation for citizenship education. The program comprises the computer game, Space Station Leonis, together with associated curriculum materials, learning processes, formative assessments, and a summative assessment. The program has been designed to provide students with an augmented learning space that incorporates dyad-based game playing, wiki-driven peer discussion and reflection, and class-based dialogic engagement on critical issues related to citizenship education in the Singapore education context. It comprises nine lessons of two hours per lesson.

The game Space Station Leonis was designed and developed by the Learning Sciences Lab of the National Institute of Education, Nanyang Technological University, Singapore. It is a hybrid game that consists of four episodes of role playing and three episodes of simulation game play. Role playing both opens and closes the entire game, with students playing the role of the default protagonist. For episodes 2 and 3, students can choose between two characters available. The game is a single-player game. It was developed for personal computers running the Windows operating system.

The game is a futuristic sci-fi adventure. Set in the context of the 23rd century, the inhabitants of Earth have colonized the Moon and other planets, including Mars. Leonis is a space station that orbits the Earth. Its inhabitants include emigrants from Earth, the Moon colonies, as well as Mars. Lacking natural resources, its long-term survival is somewhat precarious. Cooperation between the multi-ethnic and multi-faction inhabitants of Leonis is vital if Leonis is to be sustained and is to prosper. The context described is actually an allegory of Singapore, with its limited natural resources and its multi-ethnic, multi-racial population. It serves as a microcosm within which all the key issues related to citizenship education can be explored in the classroom, based on the conceptual framework described later.
To provide readers with a feel of the game, Figures 1 and 2 illustrate playing the game in role playing mode.

Figure 1 depicts the situation where the protagonist, Radha (the woman shown on the right who comes from the Moon colonies), discusses with her friends, Alan and Charlie (also from the Moon colonies), about the Leonis government’s directive that, at a forthcoming national parade, Leonis inhabitants who emigrated from the Moon colonies should be prohibited from wearing their national costume. This directive was motivated by fear of inadvertently promoting an undesirable association between the Lunar national costume and identification with a terrorist group, the Lunar Liberation Front. Figure 2 shows Radha faced with a decision point in the game: should she (1) respect (and accept) the government’s wishes, or (2) participate in a petition against the government’s directive so that she and her friends can wear the Lunar national costume at the parade? Decision points like these in the role playing segments of the game were deliberately designed to throw up ideological tensions related to values so as to create a context within which sensitive issues related to differences arising from race, religion, other beliefs, and so on, could be surfaced and addressed in a constructive and non-threatening way. Through role play, students participate in projective embodiment of the protagonist character in the 3D game space and act vicariously through their on-screen avatar. This design allows students to act in the first person, and to learn by making decisions and having to live with the consequences thereof. A high level of personal agency is thereby realized, helping to make the experience of game play emotionally engaging and the learning experience impactful.

In contrast, Figure 3 illustrates game play in simulation mode. Here, students assume the role of the president of the space station. They have to learn to manage the economy and “affairs of state” of the space station (including foreign relations and terrorist attacks) so as to sustain and seek the long-term survival and prosperity of the station’s inhabitants. The screen
snapshot shows, in particular, the development of the economy and social infrastructure of the space station. These include the provision of housing and education, as well as medical and defence needs.

--------------------------------
Insert Figure 3 about here
--------------------------------

The conceptual framework for the Leonis learning program is shown in Figure 4. Game-based learning is conceived of in terms of a dialectical interplay between recurrent cycles of game play that are coupled with whole-class dialogic activity (Bakhtin, 1981; Sidorkin, 1999). Over time, a trajectory of developmental learning is achieved through participatory appropriation (Rogoff, 1993) in the lifeworld of the students. From the viewpoint of learning design, we instantiate a generalized model of game-based learning that includes two parts: (1) the Play–Dialog dialectic that involves immersive game play and stepping out of and back from the game space into the classroom space to engage in multivoiced dialogic exchanges, facilitated by the teacher, in the spirit of heteroglossia (Bakhtin, 1981), and (2) the Competence-through-Performance trajectory that entails the developmental and participatory appropriation of skills, knowledge, identity, values, and epistemology (Shaffer, 2006) that constitute the continuing flow of becoming in the lifeworld of students.

--------------------------------
Insert Figure 4 about here
--------------------------------

As shown in Figure 4, game play takes place in the material world. Students project themselves (Gee, 2007) into the immersive game space—Projective identity (Type 1)—and thereby engage in an embodied, embedded, and experiential form of learning (Chee, 2007). Importantly, this is a form of first-person learning, where personal agency can be exercised to drive learning and where students are able to act upon choices of their own making. Learning interaction is transactional in the sense articulated by Dewey and pragmatist philosophers. As game play time is action time rather than reflection time, students are required to ‘pull back’ into a dialogic learning space where they can reflect on their actions in the game, and the consequences that ensued. At the same time, they participate in critical and reflective dialog with peers on the value-laden issues deliberately designed into the game (as illustrated by the
role playing example above). This entire dialogic process is facilitated by a teacher whose role is not to promote a ‘right answer’, given that there are no ‘right answers’ in value-laden issues, but rather to help students “interanimate” the utterances of one another (Bakhtin, 1981). In the process, students also crystallize their ideas on issues and take personal positions on key themes related to citizenship education as the ideas contributed to the public discourse space vigorously ‘rub up against each other’. The overarching pedagogical objective is to have students become more critically aware of, and then to develop, their own set of values so that preferred dispositions—the tendencies to act in certain ways rather than others—can be nurtured. We speak here of ‘preferred’ dispositions rather than, say, ‘positive’ dispositions because we wish to avoid imposing our personal value judgments on the students. We prefer instead that they be given the personal ‘space’ and discretion to decide on their personal values, but always in a manner that allows them to be able to justify the position they choose to adopt on an issue and always with full understanding that they must be completely willing to accept the consequences of whatever (inherently value-laden) actions they choose to take. These learning activities are situated within the broader context of helping students with the process of becoming: constructing themselves and developing their personal identities (Holland, Lachicotte Jr., Skinner, & Cain, 1998). Over time, it is theorized that students construct their personal identity. But it must be borne in mind that identity, as construed here, is always in the making and never becomes an eternal fixture. Assessment of learning outcomes, in a program such as Leonis, can never be conclusive as the real test of the effectiveness of the program will only become manifest, and then only partially, by what students say and do later on in life; for example, how they participate in civic life or respond to a terrorist attack subsequent to their participation in the learning program. This prospective behavior is shown as “Projective identity (Type 2)” in Figure 4. An extended explication of the theoretical model is contained in Chee (2008). Additional descriptions of the game and its design rationale can be found in Chee (2007) and Chee, Loke, and Tan (2008).

The research study

The study reported here focuses on students’ dispositional changes arising from participation in the Leonis learning program. It describes a classroom intervention study, conducted in August and September 2008, at a government funded, neighborhood secondary school. As explained previously, the focus on self-reported dispositions is based on the perspective that
Dispositions are tendencies to act in fairly stable and habitual ways, based on values. Ultimately, the learning program seeks to inculcate ‘preferred’ values based on critical self-awareness of issues, while not taking a dogmatic stance on any particular issue.

Based on the foregoing, we detail findings derived from a comparison between pre-test and post-test responses that students offered to a set of questions eliciting the extent to which they agreed with statements relating to six themes associated with citizenship education in Singapore, namely, (1) cooperation with others, (2) empathy for others, (3) embracing racial diversity, (4) belief in racial equity, (5) sense of self-responsibility, and (6) civic consciousness and active citizenship.

Subjects

The subjects in this study comprised 42 students of mixed gender in a government secondary school (33% boys and 67% girls). On average, students were 15 years old. This class of students was selected by the Head of Department of Social Studies to participate in the learning program on the basis that they comprised one of the better classes in the 15-year-old cohort of students in the school.

Materials

As part of the Leonis learning program, students played the computer game Space Station Leonis. They also used a wiki, with a template prepared in advance for each class lesson, to document the key actions they took while playing the game and to document the associated reasons they had for taking the said actions. Data from the wiki was used to guide formative assessment. Engagement in the dialogic segment of each lesson was often contextualized by recent newspaper reports dealing with issues pertinent to the particular lesson; for example, ‘import’ of foreign talent into the Singapore workforce, riots in China, and the war in Iraq.

Students were also asked to design and create an end-of-program campaign artifact (for example, a flyer, poster, or podcast) that they would use to advocate a certain position on a contentious issue. For instance, students could try to advocate racial harmony through policies to develop a shared Singapore identity, an attempt to homogenize the different races by ‘stirring’ into a common melting pot, or they could seek to achieve racial harmony by
encouraging races (factions in the context of Leonis) to preserve their distinct practices and customs, a policy that seeks to achieve harmony by preserving diversity and respecting difference. (Interestingly, in Singapore, both policies are pursued simultaneously.)

As part of the evaluation of changes in disposition arising from the Leonis learning program, an instrument was designed to elicit student responses to statements related to the six themes mentioned above.

Procedure
The Leonis learning program was carried out as a required complementary component of the Secondary Three curriculum on Social Studies. Lessons took place once a week, on average. The students’ regular Social Studies teacher led in the implementation of the program. She was provided with two sessions of professional development prior to the commencement of the program. Assessment derived from the program constituted 50% of students’ subject mark for Social Studies for Term 4 of the school year.

The pre-test instrument on students’ dispositions was administered about a week prior to the commencement of the program. Students were asked to respond to 17 statements by choosing the extent to which they disagreed or agreed with them. The scale comprised six descriptors, namely Strongly Disagree, Disagree, Partly Disagree, Partly Agree, Agree, and Strongly Agree. To avoid systematicity in the tendency of the “preferred” response always being on the same end of the scale, seven questions, randomly selected, were restated so that the “preferred” response required disagreement with the statement instead. Several students were also interviewed, some as a group and others individually.

The post-test was conducted during the week in which the program ended. As a precaution against the phenomenon known as the “response shift bias” (Howard, 1980; Rockwell & Kohn, 1989), students were asked, in the post-test, to also provide a retrospective pre-test rating. The adoption of this device has the advantages of (1) ensuring that pre- and post-test ratings are done on an “internally consistent” intra-individual scale, and (2) avoiding potential ceiling effects that can arise from students initially over-rating themselves positively. The motivation for the said strategy rests in the recognition that the research
intervention, as an intervention, is in itself a source of perturbation that can, and usually does, lead students to modify their putative intra-individual scale. Executing the post-test in the manner described has the benefit of explicitly recognizing the potential impact of the intervention on changing each student’s intra-individual scale response. More importantly, it allows us, as researchers, to assess whether, and, if so, to what extent, there is a systematic effect with respect to such putative scale shifts.

Data analysis
To evaluate the students’ change in dispositions over the course of the research intervention, a paired samples $t$-test was performed comparing their post-test response with their retrospective pre-test response. The analysis was performed using the statistical package SPSS. Student responses were coded with the numbers 1 to 6, corresponding to the disagreement–agreement scale. In performing the statistical analysis, reverse data coding was executed in respect of statements that required disagreement as a preferred outcome; hence, stronger disagreement on such questions were coded with a larger numeric score. The data sample size was 42. Each variable was found to have a normal distribution.

Results
Table 1 below summarizes the results of the paired-sample $t$-tests. Reverse coded statements are shown in italics. We shall present the results according to the six themes of citizenship education referred to above. Overall, they show that changes in students’ dispositions were significant, with the exception of item (3), and with the changes being marginally significant ($p < .10$) for items (11), and (13).

| Insert Table 1 about here |

The first theme, cooperation with others, is represented by item (1) only: “problems between people are best handled by working together to find a solution.” The difference between pre and post-test was significant ($p < .001$), with a medium effect size (Becker, 2000).
The next set of dispositional items, relating to the theme “empathy for others” comprises items (2), (3), (5), and (11). Item (2), “I think about how my decisions will affect other people,” was significant \( (p < .001) \), with a large effect size. However, item (3), “I sometimes find it difficult to see things from another person’s point of view,” showed no significant change \( (p = .314) \) due to the relatively large standard deviation of means. Item (5), “Other people’s problems don’t bother me,” was significant \( (p = .005) \), with a small effect size, and item (11), “The poverty of others is not a problem that is important to me,” was marginally significant \( (p = .067) \). Items (3), (5), and (11) were reverse coded items.

The third theme, embracing racial diversity, is reflected in item (4): “Singapore is a better country because people from many different cultures live here.” This item was statistically significant \( (p < .001) \), with a medium effect size.

The fourth theme, belief in racial equity, consists of item (6), (8), and (9). Item (6), “I base my decisions on what I think is fair and unfair,” is a reverse coded item that showed a statistically significant change \( (p = .039) \) with a small effect size, but in the direction opposite to what was “preferred.” Item (8), “All people should have equal chances to get a good education in Singapore,” showed a statistically significant difference \( (p = .002) \) with a medium effect size. Item (9), “People should be judged for what they do, not where they are from,” showed a statistically significant difference \( (p = .001) \) with a small effect size.

The fifth theme, sense of self-responsibility, comprises one item: item (7). This item, “No matter how angry someone makes me, I am still responsible for my own actions,” was statistically significant \( (p < .001) \), with a medium effect size.

Finally, theme six, civic consciousness and active citizenship, consisted of seven items: (10), (12), (13), (14), (15), (16), and (17). Item (10), “Pollution is not a problem that is important to me,” showed a statistically significant change \( (p = .003) \) with a small effect size. Item (12), “As teenagers, my friends and I should find ways to help others in the community,” was also statistically significant \( (p < .001) \), with a medium effect size. Item (13), “I don’t care what’s happening in politics,” was marginally significant \( (p = .062) \). Item (14), “As teenagers, my friends and I have a responsibility to do what we can to protect the environment,” showed a statistically significant difference \( (p < .001) \), with a medium effect size.
Item (15), “I feel that I can make a difference in my community,” showed a statistically significant difference \((p < .001)\) with a medium effect size. Similarly, item (16), “People should discuss social and political problems that affect the future of Singapore,” showed a statistically significant difference \((p < .001)\) with a medium effect size.

Finally, item (17), “The world would be a better place if people were free to do what was best for themselves,” showed a statistically significant difference \((p = .005)\) with a small effect size. This item was reverse coded.

Discussion

The results above indicate that, overall, the Leonis learning program, when enacted according to the principles embodied in the conceptual framework of Figure 4, can contribute to shaping students’ (imputed) values, as manifested in dispositional statements, in educationally “preferred” directions.

The theme of instilling cooperation with others was an explicit consideration in designing some of the role playing segments of the game. Player decisions at important junctures of the game helped students to explore the circumstances under which group interests need to be prioritized over self interest. In one particular episode, students played the role of the protagonist Mei Ling who, along with other residents, was trapped in the ruins of Sector Two of the space station with the oxygen supply fast diminishing. The needs of other residents seeking to escape to Sector One, including elderly residents, is made ‘emotionally real’ to the students through the stark choices that they are required to make in the course of game play. The results strongly suggest that this game design was effective as students showed a statistically significant shift in disposition toward valuing working together to find solutions, with a medium effect size.

The second theme, focusing on encouraging empathy for others, showed mixed outcomes. Disposition (2), relating to thinking about how one’s decisions affect other people, is noteworthy for its statistical significance and especially its large effect size (Cohen’s \(d = 1.07\)). This outcome is particularly satisfying because the design of the decisions that students had to make while playing the game was oriented directly at having students learn to be
sensitive to the impact of their own decisions in the game on other characters in the game. Thus, there was an occasion where the player, as the protagonist Stahl, had to decide whether to (1) inform the leader of the invading Martian forces, who had shown himself to be very friendly, about a planned meeting of the resistance movement, or (2) to keep quiet about it. The design of these decisions play upon the tensions of trusting others versus being discreet about matters whose import may as yet be unclear.

The finding on item (5), which was reverse coded, shows a shift in the “preferred” direction of appropriating a disposition of concern related to the problems of others and recognizing that no person is an island unto herself or himself in a multi-ethnic and multi-cultural world. Item (11) is an instantiation of a particular problem faced by others, namely poverty. This item was marginally significant statistically, and it suggests some development of empathy for those who are less well off materially.

The result on item (3) was not significant. This item may have been problematic because the experience of game play could have pulled students in opposite directions. On one hand, as a reverse coded item, we expected students to more strongly disagree with the statement at the close of the research intervention compared to the beginning; that is, they would find it less difficult to see from another person’s point of view. However, the game design also sought to instil a tolerance for diversity and hence the acceptance of multiple points of view. This tension may have accounted for the non-significant finding.

The third theme, comprising one item on racial diversity, was statistically significant with a medium effect size. This outcome can be attributed to the design of the game, which sought to instil the cultural value of multiracialism found in Singapore. By design, inhabitants of the space station were all immigrants from other planetary locales (e.g. Earth, moon, and Mars). In order not to have to address issues of race directly—as this is always a potentially sensitive political issue in Singapore—factions were used as a surrogate for race, to embrace all the entities that would hold symbolic value for any particular community. The need for mutual respect and peaceful co-existence was emphasized in the game episodes.

Like the theme above, the fourth theme, racial equity, is also a cornerstone of Singapore’s National Education agenda. Item (8) focuses on the agenda of equal access to education for
all, regardless of race. On this item, we see that students empathized with this sentiment. Their disposition shifted in favor of equal access with a medium effect size. Item (9) sought to encourage students to judge people on the basis of their actions rather than from their country of origin. On this item, students showed a positive dispositional shift with a small effect size.

The dispositional change related to item (6), concerning basing one’s decisions on what one thinks is fair or unfair, was significant, but in the direction opposite to that “preferred.” A previous study with another group of students (Chee et al., 2008) found a similar result. We have come to believe that this unexpected outcome is the result of a problematic wording of the item. As a reverse coded item, the intention was that students would move away from self-centric thinking and begin to appreciate the need to consider the thinking of others as well in problem solving situations; that is, the focus of the item was on the phrase “what I think.” It appears that many students interpreted the item primarily in terms of the words “fair and unfair” instead, leading them to stronger agreement with the statement rather than disagreement (before reverse coding). In view of this outcome, we plan to rephrase this item in future work.

The fifth theme, focusing on self-responsibility, consisted of one item that highlighted self-control and responsibility for one’s own actions. The dispositional change here was statistically significant with a medium effect size. We attribute this change directly to the game design. A key objective was to help students grasp the fact that while they were free to choose any of the options the game presented to them, they would have to learn to accept the consequences of their choice. In the episode where the protagonist Mei Ling was travelling with a band of people and trying to escape from Sector Two of the space station that had suffered a power failure with the consequence that the amount of oxygen in the atmosphere was rapidly diminishing, she had to put up with her pesky young brother, Ken, who was throwing a tantrum because he had lost his toy along the way. Critical decision points during this episode allowed the students playing the game to deal with Ken in ways that would either help or hinder progress in the group trek to safety. By the choices that students made, they learned the importance of seeing beyond the trials of the moment and to appreciate the bigger picture of what was at stake and the role their own choices played in the sequence of unfolding events.
The sixth theme, civic consciousness and active citizenship, comprised seven items. Items (10) and (14), related to pollution and protection of the environment, were significant. In the simulation segment of the game, students had to decide *where* to locate factories relative to human dwellings. They also had to consider the importance of ecological balance in developing the economic infrastructure of the space station as failure to do so incurred both economic and social costs. We believe that episodes such as these sensitized students to the issues tapped into by these items.

Students in Singapore are well known for their political apathy. We were therefore very pleased that there was a shift of marginal statistical significance away from this attitude, as manifested by their responses to item (13). While this shift may not quite constitute an embracing of active citizenship, it is nevertheless a promising step in the preferred direction. On a related note, students learned to recognize the need to discuss and negotiate the political future of Singapore (item 16), a dispositional shift that is of considerable local importance.

The positive dispositional shifts with medium effect size reflected in items (12) and (15) are particularly satisfying. They demonstrate that, through learning with the *Leonis* program, students developed a belief in their ability to make a difference as well as a sense of obligation and responsibility toward the social and political future of Singapore. Item (17) reinforces the general orientation toward placing the interests of the community above the interests of oneself.

To summarize, the findings above clearly suggest that a game-based learning program, comprising student game play that is complemented with dialogic learning, can be efficacious in helping students develop desirable dispositions related to the *becoming* of citizens. We emphasize that our pedagogical goal is not the learning of facts and skills *from* the game but, rather, the fostering of values and dispositions appropriate to citizenship education through learning *with* the game and with one another (including the teacher). This approach targets the authentic learning objectives of education as the *becoming* of a certain type of person through the development of values, personal identity, and epistemology, in addition to knowledge and skills. The approach of process philosophy, with its orientation toward *becoming*, provides the foundation for the design of a learning program in these terms.
As a program of learning innovation, our research experience with the Leonis program and the associated research findings have implications for educational policy, research, and teaching and learning practice. From a policy perspective, our work suggests a viable, alternative approach to citizenship education that can provide the traction policy makers and school administrators seek in principle but so often lose in practice. This situation is prevalent in Singapore where the objectives related to the ‘O’ level Social Studies curriculum include a distinct set of components dealing with the development of students’ values and attitudes (e.g. students will respect and value diverse perspectives and cultural and historical backgrounds of people, and work toward peaceful relationships). Such learning goals are usually lost when translated into practice because official examinations only assess the other two easily assessable components of the curriculum that concern (1) knowledge and understanding, and (2) skills and processes. Our research suggests that a more holistic evaluation of student learning is not only desirable but also possible.

From a research perspective, our work highlights the critical importance of approaching student learning in a broader and more authentic manner, recognizing that impactful learning transforms students in lasting, developmentally oriented ways. Such learning increases students’ capacity for meaningful and desirable performance in the real world, in ways that have high social capital. Our grounding on process philosophy helps us to cast the educational agenda in a radically different light, placing emphasis on innovation, creativity, and personal growth that can arise when students, as empowered agents of learning, strive toward the construction of a “better tomorrow.” In respect of the pedagogical design of game-based learning, our work reiterates the importance of careful learning design that achieves alignment between the design of in-game experiences and the desired outcomes of learning. It also highlights the importance of designing the learning environment to include a dialogic space within which students’ ideas can interact as the students engage in a collaborative process of group meaning making. Thus, students do not simply learn from technology, but rather learn with technology and with one another.

Finally, from the perspective of teaching and learning practice, we wish to emphasize that innovation implies change, and preparation for change, in respect of both teachers and students, is vital to the success of any program of learning innovation. Teachers need to ‘buy
in’ to the innovation not only ‘with their head’ but also ‘with their heart’. The challenge faced by teachers is quite daunting as adopting a learning innovation usually entails taking a big step into the unknown. Scaffolding the process for teachers it thus a vital component of the research effort. We provided teachers with professional development prior to the commencement of the classroom intervention. Our approach was to first let teachers experience the *Leonis* learning program as if they were students themselves. This experiential approach helped them to appreciate what their students would encounter when using the game. It also helped them, over time, to rise above the game itself and to begin to think of the game and complementary dialog as a student-centered form of learning from a *teacher’s perspective*. To this end, we tried, as researchers, to always be very sensitive to teachers’ feedback and operational concerns, such as the time required to enact the learning program (given limited curriculum time) and the modes of assessment to apply. Overall, we positioned our interaction with the teacher as a collaborative endeavor and as taking a journey together. This positioning made us partners in a common endeavor and helped to develop the trust and rapport needed for the innovation program to succeed. In this way, learning was inescapably experiential for the teacher as well as for us, as researchers. With regard to students, it should be noted that student expectations need to be carefully managed prior to, as well as during, the course of the implementation of the learning program. Game-based learning makes both new and greater demands on students compared to what they are accustomed to in class: being told about things as they sit passively listening. Getting student ‘buy in’ is equally important to getting ‘buy in’ from teachers for the program to succeed.

**Conclusion**

In this paper, we have articulated a model of game-based learning that recognizes the importance of dialog and development in the process of learning. Recognizing that the competencies needed for active citizenship do not reside in students’ content knowledge but, rather, in the need to help students *become* certain kinds of people, we have grounded our work on the foundation of process philosophy. We have argued in favor of viewing learning in terms of *becoming* and explained the critical role of values to this process. Our work with *Space Station Leonis* in the domain of citizenship education provides an exemplar of how game-based learning can be instantiated in classroom learning contexts to good effect.
Acknowledgments

The work reported in this paper was funded by a Learning Sciences Lab research grant, number R8019.735.NG03. In a project of this scope and diversity, a multidisciplinary team is indispensable. We wish to acknowledge the contributions of all team members: Nathanael Ng, Liu Yi, Loi Hui Min, Yuan Tao, Eric Chan, Eric Salim, Henry Kang, Chen Jieyang, Rave Tan, Ahmed Hilmy, and Kenneth Lim.

References


Yam San Chee is an Associate Professor in the Learning Sciences & Technologies Academic Group and the Learning Sciences Lab at the National Institute of Education, Nanyang Technological University, Singapore. He obtained his BSc (Econ) Hons from the London School of Economics and Political Science, University of London, and his PhD from the University of Queensland, Australia. Dr Chee’s research focuses on new literacies and new media in education, with a special emphasis on game-based learning. Recent games developed for research include Space Station Leonis, Escape from Centauri 7, and Ideal Force. Dr Chee also conducts research on the interaction between online virtual life and real life and how this interaction impacts the construction of self identity. Dr Chee was the Founding Executive Editor of Research and Practice in Technology Enhanced Learning, the journal of the Asia-Pacific Society for Computers in Education.

Swee Kin Loke is a Lecturer (Research) in the Learning Sciences Laboratory at the National Institute of Education, Singapore, and a trained schoolteacher. His specific contribution to the Space Station Leonis project was the design and construction of learning activities to support the game-based learning. He worked previously in the Educational Technology Division of the Ministry of Education, Singapore, where he was part of the team designing and implementing a national level policy, the Baseline ICT Standards.

Ek Ming Tan is a trained schoolteacher on secondment to the National Institute of Education, Singapore, as a Lecturer (Research). He obtained his BArts from the National University of Singapore and a Masters in Education from the University of Western Australia. Prior to his current position, he was a Level Head in a Singapore Secondary School and Acting Head of Department for English Language and Literature.
Figures

Figure 1. Screen snapshot illustrating game-based learning in role playing mode.
Figure 2. Screen snapshot illustrating a decision point during role playing.
Figure 3. Screen snapshot of *Space Station Leonis* game play in simulation mode.
Figure 4. Conceptual framework of the *Leonis* learning program.
Table 1. Summary table of paired-samples $t$-tests on 17 dispositional statements related to citizenship education.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Statement</th>
<th>$N$</th>
<th>Pre-test mean</th>
<th>Post test mean</th>
<th>$t$ statistic</th>
<th>$p$ (one-tailed)</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Problems between people are best handled by working together to find a solution.</td>
<td>42</td>
<td>4.86</td>
<td>5.43</td>
<td>5.27</td>
<td>.000**</td>
<td>0.78†††</td>
</tr>
<tr>
<td>2.</td>
<td>I think about how my decisions will affect other people.</td>
<td>42</td>
<td>4.43</td>
<td>5.31</td>
<td>7.11</td>
<td>.000**</td>
<td>1.07†††</td>
</tr>
<tr>
<td>3.</td>
<td><em>I sometimes find it difficult to see things from another person's point of view.</em></td>
<td>42</td>
<td>3.10</td>
<td>3.02</td>
<td>-0.49</td>
<td>.314</td>
<td>n/a</td>
</tr>
<tr>
<td>4.</td>
<td>Singapore is a better country because people from many different cultures live here.</td>
<td>42</td>
<td>4.69</td>
<td>5.12</td>
<td>4.71</td>
<td>.000**</td>
<td>0.62††</td>
</tr>
<tr>
<td>5.</td>
<td><em>Other people's problems don’t bother me.</em></td>
<td>42</td>
<td>3.76</td>
<td>4.14</td>
<td>2.72</td>
<td>.005**</td>
<td>0.29†</td>
</tr>
<tr>
<td>6.</td>
<td><em>I base my decisions on what I think is fair and unfair.</em></td>
<td>42</td>
<td>2.24</td>
<td>2.00</td>
<td>-1.82</td>
<td>.039*</td>
<td>-0.23†</td>
</tr>
<tr>
<td>7.</td>
<td>No matter how angry someone makes me, I am still responsible for my own actions.</td>
<td>42</td>
<td>4.90</td>
<td>5.48</td>
<td>4.81</td>
<td>.000**</td>
<td>0.68††</td>
</tr>
<tr>
<td>8.</td>
<td>All people should have equal chances to get a good education in Singapore.</td>
<td>42</td>
<td>5.54</td>
<td>5.86</td>
<td>3.12</td>
<td>.002**</td>
<td>0.58††</td>
</tr>
<tr>
<td>9.</td>
<td>People should be judged for what they do, not where they are from.</td>
<td>42</td>
<td>5.33</td>
<td>5.67</td>
<td>3.32</td>
<td>.001**</td>
<td>0.45†</td>
</tr>
<tr>
<td>10.</td>
<td><em>Pollution is not a problem that is important to me.</em></td>
<td>42</td>
<td>4.12</td>
<td>4.55</td>
<td>2.95</td>
<td>.003**</td>
<td>0.30†</td>
</tr>
<tr>
<td>11.</td>
<td><em>The poverty of others is not a problem that is important to me.</em></td>
<td>42</td>
<td>3.90</td>
<td>4.14</td>
<td>1.53</td>
<td>.067</td>
<td>n/a</td>
</tr>
<tr>
<td>12.</td>
<td>As teenagers, my friends and I should find ways to help others in the community.</td>
<td>42</td>
<td>4.19</td>
<td>4.90</td>
<td>5.75</td>
<td>.000**</td>
<td>0.67††</td>
</tr>
<tr>
<td>13.</td>
<td><em>I don’t care what’s happening in politics.</em></td>
<td>42</td>
<td>3.21</td>
<td>3.45</td>
<td>1.57</td>
<td>.062</td>
<td>n/a</td>
</tr>
<tr>
<td>14.</td>
<td>As teenagers, my friends and I have a responsibility to do what we can to protect the environment.</td>
<td>42</td>
<td>4.50</td>
<td>5.02</td>
<td>4.22</td>
<td>.000**</td>
<td>0.58††</td>
</tr>
<tr>
<td>15.</td>
<td>I feel that I can make a difference in my community.</td>
<td>42</td>
<td>3.86</td>
<td>4.57</td>
<td>5.55</td>
<td>.000**</td>
<td>0.68††</td>
</tr>
<tr>
<td>16.</td>
<td>People should discuss social and political problems that affect the future of Singapore.</td>
<td>42</td>
<td>4.50</td>
<td>5.10</td>
<td>4.50</td>
<td>.000**</td>
<td>0.61††</td>
</tr>
<tr>
<td>17.</td>
<td><em>The world would be a better place if people were free to do what was best for themselves.</em></td>
<td>42</td>
<td>2.88</td>
<td>3.40</td>
<td>2.75</td>
<td>.005**</td>
<td>0.31†</td>
</tr>
</tbody>
</table>

** $p<.01$; * $p<.05$

††† large effect size; †† medium effect size; † small effect size