Simulation & Gaming
http://sag.sagepub.com/

Serious Games, Debriefing, and Simulation/Gaming as a Discipline

David Crookall

Simulation Gaming 2010 41: 898
DOI: 10.1177/1046878110390784

The online version of this article can be found at:
http://sag.sagepub.com/content/41/6/898

Published by:
SAGE
http://www.sagepublications.com

On behalf of:
Association for Business Simulation & Experiential Learning
International Simulation & Gaming Association
Japan Association of Simulation & Gaming
North American Simulation and Gaming Association
NASAGA
Playful Methods. Serious Results.
North American Simulation & Gaming Association
Society for Intercultural Education, Training, & Research

Simulation & Gaming
41(6) 898–920

DOI: 10.1177/1046878110390784
http://sg.sagepub.com
SAGE

Serious Games, Debriefing, and Simulation/Gaming as a Discipline

David Crookall

Abstract

At the close of the 40th Anniversary Symposium of *S&G*, this editorial offers some thoughts on a few important themes related to simulation/gaming. These are development of the field, the notion of serious games, the importance of debriefing, the need for research, and the emergence of a discipline. I suggest that the serious gaming community has much to offer the discipline of simulation/gaming and that debriefing is vital both for learning and for establishing simulation/gaming as a discipline.

Keywords

academic programs, acceptability, after action review, 40th anniversary, computers, debriefing, definitions, design, discipline, engagement, events, experiential learning, feedback, games, interdisciplinarity, journals, learning, periodicals, philosophy of simulation, practice, processing experience, professional associations, publication, research, review articles, scholarship, serious games, S&G, simulation, simulation/gaming, terminology, theory, training

The field of simulation/gaming is, to be sure, rather fuzzy, and sits uneasily in many areas. The 40th Anniversary Symposium was an opportunity to take stock, to consolidate some of the work done over the past 40 or so years, and to offer pointers for the future. I take the opportunity here to add some of my own thoughts, inspired by this symposium. These thoughts touch on

- the development of the field of simulation/gaming,
- the inclusion of serious games in the wider endeavor of simulation/gaming,
- the importance of debriefing and of research on debriefing,

Université de Nice Sophia Antipolis, France

- simulation/gaming, including serious games, as a discipline, and
- debriefing as an indirect key for simulation/gaming to become a discipline.

The "40th authors" can feel justly proud of their individual and collective achievement, and I would like to thank them for their endeavor and patience, especially for responding so positively to my various requests as each of their articles took shape. In my invitations, I announced the spirit, which was quality above all—and authors have risen to the challenge. I thank all the authors; you have done a marvellous job—and accomplished a tremendous service to the profession and to the journal. My thanks also go to the production editors at SAGE. Already some of the articles are at the top of the "most read" list, and I suspect that in time they will be among the "most cited." Apologies for not mentioning all 40th authors by name in this editorial and probably for omitting key authors from past issues. However, searching at sg.sagepub.com will give you them all. I also wish to thank several people for their valuable comments on an earlier version of this editorial—list in the author's note below.

Journal and Symposium

Depending on where one looks, this journal is referenced under several names:

- *Simulation & Gaming: An Interdisciplinary Journal of Theory, Design and Research* (initial *&*, no serial comma, and *and*);
- *Simulation & Gaming: An Interdisciplinary Journal* (still with *&*);
- *Simulation & Gaming* (still with *&*);
- *S&G* (abbreviation, still with *&*).

Unfortunately, some authors tend to write "S&G" to refer to the field, which causes confusion with the name of this journal and says little to people outside the area. I therefore tend to refer to the broad field with the term simulation/gaming, which may be abbreviated to s/g, but I sometimes use other terms, such as gaming, simulation, experiential learning, or exercise.

Simulation/gaming encompasses an array of methods, knowledge, practices, and theories, such as simulation, gaming, serious game, computer simulation, computerized simulation, modeling, agent-based modeling virtual reality, virtual world, experiential learning, game theory, role-play, case study, and debriefing. Some readers may baulk at collecting such a motley in the same mixed bag and object that computer climate change modeling has little to do with social interaction role-play, but where does one draw the line? Actually, they do have something in common, for some games immerse you in the societal impact of climate change. More important than the line is the fact that all these and related methods occupy spaces in an X, Y, Z chart or maybe they are multidimensional spirals, concept maps, and figures in X, Y, Z scatter bubble charts embedded in an X, Y, Z flow chart, still to be built. This journal *S&G* is concerned with all the above and more and is doing its part to build the charts.

Table 1. Issues of 40th Anniversary Symposium of *S&G*

Anniversary issue	Journal issue	Date
40th 1	40-2	April 2009
40th 2	40-3	June 2009
40th 3	40-4	August 2009
40th 4	40-5	October 2009
40th 5	40-6	December 2009
40th 6	41-1	February 2010
40th 7	41-6	December 2010

Some major bits of the chart have been examined in the pages of this and other journals, in particular, in various special topic symposia, such as debriefing or business, and in previous anniversary symposia, such as for the 25th anniversary, in 1994. Many of the bits have now been consolidated in this 40th Anniversary Symposium of *Simulation & Gaming: An Interdisciplinary Journal of Theory, Practice and Research* (*S&G*). This issue concludes the symposium, which has spanned seven issues—see Table 1.

Each article examined a portion of the area, covering the following topics, in chronological order of publication:

1. Terrorism and game theory
2. Business simulations and cognitive learning
3. Game attributes and learning outcomes
4. Computerized simulation in the social sciences
5. Experiential learning
6. Performance measurement
7. Video game effects
8. Terminological ambiguity
9. Business gaming
10. Social choice
11. Rhetoric and policy making
12. Nursing
13. Assessment
14. Development of simulation/gaming
15. Mobile games
16. Social and emotional learning
17. Physical games
18. eLearning environments
19. Online game development
20. Emergency response
21. Games technology
22. Humor
23. Public policy
24. Military training
25. Philosophy and epistemology
26. Gender
27. Computer-assisted language learning
28. Intercultural communication
29. Simulation/gaming adoption
30. Cellular automata
31. Time
32. Why simulation games work
33. Profiling *S&G*

Full bibliographical details are provided in the reference list at the end of this editorial.

As you can see, the range of topics is broad. It could be said that the articles collectively cover a major portion of the issues central to simulation/gaming. It could also be said that they touch on only a small fraction of the field, with many topics still in need of review. The symposium is not as broad as I had projected in an earlier editorial, but more review articles are still being written and will be published in a later symposium. A complete review of such a broad field must be an ongoing process.

This journal is a representative reflection of the field, but as with all good journals, it also influences the field. The 33 pieces in the symposium are all review or survey articles; the scholarship to be found in this collection is therefore huge. Probably, no other single collection of articles has pulled together such an enormous amount of scholarship, research, insight, and thought related to simulation/gaming. At the same time, this collection provides strong pointers for the future.

The penultimate 40th Anniversary article, by Johanna, Precha, and Juuso, is more about this journal than the field, but it still does reflect the field as told in *S&G*. They have analyzed the evolution of the first 40 years of research in *S&G*; thus, their article will be of particular interest to *S&G* authors and "fans" and to those wishing to see how simulation/gaming has evolved, at least in the pages of *S&G*.

Development

Indeed, during the 40-year life of this journal, the field of simulation/gaming has seen a spectacular development, both in the variety and richness of game types and in the spectrum of applications and users. This is reflected in the amount and variety of publication undertaken, both in books and in periodicals, such as *S&G*, its sister journals, and many nongame journals. Games are now used in almost every conceivable area, and this is reflected in this 40th Anniversary Symposium.

An example of a relatively recent newcomer is advergames—games used as publicity for a product or service, particularly on the internet. Although some research has been done on this from the point of view of publicity impact (see, e.g., *Journal of Interactive Advertising*), I know of none conducted from a gaming or learning perspective, but I hope to be corrected. Might one be able to extrapolate from advergames to learning? Might advergames have something to contribute to learning games? An example of a recent milestone has been captured in headlines that have announced that the games industry budget is now greater than that of TV and that video games generate more revenue than the Hollywood film industry. Articles about such topics for *S&G* would be welcome, especially if written from the perspectives of gaming and learning.

Both the scope and the depth of scholarship on simulation/gaming have grown exponentially in the last decade. It is difficult to say whether increased simulation/gaming scholarship has encouraged more publications or whether more publishing outlets have lead to more opportunity for scholars. However, and in addition, I would guess that the number of scholarly simulation/gaming articles appearing in specialized (nonsimulation/gaming) journals, such as *Academy of Management Journal*, *Decision Sciences*, *Journal of Computing in Childhood*, *Political Geography*, or *Journal of Hospitality & Tourism Research*, has been and will remain greater than the number appearing in dedicated

simulation/gaming journals such as *S&G*. This may be more the case in social science than in physical science and engineering. Is this a reflection of the higher quality of such journals as *Management Science* or simply the lack of space in *S&G* and maybe other simulation/gaming journals? Maybe both. Maybe also articles in simulation/gaming journals tend to focus more on the game aspects, whereas authors who wish to focus more on substance tend to go for specialized journals. An analysis similar to the profiling article in this 40th Anniversary Symposium would shed some useful light here. Whatever the exact nature of the current situation may be, I here offer a relatively easy prediction—that the number and quality of simulation/gaming journals will continue to grow over the next two decades. After that, prediction becomes hazardous, but my hunch is that things will begin to level out.

When *S&G* was founded, it was, I believe, one of only two academic (dare I say serious?) periodicals on the topic. The other was *Simulation: Transactions of the Society for Modeling and Simulation International*, founded in 1963, now published by SAGE Publications, edited by Levent Yilmaz with Gabriel Wainer, both authors in *S&G*. The founding editors of *S&G*, Michael Inbar and Clarice Stoll, supported by Sara and George McCune of SAGE Publications, are to be congratulated for their 1970 initiative in starting *S&G*. I wonder if the initials, S and G, of their names also had anything to do with the title of *S&G* ☺.

Forty years later, over two dozen excellent sister journals are well into, have begun or are about to begin, their life. Examples are the following, apologies for inadvertently omitting ones that should be included below:

Civil Aviation Training
Clinical Simulation in Nursing
Communications in Statistics: Simulation and Computation
Developments in Business Simulation and Experiential Exercises (ABSEL)
Eludamos. Journal for Computer Game Culture
Game Journal
Game Studies: The International Journal of Computer Game Research
Games and Culture: A Journal of Interactive Media
International Journal of Computer Games Technology
International Journal of Engineering Simulation (with Industrial Applications)
International Journal of Gaming and Computer-Mediated Simulations
International Journal of Mathematics and Computers in Simulation
International Journal of Modelling and Simulation
International Journal of Role-Playing
International Journal of Simulation and Process Modelling
International Journal of Simulation Modelling
International Journal of Simulation Systems, Science & Technology
International Journal of Soft Computing Simulation and Software Engineering
International Journal of Game-Based Learning
International Journal of Gaming and Computer-Mediated Simulations
Journal of Artificial Societies and Social Simulation
Journal of Defense Modeling and Simulation

Journal of Game Development
Journal of Gaming and Virtual Worlds
Journal of Policy Modeling
Journal of Simulation
Journal of Statistical Computation and Simulation
Journal of System Simulation
Journal of Virtual Worlds
Journal of Virtual Worlds and Education
Journal of Virtual Worlds Research
Loading...
Modelling and Simulation in Materials Science and Engineering
Simulation and Gaming for Education and Development
Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare
Simulation Modelling Practice and Theory
Studies in Simulation and Gaming (JASAG)
Training and Simulation Journal
Transactions on Modeling and Computer Simulation (TOMACS)
Transactions on Simulation Tools & Techniques
World Journal of Modelling and Simulation

Through these journals, the various related domains of simulation, computer simulation, gaming, serious gaming, role-play, experiential learning, modeling, debriefing, events, virtual worlds, and others have produced a respectable and developed scholarship, a term that I would expand to include *theoretical* enrichment, sets of best *practices*, and a solid *research* base. These are the three pillars of *S&G*, as indicated in its subtitle, and they are symbolized by the triangle on the cover.

It is clear, from the above list, that *S&G* is not alone, which is an excellent thing. Despite some superficial perception perhaps of competition among journals, the underlying sense is that we are all focused on similar ends and that we all benefit from the work done by the others. Simulation journals in science and engineering are more numerous and older than those in the social sciences and humanities. My impression is that some of the other journals, particularly in computer science and engineering, produce probably more solid scholarship on the whole than does *S&G*, but this 40th Anniversary Symposium will help to upgrade game scholarship in the more social disciplines. We are lucky to have in this symposium three excellent articles on games technology, one of them co-authored by the Editor of probably the world's foremost journal on games technologies: *International Journal of Computer Games Technology*. Also, several *S&G* Editorial Board members are editors of other journals.

Despite, or rather because of, other sister journals, *S&G* can claim three (interrelated) qualities. These are:

1. *S&G* does publish some highly *influential* articles,
2. *S&G* is probably at the very *center* of the simulation and gaming world, and
3. I would suggest that *S&G* is one of the most *eclectic*, not only among simulation/gaming journals, but among all journals.

Some of those influential articles are in this 40th Anniversary Symposium, for example, the reviews on terrorism, video game effects, experiential learning, and philosophy. A Venn diagram of the scopes of the above journals would probably place *S&G* in or near the center. Of course, eclecticism can be a mixed blessing. It can be a weakness, with topics spread thinly. However, it is mainly a strength, with broader representation of the field, greater capacity to integrate, more cross-fertilization, and richer interdisciplinarity. In 2000, I wrote an editorial titled *Thirty years of interdisciplinarity* and noted mostly the fact that simulation/gaming is relevant to many disciplines, from languages to computer science, from management to climate change, and from health to physics. However, it is also clear that simulation/gaming draws on the expertise and experience of an increasingly wide variety of disciplines, such as education (learning), social interaction, research methods, psychology, information processing, group dynamics, computing, sociology, creativity, video graphics, facilitation, and statistics. This 40th Anniversary Symposium reflects both these multidisciplinary dynamics in simulation/gaming.

Definitions

For over four decades, debates have taken place, in conferences and the pages of this and other journals, on what *simulation* is and what a *game* is, and on how they are to be defined and distinguished. Also, of course, people in engineering or climate change will define *simulation* very differently from those working in management or cross-cultural communication. However, when we meet face-to-face, we do seem to understand each other—more or less. As Wittgenstein said of *game*, it is almost impossible to define, but we recognize one when we see it. Many authors (including myself) have had a stab at explaining their take on and their definition of such matters. It has not been easy, and the debate continues. Some would see this as one of our major failings, that is, our apparent "inability to grasp and explain to others the nature of what we do on all of gaming's levels of activity" (personal communication by Joe Wolfe). However, I hope that the 40th Anniversary articles will contribute some clarification.

Despite the arguments and the widely different perspectives on these things, scholarly work has continued. It is as if simulation/gaming research and development have little patience with petty arguments, and it is right that this should be so. Some might, of course, argue that the terms that we use condition what they are. However, as the philosophy of simulation attests, anything can simulate anything else; simulation is all in the mind, not in some intrinsic quality of the objects that we employ in the simulator. What these things are is what we decide they are, with arguments about the definitions of terms being more an obstacle to progress in the real substance than an elucidation of "what they really are," as if simulations existed without the effort of our minds, as if they were something other than a creation of our mind. I wonder if gamers dabble more in reification than other scholars? I wonder if that hypothesis could ever be tested?

The debate will surely continue, and we will be blessed—and confused—with as many definitions as authors who care to offer their thoughts on the matter. What might be useful is a broad and historical review article that surveys the entire range of terms and concepts. I say *might* as it is not a foregone conclusion that even a definitive

definition, if such were to transpire, would have such a massive effect on the research or its results. However, it would certainly highlight the great variety of conceptualizations already published and the fact that no one holds a monopoly on the matter. Some of the more powerful and insightful discussions on this matter are to be found in the philosophy of simulation articles, one of which appeared as part of this 40th Anniversary Symposium, and a bunch more to appear in their own symposium, but already available online at the journal website, http://sg.sagepub.com.

Serious

More recently, a new debate has emerged about the term *serious games*. The debate this time, however, seems to be less on what games are; after all, we have had half a century to figure that out, despite the continuing arguments about definitions mentioned above. The new debate, rather, is more on whether the term is appropriate, at least the *serious* part of the term. Some say that *serious* is not serious and gives an unserious connotation to the very serious work of simulation/gaming. Others, often doing the hard (serious) spadework, put forward the argument that *serious* makes games seem less frivolous to funding agencies and to conservative (or even forward-looking) educational bodies that want to be seen as experts in the serious, and increasingly competitive, business of teaching and research. The more enlightened bodies now see serious games as a means of leveraging greater competitiveness.

The origin of the term has, rightly or wrongly, been traced back to Clark Abt's book of the same name, but in the early days, in-game video material was nonexistent and computers were used rarely and mostly experimentally. For the purpose of this editorial, therefore, and not wishing to formulate a definition, I will take the term *serious games* to include games that make use of computer technology and advanced video graphics and that are used for the purposes of learning and training, as researched and talked about in countless conferences, publications, institutes, and websites. Personally, I prefer the term *computerized simulation/game for training* or *learning* because it includes explicitly the three main elements, and also because a learning game is indeed serious, almost by definition, and so does not in itself really need the epithet.

However, *serious game* is easier, more memorable, and seems to have the day. It is also understood by all, certainly by many more than those who understand *video game*, or even *game*, as an educational method. Video games have had much bad press in the last couple of decades, as reviewed in the video effects article in this 40th Anniversary Symposium. In truth, the term *serious* is used, not so much to qualify *game*, but as an insurance against misguided minds from outside. It is easy, from the inside, to condemn a term, when really we should be concerned about how we both promote and develop the field and thus, establish its long-term viability. Serious gaming seems to have captured the imagination of, and drawn strong support from, many well beyond the actual gaming world. Even governments are providing support for serious games, with recent examples including a major thrust by the French Government, funding by the U.S. Institutes for Health and a European Union grant for the GaLA network. Surely that is a good thing.

In addition, it seems unreasonable, maybe foolhardy, to make any attempt to change vocabulary once it has become a well-established part of everyday usage. If the French Government's attempts (notably the Toubon law, 1994) to legislate what words should or cannot be used resulted in failure, what chance has any individual to change the use of *serious game* as a serious term? Technologies change, people's habits change little and slowly. We still use the word *hang up* (*racrocher* in French), even though we have ceased to do the action for several decades.

Probably, the various terms will be used interchangeably, according to circumstance or opportunity. Indeed, several terms are in use (see my lists above), others being *digital learning games*, *game-based learning*, *applied games*, *educational games*, and *edutainment games* among others; and in French, *activité ludique*. Another recent development comes under the banner of *persuasive games*, pioneered by Ian Bogost. Game dictionaries are now appearing on the internet, although they tend (for the moment) to focus more on entertainment games. I often suggest to novice teachers (would-be gamers) that they at first tell their superiors and even their students that they are doing an *activity* or an *exercise*. That seems to keep everyone happy!—during which time they begin to understand the serious nature of their undertaking.

Let us remember too, for example, that a *policy exercise* is a very serious game and that, as Dick Duke reminds me, computers and video graphics are not required for some serious policy games. See also Igor's article, in this 40th Anniversary Symposium, which takes us back nearly half a century, when serious games were being played at prestigious organizations such as the RAND, several decades before the advent of the modern serious game.

Placing restrictions on terminology could have the undesired effect of dampening creativity, enthusiasm, and development—all of which are hallmarks of our profession. Within the pages of *S&G*, authors use a fairly wide range of terms. Maybe someone should invent a game to teach about game-related vocabulary; however, if such a game were to reflect realty, then it may be too difficult to win.

I am unaware of any academic journal that has the term *serious game* in its title, maybe it is time for someone to create one. However, *S&G* has already published several articles by serious games authors, including some in this 40th Anniversary Symposium. *S&G* is receiving greater numbers of submissions from serious games people, and I encourage that. An important article for *S&G* would be one that shows how the more traditional and the more serious strands have helped and can help each other and even work closely together. It is being done in several places already, two examples being TU Delft and the SGI, Coventry University.

I am sure that some dust will continue to fly for the next few years, maybe decades, and that researchers and developers will continue to do their thing, despite the arguments one way or the other with regard to the term *serious*. That actually may be a healthy stance, especially if discussed in rigorous, balanced, and literature-based articles. Also, serious gamers and simulation/gamers (of the more traditional kind, for want of a better word) may build more solid bridges and interact more positively so as to learn from the other side. Thus, I am less concerned (professionally, for *S&G*, and for the field) with

what stickers we apply to these fabulous things (games or serious games or exercises or events) in which we ask people to become engaged for some learning objective. I do have a soft spot for Ken Jones' term *event*—maybe we should use it more.

Debriefing

However, what is of far greater concern to me and to the journal, and should be to the field, is what is being done on the learning ground, in the guise of game, serious or otherwise. In these events that we run, one thing that is **not** being done as much as it should is proper debriefing—that is, the occasion and activity for the reflection on and the sharing of the game experience to turn it into learning. The concern with debriefing seems to have been lost in some recent developments, particularly in some of the work accomplished under the banner of serious games. I have come across books with *serious game* in their title, but with not a single mention of or reference to debriefing. This gap occurs despite an entire *S&G* symposium in 1992 being devoted to the topic, guest edited by one of debriefing's most articulate proponents, Linda Lederman, and containing *S&G*'s third most cited article (on debriefing), by Linda. It is as if a whole history of scholarship has been overlooked, at best, and sidestepped, at worst. Things seem to be changing, however. Some serious game scholarship is beginning to look at debriefing. Maybe the technological glitz is wearing off and the learning is beginning to shine through.

The concern about debriefing stems not from some kind of orthodoxy, but simply from a condition of learning. This has been articulated most fully by Dave Kolb in his experiential learning theory (ELT)—see Alice and Dave's article in this 40th Anniversary Symposium. I would say that ELT is more than a theory—it lays the foundation for best practices for many gamers, but not for as many as it should be. Don Thatcher was probably the first to bring together Dave's ELT and the practice of simulation/gaming and to highlight the crucial role of debriefing in the learning spiral. See the 1990 issue of *S&G* devoted to Don.

In my view, we will neglect debriefing at our peril. If we accept the basic idea that the real (solid, lasting, meaningful, and deeper) learning comes not from the game, but from the debriefing, then we as gamers are shooting ourselves and our learners in the foot by neglecting the debriefing phase of the gaming process. For all their wonderful creativity and enthusiasm, some serious and other gamers seem to have forgotten that the learning comes from the debriefing, not from the game. That is putting it starkly, but it reflects a fundamentally crucial part of the learning process involved in the gaming experience. Debriefing is the processing of the game experience to turn it into learning (to paraphrase Dave Kolb).

Others may think somewhat differently and consider that learning *has* occurred and that

> such learning is not dependent on the existence of a debrief. A good debrief, however, allows the individuals who were in the experience to share, cross-fertilize, and to generalize their learnings from and between all who participated in the same experience. (Joe Wolfe, personal communication.)

However, we are not as far apart as it may seem. First, debriefing is recognized as essential, and second, sharing is common to both views. Some learning often occurs while a game is being played, but deeper lessons are drawn and drawn out in a debriefing session.

If we are going to take our serious gaming seriously, and if we wish educational authorities to accept them as a legitimate source of learning, then we need to do it seriously, which means debriefing seriously. In many of the games that I run, the debriefing is longer and more engaging for participants than the game itself. It is in the debriefing that my students and trainees really "get serious." I have said elsewhere, and others too have said it, that game design should start with the place where the participants are going to learn, that is, with the debriefing. At the very least, the debriefing should be a design consideration right from the start.

If we take the term *serious game* to include the use of computers, then we have a powerful tool indeed for debriefing. Serious games can easily include tools and modules of various kinds to collect data transparently during play. The data can then be processed to provide material for feedback during play, as in-game debriefing, and also made available as part of the end-of-game debriefing. Fred Goodman always said that debriefing is too important to be left until the end of the game. We did automated in-game data collection to some extent in Project ICONS and Project IDEALS (use Google to find them). As Jonathan Lean (personal communication) points out, ideally,

> the design of debriefing should be done by the individual educator to best achieve learning outcomes (the same game could be used by different educators for different educational purposes). However, any enabling tools that can be built in to collect data are clearly advantageous.

It is relatively easy, technologically, to build in debriefing data collection into game software. Some wonderful debriefing tools can relatively easily be designed with the same imagination and expertise that go into serious game software and graphics.

The problem is that debriefing does not appear to be quite as sexy as the flashy game ware that is usually touted as *the* game. Funders buy sparkle. Funders usually do not understand that learning comes from processing the game experience—that is, in the debriefing. Funders therefore do not see the need to pay for what they see as irrelevant or useless code.

However, gamers in the know can change that. We can insist on designing serious games that have debriefing built in as an integral part of both the software and the procedures for running the game. Thus, participants can debrief in a richer and more accurate way. They have to confront certain hard game facts, instead of denying them, as is sometimes the case during debriefing. For manual (and even for serious) games, we can (and I do) use observers who report on the event, and make video recordings that can be played back, as part of the debriefing.

Debriefing is a common, almost daily, activity, in which most people engage naturally. Teachers meet for lunch and talk about the great or difficult class that they had, get things off their chest, exchange ideas, share, and generally process their experience. We do that with various people, in various way—with friends, family, counselors, trainers, and more recently, through online forums. Indeed, informal debriefing is so common and we do it so naturally that we hardly give it a thought, and certainly do not call it debriefing—"hey, Igor, I'd like to debrief a problem I had in the office today" is usually expressed as "hey, Jac, I'd like to get your thoughts on something." For multiplayer games, online, in a training session, or classroom, the desire to talk about it after will be enormous for many people. Various electronic and paper-prompted means can be designed for such discussions. With a little imagination, debriefing modules can be built into almost every single-player serious games (either on a computer or on the internet). Designers and facilitators can easily set up discussion forums specifically for the game; they can provide live chats, informal opportunities to share written thoughts and feelings. Such forums or other sharing modules can be designed so as to offer more formalized content sessions that provide guidance for more structured live or asynchronous discussion. At least at the start, to get discussion going, they might also include something along the lines of Weizenbaum's ELIZA; however, I doubt that debriefers (ex-participants) will need much prompting. As Igor Mayer (personal communication) points out,

> Interestingly, social knowledge construction (on the Internet) around serious games takes place, . . . the player communities themselves are debriefing themselves by constructing meaning among each other. How they do that is little understood.

Research in that area, and an article for *S&G*, would help us understand better and may also generate ideas for ways to provide debriefing for serious games online.

Of course, the perceived need for debriefing depends to a certain extent on the idea behind the term *game*. If we take *game* to mean the package (board, computer software, set of rules, etc.), then it is less likely that we are going to consider that it must also include "additional" physical things or even activities that enable debriefing. If we take *game* to be the actual event or play, that is, the implementation with a set of participants, then we should automatically consider that debriefing is part of the event. Does *serious game* refer to a package or to an event? If the former, then it really should include debriefing provision, as outlined above. If the latter, then we should hear more in the literature about the debriefings that occur during and/or after the play.

I wonder if I can add to Martin Shubik's predictions, see his article in this 40th Anniversary Symposium: At some point in the future, a large proportion of the more suitable serious games will have built-in debriefing data collection, some of which will be used for immediate feedback and some or all used in debriefing at the end of game. However, maybe that is an easier prediction to make than the ones that Martin made because that type of data collection for after-action review is already used in professional training simulators, such as for flight training, military and civil, business, medical

procedures, emergency response (see the articles in this 40th Anniversary Symposium), and police training. In flight simulation sessions, for example, every detail is recorded; for learning during the after action review, the flight can be played back and every aspect of the flight examined and discussed in detail.

Discipline

Some of the above considerations bring me to the important question of discipline. Is simulation/gaming a discipline? For many years, I have disagreed with my friend Dick Duke; he has often said that simulation/gaming is a discipline. I used to say that it was more a method than a discipline. Even though I still have reservations, I have moved considerably toward Dick's viewpoint. Now, I am tempted to agree that, on the whole, simulation/gaming has become or is becoming a discipline. I say "on the whole" because it may be useful to clarify or develop several aspects before declaring that simulation/gaming is a true discipline.

What has changed that allows me to change my mind? I have touched on some of the things in this and in previous editorials. I outline below, in no particular order, various arguments that could be put forward to support the notion of simulation/gaming as a discipline. Some of the arguments also contain suggestions for future development.

A solid body of ***scholarship***. This I see as comprising three interrelated facets (subtitle and triangle of *S&G*):

1. useful **theory**, grounded in and clarifying research and practice,
2. a set of best **practices** and skills, especially in running and debriefing games, and
3. extensive **research** and knowledge bases.

Traditionally, the strongest scholarship in *S&G* has come from the business community, mainly ABSELites, although we now find increasing contribution from a wider variety of subject areas. Gaming scholarship can now be found in many outlets: academic journals and books, of course, but increasingly in PhD dissertations, websites, commissioned reports, proceedings, and conferences. This 40th Anniversary Symposium has reviewed some of that scholarship.

Theory. Without theory, no discipline can exist. However, in simulation/gaming, theory must be clearly and strongly grounded in practice and research. Theory is gradually built from, and guides, research, even more in simulation/gaming than in some other disciplines, partly because we ask participants to build their own theories as they take part in and debrief the practice. A large body of simulation/gaming theory has been built up over the years and various facets of this theory have been reviewed in many articles in this 40th Anniversary Symposium, including those by José and Michael, Precha, and Warren. Several years ago (1995), Fred Goodman wrote an inspiring *S&G* article entitled *Practice in theory*.

Careful ***assessment***. This is often the basis of good scholarship, and several articles in this 40th Anniversary Symposium provide excellent reviews of the intricacies of assessment; see, for example, the ones on assessment and on performance measurement.

*Increasing **acceptability** by the **academic** community*. This seems to be particularly the case in business and management and in computer science. For a review of one aspect of this see the two Jonathans' (Lean and Moizer) article in this 40th Anniversary Symposium as well as several *S&G* articles by Tony Faria et al. and an upcoming one on schools in Singapore. See also the substantial scholarship coming out of ABSEL and DiGRA, among other associations. Some university departments are now doing excellent work, particularly in the Netherlands, probably the world's most active country for simulation/gaming; with Finland hard on their heals.

Academic programs. One of the earliest academic programs was the one at Michigan started by Dick Duke, Fred Goodman, Al Feldt, and others. More recently, increasing numbers of gaming programs, some at the PhD level, have been established in universities the world over. It seems that some university departments (the more enlightened ones) are now falling head over heals to get in on the act of offering degree courses in some aspect of gaming. These are often reported in the DiGRA forum. *S&G* would welcome a survey article on such programs.

Teacher training. Related to such programs is the training of teachers and trainers who design, run, and debrief simulation/games and serious games. Most teachers running games in schools and universities do so individually and at their own initiative, sometimes in the face of adversity from colleagues and departments (rarely from students!). They tend to use existing games, mostly serious ones; thus, the great need for training is in running and debriefing, less in design.

Academic programs should include a strong component of learning the "chalk-face" skills of actual hands-on facilitation and debriefing. Every teacher training program in the world should have a course entitled "How to run and debrief simulation/games and serious games." Every professional trainer training program should include a substantial component related to facilitating and debriefing games. It flies in the face of common sense to ask teachers to adopt serious games without the required classroom skills of facilitation and debriefing. Society spends millions on education and on teacher training, and increasingly now, it seems, on adopting serious games for classroom use, but what is spent on activating the learning potential of those games through training teachers to become skilled game managers and debriefers? Just as we are not born teachers, we are certainly not born with such skills; they need to be learnt, and they are particularly difficult skills to learn. However, the first step is for educators to realize that learning comes from the debriefing, not from the game.

Several as yet small-scale efforts are paving the way. Examples include the ISAGA Summer School and the NASAGA and ThaiSim pre-conference training workshops. However, education ministries need to realize the dire need for this type of training to become institutionalized, as an essential component of all teacher training courses. This is a chicken and egg problem, but the more serious we become in rigorous running and debriefing, the better the results, the more positive other teachers' and parents' views will be, and more education authorities are likely to take notice. The greater the institutionalization, the greater the claim to being a discipline. In such efforts, the term *serious game* is certainly attractive.

Professional acceptance. Full acceptance by training and industrial communities is already a reality. This is clear from game-based training organizations, such as NASAGA, from industry-based simulation organizations, such as SIAA, from institutes, such as the SGI, from chambers of commerce, such as Valenciennes, France, from hundreds of companies, such as KTM Advance. It is also clear from a myriad websites and short showcase conferences on serious games, from some of the industry-oriented journals mentioned above, and in some articles in this 40th Anniversary Symposium, such as the ones on emergency response and on military gaming. It is a reality of which part of academia largely appears still to be unaware.

Proven impact *or societal utility of simulation/games*. Related to professional simulation/gaming is the major effect that simulation/gaming has had in some areas, most notably aviation. No airline pilot today can be certified without training in high-end simulators. No airline trainer would consider the simulated flight complete without a full debriefing. You would not buy a plane ticket if you suspected that the pilot had not been thoroughly trained in a simulator. Flight simulators have proved their worth beyond all doubt, not just in terms of learning, but also in terms of economic viability and lives saved. Using the known benefit of aviation simulators, Dave Gaba (Editor of *SiH*) and colleagues are spearheading a group in the United States, which is on its way to making simulation-based training compulsory for all medical personal. Wendy and Felissa, in their 40th Anniversary article on nursing, have reviewed the very real contribution in that area. Simulations and games are widely used in areas such as electronics, weather forecasting, pilot training, engineering, emergencies, navigation, and military. Their reliability there is beyond doubt and they receive massive funding. This recognition strengthens simulation/gaming claims to have reached disciplinary status.

Impact research *needed*. However, in the "softer" applications, impact studies are still needed, both as a measure for the profession and as a way to attract funding. Increasing use is being made of excellent simulators to teach people to drive and about road safety (see recent articles in *S&G*); however, it would be useful to know if they are helping to reduce the death toll on the roads. I wonder if businesses would be more successful if all CEOs were obliged to participate in business games. Do we know if simulations help authorities to make better decisions? Politicians seem to play their own, nonlearning games. What real difference do games make in increasing a nation's foreign language skills? We hear of game-based cross-cultural training programs making a difference to a company's efforts abroad, but we do not know if this makes international trade any fairer. We assume that wargames conducted behind the closed doors of military organizations make armies better at fighting, but does peace gaming make any difference in efforts to promote peace and human rights in the world? Has human trafficking in particular and exploitation in general been reduced? Has simulation/gaming helped to make people less greedy and improve that state of our spaceship earth? Computer simulation of climate systems does seem to be making a real difference. However, to reduce climate change, we have to increase mind change—certainly a more difficult task. The editorial, titled *Acting, knowing, learning, simulating, gaming*, which Warren Thorngate and I enjoyed writing about a year ago, was rather pessimistic for those areas. My hope is that, with

the help of the whole simulation/gaming community, including serious gaming, we may make a positive difference. The use of simulations and games is increasing, but in schools and universities, doubt still lingers, to put it mildly, maybe because we have not yet demonstrated, with hard research, that simulation/games can be a force for good in the above and related areas.

I read with interest an announcement that a large grant from the National Institutes of Health is to fund the development of video games that aims to "neutralize implicit, unintentional biases against women, minorities and people with disabilities" in science. That is a laudable objective indeed, but two things will be needed. One is proper in-depth debriefing to help break down heavily engrained prejudice (I doubt that a game by itself can do the job, given that so much else has failed) and the other is a long-term impact study.

Funders and the public have a right to expect some kind of assessment of the results of the projects that they have funded. The discipline of simulation/gaming also needs to know. A review article on the larger contribution of learning simulation/games and serious games to society would be most welcome and would certainly help to establish simulation/gaming as a discipline as well as attracting more funding. Already some of the 40th Anniversary articles provide important pointers. As Igor Mayer points out, we might also do well to look at the "gamification of society, which implies that games and game-principles (immersion, engagement) increasingly color our perceptions and behavior in society, learning, politics, and so on."

Game ingredients. We seem to have fairly broad agreement, in both theory and practice, on certain key elements for a game to achieve its learning objectives. For example, most agree that vital ingredients include engagement, the whole person (including emotions), trust, challenge, balance between simplicity and realism (according to learning objectives), integration of affective and cognitive dimensions, trained game facilitator, clear learning and game goals, and probably the most important of all proper debriefing, even if it appears not to be done as much as it should. In this 40th Anniversary Symposium, the article, among others, on game attributes discusses many more components necessary for positive learning outcomes. Also, the 40th Anniversary article by Gert Jan, Léon, and Vincent, and the book from which it is drawn, should probably be the starting point of all good research into effectiveness of simulation/gaming in general and serious games in particular. In any case, general agreement on basic ingredients is conducive to a strong discipline.

Professional ***associations***. All vibrant disciplines are bolstered by professional communities, often grouped under a variety of associations of varying orientation or focus. Some of these associations hold a major annual conference, probably the foremost, academically, being ABSEL, ISAGA, JASAG, DiGRA and EUROSIS, but many others, such as such as ANGILS, ASPiH, DGTE, DIGITEL, ECGBL, IADIS, G4C, SAGANET, SAGSAGA, SESAM, SGI, SSAGSg, and ThaiSim (apologies to missing ones), hold shorter, but important, serious games and simulation/games conferences in various parts of the globe. Some conferences produce proceedings, and some of the better papers then find their way into a journal. Some nonsimulation associations organize gaming events, for example, the American Library Association, "the oldest and largest library association in the world" holds an annual continent-wide games day. Some of

the simulation/gaming associations are older than this journal, such as NASAGA and SCS. *S&G* is lucky to be associated with over 12 organizations in various parts of the world. I say "over" because new ones are currently being created or becoming associated with *S&G*. I am proud to have lent a helping hand in the creation of some of these and to have had the journal support their development. The current associations list can be found at http://www.unice.fr/sg/.

***Publication** in **books** and especially in **journals**.* *S&G* and its sister journals attest forcefully to the establishment of simulation/gaming as a well-developed discipline with a rich and high quality scholarship. Published scholarship is the backbone of a discipline. In many disciplines, much of the essential or recognized publication is in the form of scholarly articles or chapters. In simulation/gaming, university recognition of publication must also include the games themselves. The design and production of a game (perhaps in similar fashion to a computer language) should be given as much recognition for promotion as an article or a book. However, for a learning game to receive full recognition, it must include proper debriefing components. Ideally, it and the learning should also have been assessed, but that takes much time and is not always possible to accomplish.

It is worth mentioning here that *S&G* does publish ready-to-use simulation/games, all of which include debriefing. My warm thanks go to Pietrre Corbeil for his excellent guidance to game authors. However, in *S&G*, they are not computerized simulation/games; hundreds of websites provide access to serious games. For more information, see various *S&G* issues and the guide for authors.

Its own discipline. The journal *S&G* used to be classified in methods along with the discipline of statistics. Just like its older sisters, statistics, mathematics, education, or English, simulation/gaming is relevant to most other disciplines and yet can also be a discipline in its own right. All those involved in simulation/gaming can help by requesting that bodies (publishers, libraries, and authorities) classify simulation/gaming activity and production under the disciplinary banner of simulation/gaming.

Debriefing. Yes, again. Assuming that debriefing produces at least some of the deeper and more lasting learning that we wish to offer our learners, then the more that we do the required debriefing, the more simulation/gaming is going to make a real contribution in society and in people's lives. Then, the more simulation/gaming will be recognized as a valid, even desirable, methodology in academia, and the more it will be considered as and be supported in its claim to be a discipline. In other words, debriefing is not only a key for learning, it could also turn out to be a key for simulation/gaming to become a discipline.

Philosophy. Maybe the strongest argument that can be put forward for declaring a subject to be a discipline is when philosophers delve into its real substance and examine its underlying assumptions; see Till and Paul's article in this 40th *S&G* Anniversary Symposium. See also several articles already online and to appear in an upcoming *S&G* symposium on the philosophy and epistemology of simulation.

This symposium. Finally, yes, I would say that this 40th *S&G* Anniversary Symposium of review articles (with more to come) puts a clear stamp of approval on any application that simulation might make to obtain the honor of becoming a discipline.

The above points, and no doubt others, provide sufficient weight for simulation/gaming to be considered a full-fledged discipline. However, despite the above points, a few

areas would probably welcome some additional effort. I shall outline three areas that need further effort and which should contribute the emergence of a strong, vibrant, and tolerant discipline.

Openness. Squabbles over whether this or that term is suitable probably reflect more gamers' concerns about legitimacy (or even ownership) of their work than about scholarship. Maybe if protagonists were able to accept other terms more openly, the discipline would see more cooperation, integration, and thus, more energy going into development rather than into petty arguments. For example, I would see serious games as one of the major components within a broad discipline of simulation/gaming. In this way, serious gamers might embrace the more traditional stuff, along with its already solid findings dating back some 40+ years, and simulation/gamers might draw greater inspiration from serious gaming, which is probably the most vibrant part of simulation/gaming today. I hope that this 40th Anniversary Symposium has been able to bridge the apparent gap. I would like *S&G* to continue that reaching out. We have everything to gain from sharing, just as we do in debriefing.

Theory, practice, and research. Further research, along with development of theory and practice, would contribute to strengthening the arguments in favor of simulation/gaming as a discipline. More ambitious and rigorous research is needed, which needs to be funded and to be disseminated. Many of the articles in this 40th *S&G* Anniversary Symposium point to further research that is needed, research into new areas as well as more refined research into current areas. I had the privilege in 1998 of co-authoring with Joe Wolfe a well-cited *S&G* article on the topic and some of the arguments put forward there are just as valid today as they were 12 years ago.

Debriefing research. I have already touched at some length on debriefing, but we need more research on it. Debriefing is one area in which all three prongs of theory, practice, and research have much to contribute. Some years ago, probably in an editorial, I suggested a research structure that would explicitly include debriefing. In the appendix here, I suggest a more elaborate one, even though it may prove difficult to implement. In any case, debriefing as the real fount of learning in simulation/gaming needs to become a central object of research in as many research projects as can reasonably and coherently accept them. It also needs to become a central concern in both theory and practice. Excellent examples include Linda Lederman's symposium, Dave Gaba's review article in *SiH*, and a number of studies that point to the vital importance of debriefing. Here, I remind authors that they must justify omission of mentioning debriefing in articles that they submit to *S&G* (in cases, of course, where one would expect mention of debriefing).

The Discipline of Simulation/gaming

Alternatively, maybe we should just go the whole hog now and simply proclaim simulation/gaming, with serious games, to be a full-fledged discipline and worry about niceties later. In some ways, things are or become what we say they are, and wrinkles get ironed out along the way. Just as we imagine the simulation situation to be real, and it thus becomes real in its consequences, could we be bold enough to consider that the discipline of simulation/gaming does indeed exist?

Although this issue officially closes the 40th Anniversary Symposium, it is likely that we will publish a similar symposium, containing articles originally intended for 40th,

but which we were not able to include here. The topics are important, including law, organizational change, science, international relations, culture and computers, the internet, design, natural resource management, crises, healthcare, and debriefing. These upcoming review articles too will contribute to making simulation/gaming a discipline. If you would like to write a review article, please be in touch. I would also welcome some short debate articles on the issue of whether simulation/gaming already is or should be a discipline. Because of its central position in the field, *S&G* is a particularly suitable forum for such disciplinary and interdisciplinary discussion. Simulation/gaming has become a vibrant multidisciplinary discipline.

Appendix—Possible Structures for Research on Debriefing

Table A1 elaborates on a general research structure that could be used to examine debriefing directly, or even the learning process in simulation/games more generally. Of course, not all paths could be followed in one single experiment. The three most promising paths would probably be B and D or E. Other combinations may throw light on the vital role of debriefing. My prediction is that learning would be greater, richer, and longer lasting in Groups D and E. Moreover, the technology of serious games can be harnessed to capture certain measures transparently during play and then to provide matter for in-game feedback and for debriefing after the game.

Table A1. Possible Research Designs for Exploring the Value and Mechanism of Debriefing

Group A	Group B	Group C	Group D	Group E
Non-game teaching method	Game—no debriefing	Game + minimal debriefing	Game + full debriefing	Game + full debriefing + 2nd game + debriefing
Pretest	*Pretest*	*Pretest*	*Pretest*	*Pretest*
Teaching	Game	Game	Game	Game 1
				Postgame test
				Full debriefing
		Postgame test	*Postgame test*	*Postdebriefing test*
		Small debriefing	**Full debriefing**	Game 2[a]
				Debriefing
Posttest	*Posttest*	*Postdebriefing test*	*Postdebriefing test*	*Postdebriefing test*
Long-term test	*Long-term test*	*Long-term test*	*Long-term test*	*Long-term test*

a. Personal and colleagues' experience (the first, I think, being Alan Coote) tells me that running a game a second time, or running a second similar game, after the debriefing of the first game makes a huge difference in learning. Whenever possible, I provide training with that pattern. In the first game and debriefing, the trainee learns; in the second game and debriefing, the trainee consolidates and realizes that he or she has learnt. Perhaps, this follows more fully Dave Kolb's four quadrant Experiential Learning cycle. In any case, the learning return on effort and time invested in the second round is far greater than that of the first round; I would guess that two related games in this manner provide the equivalent of three or even four separate ones. Of course, research may be able to show this.

The term *test* is intended to be more than the self-report questionnaire traditionally used in educational research. It is meant to cover a broad spectrum of data collection methods, especially those that are more sensitive to simulation/gaming learnings. Maybe the Solomon Four-Group design could be used, but it would require greater number of groups. I would think that conversation analysis (ethnomethodology) would also be a powerful way of analyzing and inferring some kinds of learning—see some early simulation/game analysis by D. R. Watson, Les Sharock, and others and also a few articles in *S&G*.

The very first objective of research here would be to show that debriefing does indeed produce learning, that is, transform the game experience into learning. Further objectives would be to elucidate how debriefing actually does this and what combinations do it best for what types of learner and learning objectives.

Of course, the above are ideals, and several obstacles would need to be overcome. First, learning measuring instruments need to be sufficiently sensitive and they need to target the type of meaningful learning that comes from debriefing simulation/gaming. Second, as Precha Thavikulwat (personal communication) points out, we have an ethical quandary. If we believe that debriefing is so important, can we ethically use pattern B (no debriefing)?

My tentative answer might be that if we adopt the stance of "do no harm," then we need to obtain research-based evidence, even if it means that one group may not, in that particular experiment, benefit from the debriefing and still come to no harm. Paths for Groups C, D, and E provide a postgame test (before debriefing) and also a debriefing. In any case, Precha raises an important issue, which is valid for much educational research, especially that in which we compare groups.

However, this in turn poses the ethical question: Should we use traditional teaching methods when we "know" that experiential learning methods like fully debriefed simulation/games are sometimes "better"? We cannot force teachers to use methods that they do not want to use or are afraid of using, but we can train them. We can also do research that will convince authorities (ministries, headmasters, etc.) that simulation/games are great ways to help people learn. Some interesting research on debriefing in the medical training arena has appeared fairly recently in *Simulation in Healthcare*. You may wish to join the LinkedIn group called Debriefing http://www.linkedin.com/groups?gid=3153633&mostPopular= .

Author's Note

My warm thanks go to several people for their insightful comments on an earlier draft of this editorial, they are Richard Duke, Richard Dukes, Jonathan Lean, Linda Lederman, Igor Mayer, Precha Thavikulwat, Warren Thorngate, Joe Wolfe, and Yeo Gee Kin.

References for 40th Anniversary Symposium articles

This list contains the complete set of articles that have appeared in this 40th Anniversary Symposium. Article titles are in bold.

Anderson, P. H., & Lawton, L. (2009, April). **Business simulations and cognitive learning: Developments, desires, and future directions**. *Simulation & Gaming, 40*, 193-216. doi:10.1177/1046878108321624.

Barlett, C. P., Anderson, C. A., & Swing, E. L. (2009, June). **Video game effects—Confirmed, suspected, and speculative: A review of the evidence**. *Simulation & Gaming, 40*, 377-403,first published on December 22, 2008. doi:10.1177/1046878108327539.

Bragge, J., Thavikulwat, P., & Töyli, J. (2010). **Profiling 40 years of research in simulation & gaming**. *Simulation & Gaming* (this issue, 869-897).

Chin, J., Dukes, R., & Gamson, W. (2009, August). **Assessment in simulation and gaming: A review of the last 40 years**. *Simulation & Gaming, 40*, 553-568. doi:10.1177/1046878109332955.

Crookall, D. (2009, April). **Coming of age**. *Simulation & Gaming, 40*, 162-163. doi:10.1177/1046878109334251.

Crookall, D. (2009, June). **Evolving**. *Simulation & Gaming, 40*, 290-296. doi:10.1177/1046878109337760.

de Souza e Silva, A., & Hjorth, L. (2009, October). **Playful urban spaces: A historical approach to mobile games**. *Simulation & Gaming, 40*, 602-625, first published on April 26, 2009. doi:10.1177/1046878109333723.

Dormann, C., & Biddle, R. (2009, December). **A review of humor for computer games: Play, laugh and more**. *Simulation & Gaming, 40*, 802-824, first published on August 2, 2009. doi:10.1177/1046878109341390.

Faria, A. J., Hutchinson, D., Wellington, W. J., & Gold, S. (2009, August). **Developments in business gaming: A review of the past 40 years**. *Simulation & Gaming, 40*, 464-487, first published on December 22, 2008. doi:10.1177/1046878108327585.

Fowler, S. M., & Pusch, M. D. (2010, February). **Intercultural simulation games: A review (of the United States and beyond)**. *Simulation & Gaming, 41*, 94-115. doi:10.1177/1046878109352204.

Garson, G. D. (2009, April). **Computerized simulation in the social sciences: A survey and evaluation**. *Simulation & Gaming, 40*, 267-279, first published on July 18, 2008 doi:10.1177/1046878108322225.

Grüne-Yanoff, T., & Weirich, P. (2010, February). **The philosophy and epistemology of simulation: A review**. *Simulation & Gaming, 41*, 20-50. doi:10.1177/1046878109353470.

Hofstede, G. J., de Caluwé, L., & Peters, V. (2010). **Why simulation games work—In search of the active substance: A synthesis**. *Simulation & Gaming* (this issue, 824-843) first published on August 5, 2010. doi:10.1177/1046878110375596.

Hromek, R., & Roffey, S. (2009, October). **Promoting social and emotional learning with Games: "It's Fun and We Learn Things"**. *Simulation & Gaming, 40*, 626-644, first published on June 15, 2009. doi:10.1177/1046878109333793.

Jenson, J., & de Castell, S. (2010, February). **Gender, simulation, and gaming: Research review and redirections**. *Simulation & Gaming, 41*, 51-71. doi:10.1177/1046878109353473.

Klabbers, J. H. G. (2009, August). **Terminological ambiguity: Game and simulation**. *Simulation & Gaming, 40*, 446-463, first published on December 24, 2008. doi:10.1177/1046878108325500.

Kolb, A. Y., & Kolb, D. A. (2009, June). **The learning way: Meta-cognitive aspects of experiential learning**. *Simulation & Gaming, 40*, 297-327, first published on October 10, 2008. doi:10.1177/1046878108325713.

Lee, Y.-I., Trim, P., Upton, J., & Upton, D. (2009, December). **Large emergency-response exercises: Qualitative characteristics—A survey**. *Simulation & Gaming, 40*, 726-751, first published on October 22, 2009. doi:10.1177/1046878109334006.

Mayer, I. S. (2009, December). **The gaming of policy and the politics of gaming: A review**. *Simulation & Gaming, 40*, 825-862, first published on September 2, 2009. doi:10.1177/1046878109346456.

Moizer, J., & Lean, J. (2010, February). **Toward endemic deployment of educational simulation games: A review of progress and future recommendations**. *Simulation & Gaming, 41*, 116-131. doi:10.1177/1046878109359052.

Moreno-Ger, P., Burgos, D., & Torrente, J. (2009, October). **Digital games in eLearning environments: Current uses and emerging trends**. *Simulation & Gaming, 40*, 669-687, first published on July 30, 2009. doi:10.1177/1046878109340294.

Morgan, G. (2009, October). **Challenges of online game development: A review**. *Simulation & Gaming, 40*, 688-710, first published on July 24, 2009. doi:10.1177/1046878109340295.

Nehring, W. M., & Lashley, F. R. (2009, August). **Nursing simulation: A review of the past 40 years**. *Simulation & Gaming, 40*, 528-552. doi:10.1177/1046878109332282.

Peterson, M. (2010, February). **Computerized games and simulations in computer-assisted language learning: A meta-analysis of research**. *Simulation & Gaming, 41*, 72-93, first published on December 13, 2009. doi:10.1177/1046878109355684.

Prakash, E., Brindle, G., Jones, K., Zhou, S., Chaudhari, N. S., & Wong, K.-W. (2009, December). **Advances in games technology: Software, models, and intelligence**. *Simulation & Gaming, 40*, 752-801, first published on October 29, 2009. doi:10.1177/1046878109335120.

Salas, E., Rosen, M. A., Held, J. D., &Weissmuller, J. J. (2009, June). **Performance measurement in simulation-based training: A review and best practices**. *Simulation & Gaming, 40*, 328-376, first published on December 22, 2008. doi:10.1177/1046878108326734.

Sandler, T., & Siqueira, K. (2009, April). **Games and terrorism: Recent developments**. *Simulation & Gaming, 40*, 164-192, first published on May 7, 2008. doi:10.1177/1046878108314772.

Shubik, M. (2009, October). **It is not just a game!** *Simulation & Gaming, 40*, 587-601, first published on April 26, 2009. doi:10.1177/1046878109333722.

Smith, R. (2010, February). **The long history of gaming in military training**. *Simulation & Gaming, 41*, 6-19, first published on April 27, 2009. doi:10.1177/1046878109334330.

Thavikulwat, P. (2009, August). **Social choice in a computer-assisted simulation**. *Simulation & Gaming, 40*, 488-512, first published on May 13, 2009. doi:10.1177/1046878109335921.

Thorngate, W., & Tavakoli, M. (2009, August). **Simulation, rhetoric, and policy making**. *Simulation & Gaming, 40*, 513-527, first published on February 6, 2009. doi:10.1177/1046878108330539.

Tomlinson, B., & Masuhara, H. (2009, October). **Playing to learn: A review of physical games in second language acquisition**. *Simulation & Gaming, 40*, 645-668, first published on July 24, 2009. doi:10.1177/1046878109339969.

Wainer, G., Liu, Q., Dalle, O., & Zeigler, B. P. (2010). **Applying cellular automata and DEVS methodologies to digital games: A survey**. *Simulation & Gaming*, (this issue, 796-823) first published on August 13, 2010. doi:10.1177/1046878110378708.

Wilson, K. A., Bedwell, W. L., Lazzara, E. H., Salas, E., Burke, C. S., Estock, J. L., . . . Conkey, C. (2009, April). **Relationships between game attributes and learning outcomes: Review and**

research proposals. *Simulation & Gaming*, *40*, 217-266, first published on August 26, 2008. doi:10.1177/1046878108321866.

Zagal, J. P., & Mateas, M. (2010). **Time in video games: A survey and analysis**. *Simulation & Gaming*, (this issue, 844-868) first published on August 5, 2010. doi:10.1177/1046878110375594.

Bio

David Crookall (PhD, Université de Nancy) teaches in the International Management Institute at the Université de Nice Sophia Antipolis, France. He has published widely on several topics, including simulation/gaming, and has conducted workshops in several countries around the world. He is Editor of *Simulation & Gaming: An Interdisciplinary Journal*. Contact: simulation.gaming@gmail.com.