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Henry Ellington¹

Abstract

In this invited autobiography, the author describes the impact that educational gaming and simulation has had on his professional career. He begins by reviewing his early life and education in Aberdeen and his subsequent work as a research scientist, schoolteacher, and physics lecturer. He then shows how he changed disciplines from physics to educational technology in 1973, and almost immediately became heavily involved in the development and promotion of educational games and simulations. He describes the first three projects in which he and his colleagues were involved and shows how these led to a wide range of spin-off exercises, most of which were published and marketed by prestigious external bodies. He then describes the contributions that he and his team made to the general promotion of such exercises as educational and training tools and to the theory of game design. Next, he shows how his work as an educational developer diversified during the latter part of his career, covering such areas as academic staff development, distance learning, academic quality, and embedding the systems approach into curriculum development. He concludes by outlining the various things that he has done since he retired from full-time employment in 2001.

Keywords

board games, case studies, competitions, computer exercises, curriculum development, educational development, game design, game promotion, manual exercises, primary education, science education, secondary education, simulation/games, staff development, systems approach, technology, tertiary education, training

Simulation/gaming has been very good to me. Indeed, it is no exaggeration to say that it transformed my life. Until 1973, I pursued a conventional (and relatively undistinguished) career as a professional physicist, working successively as a research scientist, schoolteacher, and college lecturer. Then, I took the considerable gamble of

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moving from physics into educational technology—as educational development was then called—and my life completely changed. By the time I retired from full-time employment in 2001, I had gained a national and international reputation in my new field, had become Britain’s first professor of educational development, had received the first higher doctorate awarded by The Robert Gordon University (RGU), had written more than 100 papers and 15 books, and was much in demand as an educational and training consultant, both at home and abroad. All this was made possible by the work on educational gaming and simulation that I and my colleagues carried out during the 1970s and 1980s, work that established the research group that I had the privilege of leading as a major player in the field. *Simulation & Gaming* editor, David Crookall, has asked me to let readers know how this happened by writing this autobiographical article. I hope that you find it of interest.

My Early Life, Education, and Career as a Physicist

I was born in Aberdeen in 1941, to working-class parents, and grew up during the rationing and general austerity that lasted for many years after the end of the Second World War. At the end of my primary education, I sat the dreaded Control Exam (the Scottish equivalent of the 11+) and managed to win a Foundation Scholarship to Robert Gordon’s College, Aberdeen’s most prestigious senior secondary school for boys (had I not done so, my parents could never have afforded the fees). I did well there, being Dux of Division in each of my first 5 years and, in my 6th year, winning the top open science bursary to Aberdeen University. Together with my summer job as a bus conductor and my local-authority maintenance grant, this made me financially secure during my time as a student. I majored in natural philosophy (the name for physics at all the ancient Scottish universities), graduating with first-class honors in 1963.

In those days, final-year students with the prospect of good degrees did not have to go out looking for jobs; would-be employers came out looking for them, in a process known as the “milk round.” As a result of this, I received no fewer than four good job offers in various parts of the United Kingdom Atomic Energy Authority (UKAEA), and eventually took up a post as a Scientific Officer at Harwell, Britain’s main civil atomic research establishment. The job involved carrying out basic research on the plasma physics of magnetohydrodynamic power generation. During my 2 years at Harwell, I spent some time tutoring junior scientific staff in physics and mathematics, and found that I had something of a flair for teaching. I therefore decided to return to Aberdeen to train as a teacher, and subsequently worked for a short time as a physics teacher in a local school before becoming a lecturer in the School of Physics at Robert Gordon’s Institute of Technology (RGIT), Aberdeen’s second higher-education institution. This became The RGU in 1992, as part of the massive expansion of the British university sector that took place in that year.

I thoroughly enjoyed this work, pioneering the large-scale use of hand-out notes in the various courses that I taught, and also completing an external PhD at Aberdeen University—based on the research that I had carried out at Harwell.

My Move Into Educational Technology and Academic Gaming

In 1973, RGIT decided to convert its existing Audiovisual Aids Unit into a fully fledged Educational Technology Unit by the appointment of academic staff. By then, I was married with two young children and a large mortgage, but, with the full support of my wife Lindsay, decided to apply for a job in the new unit, despite the fact that I knew virtually nothing about educational technology at the time. I was appointed as its Head, a post that I held until I retired in 2001, although my department underwent two changes of name during the intervening period—first to the Educational Development Unit and then to the Centre for Learning and Assessment, reflecting the changes in “educational fashion” that had occurred.

My involvement in educational simulation/gaming began almost immediately after taking up my new post. It started with a casual conversation with Norman Langton, who was then Head of the School of Physics and Deputy Director of RGIT. One morning, he accosted me in the corridor outside his office and asked me if I knew anything about educational games. When I confessed that I did not, he suggested that I remedy the situation rather quickly, because the Scottish Education Department wanted us to develop a physics-based exercise to keep 5th-year secondary school pupils “usefully employed” during the somewhat slack period at the end of the summer term, following the higher-grade examinations. After making a fact-finding visit to Glasgow to meet Jetta Megarry (then Scotland’s leading expert on science-based educational games), I set up a working group that included four local physics teachers and a member of The Schools Inspectorate in order to develop the new game. The eventual outcome was THE POWER STATION GAME—a competitive planning exercise based on the design of a new 2000 MW power station (see Photo 1). Interested readers can find a detailed account of its development elsewhere (Ellington & Langton, 1975).

Shortly after starting work on THE POWER STATION GAME, I became involved in a second major game design project. This began with an approach to RGIT’s Director, Peter Clarke, from Aberdeen’s local morning newspaper, *The Press and Journal*, which was interested in sponsoring a business-management competition based on the burgeoning North Sea oil industry, of which Aberdeen was the center. Because RGIT already ran a number of courses connected with the offshore oil industry, had a traditional interest in business management, and had recently become involved in educational simulation/gaming, it was hoped that the Institute would collaborate with *The Press and Journal* in developing and running such a competition. A second working group was set up in RGIT to see the new project through, and the eventual outcome was the BRUCE OIL MANAGEMENT GAME, a computer-mediated simulation/game that was run as a national and (later) an international competition for six successive years, starting in 1974-1975. Interested readers can again find a detailed account of its development elsewhere (Ellington, Addinall, & Langton, 1978).



Photo 1. The climax of THE POWER STATION GAME, in which the three competing teams present their schemes (coal, oil, and nuclear) to the “Generating Board”—in this case, delegates at the 1977 Society for the Advancement of Gaming and Simulation in Education and Training Conference

One immediate spin-off from work on the BRUCE OIL MANAGEMENT GAME came in 1974, when Tim Kenny of Shell Exploration and Production Ltd. approached RGIT requesting assistance with the development of a family board game based on the North Sea oil industry, since Shell wished to produce such a game for publicity purposes. I was already working on such a package with Eric Addinall, a senior lecturer in the School of Physics who was to be my principal collaborator during the next 16 years, so Tim Kenny retained us as consultants to help him see the project through. The resulting game, NORTH SEA, was produced by John Waddington Ltd. (the U.K. publishers of MONOPOLY), and was launched jointly by Shell and RGIT during the “Offshore Europe” conference and exhibition that was held in Aberdeen in the autumn of 1975. It was also put on sale to the general public in the North East of Scotland, and aroused a great deal of interest. Eric and I had visions of being able to retire to the Bahamas on the strength of our royalties, but, in the event, Shell only produced 6,000 copies, so it was not to be! Once again interested readers can find a detailed description of the game, which can be seen in Photo 2, elsewhere (Ellington & Addinall, 1978).



Photo 2. Henry Ellington (left), Eric Addinall (center), and Norman Langton playing NORTH SEA shortly after its launch in 1975.

How I and My Colleagues Built on This Early Work

The three original simulation/gaming projects described above not only enabled everyone involved to learn a great deal about how to design and run such exercises, but they also proved to be the starting point for a large number of other projects. In retrospect, I can see that there were four main reasons why I and my colleagues were so successful in this work.

- First, I was able to build up an extremely powerful R&D team, the key members of which were myself, Eric Addinall, and Fred Percival (who joined my department in 1976, after completing a PhD in science education at Glasgow University).
- Second, I and my team had the full support of the senior management of RGIT, with the Director (Peter Clarke) and the Deputy Director (Norman Langton) being fully committed to establishing the Institute as a center of excellence in the field.
- Third, we were able to establish close working links with a wide range of prestigious external bodies, all of which had a vested interest in promoting

the use of simulation/gaming. (The role of RGIT's funding body, the Scottish Education Department, was particularly important in this regard.)

- Finally, the time was ripe for the wider use of such exercises in education and training, since group learning was now starting to replace programmed learning as the new "bandwagon movement" in progressive education (Elton, 1977).

Work on THE POWER STATION GAME led directly to the production of a whole range of similar manual exercises with a technological theme. These included POINT FIELDS (a simulated public inquiry into the building of a petrochemical plant), HYDROPOWER (a multidisciplinary, multiproject pack based on hydroelectric pumped storage), THE CENTRAL HEATING GAME (a similar package based on domestic central heating), POWER FOR ELASKAY (a simulated design project based on alternative energy), and FLUORIDATION? (a role-playing simulation game based on the water fluoridation controversy). All five exercises were published by the Institution of Electrical Engineers (IEE), which had previously published THE POWER STATION GAME. We had hoped that the IEE would also publish THE NUCLEAR DEBATE, a suite of structured discussion exercises based on nuclear power, but they rejected it because it allegedly contained too much antinuclear material. It was also rejected by the Association for Science Education, this time because it allegedly contained too much pronuclear material. We finally managed to get it published by the Scottish Council for Educational Technology, which agreed with us that it was a nicely balanced package!

Work on the BRUCE OIL MANAGEMENT GAME catalyzed the organization of three further competitions, all involving teams of senior pupils in secondary schools. The first was HYDROPOWER 77, which was run in collaboration with the North of Scotland Hydro-Electric Board over the winter of 1976-1977 and involved designing a new hydroelectric pumped storage scheme (this was the exercise on which the HYDROPOWER multidisciplinary, multiproject pack was based). The second was PROJECT SCOTIA, a U.K.-wide competition based on the design of a UHF television broadcasting network that was run in collaboration with the IEE, the British Broadcasting Corporation, and the Independent Broadcasting Authority over the winter of 1978-1979. Because of its great success, a second PROJECT SCOTIA competition was run in the southwest of Scotland in 1980 (see Photo 3). The third was the AGECROFT TROPHY COMPETITION program, in which three teams from different secondary schools played THE POWER STATION GAME over a 2-day or 3-day period. The competition, which was sponsored by the IEE, was run in various parts of the United Kingdom during the late 1970s and early 1980s. It was, for example, run as a demonstration exercise at the 1977 Society for the Advancement of Gaming and Simulation in Education and Training (SAGSET) Conference and the 1981 Association for Programmed Learning and Educational Technology (APLET) Conference, both of which were held in RGIT—(see Photo 1). I was heavily involved with SAGSET and APLET from 1974 onward.



Photo 3. Henry Ellington participating in the judging of the 1980 PROJECT SCOTIA competition in Ayr Town Hall

The work described above did a great deal to promote the widespread use of games and simulations in schools, colleges, universities, and training establishments throughout the United Kingdom. The IEE's Schools Liaison Service (with which I worked closely over a 20-year period) played a key role in this regard, using the various exercises that I and my colleagues had produced as vehicles for raising awareness of electrical engineering among pupils, with a view to recruiting them into the profession. Then—and this was a crucial breakthrough—the highly influential Association for Science Education actually wrote such exercises into the curriculum of their new “Science in Society” alternative O-level course, which was widely adopted by secondary schools throughout the United Kingdom, following its launch in 1980. I and my colleagues wrote five of the key exercises for this course, adapting them from packages previously published by the IEE (Ellington, Addinall, Percival, & Lewis, 1979). A few years later, we made a further breakthrough, being invited to write a suite of 14 educational games, simulations, and case studies for the new foundation-level science course being developed by the Scottish Education Department (Ellington & Addinall, 1984).

During the first half of the 1980s, I and my colleagues collaborated with Phillips Petroleum United Kingdom in three major projects. The first was the development of ILE DE PERFORMANCE, a simulated design exercise on alternative energy based on



Photo 4. Henry Ellington with his wife Lindsay, son Kenneth, and daughter Pamela photographed in the mid-1980s; Kenneth is now a hotel general manager and Pamela is a physiotherapist, both being graduates of The Robert Gordon University

POWER FOR ELASKAY that was run as a competition during the 1980 annual conference of their Petroleum Products Group in Guernsey. Eric Addinall, Fred Percival, Norman Langton, and I each acted as coach and adviser to one of the four teams into which the 138 delegates were divided for the purpose of the exercise. (Much to his delight, Norman's team won!) The second was the development of EKOFISK—ONE OF A KIND, a multiple-media package of resource materials and class exercises on the offshore oil industry designed for use in schools, and made available through Phillips' Public Affairs Department in London. The third was LICENSED TO DRILL!, a further multiple-media package for schools and colleges incorporating computer exercises that was based on the economics of North Sea oil; this was again made available through Phillips' Public Affairs Department, and was publicized via a program of launches held throughout Scotland in the mid-1980s.

Eric Addinall, Fred Percival, and I also made significant contributions to the theory of game design during the late 1970s and early 1980s. In the course of our work on game development, we found that we were effectively producing all our exercises by going through the same basic stages. We encapsulated these in a general algorithm, which was published in the first of the three books on gaming and simulation that we wrote together, *Games and Simulations in Science Education* (Ellington, Addinall, & Percival, 1981). A year later, we presented a much more detailed version of the

algorithm in *A Handbook of Game Design* (Ellington, Addinall, & Percival, 1982). Two years after that, we produced *Case Studies in Game Design* (Ellington, Addinall, & Percival, 1984). This presented 12 case studies showing how we had applied our algorithm in specific projects in which we had been involved over the years. All three books sold well, and aroused considerable interest, both within the simulation/gaming community and among educators and trainers throughout the world.

How My Work Diversified Later in My Career

From the mid-1980s onward, I spent progressively less of my time working on simulation/gaming, moving into other areas of educational development. Fred Percival had left RGIT in 1981 to become Head of the newly established Learning Resources Unit at Glasgow College of Technology. I continued to work closely with him for the next 20 years, however, mainly in writing books and educational booklets and in academic staff development. In 1984, we produced our ground-breaking *Handbook of Educational Technology*, a second edition of which was published in 1988 and a third in 1993, the last with Phil Race of the University of Glamorgan as third coauthor. I myself wrote the highly successful *Producing Teaching Materials* in 1985, producing a second edition (again with Phil Race as coauthor) in 1993. Between 1986 and 1987, I produced a suite of 25 free-standing booklets covering virtually all aspects of educational technology largely based on these two books. These were published by the Scottish Central Institutions Committee for Educational Development under the overall title *Teaching and Learning in Higher Education*, and sold extremely well throughout the United Kingdom. Over the period 1995-1997, I produced a greatly expanded, updated version of this suite of booklets with my colleague Shirley Earl, increasing the length of all the existing booklets and adding 10 completely new ones. These were published as a single package (with clearance for multiple copying) under the overall title *Teaching at Tertiary Level*, and again sold extremely well.

I also became heavily involved in academic staff development work during the late 1980s and 1990s. Over the period 1987-1988, I collaborated with colleagues from six other nonuniversity Scottish higher-education institutions (most of which joined RGIT in becoming universities from 1992 onward) in developing what I believe was the world's first self-study, open-learning course on teaching methodology for academic staff working in higher education. This course, which led to the award of a Postgraduate Certificate, was piloted in my own institution with myself as course leader, and was subsequently widely adopted throughout Scotland. I continued to run the course until I retired in 2001.

During the 1990s, my work diversified even further, moving into areas such as distance learning, academic quality, and the embedding of the educational technology-based systems approach into mainstream curriculum development. I carried out innovative work and published widely in all these areas. Over the period 1990-1991, for example, I helped to convert RGIT's 1-year Postgraduate Diploma Course in Occupational Health Nursing into distance-learning format, a truly massive task that took up much of my



Photo 5. One of the teams of participating teachers preparing their NORTH SEA AUCTION bids (watched by Henry Ellington) during the launch of the 1990 Grampian Primary Industry Project, where they were introduced to simulation/games and shown how to design them

time for well over a year. I also carried out a great deal of work on the upgrading of my institution's academic quality systems during the period leading up to the attainment of university status in 1992 and for several years thereafter, working closely with the Vice Principal, Gavin Ross.

Later, I became heavily involved in the complete rewriting of all the RGU's undergraduate course documentation that took place during the late 1990s, following the publication of the Dearing and Partington Reports on the future of British higher education. RGU had decided to implement the main recommendations of those two reports—that course teams should henceforth produce highly detailed program specifications identifying the different skills that students were expected to develop and that they should benchmark levels of student achievement at the different stages of a course. In order to help course teams to do so, I produced a ground-breaking set of generic level learning outcome templates, which formed the basis of all undergraduate course development within the University from 1998 onward. I also worked closely with course teams on the development of their course documentation. This task occupied a large part of my time in the years before I retired.

I did, however, still manage to remain active in the simulation/gaming field in the later stages of my career. I continued to work closely with Eric Addinall until he left

RGIT in 1989 to become Vice Principal of North East Surrey College of Technology. In addition to the work for Phillips Petroleum that was described in the previous section, we carried out a large amount of consultancy work for the UKAEA. Among other things, this involved developing a suite of games, simulations, and interactive case studies for use in the in-house training of middle managers at the UKAEA's fast reactor development establishment at Dounreay in Caithness. We also produced a highly innovative interactive computer database on the use of energy and electricity in Britain. This was made available to schools through the UKAEA's London-based education service.

In 1987, I made an invited 2-month lecture tour of Australia, giving talks and running workshops on different aspects of simulation/gaming for a wide range of educational and training organizations. In 1989, I made two 2-week visits to Ngee Ann Polytechnic in Singapore, the second of which involved helping staff to run a modified version of POWER FOR ELASKAY with all 500 of their 2nd-year electrical engineering students. This was great fun, particularly as my wife Lindsay was able to accompany me on the trip. I was also heavily involved in the 1990 Grampian Primary Industry Project, a major curriculum development program that was run in primary schools throughout the northeast of Scotland (see Photo 5). It involved classes of pupils in developing links with local businesses and developing games and simulations designed to help the pupils learn about the business side of industry. It was generally acknowledged to have been an outstanding success, stimulating the use of games and simulations in Grampian's schools and promoting collaboration between education and industry. In 1996, I was awarded a higher doctorate (a DLitt) by RGU, largely in recognition of my work on academic gaming and simulation.

I also produced two further major publications on simulation/gaming during the late 1990s. The first was a 143-page A4 booklet titled *Using Games, Simulations and Interactive Case Studies—A Practical Guide for Tertiary-Level Teachers* that I and Shirley Earl wrote for the Staff and Educational Development Association (SEDA; Ellington & Earl, 1998). The second was *Using Games and Simulations in the Classroom*, a book that I wrote with two of the teachers who had taken part in the 1990 Grampian Primary Industry Project (Ellington, Gordon, & Fowlie, 1998). I also continued to write articles and give conference presentations on simulation/gaming right up to the time I retired, two of the last being the opening keynote addresses at the 1999 and 2001 SAGSET Conferences (Ellington, 2000, 2002). When attending these conferences, I was extremely gratified to find that my work was still known to current workers in the field, and that my publications were still proving useful to them.

What I Have Done Since I “Retired”

Although I officially retired from full-time employment at RGU in the summer of 2001, I continued to carry out a large amount of work for the University for several years after this. Immediately after my retirement, I was invited to write the official history of the University, a project that I found highly enjoyable and extremely

interesting. The resulting book (*The Robert Gordon University—A History*) was published at the end of 2002, and was very well received. Four years later, I was asked to produce an update of the history, titled *The Robert Gordon University—The First 15 years (1992-2007)*. Due to the increasingly stringent financial constraints facing the University, this was eventually produced as an electronic document rather than as a book.

In the years leading up to my retirement, I had carried out a large amount of consultancy work for RGU's main commercial unit, Univation. I continued to work for them until 2005, mainly in connection with their various Nigerian and Algerian Projects. In all, I made six visits to these two countries between 1998 and 2005 in order to carry out staff development and teaching work, and also wrote many educational packages for Univation. Between 1996 and 2007, I also made a total of seven visits to Malaysia and Saudi Arabia in order to carry out academic staff development work.

Since my retirement, I have also carried out a large amount of voluntary work in schools throughout Scotland, mainly under the auspices of Aberdeen's local science and technology regional organization, TechFest-Setpoint, and the Royal Society of Edinburgh. I have also been much in demand as a speaker by local Probus Clubs and similar organizations. This has involved giving talks and seminars on astronomy, the history and philosophy of science, and (more recently) science and religion. Although this is now the only work I do, I have been finding it increasingly tiring in recent years, especially during TechFest-Setpoint's autumn science festival, which has involved me in being away from home for most of September and driving long distances between schools. At the insistence of my wife, Lindsay, I have now greatly reduced my commitment to the festival. Eventually, I know that I will have to stop all such work completely, but, in the immortal words of St Augustine, "not yet!"

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