Communication

Designing and Developing a Reflexive Learning System for Managing Systemic Change †

Ray Ison * and Chris Blackmore

Applied Systems Thinking in Practice Research Network, Engineering & Innovation Department, MCT Faculty, The Open University (UK), Walton Hall, MK7 6AA, UK;
E-Mail: c.p.blackmore@open.ac.uk

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* Author to whom correspondence should be addressed; E-Mail: ray.ison@open.ac.uk;
Tel.: +61-4-0430-8180.

Abstract: We offer a reflection on our own praxis as designers and developers of a learning system for mature-age students through the Open University (OU) UK's internationally recognised supported-open learning approach. The learning system (or course or module), which required an investment in the range of £0.25–0.5 million to develop, thus reflects our own history (traditions of understanding), the history of the context and the history of cyber-systemic thought and praxis including our own engagement with particular cyber-systemic lineages. This module, "Managing systemic change: inquiry, action and interaction" was first studied by around 100 students in 2010 as part of a new OU Masters Program on Systems Thinking in Practice (STiP) and is now in its fourth presentation to around 100 students. Understanding and skills in systemic inquiry, action and interaction are intended learning outcomes. Through their engagement with the module and each other's perspectives, students develop critical appreciation of systems practice and social

learning systems, drawing on their own experiences of change. Students are practitioners from a wide range of domains. Through activities such as online discussions and blogging, they ground the ideas introduced in the module in their own circumstances and develop their own community by pursuing two related systemic inquiries. In this process, they challenge themselves, each other and the authors as learning system designers. We reflect on what was learnt by whom and how and for what purposes.

1. Managing Systemic Change

Contemporary news media often refer to systemic failure as a description of a context where seemingly little can be done or as synonymous with "no one person is at fault". It would appear that there is limited appreciation that thinking based on the different traditions of systems scholarship [1,2] can be used to systemically address issues associated with change, strategy or failure. Rarely also do contemporary media accounts distinguish between systemic (relational, joined up) and systematic (linear, step-by-step) understandings and practices. In this paper, and the case we report, systems thinking/practice is conceptualized as comprising both systemic and systematic thinking/practice *i.e*., together they comprise a whole, or duality [1]. Thinking systemically or holistically, in comparison to systematically, appears far from the "mainstream" in most western societies. This paper reports on the authors' praxis as designers of a learning system that aims to address this deficiency. It tells the story of a learning system design within the Systems Thinking in Practice (STiP) post-graduate program at the Open University, UK (OU) developed to build praxis capability in relation to the systemic issues mature students confront in their professional and personal lives. The paper is a response to the editors' invitation to contribute to this special issue; it is not a report of research designed systematically to evaluate our module and program because the resources to do so were not available to us.

The STiP program has two main foci: managing systemic change and thinking and acting strategically which are manifest as two core compulsory courses or modules. This paper primarily considers managing systemic change (OU module code TU812) but keeps in mind the strategic context. The underlying premise on which the notion of "managing systemic change" is built is that by using systems thinking in practice, it is possible to appreciate potential changes in a situation of concern that are systemically desirable and, if managed appropriately, become culturally feasible (see [3] where these ideas are explicated further). The strategic opportunity offered by TU812 is that through this combination of processes, it is possible to alter the trajectory of change.

In this paper, we will elucidate further what we mean by "managing systemic change" and why and how we have designed a learning system to develop capability to do it. Two design features are highlighted (i) systemic inquiry, action and interaction and (ii) landscapes of practices and systems praxis. A limited set of evaluative data are presented to address the question: has our learning system design been fit for purpose? To conclude we reflect on the challenges for reflexive learning system

design raised by our experiences as designers. Firstly, though we explore the history of our situation and the cybersystemic understandings upon which we build.

2. Building on Cyber-Systemic Understandings

Systems education began at the OU in 1971 when John Beishon was appointed as the first Professor of Systems in the new Faculty of Technology. Beishon, leading the Systems discipline, thus faced the challenge of creating a new program of study in a form he and his colleagues were inventing as they went along, as well as drawing together conceptual and methodological material from the cybernetic and systems fields—which were then still in their infancy. From these beginnings, internationally recognised cyber-systemic teaching materials, scholarship and research and transformative learning have been produced for over 40 years. Cybersystemics is a neologism that has been coined and is useful, we argue, for breaking out of the dualism, manifest in social and organizational separations (such as different professional societies), associated with the use of systems and cybernetics concepts [4]. The OU provides an excellent case study of how the intellectual lineages of cybernetics and systems have been mutually influencing in the pedagogy that has been undertaken since 1971.

Beishon set the essential directions for systems teaching. Under his chairmanship, the course T241, Systems Behaviour, the first systems course, ran for 18 years from 1972–1990 with several other systems courses running in parallel and following on. In appreciating the OU context, it is important to know that a course (now called a module) currently involves an investment anywhere between 0.25 and 1 million pounds. Historically, OU courses generally settled into a 60 or 30 credit structure where one credit equates to about 10 h of study. The design praxis reported here concerns "Managing Systemic Change: Inquiry, Action and Interaction", (TU812), a 30 credit module which is one of two core modules in the STiP program. At a conservative estimate, over 30,000 students have studied Systems courses at the OU. A "student" in the Open University today has the median age of 32 and is probably in full-time employment whilst studying—students may also come from anywhere in the world though a greater percentage come from the UK and Ireland, followed by continental Western Europe. The OU is recognized internationally for its model of supported open learning; it is the largest academic institution in the UK, in terms of student numbers with "more than 240,000 students, close to 7,000 tutors, more than 1100 full-time academic staff and more than 3,500 support staff" (see [5]). A M.Sc. in the OU comprises 180 credits with the option of a 30 or 60 credit research project component. It is possible also to obtain a PG Certificate (60 credits) or PG Diploma (120 credits) on the way to gaining a M.Sc. or as awards in their own right.

The founding rationale for the OU Technology Faculty, of combining disciplines of synthesis (systems, design) with disciplines of analysis, remains relevant today in fields such as sustainable development [6,7], innovation studies, health, engineering and organizational change and viability (e.g., [8]). Systems thinking and practice skills are in demand for addressing consistent public policy failure in response to a range of "wicked problems" [9,10] including human-induced climate change, what Levin *et al.* [11] call a "super wicked" problem. These authors attribute super-wicked problems with four additional features in addition to the 10 proposed by [12], notably: (i) "time is running out", (ii) "those seeking to end the problem are also causing it", (iii) there is "no central authority", and (iv) "policies discount the future irrationally". Despite the growing sense of urgency to respond to

"super-wicked" problems, higher education institutions now seem less able to organize inter and trans-disciplinary modes to deal with the challenges such issues of global significance raise. Examples include the demise of the 17-year initiative at Hawkesbury described in [13] as well as the Systems initiative at the University of Queensland (see [14]). Nor do they seem able or willing to invest in curricula that address the growing need for cybersystemic understandings [7]. For example, complexity "managing" skills are recognized as being deficient among graduates and thus constrain UK international competitiveness [15]. King and Frick [16] describe systems thinking as a difficult skill to acquire and as not commonly taught. There are fortunately some exceptions [17]; the ISSS (International Society for the Systems Sciences) has attempted to maintain an ongoing conversation about systems education (see [18]) as has IFSR (the International Federation for Systems Research) through conversations devoted to the topic [19].

However, despite Systems education being offered in higher education for over 40 years, there is still no strong body of empirical evidence for what is required for good design of learning experiences, whether at a distance, as in the OU, or face-to-face. When faced with the challenge of designing the OU's first Master's level Systems offering in 2007, we had 36 years of accumulated experiential understanding as well as a limited number of research studies to draw upon. We review some of this research in the next section.

2.1. Exploring the Research Base

USA research evaluating a systems theory and methodology course for graduate students has shown that otherwise mature and intelligent students could not grasp and apply systems concepts [20]. This presents the systems educator with a major design challenge. If learning is considered a prerequisite for the emergence and evolution of systems thinking in practice which addresses complexity and is adaptive, then a theory of learning is required which makes sense of our actions in the world. It is also essential to track current on-going efforts to develop and teach concepts about systemic practices able to engage with complexity. This is because it is known [20–22] that personal change in epistemic assumptions is absolutely essential to any major breakthroughs in decision making based on understanding and application of emerging theories to practical problems. If, as Salner found, many people are not able to fully grasp relatively simple systemic concepts (such as non-linear processes, or self-reflexive structures), they will not be able to rethink organizational dynamics in terms of "managing" complexity or systemic change without substantial alteration in worldviews (their "applied" epistemology). Salner [22], drawing on earlier work by Perry [21,23] and Kitchener [24], describes the prevailing theory on epistemic learning as involving the deliberate breaking down and restructuring of mental models that support worldviews. According to Salner [22], Prigogine provides an additional lens on this theory in his discussion of "dissipative structures". This theory provides a model of the dynamics of epistemic learning; each learner goes through a period of chaos, confusion and being overwhelmed by complexity before new conceptual information brings about a spontaneous restructuring of mental models at a higher level of complexity thereby allowing a learner to understand concepts that were formally opaque.

There is considerable experience of teaching systems thinking for complexity management in the UK, but it has not been well researched. As a result, it is not known how well it is done, or whether it

could be done more effectively for a wider range of learners. Systems, cybernetic and complexity research are historically connected in their concern for understanding communication and control, emergence, self-organization, feedback and interconnectivity, but in learning system design terms, it is important to distinguish at the outset between learning concepts abstracted from their context and use or as part of what we at the OU call an active pedagogy *i.e.,* as part of praxis in the learner's own context/lifeworld. Over the years, we have also become aware of another important pedagogical design issue which has triggered increasing ethical concern. Developing new courses or ways of teaching may be insufficient to develop STiP competencies which are sustained if the institutional structures (e.g., promotions procedures, *etc.*) and the key relationships (the organization) of a firm where a learner is employed are inimical to the further development and testing of their mental models. Thus, we hypothesize, there is a need to consider what characteristics are most likely to be needed for the design of "learning systems" (a system where there is a high degree of connection between learner, tutor, course, work context, and academic management of the curriculum). It is possible that a learning system capable of sustaining life-long STiP competencies will require different structures and organization than is currently found in most formal and non-formal education and training settings which often militate against emergence and self-organization.

2.2. Learning System Design and Facilitation of Learning—Some General Principles

It can be argued that OU academics are designers and developers of "learning systems" rather than simply producers of courses [25,26]. Our praxis has evolved over 40 years under joint pressures of competition from other providers and new technologies for design and delivery of material and mediation of learning [27]. How we have come to understand the concept of a "learning system" and its design is outlined in Figure 1.

Following Wenger [28], we contend that learning of itself cannot be designed but social infrastructure that fosters learning can be and that there are few more urgent tasks in today's societies [29]. Ison *et al.* [26] distinguish between first- and second-order design of learning systems by applying *cybernetic* frameworks of understanding (Figure 1). First-order design is characterised by blueprints, goal-seeking behaviour and an assumption that control is possible. Second-order design contextualises whatever is designed and occurs when designers show awareness that the design setting includes themselves and their history.

In keeping with a second-order design approach, the authors/designers of TU812 began by considering their own histories and their own understandings of the system of interest of which TU812 was a part. The notion of a "trajectory" was used—a past, present and future pathway—developed by Wenger [28] to help people understand their identities in relation to a community of practice. The example of the authors' trajectories was also used to guide students to explore, and share with each other in their online forum, their own trajectories as points of entry to the module. They also concluded the module by reflecting on a particular aspect of their trajectory and how they might make changes—this concerned the extent to which they interacted with other people in their practices related to managing systemic change and the extent they might want to in future. Wenger [28] (p. 155) claims that "a sense of trajectory gives us ways of sorting out what matters and what does not, what contributes to our identity and what remains marginal" and in his later work he connects the idea of

learning as a trajectory with "The concept of learning citizenship which refers to the ethics of how we invest our identities as we travel through the landscape." Thus, learning of individuals is still very much within a social context, recognising the potential of an individual to bridge communities and to help connect others to communities that will enhance their learning capability.

Figure 1. Understanding a Learning System? (from Ison *et al*. [26] (p. 1344)).

"For Blackmore [30] a learning system comprises interconnected subsystems, made up of elements and processes that combine for the purpose of learning. The placement of a boundary around this system depends on both perspective and detailed purpose. From a first-order perspective the design of a learning system might seemingly involve combining elements and processes in some interconnected way as well as specifying some boundary conditions—what is in, what is out—for the purposes of learning. The specification of learning outcomes (often expressed as aims and/or objectives) in the absence of any real contextual understanding about learners predisposes, or restricts, most OU distance-learning course designs to this approach. However, we and others in the OU, have in our design practice made the shift described by Bopry [31] as moving from prescription of instructional methods and means to the development of cognitive tools to provide support for the activity of the learner. With this shift we see a "learning system" as moving from having a clear ontological status (e.g., this course) to becoming an epistemic device, a way of knowing and doing (sensu Maturana—see [32]). This is consistent with Blackmore's [30] claim that appreciative systems (sensu Vickers [33]) are learning systems suggesting a design perspective that is more organic and observer dependent viz: let us consider this situation as if it were a learning system, or, in Vickers' terms. "I have found it useful to think of my life's work in terms of appreciative systems".
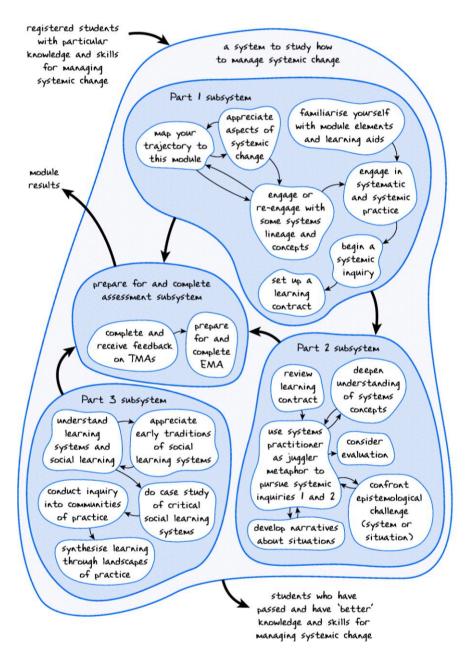
Reflecting this turn Russell and Ison [34,35] suggest it is a first-order logic that makes it possible to speak about, and act purposefully to design or model a "learning system". A second-order logic appreciates the limitations of the first-order position and leads to the claim that a "learning system" exists when it has been experienced through participation in the activities in which the thinking and techniques of the design or model are enacted and embodied. An implication of this logic is that a "learning system" can only ever be said to exist after its enactment—that is on reflection. The second-order perspective is not a negation of the first—they can be understood as a duality. This first to second-order shift also enables a more effective engagement with the difficult concept of "learning"."

3. Central Learning System Design Elements

Figure 2 is a summary from one of the designer's perspective of the overall module (*i.e*., learning system) design for TU812 "Managing Systemic Change: inquiry, action and interaction". It is not possible here to go into detail about every feature; the module has the following administrative features: (i) it was co-designed by the authors, in conjunction with other professionals such as editors, graphic designers, specialist consultants, *etc.*, and presented for the first time in 2010 as part of a new STiP MSc; (ii) it is a 30 credit module requiring approximately 300 h of study time by mainly mature

age students who study at a distance; (iii) the module is a compulsory component of two named qualifications—a Post Graduate Diploma (STiP) and M.Sc. (STiP) and can be counted towards some other awards. In the STiP qualification context, monitoring and evaluation of learning is a key part of our design principles. Three tutor-marked assignments (TMAs) and one end-of-module project-based assignment (EMA) are used to assess the module.

Figure 2. A conceptual model of a system to study how to manage systemic change using the Open University module TU812. Source: Open University [36] (p. 177).

Iterative use of a "learning contract" in successive TMAs was designed to test if students can make the shift from a systematic to a systemic design. The move from a systematic to a systemic design can be understood through the move from a tabular matrix with independent cells to a systemic diagram, such as an SSM (soft systems methodology) style activity model which encompasses connections and feedback processes. This is more than a shift in representation, though this is also needed. This evolving

learning contract forms the foundation for their engagement with the course concepts so that the students' own learning needs and desires for situational transformation can be accommodated within the module context.
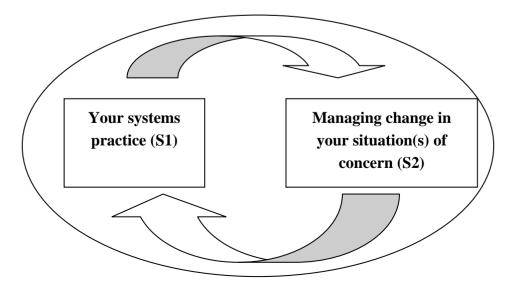
In the rest of this section, we address two of the main conceptual elements that were built into the module design, systemic inquiry and landscapes of practice.

3.1. Systemic Inquiry, Action and Interaction

As the module title suggests, inquiry, action and interaction are three key elements of managing systemic change. Inquiry, referred to as "systemic inquiry" in the module, (following [3,37]) is, we argue, a key form of practice for situations that are best understood as interdependent, complex, uncertain and possibly conflictual and in which there are multiple stakeholders each with their own history and perspective. Systemic inquiry, in the sense developed in this module, is also an expansion of traditional practices associated with project and program management because it assumes uncertainty and complexity as a starting point. Systemic inquiry can be seen as an antidote to living in an increasingly "projectified world" [1] and an extension of concerns with inquiry-based approaches evident in the scholarship of C. West Churchman and Peter Checkland (see [38]).

The way "action" is understood in the module is straightforward—it is about putting thinking into action to effect change, change that is systemically desirable and culturally feasible *i.e.*, it is change that is more than being just desirable or feasible. As all action is achieved through some form of practice, a key element of the module involves the learner critically exploring what systems practice is and how it can be done as well as appreciating what sort of difference it can make (this is S1 in Figure 3). In the module, students undertake two systemic inquiries; as Figure 3 depicts the course is about reflexive practice, which is more than reflective practice *i.e.*, we understand reflexivity to be a second-order practice involving reflection on reflection.

> **Figure 3.** A virtuous cycle of inquiry in which an appreciation of systems practice (S1) when enacted can contribute to managing change in a situation or situations of concern (S2) that is systemic, at the same time as deepening understanding and practice of systems practice (S1) which can be applied in new situations (Sn). Source: Open University [36] (p. 58).

The module design starts with the practitioner and their situation (Part 1), expands to include the dynamics of practitioner, situation, frameworks and methods (Part 2) and then expands to include material that develops skills and understanding and interaction through social learning and communities of practice (Part 3). This design recognises that as more stakeholders become involved the complexity expands as do the demands for practice involving interaction of some form with others (stakeholders, clients, employees, employers *etc*.). Had our situation involved face-to-face teaching or more interactive blended learning, we would probably have started out differently.

3.2. Landscapes of Practices and Systems Praxis

Wenger's social theory of learning, elaborated in his work on Communities of Practice [28], also has interaction at its core. For Wenger, social learning is about learning in a social context and learning can be viewed as a journey through landscapes of practices (LoPs). TU812 students use the ideas of CoPs and LoPs in relation to situations of their own choice. Wenger [39], (p. 140) argues that "As learning gives rise to a multiplicity of interrelated practices, it shapes the human world as a complex landscape of practices. Each community is engaged in the production of its own practice—in relation to the whole system, of course, but also through its own local negotiation of meaning. This process is therefore inherently diverse".

The LoPs concept enables students to review their own future learning trajectories by helping them review their multi-membership of communities, recognise the multiple levels of scale with which they identified and generally providing them with a potential way of considering what they perceive beyond the communities and practices with which they most identified from their own experience. Wilding [40] reflected in her blog on what she had learned as she had taken her journey through landscapes of practices in her Open University studies. For Wilding, it was a range of concepts, methods and techniques that had made her think differently about her connections with communities of practice; "What I have also realised is that my academic studies have put me at the periphery of a number of different communities of practice. In a very formal sense I have accessed the documented know-what and know-how of that community with only incidental access to individuals from that community and then I have moved on".

Students found particularly inspiring Wenger's suggestion that "…we each have a unique trajectory through the landscape of practices. This trajectory has created a unique point of view, a location with specific possibilities for enhancing the learning capability of our sphere of participation. From this perspective, our identity, and the unique perspective it carries is our gift to the world" [41], (p. 197). An example of a TU812 student using this unique trajectory idea in reflecting on her practice comes from Wilding [42] "*I realised I'd been learning all this systems stuff and then feeling disappointed that others around me hadn't—suddenly this became my responsibility—my gift—I'm their bridge into systems practice. This is not an easy role to take on. When you are a change agent working inside an organisation, it's like a game of chess, you have to pick your moves, pick your timing and it seems that I too have to try and temper the theory*".

Blackmore [2] adapted Wenger's concept of a landscape of practices to map a landscape of systems praxis in relation to a range of focuses that authors writing about social learning identified with. Fourteen themes arose from these authors' accounts of their trajectories, multi-membership and

working at multi-scale which give some idea of what learning for sustainability in times of accelerating change might look like. These themes were

(1) Institutions, organisations and institutionalising
(2) Ethics, values and morality
(3) Communication
(4) Facilitation
(5) Managing interpersonal relationships and building trust
(6) Communities and networks
(7) Levels and scale
(8) Boundaries and barriers
(9) Conceptual frameworks and tools
(10) Knowledge and knowing
(11) Transformations
(12) Time lag and dynamics of praxis
(13) Design for learning
(14) Stability, sustainability and overall purpose.

The concepts of communities and landscapes of practices have proven to be useful elements in the design of TU812 particularly as ways of conceptualising students' actions and interactions in managing systemic change in their own situations.

3.3. Fit for Purpose?—The Student Experience of TU812

In this section, we first provide evidence of impact, before discussing the evidence for student experience to date in relation to our design considerations. As outlined earlier, evidence has not, unfortunately, been gained through a comprehensive and rigorous systematic evaluation of the module or STiP program (though since beginning this paper, some funding to begin such a study has been obtained). A module at the OU is almost literally a fixed product until the course review date—in the case of TU812 the first opportunity to substantially revise course content is 2017. In the interim, as designers we have to use the feedback to hand to adjust, not substantially alter, each new presentation Evidence comes from four sources: (i) sector wide analysis in the UK; (ii) the OU's internal monitoring and evaluation procedures for all modules, including end of module surveys of students; (iii) comments from the module External Examiner, part of the UK and OU's quality control processes and (iv) qualitative data from surveys, comments within the module on-line Forum (within the OU's standardized Moodle-based virtual learning environment, or VLE) and student and alumni blogs.

3.4. Sector-Wide Positioning

It is not always easy to judge a program's performance in relation to sector wide offerings. Within UK HE data collection, TU811 and TU812 are recorded under the Business and Management subject Innovation, Enterprise and Creativity. Data prepared by Martin Reynolds for internal program review purposes show that the part-time market is small and driven by the OU. In 2006/07, the market was 4 FTEs (Full Time Equivalents) rising to 91 FTEs in 2010/11. The increase was due to the OU's entry

in 2007/08. The 2010/11 data shows that the OU had 74 FTEs from a total market of 91 FTEs. The next largest provider was the University of the West of Scotland (4 FTEs). Other institutions record STiP-like qualifications under different subject categories such as Change or Strategic Management. "Systems" content is covered within many Masters in Management qualifications rather than typically as a standalone offer. For example, systems thinking and strategic modeling is a component of LSE's M.Sc. in Management qualifications. The University of Derby is offering a M.Sc. in Business and Systems Thinking (full-time) but the University of Bristol is no longer accepting students on its M.Sc. in Systems Learning and Leadership, and Northumbria has withdrawn its M.Sc. in Complex Systems Thinking and Practice. So, the STiP Award provides a unique HEI offering at PG level in the UK. Whilst some universities including the OU have a record of incorporating Systems thinking within modules associated with established disciplinary areas—typically, business studies, health studies, international development, environmental management—the OU appears to be the provider of the only accredited Masters level program in Systems Thinking.

3.5. OU Monitoring and Evaluation

Data on student registrations on TU812 are shown in Table 1 alongside registrations in the other core module for the STiP program "Thinking strategically: systems tools for managing change" (OU course code TU811). In four presentations, 365 students have registered on TU812; this is at the higher end of student registrations on PG modules offered by the MCT (Mathematics, Computing and Technology) Faculty at the OU. As shown in Table 2, 18–40% of students registering on TU812 came from outside the UK in the first two presentations, the majority being from an EU member state other than UK or Ireland. Student completion rates for TU812 ranged from 79–81% for the first two presentations (2010–11) whilst pass rates were 75–76%. These are typical of supported open learning completion rates and may be contrasted with the recent development of MOOCs (Massive open online courses) where completion rates average about 7% and rarely exceed 25% [43].

Table 1. Data on students registering on STiP core module presentations (TU 811 and TU 812) 2010–2013 (N.B. Historically registration at the OU is module, not award based, though this is changing so data applying to each module do not necessarily apply to the same students).

Year	TU811	TU812	Total
2010	91	107	**198**
2011	134	83	**217**
2012	111	78	**189**
2013	110	97	**207**
Total	**446**	**365**	**811**

Table 2. Core STiP module student origins 2011–12.

Module	Presentation	Non-UK%	*EU*	*Ireland*	*Outside EU*
TU811	2011	31%	18%	3%	9%
TU811	2012	28%	11%	5%	12%
TU812	2011	40%	28%	4%	8%
TU812	2012	18%	15%	n/a	1%

Evidence of STiP impact to date can be seen through citations data and sales figures for the set of co-published books produced for the STiP programme (Table 3) as well as publication, including citation, data for recent scholarly publications by the STiP team and STiP graduates (e.g., [8,40,42,44]).

Table 3. Book sales (includes print sales, MyCopy sales, bulk sales and individual eBook sales—as of April 2013) and chapter downloads 6 June 2010—March 2013 of the four books co-published by the Open University with Springer (UK) for use in the STiP (Systems Thinking in Practice MSc programme).

Title	2010	2011	2012	2013	Total	
	Chapters	Chapters	Chapters	Chapters	Books	Chapters
Systems Thinkers (ST)	3344	2548	3621	574	**1437**	**10,903**
Systems Approaches (SA)	1101	1171	1499	424	**1022**	**4195**
Systems Practice (SP)	346	439	582	107	**477**	**1474**
Social Learning Systems (SLS)	969	1281	1451	406	**465**	**4107**
TOTAL					**3401**	**20,679**

With respect to annual course surveys following the 2012 presentation (completed by 61 students or 47.5%), there was positive support for the teaching support (96.6%), teaching materials (69%) and learning outcomes (85.5%). Keeping up with the workload at 62.1% did not seem highly problematic nor did study experience (69%).

3.6. External Examiner Comments

As with all HE teaching programs in the UK external examiners from within the HE sector have been appointed to independently monitor and report on quality. In the case of the OU, appointments have historically been at the level of each module. External examiners submit reports annually and module teams are expected to respond to comments as soon as practicable. The first TU812 external examiner in a final report based on four years of experience commented that: "*over* (the four years) *I have seen a steady increase in the quality of the scripts and the maturity of the program. I believe that the course is excellently run. The OU should be commended on its commitment to innovative programs of this kind*." It was said that "*the team has worked well together to build a program of high quality. There is a strong sense that this program is run by a team, unlike some programs I have seen which feel like collections of individuals with all of the disjunctures that then have to be knitted together. Staff are committed and listen to constructive feedback. This has led to a maturing of the program, and a high quality of output from the students*". The external congratulated the team on producing and developing an excellent course and noted concerns that in limited instances, students may pass without proper engagement with the course and that courses of this nature really need to have time for good face-to-face contact. The examiner claimed that "*if the core competencies learned relate to the ability to recognise, catalyse, facilitate systemic change, then it follows that part of the training should support the facilitation skills required. Facilitation training cannot be done at a distance. So I would request that consideration be given to building this into this* program". This supports our desire where possible to build blended learning opportunities for our students.

3.7. Qualitative Sources

Feedback from qualitative sources ranges from some of the most positive and enthusiastic we have ever received as educators to feedback that is less than enthusiastic. The balancing of systems theory with practice that Wilding (ibid) refers to was also a challenge for us, the authors, in relation to TU812. Our praxis-based approach was not readily appreciated by all our students, many of whom came from quite practical engineering and technology backgrounds because of our faculty base. For some coming from more positivist traditions, having to be self-critical and to explore assumptions underlying one's own thinking and doing was a step too far. Others however felt fundamentally changed by the experience of discovering their own epistemology. TU812 became known within the OU as a "marmite" module, as students who responded to requests for feedback tended to either love it or hate it (mimicking the advertising campaign for the well known yeast extract spread found in many households in the UK). We found that those students whose views on the module were in the mid-range rarely offered us detailed feedback. For example, in the 2012 annual survey, the module did not appear to meet all students' expectations (rated at 46.4% which is below average). This can be explained in part based on the background research in the area of systems/teaching/learning which suggests that a bimodal response amongst students is likely.

Posting to the module VLE (virtual learning environment) on 3 April 2012, a thread exemplifies a very positive response:

"*…… I took the PFMS model [a conceptual model of practice comprising practitioner, framework of ideas, method and situation] to take a snapshot on what has happened with my framework of ideas, my methods and myself by engaging in the TU812 module. It was nice to take in the shifts I made and to realize how much easier it is to work with this model than the first time I looked at it.*

I can only concur with K's statement in his posting ……… "I can conclude already now that I am not the same person any more than I was before I started this module. And while all people are changing all the time, I experience this module as a catalyst for personal change. Without studying this module, I wouldn't be undergoing such a fundamental, mind-opening change in such a short time. That's a very satisfying experience."

Thank you K, for your well-chosen words (so authentic Description: wink). Thank you TU812 team and fellow students here at the course forum for such a wonderful module ……".

Another posting to the VLE in December 2013 from a "student" recently retired from a mining multi-national exemplifies the potential for personal, systemic transformation offered by TU812. In this instance, the person had studied systems, especially SSM, early in his career:

"*Anyway, my thinking is going along these lines now, i.e., that systemic inquiry is "always appropriate", either as the opening gambit and/or as the end game. All my "systems" activities for the last 20–30 (i.e., post "soft"), have taught me that in many cases where a system has "failed", it has been because the "system design" did not address the right problem, or had not explored the problem in sufficient depth. Thus, in my practice (gained from the "virtuous circle" process), I have, as far as possible, tried to ask "is this the right problem" or, "are (we) asking the right question". Asking these questions has to be systemic, as I see it, because of the uncertainty (i.e., we don't know the answer at this stage). This process is holistic and usually quickly leads you (to) a point where you can say*

with a lot less uncertainty that this (is) a "difficulty" and can be dealt with systematically or this is messy/wicked/whatever and will require a much more rigorous inquiry. Having given it a bit more thought (maybe even at home), this is the point at which you have to go to your "paymaster" and try to convince him/her that the benefits that will accrue from a properly constituted and resourced inquiry will be cost-effective. Then it's out of your hands".

Our OU experience of systems education points to a range of issues that confront the would-be systems educator. Perhaps the most significant is the lack of institutionalised demand-pull for STiP skills and capabilities e.g., through advertised posts, capability and skills frameworks; professional success narratives and the like.

4. Challenges for Reflexive Learning System Design

If the future of our climate-changing world is unknowable, there is a need to take more responsibility for systemic effects of human actions [6]. This reflection shows how this can be done through designing and participating in learning systems that generate effective systems practice. Our design for a coupled system—student and context—has realised many of its design ambitions—but has also come with certain costs in that it alienates some students and the OU standard evaluation processes are not sensitive to our design ambition. As we go forward we face challenges regarding how far we can go with this design without for instance more face-to-face elements and keeping to a generic form of STiP rather than tying it into one sector or another e.g., health, environmental management, *etc*.

Our module and program raises the challenge of praxis rather than just the theory or practice and this in turn raises questions about the epistemological issues at the heart of systems education, pressures in some quarters to move to more utilitarian methods and tools-based teaching and the nature of evaluation where transformative learning is the ambition. The former Centre for Systemic Development (University of Western Sydney, Hawkesbury) (e.g., [13,45–47]) as well as Systems educators at the OU have tried to incorporate what is known about making epistemic change happen for people, and it has been done in the past with encouraging short term results as far as we know (e.g., [48–50]). What is lacking is any longer term (and longitudinal) check on the degree to which learning that we can "see" is being utilized and further developed in practical situation improvement in organizations. However, the failure to embed STiP in contemporary organizational life can be seen as a form of institutional failure as much as a failure in learning system design [10,51]. There is a strong case to return to the ambition articulated by Erich Jantsch [52] and examine why his vision of the systems-based transdisciplinary university has failed to materialize. This is particularly so as his vision remains relevant today [5,29].

A research program to address these concerns is needed and under development at the OU. Our reflections demonstrate that the purposeful design of a second-order learning system in which reflexivity is an emergent outcome is possible—*i.e.*, students can carry out simultaneously the two inquiries described in Figure 3, and thus think about thinking as well as design their designing. As evidence of the transformative potential of our module and program, readers are invited to read Helen Wilding's reflections on her study of the module TU812 and the other core module in the STiP program (Thinking strategically—TU811) (see [53]). The emergence of a self-organising and enthusiastic LinkedIn on-line community of 394 STiP alumni can be seen as testimony to the impact of

our program. In the context of the theme for this special issue of Systems Education for a Sustainable Planet, recent discussion threads by STiP alumni have included: the Circular Economy; Innovation for a complex world; and multiple threads about systems praxis.

In the context of sustainability and transformative education, much still needs to be learnt about the relationship between knowledge, learning and action [54,55] and the institutional settings that are conducive to innovative forms of praxis. Many models and frameworks have been developed that help to conceptualise this relationship (see [17]) including some of those included in TU812. Our experience with TU812 affirms earlier experiences we have had that when engaged with rigorously within an appropriately designed learning system, systems thinking and practice can orchestrate effective, reflexive, transdisciplinary praxis. Our experience shows that it is possible to transcend disciplinary background, domain of concern as well as cultural background to facilitate the emergence of profound learning relevant to managing our co-evolutionary futures. In our human circumstances, more investment in learning systems of this nature seems warranted.

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Author Contributions

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Conflicts of Interest

The authors declare no conflict of interest.

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