Integrating sustainable development into economics curriculum: A case study analysis and sector wide survey of barriers

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1. Introduction and background

1.1 The importance of the subject of Economics for Sustainable Development and Cleaner Production

Economics is a critical subject in bringing about sustainable development; by its definition it addresses questions of resource allocation. It is the flow of resouces through societies and economic systems that is driving key global environmental pressures as evidenced by Allwood et al (2011) but also social impacts and inequality, as evidenced by Piketty (2015). Fundamentally, economics addresses choices about what is produced and consumed in

societies. It is these choices and incentives that are central to the root causes of global environmental and social impacts. Jackson (2009) demonstrates this in relation to economic growth and that technology alone is highly unlikely to be enough in resolving key global environmental pressures. This paper starts by identifying literature on educating for sustainable development in business and economics and highlights that the integration of sustainable development into mainstream economics curriculum is scant and largely missing based on current evidence.

1.2 Educating for Sustainable Development

Our Common Future (1987) was the key publication in terms of influence and early shaping of societies' thinking on environment, development and governance and resulted in the Brundtland definition of sustainable development: "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED 1987). Our Common Future (1987) set out the case for three reinforcing and critical aims of sustainable development: 1) improved equity in resource distribution benefits across and within societies; 2) improving human well-being; 3) development that is within environmental constraints and maintains ecological integrity over intergenerational timescales. From review it was found that sustainable development has been defined in many different ways in the literature (Mebratu 1998, Pezzoli 1997) and that there is substantial differences in argument and opinion concerning how it should be defined, see Lele (1992), Beckerman (1994), Robinson (2004), Sneddon et al. (2006), DesJardins (2015) and Pater and Cristea (2016). Sneddon et al (2006) cite the Brundtland definition as the most widely accepted.

At the international level the UN have led the education for sustainable development (ESD) agenda since 1988, where UNESCO put forward the concept of Education for Sustainability, building on a number of past events and initiatives. More recently, the Principles for

Responsible Management Education (PRME) was developed in 2007 as a platform to increase the profile of sustainability in higher education (UN PRME 2017).

There has been some progress in implementing ESD in business schools, see for example Singh et al (2011), Dieck-Assad (2013), Sharma (2013), Wieland and Fitzgibbons (2013), Kopnina (2014), Adomßent et al (2014), Marques et al (2016), Landrum and Ohsowski (2017), Fisher and Bonn (2017) , Kolb et al (2017), Filho (2017), Gupta and Singhal (2017) amongst others[1]. Table 1 identifies the scope of these studies.

Study	Scope of what is covered relevant to the current paper
Stubbs and Cocklin (2008)	Presents a framework to help MBA students understand and reconcile different sustainability perspectives in business and found it usefull in developing critical and reflective thinking.
Singh et al (2011)	The study looks at top business schools in India which promote sustainability issues, exploring practices of incorporating sustainability applied by leading professors and business schools
Sharma (2013)	The study draws lessons from practices in developing sustainable development curriculums and programs in two different business schools (in the USA and Canada).
Wieland and Fitzgibbons (2013)	The study looks at the effect of an increased focus in business curricula to adopt corporate sustainability related courses and the influence of this on students views concerning legitimacy of social and environmental issues in corporate decision making.
Dieck-Assad (2013)	In parts of the paper the responsibility of business schools in educating on globalisation and sustainability is discussed and some goals set out.
Kopnina (2014)	The study conducts case study analysis of the shift in business students understanding of environmental problems and economic development before and after an intervention.
Adomßent et al (2014)	The study looks at Management education for sustainable development in Central and Eastern Europe, exploring initiatives to integrate sustainability including some on curriculum development.
Marques et al (2016)	The study analyses the elements present in post graduate programmes in Administration that improve the formation of professionals commitment to sustainability by analysing pedagogical projects of eight programmes of an MSc in Business Administration.
Landrum and Ohsowski (2017)	The study identifies the content of introductory business sustainability courses in the USA to identify the most frequently applied reading material and its sustainability orientation, looking at syllabi reading lists of 81 courses from 51 US colleges and universities.
Fisher and Bonn (2017)	The study investigates the level to which Australian undergraduate management curricula explicitly identify a focus on sustainability and changes occurring between 2009 and 2014 using web-based content analysis of 40 Australian universities' business and management courses.
Kolb et al (2017)	The study analyses the relationship between sustainable development goals and education in business schools via action research and key word searches of a case study to explore education activities.
Filho (2017)	The study investigates an example of how to implement the PRME and UN 2030 Agenda for sustainable development in higher education school curricula using a Brazilian business school case study.
Gupta and Singhal (2017)	Proposes a framework for integrating sustainability into curriculum in Business Schools.

Table 1: Scope of business or business and management school wide studies

[1] There have been systematic reviews and institution wide case studies on the subject such as Wu and Shen (2016). UK institution wide are those such as Scott and Gough (2006), Lampkin (2015) and Wyness and Sterling (2015) Cicmil et al (2017) and Tierney et al (2015). Many special issues have also been undertaken in relation to educating for sustainable development more generally such as Ramos et al (2015).

From review it was found that such business or business and management school wide studies do not generally report specific progress in economics, there was also found to be a lack of reporting on progress in relation to economics.

In the past when economics courses have educated on sustainability, this has usually been through a module on environmental economics, economics of the environment, business and sustainability or to tack the subject onto the end of a course (The Handbook for Economics Lecturers 2014a&b). A more effective way to integrate sustainability would be to incorporate it throughout an introductory economics course (The Handbook for Economics Lecturers 2014a&b). The latter approach will have greater constructive alignment. Sidiropoulous (2013) argues for integrating into main programmes. If provided as an elective module, some students may not attain any education on sustainability. Spash and Ryan (2012) identify a number of fields of economics that have paid some attention to environmental concerns in research, through theoretical and empirical work. From this study's review, three evidence based empirical studies were found that examine implementation of ESD into economics curriculum: Green (2013); Lungu (2013) and America (2014). Green (2013) identifies integration of sustainability as often not common place. Green (2013) interview 54 students from three leading US universities for economics and found that introductory economics courses place little emphasis on the environment and sustainability. Lungu (2013) conducted archival research of journal papers and other survey work for looking at educating for sustainability in accounting; a survey questionnaire was then conducted with students in economics and accounting. The results of Lungu (2013) are somewhat unclear, but from discussion they identify that the discipline of economics and accounting had significant reluctance to educate on sustainability. This situation is coherent with mainstream introductory economics text books, where the majority have little to no discussion of environmental components in relation to sustainable development (Reardon 2007). America (2014) studied in relation to pre-higher

as opposed to higher education, conducting interviews with teachers in economics and management science to understand conceptions of sustainable development and curriculum. Their main relevant finding is that teachers made connections between economic and social issues but not with environmental issues. From review, the small number of studies that empirically investigate the integration of sustainability into economics curriculum in higher education focus on specific courses rather than programme/department wide interventions, and also do not undertake primary research with academics. Spash and Ryan (2012) conduct empirical analysis with academics on economic schools of thought on the environment. Spash and Ryan (2012) identify economics as being generally slow and reluctant in seriously addressing environmental problems within its core disciplinary teaching, they do however recognise areas of theory in economics that have attempted to pay attention to environmental concerns.

The current study address gaps in the literature by conducting an empirical investigation of a department wide intervention and a survey of the barriers to integrating sustainable development into economics curriculum. No studies have empirically assessed barriers to integrating sustainability into economics curriculum. Given this situation and the small amount of empirical work on ESD in economics, this paper makes a significant and original contribution. The paper firstly describes an intervention conducted to integrate sustainable development into all modules of economics curriculum at a case study UK University; secondly we assess the success of this intervention at the case study University and thirdly we conduct a survey of the barriers to integrating sustainable development into economics curriculum and teaching with academics from Economics departments in UK Higher Education Institutions.

The approach and method is detailed next (Section 2), followed by results (Section 3), discussions and conclusions (Section 4).

2. Approach and method

2.1 Background on the intervention and case study

The case study was selected due to being one of the few known Economics groups that has attempted to systematically embed sustainability into the curriculum across all modules. A case study approach was used in the first instance, as there are few departments that have attempted to embed sustainability into economics curriculum, and there was a clear opportunity to develop learning from one of the few departments that has attempted this. A case study approach is deemed a suitable approach when researching educating for sustainable development, as many studies on educating for sustainable development apply case study approaches. The case study university is an Alliance university, where the vast majority of Economics staff are highly research active and staff numbers are above 20. The numbers of students that the economics group intakes on average is around 80 students per year, around 40% of students tend to have a tariff of higher than 300 UCAS points, and the majority of students are white male.

The first systematic attempt at the process of embedding sustainability into the case study's economics curriculum occurred in 2011, which coincided with a re-design of the entire programme. Higher management identified that sustainability had to be part of all programmes. In the economics group, this was interpreted as trying to get as many mentions of sustainability into the module specifications as possible, even in cases where it seemed difficult to do so. Lecturers were encouraged to implement this during preparation of specifications for the curriculum refresh. The aim was to embed sustainability beyond the 2nd and 3rd year specialist elective modules. The rationale for this was that if sustainability is within module specifications, this creates a pressure to include it in teaching. One of the people involved in the team that undertook the process identified that they could guarantee that all students will

have done something related to sustainability, but how broad integration was beyond that, was not clear.

The research questions for the paper are as follows:

1. To what extent did the initial intervention result in integration of sustainability into teaching and the curriculum for the academics sampled?
2. To what extent did the initial intervention result in deep or surface integration?
3. What barriers to integrating sustainability into economics curriculum and teaching are identified from interview data?
4. To what extent are barriers to integrating sustainable development into curriculum and teaching perceived more widely by academic economists?

2.2 Conceptual framework

The theoretical framework by Biggs (2003) was found to be most appropriate in assessing constructive alignment[2] and whether an approach to curriculum[3] will provide deep or surface[4] understanding. The general educational theory of constructive alignment was chosen to apply in this study, because it is a systematic approach which aids comparison across courses, allowing assessment of the extent to which constructive alignment and deep learning of

[2] When integrating sustainability into the economics curriculum and teaching, there is a need to regularly check course aims and objectives, and content and evaluate alignment (Economics Network 2014).

[3] For the paper curriculum is defined following Smith (2013): "*encompassing everything that makes up the educational experience on a course or programme. I believe that this has three main elements; the syllabus (the choice of topics, resources, examples or case studies); the processes (the teaching methods and learning activities); and the participants (the students and tutors on the programme*)."

[4] Draper (2013, p.1) nicely describe deep and surface learning as follows: "surface learners tended to concentrate on the writer's main point, and reproducing the main facts. Associated with anxiety in learning, the surface learners were dispassionate with the material. The students felt pressurised and rushed into retention of information; thus, they only memorised and did not understand the meaning behind the material. When it comes to recalling information, surface learning is not as effective because less information is remembered as efforts are placed on memorisation rather than understanding." "deep learners transformed the knowledge they gained by exploring it beyond the main point. Deep learners aimed to understand the meaning behind the text, and interacted with the material by creating relevant arguments and examples related to their daily lives. Rather than memorisation, the learners engaged and thought critically about the information. They showed great interest and were calm in their learning of the information. As deep learners are more engaged, information is more likely to be retained long-term" .

sustainability is present. Biggs (2003) identifies that constructive alignment requires a theory of teaching your discipline over and above knowledge of the discipline itself. Some such as O'Neil (1994) however, suggest that it results in graduates lacking knowledge in traditional academic subjects as constructive alignment hangs off stated learning outcomes, which emphasise broad (reducing a more reducionist approach), personal and social outcomes for students to achieve. Successful integration of sustainability, however, explicitly requires a broader interdisciplinary understanding and approach, making students more rounded and focused on a wider set of interlinking societal goals. There is a need to update economics curriculum and teaching to produce graduates with the inter-disciplinary and social sciences understandings. This is required to ensure that society can address complex (non-linear) global challenges such as staying within key global environmental pressures, not just determining a linear path of output and GDP growth that can have disastrous effect on staying within (non-linear) environmental limits as set out by Rockström et al (2009).

Additionally, a broader framework and approach need not erode rigour and knowledge, quite the reverse, it can actually help develop cognitive skills if done intelligently and making use of relevant economic theory. It also ensures students are measured on and achieve a desired outcome and is also student focused. Tam (2014) also identifies that constructive alignment improves systematic accountability, a useful characteristic when determining the extent of integration of sustainability. The conceptual framework used in this study is presented in Figure 1.

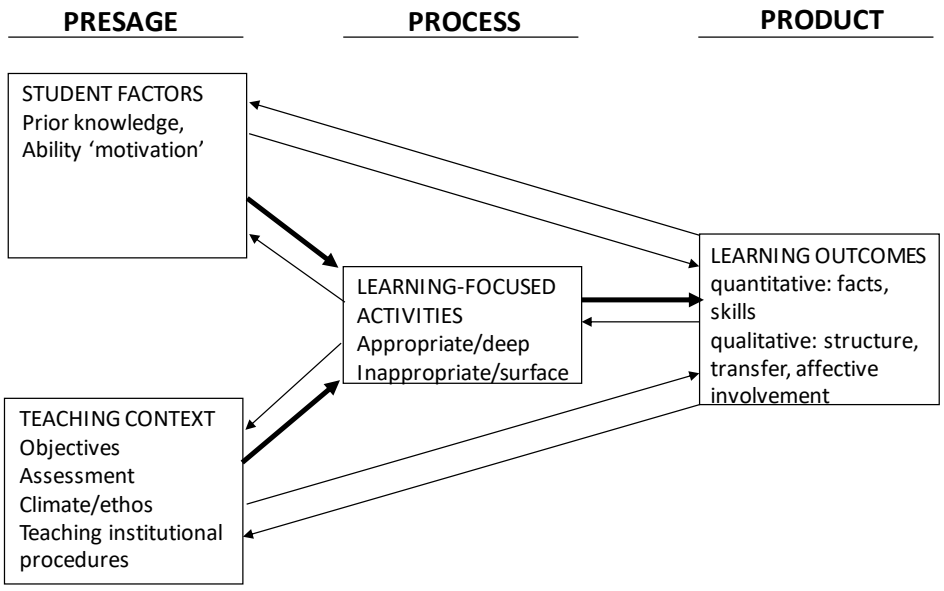

Figure 1: The 3P model of teaching and learning (Biggs 2003)

The 3P model articulates three points in which learning-related factors are placed: 1. Presage, before learning takes place; 2. Process, during learning; 3. Product, the outcome of learning. Presage factors are of two types: student based and teaching based. These factors interact as a system to determine the student's immediate learning-related activities and approaches to learning (Biggs 2003).

The general direction of effect is shown by the heavy arrows in Figure 1: here the student and teaching presage factors jointly determine the approach a student uses for a given task and that in turn gives rise to the outcome. The light arrows connect the components, as all components are said to interact to form a system (Biggs 2003).

The model brings attention to three sources that can affect the learning outcomes:– 1. Student based factors - what the student is; 2. teaching based factors – what the teacher does and 3. An interactive effect from the system as a whole – what the student does.

The principle of constructive alignment which is key to the 3 Ps model is now discussed. To work well all components need to be aligned to each other, as imbalance in the system will lead

to poor teaching and surface learning. Aligned teaching has maximum consistency across the system. When alignment exists, teaching is likely to be much more effective than when it does not. Each component should work towards the common end of deep learning as opposed to surface learning.

2.2.1 The parts of the 3P model

Student factors

A factor effecting the success of learning is whether students have knowledge on the topic and its importance (sustainability), ability and motivation towards its inclusion.

Teaching context

Teaching context is important – what is taught, how it is taught and assessed, the approach of the teacher, climate and ethos of the classroom and university itself. Objectives and assessment influence intrinsic and extrinsic motivation for student learning and constructive alignment. The nature of teaching and integration shapes the learning experience of students and depth of knowledge and understanding that they attain, as does the ethos of lecturers. Institutional procedures are important as they can provide pressure points and opportunities to help encourage the integration or potentially detract from the integration of sustainable development into economics curriculum.

Learning focused activities

These activities substantially shape the depth of knowledge and learning. The broad format of teaching activities are known: lectures, interactive workshops and seminars (in various

structures); therefore the focus here was to explore examples of teaching sustainability and its integration. This provides understanding on depth of integration.

Learning outcomes

The learning outcomes are the result of many factors occurring in interaction and can include quantitative (facts, skills) and qualitative (modes of thinking, feeling and analysis developed etc).

2.3 Method

The case study applied surveys, interviews and key word searches. Surveys and key word searches provide quantitative findings, where as depth and narrative is collated from interviews. Such mixed methods approaches are highly appropriate to this type of study (Tierney et al 2015). The study went through University ethics approval.

2.3.1 Student survey

The survey was undertaken to understand students' knowledge on the importance of integrating sustainability into the curriculum and their motivation. This study follows questions developed by Drayson et al (2013) and applies the five-point Likert scale questions provided in Appendix A. The survey was undertaken with 1st and 3rd year economics students at the case study university. Samples sizes of 46 (1st year economics) and 50 observations (3rd year economics) were collected in September 2016. Timing of the student surveys ensured that the 3rd year students had experienced teaching through the predominant time of the intervention measurement with academics. Consistent questions with Drayson et al (2013), allow comparison. Surveys were administered during lectures. Perceptions of students on the importance of sustainability provide an indication of pre-existing knowledge of sustainability. Ideally, one would measure in detail previous exposure of students to sustainability issues to

assess their knowledge. This however, would have required a longer survey substantially lowering the response rate (based on past experience). Therefore, the current study made use of pre-existing secondary data on this aspect for the case study university provided by Gough (2018), to inform on students' past exposure to sustainability issues and knowledge.

2.3.2 Interviews

Interviews were designed to primarily provide exploration on the ethos of lecturers relating to sustainability and its integration and relevant learning focused activities. Interviews were semi-structured but designed to be adaptive and somewhat unstructured if important information came up, allowing the study to capture depth and the essentially qualitative nature of the process (Kleining 1998). Seven lecturers from the department came forward to be interviewed. A person who helped bring about the initial intervention was interviewed to gain knowledge on the intervention and his experience (given the pseudo name of Ian).This interview was unstructured and of a receptive form as the aim was to understand the intervention and experience on integrating sustainability. The interview schedule is in Appendix A. Interviews were analysed using thematic analysis. When reporting interview data certain sections apply actual quotations to best represent the data. In places some longer quotes were provided as they were critical in establishing and representing the actual and important perspectives that the respondents provided. Pseudo names were given to protect all interviewees' identity. All interview participants were from the case study university.

2.3.3 Key word searches

For those that participated in interviews, module specifications were searched for key sustainability terms to check integration into objectives and assessment within modules. Module specifications were searched systematically using key words: Sustainability;

sustainable development; environmental; economic; social. Learning outcomes also identified in the module specifications were looked at to explore integration of sustainability.

2.3.4 Survey of barriers

Appropriate Likert scale questions were developed and used in the sector wide survey of barriers to integrating sustainable development into economics curriculum and teaching, building on the themes picked up in interviews. Likert scale questions allow increased capacity for quantification and higher response rates. An initial survey was piloted with colleagues, the final questions and survey are provided in Appendix B. The survey was administered via email with a word file and alternative online version sent to key Economics Network contacts at each university, who were asked to disseminate to lecturers in their department. A sample of forty-two responses were received: twenty-two were mainstream economists, fifteen were heterodox and five did not disclose. Results were analysed using descriptive statistics and relevant statistical tests.

3. Results

3.1 Student factors from surveys with students

In order to assess students' understanding of the importance of and motivation to increase inclusion of sustainable development into the curriculum and teaching, results are presented in Figure 2. Major differences between 1st and 3rd years were found for the 1st, 2nd and 4th questions.

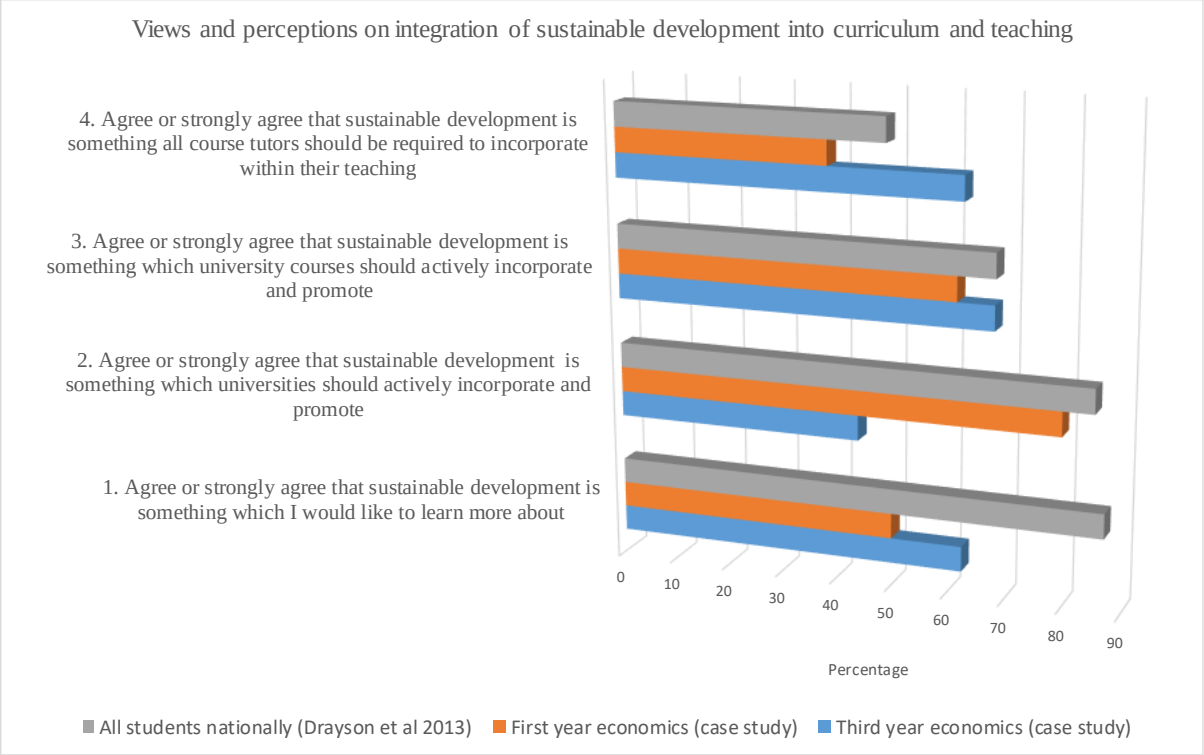

Figure 2: Results on student factors

In terms of constructive alignment of student motivations for integrating of sustainability into the curriculum, the general survey of Drayson et al (2013) shows fairly strong alignment with student motivations and preferences; students generally see sustainable development as something they would like to learn about and should be actively incorporated and promoted. Such motivations and preferences partially determine the type of student approach taken and engagement (e.g. proactive and motivated in learning) when encountering sustainability in the curriculum and that in turn shapes their achievement of learning outcomes. Comparatively, the economics students at the case study university (both 3rd and 1st years) are generally less motivated to learn about sustainable development. This said, at least 60% of third year economics students are motivated. What is interesting is that although this is so, both 1st and 3rd year economics students recognise the importance of learning (question 3) broadly as much as do the general co-hort, and when it comes to recognition of the importance of incorporation by all their course tutors (question 4), the third year cohort recognise this as much more

important than first year students (and the national cohort) which is indicative that economics programmes are developing students understanding of sustainable development and its importance. One of the results to question 2 is somewhat surprising, as it suggests that 3rd year economics students are less keen on seeing sustainability integrated by Univesities, but on all other questions the 3rd years score higher than 1st years. This latter surprising result is believed to be due to the nature of the case study and the way this question was phrased (i.e. universities as opposed to our university).A key feature of the case study university is that it features sustainability strongly and communicates this to students, so students may perceive this as a compentative advantage in their degrees that they would not want replicated by other universities. Case study university collected data in 2015 (from a cohort of 221 students) showed that the majority of students (over 50%) had at least some pre-existing teaching on the majority of sustainability themes/issues in their secondary school education. So in this respect there was found to be constructive alignment with pre-existing knowledge and teaching that would aid their achievement of learning objectives on sustainability. See further detail in Appendix D.

3.2 Teaching context: Institutional procedures on integrating sustainability

Internationalisation, sustainability and employability are advocated by the university to be within programmes of all degrees at the case study university. Ian identified that he was aware of higher level university policies and that the priorities have positively influenced his ability to justify integrating sustainability into the curriculum. Emphasis on sustainability is also identified in 3 of the 4 key priorities of the University's vision.

3.3 Teaching context: Lecturers' ethos and perceptions on sustainability

This section reports lecturers' ethos and perceptions about sustainability. A number of questions were asked to explore this as shall be seen. This is important as perceptions of

sustainability and ethos of lecturers towards sustainability will affect how they integrate sustainability as well as what sustainability is perceived to be.

Interview participants were asked: Is there an understanding or definition of sustainability that you have in mind? Interpretations of sustainability were different and included: "*economic and ecological*"; "*whether this is sustainable through the generations*"[5]; "*balancing different sets of priorities, economic, social and environmental*"; "*agricultural sustainability, environmental sustainability*"; "*sustainability is that we leave enough resources for the future. I think it is resource allocation for an economist; I think we have to seriously consider that*".

The Brundtland definition was identified due to being the most popular definition worldwide. Some interesting comments were made in relation to ethos on sustainability, mainly around inequality and the importance of looking at this. Interestingly definitions of sustainability such as the Brundtland definition focus on the distribution of resources between generations (inter), so debates on income equality and inequality (which were mentioned by Sarah and John) are important and quite coherent with this. Des believed that inequality within generations (intra) is important primarily due its high potential to cause conflict and hampering of social and economic development. Mainstream economics tends not to deal with inequality in resource use but focuses on efficiency of allocation, so as it stands is not coherent with the Brundtland definition of sustainability.

Brian (and others) identified issues with the term sustainability. He states: "*you could talk about the sustainability of student numbers, you could talk about sustainability of resources, um, could talk about sustainability for lots of different things*"

[5] John also discussed the influence on consumption possibilities and the environment, and the difficulty of knowing what people mean by sustainability. He also discussed inequality once the Brundtland definition was introduced.

Critically, this commentary identifies that when someone states the term sustainability, it is quite clear that they might be interpreting it very differently from another person. This underlines the importance of use of a definition. Likewise Des and Ben states:

"*Yes, I am familiar with the term sustainability, but I appreciate that it's a pretty loaded term and most people probably have different interpretations of what it means*" (Des)

Findings on differences in interpretation resonate with findings from the literature. Ben also identified difficulties in operationalising one definition[6]. Des preferred broader definitions such as the Brundtland definition as he saw this as useful to explain a whole raft of different types of sustainability issues that occur in diverse ways over time. Brian was less keen and saw as a bit ideological. Although viewpoints and ethos on defining sustainability differed, a number of the lecturers had a good understanding of sustainable development. This said, it was clear that one or two lecturers interpreted sustainability as focused purely on the economic aspect. This underlines the importance of using the term sustainable development as opposed to sustainability, as sustainable development has a clearer definition.

3.4 Teaching context: Sustainability terms in module specifications

[6] "*You know the kind of areas we deal with, I think you have to acknowledge that sustainability is a contested idea. So it's difficult to teach, and I'm not sure whether there is an orthodox position on sustainability as such, I think our job is probably to raise it as something to be thought about and for students to find some kind of resolution to it, and if the student asks directly what our ethical position is, we can tell them, but I'm not sure it's our job to tell the students what their ethical framing should be*." (Ben)

Modules	Mentions of sustainability, social, environmental or economic in teaching context - objectives, aims and assessment	Mentions of sustainability, social, environmental or economic in learning outcomes	Mentions of sustainability within the document
1	Economic	Social aspects addressed	No but social aspects addressed
2	No (though economic is clearly within)	No	No
3	No (though economic is clearly within)	Economic	No
4	Economic	Economic	No
5	Economic	Economic	No
6	Economic and environmental (pollution)	Economic, social and environmental	No but economic, social, environmental
7	Economic	No	No
8	Economic	Economic	No
9	Economic	Economic	No
10	Economic	Economic	No
11	Economic	Economic	No
12	Economic	Social and economic	No but social, environmental, economic

Table 2: Key word search of module specifications

Results from the analysis in Table 2 show that 9 of the 12 modules taught by the interviewed lecturers have no mention of sustainability, environmental or social within the module specification. Of the three that do, all mention in learning outcomes, and only one mentions in aims, objectives or assessment. All 12 modules mention of one aspect of sustainability; economic. Following the framework of Biggs (2003) and based on this assessment, one could conclude that there is not constructive alignment and deep integration of sustainability in 9 of the 12 modules, as there is no mention in the aims, objectives or learning outcomes.

Mentions of sustainability in aims, objectives and learning outcomes of module specifications ensures that sustainability content will be taught, increasing constructive alignment and providing a clear extrinsic motivation for students in learning sustainability material within courses. A more aligned system wide approach such as this is more likely to lead to deeper learning and certainty of student engagement according to the 3P model.

3.5 Integration of sustainability and learning focused activities

3.5.1 Integration of sustainability

When we asked about the extent of incorporation of sustainability into their modules (on a scale of 1-10 one being not at all, 10 being completely) lecturers' responses were as follows:

To what extent do you think sustainability is incorporated into the teaching of each of your modules?		
Sarah	**John**	**Dan**
"2 out of 10 it's not in the forefront"	***Level three module 3-4; level one module 1 or 2 perhap; Other module given 8/10.***	***"1 you could shoehorn it in there by doing something statistical with it** , the economics is the same again, very difficult to do anything. Some potential examples for future provided. Micro not really sure, some opportunities identified e.g. utility and fully informed consumption decisions."*
Ben	**Des**	**Brian**
*"Difficult question because I guess we shauld ask to what extent it should be embedded, I would say that it is mentioned, **I don't know how that would score on a 1-10 scale because I would say how else, how much more could I do** ? 6-10.."*	*In terms of one of his modules, he is almost exclusively looking at macroeconomies sustainability, this module was given **2-3 out of 10.** Almost purely economic themes but specifically addressed. " **The other module has no specific topic on sustainability, however it is in everything - high score."***	***"Based on the definition you have given me probably 1.** Based on a much broader definition of sustainability and hopefully producing economists which make more sustainable decisions in the future, maybe 4."*

Table 3: Extent of incorporation of sustainability into their modules as rated by interviewed lecturers

These results suggest that two to three modules have sustainable development integrated to a high extent.

3.5.2 Integration of sustainability and learning focused activities

Ben identified that sustainability is mentioned as an ethical framing of research activity, an ethical position one can take, it is also mentioned in terms of resources, travel, paper etc. Others, however provided more detail.

Sarah: "*There are certainly elements of sustainability in micro, in terms of talking about externalities, social and marginal cost, which is probably a bit dull, but we don't really get on to talk about things like inequality for example, but these are the kind of things we put in happiness economics and labour economics as well*". Sarah also discussed some specific cases of looking at things like past BP oil spills, Chernobyl, who should pay and who is liable, whose happiness etc.

John: "*we were working with the sustainability team here (case study university), in terms of evaluating the university's farmers market, we plugged that into the course and that overhung*

the whole of the course really, throughout the whole of the semester, we were trying to get the students to undertake an economic evaluation/economics appraisal of the farmers market."

Peter – "So that was looking at it in terms of the economic outputs, so not the environment, but economic and social?"

"*Yea, I think there was a sort of social dimension, and I think cause with a lot of the cases, when they tried to monetise a lot of the benefits and costs it's very difficult to do, and within the project a lot of it was qualitative analysis looking at how the farmers market fits in with the strategic objective of the university as a sustainable university, and really that's where the case was being made, so the economics in terms of the pure monetary cost of running it and the revenue that's coming from it, that would give you a net negative value, but its only when you consider the wider strategic case that you got a positive by the end of it."*

John also identified that he does quite a bit of teaching about inequality, even though he usually uses neoclassical economics framework in teaching. Dan also used a Neoclassical framing when teaching, but extends utility functions to include environmental aspects, as he stated that this makes it easier for the students. Des also tended to teach through a neoclassical economics framework. In Des's development course however, he uses the concept of sustainability in relation to development process and mainly focuses on agricultural sustainability and environmental sustainability in the sense that some development policies can end up damaging the environment. In terms of emerging economies, Dan strictly and exclusively looks at macroeconomic sustainability in economic terms. i.e. is this a viable model they are pursuing and if there are consequences, how are they going to fill the gaps that open up etc. Des also provided other examples relating to trade and choices about what resources countries should exploit. He also highlighted sustainability as extremely important in a developing country context.

Brian was somewhat different as he can be seen as more pluralist in his teaching but does not integrate environmental aspects.

Applying the 3Ps model, these answers and examples provide some insight about the extent to which sustainability is embedded in learning activities, and clearly it varies. In summary, a number of these answers show a level of integration of sustainability into the economics curriculum and some (two modules of John and Des) indicate a deeper approach. For the sample overall, Table 1 evidences a level of resistance as only 3 of 12 modules ensured that sustainability terms were within and remained in module specifications, even though this was asked of them. Four of the six lecturers applied a neo-classical framing (although Sarah and Brian used this as a starting point). Two of the lecturers were quite clearly pluralist in their approaches. When classifying themselves as economists; Sarah identified as neoclassical/applied; Brian as pluralist; John as Keynesian; Ben Heterodox and empirical; Des as a dependency theorist and Dan a disillusioned economist.

3.6 Barriers to integration of sustainability into the curriculum and teaching: interview results

This theme emerged from the interview data as it became clear that barriers are an important issue (there were no pre-planned questions).

3.6.1 Disciplinary culture

It was clear from the last section of the paper that some academics applied a pluralist approach to teaching, but others did not. In the interview with Ian, he raised the statement that an inter disciplinary approach to integrating sustainability into economics is important. He states:

"*Well I think if you are going to do sustainability well you have got to, well I'm not claiming to be an interdisciplinary expert by any regards, but I have forced myself to learn about the*

basics of ecosystems, that kind of thing, but a lot of people consider themselves disciplinary specialists and if you are going to do something like sustainability, then they regard themselves as not equipped, I'm just not equipped to learn about how the system works because it's not in my disciplinary sphere. So, I can't think about it. I think it's, partly a reflection of the unrealistic nature of economics, where you don't really need to understand the object that you are studying, you just need to understand the theory, if you can do the theory then that's fine. (Ian)"

Peter: "Do you think that would be the case in other disciplines, or whether that is something specific to economics?

"I think that it is probably true of all disciplines that they are not thinking outside their own, but economics, my impression is that economics is even more like that than some others, because there is a very sort of a very monistic attitude towards how it is taught, you know it's got to be maths, it's got to be models, it's got to be, that's the way of doing economics, the economics scientific method, it's got to be you know, rationality, equilibrium these kind of things. Where as in other kinds of disciplines, they are not as dogmatic about how you do the discipline. I mean if you read theology, they don't even define what theology is, where as in economics, there is an attempt to say, economics is about allocation of resources, something like that, ok so there is a greater degree of monism and arguably dogmatism in economics which I think makes that, that exacerbates the problems that everybody else faces." (Ian)

3.6.2 Defining economics

Leading on from the last point, a further question was asked by Peter: "So am I right in saying that in trying to be very explicit about exactly what they are looking at results in a kind of, that leads on to?"

"Yea, well if you think about it, once you define economics as being about rational agents in equilibrium systems, and they are all maximising utility, then that really closes down the number of questions that you can really ask and also it leads you into, the way of asking them is very formal, very mathematical, so by defining economics that narrowly, you've locked yourself in to a narrow way of thinking, and it's only going to get narrower, I think. Whereas if you don't define the subject quite as narrowly as that, then you can say economics is about how, stuff gets made and moved around and well if you define more vaguely like that, well it's about social provisioning systems, if you think about social provisioning systems, and economics is the study of that, that is immediately much more broad" (Ian)

3.6.3 The mainstream of the subject and research policy

What would you say the difficulties are in integrating?

"*The main barrier is the subject matter. We have the established doctrine, the established theory, I mean, where is sustainability in that? I mean, if we started off every economics course by saying what are the biophysical conditions for a sustainable economy? If we stated, off, if that was weeks 1-3, would our economics look anything like it does? I don't think so. But, because we started off with, supply and demand, then we are already kind of trapped, and then when students come to externalities, they think, oh, what are these externalities? This is too complicated, let's get back to the.. and it's not their fault, that's just, uh, the way they have been trained to think.* (Ian)

Peter – "Do you see that as a barrier? How much of a barrier do you see this as?"

"*Well, It's the main barrier, it's a huge barrier."*

"Will that change? I mean there is that phrase about, the subjects change one retirement at a time, but once one person has retired, you are going to get somebody that's trained in the same methods" (Ian)

"The best, the very, very best economists are quite open minded and much more flexible, and you see people like Arrow and Solow, and people like that, and they have looked at the environment, and they have said some quite interesting things about the environment. But, there, they can already do that, because they are already at the top. The vast ranks of people below are, there not in a position to do that, they are just trying to get themselves established, so what do they do? They mimic the people just above them, and the rewards mechanisms are set up so that you start looking around for 3 or 4-star journals".

Ian mentioned that the Research Assessment Exercise shapes who is hired i.e. those with 3* or 4* publications in economics tend to get hired. Lee (2007) published a paper empirically demonstrating that the UK Research Excellence Framework leads to positive discrimination towards hiring mainstream neoclassical economists that tend to be less pluralist because 3* and 4* economics journal predominantly tend to be neo-classical reflecting the dominance of this training and representation in the profession.

This situation was further illustrated and clarified by comments made by Brian[7] and Dan[8]

3.6.4 Barriers – "our logic":

[7] "*when I was doing my PhD I was probably neo-classical, but I thought that was what was required. I was trying to fit in with the literature, but then I became a little bit institutional probably, probably some quite strong institutional bits inside of me, but more pluralistic now. But it really depends who you are writing for, when I am publishing journal articles I am very neo-classical as I know it's more likely to get published in high quality journals*."

[8] "*Entirely disillusioned with the whole profession", "disillusioned with research and the impact that research has. Very disappointed." "In the sense that we become hoop jumpers, in order to progress our career."* (Dan)

In his interview Ian stated another barrier, in this study termed 'our logic', interestingly three other academics picked up on the "our logic" barrier, Brian, Sarah and Dan. We start by looking at Ian's comments:

"I think the other thing about it is hubris, this notion that we can look at other disciplines, but we only look at in terms of how can we help them get better at what they do, you know, this kind of economic imperialism, arguments of Gary Becker type. I don't think there is anything wrong necessarily in thinking about, can we apply economics to households, the way households work, seems reasonable, but, um, can we not learn anything from anyone else about how households work, probably can. And we also don't have to assume that households are utility maximisers, or rational agents, or thinking of them as individuals[9]"

Sarah picked up on the issue of 'our logic', she states:

"*I am certainly aware of it (sustainability) for sure, but I think it, I think economists, I don't know, it depends how people see, what people see as sustainability, possibly not all people see it like I do, which is a very good thing, environmental economics, or see it as that, but they may do, and if they do, then it's going to be hard for them to get out of that pigeon hole, and I think that is, this is probably a hindrance to incorporating other parts of sustainability, into what we teach. We pigeonhole it I think, and we think oh well, that's environmental economics and we can put that in micro (yea), a bit of macro (yea) there we go, and we can move on. Whereas, perhaps we should be more aware of a broader definition*."

Brian identified that there was a very good paper by Tomer (2001) that emphasised that the vast majority of peoples' decisions are not made in a rational neoclassical way and therefore to just apply neoclassical approaches would be a limitation.

3.6.5 Motivation and habit of teachers as opportunities and barriers

Sarah made some important comments in relation to motivation and habit:

"*it's fairly hard to realistically do that uh (integration of sustainability), unless people buy into it, see you doing it, and I think that with all these things, that's key, implementation is really hard, it's really hard to get people to engage, or perhaps change, be susceptible to change what they are doing, trying to think about things in a different way, it's hard to do that, especially when people have been teaching things for decades really and I think it's a bit of a hindrance*." (Sarah)

Peter - "Am I right in reading that as the role of habit in a way, in the sense of the habit of teaching?"

"*Yes, I think there is that, also, I think you can get comfortable in teaching the same thing, and some would say also people can be lazy*" (Sarah)

Sarah identified that most people are quite good at updating things, some people need a push, but then people kind of get there. She also identified the need to challenge practice, but that ultimately people need to buy into what is being asked of them, you can push them so far, but if they don't buy into it, it's not going to be particularly effective (i.e. they will be ticking boxes as opposed to going, ok, no, this is quite a good idea).

3.6.6 Barriers – "cutting the curriculum"

In his interview Brian stated the following:

"*My personal view is that most second year intermediate micro economic textbooks teach maximisation and these sort of things you know, in a very neoclassical way, which students across the planet are complaining about and are saying are unrealistic, um wrong, and I have*

tried to teach aspects which get students to think about a broad range of things, with a greater variety of perspectives, and sustainability could potentially be one of them.

Peter: "so if you were looking at utility as an example?"

" Well the standard second year intermediate level micro economic approach to choice, which is like an individual thinking like a computer, not influenced by society and their social group, by people they know, just selecting a good that maximises some level of satisfaction that they are given but is not influenced by anything, subject to the prices that they meet at the market place, and therefore we come to an optimal position, which a computer or mathematician will come to. In reality we don't think like that, there are lot of other issues that we need to consider if we are going to produce economists who then advise the government in future" (Brian)

John also identified in his interview that it is actually quite hard to integrate sustainability into some economics modules, because of the content. Carrithers and Peterson (2006, p. 373) also identify this; they suggest that with regards to teaching markets and capitalism versus sustainability:

"*…the gap is so wide and the ideas that are promoted are so disconnected that students are trapped into choosing one or the other position (or neither) and are left unable to link the two sides of the discussion. Such an educational process is not one that produces free and reasoned discernment."*

When teaching business, some such as Stubbs and Cocklin (2008) have put forward frameworks to help students consider sustainability in different perspectives alongside the mainstream business point of view, this however does requires a more pluralist training.

3.7 Barriers to integration of sustainability into the curriculum and teaching: survey results

Results in addressing the fourth research question are now presented: To what extent are barriers perceived more widely by academic economists?

SUMMARY RESULTS	ALL ECONOMISTS				MAINSTREAM RESPONSE				HETERODOX RESPONSE			
Statement	Strongly disagree/ disagree	Strongly agree/ agree	I don't know	I don't want to tell	Strongly disagree/ disagree	Strongly agree/ agree	I don't know	I don't want to tell	Strongly disagree/ disagree	Strongly agree/ agree	I don't know	I don't want to tell
The method or approach of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum	**21**	19	2	0	9	13	0	0	10	4	1	0
The assumptions of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum	**23**	11	5	2	8	10	1	1	13	0	2	1
Mainstream definitions of economics help the integration of sustainable development into economics education	18	16	5	2	7	12	2	1	9	2	3	1
The dominant established curriculum and its scope (micro, macro and econometrics) helps enable pathways to bring sustainable development into economics curriculum	19	15	4	1	8	11	2	1	10	4	1	0
The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development	**26**	6	8	0	13	5	5	0	12	1	2	0
Environmental economics (an extension of mainstream economics) can adequately allow incorporation of sustainable development into economics curriculum when combined with neo-classical economics	14	15	10	1	4	10	8	1	10	4	1	0
Past habits in teaching economics (in terms of choice of content and method) help teachers to incorporate new curriculum such as sustainable development into economics	20	11	8	1	10	6	6	1	10	4	1	0
Lecturers in economics departments in the UK would generally be motivated to integrate sustainable development into economics curriculum	16	9	7	2	8	5	4	1	8	3	2	1
Economics journals are generally open to publishing topics focused on sustainable development	13	13	12	1	6	7	8	1	6	6	3	0
Economics journals are generally open to publishing new topics focused on sustainable development	12	13	12	1	6	7	8	1	6	6	2	0
Number of respondents	**42**				**22**				**15**			

Table 4: Results of the survey on barriers to integrating sustainable development into economics curriculum and teaching with UK Academic economists.

In Table 4, the data has been analysed in three different groups: 'all economists'; 'mainstream economists'[10] and 'heterodox economists'. The table highlights in black where there was

[10] Mainstream response includes those classifying as: Economist; Neo-classical economist; New Institutional Economist; Environmental Economist; Empirical Economist; Applied Economist; and other category is identified as neoclassical (unless identified as non-neoclassical). Heterodox response includes those in all remaining categories. 4. Institutional Economist; 5. Evolutionary Economist; 6. Feminist Economist; 9. Ecological Economist; 10. Austrian Economist; 11. Heterodox Economist; 12. Post Keynesian Economist; 13. Empirical Economist; 15. Economic Historian; 16. Pluralist Economist; 17. Keynesian Economist; 18. Other. The majority were mainstream/neoclassical economists (59%) of those that identified.

greater consensus on answers (50% or above) for respondents in each group: “all economists”, “mainstream economists” or “pluralist economists”.

In all but three statements, there were generally more respondents that disagreed than agreed with statements, therefore broadly indicating a strong wider perception of the existence of the range of barriers and challenges identified in the interview data.

For the all economists grouping and the greatest perceived barriers, sixty one percent disagreed or strongly disagreed that (statement 5) *“The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development”* and only six respondents agreed. This was identified as a key barrier in interview data. Also, fifty four percent disagreed/strongly disagreed that (statement 2) “*the assumptions of neoclassical economics helps the integration of sustainable development into economics curriculum*”; only twenty six percent agreed or strongly agreed. Fifty percent of “all economists” disagreed or strongly disagreed that *“The method or approach of neoclassical (mainstream) economics helps the integration of sustainable development into economics curriculum”* (fourty five percent agreed or strongly agreed).

Habit of content and method also came out as a key barrier from the wider canvas, most economists disagreed that *“past habits in teaching economics (in terms of choice of content and method) help teachers to incorporate new curriculum such as sustainable development into economics.”*

Additionally, most economists disagreed with the statement: “*Lecturers in economics departments in the UK would generally be motivated to integrate sustainable development into economics curriculum*”.

Although results showed generally a higher proportion disagreeing or strongly disagreeing with most statements, a test was run to identify those statements where there could be 95% certainity (statistical significance) in the existence of difference in answers beween the categories. Difference between the aggregated categories: stongly disagree and disagree versus strongly agree and agree were tested and examined using a one-sample binomial test. If no difference existed in the result one would expect a 50/50 split between the answers to the two categories. Results are provided in Table 5.

Survey Question	Critical values attained from the One-Sample Binomial Test to test for significant difference between the aggregated categories: stongly disagree and disagree versus Strongly agree and agree
Statement 1: The method or approach of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;	0.87
Statement 2: The assumptions of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;	0.059
Statement 3: Mainstream definitions of economics help the integration of sustainable development into economics education	0.86
Statement 4: The dominant established curriculum and its scope (micro, macro and econometrics) helps enable pathways to bring sustainable development into economics curriculum;	0.61
Statement 5: The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development	0.001
Statement 6: Environmental economics (an extension of mainstream economics) can adequately allow incorporation of sustainable development into economics curriculum when combined with neo-classical economics	1
Statement 7: Past habits in teaching economics (in terms of choice of content and method) help teachers to incorporate new curriculum such as sustainable development into economics	0.15
Statement 8: Lecturers in economics departments in the UK would generally be motivated to integrate sustainable development into economics curriculum.	0.23
Statement 9: Economics journals are generally open to publishing topics focused on sustainable development;	1
Statement 10: Economics journals are generally open to publishing new topics focused on sustainable development;	1

Table 5: Significance test results from applying the one-sample binomial test to identify those statements where the difference in answers were statistically significant.

Those values that were significant (values at or below 0.05) indicate with 95% confidence that difference in answers exists and is therefore said to be statistically significant (testing at ninety percent is sometimes conducted but less scientifically robust). It can be seen that a statistically significant difference in answers was found for statement 5; difference in answers for Statement

2 were also on the verge of being proven statistically significant as the p value is 0.059 (significant is deemed 0.05 or below).

Spash and Ryan (2012) identify three broad schools of thought within economics on how environmental issues should be addressed: New Resource Economics[11]; New Environmental Pragmatism and Social Ecological Economics, they survey economists on their positions at three conferences: the Ecological Society for Ecological Economics (ESEE); the Association of Heterodox Economics (AHE) and the European Association of Environmental and Resource Economics (EAERE). From their analysis major division is found between the positions of the EAERE neoclassical sample and the two heterodox samples (AHE and ESEE). The current study tested for significant difference in answers between the mainstream (Neo-classical) and heterodox economists in relation to integrating sustainable development into economics curriculum. A cross tabulation and chi-squared test was run to observe whether there was a significant difference between answers for each question between mainstream and heterodox economists. When testing the answers for agree and strongly agree were aggregated and answers of disagree and strongly disagree were aggregated. The answer 'I don't want to tell' was removed from the analysis as for nearly all questions only zero or one participant answered this category. The Fisher's exact test is an appropriate test statistic to use when the sample size is on the low side (but still high enough to robustly test significance) at around 40 as it is here. A summary of the results from the test are provided below in Table 6, detailed results are provided in Appendix E.

[11] *"New Resource Economics: We should base our efforts upon the basic tenants of accepted economic theory, such as the axioms of consumer choice and model of the individual as a rational agent. The most important role for the research is to inform policy makers as to the efficient use of scarce resources".*
"New Environmental Pragmatism: The natural sciences provide objective information that should be the primary basis for informing policy, but we face a communication problem. The most important role for research is to be pragmatic and employ whatever approaches are effective to inform the policy communication about environmental problems and their solution."

"Social Ecological Economics: Environmental problems are complex, can be viewed from multiple perspectives and involve values that are often incompatible. The most important role for research is to understand different disciplinary perspectives and develop institutional approaches and social processes to address the interface between economics, science and policy."

Survey Question	Critical values attained from the Fishers exact test (Exact Significance 2 sided) to test if significanct difference in responses of mainstream versus heterodox economists
Statement 1: The method or approach of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;	0.21
Statement 2: The assumptions of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;	0.003
Statement 3: Mainstream definitions of economics help the integration of sustainable development into economics education	0.035
Statement 4: The dominant established curriculum and its scope (micro, macro and econometrics) helps enable pathways to bring sustainable development into economics curriculum;	0.241
Statement 5: The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development	0.093
Statement 6: Environmental economics (an extension of mainstream economics) can adequately allow incorporation of sustainable development into economics curriculum when combined with neo-classical economics	0.005
Statement 7: Past habits in teaching economics (in terms of choice of content and method) help teachers to incorporate new curriculum such as sustainable development into economics	0.27
Statement 8: Lecturers in economics departments in the UK would generally be motivated to integrate sustainable development into economics curriculum.	0.7
Statement 9: Economics journals are generally open to publishing topics focused on sustainable development;	0.54
Statement 10: Economics journals are generally open to publishing new topics focused on sustainable development;	0.36

Table 6: Results from applying the Fisher's exact test to assess significant difference in answers provided by the heterodox and mainstream sample.

It can be seen that the Fisher's exact test provides a value for exact significance (2 sided) below 0.05 (which is significant) for statements 2, 3 and 6. For statement 2, when asking about whether the assumptions of neoclassical economics help with the integration of sustainable development into economics curriculum, there was significant difference between the heterodox response compared to the mainstream; none of the heterodox economists agreed or strongly agreed (as compared with ten of the mainstream) and thirteen disagreed or strongly disagreed (eight for the mainstream). There was also significant difference in relation to whether mainstream definitions of economics help the integration of sustainable development into economics education, with only two heterodox economist agreeing or strongly agreeing (as compared with twelve mainstream) and nine disagreeing or strongly disagreeing (as compared with seven for the mainstream). For some statements however, mainsteam and heterodox economists provide answers that are more consistent for example statements five, seven, eight, nine and ten.

4. Discussions and conclusions

4.1 Integration of sustainable development into the curriculum for the case study

This study examined the extent of integration of sustainable development into economics curriculum at a case study economics group in higher education. Following the conceptual framework applied, the study found constructive alignment between the student factors (attitudes and motivations for learning sustainability) and integration of sustainable development into economics curriculum for the majority of economics students, but less than the national co-hort of Drayson et al (2013). Such motivations and preferences partially determine the type of student approach taken and engagement (e.g. proactive and motivated in learning) when encountering sustainability in the curriculum and that in turn shapes their achievement of learning outcomes. The wider university survey shows that the majority of students also attain at least some understanding of sustainability before entering the university system, so there seems to be student alignment here also.

On examining institutional procedures, the University has an ambitious vision and policy on implementing sustainability into the curriculum and teaching across all programmes.From interview data this was seen to be helpful in justifying the need to make changes in the curriculum and a key driver for change, although also led to the top down approach at the department level for which resistance was experienced. At the whole University scale, studies such as Wang et al (2013) also identify leadership as important. The analysis of module specifications showed that nine of the twelve modules that lecturers taught do not have any mention of sustainability, environmental or social within module specifications. This was so even though the initial intervention attempted to encourage all module leaders to include mentions of sustainability terms into these specifications. Interview data and analysis to look at ethos and examples of what was taught showed however that quite a number of the modules

did look at sustainability in practice but often not in a deep way. It was however clear that 2 modules in the sample have sustainable development embedded with evidence of a 'deep' integration. A limitation of the study is that not all lecturers in the department took part, only a sample, those that came forward voluntarily. Even still it can be concluded that the initial intervention from 2011 was only partially successful. One must conclude that a top down approach on its own at integrating sustainable development into economics curriculum is at best only partially effective. The latter conclusions address the first and second research questions.

4.2 Barriers to integrating sustainable development into economics (from interviews)

From the interviews, a range of problems and challenges to integration were identified. Specialisation and monism of economics, as well as narrow focus (in terms of how it is defined) was seen to hinder the integration of sustainability into economics curriculum (these views also resonate with recent student protests globally). It was also identified that mainstream neo-classical teaching is a barrier to the integration of sustainability and that to overcome this, there is a need for more breadth, inter-disciplinarity and pluralism. Interviews and literature indicate that the Research Excellence Framework (UK research assessment framework) poses a barrier in terms of the recruitment of interdisciplinary and pluralist economists and publications of inter-disciplinary/pluralist work in economics. Articles on university research for sustainable development such as Waas et al (2010) have not highlighted such issues. There were also seen to be problems ('our logic') in that economists can often interpret sustainability through only their own disciplinary lenses and often in a narrow way without considering other lenses. The dominance of training in neoclassical economics was identified as likely to compound this issue and more particularly because of the large number of people progressing into academic careers with mainly this training. Barriers were also identified in relation to motivation, habit and time.

4.3 Barriers to integrating sustainable development into economics (from surveys)

Survey questions were developed to explore these barriers more widely and address the forth research question: To what extent are barriers perceived to integrating sustainable development into economics curriculum more widely? Taken as a whole the survey results are broadly supportive of evidence of the barriers picked up in interviews. Statements where there was most evidence for the existence of barriers and challenges were indicated by levels of disagreement with the following statements (1, 2 and 5):

"*The assumptions of neoclassical economics (mainstream) helps the integration of sustainable development into economics curriculum*" (levels of disagreement were on the verge of being proven with 95% confidence)

"*The method or approach of neoclassical (mainstream) economics helps the integration of sustainable development into economics curriculum*" (levels of disagreement not enough to prove with 95% confidence)

"*The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development*" (disagreement result proven with 95% confidence)

These results show with statistical significance that the Research Excellence Framework is harming the recruitment of interdisciplinary economists able to address sustainable development in the UK. One can then ask how does this affect the integration of sustainable development into economics curriculum? Applying our 3Ps model, it can be seen that the process (part of the integration into the curriculum) will be affected and in particular the learning focused activities as these are determined almost entirely by the economists that are

recruited. Results also indicated a perceived lack of motivation from staff to the integrate sustainable development into economics curriculum.

Given the results of this study, the current author recommends that there is a review of the UK Research Excellence Framework to ensure that it does not inhibit the recruitment of inter-disciplinary and pluralist lecturers in economics that have the right mix of skills to integrate sustainable development teaching and research into economics. This is important and vital as economics is arguably the most critical discipline in moving towards sustainable development as highlighted at the start of this paper.

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Appendix A: Questions to investigate student understanding and motivation towards sustainability (answered on a 5-point Likert scale: Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree)

1. Sustainable development is something which I would like to learn more about
2. Sustainable development is something which universities should actively incorporate and promote
3. Sustainable development is something which university courses should actively incorporate and promote
4. Sustainable development is something that all course tutors should be required to incorporate within their teaching

Appendix B: Interview schedule:

1. Are you familiar with the term sustainability?
2. Do you believe sustainability to be important?
3. Is there an understanding or definition of sustainability that you have to mind? Identify the Brundtland definition.
4. Do you think that the Brundtland definition is a good definition of sustainability?
5. Which modules do you teach to economics students?
6. Undergraduate or post graduate?
7. To what extent do you believe references to sustainability are incorporated into your module specifications?
8. Can you think of any ways that you have incorporated aspects of sustainability into your teaching of each of these modules? (take each module one at a time). Provide examples.
9. To what extent do you think sustainable development is incorporated into the teaching of each of your modules on a scale of 1-10 (one being not at all integrated;10 being fully integrated).
10. When you teach sustainability does it tend to be through a neo-classical/ environmental economics framing?

11. If you had to describe or identify or categorise yourself as an economist, how would you describe yourself?

Appendix C: Barriers survey

To what extent do you agree or disagree with the following statements (a 6-point Likert scale is used: 1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree 5. I don't know 6. I don't want to tell)

Feel free to provide further comment or knowledge to go with any of your answers under each question.

1. The method or approach of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;
   (further content or knowledge if you wish to provide)

2. The assumptions of neoclassical (mainstream) economics help the integration of sustainable development into economics curriculum;
   (further content or knowledge if you wish to provide)

3. Mainstream definitions of economics help the integration of sustainable development into economics education (4 are provided below - these will be provided in due course)
   (further content or knowledge if you wish to provide)

4. The dominant established curriculum and its scope (micro, macro and econometrics) helps enable pathways to bring sustainable development into economics curriculum;
   (further content or knowledge if you wish to provide)

5. The UK research excellence framework (in its current form) helps enable the recruitment of interdisciplinary economists able to address sustainable development
   (further content or knowledge if you wish to provide)

6. Environmental economics (an extension of mainstream economics) can adequately allow incorporation of sustainable development into economics curriculum when combined with neo-classical economics
   (further content or knowledge if you wish to provide)

7. Past habits in teaching economics (in terms of choice of content and method) generally help teachers to incorporate new curriculum such as sustainable development into economics
   (further content or knowledge if you wish to provide)

8. Lecturers in economics departments in the UK would generally be motivated to integrate sustainable development into economics curriculum.
(further content or knowledge if you wish to provide)

9. 3 and 4* Economics journals are generally open to publishing topics focused on sustainable development;
(further content or knowledge if you wish to provide)

10. 3 and 4* Economics journals are generally open to publishing new topics focused on sustainable development;

(further content or knowledge if you wish to provide)

11. How would you classify yourself as an economist? Please highlight as appropriate:

    1. Economist; 2. Neoclassical Economist; 3. New Institutional Economist; 4. Institutional Economist; 5. Evolutionary Economist; 6. Feminist Economist; 7. Environmental Economist; 8. Mainstream Economist; 9. Ecological Economist; 10. Austrian Economist; 11. Heterodox Economist; 12. Post Keynesian Economist; 13. Empirical Economist; 14. Applied Economist; 15. Economic Historian; 16. Pluralist Economist; 17. Keynesian Economist; 18. Other.

Appendix D:

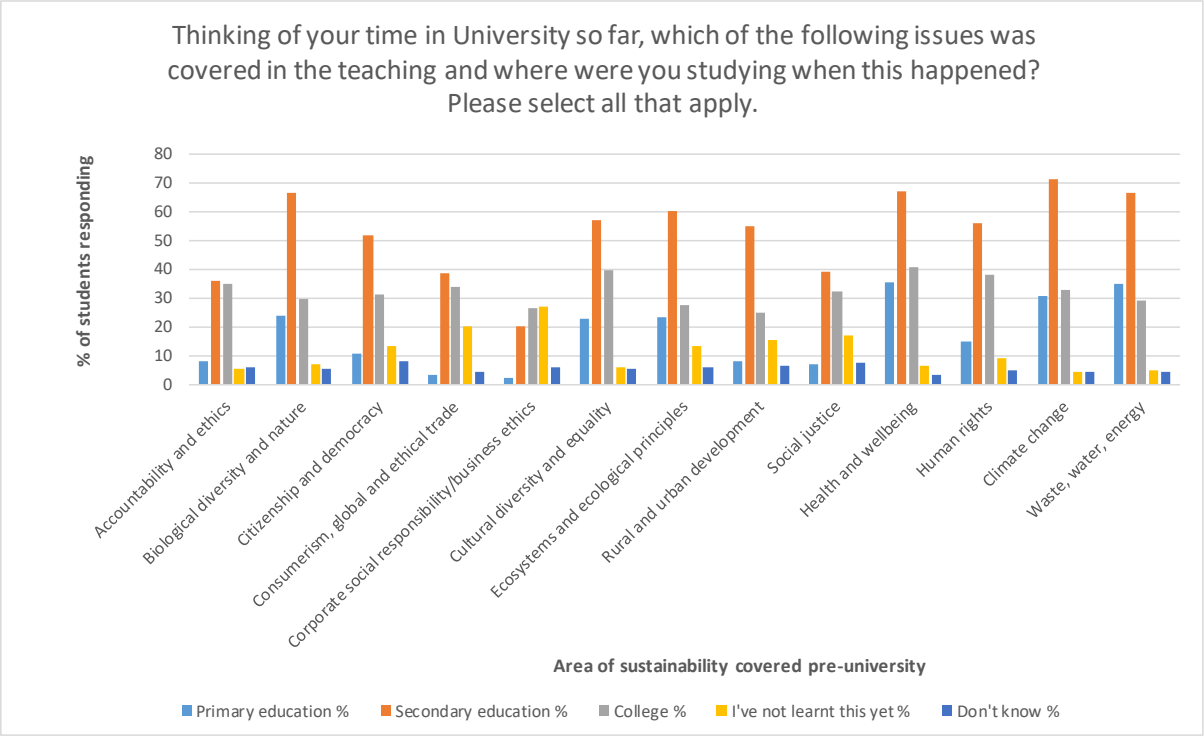

Figure D1: Areas of sustainability covered pre-university (Gough 2018)

The sample for the data above is from a survey of 221 students. It can be seen that in relation to pre-existing teaching of sustainability knowledge, the majority of students (over 50%) had pre-existing teaching on the majority of sustainability themes/issues in secondary school. The majority of students that took the survey were from the UK and in first year, had gone straight from school to university. Students studying business and administrative studies were the most highly represented in the sample. Given that secondary school curriculum is fairly consistent between schools in the England, one would expect economics students entering higher education to have a somewhat similar level of exposure to sustainability related teaching before entering the University system.

Appendix E

Statement 1

Answer to question * Training Crosstabulation

			Training		
			HeterodoxEconomists	MaintsreamEconomists	Total
er to question	Disagree/Strongly Disagree	Count	10	9	19
		Expected Count	7.3	11.7	19.0
	Agree/Strongly Agree	Count	4	13	17
		Expected Count	6.5	10.5	17.0
	I Don't Know	Count	1	2	3
		Expected Count	1.2	1.8	3.0
		Count	15	24	39
		Expected Count	15.0	24.0	39.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.247[a]	2	.197	.211		
Likelihood Ratio	3.313	2	.191	.305		
Fisher's Exact Test	3.275			.211		
Linear-by-Linear Association	2.160[b]	1	.142	.197	.111	.073
N of Valid Cases	39					

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.15.

b. The standardized statistic is 1.470.

Statement 2

Answer to question * Training Crosstabulation

			Training		
			HeterodoxEconomists	MainstreamEconomists	Total
Answer to question	Disagree/Strongly Disagree	Count	10	8	18
		Expected Count	7.0	11.0	18.0
	Agree/Strongly Disagree	Count	0	10	10
		Expected Count	3.9	6.1	10.0
	I Don't Know	Count	2	1	3
		Expected Count	1.2	1.8	3.0
Total		Count	12	19	31
		Expected Count	12.0	19.0	31.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	9.457[a]	2	.009	.005		
Likelihood Ratio	12.831	2	.002	.002		
Fisher's Exact Test	10.304			.003		
Linear-by-Linear Association	1.428[b]	1	.232	.286	.180	.113
N of Valid Cases	31					

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.16.

b. The standardized statistic is 1.195.

Statement 3

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	9	7	16
		Expected Count	6.4	9.6	16.0
	Agree/Strongly Agree	Count	2	12	14
		Expected Count	5.6	8.4	14.0
	I Don't Know	Count	3	2	5
		Expected Count	2.0	3.0	5.0
Total		Count	14	21	35
		Expected Count	14.0	21.0	35.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.451[a]	2	.040	.040		
Likelihood Ratio	6.967	2	.031	.035		
Fisher's Exact Test	6.526			.035		
Linear-by-Linear Association	.591[b]	1	.442	.482	.301	.144
N of Valid Cases	35					

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.00.

b. The standardized statistic is .769.

Statement 4

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	10	8	18
		Expected Count	7.5	10.5	18.0
	Agree/Strongly Agree	Count	4	11	15
		Expected Count	6.3	8.8	15.0
	I Don't Know	Count	1	2	3
		Expected Count	1.3	1.8	3.0
Total		Count	15	21	36
		Expected Count	15.0	21.0	36.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.903[a]	2	.234	.278		
Likelihood Ratio	2.955	2	.228	.372		
Fisher's Exact Test	2.912			.241		
Linear-by-Linear Association	2.051[b]	1	.152	.196	.120	.078
N of Valid Cases	36					

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.25.

b. The standardized statistic is 1.432.

Statement 5

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	12	7	19
		Expected Count	8.9	10.1	19.0
	Agree/Strongly Agree	Count	1	5	6
		Expected Count	2.8	3.2	6.0
	I Don't Know	Count	2	5	7
		Expected Count	3.3	3.7	7.0
Total		Count	15	17	32
		Expected Count	15.0	17.0	32.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.163[a]	2	.076	.093		
Likelihood Ratio	5.446	2	.066	.093		
Fisher's Exact Test	4.868			.093		
Linear-by-Linear Association	3.463[b]	1	.063	.087	.048	.031
N of Valid Cases	32					

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 2.81.

b. The standardized statistic is 1.861.

Statement 6

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	10	3	13
		Expected Count	5.4	7.6	13.0
	Agree/Strongly Agree	Count	4	10	14
		Expected Count	5.8	8.2	14.0
	I Don't Know	Count	1	8	9
		Expected Count	3.8	5.3	9.0
Total		Count	15	21	36
		Expected Count	15.0	21.0	36.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	11.093[a]	2	.004	.005		
Likelihood Ratio	11.826	2	.003	.007		
Fisher's Exact Test	10.692			.005		
Linear-by-Linear Association	9.979[b]	1	.002	.002	.001	.001
N of Valid Cases	36					

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.75.

b. The standardized statistic is 3.159.

Statement 7

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	10	10	20
		Expected Count	8.1	11.9	20.0
	Agree/Strongly Agree	Count	4	6	10
		Expected Count	4.1	5.9	10.0
	I Don't Know	Count	1	6	7
		Expected Count	2.8	4.2	7.0
Total		Count	15	22	37
		Expected Count	15.0	22.0	37.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.745[a]	2	.253	.241		
Likelihood Ratio	3.033	2	.220	.241		
Fisher's Exact Test	2.617			.269		
Linear-by-Linear Association	2.503[b]	1	.114	.139	.084	.050
N of Valid Cases	37					

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 2.84.

b. The standardized statistic is 1.582.

Statement 8

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	8	8	16
		Expected Count	6.9	9.1	16.0
	Agree/Strongly Disagree	Count	3	5	8
		Expected Count	3.5	4.5	8.0
	I Don't Know	Count	2	4	6
		Expected Count	2.6	3.4	6.0
Total		Count	13	17	30
		Expected Count	13.0	17.0	30.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.645[a]	2	.724	.699		
Likelihood Ratio	.650	2	.723	.699		
Fisher's Exact Test	.700			.699		
Linear-by-Linear Association	.586[b]	1	.444	.499	.299	.138
N of Valid Cases	30					

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 2.60.

b. The standardized statistic is .765.

Statement 9

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	6	6	12
		Expected Count	5.0	7.0	12.0
	Agree/Strongly Agree	Count	6	7	13
		Expected Count	5.4	7.6	13.0
	I Don't Know	Count	3	8	11
		Expected Count	4.6	6.4	11.0
Total		Count	15	21	36
		Expected Count	15.0	21.0	36.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.388[a]	2	.500	.489		
Likelihood Ratio	1.431	2	.489	.489		
Fisher's Exact Test	1.405			.536		
Linear-by-Linear Association	1.162[b]	1	.281	.304	.193	.094
N of Valid Cases	36					

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.58.

b. The standardized statistic is 1.078.

Statement 10

Answer to question * Training Crosstabulation

			Training		
			Heterodox Economist	Mainstream Economist	Total
Answer to question	Disagree/Strongly Disagree	Count	6	6	12
		Expected Count	4.8	7.2	12.0
	Agree/Strongly Agree	Count	6	7	13
		Expected Count	5.2	7.8	13.0
	I Don't Know	Count	2	8	10
		Expected Count	4.0	6.0	10.0
Total		Count	14	21	35
		Expected Count	14.0	21.0	35.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.372[a]	2	.305	.357		
Likelihood Ratio	2.522	2	.283	.357		
Fisher's Exact Test	2.345			.357		
Linear-by-Linear Association	1.894[b]	1	.169	.200	.123	.068
N of Valid Cases	35					

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.00.

b. The standardized statistic is 1.376.