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## Educating for environmental sustainability and educating for creativity: actively compatible or missed opportunities?

# Educating for environmental sustainability and educating for creativity: actively compatible or missed opportunities?

**Kay Stables**

**Abstract** This paper identifies the importance of both creativity and environmental sustainability for developing individual learners and society as a whole. It suggests that sometimes these two concepts appear to be in tension and that, politically, each is often championed by different communities. The relationship between creativity and environmental sustainability is explored in three separate contexts: in a design and technology schools context where teenage learners are being facilitated to develop creative responses within design briefs that include environmental considerations; through interviewing student teachers who have undertaken an ecodesign project; and through interviews with professional ecodesign practitioners. The tensions, compromises and contradictions evident where there is limited experience of environmental issues is contrasted with the level of optimisation and creativity engaged when designers have more maturity in this area. Finally, some suggestions are made for taking forward creativity and environmental sustainability in technology education through an ecodesign capability approach.

**Keywords** Creativity · Environmental sustainability · Ecodesign · Technology education

## Introduction

Within 21st Century education agendas across the globe, certain concepts have become ubiquitous. Among these is the imperative for educating young people to contribute to increasing environmental sustainability and also the desire for developing the creativity of the population. The instrumental drivers for these two agendas could be viewed as being in tension—the first frequently having been driven by an environmental activist agenda (for example led by NGOs such as Greenpeace and Friends of the Earth), the second by a political/economic agenda focusing on creativity and cultural industries (for example

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Taiwan, MoE 2002: and UK, DCMS 2001). In the past there have been plenty of examples of where one agenda has been prioritised at the expense of the other, but increasingly the drivers for both agendas are converging (arguably) around an economic agenda as governments and, possibly more critically, industry are recognising the economic advantages of 'green' policies and lowering carbon footprints.

From an educational (rather than instrumental) viewpoint the two can be seen to have equal worth in the education of all young people. But by-and-large, the development of creativity and addressing environmental sustainability within educational contexts has been one of silent partners—where the priority for one has muted the other, either explicitly or by default. Explicit 'muting' can be seen where, for example, the imperatives of producing sustainable solutions using appropriate technology that are culturally sensitive has prevented free and creative exploration that ignores the environmental impact of resources used. The converse can be seen where projects focusing on creativity and innovation are seen to be constrained if environmental considerations have also to be taken into consideration. These two standpoints have resulted in unhelpful stereotypes of design for sustainability being practical but aesthetically barren and of tokenistic projects where lip service is paid to either creativity or sustainability.

Within the professional ecodesign world there is considerably more maturity, evidenced, for example, by exhibitions such as 'Good and Gorgeous' ([re]design 2006), 'Well-fashioned: Eco style in the UK' (Crafts Council 2006) and "Climate Cool by Design" ([re]design 2007/8) where high levels of creativity have been fused with highly developed knowledge and understanding of environmental issues and impacts. At the level of school education (i.e. 5–18) the two areas have typically been linked to different dimensions of technology education curricula. Creativity is typically seen as something that is developed in a design context and through practice—being creative is an active, capability-focused venture. Understanding issues of environmental sustainability however has more frequently been linked to technological literacy rather than technological capability—being aware of the *impacts* of technology on humankind rather than *taking action to 'design out'* negative impacts. A major question to explore therefore is how the two areas can be brought together in technology education classrooms, workshops and studios in ways that enable their educational potential to be fully and mutually exploited to the benefit of developing young learners.

This paper will start with an outline of research that has explicitly forefronted creativity within a schools design and technology context, in which sustainability issues played a minor role and use this to raise some questions about the relationship between creativity and environmental sustainability. It will then explore these issues further through interviews with two sets of practitioners—design and technology student teachers and professional ecodesign practitioners. The paper will then draw together the issues and ideas raised and make proposals for future developments.

## A 'cause for concern' over creativity identified

In 1999, in preparation for the launch of a refreshed National Curriculum for Design and Technology in England a vision statement entitled 'The importance of Design and Technology' was published. This statement laid out the aims of the curriculum area, including that the subject developed learners' abilities to " think and intervene creatively to improve quality of life" to become "creative problem solvers" and to "combine

practical skills with an understanding of aesthetics, social and environmental issues" (DfES/QCA 1999).

Despite the vision, concern was raised that practice in classrooms was not matching up to the aspirations expressed through the 'Importance' statement. A Department for Education and Skills' Design and Technology Strategy Group commissioned report, (Prest 2002) identified a mismatch between the vision and content of the curriculum document in a range of areas, not least that of supporting creativity and developing environmental understanding. This was identified as particularly problematic in terms of assessment. As a result the Strategy Group commissioned research to develop assessment tools and approaches that:

- utilise new technology;
- prioritise students intervening creatively in the made world;
- enable students to work collaboratively;
- recognise social and environmental issues;
- reward design innovation (Barlex 2003, p. 9).

The resulting project, *Assessing Design Innovation* took on this challenge. Based on an approach we termed the 'unpickled' portfolio (developed through earlier research, see Stables and Kimbell 2000) we developed an assessment activity structure for design tasks lasting six hours, that involved collaborative 'critical friends' and that placed at the heart of the activity strategies to support creativity and innovation (Kimbell et al. 2004).

## Creativity and innovation—a success story

The approach taken drew on earlier research (Kimbell et al. 1991; Stables and Kimbell 2000); on observing experienced Design & Technology teachers facilitating creativity through open, intensive two-day design projects; and on analysis of work deemed by teachers and examination awarding bodies to be either highly creative, or good quality but mundane. In particular, we choreographed the activity through a series of sub-tasks that promoted an interaction between action and reflection and that provided evidence 'prompts' that provided a terrain in which learners could *have*, *grow* and *prove* ideas in such a way that facilitated the development of creative ideas whilst leaving behind a strong evidence trail (Stables and Kimbell 2007; Kimbell and Stables 2007). The detail of this approach and the project itself have been described elsewhere in considerable detail, (Kimbell and Stables 2007) but a mark of the success in terms of creativity and innovation is that the prototype 6-h design activity has now become embedded in the national General Certificate of Secondary Examination (GCSE) by forming one part of the assessment of the OCR Awarding Bodies' Product Design GCSE—the 'Innovation Challenge'.

## Creativity and innovation in a sustainability context

However, an aspect of the research project that was less successful was developing assessment materials that explicitly focused on "recognis[ing] social and environmental issues" (Barlex 2003, p. 9). It would be fair to say that this part of our brief was given less emphasis through the research, although it was not ignored. Our approach to addressing this was partly through embedding sustainability issues into the context and requirements

of the design challenges set, and partly through the prompts provided during the 6-h activities.

A range of design challenges were developed—two by the research team and a further set by the experienced teacher/examiners working with us on the project. The two developed by the team had an explicit environmental sustainability component. In the first, 'Light Fantastic', the challenge was to develop light bulb packaging that would do all the things regular light bulb packets do and in addition have the capacity to be turned into a lighting feature itself, to avoid the package being thrown away. This task became our 'control' activity—all learners who were assessed undertook this challenge and then a parallel task developed by one of the teacher examiners. As a result, over 600 learners have undertaken this activity. But beyond implicitly addressing the requirement to design the packaging to not be thrown away, only a tiny percentage of these students actively addressed environmental sustainability in their designing.

The second design challenge created by the research team ('Cardboard City') was even more explicitly focused on environmental sustainability. The challenge was as follows.

### Cardboard city task

JB is about 26 years old, single, short of money, and has just moved temporarily into an unfurnished but large bed-sit. The bed-sit overlooks a shopping centre where corrugated cardboard boxes are freely available.

– JB wants to construct some sort of modular space-divider so that the room looks broken up
– In addition to breaking up the space, the divider needs to perform an additional function (e.g. playing with light, creating storage, making sounds)
– JB dislikes wasting world resources (JB is a bit of an eco-warrior)
– Wallpaper paste and some joining components are also available

Design and prototype at least one module that

– Would, if repeated, make up a complete space-divider
– Is something that JB wants
– Is suitable for the bed-sit
– Works well for what it has to do *and* for JB

To address this challenge, the learners worked as individuals in a group of three 'critical friends'. They started by fleshing out the user profile given of 'JB' and then put down some initial ideas that went through a process of development by rotating the early ideas amongst the group of three, coming back to the originator who then took forward what they saw as the best of the ideas. There then followed a period of development which had interjected into it a periodic request to roll a 'random question' dice that provided prompts to provoke learners to think more deeply about their designing, and a request part way through to evaluate the ideas each was developing. Towards the end of the first three-hour session, learners peer-reviewed the work within each threesome and identified 'what to do next' in preparation for the second three-hour session the following day. Photographs of their developing ideas (typically 3D sketch models) were taken roughly once an hour, printed and inserted into each developing portfolio. The second session started with a reflective celebration of what had been achieved in session 1, followed by further time to develop ideas (again typically through 3D sketch modelling) interspersed with prompts to reflect

and evaluate and the taking of photographs of the developing model. Towards the end of the session there was further peer review, followed by a final 'fastforwarding' of the idea being developed to show, in sketch form, how learners envisaged their final outcome to look.

In terms of creative responses, we found we had a similar range to other activities within the research project. Figure 1, which shows the development work of the learner with the overall highest 'holistic' score for creativity and innovation, demonstrates the process that was undertaken and also illustrates the kind of creative response we witnessed.

Through the ideas expressed, and the accompanying comments, it was clear that the major emphasis for the learners was to develop a creative solution to JB's needs. But in terms of responding to issues of environmental sustainability, things were more disappointing. Because of the way in which the task was structured, there were a range of points where learners *might* have been expected to explicitly make reference to environmental issues or ideas, in addition to those that could occur through the learner's general approach. These were:

– in the client profile developed at the outset;
– in response to requests to reflect on the task when developing ideas
– in response to evaluate ongoing work: through identifying what was working well and what not so well; through questions on the dice (e.g. . "what more could you do to make your product environmentally friendly and socially responsible?");
– through peer review;



**Fig. 1** exemplifying the approach taken

– through self reflection at the end of session 1 and session 2 (where the learners are requested to review what they have done so far in relation to the brief; JB's likes, wants and needs; and the models, experiments and ideas developed to that point.)

Table 1 indicates that, for the 21 learners involved in trialling this design challenge, the number and range of places in which environmental issues were mentioned was patchy, always in relation to prompted responses (as opposed to self-generated) and with no apparent pattern in relation to the quality of the work. Two of the three highest scorers make no explicit mention of environmental issues at all, while both of the lowest scorers do. (Holistic 11 was the highest score—the highest possible score was 12—and 2 was the lowest.)

Looking in more detail at the types of comments that were being made (see Table 2) it is clear that, for most, any reference to sustainability was somewhat superficial. In developing the user profile the majority of the comments re-stated the brief and in only a minority was there any real indication that designing was being influenced by sustainability issues. Perhaps the most convincing was script A4163 where materials are being used in the design with clear intentions of using less.

"I would use less cardboard and make use of every bit. And then when I stack them upon each other, I wouldn't make the slit so deep to save space and money" (learner A4163)

Table 1 The areas where environmental sustainability (eco) comments were made

| Script number | Holistic score | Explict mention of eco in initial profile creation | Exlicit eco comment elsewhere? | Eco contradictions | Unprompted eco comments |
|---|---|---|---|---|---|
| a4161 | 11 | No | No | No | No |
| a4138 | 10 | No | No | No | No |
| a4163 | 10 | Yes | Yes | Yes | No |
| a4162 | 9 | No | No | No | No |
| a4160 | 8 | Yes | No | Yes | No |
| a4172 | 7 | Yes | Yes | No | No |
| a4173 | 7 | Yes | No | No | No |
| a4132 | 6 | Yes | Yes | Yes | No |
| a4165 | 5 | No | Yes | No | No |
| a4171 | 5 | No | Yes | No | No |
| a4167 | 5 | Yes | No | Yes | No |
| a4176 | 5 | Yes | Yes | Yes | No |
| a4134 | 5 | Yes | Yes | No | No |
| a4169 | 5 | Yes | Yes | Yes | No |
| a4175 | 4 | Yes | No | No | No |
| a4168 | 4 | Yes | Yes | No | No |
| a4170 | 4 | Yes | No | Yes | No |
| a4128 | 3 | No | No | No | No |
| a4123 | 3 | No | No | No | No |
| a4139 | 3 | No | Yes | No | No |
| a4164 | 2 | Yes | No | Yes | No |

**Table 2** Examples of 'eco' comments, contradictions and actions

| Script number | Holistic | Comments within client profile | Comments in relation to 'dice' questions (Qu A: What more could you do to develop your idea for your user? Qu B: What more could you do to make your ideas environmentally friendly and socially acceptable? Qu D: How could you make your ideas cheaper to produce? | Eco contradictions in the work |
|---|---|---|---|---|
| a4163 | 10 | JB likes practility and not wasting stuff | Qu D: "I would use less cardboard and make use of every bit. And then when I stack them upon each other, I wouldn't make the slit so deep to save space and money." | World "paint so it would look more attractive." |
| a4160 | 8 | Says JB is a Greenpeace worker | Qu A—"make it more decorative for all his parties—more colours." | Module is coloured (somehow) and has mini lights all over it. |
| a4172 | 7 | "JB likes making stuff out of old unwanted things." | Qu B—"use used products e.g. old sticks" | |
| a4173 | 7 | JB is an 'environmentalist decorator' | | Qu D—"make it out of cheaper material."—despite already using discarded corrugated cardboard |
| a4132 | 6 | "He likes being an ecowarrior." | | Adds plastic mirrors |
| a4167 | 5 | JB "saves and makes the most out of worlds resources." | Qu D "I would use less sticks" | Paints model |
| a4176 | 5 | JB likes practility and not wasting stuff | Qu A—"I could try to make it more attractive and practical". Qu B "I will telll everyone it is biodegradable and also be used again." | Paints model |
| a4134 | 5 | A bit of a hippy, likes saving the earth's resources | Qu B—"To make it more environmenatlly friendly I would use all the excess bits cut off" (although not clear from the design how) | Says the design needs to fit to JB's hippy personality, then covers the cardboard with foil |
| a4169 | 5 | Person is an eco-decorator | Qu D—"I could use cheaper material and manufacturing processes." | Eco decorator but likes shopping |
| a4175 | 4 | JB is eco-warrior decorator | Qu A—"I think it could be more easy to dissassemble." Qu B—"I don't know" | |
| a4170 | 4 | Says JB is a Greenpeace worker | Qu A—"Make it more colourful and decorative." | Adds yellow and black paint and foil to decorate—reason given for not using foil—less attractive. |
| a4164 | 2 | JB likes to be eco-friendly | Qu A—"I would add a coloured neon at the bottom to make a light" … not a very eco response! | JB has a 'modified Punto and whole design, visually, is around a car. |

But the learner then talks of painting the modules to "look more attractive", which potentially contradicts his earlier eco intentions. The evidence of contradictions across the range of the work illustrates a lack of real awareness of environmental issues and approaches—for example, identifying JB as an 'eco decorator' who likes to spend their time 'shopping'; the frequency of decorating the modules with paint, foil, plastic mirrors or lights; or the most extreme case of making the whole module look like a car and adding neon lights to it.

So, while we witnessed some exceptionally creative responses to both the 'Cardboard City' and 'Light Fantastic' design challenges, the evidence of environmental awareness being demonstrated was at best superficial or tokenistic and at worst simply not there. This raises a range of questions. Was this because the learners had no awareness? Or was it that they had a level of awareness, but no repertoire of strategies to utilise this in their designing? Or is it simply more difficult or complex to be creative in designing and address environmental challenges?

## Exploring issues further through practitioner interviews

To explore further the relationship between creativity and sustainability, interviews were undertaken with two groups of designers. The first group were undergraduate initial teacher education students undertaking a BA with Education to teach Design and Technology in Secondary schools in England. During their second year they undertook an ecodesign project that commenced by them being introduced to a range of ecodesign tools such as cradle to grave product life cycle analysis and energy audits, exploring existing initiatives and being made aware of impending sustainability legislation that would impact on designers. The students drew on this introduction to undertake an energy audit on a range of similar products and then re-design one of the products to have a better rating. They then moved onto a wider brief of designing and modeling an ecodesigned product, producing a rationale for the decisions they made and a justification for why it was a better product. The students brought to this a range of experiences and levels of understandings of sustainability, and all had worked on a 'recycle and re-invent' textiles project in their first year. Five self-selected students were interviewed about their experiences of the project.

The second group interviewed were ecodesign practitioners who also, in various ways have links with teaching and/or research at Higher Education. Three practitioners were interviewed in depth about their practice. One has run her own textiles design business and now works in Higher Education within a Textiles Environmental Design group. The second has a BA in Ecodesign and operates part time as an ecodesigner-maker and part time as a researcher/lecturer in higher education. The third works as a consultant in trend-forecasting, focusing on sustainability issues and as a design lecturer in higher education.

The interviews were semi-structured, voice recorded and transcribed. Both sets were ordered to explore the following:

–   the nature of each individual's practice in the context of ecodesign;
–   the extent to which each individual saw ecodesign projects as more difficult or complex than 'regular' design projects;
–   the extent to which either creativity or ecodesign tools were utilised;
–   whether their designing is driven more by creativity or sustainability issues;
–   the extent to which they felt that ecodesign forced them to compromise or enable them to optimise solutions;

- whether, when designing they saw themselves as educating *through* the design;
- the impact that their ecodesign practice had on their educational practice; and to the professional designers,
- how they would introduce ecodesign to teenagers in a schooling context.

**Insights arising from the student teacher practitioners**

The projects the students undertook fell roughly into two camps: two designed campaigns; three used existing discarded products to create new product(s). The first 'campaign' student (Student Practitioner 1: SP1) was disturbed by anti-eco propaganda and targeted his project directly at turning the problem of waste back onto manufacturers.

> I thought how could you turn that round, how could you convince someone to … If, if you're playing on people's natural laziness to not play their part could you then turn that round? And that made me think about putting the pressure back on the manufacturers and the companies and looking at packaging basically … if you intentionally just littered and threw it around and then maybe, I don't know, maybe the powers-that-be wouldn't see a way out of it other than getting the companies who supply you with the stuff in the first place to reduce their outgoing waste. (Student Practitioner 1)

His project outcome was a skip filled with waste packaging accompanied by a leaflet designed to convey information about the issue and the campaign.

The second 'campaign' student (Student Practitioner 5: SP5) developed a campaign against free newspapers. To do this he created a blog on the subject and designed a set of stickers with non-committal questions on them such as "free newspapers good or bad? Voice your opinion" and the web address of the blog. He then stuck the stickers on 20 free newspapers each day for two weeks and monitored the feedback on his blog.

Of the three product-focused students, one (Student Practitioner 3: SP3) converted a discarded washing machine drum into a stool, one (Student Practitioner 4: SP4) explored appliquéing old potato crisp packets onto cushion covers and one (Student Practitioner 2: SP2) used newspapers as a source material to create a culturally and ethically sensitive jewelry collection.

> I based mine using newspaper … I used sort of like paper mache techniques, … twisting it, … combining with other materials … I looked at how jewellery in Africa is worn, and it's very bold and big, and round the neck especially. (Student Practitioner 2)

Ecodesign is more complex?

The motivations and approaches of the students varied and all but one saw the project as more complex—but for different reasons. SP1 thought it was more complex because he wasn't sure what he was going to produce (beyond the skip of rubbish); SP2 because she wanted it be a really 'wow' creative solution and also be eco-friendly; SP3 because she found it hard to find a starting point; and SP4 because she felt her own personal knowledge was very basic and that she was treating the project as a set of boxes to be ticked.

The fifth student (SP5) didn't see it as more complex but rather as an opportunity to explore something in quite a fresh way.

I didn't think it was a difficult project. I thought it was quite intriguing in that we were given this to do … So it was quite good because you were given this little thing that was yours and there was no real right or wrong answer because no one else had done it before and you could just take it away and kind of un-box it yourself. (Student Practitioner 5)

It was clear throughout the interview that this student had a well-developed understanding of sustainability issues and a strong commitment to them. When asked whether he saw himself in this ecodesign project as designer or educator, he claimed the educator role without any hesitation. This was echoed by the other 'campaign' student (SP1)

I wasn't thinking about what's the thing I'm going to end up with I was thinking about, cause it's all to do with, well, to me, it all seems to do with issues, you know, it's all to do with educating people about that and it's not always about having a thing at the end of it. (Student Practitioner 1)

The other students said that although the brief gave food for thought for school projects, none saw it as an educating vehicle per se. For these three students it was treated as a standard design project.

Creativity or sustainability…optimising or compromising?

The differences in views of complexity were linked to the views expressed about their own creativity in the project and the extent to which they felt they were optimising or compromising in realising their outcome.

SP1 was ambivalent about the extent to which his project was creative. He saw it as "an interesting idea" although not necessarily a new one. He felt somewhat lost in the project—partly because he wasn't sure what his outcome ought to be. Because he had big aspirations for the project, he felt his outcome was a compromise, mainly because he couldn't realise his aspirations through a student project. So, while he showed strong commitment to and understanding of environmental sustainability issues, he felt a measure of frustration in addressing these through design.

For SP2, having to consider eco issues acted as a spur to her creativity. It provoked a different way of working to how she usually approached design projects, involving her working far more directly through experimenting with materials. She felt the project allowed her to achieve a good balance between being creative and addressing sustainability issues. In response to a question on whether creativity or sustainability was the key driver for her she stated

A bit of both I believe, because being sustainable, I was using those sorts of materials, which I wouldn't have used in a normal sort of project. But being creative with it just so I could like, basically prove to myself that, "Yeah", I could make something really attractive from a blank sheet, sort of like newsprint and you know still sort of be creative within it. (Student Practitioner 2)

Although seeing the project as complex, she felt she was largely optimising in her approach, because the eco issues were feeding her creativity and her creativity was feeding the eco issues.

Likewise SP3 found the challenge of ecodesign made her more creative—having to focus on eco issues pushed her to think harder and seek new solutions.

> I think it actually helped me being creative because, if that, I think if I had found someone to take that washing machine down for me I probably would have thrown it out earlier, without thinking that, "Oh yeah. I could actually use it", you know. But it was not until I sat thinking and thinking, "What should I do? What should I do?" saying, "I've got this washing machine just sitting out there—what can I do with it? (Student Practitioner 3)

She also considered that her design developed through optimisiation rather than compromise although she too found the project complex. She also noted that she was able to bring a stronger ecodesign dimension to her next project.

For SP4 the ecodesign focus of the project was limiting. By her own admission, she had a very basic understanding of environmental sustainability issues before starting the project and felt that this had a negative impact on her whole attitude and approach. She conceptualised the whole project in terms of recycling and found this distinctly unmotivating. She felt she was just going through the motions—just 'ticking boxes'. Without the motivation she found it hard to raise her game in terms of creativity.

> I did feel that I needed, you know, it's the whole tick boxes, it's got to be eco, it's got to be eco, and that's always constant at the back of your mind, you know. I would have felt comfortable, if it was just something that we had to bring in, experimented with and if we didn't like it, you know, go away from there rather than, it was so focussed on it. (Student Practitioner 4)

As a result she stuck to her pre-existing textiles skills and applied these to using crisp packets in decorative finishes. She couldn't identify any way in which she had progressed as a designer and felt she had 'played safe'. However, reflecting back, seeing the ways others addressed the task enabled her to see how she could have done things differently and moved beyond recycling. She definitely felt her project was one of compromises.

SP5 found the project intriguing and motivating because it was so different to previous projects; so lacking in constraints; because he felt he was being given permission to approach the project in a very individual way; and because the outcome didn't have to fit any norm—for example, it was OK to create a blog as an outcome.

> Looking back over the two years that's been probably the project that I've felt most proud of coz it was so three dimensional, and you know, there was the blog and the kind of in-situ part … Yeah, looking back I think that was more creative purely because I could use resources at Goldsmiths and do things on my own. (Student Practitioner 5)

For him the project was very much about being creative and optimising. But he did comment on other students who he felt stemmed their creativity by getting into what he described as a "cul de sac" of taking a more superficial view of sustainability as recycling and not seeing the 'bigger picture' of sustainability.

Use of ecodesign tools?

Despite the initial experience of exploring a range of ecodesign tools at the start of their projects, none of the students (rather surprisingly) explicitly used any ecodesign tools in creating their outcomes.

Impact on practice as educators?

In exploring the way the ecodesign experience impacted on their practice as teachers there was a split between the 'campaign' students and the 'product' students, the latter having gone further in applying their experience in school placements. The most developed school-based practice was evident in discussion with SP2 who has been involved in recycling projects in school and in her current placement was working closely with the teachers to create a focus on sustainability that featured throughout the design and technology department's scheme of work. She was very conscious of the challenge of engaging teenage learners in ecodesign because, in her words,

> some of the kids are finding it a struggle, like, finding it a struggle because it's not pleasing, it's not what they would buy. It's not attractive enough. (Student Practitioner 2)

Based on her own design experience, she moved them forward by emphasising creativity through scenario building and hands-on experimentation.

> "So it's quite tough for those ones but I think, well, like yeah, we sort of like encourage them to do a bit more sort of practical work and come up with more designs and things." (Student Practitioner 2)

She was also aware of the limitations of what is being done in school in terms of the use of materials, processes, etc. that are not degradable or sustainable. Generally she demonstrated well-considered understanding of how to develop environmental awareness through design practice in schools.

The other two 'product' focussed students had also explored ecodesign practice in schools, again at the level of recycling and starting from an issues base and trying to emphasis creative approaches as a way of helping the learners take ownership. This had worked more effectively where the teacher-mentors have a level of understanding of incorporating sustainability issues into design practice, but not all felt a lead from their mentors. This resonates with research in science and geography teacher education, which indicated that student teachers were ahead of their school mentors in dealing with environmental issues (Summers et al. 2005).

Interestingly, both of the 'campaign' students who demonstrated very developed understanding of environmental sustainability issues in their own projects, had not been involved in any ecodesign projects in school and found it difficult to express clearly how they would address this challenge. For SP5, it was almost as if his own high level of understanding of the complexity of sustainability was obscuring his view of how to implement ecodesign in schools, even though he showed a strong commitment to doing so.

> To invest that learning at such a young age, because we were the wasteful generation and they're the … generation to make a difference … I think it would be quite difficult to transcend, to cross a boundary of, not just taking something and then making it into something else, but actually doing something that's much further beyond that. I think that that perhaps, in school that can be a little bit over their heads … I'm not actually sure of what I'm trying to say. Just trying to think out of the box a little bit more than taking a product and making it into something else. (Student Practitioner 5)

The second 'campaign' student similarly had no opportunity to put ideas into practice in school and appeared to be too overwhelmed by the scale of the issues to know where to begin.
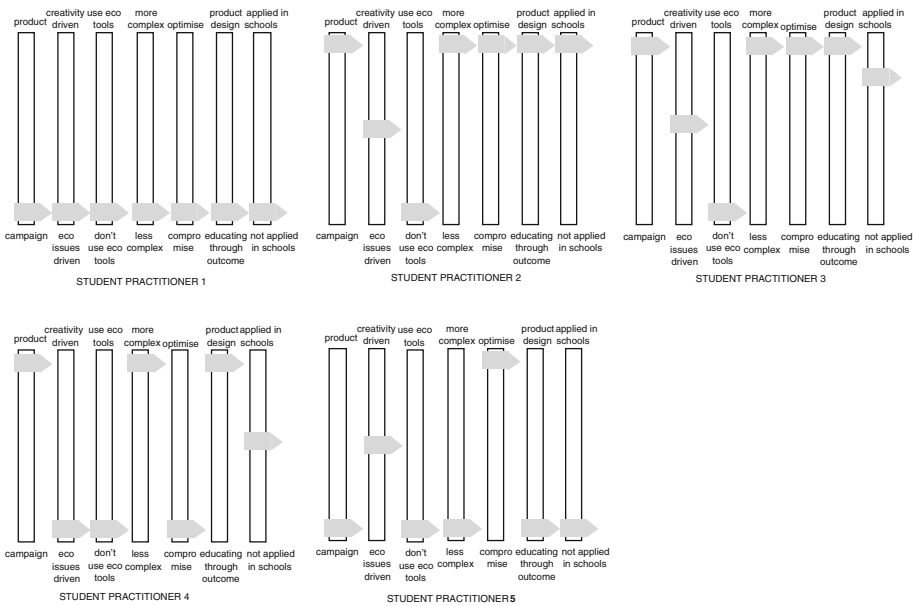
**Fig. 2** Schematic analysis of student practitioner interviews

In relation to the areas explored in the interviews, Fig. 2 shows, schematically, the views expressed and positions adopted by each student, indicating the variations and contrasts, most notable perhaps between SP1 and SP2.

## Insights from the professional designer practitioners

Eco-design is more complex?

All three of the professional practitioners felt that, if anything, ecodesign was less complex than design that didn't have a sustainability focus, mainly because of the framework that one is, by definition, working within. However, each also recognised that the level of complexity—real or perceived—relates to experience and understandings of both the design practitioner and also their client. As one stated

> If you try to design a patent leather shoe for twenty five pounds for Primark in luminous orange then you have problems (Professional Practitioner 1)

One practitioner in describing her own development as an ecodesigner also highlighted the issue of confidence.

> probably about a year ago I stopped feeling overwhelmed if someone talked about something that I hadn't heard about before and understood what that was and where it fitted and what it drew from … And the comfort with the complexity then kicked in and now when I talk to people about it I can quite clearly see where they are in that scale. And I think a lot of people are in that middle, swimming. (Professional Practitioner 2)

For the third practitioner, it wasn't just about people's level of experience, but about the approach that was taken. For her, a big concern was engaging people with sustainability issues in ways that were manageable and practical, rather than overwhelming

> If you look at it from a life cycle perspective and a quantitative nature then it can become really, really complex. But when you start with talking about habits and … experiential aspects I think most designers understand that, actually it's 'what I'm already doing and I … have to trust my own feelings a bit more' … I think here it's really important to ask people to bring in those personal and professional value system because it makes a lot of sense … it means that you don't fight against a lot of things that you actually know are idiotic. So in that sense it decreases the complexity. PP3

Use of ecodesign tools?

The importance of an ecodesign framework was stressed further when discussing the use of ecodesign tools. Unlike the student practitioners, all three made explicit, intentional use of ecodesign tools, although interestingly they were seen as much as design strategies as ecodesign tools. For PP1, part of her research involved working with fellow textiles designers to identify such strategies and a 'toolbox' of seven strategies, explicitly dealing with sustainability in textiles design, had emerged, linked by an

> eighth strategy if you like, the more of these approaches that you link, the more you layer into one project, potentially the better that product will perform in environmental terms. (Professional Practitioner 1)

For PP3 these tools were seen in the context of 'meta design' and very much linked to 'futures thinking', involving strategies such as free flow writing; future stories and scenario building; exploring the possible, probable and the desirable; and cycles of action and reflection. Once again the issue of confidence was raised as the tools provide a framework within which to think and create.

Creativity or sustainability?

The three professional practitioners were equally clear on the importance of creativity, albeit within a sustainability context. As one practitioner put it

> It's my boundary but it's not … the outcome is to create something that fulfils me creatively and complies to the eco. I couldn't just have the eco side of it. (Professional Practitioner 2)

And a second

> when I try to communicate sustainability I'm as much interested in the experiential and inspirational aspects as I am in the facts and figures. And to me that's really, really important. (Professional Practitioner 3)

The extent to which the importance of creativity as a driver is linked to being a design practitioner emerged in the interview with PP1, who currently spends less time in a practitioner role and is aware of the disadvantage this has in being able to bring a vitality to the ecodesign table. She first reflected on a previous project in which she operated as designer and curator (Crafts Council 2006) and how her creativity was driven by the eco considerations within the brief, particularly that of emotional durability.

So if you start thinking about emotional durability then it's a different creative brief. But, say, you know my work, … with the Well-fashioned exhibition … that whole project came out of the idea of emotional attachment to objects and trying to put specialness in *designing in* specialness. The whole kind of creative drive for that collection came from a core value, an ecodesign idea. (Professional Practitioner 1)

But reflecting on her current role, leading a research team she declared

Actually I don't like what I make any more probably because I don't spend enough time doing it but also because of exactly those reasons that it starts to feel very worthy and laboured and conceptual and it just ain't the same as throwing some pins on some satin and having fun. (Professional Practitioner 1)

The importance of creative practice is one that will be returned to later.

Optimising or compromising?

The three professional practitioners shared the view that designing for sustainability was about optimising not compromising, although they recognised that it can be seen as requiring compromise by those who become focused on legislation that requires them to change their practice, or who have no strategies for dealing positively with the issues. For PP2 who, in operating as a relatively small-scale designer-maker, has a measure of control over all aspects of design and production, it's all about optimisation. For her, working creatively within an ecodesign framework brings its own satisfying aesthetic

For me there's absolutely no compromise—I feel nothing, no compromise in it. It gives me really, really good boundaries … I really, really like working to that and I really like knowing I'm designing things that feel right for me in my heart and in my head. That they have got more thinking and more intelligence behind them—even if they're pretty things (Professional Practitioner 2)

PP3 also identified the potential to create a new aesthetic with ecodesign as the driver, citing as an example the shoe company Terra Plana who have identified the most damaging effects of the shoe industry and, in designing these out have created highly innovative products that are very inspiring. However, PP 1 painted a more polarised picture with her comment that it's not so much a question of compromise or optimise—designers are either addressing sustainability issues, or they are not.

Designers can't unravel, easily unravel all the issues that are involved and work out how they can take some of them on. It's like you either are doing it or you're not. If you're doing it generally I think people are quite inspired when they're doing it and that they're driven by it and they're energised by it. So actually the block is right at the beginning and of course the most difficult one to actually challenge. (Professional Practitioner 1)

Impact on practice as educators?

All three of the professional practitioners have some level of involvement with under-graduate design students and experience of supporting such students in developing capabilities as ecodesigners. None of the students concerned are undertaking explicitly ecodesign degrees but all are involved in degree programmes where sustainability issues have a high priority. This means that design briefs the students are working to may have an

explicit ecodesign focus, but equally they may not—in which case it will be up to the student to identify such priorities should they choose to. The research centre in which PP1 works provides the students in her institution with a textiles environmental resource that they can draw on as and when they need, and she also provides seminar inputs and 'consultancy' for their project. Significant numbers of the students choose to take some form of sustainability emphasis in their work, often in essay/dissertations. However, there is not always the same level of support/understanding from studio tutors, and in practice based work there is a mixture of responses from those working from principles, who achieve very successful outcomes to those who take a more superficial approach (typically focused on recycling) whose outcomes are less convincing. This range has interesting parallels with the range of project work from the student teacher practitioners interviewed.

PP2 takes an approach based on her experience of seeing students overwhelmed and ground down by the weight of dealing with eco issues. Based on her own motivations, she is keen for them to see the creative potential of ecodesign and to take a more evolutionary (rather than revolutionary) approach. She explained how she would

> talk them through some real examples of that and also some crazy ideas that maybe, could happen from that. And they, you'd see them change … I've seen people a lot being talked to about eco issues in lectures and as it goes in they sink and get [overwhelmed] so I do everything I can to leave them knowing they **can** do. So I'm really, really clear with them … that there's no way they can incorporate every idea and they should decide what's important to them and that's what they deal with (Professional Practitioner 2)

This 'can do' approach was echoed by PP3 who outlined practical measures to help students deal with the issues through hands-on, active approaches.

> For example we make a diagnostic mapping of an object that they consider a fashion object and then we redesign it, by mapping sustainability … so I know exactly what they know and initially they know a lot. They have quite a lot of fragmented knowledge or 'sample facts' as I call it. And they continually put it in the system so it's making more aware how the different parts work together. (Professional Practitioner 3)

She stressed the importance of not being 'the sustainability police' and being transparent about complexity while helping them simplify things to a level they could be dealt with—sometimes letting creative exploration lead, and then unpicking and exploring ecological consequences and choices afterwards.

> they know that there's an issue around recycling and energy for example so you have to be really, really transparent about, "Yes. It is complex" … And that is difficult because they're very young and … you want them to be enthusiastic but you have to do that and find the right balance of the sort of agency and information—because too much information and too little agency is no good. And the opposite is no good either. (Professional Practitioner 3)

None had direct experience of developing ecodesign approaches with teenagers in a school setting, but when asked how they might approach this, all three were prepared to offer some suggestions. PP1 suggested starting by dealing with over consumption—with "affluenza" (James 2007)—the desire to have more 'stuff'. In particular she would be keen to move beyond focusing on recycling, because quite simply
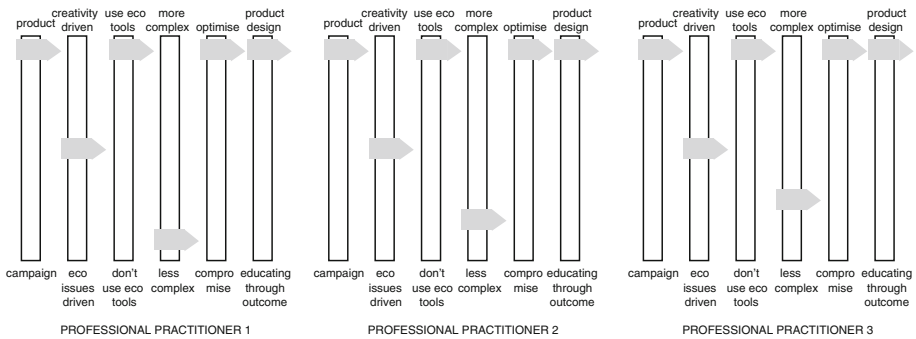
Fig. 3 Schematic analysis of student practitioner interviews

Recycling is so transferable, so immediate, but the reason that I wouldn't really want to work with recycling is that it's the wrong end of the chain. (Professional Practitioner 1)

PP2 also avoided a quick-fix focus on recycling—wanting to take a much more holistic (and ambitious) approach.

I think that it would have to be in developing them as bright, questioning and creative and caring individuals to then have the capacity to take in those ideas and want to work with them. So it would probably be to do with compassion and maybe respect for nature and other people and understanding of geography. I think it would be a very whole approach (Professional Practitioner 2)

In character with her responses to all questions in the interview, PP3 proposed a very hands-on, practical and positive approach,

Probably keep a diary and talk about diaries and make scenarios together. And possibly in order to not to make it very no, no, no, again do vision work so quite a long time in the future and then from that perspective look at the diaries … How much do I wash and how does it feel when I wear something and then compare that with how everyone thinks today. [Then] probably design something from that future scenario. (Professional Practitioner 3)

She also stressed the importance of group work, a comment that had resonance with PP1, who highlighted the potential shown by co (collaborative) design, as a way to bringing joy to designing.

I mean the co design and the enabling aspect of good design projects are where the joy would come in. Because of course they involve other people and … collaborative projects, community based design, etc, are incredibly important aspects of ecodesign thinking but by their very nature they are often very joyful (Professional Practitioner 1)

Taking an overview of the views presented by the professional practitioners (see Fig. 3) it can be seen that, unlike the students, all three had an almost identical profile.

## Discussion

Looking at the three sets of data from the school students, student teachers and professional practitioners, it is clear that the greater the experience of addressing environmental

sustainability the more mature the approach to designing. This could be seen as inevitable and would certainly accord with literature on the differences in approach that might be seen between novice and expert designers (Dorst 2003; Lawson 2004). The maturity evident in the approaches of the professional practitioners is distinct in that they not only demonstrate highly developed understanding of the issues but also high levels of capability in creating new features by working with these issues. And critical in each case is the imperative for creative response. For the professional practitioners it appears that the synchronicity between creativity and sustainability makes ecodesign a manageable process of optimisation.

This mirrors some of the student practitioners, the major difference being in their experience at handling the issues in the way that reduces complexity. From both groups there is a strong indication that making the process both manageable and creative is the not insignificant ingredient of action—of working with the issues in practical, hands-on ways, so that the issues are being dealt with holistically and are embedded in the process of designing. Essentially this is a capability approach—put simply what the person (or designer) "can be and can do" (Sen 1992) which, in the context of ecodesign, can be seen as their values (what they can be) and their design responses (what they can do). In highlighting capability here, this is to mark it out from what might (in technology education) be termed a 'literacy' approach that sees the priority as educating young people to be critical and informed users and consumers of technology as opposed to what Black and Harrison term "interaction between the processes of innovative activity and the resources being called upon" (Black and Harrison 1985, p. 6) and which is the basis of the vision for design and technology education within the English National Curriculum.[1]. Within this, the emphasis is on active participation, neatly captured in the following statement by Kimbell and Perry.

> It is a move from receiving 'hand-me-down' outcomes and truths to a situation in which we generate our own truths. The pupil is transformed from passive recipient to active participant. Not so much studying technology as being a technologist (Kimbell and Perry 2001, p. 7).

This capability approach holds strong messages about effective ways to work. Exploring ways of introducing ecodesign approaches into the 11–14 curriculum, Goggin and Lawler identified two main routes to addressing environmental sustainability: to reduce consumption and to reduce the environmental impact of production (Goggin and Lawler 1998). A literacy approach supports achieving the first of these, and a capability approach supports the second (Stables 2001). This is echoed in the comment made by PP1 that, in schools she wouldn't start with recycling because "its at the wrong end of the chain". Quite simply, designers can come in at *beginning* of the process of creating a new outcome, not just tidy things up at the end. This approach is underscored by the vision of the Textiles Environment Development group.

> TED's position is very unique in research terms. Whereas other research projects look to the manufacturer or producer to 'clean up their act', the TED Project wants to challenge the designer to design textiles that have reduced impact on the environment at the outset (Earley 2007, p. 1).

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[1] For a more detailed discussion of this distinction between technological capability and technology literacy see Kimbell and Stables 2007.

At the end of the day, consumers can only do so much—by what they consume, what they don't consume, by what pressure they can bring. Responding to the mess at the end of the chain can be a limiting and frustrating experience.

> Well-meaning behaviour like recycling newspapers and bottles probably does more to massage our conscience than save the planet. (Goggin and Lawler 1998, p. 107)

But designing enables active participation at the front end and throughout the whole process of realising new futures. Such pro-active, front-end approaches to designing are both critical (Elshof 2006) and have huge potential. Designers, for example, have the power to envision a future where there is nothing to recycle. And the level of creativity required to achieve such a thing would be vast. Creativity has been seen to be critical in the context of ecodesign, and yet the tension between being creative and addressing environmental sustainability that was highlighted at the start of this paper was very real in the design responses within the Assessing Design Innovation project. It could be argued that, in that project, we were effectively drawing together strategies that allowed us to 'hot house' the latent creativity in learners.

A question that might then be asked is whether it is possible to 'hot house' the ability to deal with sustainability in designing—and the answer is probably "no". While the use of a range of ecodesign tools could potentially help in this process, there are underlying value systems and beliefs that need to be secured at the same time. Introducing a range of ecodesign tools to the student teachers didn't mean they would use them while designing— as became apparent in the interviews. Looking at the ecodesign tools utilised by the professional practitioners, it is clear that the tools themselves are of quite different kinds— from highly technical, quantitative ones such as energy audits, to those that are more qualitative and values-based, such as considering emotional durability. PP2 spoke a great deal of her concern to design into a product a desire for it to have longevity and to be cherished—and dealing with such topics raises a whole range of questions when considering many of the projects that are undertaken in school technology workshops—where the emphasis is often on technical skills development rather than emotional durability! There would appear to be no quick fixes. Indeed, rather than 'hot housing', the metaphor that would seem more appropriate is perhaps 'slow cooking'. And with references to emotional durability, anti consumption and cherishing, one could see a case for a re-emergence of craft skills, not as technical exercises, but in the model of sloyd education.

## Ways forward

Very real insights provided from the student teachers and professional practitioners present ways forward. The value of 'futuring' and scenario building was stressed by PP3, and was pinpointed as a way to engage and develop corporations, students and teenage learners in designing within a sustainability context. She proposed that this was built directly out of the learner's own actions and feelings—as recorded through diaries—a way to help them embed new ideas in their own experiences. The student teachers now trying to put ideas into practice in school all stressed the need to work within the realities of the young learners and to allow them to take ownership of the projects.

Undertaking this in a way that doesn't weigh the learners down was stressed—and through the interviews with the professional practitioners it was clear that the maturity of ecodesign recognises the importance of bringing a lightness and optimism to the whole approach exemplified by the word 'recycling' having been replaced by 'upcycling' in the

current research being undertaken by the Textiles Environmental Design group in their current research project 'Ever and Again' which explores ways of bringing new life and added value, including through using new technologies such as laser etching, sonic welding, electro-conductive pastes, electroplating and digital and dye sublimation processes (Earley 2007). There was also recognition of the need to allow free, creative exploration that didn't have eco issues at the forefront—and then to use ecodesign tools to unpack the ideas once developed. The practitioners all stressed an evolutionary approach that enabled and built confidence rather than overwhelmed.

What is abundantly clear from the interviews is that rather than being in tension, or being 'silent' partners, creativity and environmental sustainability can be brought together through ecodesign as harmonious and dependable partners. Creativity is critical in addressing environmental sustainability, and environmental sustainability provides a clear framework within which to be creative. But what is also clear is the importance of taking a holistic approach that embeds a sophisticated and broad frame of eco issues and tools—from the quantitative to the qualitative.

The interviews discussed in this paper are an initial step in identifying new approaches to addressing environmental sustainability through technology education. There is clearly much to be learnt from professional practitioners and it is hoped that further work can now be undertaken in partnership with such practitioners to draw more closely together ways of supporting learners at all stages in creatively and actively designing out environmental damage and over consumption by designing in such features as energy efficiency *and* emotional durability.

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