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Investigating the Potential of Design Jams to Enhance Sustainable Design Education

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Abstract
It has been acknowledged that in the current sustainable design practice, the main focus tends to be on environmental and economic sustainability, while the social dimension of sustainability has been essentially neglected. This paper aims to address this disparity through Design Jams, and evaluates whether the use of Design Jams is relevant or not to engage student designers within social sustainability and impart key competencies in informal learning. Drawing on the literature on social sustainability in design (SSD) education, key competencies for sustainable development and Design Jams, this paper proposes a conceptual framework for SSD learning, and then outlines the findings from three Design Jam case studies conducted at School of Design, University of Leeds. The conclusion is drawn to inform an ongoing research project with the aim to explore ways in which student designers could be more engaged with social sustainability, and thus to become social change agents.

Keywords: Sustainable Design Education, Social Sustainability, Design Jams

1 Introduction

Sustainability is widely understood as a three-pillar concept that integrates social, economic and environmental concerns in equal measure. However, it has been acknowledged that in the current sustainable design practice, the main focus tends to be on environmental and economic sustainability, while the social dimension has been essentially neglected [1-2]. This new aspect of practice needs to be reflected in design education so that capacity could be built early to facilitate mainstreaming social sustainability in the students' future professional practice.

Education for Sustainable Development (ESD) considers the long-term development and responsibility for people to build communities not only for themselves but others. Such a future-oriented and global perspective of responsibility requires profound changes in students' knowledge, skills and values that enable them to live and work in a sustainable manner [3]. ESD is participating in the discussion about a new learning culture which remains open-ended on a participative and interdisciplinary basis [4], and cultivates people with a set of competencies required for active, reflective and co-operative participation toward sustainable development. It is suggested that an active use of formal and informal learning settings within

higher education is required to provide various contexts where the key competencies can be tested and consolidated [5].

While discussing the integration of social sustainability into design education, the focus has been placed mainly on study programmes and courses in formal learning settings [2] [6]. To date, little attention has been given to the implications of informal learning in higher education so that student designers could be educated, engaged and empowered to respond to the social issues. This paper aims to address this disparity through Design Jams, and evaluates whether the use of Design Jams is relevant or not to engage student designers within social sustainability and impart key competencies in informal learning. Drawing on the literature on social sustainability in design (SSD) education, key competencies for sustainable development and Design Jams, this paper proposes a conceptual framework for SSD learning, and then outlines the findings from three Design Jam case studies conducted at the School of Design, University of Leeds. The conclusion is drawn to inform an ongoing research project with the aim to explore ways in which student designers could be more engaged with social sustainability, and thus to become social change agents, by collaborative design workshops.

1.1 ESD as a new vision for Education

Sustainable development requires active, knowledgeable and caring people capable of making the right choices about the complex and interrelated sustainability issues. This represents a new vision for education, ESD, which focuses on new values and a new learning culture [7].

ESD is not only meant to develop scientific and technological knowledge and skills related to sustainability, but also as a primary agent to change the "whole person", and impart motivations, values and ability to act [7]. Based on Bloom's [8] taxonomy of learning domains, the cognitive domain refers to knowledge and skills while the affective domain refers to motivation and the organisation of a person's value system. Hansmann [9] argues that sustainability oriented learning should aim at both cognitive and affective domains. The cognitive domain includes a systemic understanding of the sustainability problems and the affective domain relates to values, motivations and justification for pursuing and applying the acquired knowledge and skills [9]. From a psychological perspective, values (an important life-goal or a societal condition that people desire), together with attitudes (predisposition to behave) and belief systems (people's assessment of the parameters of the world), are linked to behaviours ("Figure 1. Tri-component model of behaviour"). None unique hierarchy exists among these determinants, but it is possible to affirm that values and attitudes are clearly significant in facilitating sustainable decisions and actions [10].

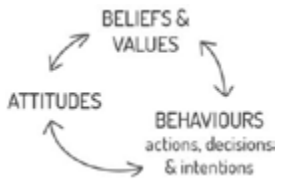

Figure 1 Tri-component model of behaviour. Adapted from Murray and Murray [10].

Therefore, implementation of ESD in higher education requires a review of educational objectives so that competencies required in the active, reflective and co-operative participation in shaping sustainable development can be equipped [5]. Barth *et al.* [5] define the competencies characterised as dispositions of self-organisation and comprising different psycho-social components. de Haan [11] proposes the following eight key competencies

which are expected to enable such participation towards sustainable development: (1) competency in foresighted thinking; (2) competency in interdisciplinary work; (3) competency in cosmopolitan perception, transcultural understanding and co-operation; (4) participatory skills; (5) competency in planning and implementation; (6) capacity for empathy, compassion and solidarity; (7) competency in self-motivation and in motivating others; and (8) competency in distanced reflection on individual and cultural models.

As part of the new type of learning, ESD emphasises a more open-ended, participative, interdisciplinary and experiential learning approach [4] [7]. A reorientation should shift from indoctrination to enabling-oriented and competence-centred learning where motivation and justification for pursuing and applying the acquired knowledge and skills can be provided [9], and interdisciplinary cooperation and self-reliance as well as self-direction can be strengthened [5].

1.2 Social Sustainability in Design (SSD) Education

Only recently educators have begun to elaborate how social sustainability can be embedded in the curriculum to form an integral part of design education. Discussions are held on the provision of tools and case studies to introduce social sustainability issues, skills and capacities into design education.

It is argued that many global social issues of sustainable development, such as population growth, human rights, child labour, might "be outside the remit of (student) designers" [6]. Given the importance of designing for "real needs" in social sustainability, Lofthouse [6] identifies five social themes that (student) designers should be considering: 1) to encourage health and well-being; 2) to encourage participation and belonging; 3) to encourage empowerment and promote human competence; 4) to enhance social interaction, communication and engagement; 5) to enrich users' lives or increase quality of life for all.

From these issues identified, SSD often deals with human and societal behaviour, compared to environmental and economic aspects, which have long been thought to be complex and immeasurable [2]. This means that besides more explicit practical design skills (such as idea generation, visual communication, design development, etc.), designers require more collaborative and diverse competencies in terms of transformation and participatory design, socio-entrepreneurship and user-centred design [12]. McMahon and Bhamra [2] suggest a set of skills and capacities that (student) designers require to direct their practice toward social sustainability, as shown in "Figure 2. Key skills and capacities for SSD".

Figure 2 Key skills and capacities for SSD, from McMahon and Bhamra [2].

Consistent with the new type of learning required in ESD, to successfully impart knowledge and skills for SSD, those methods that involve an affective domain of learning are

increasingly necessary. They would aid (student) designers to recognise and prioritise the opportunities to use the acquired knowledge and skills and breaking through established patterns of action [5] [10]. This remains a challenge for SSD learning.

1.3 Design Jams: creative and collaborative environments for SSD learning

For SSD learning, it is important to create a collaborative learning environment where people with different skills and capabilities and from different cultural and disciplinary backgrounds can learn from each other, and work together. Collaboration allows designers to hear other voices, build on both collective and individual knowledge and develop softer skills like compromise, dialogue, reflection and empathy [2]. Millican in [13] suggests the use of teaching/learning approach that encourages student engagement with people who have different personal experiences as opportunity to learn from that difference. Doing this at a local level can broaden and enrich the students' perspectives on social issues.

As one of the opportunities to tackle local and global social issues creatively and actively, Design Jam represents today a space to meet new people with different knowledge, skills and experiences, to work collaboratively and intensively with for one or two days. Design Jam came from the event of *Hackathons* where programmers, graphic and/or interface designers, project managers, etc. work intensively on collaborative software projects. User experience (UX) designers then used the Design Jam to practise UX techniques for doing research, brainstorming, sketching, wireframing and prototyping as well as improve collaboration skills [14-15]. The Design Jam format has been recently used in other design fields. This includes non-profit Service Design that has adopted Design Jam as an open-source thinking and sharing approach to working with local volunteers. One example is represented by Global Jams [16]. In the case of Global Jams, through the use of technologies and the Network to share information, knowledge, projects and experiences and collaborate across countries and cultures, each participant has an active role within a wider event happening at the same time all over the world. The perception of being part of a growing community would contribute to affective domain of learning [8], helping people to create a positive emotional bound with social issues.

Design Jam offers an opportunity for both cognitive and affective learning towards SSD. It not only allows participants to implement explicit skills required by traditional design but also improves their collaborative and diverse skills and capacities for SSD. In Design Jams, to resolve the design problem together, participants with different expectations and needs have to communicate, negotiate and then achieve the goal which builds on common interests and values. This offers a potential method of promoting sustainability values and deepening participant awareness of the complexity of sustainability issues.

1.4 Conceptual framework for SSD learning

Drawing on the literature review, imparting knowledge, skills and values for SSD and competencies for Sustainable Development requires a shift in how designers are taught. "Figure 3. Conceptual framework for SSD learning" lists these elements and shows that the acquisition of them depends on a long-term learning process based on the balance between cognitive and affective learning domains. The cognitive learning domain refers to the enhancement of intellectual capabilities and knowledge, including the development of skills, while affective domain refers to attitudes and the organisation of a person's value system [9].

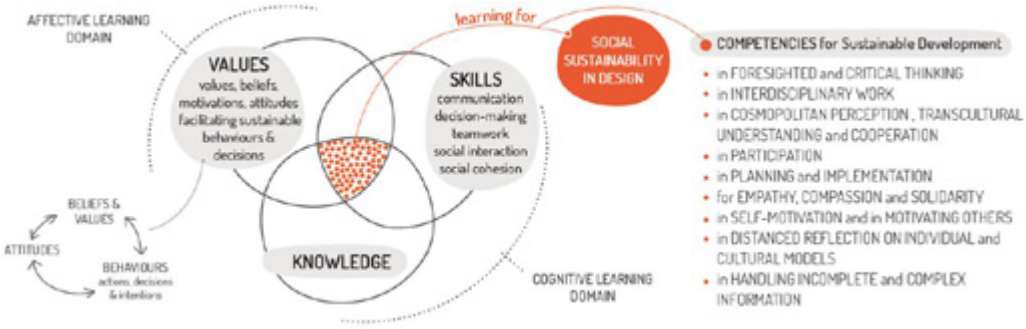

Figure 3 Conceptual framework for SSD learning. Adapted from Murray and Murray [10], Barth *et al.* [5] and McMahon and Bhamra [2].

To enhance SSD learning, it is necessary to provide learners not only knowledge and skills, but also opportunities through which they can become aware of and promote their own value system and motivation towards sustainable development. The aim of this study is to evaluate whether the model of Design Jams can be or not an effective learning opportunity to engage student designers within social sustainability, and develop a critical and socially responsible way of thinking towards sustainability in an informal and collaborative learning environment.

2 Methods

This paper reports three Design Jams conducted at the School of Design, University of Leeds.

Based on the Global Jam model [16], "Figure 4. Design Jam Recipe" shows basic "ingredients" and "rules" for organising a Design Jam in a local community. It is intended to create a template to introduce new elements (i.e. design tools, research methods and subject expertise) in the case studies, and test and reflect on factors that allow more active and co-operative student participation.

"Table 1. Three Design Jams" demonstrates the three events were composed of different elements. Differences included the types of participants and number of participants, overall goals, themes and questions to initiate brainstorming. Two Jams were part of global events and one was local. In particular, "Table 1" shows how a Design Jam can be an opportunity for interdisciplinary dialogues and activities: bringing together people with a diverse range of backgrounds. Experts (mentors), facilitators and jammers all brought their own knowledge and experience in to the discussion adding to the richness of the experience (the mentors' insights are listed in "Table 2. Design projects"). The first *Leeds Sustainability Jam* was the local event of the *Global Sustainability Jam 2013* with the aim to pilot the Recipe to support SSD learning. Given the positive feedback on participant engagement and quality of the design outcomes generated, it led to the following *Leeds Service Jam*, as part of the *Global Service Jam 2014*, to improve the Recipe regarding its structure, procedure and elements. The improved model was then tested with postgraduate students of the School of Design and staff of University of Leeds through the *Playful School Jam*.

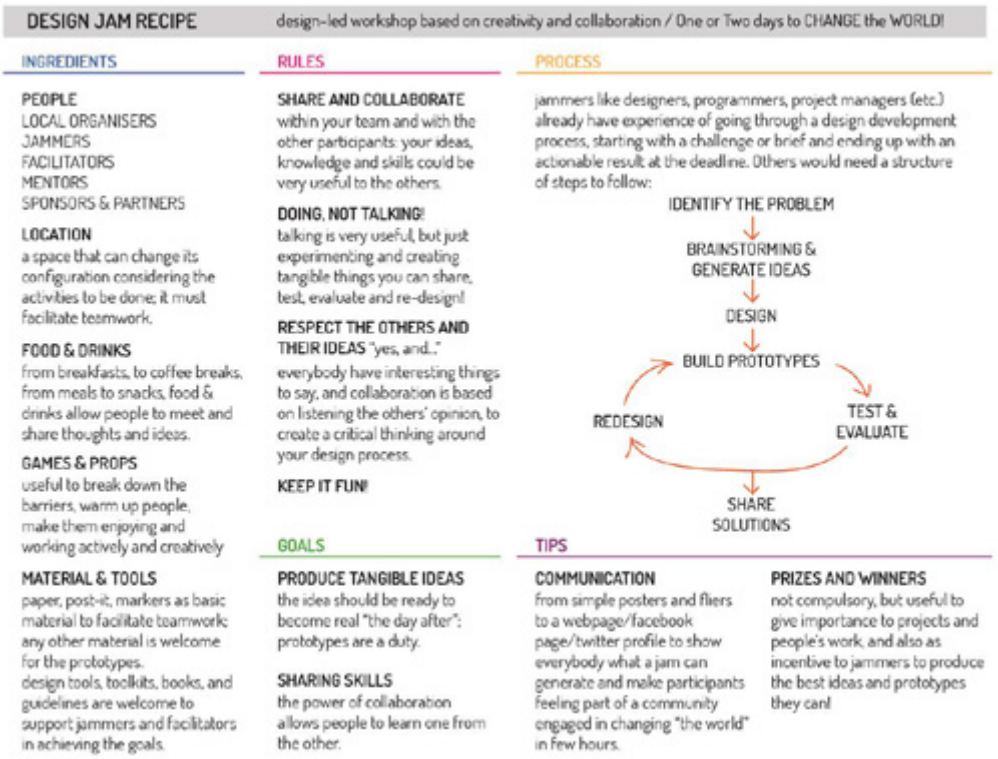

Figure 4 Design Jam Recipe: main elements and aspects that characterise a Design Jam.

Table 1 Three Design Jams: themes, goals and participants

LEEDS SUSTAINABILITY JAM	LEEDS SERVICE JAM	PLAYFUL SCHOOL JAM
13 JAMMERS in 3 teams **6 students** : 2 MA Design + 2 BSc Environmental Science + 1 BA Fine Arts + 1 Scientific Studies (High School) **7 non-students** : 1 Graphic Designer + 1 Geographer (Sustainability Team of University of Leeds) + 2 Volunteers of Hollybush Conservation Volunteers + 2 Communication Designers + 1 Researcher in Arts & Culture Sector	**20 JAMMERS** in 3 teams **8 students** : 2 MA Design + 1 MArch Architecture + 4 Architectural Technology + 1 Communication Designer **12 non-students** : 3 Architects + 1 Usability Specialist + 1 UX Designer + 2 Business manager and analyst + 1 Musician + 1 Photographic Journalist + 1 from Innovation + 1 Facilitator (as profession) + 1 from Sociology	**8 JAMMERS** in 3 teams **8 students** : MA Design
5 FACILITATORS 1 Designer/Researcher in Service Design & Social Innovation + 1 Designer/ Researcher in Affective Graphic Design + 1 Researcher in Design for Disassembly + 1 Researcher in Sustainable Fashion Design & Marketing + 1 Researcher in Sustainable Colouration & Manufacturing of Textiles	**5 FACILITATORS** 1 Designer/Researcher in Service Design & Social Innovation + 2 Service Designers + 1 Business Analyst Coach and Trainer + 1 Expert in facilitating and building teams	**2 FACILITATORS** 1 Designer/Researcher in Service Design & Social Innovation + 1 Designer/ Researcher in Affective Graphic Design
4 MENTORS 1 Lecturer/Researcher in Sustainable Design + 1 Researcher in Sustainable Consumption + 1 Lecturer/Researcher in Environmental Communication + 1 Technical Director of the Society of Dyers and Colourists (UK)	**2 MENTORS** 1 Member of Sustainability Team, University of Leeds (communication) + 1 Member of Leeds Data Mill Project (smart city & open data)	**2 MENTORS** 1 Member of Sustainability Team, University of Leeds (communication) + 1 Director of Student Education at School of Design, University of Leeds
MAIN GOAL To design practical solutions i.e. objects, networks, initiatives, services to help people be more sustainable, building ideas on the global theme "A+B=3".	**MAIN GOAL** To design new services building ideas on the global theme "box".	**MAIN GOAL** To design practical solutions i.e. objects, communication artefacts, networks, events, services to solve problems of the school and campus, concerning: common spaces, recycling, communication among students and teachers, mobility and the case of the Bike Hub.
BRAINSTORMING ON... What is Sustainability for you? Which is the field in which you would like to bring sustainable changes through to your idea?	**BRAINSTORMING ON...** What can design do in your opinion? Which is the field in which you would like to design a new service?	**BRAINSTORMING ON...** What is the school of design for you? How would you like it to be? What is community for you?

The three Jams were evaluated through surveys, direct observation of activities and dialogues, final design outcomes and informal interviews with jammers and facilitators after the Jams.

Except for the *Leeds Sustainability Jam* which was the first experience and still exploratory, the jammers at the second and third Jams were asked to fill two surveys, the first survey (S1) at the beginning of the event and the second survey (S2) just at the end, to compare what they expected from the Jam with what they had learnt and could take away after the experience.

3 Results

The data analysis phase is guided by the following five themes: the participants' interest in dealing with social issues, the effectiveness of mentors' insights, the opportunity to promote competencies for social sustainability, the challenge of an interdisciplinary learning environment.

The participants' interest in dealing with social issues

As shown in "Table 2. Design projects", it is possible to identify that all the design projects generated at the Jams addressed some of the "social issues" described by Lofthouse [6]. Particularly, 2) and 4) characterise each project. It is evident that the Design Jams activities (e.g. brainstorming, sharing personal experience of jammers and facilitators, and communicating with potential users through the interviews outside the classroom) enabled participants to better understand the importance of designing for "real needs" in social sustainability, so that to respond to the social sustainability, a very abstract concept, in a more creative, active and practical manner.

Table 2 Design projects generated and the mentors' insights in three Design Jams

LEEDS SUSTAINABILITY JAM	LEEDS SERVICE JAM	PLAYFUL SCHOOL JAM
COFFEE BEAN Do more with your cup of coffee! social issues: #2 #4 #5 post-jam engagement: -	**PANDORA Replace fear with knowledge for teens** social issues: #2 #3 #4 post-jam engagement: -	**FINDME Find ad contact the person you need** social issues: #2 #3 #4 post-jam engagement: -
THE FOOD EXPERIENCE Eat. Speak. Share. social issues: #1 #2 #4 #5 post-jam engagement: the project became subject of a final year dissertation in design	**JOB BOX Experience someone else job! Share yours!** social issues: #2 #3 #4 post-jam engagement: -	**DESIGN HUB A place to engage all design students** social issues: #2 #3 #4 post-jam engagement: the team left evidence of the project in a common room of the school to test the interaction of the school community with it
WALK-IN-WORDROBE Clothing co-op. share & care! social issues: #2 #4 #5 post-jam engagement: the team tried to continue the project after the jam, by exploring the opportunities to implement it as a university campus service	**SKILL-BOX Share skills & capabilities with friends!** social issues: #2 #3 #4 post-jam engagement: -	**THE BIKE HUB TRAIL Raising awareness of BikeHub** social issues: #1 #2 #5 post-jam engagement: the team presented the idea to the Sustainability Team (University of Leeds) and got positive feedbacks to implement it in the campus
MENTORS' INSIGHTS about Less Consumerism; Local/Global; Circular Economy; Science & Design for Best Practice // Sustainability Communication; Technology & Nature // Change Behaviours or Practice? What is the role of our values? // Health and well-being (high physical and emotional activities); A sense of community and belonging; Sharing products and services; Behavioural change	**MENTORS' INSIGHTS about** Sustainability as Environmental, Economic and Social challenges; Communicating Sustainability; Changing Behaviours // Open Data; Sharing Information; Community; Smart City	**MENTORS' INSIGHTS about** Sustainability as Environmental, Economic and Social challenges; Communicating Sustainability // Communication in the school; Creative Solutions to Improve // Sense of Community; Sharing

social issues: #1 encourage health and well-being; **#2** encourage participation and belonging; **#3** encourage empowerment and promote human competence; **#4** enhance social interaction, communication and engagement; **#5** enrich users' lives or increase quality for all

The informal interviews reveal that some of projects were further developed even after the Jams: "The Food Experience" was taken into consideration by one of the student designers for her final year dissertation; "Walk-in-Wardrobe" encouraged some from the team to continue the idea independently; after having presented the design concept to the Sustainability Team of the University of Leeds, "The Bike Hub Project" team got very positive feedback and students were offered a chance to put the idea into practice. These cases demonstrate that the Design Jam could motivate the student designers to participate in social sustainability and have a potential to nurture more involved students for a long-time of significant participation.

The effectiveness of mentors' insights
The teams built their ideas through an iterative and creative process made of four stages: questioning, interviewing, prototyping and testing. Participants were firstly invited to reflect and brainstorm on the main theme, some general questions (see "Brainstorming on…" in "Table 1") and insights provided by the mentors. It can be affirmed that the mentors provided new points of view on the general design theme, enabled a deeper knowlege of the subject and encouraged students to embrace social and behavioural issues to develop design solutions (see "Table 2": the mentors' insights discussed by the teams during their design process).

In *Playful School Jam*, the inputs offered by mentors helped student designers to think critically about culture within the school and university. The students were involved in real school challenges. Dialogue and re-evaluation between the student team members was encouraged, as were interviews with target users and potential stakeholders such as other students and staff members of the School of Design. All of this allowed students to become more aware of their role and responsibility as designers. They realised that they would be able to provide new perspectives and creative solutions to the problems in the school, as one commented on this in the survey that: "it was interesting to see how the culture has to be changed to enforce other changes and also how staff reacted to our design solutions". The experience of the Jam provided students with the opportunity to reflect on the chance to work in the local community and enhance a cultural change within their own school through the design concepts developed.

The opportunity to promote competencies for social sustainability
From the survey it is clear that the experience of Design Jams helped participants to reflect on their approach to and capability for collaborative working, and also to become aware of their skills and attitudes towards sustainability. The responses given to "what in the design jam was difficult to deal with?" helped to understand how Design Jams were useful to bring people to think about their own skills and capabilities in particular when they struggled with specific activities, such as: *"to keep the energy"*, *"to overcome mind-block and confusion"*, *"to narrow ideas to just one project"*, *" to communicate ideas to the others"*, *"to translate the idea into something physical and tangible (prototype)"*. Additionally, some of the key competencies, such as self-motivation, motivating others, and empathy, then in critical thinking, interdisciplinary work, cooperation and participation, were developed or improved while they tackled with these difficult activities.

While other's impression of the Design Jam process and advantages of the participation: *"people are really interested to hear what other people have to say. That way you feel comfortable to expose your point of view"*, and *"it was a nice opportunity to grow up in work and personality"*.

It approved that the Design Jam was an occasion for participants to test and develop their self-confidence and self-control capabilities required in the teamwork, especially with people from a tremendous diversity of age groups and social, cultural and educational backgrounds.

Participants stated that they have learnt and enjoyed learning about the collaboration, sharing and brainstorming. They appreciated the importance of having happy and funny times, being free, being challenged in an extreme manner over a very short period of time. Some reflected on and provided responses to the informal and collaborative learning environment: *"that collaboration between different disciplines can produce some great and unexpected ideas"* and *"you can learn, work and play at the same time"*.

The challenge of an interdisciplinary learning environment
Design Jams represented an opportunity to open interdisciplinary discussions on complex issues. They allowed participants to think more critically and generate practical design ideas that come through ruminating over various possibilities. As seen in "Table 1. Three Design Jams", the Global Jams had more chances to create interdisciplinary learning environments and approaches; *Leeds Sustainability Jam* and *Leeds Service Jam* gathered people from different backgrounds with many different skills and expertise. The results from the surveys (S2) uncovered that while participants enjoyed meeting and collaborating with people from different backgrounds, many had encountered some frustrating and difficult moments in the process. This did not happen in *Playful School Jam* where jammers were only student designers from the same programme, but from their feedbacks they missed the presence and exchange with new people from other courses and experiences.

The presence of facilitators was found very important. Especially in the case of Global Jams the facilitators supported the interdisciplinary dialogues within and across teams and allowed a balanced conversation in mind-block situations. However interdisciplinary and intercultural environments require more efforts on the enhancement of openness, collaboration, self-control, self-confidence and empathy. These elements allowed participants to understand better and engage more in social sustainability and embrace a socially responsible way of thinking and doing.

4 Conclusions
Design Jam offers collaborative and informal learning spaces for all the participants (jammers, facilitators, mentors) to be co-creators of knowledge and experiences in SSD. Design Jam stresses on the (design) process and exchange of experiences, feelings and insights within and across teams. In particular, this study suggests the Design Jam as a potentially effective and affective learning model to support SSD. It provides student designers with more chances to work with experts and others with different experience and backgrounds. This enables them to develop collaboration and communication skills, and moreover to become aware of and more sensitive to social issues. It can be concluded that the Design Jam represents an opportunity to shape and enhance student competencies towards sustainable development. Through open dialogues and collaboration, participants reflect consciously or even unconsciously on their own skills, values and knowledge and understand the importance of caring about social issues.

To allow the collaboration and interdisciplinary activities, it is necessary to create an environment and provide tools and methods that enable to support the communication and understanding within and across the teams, and offer a balanced and open dialogue inside and outside the classroom. The development of the Design Jam model will continue through an on-going cycle of testing and refinement in the next stage of this study.

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Citations and References
[1] Steiner, G. & Posch A., "Higher education for sustainability by means of trans-disciplinary case studies: an innovative approach for solving complex, real-world problems", *Journal of Cleaner Production*, Vol.14, No.9 11, pp 877-890, 2006.

[2] McMahon, M. & Bhamra, T., "Design without borders: International collaborative design projects as a mechanism to integrate social sustainability into student design practice", *Journal of Cleaner Production*, Vol.23, pp 86-95, 2011.
[3] Dyer, A. & Selby D., *Centre for Excellence in Teaching and Learning: Education for Sustainable Development*, The University, Plymouth, 2004.
[4] Sterling, S., *The Future Fit Framework. An introductory guide to teaching and learning for sustainability in HE*, The Higher Education Academy, York, UK, 2011.
[5] Barth, M., Godemann, J., Rieckmann M., Stoltenberg U, "Developing key competencies for sustainable development in higher education", *International Journal of Sustainability in Higher Education*, Vol.8, No.4, 2007.
[6] Lofthouse, V., "Social Issues: Making them relevant and appropriate to undergraduate student designers", *Design and Technology Education: An International Journal*, Vol.18, No.2, 2013.
[7] UNESCO, *Education for Sustainability, from Rio to Johannesburg: Lessons Learnt from a Decade of Commitment*, UNESCO, Paris, France, 2002.
[8] Bloom, B.S., *Taxonomy of Educational Objectives. The Classification of Educational Goals*, David McKay, New York NY, USA, 1956.
[9] Hansmann, R., "Sustainability Learning: An introduction to the concept and its motivation aspects", *Sustainability*, Vol.2, 2010.
[10] Murray, P.E. & Murray, S.A., "Promoting sustainability values within career-oriented degree programmes. A case study analysis", *International Journal of Sustainability in Higher Education*, Vol.8, No.3, 2007.
[11] de Haan, G., "The BLK '21' programme in Germany: a 'Gestaltungskompetenz'-based model for education for sustainable development", *Environmental Education Research*, Vol.1, pp 19-32, 2006.
[12] O'Rafferty, S., Curtis, H., O'Connor F., "Mainstreaming sustainability in design education – a capacity building framework", *International Journal of Sustainability in Higher Education*, Vol.15, No.2, pp 169-187, 2014.
[13] Blake, J., *Community Engagement Towards a Sustainable Future*, Pedagogic Research Institute and Observatory (PedRIO), Plymouth University, Plymouth UK, 2013.
[14] en.wikipedia.org/wiki/Hack_Day (accessed on 10/07/2014)
[15] www.designjams.org/about/ (accessed on 10/07/2014)
[16] planet.globalservicejam.org ; www.globalsustainabilityjam.org ; www.govjam.org (accessed on 10/07/2014)