Original Paper

SUSTAINABILITY IN DESIGN PROJECTS: A PROPOSAL TO APPLY SUSTAINABILITY TO EDUCATION AND PROFESSIONAL PRACTICE

Sustentabilidade nos Projetos de Design: Uma proposta para aplicar a sustentabilidade na educação e na prática profissional

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ABSTRACT

Higher education institutions have a responsibility to contribute to a more sustainable development. However, this contribution hasn't always been consequential, especially when the focus is more on the construction of mere tools for sustainability, than on the process of internal transformation. That is, on the development of a true training for sustainability, consequently for a curriculum more oriented towards sustainability and with valid contributions for sustainable development, namely in the regions where they are based. On the other hand, ecodesign analysis tools, namely checklists, have been used successfully in companies, but also in education, and have made an important contribution to sustainability, fundamentally in the environmental and economic dimensions. Consolidated experiences in these areas have shown that employing these tools implies a contextualization of their use, in the case of their application in a teaching context, among students, or in a business environment, among professionals. It depends on the social, economic, and business context of the region or country, but, in the specific case of an application in education, it also depends on the type of subjects and the teaching and learning methods.

In addition, the usefulness of the checklists is observed in various contexts of everyday life, but also in the professional environment and in teaching, as it is a tool that can help teachers and students to guide projects towards the final objectives, also valuing the process of getting there.

The present study emerged from an investigation carried out within the scope of sus-

RESUMO

As instituições de ensino superior têm a responsabilidade de contribuir para um desenvolvimento mais sustentável. Contudo, esta contribuição nem sempre tem sido consequente, especialmente quando o foco está mais na construção de meros instrumentos de sustentabilidade, do que no processo de transformação interna. Ou seja, no desenvolvimento de uma verdadeira formação para a sustentabilidade, consequentemente para um currículo mais orientado para a sustentabilidade e com contribuições válidas para o desenvolvimento sustentável, nomeadamente nas regiões onde se encontram sediadas. Por outro lado, os instrumentos de análise de concepção ecológica, nomeadamente listas de verificação, têm sido utilizados com sucesso nas empresas, mas também na educação, e têm dado um importante contributo para a sustentabilidade, fundamentalmente nas dimensões ambiental e económica. Experiências consolidadas nestas áreas demonstraram que a utilização destas ferramentas implica uma contextualização da sua utilização, no caso da sua aplicação num contexto de ensino, entre estudantes, ou num ambiente empresarial, entre profissionais. Depende do contexto social, económico e empresarial da região ou país, mas, no caso específico de uma aplicação na educação, depende também do tipo de disciplinas e dos métodos de ensino e aprendizagem.

Além disso, a utilidade das listas de controlo é observada em vários contextos da vida quotidiana, mas também no ambiente profissional e no ensino, pois é uma ferramenta que pode ajudar professores e estudantes a orientar projectos para os objectivos finais,

tainability in communication design projects, involving several curricular units of a communication design course. Its final objective is to formulate a proposal for the application of sustainability to education and professional practice in this field of design. The main intention is to encourage design practices that consider aspects of environmental, social and economic sustainability, consolidating the training of students for a more sustainable development.

At the methodological level, the study was grouped into four phases of action. In the first phase, the state of the art was analysed, the most appropriate method was chosen – an Ecodesign Checklist – and developed to evaluate communication design projects and to introduce improvements in products sustainability and design projects.

Three curricular units from the third year of the Communication Design bachelor's degree were selected, which allowed to carry out the communication design project (Communication Design IV subject), create ecodesign strategies (Sustainable Design subject) and plan their graphic production (Graphic Production I subject). Within this context a packaging and labelling design problem was defined as the project to be carried out evolving the subjects, having in mind the importance that this area of design has in the region where the school is located. To this end, an *Ecodesign Checklist for Packaging and Labelling* was developed, which allowed the design aspects for sustainability to be articulated between the three curricular units. In a second methodological phase, the *Packaging and Labelling Ecodesign Checklist*, was implemented and a first assessment study was carried out, regarding the potential contributions to the main aspects of sustainable development and to the training and curriculum of students involved. In addition to put in practice the *Packaging and Labelling Ecodesign Checklist*, surveys were also carried out with the involved students, in order to assess the impact of using the method on their curricular training and on their design practices.

It is expected that in a third phase, this study can be applied to other subjects of the Communication Design degree and in a fourth phase to be extended to professional practice. This article presents the first analyses and

valorizando também o processo de lá chegar. O presente estudo surgiu de uma investigação realizada no âmbito da sustentabilidade em projectos de design de comunicação, envolvendo várias unidades curriculares de um curso de design de comunicação. O seu objectivo final é formular uma proposta para a aplicação da sustentabilidade na educação e na prática profissional neste campo do design. A principal intenção é encorajar práticas de design que considerem aspectos de sustentabilidade ambiental, social e económica, consolidando a formação de estudantes para um desenvolvimento mais sustentável. A nível metodológico, o estudo foi agrupado em quatro fases de acção. Na primeira fase, foi analisado o estado da arte, foi escolhido o método mais apropriado - uma *Ecodesign Checklist* - e desenvolvido para avaliar projectos de design de comunicação e introduzir melhorias na sustentabilidade dos produtos e projectos de design.

Foram seleccionadas três unidades curriculares a partir do terceiro ano do bacharelato em Design de Comunicação, o que permitiu realizar o projecto de design de comunicação (disciplina de Design de Comunicação IV), criar estratégias de design ecológico (disciplina de Design Sustentável) e planear a sua produção gráfica (disciplina de Produção Gráfica I). Neste contexto, foi definido um problema de design de embalagem e rotulagem como sendo o projecto a ser realizado, evoluindo as disciplinas, tendo em conta a importância que esta área de design tem na região onde a escola está localizada. Para este fim, foi desenvolvida uma *EcoDesign Checklist para Embalagem e Rotulagem*, que permitiu que os aspectos de design para sustentabilidade fossem articulados entre as três unidades curriculares.

Numa segunda fase metodológica, foi implementada a *EcoDesign Checklist para Embalagem e Rotulagem*, e foi realizado um primeiro estudo de avaliação, relativamente às potenciais contribuições para os principais aspectos do desenvolvimento sustentável e para a formação e currículo dos estudantes envolvidos. Para além de pôr em prática a *EcoDesign Checklist para Embalagem e Rotulagem*, foram também realizados inquéritos com os estudantes envolvidos, a fim de avaliar o impacto da utilização do método na sua formação curricular e nas suas práticas de concepção.

reflections obtained in the first two methodological phases of this investigation, evaluating the importance of conducting the inquiry into a more holistic perspective, which includes a curriculum and training for sustainability, transposing the limits of the design project or of the designed products. It is also presented here the study contributions evaluation, specifically the *Ecodesign Checklist for Packaging and Labelling*, for the "Sustainable Development Goals - 2030" in Portugal and in the region where the higher education institution is located, highlighting the aspects considered as fundamental, and within the reach of design and communication designers.

The first presented results are exploratory, as the intention is to develop the study by comparing results on a continuous basis. The evaluation of the *Packaging and Labelling Ecodesign Checklist* was carried out considering the academic universe in which it was implemented and intends to establish improvement parameters for its use. These parameters include the ease of use of the Checklist; the achievement of ecodesign objectives and of social and economic sustainability; and the contribution to students' training in the scope of sustainability. Some of the criteria initially defined for this study, specifically criteria related to collaborative practices applied to the field of design, were conditioned by the constraints of social confinement. However, it is expected to apply and test these criteria in the next round of the *Ecodesign Checklist implementation*.

Espera-se que, numa terceira fase, este estudo possa ser aplicado a outros temas do curso de Design de Comunicação e, numa quarta fase, ser alargado à prática profissional.

Este artigo apresenta as primeiras análises e reflexões obtidas nas duas primeiras fases metodológicas desta investigação, avaliando a importância de conduzir o inquérito numa perspectiva mais holística, que inclui um currículo e formação para a sustentabilidade, transpondo os limites do projecto de concepção ou dos produtos concebidos. Apresenta-se também aqui a avaliação dos contributos do estudo, especificamente a *EcoDesign Checklist para Embalagem e Rotulagem*, para os "Objectivos de Desenvolvimento Sustentável - 2030" em Portugal e na região onde se localiza a instituição de ensino superior, destacando os aspectos considerados fundamentais, e ao alcance dos designers de design e comunicação.

Os primeiros resultados apresentados são exploratórios, uma vez que a intenção é desenvolver o estudo através da comparação de resultados numa base contínua. A avaliação da *EcoDesign Checklist para Embalagem e Rotulagem* foi levada a cabo considerando o universo académico em que foi implementada e pretende estabelecer parâmetros de melhoria para a sua utilização. Estes parâmetros incluem a facilidade de utilização da *Checklist*; a realização dos objectivos de concepção ecológica e de sustentabilidade social e económica; e a contribuição para a formação dos estudantes no âmbito da sustentabilidade. Alguns dos critérios inicialmente definidos para este estudo, especificamente critérios relacionados com as práticas de colaboração aplicadas ao campo da concepção, foram condicionados pelos constrangimentos do confinamento social. Contudo, espera-se que estes critérios sejam aplicados e testados na próxima ronda de implementação da *EcoDesign Checklist*.

1. INTRODUCTION

1.1. Context

Due to its pedagogical and training nature, higher education institutions have the responsibility to contribute to a greater sustainability in development and have the opportunity to assess the best possible ways to do so, and to enable this contribution in a more consequential way. The awareness of this fact has given rise to more tools for the assessment of sustainability parameters. However, the use of these tools by higher education institutions did not always have the expected results, when the focus was more on the final product, or merely on the indicators, than on the internal transformation process, that is, on the development of a true curriculum and training for sustainability (Rammel *et al.,* 2015) [1].

Mader *et al.* (2015) [2], and Scott *et al.* (2012) [3], advocate a shift towards sustainability, at the level of curriculum, as a whole, and consequently a change in the practices and positioning of higher education institutions, in this context. Scott *et al.* (2012) [3] advocate greater student involvement in practices for sustainability, learning by doing. More consequent methodologies and applications in their professional training, but also personal, leading to a greater motivation and better systematisation of knowledge and processes. Sterling (2015) [4] emphasises that the greater involvement of students in decision-making processes, and in community problems, promote better training for sustainability.

In addition to the humanist aspects, other benefits should be considered when defining sustainability assessment methodologies and their suitability for design projects, and for the academic curriculum of their subjects. According to Carvalho & Sposto (2012) [5], the results of assessments in more restricted spheres must be aligned with the sustainable development goals defined at the national and global levels. The contribution of higher education institutions, in this context, should seek to frame their actions within the goals defined in the national objectives, so that their participation in the country's sustainable development is effective.

The document summarising the *Sustainable Development Goals*[1] for Portugal defines, together with the principles adopted by the General Assembly of the United Nations, a list of global indicators, whose limit sets the year 2030 for their achievement (Instituto Nacional de Estatística [INE], 2018) [6]. In this context of collaboration, and so that each country can adapt relevant goals and objectives from a national perspective, more suitable indicators are defined for each of the countries, and it is up to higher education institutions to recognize the importance of these indicators, celebrating a valid commitment with the sustainable development of the country.

2. A PROPOSAL FOR THE APPLICATION OF SUSTAINABILITY TO TEACHING AND PROFESSIONAL PRACTICE

2.1. Study plan for the assessment and application of sustainability criteria

This study intends to frame the communication design curriculum in a more sustainable panorama, through the development of a methodology with the inclusion of specific tools, making it easier to adapt the projects carried out in the scope of Communication Design, to the objectives defined for environmental, social and economic sustainability as well as the principles of the circular economy.

The plan of studies to be carried out was divided into four action phases, according to the estimated evolution, with the following starting questions being formulated for its initial phase:

[Phase 1]

> a) Evaluation of sustainability assessment instruments, and their suitability for communication design projects and teaching for sustainability; selection of criteria for sustainability and its organisation.

b) Compliance with the *Sustainable Development Goals*, outlined for Portugal in the 2030 horizon.

[Phase 2]

a) Analysis of the assessment instrument to achieve sustainability, considering its usefulness and suitability to communication design projects; the ability to articulate between curricular units; and regarding the contribution to create awareness and responsibility among students.

[Phase 3]

a) Application of the assessment tool to sustainability, in other communication design curricular units, gradually guiding the curriculum towards greater sustainability.

[Phase 4]

a) Adjustment of the assessment instrument to sustainability, to communication design projects carried out in the professional context.

2.2. Methodology and results of the first two phases of the study

The state of the art was investigated, and the necessary studies and bibliographic references were carried out to evaluate the tools used to conduct sustainability characteristics in design projects. It was concluded that checklists are important tools in the practical phase of design project development. They should fit in and follow up the earlier phases of setting overall goals and strategies of a project.

Based on a selection of checklist cases, the design and production phases were identified, with all the diversity of decisions that these phases imply, as those to which communication designers should give more importance, in order to obtain results with a lower environmental impact and with greater social and economic advantages. Thus, recognizing the need to introduce, in these phases, strategies for its sustainability, linking them in a consistent way. It was decided that this interconnection should be carried out through an "Ecodesign Checklist"; as these tools allow the necessary flexibility to share criteria, either between the different phases of a project, or between curricular units of a course.

In order to design a scenario of greater sustainability, three curricular units were selected, from the course program of the Communication Design course, coinciding in the academic year and semester, whose curricular contents allowed evaluating the graphic component in the design project of communication (Communication Design IV), the development of strategies to sustainability (Sustainable Design) and production planning (Graphic Production I). As a way of implementation, a joint academic exercise was employed, starting from the formulation of a communication design problem, the packaging, and the label. The exercise was shared and developed in the three curricular units, crossing the three main objectives under analysis: implementation of a specific communication design project; definition of strategies for the environmental, social, and economic sustainability of the designed parts and services; and adaptation to a production plan, with a special focus on graphic production. The *Ecodesign Checklist*, developed for this study, was built from reference examples, with a predominance of methodologies presented in the *Delft Design Guide* (**Boeijen** *et al.,* 2020) [7], such as the *Ecodesign Checklist* and in the *Lista de Design de Ciclo de Vida* by Frazão *et al.,* (2006) [8]; complemented with the list by Delfino *et al* (2015) [9], for packaging; and with the *Sustainable Design Checklist* of the Design Can Change collective (undated)[10]; and the proposals by Matos & Delfino (2015) [11], focused on graphic design. Other consolidated methods were also selected and used as a comparison term, such as *Ecodesign Strategy Wheel* (Boeijen *et al.,* 2020) [7] *MET Matrix* (*ibid.*) [7] and the criteria defined in *The EcoDesign Checklist*, presented by Brezet and Hemel, in 1997 (Behrisch *et al.,* 2010) [12].

As a result, we obtained the *Ecodesign Checklist for Packaging and Labels* (Fig.1), adapted to the specific project. The *Checklist* was divided into two fields, in one of them the sustainability criteria to be introduced in the communication design project were listed, in the order of the project phases previously identified, and it was intended that the items listed would serve as a guide and verification of the sustainability status achieved in the project. In another field, of observations and notes, it was intended to observe the interpretation given by students to the criteria listed, so this *Checklist* has a field for "comments", allowing students to have proper considerations about the selected sustainability criteria introduced in the project. The sustainability criteria listed, were optimised to implement a specific project, packaging, and label design; having been organised as follows:

	X	
A. LABEL/ GRAPHICS		Comments/Notes
The subdivision of this component was implemented by "fundamental criteria" to be considered in a communication design project, including "criteria" of environmental sustainability and social sustainability.		
B. PACKAGING AND LABEL/ MATERIALS		Comments/Notes
The subdivision of this component was implemented by "fundamental criteria" to be considered in an ecodesign strategy, in a packaging design project; in terms of form and materials, and values the principles of the circular economy.		
C. PRODUCTION		Comments/Notes
The subdivision of this component was implemented by "fundamental criteria" to be considered in the graphic production of a packaging and label design project, including environmental, social, and economic sustainability factors.		

Fig.1
Organisation Summary
of the *Ecodesign Checklist for
Packaging and Labels*
Source: the author

The application of the *Ecodesign Checklist for Packaging and Labels*, in the selected curricular units, followed the pre-defined stages of decision-making for the introduction of sustainability criteria defined as fundamental for the design of packaging and labels.

The "A" component was implemented and evaluated in the curricular unit "Communication Design IV", the "B" component was implemented and evaluated in the "Sustainable Design" curricular unit, and finally, the "C" component was implemented and evaluated in the curricular unit "Graphic Production I", without prejudice to the relationships between the different phases of the project and its implementation that necessarily interrelate. As a result, twelve packaging and label ecodesign projects were obtained, mostly carried out in groups of two to three students. The *Ecodesign Checklist for Packaging and Labels* was used by all groups of students and allowed to conduct a constant verification of all items listed, including those defined in another curricular unit, promoting the project's interconnection with the principles of sustainability, and trying to raise awareness among the students involved to the importance of applying these principles in design projects, regardless of the curricular unit.

2.2.1. Analysis of the *Ecodesign Checklist for Packaging and Labels* and its application

As a way to value the participation and opinion of students, and to qualitatively assess the results obtained in this phase of the project (Masoudi *et al.,* 2012) [13] two focus groups were carried out with some of the students involved, through which it was concluded that the organisation of the *Ecodesign Checklist for Packaging and Labels* favoured the understanding of the project as a whole, with the students referring to the importance of the *Checklist* as a link between the different phases of the project and, consequently, better organisation and verification of the communication design project itself.

According to the students, the *Checklist* also facilitated the interconnection of the contents taught in the three curricular units and promoted even greater awareness of the importance of introducing sustainability criteria in communication design projects, carried out in curricular units that do not have this focus.

Regarding the listed sustainability criteria, students fundamentally observed the extension and the complexity of some technical terms used, which led to the need for additional research to better understand the criteria and its application. This fact, initially understood as an obstacle by the students, was an important aspect for the consolidation of related skills, as it promoted autonomy in the study and research of the scientific and technological area in question.

The creation of an additional guide was suggested, which compiles bibliography and information on technical and material aspects, in order to facilitate the understanding of these aspects, and their efficient introduction into the project.

In order to assess the technical terms considered more complex, reported by the students involved in the focus groups, questionnaire surveys were undertaken to all students who used the *Checklist*, with 16.7% of response rate being obtained relatively to the universe to be inquired, which allowed comparing the data obtained with the real need for additional explanation of the technical terms, fundamentally, to materials and regulatory environmental procedures. Observing, therefore, the possibility of adding a guide that simultaneously serves as a glossary and support for the selection of more sustainable materials is very useful. A suggestion that will deserve, in the future phases of the project, a more careful evaluation, for possible integration in teaching, but also in professional projects, with a focus on local development and on the circularity of materials or production residues.

3. CONTRIBUTION TO THE ACHIEVEMENT OF THE SUSTAINABLE DEVELOPMENT GOALS, *2030*

The analysis of the document *Sustainable Development Goals*, 2030 (INE, 2018) [6] allowed to frame the study, fundamentally in "Objective 12 - Sustainable production and consumption", in several of its goals.

This study unequivocally contributes to the goal that defines as important "by 2030, achieving sustainable management and efficient use of natural resources" (INE, 2018, p.160) [6], as it leads students to equations of greater rationalisation and efficiency in the use of materials used in the design of packaging and labels and for dematerialization, whenever possible and desirable. It respects the goal that set "by 2020, [of] achieving the healthy environmental management of chemicals and all waste, throughout their entire life cycle, in accordance with agreed international frameworks, and significantly reducing their release to air, water and soil, in order to minimise their negative impacts on human health and the environment" (INE, 2018, p.162) [6], as it leads students to consider all phases of the life cycle of the designed products , according to the minimization of toxicity and pollution associated with materials and forms of production, leading them to the mitigation of damage to human health and the environment (INE, 2018, p.162-163) [6].

It should be noted that in Portugal, in the period between 2010 and 2016, among the waste considered hazardous, 34.6% was secondary waste, resulting from the treatment of

hazardous waste (INE, 2018, p.164-168) [6]. Thus, it is considered very important that ecodesign checklists encourage longevity in the use of final products, stimulating product reuse strategies, helping to minimise waste arising from post-consumption and mitigating the need for dangerous waste treatment processes.

In the goal defined so that "by 2030, substantially reduce the production of waste through prevention, reduction, recycling and reuse" (INE, 2018, p.169) [6] the *Ecodesign Checklist for Packaging and Labels* encourages the recovery of waste, namely in the use of post-consumer materials, or studying forms of incentive, facilitation and information for the correct separation and recycling of the material components of packaging, and consequent adaptation to the Integrated System for Packaging Waste Management (SIGRE).

Despite the importance for social and economic sustainability, namely local, through encouraging the use of materials and productions in the local economic sector, the *Ecodesign Checklist for Packaging and Labels* has a strong participation in the environmental component and in the promotion of principles of circularity, associated with encouraging the circular dynamics of waste, post-consumption, industrial and secondary.

NOTES

[1] Goal 1 - Eradicate poverty; Goal 2 - Eradicate hunger; Goal 3 - Quality health; Goal 4 - Quality education; Goal 5 - Gender equality; Goal 6 - Drinking water and sanitation; Goal 7 - Renewable and accessible energy; Goal 8 - Decent work and economic growth; Goal 9 - Industry, innovation and infrastructure; Goal 10 - Reduce inequalities; Goal 11 - Sustainable cities and communities; Objective 12 - Sustainable production and consumption; Goal 13 - Climate action; Goal 14 - Protect marine life; Goal 15 - Protect terrestrial life; Goal 16 - Peace, justice and effective institutions; Objective 17 - Partnerships for the implementation of objectives. (INE, 2018).

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