Digital education, information and communication technology and education for sustainable development

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INTRODUCTION

To enable education to deploy its transformation capabilities in the various programs related to sustainable development, we must engage the education system in profound pedagogical and organizational transformations.

This evolution of education linked to ESD does not consist in identifying and comparing existing methods, but in optimizing and modifying these methods thanks to the contribution of digital technologies which constitute a powerful lever of transformation combining pedagogy and social context. / institutional and digital approach.

EDUCATION, DIGITAL EDUCATION AND ICT

For several years, digital technology has been a major contributor to the evolution of educational processes, in particular that of ESD.

After the initial Web 1.0, Web 2.0 technologies allowed learners to interact with others and with content. The creation, in 2002, of the MIT OpenCourseWare allowed the diffusion of courses accessible to all, diffusion facilitated by the creation of Creative Commons Licenses authorizing a free access to these courses. The resulting open education movement has resulted in many changes in education, training and research.

In this new digital landscape, ICTs are an essential means of training and acquiring new knowledge because they constitute one of the main levers to favor the emergence of new pedagogical practices facilitating access to everyone's knowledge throughout of life. ICTs and digital resources thus offer everyone the opportunity to capitalize on knowledge and know-how, particularly in the case of sustainable development, whose reference to multiple topics and disciplinary fields requires a global and transversal approach that breaks with the usual teaching methodologies.

In addition, ICTs also address the many challenges faced by many education systems, such as lack of teachers, lack of skills in ICT implementation, lack of ICT infrastructure or access and insufficient staff training.

ACHIEVEMENTS IN DIGITAL EDUCATION, ICT AND ESD

Digital education and ICTs are an essential component of the implementation of ESD, both in terms of strategic innovation, pedagogy renewal, teacher training, inclusive school development and partnership with other actors of sustainable development.

Digital technologies generate a great deal of data that is collected, stored and processed by a multitude of actors to implement new pedagogies that help rethink ESD,
   (i)   for the benefit of learners who can thus access specific learning paths;
   (ii)   for teachers who have the opportunity to develop new pedagogies and new resources;
   (iii) for education researchers who will better understand ESD and be able to modify practices;
   (iv)   for the overall management of the education system through the statistical use of data to evaluate practices and model changes.

Some examples illustrate these various aspects:

- The **pedagogical innovation** resulting from digital development for ESD contributes to modifying the practices of both teachers and students who will have the opportunity to train themselves, to self-evaluate, to participate in diagnostics based on resources adapted to their levels or needs.

- **DLT technology** (Distributed Ledger Technology) and **blockchain technology** offer the possibility to update and enhance the "open resources" while ensuring their traceability, which simplifies the process of database improvement and verification, and improves accessibility by making it easier to share and track the use of documents.

- **Teacher training** benefits greatly from the contribution of digital technology to the support and enhancement of their skills, especially digital tools that improve the diversity of training and provide students with appropriate digital skills

- The **development of inclusive schools** is greatly facilitated by digital technologies that help students in difficulty or with disabilities, by providing them with resources and by facilitating the monitoring and evaluation of their schooling.

- **Strengthening partnership** through digital technology that strengthens linkages with these key business and community partners by bringing ESD closer to real-life situations in society. These partnerships make it possible to offer teachers and learners digital resources for vocational and technological training.

THE CHALLENGES OF DIGITAL EDUCATION AND ICT IN RELATION TO ESD

ESD placed in the context of digital learning can be considered through various pedagogical approaches aimed at combining different learning modalities and training devices, but which raises several questions:

1. **Behaviors**: How to move from digital tools and new technologies to behavioral or mental changes specific to ESD?
These tools must be used not for their own novelty and entertainment, but for their capacity to highlight the various representations of sustainable development and to contribute to the training of users in reference to a real educational model based on a rigorous scientific framework. planning for practical implementation, open to society and its values. The project approach involving ICTs and personal investments must play an important role.

2. **Framework**: How to develop a structured and integrated framework for addressing education, communication and learning issues?
The mobilization of the sciences of communication makes it possible to better define the stakes: what is sustainable communication? What are the best learning processes? What role does the trainer play in this configuration? While the interdisciplinary aspect of sustainable development is obvious, what remains to be invented is the so-called "sustainability science" which implies that the teacher and the academic program are not subject-oriented or restricted; harmonized transversely.

3. **Role of institutions**: How will the institutions that are today the guarantors of knowledge and its diffusion integrate the more frequent use of new technologies?

In the future, it seems necessary to involve ESD in several ways:

    (i)   support innovative projects proposed by trainers;
    (ii)   provide ICT training and modules for learners and teachers;
    (iii)   integrate these actions in a skills framework enriched by diplomas;
    (iv)   integrate disciplines and components that are too often absent from ESD;
    (v)   develop tools that are part of a lifelong learning journey;
    (vi)   build on these tools to adapt knowledge control methods; and
    (vii) establish a multilateral dialogue with stakeholders, including policy makers.

4. **Role of UNECE**: How can UNECE play the role of facilitator in this relationship between the world of education and ICT?

The relations between these two worlds are sometimes chaotic. Education takes the form of a socialization model, which implies a more or less long learning process, whereas ICTs refer to instant information, playful practices and networking. In the case of ESD, the most appropriate solution would be capacity building, such as the projects launched by the European Commission. However, these programs should include an institutional component (for example, a rectorate or ministry of education) to institutionalize ESD.

WHAT SUGGESTIONS FOR DEVELOPING DIGITAL EDUCATION, ICT AND ESD?

The learning objectives of ESD can be summarized as cross-cutting key competencies for sustainability that relate to all SDGs. Achieving these goals requires acquiring, in addition to basic knowledge, a range of skills such as critical thinking, normative and strategic skills, collaboration, self-awareness, problem solving, and so on.

Faced with this challenge, ICTs have a range of potential applications that facilitate innovative pedagogies for learning about ESD. In this perspective, several lines of reflection and action can be envisaged:

1. **Develop digital resources and tools** to reinforce the current ICT potential by combining formal, non-formal and informal learning and to highlight their impact in the current educational scenario. This integration will encourage the design, creation and sharing among students, faculty and society so that knowledge can be combined and developed together.

2. **Generalize e-learning** and blended learning combining face-to-face training, conducive to learner-trainer interactions, and e-learning, which is an effective way to learn using immersive learning models. effective.

3. **Apply Learning Analytics** and other artificial intelligence techniques to ESD to measure, collect, analyze and process data associated with learners and their environment, in order to understand and understand optimize learning and the conditions in which it occurs.

4. **Develop social networks** as a key instrument, knowing that these social networks are totally useless without an educational purpose and a judicious integration into a framework, a strategy or an itinerary.

5. **Integrate an Open Science framework**, as well as a practical implementation plan, to use, reuse, create and share open educational resources and best practices at all levels of training, including training of teachers and administrative staff.

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Comments and suggestions of the workshops

During the two workshops, participants were asked to comment on the points mentioned in paragraph 65 (Challenges on digital education) and paragraph 67 (Activities, suggestions and actions). Several comments and suggestions were issued and the main ones are summarized below the main ones are summarized below and can be applied to many of the themes mentioned in both paragraphs 65 and 67.

- ICT should provide the steering committee members with a means to collaborate online, and improve the communication flow between the face-to-face meetings. This means using a blended approach;

- UNECE is in charge of ESD and we should invite other contributors from outside, with different approaches, so that the dialogue is improved and filled in;

- Refer to digital as a "social network" means many resources and communication ways. There is a need to adapt the message to the channel, so that the dissemination function from the steering committee reaches a number of target publics

- The integration of open education means not just OER (REA/REL) but access, ICT, licensing, research results, research data and a number of resources that integrate Open Educational good practices for the good of ESD

- We would benefit from the use of analytics dashboard to store, retrieve and report user behaviour and performance. This would imply to address a specific group with a personalized message and action plan, which would improve the result

- The topic would benefit from a centralized hub that collects project results (e.g. Erasmus+) for an easy, open access worldwide