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Editorial message

Dear Colleagues,

JIIM is an international, multidisciplinary, blind peer-reviewed journal that publishes research efforts on all aspects and issues regarding Information Science and Integrated Information Management. The current issue publishes research articles about bibliotherapy, E-government platform for Educational and Research Management and Sustainable Development Literacy.

The first paper investigates bibliotherapy's nature and characteristics, as they have been formulated in experts' opinions on the specific topic. This research sets a general framework and examines the relationship between bibliotherapy and librarians. Participants believe that books can be used to treat psychological problems and difficulties and improve the quality of life of individuals. Thus, bibliotherapy can strengthen libraries' position in modern societies and offer new, relevant services.

The second paper concerns the architecture of an E-government platform for Educational and Research Management (e-EDURES) in Higher Education Institutions. An integrated strategic planning and decision support system (DSS) is included at the center of the architecture for facilitating the decisions and the design of future actions, enabled by data mining and visual analytics techniques. The platform incorporates interactive visual interfaces to support Knowledge Discovery from Data Visualization, providing the user with enhanced assistance throughout the decision-making process.

The following paper discusses the methods and tools used to deliver a source mapping for sustainable development literacy (SDL), a relevant Delphi Study, an SDL Curriculum and an e-Learning Module in the EDUCABILITY Virtual Learning Environment. One of the major thrusts of Education for Sustainable Development (ESD) is to reorient education at all levels to address sustainability issues, meaning to rethink and revise education from nursery schools through university to include principles, skills, knowledge, and values related to sustainability. Regarding librarians, it is vital to their role to raise users' SDL levels to help achieve the Agenda 2030 goals.

We welcome special Issues proposals that should be emailed to the Assistant Editor-in-chief (dkouis@uniwa.gr). Finally, we expect your contribution and active support with remarks and points of improvement.

Associate Professor - Assistant Editor-in-chief

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Bibliotherapy. A "new" service for Libraries

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Abstract:

Purpose - *The present research aims to investigate the nature and characteristics of bibliotherapy, as they have been formulated in experts' opinions related to the specific topic. The research aimed to set a general framework and to examine the relationship between bibliotherapy and librarians.*

Design / methodology / approach *- The generic purposive sampling technique was used to investigate the topic. Six in-depth semi-structured interviews were conducted. Interview data were analyzed, and 5 distinct categories emerged.*

Findings *– Participants believe that books can be used to treat psychological problems and difficulties and improve the quality of life of individuals. Thus, bibliotherapy can be viewed as an opportunity for libraries to strengthen their position in modern societies and offer new, relevant services.*

Originality / value *- The paper presents the views of six experts (three from Greece, one from Italy and two from the UK). Two of them were approached due to their direct professional involvement with bibliotherapy. The remaining participants are connected in various ways to books and reading and have a good insight into the therapeutic potential of books.*

Index Terms **—** Bibliotherapy, Book therapy, Greek libraries, Mental health, Psychological well-being

I. Introduction

Bibliotherapy can be described as the use of reading to change the way people act or behave [1]. As stated in the Online Dictionary for Library and Information Science, Bibliotherapy is defined as the "use of books selected based on content in a scheduled reading project, planned to facilitate the recovery of patients who have a mental illness or emotional disorder" [2] It has also been described by book therapists Berthoud and Elderkin in their famous book Novel Cure (2013) as "prescribing fiction for life's illnesses" [3]. Undoubtedly, bibliotherapy remedies are not limited to fiction, as self-help books are also widely used in several bibliotherapy programs worldwide. However, the use of literature is considered "the purest and best form of bibliotherapy" **[4, p. 54].**

In the history of bibliotherapy, books have been used to strengthen emotional skills or as a problem-solving tool, with different names depending on time and place **[5].** Although this practice has received increasing attention in recent years, the term "bibliotherapy" was first introduced a century ago. In contrast, the underlying belief that books can offer therapeutic benefits to readers dates back to antiquity. As early as 1939, the Association of Hospital and Institution Libraries, then a division of the American Library Association (ALA) **[6]**, commissioned a study of this therapeutic method, and thus bibliotherapy was officially associated with librarianship. Notwithstanding its healing potential and apparent connection to books and libraries, bibliotherapy has not gained a clear position in libraries **[7]**.

II. Bibliotherapy and Libraries

In the digital age, libraries faced with the challenge of staying relevant have overly focused on "technological offerings, virtual holdings, and remote interactions" **[8, p.197]**. However, as custodians of written cultural heritage and key disseminators of information and knowledge, they cannot abandon their social role, which is a basic part of their raison d'être. Thus, new library roles and relevant user services are being sought. In this context, the promotion of the love of reading, which has been underestimated in recent years, seems to be regaining ground. Moreover, activities like bibliotherapy constitute a first-class opportunity for libraries to strengthen their position in modern societies. Studies have demonstrated the beneficial effects of reading on one's mental health and quality of life. Engaging with books has been shown to alleviate stress and anxiety, foster increased empathy, and enhance overall well-being **[9]**. As a result, libraries can be a crucial source of support for individuals looking to improve their mental health through reading and other resources **[10]**.

Unquestionably bibliotherapy and the library have something so common that it can hardly be overlooked. What exactly will be the library's role is an issue to be investigated as there are different service models around the world. Considering the various relevant library programs, we conclude that the library can play a dual role:

1. as the place in which people can get prescribed books;

2. as an area that cultivates the love of reading, organizing dedicated reading clubs or groups.

In both cases, its role as an information provider remains strong. An organized and active library and, even more, a network of libraries can be a valuable infrastructure for all types of social action and, of course, for bibliotherapy programs. Since libraries promote reading for educational and entertainment purposes, bibliotherapy adds the therapeutic dimension and becomes relevant to the purposes of 21st-century librarianship. The IFLA (International Federation of Library Associations and Institutions) website hosts a long list of articles on the impact of libraries on the well-being of children and young adults. These include articles on library bibliotherapy projects where it is noted that "as all librarians know, reading improves skills like empathy, emotion detection and perseverance" as well as that "continuing education keeps professional librarians informed about child and youth development **[11]**.

The various forms that bibliotherapy can take are inferred from the various definitions available. Specifically, it can be classified as follows **[12]**:

- *Creative Bibliotherapy:* Refers to using fiction and poetry in an official schema to improve mental health. It generally adopts the group therapy approach to ensure the efficient use of time and resources. Creative bibliotherapy groups operate in the form of a traditional reading group, under the reading model standard guided by a trained mediator, or in a combination of both, focusing on literature and sometimes poetry. Some creative literature programs focus on a particular list of books, while others highlight the diversity of readership preferences. Social interaction and group dynamics are also important aspects of the whole effort.

- *Informal Bibliotherapy*: It refers to the exploitation of readers' daily reading ability and the experience of librarians to connect public library users with books which can improve their quality of life. There is, of course, a social dimension to the informal work that is based on the librarians' interaction with the library users. This means that the proposals they make are based on the knowledge of the material that previous readers have used. In other words, public library staff essentially function as bibliotherapists in action, especially in areas without an official bibliotherapy project.

- *Self-help bibliotherapy:* It refers to the use of self-help and not fiction books that libraries may be regarded as 'mental dispensaries' are often recommended by doctors to provide practical help. Self-help bibliotherapy usually operates as a formal schema "Books on Prescription" (BoP), and libraries are used to supply the appropriate materials. Books are selected on the basis of the cognitive behavioural psychotherapy (CBT) approach and are differentiated from the widely available low-quality self-help resources. The person to which a book is prescribed is expected to use a text without further support from doctors.

Librarians can also engage in "crisis bibliotherapy'" or "community bibliotherapy". Crisis bibliotherapy is intended to provide a safe environment to promote problem-solving. In these situations, the librarian operates as usual and engages in the following activities: preparation of reading lists, information provision, cultural programming, and networking with community agencies. In some cases, mental specialists are involved, offering expert guidance to individual persons. Apparently, librarians should go beyond their established professional role to facilitate the provision of this specific service. In some cases, if considered necessary, they collaborate with mental health professionals for guidance **[13].**

Looking for the most appropriate scope for implementing a bibliotherapy program in Greece, university libraries could be considered more suitable due to their flexibility. In Greece, a reliable academic library network designs and implements a bibliotherapy program, regardless of the chosen bibliotherapy approach. Academic libraries have an established representative body (HEAL link) with extensive experience in large and demanding projects. They have staff that is likely to adopt new roles more easily, targeting a community of mainly young adults who are considered appropriate for implementing such projects. In addition, many universities have staff well qualified with a great potential for further training. Universities also traditionally offer a variety of social services (accessibility units and psychological support units), with staff that can contribute to the implementation of bibliotherapy programs.

III. Research Methodology

The research aimed to set a general framework and examine the relationship between bibliotherapy and librarians. The generic purposive sampling technique **[14, p.418]** was used instead of a random sample, i.e., a selection of people who can help understand the phenomenon [15]. The sample was as representative as possible, as it should be in these kinds of studies [16]. Although bibliotherapy is widespread in several countries, such as the United States of America, the United Kingdom, and Scandinavian countries, it is almost unknown in Greece. For this purpose, three of the six participants in this research come from countries other than Greece. Of them, two were approached due to their professional involvement in bibliotherapy. The remainder is connected in various ways to books and reading, and they have a good insight into the therapeutic potential of books. Six in-depth semi-structured interviews were conducted. The interview guide (see Appendix), which comprised a different set of questions for each interviewee as they approached this topic from a different angle, was initially sent to them via email. Half of the participants provided part of their responses in writing, while in a second phase, an online supplementary meeting was held, where these answers were further discussed. The other half of the participants' responses were obtained exclusively via a face-to-face interview.

The following professionals contributed to the present work:

1) A clinical psychologist (specialized in cognitive behavioural psychotherapy) who has been engaged in therapy, education and research for over 40 years. He introduced Bibliotherapy in Wales by organizing a national project, which was then extended to the entire United Kingdom and became a model for other countries.
2) A successful professional bibliotherapist in Great Britain, coauthor of the successful bibliotherapy book, *The Novel Cure: An A-Z of Literary Remedies* (2013).
3) A librarian from Rome, editor of the Italian edition of the book mentioned above and author of the prize-winning novel titled "The Lost Reader".
4) A Greek children's book author, chosen because all her books discuss issues that help children understand themselves and the world around them and prevent psychological tensions.
5) An award-winning kindergarten teacher has created a pedagogical tool using literature for children's socio-cultural awareness and development.
6) A librarian and library director, distinguished as a teacher librarian, was chosen precisely because of her position in the Greek librarianship community and wider public recognition. *References*

IV. Results

After analyzing the interviews of the six (6) participants, their responses were organized thematically into the following themes: 1) The need for alternative (psychotherapeutic) methods, 2) Method, 3) Method effectiveness, and 4) Method acceptance. The last step is the presentation of the qualitative research, which includes the detailed presentation of the previous steps, the connection of the thematic units with the literature and the presentation of excerpts from the interview or observation related to the analysis and interpretation of each thematic unit. As the first interviewee points out, "bibliotherapy is both effective and very cheap", referring to the bibliotherapy program that uses self-help books. "The participation of (English public) libraries in the program helped them survive difficult times. A new service was added to those they already offered and the community's interest in their social role was renewed. This is a win-win program for everyone (and libraries, of course) as it does not replace any other treatment, but instead it can be combined (e.g., with psychotherapy)". The future of bibliotherapy is related to the rise in the use of electronic and audiobooks and the utilization of new technology. "The pandemic has shown that we need to be able to operate remotely, and libraries can have a role under these conditions as well". The second interviewee believes that "the best libraries are those that build a community. We must never forget that we are human because we know how to read. Reading is our most human activity. To me, libraries should be where books are not only studied, but also discussed". The sixth interviewee suggests that "bibliotherapy for librarians" could be included in the university curriculum. Libraries must find their role in an age where people are looking for something to draw strength from.

For the second interviewee "books are conversation- and communication-starters. They raise important issues and can bring human beings closer. Perhaps literature and reading can help us communicate with mutual respect, without violence and prejudice. That is a great healing exercise." bibliotherapy, after all is the "confidence that books can change people's lives". The third interviewee states: "I really believe in the dynamic that is created when people get together to talk about a book they've read. In group readings, people talk about the book and themselves in a safe environment - it is definitely a form of psychotherapy because people are not afraid to talk about books, while sometimes an upcoming visit to the psychotherapist seems scary".

According to the sixth interviewee, bibliotherapy, in a broader perspective, is the mental support that reading books offers; the relief from loneliness and personal problems which is made possible when someone is part of a book club. She also considers bibliotherapy as an appropriate method for children, and a rather informal form of it is usually applied by kindergarten teachers. The fifth interviewee argues that suitable book-reading programs can work across ages, adapting activities and goals to cognitive, emotional and social needs. The fourth interviewee denotes that "It is certain that books can have a psychotherapeutic character. Perhaps their influence also depends on the character of the child-reader, as some children are more receptive to the messages of books and others less so". The submitting author is responsible for obtaining the agreement of all coauthors and any consent required from sponsors before submitting a paper. It is the obligation of the authors to cite relevant prior work.

Authors of rejected papers may revise and resubmit them to the journal again.

V. Conclusions

Our results largely confirm the potential of making bibliotherapy an integral part of modern libraries' services. The most widespread bibliotherapy program worldwide is based on the selection of special self-help books that can be prescribed by medical doctors, i.e., books on prescription, where libraries assume the role of "pharmacies". Users can also choose to borrow some of the listed books without a prescription. Another approach entails reading groups as the basis of a group book therapy program in the safe environment of the library. Depending on the approach, the role of the librarian and the need for specific training is differentiated.

Based on the above, two main trends are relevant to the types of books used in bibliotherapy. The first that can be termed «psychological» uses cognitive behavioral therapy and is based mainly on self-help books, which help correct negative behaviours by offering an alternative, positive prospect. The other, called "philosophical", utilizes fiction books. This reading material can be used in individual or

group therapies. In both approaches, other people's memories can be used as the therapeutic basis, as recorded in the books.

The present research confirmed that reading is not just a leisure activity but also a way of addressing mental health problems. It can be used to manage difficult emotions and facilitate the experience of catharsis and empathy. Bibliotherapy is applied with very good results in young individuals as it is linked to education and social development. It helps people to set and achieve goals and understand themselves, others, and their environment. Nowadays, children struggle with various issues, such as adapting to the school environment, bullying, friendship, and cooperation. Bibliotherapy can help them positively respond to these challenges and help to overcoming fear, anxiety, anger, and frustration. Many good children's books, with a psychological (essentially bibliotherapy) dimension, can be used as a pedagogical tool for sociocultural encouragement.

Libraries (mainly public and school libraries) can play a pivotal role in bibliotherapy programs. This stems from their irrefutable social role and established connection to society, which will further strengthen via such initiatives. Existing library reading clubs can perhaps serve as the first step towards creating bibliotherapy groups.

One of the key advantages of bibliotherapy is that it provides a low-cost and easily accessible starting point for those who may not have access to traditional therapy. However, it's important to note that bibliotherapy should not be considered a replacement for conventional therapy, but rather as a supplementary form of therapy that can enhance the overall treatment experience. It can also help doctors, nurses, and other health professionals to cope with the saturation of healthcare services. The fact that it can be widely available can and should be considered by the state when developing public policies for mental health care.

Technological progress can be exploited by bibliotherapy, which has been demonstrated during the COVID-19 pandemic. Distance sessions help in many cases, regardless of the limitations of the pandemic. Moreover, electronic books and digital material are also good options, except perhaps in cases where bibliotherapy is used to deal with the internet and electronic media addiction.

However, any attempt to introduce new services to libraries necessitates the buy-in of professional librarians. This requires the willingness to accept change and eagerness for new skill development. However, the basic qualification of a bibliotherapist is that they love to read.

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Eftichia Vraimaki is an assistant professor at the Department of Archival, Library & Information Studies of the University of West Attica and a member of the Information Management Research Lab. She holds a BA in Librarianship, an MSc in Financial Information Systems from the University of Greenwich, London, UK, and a PhD in Knowledge Management and Organizational Behavior from the Department of Production and Management Engineering, Democritus University of Thrace, Xanthi, Greece. Eftichia has participated in several national and E.U. co-funded research projects, and her work has been published in international peer-reviewed journals and conference proceedings. Her research interests include knowledge and library management, organizational behaviour, and acceptance of information technology.

Katerina Maniadaki is a Developmental Psychopathology Professor specialising in ADHD, Deputy Head of the Department of Social Work at the University of West Attica, and Director of the PsySup Lab. Since 1996, she has been working as a clinical psychologist at the Psychological Center "ARSI", where she is responsible for diagnosing and treating individuals with developmental disabilities. Her research interests include early identification, secondary prevention, and treatment of neurodevelopmental disorders. Her publication record consists of 7 course books at Higher Education Institutions, several chapters in edited volumes, and many international refereed journal and conference papers. Her last book, "The Complete Guide to ADHD: Nature, Diagnosis and Treatment", published by Routledge in 2018, has been internationally reviewed and endorsed. Her biography was presented at the Greek Who is Who in 2012. She has received the Universum Donna 2016 Award from the International Cultural Association Universum Academy Switzerland for contributing to scientific research, culture and humanity.

VIII. APPENDIX

List of the research questions

1st interviewee – clinical psychologist

1. What did make you go into bibliotherapy? How did you come up with that concept?

   What did make you take up book therapy professionally?
2. Who could benefit most from such a therapy? Is age relevant, for example?
3. What difficulties did you face in introducing bibliotherapy?
4. Isn't there usually resistance to change?
5. Do you think librarians need specific training to involve in a bibliotherapy project?
6. Could bibliotherapy become a kind of group therapy? Can librarians, for example, organize book therapy sessions to read these specific books to a group of people and discuss it with them?
7. You were joined by many Community Navigators at an event at the Reading Agency. What is a Community Navigator?
8. Could bibliotherapy work as a preventing rather than a treating way? If so, under which conditions?
9. Would you include books other than self-help ones in the reading list such as literature, drama, poetry etc.?
10. Introducing bibliotherapy to a new audience such as the Greek community and a new reality, what would you advice? Where should we make more emphasis?
11. How does the future of bibliotherapy look like, in your opinion?

2nd interviewee – author, librarian

1. What did inspire you to write books with bibliotherapy content?
2. What is bibliotherapy, in your opinion?
3. Your book character «invents» a new profession to make a living, the bibliotherapist. What skills do you think are necessary to practice this profession?
4. Currently, bibliotherapy uses self-help books. As you also imply in your books, do you believe literature and other forms of writing can help in bibliotherapy sessions?
5. Which do you believe is the role of the library in bibliotherapy?
6. Which do you think is the librarian's role in bibliotherapy?
7. How do you imagine the future of book therapy?
8. Can you imagine a situation where psychiatrists provide guidelines to writers and order literature books on demand (e.g. stories) to be used in therapy sessions? How would you see such a collaboration?

3rd Interviewee – bibliotherapist

1. Could you describe a bibliotherapy session?
2. What kind of books do you suggest?
3. You are asking people what kind of readers they are. Do you think book therapy could benefit from readers profiling? Should we recommend different books to

different people? Up to what extent?

4. People of all times seem to use stories for multiple purposes, like building social bonds, entertainment, etc. Could books and stories in our modern individualistic societies still have a social function?
5. In your first video for 2021, you talked about new beginnings. I found this very uplifting and hopeful. Do you think books could help us with the anxiety we all experience due to the pandemic? Could libraries have an active role in this?
6. Just by watching your videos, I felt optimistic and positive. You have a certain charisma and passion and you inspire people. So, how would you describe a good bibliotherapist? What are their characteristics and skills?
7. How do you see the future of bibliotherapy?

4th interviewee – children's book author

1. Do you think that children's books can also have a psychotherapeutic character?
2. From your own books, can you think of any that would help children with any psychological issues they face or any that explain psychological conditions?
3. Have you ever heard of the term bibliotherapy? If not, what do you think it is?
4. How would you feel about receiving book orders from psychotherapists or educators asking you to talk about specific situations in your books (eg. dealing with bullying), possibly following some guidelines?

5th interviewee – teacher

1) How was the idea of the action "Playing a Book" born? What exactly is the process?

2) Do you think it could work for older children and children with special needs?

3) In one of the press interviews you mention that the parents happily accept these actions. Can you think of possible circumstances where the parents would have had a negative reaction?

4) What kind of books do you use and why?

5) Do you have specific books that you use for specific children's issues? (e.g. phobias)

6) Do you think that such kind of activities could took place in children's library environment??

7) Could a librarian support this? And if so under what conditions?

6th interviewee – librarian, library director

1) What is bibliotherapy according to your opinion?

2) Do you think that bibliotherapy can be introduced in Greek libraries?

3) Could a librarian support this? If so, under what conditions?

4) What changes should happen in the libraries to be able to support bibliotherapy programs?

5) What are the difficulties you think will arise?

Journal of Integrated Information Management electronic journal

An Academic E-government Platform for Managing Educational and Research Activities

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Abstract:

Purpose **-** In this article, we propose the architecture of an E-government platform for Educational and Research Management (e-EDURES) in Higher Education Institutions. An integrated strategic planning and decision support system (DSS) is included at the center of the architecture for facilitating the decisions and the design of future actions, enabled by data mining and visual analytics techniques.

Design/methodology/approach **-** The platform study focuses on the development of services related to i) the management of educational data generated by blended learning, along with ii) the utilization of data related to R&D activities in higher education Institutions. The proposed approach studies the system architecture at four levels: data collection, data preparation, data mining, and knowledge discovery.

Findings **-** The e-EDURES platform should be based on data mining techniques to predict the potential learning progress of each student, whereas focusing on research, Social Network Analysis, and coauthorship networks modeling using graph metrics and Data Environment Analysis have been used as a measure of the effectiveness of the research activities.

Originality/value **-** The platform incorporates interactive visual interfaces to support Knowledge Discovery from Data Visualization, providing the user with enhanced assistance throughout the decision-making process.

Index Terms **—** E-government Platform, Digital Archives, Research Indicators, Visualization, Visual Analytics, Co-authoring, Knowledge Discovery, Graph Metrics, Data Mining.

I. INTRODUCTION

Assessment and overview of performance in academia are crucial for enhancing educational and research activity and contribute to the definition of the level of the offered services. Technology can enhance the work of policymakers (PM) by enabling them to get informed about the progress in academic activities (including both research and educational activities), with ultimately leads to the improvement of the academic processes and their outputs, to make recommendations based on the current status and estimate the effect of these recommendations to the future, according to current and past performance. In this paper, we study and propose the architecture of an e-Governance Platform for Educational and Research Management (e-EDURES) which supports centralized administration **[1]** using Interactive Data Visualization Interfaces for Knowledge Discovery (KDD-V). The main research issue we address is creating a user-friendly e-Government platform that will leverage a data-driven approach, allowing PM to use the extracted knowledge to make strategic decisions at an institutional or individual level. A set of primary Digital Government architecture characteristics are based on the fundamental principles described in the work of Baheer et al. **[2]**.

To be more precise, the operational/functional aspects considered are directly related to the research management requirements listed below:

- Archiving of Research Activities (including publications, funded projects, and patents).
- Archiving of Educational Data (i.e., visiting the course's page, accessing and downloading the educational material, grades, etc.).
- Identifying significant researchers and research areas at the institutional level.
- Support PM to get an accurate view of the performance of the academics, set priorities for their research activities, and form the institutional research policy.
- Monitoring and predicting the performance of the students.

- Ameliorating teaching through course analytics.

The main contribution of this study is a system that no-expert data analysts can use to analyze the effectiveness of collaborative structures within academic institutions. In addition, we offer a variety of social network analysis (SNA) and data mining methods to measure the performance of research activities at individual or institutional levels, as well as the evaluation of the learning process outcomes. The results of those methods are presented using visual analytics tools, namely graphs, parallel coordinators and regression lines.

The remaining paper is organized as follows: Section 2 offers a concise overview of current Research Information Systems (RIS), emphasising their functional role in supporting the management of research activity and literature review of the fundamentals of Decision Support Systems (DSS). In addition, the application of educational data mining methods is presented. Section 3 discusses data analytics methods of e-EDURES, and the proposed systems' architecture is presented in Section 4. The implications of the proposed methodology and the conclusions of our work are discussed in Section 7.

II. LITERATURE REVIEW

In developing an E-government platform for Educational and Research Management, we have implemented a decision support system, following the basic digital archiving methods to manipulate the data retrieval process. Decision Support Systems are computer-aided tools that involve assessing the available data and presenting the alternative results from multiple viewpoints to decide which one fits better to the specific problem. Based on the fundamental components of the systems which support decision-making **[3],** our system comprises the following:

- Data management is a cohesive method of aggregating data from one or more sources using a shared data structure.
- Model management focuses on developing analytical models to generate information from the primary data.
- Knowledge management related to the generation of knowledge from the data using machine learning and artificial intelligence techniques
- Data Archiving, keeping the data no longer relevant for the analysis, available for future reference.
- The user interface concerns the interaction among the user and all the different stages of the DSS process.

Liu, Shaofeng, et al. **[4]** have demonstrated that the decision support process is a difficult task with limitations as the user faces problems in selecting the optimal answer among available alternatives or, in cases, several process steps must be changed. To address this issue, an interactive DSS **[5][6],** which enables user and process integration, must be developed. Furthermore, Fisher **[7]** suggests the most important element in the success of DSSs is the human-computer interface rather than the functionalities offered to solve a problem. In our approach, we have created a framework for Institutional Educational and Research Management consisting of various layers by building upon the KDD model **[5]**, which includes:

- Data collection,
- Data preparation,
- Data analysis and
- Knowledge discovery from data visualizations.

The evaluation process of the research activities involves accumulating a variety of qualitative or/and quantitative metrics among faculty members. According to the literature, there are various models which use different types of metrics based on the scope of the assessment. For example, Jong et al. **[8]** suggested an analytic network process for R&D project evaluation and ranking to identify the projects that should continue receiving funding. Carlos et al. **[9]** presented a multi-criteria-based decision-making model called Research Lab Evaluation (RELEV) to evaluate the research output of individuals or research institutes. Moreover, Cocci et al. **[10]** used different qualitative and quantitative indicators to measure faculty members' performance.

Social network analysis is employed to predict the evolution of prestigious members of a research community **[11]** or to examine the collaboration relationships of the researchers **[12]**, whereas VIVO **[13],** which stores the research activities of faculty members of an institution, allows recording, editing, searching, browsing, and visualizing scholarly activity.

Numerous systems and tools utilize machine-learning techniques to analyze research data and evaluate research outcomes. For instance, the National Institute of Health (NIH) has developed the Research Portfolio Online Reporting Tool (RePORT) **[14]** for the retrieval of research articles from PubMed **[15]**. It generates reports based on the analysis of research activities. Another approach, STAR Metrics **[16]**, measured various indicators, such as the publications, the citations, the environmental impact factors, the student mobility and employment, to estimate the impact of investment on scientific knowledge. Online Analytical Processing (OLAP) has been effectively used for educational purposes **[17]**.

Data-mining techniques are utilised to reveal insights and hidden patterns based on student behaviours concerning

the analysis of the academic data produced during educational activities **[18]**. By applying Educational Data Mining **[19]** to data retrieved from learning management systems (LMS), meaningful results can be extracted, and potential problems during the educational activities can be identified. Datasets generated through educational activities have been used for early detection of failure of students **[20][21][22],** for prediction of students' performance **[23]**, for altering the learning material to be more personalized **[24]** and for the discovery of faculty behaviour on the usage of LMS **[25]**.

The main drawback of all these systems and techniques is that they focus on specific topics of research or educational activities, and they do not provide a holistic view of all the related aspects.

III. E-EDURES DATA ANALYTICS METHODS

The architecture we study and propose incorporates a decision support tool for educational and R&D activities. In this section, we examine the methods employed to evaluate R&D and the techniques used to assess learning activities.

A. Analysis of Co-authoring Networks

In our approach, to evaluate an academic institute's research outputs, we analyze and explore the scientific collaborations among the faculty members and determine their performance based on the R&D activities. As Chien Hsiang Liao, et al. **[26]** suggested, the ability of an institute to share the research results and acquired knowledge among faculty depends on academic collaboration. Due to the importance of analyzing research collaborations among faculty members, different methods have been involved: bibliographic metrics **[27]**, social network analysis **[28][12]**, qualitative methods **[29][30]** and surveys **[31]**. Using the Social Network Analysis method, we can identify the underlying structures and processes leading to specific apparent structures **[32]**. Using graph metrics **[33]** based on the graph network can also provide valuable results. For example, in **[12],** the construction of co-authoring networks was analyzed to identify the most "important" author.

In the proposed architecture, we have employed social network analysis on the coauthorship network of the faculty members, focusing on scientific publications as the parameter for the construction of the network. The analysis of the coauthorship through SNA enables the analysis and evaluate the importance of an author or author groups by employing graph metrics to quantify their collaboration. In addition, several useful measures pinpoint the significance of a specific node to the network topology **[34]**. We can explore the existing collaboration patterns using these measures on the co-authoring networks.

A co-authoring network comprises nodes (individual researchers or research groups) connected to one another through edges, representing their coauthorship and collaboration activities. The network topology is determined by the edges between the authors who have co-authored at least one publication. To better understand the significance of each node, various metrics have been developed based on the network's structure. The definitions of both nodes and edges can vary based on the research questions being explored. The methods used to measure the importance of a node by examining the whole network and its participants are described below:

- Degree Centrality measures the number of links a node (author) has.
- Closeness Centrality **[35]** indicates the number of short paths a node (author) has to the others.
- Betweenness Centrality **[36]** captures the significance of each node (author). We calculate the short paths that pass through nodes using the betweenness centrality.
- Clustering Co-efficient **[37]** indicates the one hoop connections between the neighbours of a node to all the possible connections between its neighbours.
- The Eigenvector Centrality **[38]** of a node (author) is the sum of its connections to other nodes, weighted by their centrality.

B. The efficiency of academic units using Data Envelopment Analysis

Another intriguing issue is the design of the appropriate methodology for the efficiency measure of the R&D activities among the faculty members, as the inputs and outputs are often of broad scope and intangible **[39]**. Data Envelopment Analysis (DEA) is one of the most commonly used methods **[40][31]** for efficiency measure, as it takes into account a dataset containing information on research inputs and outputs and measures the research efficiency among academic units.

Previous research on university efficiency has primarily explored the relationship between efficiency and productivity within the departments of the same institution or across different universities. In the work of Lee et al. **[41]**, they have applied an efficiency measure technique to economic departments in Australian universities. They separate the data into input, corresponding to teaching and research personnel, and output variables, including the graduates and the publications. Then they analyzed how government policy can influence productivity. Another study conducted in USA [40] examined the efficiency among 42 academic units. They have used the staff, financial resources and infrastructures as inputs, whereas the number of students, the full-time equivalent (FTE) enrolments and

grant awards are assumed as outputs. Tommaso Agasisti et al. **[42]** use as starting points the laboratories and the high-qualified human resources, while the yearly number of publications, the citations per article, the h-index, the research funded through regional or national grants, the research funded through international grants, and the applied research through externally funded orders are considered as outputs.

Our research relies on the criteria outlined by the European Association for Quality Assurance in Higher Education (ENQA) to assess research and development at higher education institutions (HEIs). ENQA developed the European Standards and Guidelines report to standardize quality assurance across Europe's higher education setting **[43]**. The main reasons for selecting these criteria were to ensure the alignment with commonly adopted standards across European institutions and use it as a case study at a Greek institution. Table 1 displays the specific criteria (indicators) utilized in our study.

Table 1. *Data Description for criteria of our study*

Index	Description
1	International Journal Articles (JAI)
2	National Journal Articles (JAN)
3	International Conference Papers (CPI)
4	National Conference Papers (CPN)
5	Citation indexes (CIT)
6	Book Chapters (BC)
7	Research Project that one of the faculty members has the role of Coordinator (RPC)
8	Research Project that one of the faculty members participates as partner -member of the research group- (RPP)
9	Research Project and partnership with external institutes (RPE)
10	Research Areas of Research Activities (RA)

In our system, we separate the indicators as:

- Inputs: human resources.
- Outputs (table 1) are grouped into publications, projects and financial support (e.g., grants) related.

DEA is a multi-factor productivity analysis model for computing the relative efficiencies of a homogenous set of decision-making units (DMUs). The efficiency score **[44]** in the presence of multiple input and output factors is defined as follows:

$$\text{Efficiency} = \frac{\text{weighted sum of inputs}}{\text{weighted sum of outputs}}$$

$$\max \quad \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}}$$

$$\text{s.t.} \quad \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}} \le 1 \qquad \forall i$$

$$v_k, u_j \ge 0 \qquad \forall k, j \ \forall i$$

Where

- x_{ji} = amount of input j utilized by DMU i,
- v_k = weight given to output k,
- u_j = weight given to input j.
- k = 1 to s, j = 1 to m, i = 1 to n,
- y_{ki} = amount of output k produced by DMU i,
- s=the number of outputs, m= the number of inputs and i= the number of DMU's.

C. Evaluate Student Performance

To measure and evaluate the efficiency of learning activities, we have to examine the students' performance and progress, as well as the availability and use of learning materials. The scope of the analysis is to identify the factors that affect students' performance and the correlation among them. We can extract hidden predictive information from datasets by employing data mining techniques. Various data mining approaches have been employed to evaluate university educational activities **[45][46]**. For instance, Wu **[47]** utilized k-means cluster analysis to identify the grouping patterns among faculty members and attempted to classify them into similar groups by comparing multiple characteristics. In addition to clustering techniques, rule-based association mining has been utilized in several studies **[48]**.

According to the literature, classification techniques have been used to analyze student performance, such as decision trees **[49]**, artificial neural networks **[50]**, support vector machines[51], regression **[52]**, etc. For example, in a study **[49],** naïve Bayes and a decision tree classifier have been used to estimate a model to predict low academic performance. In the work of Alkhasawneh et al. **[50],** Neural Networks have been selected to assist in predicting students' retention behaviours in Science and Engineering Disciplines.

Our system (e-EDURES) offers diverse data mining methods for clustering and classification. More specifically, we support a variety of techniques for knowledge extraction, ranging from k-means clustering and apriori association rule mining for identifying current efficiency to Bayesian network analysis for predicting future performance.

Although using those algorithms, the user could get useful insights about the current performance of faculty members, some hidden information may remain undiscovered. Data

visualization techniques can aid in uncovering hidden patterns within the data, ultimately enhancing the decision-making process **[53][54]**. For instance, Chen **[55]** utilized a combination of information visualizations and data mining activities to conduct a comprehensive analysis.

The proposed approach involves developing various visualization methods to offer alternative representations, allowing users to identify the underlying patterns that may not be evident using conventional visualization techniques. The user can repeat the process by selecting the appropriate one among different visualizations until a correct solution is reached to the problem at hand.

IV. E-GOVERNMENT PLATFORM FOR EDUCATIONAL AND RESEARCH MANAGEMENT

The proposed architecture is based on the interoperability of two different functional subsystems developed in the context of our previous research activities:

1) The Institutional Research Management Information System (IREMA) **[56]** examines the academic performance based on the conducted research, including the authorship of research publications and participation in research projects. Based on the quantity and the quality of the research of academics, their research work is evaluated, and the system presents those that outperformed, the research hubs that show better performance than others, and an overview of the research activities and collaborations of all the faculty.

2) The system proposed by Chytas et al. **[57]** retrieves educational, participation and socialization data. In this system, the evaluation is focused on the students and how they utilize the online educational services to succeed in a course and their actual performance on the specific course. The gathered information can inform the stakeholders about students at risk, and the retention rate of the courses. As a direct consequence, the implicated academics can take corrective actions.

In the context of e-government, we illustrate the proposed architecture described in Figure 1. This architecture facilitates the centralized administration of the two subsystems to provide PM useful information and support decision-making activities.

In Figure 1, the advanced users (power users) are responsible for: a) setting the main parameters (criteria) of the decision-making process, b) modifying the set of evaluation criteria (by adding or deleting criteria) and c) setting the criteria for weights or the type of the corresponding data mining process, as well as the associated parameters. On the other hand, the developers have full access to all the features of the multicriteria evaluation process. To elaborate, they can add data mining processes or develop custom functions based on the advanced users' needs. Apart from the advanced (power) users and developers, the DSS includes a user-friendly interface that facilitates the preparation of several reports in graphical and tabular format.

B. Application Layer

The advanced users who are responsible for the design of the data-mining process are connected to the system via the application layer. The initial phase is the data collection, which is held by each one of the subsystems separately. For the IREMA system **[56],** the collected data incorporates information from SCOPUS bibliographical database by using web Services; The aggregated data includes the authors, the publications, the research areas and the number of citations; then, a list with the faculty members sorted by the department is loaded, and the external collaborators are filtered out. Subsequently, the research areas for each one of the faculty members are automatically defined and assigned to them based on the data retrieved from Scopus. Finally, the data are enriched with the R&D activities of the faculty members from files which are uploaded coming from the University's R&D office/department.

Concerning the application system proposed by Chytas et al. **[57]**, the data are retrieved in real-time from the synchronous and asynchronous LMS platforms of the Institute. The faculty member's email is the common field of integrating the dataset for those two subsystems.

The advanced (power) users execute the DM process; observe the results, and they can change the process until the desired goal is reached. The data analysis is based on the design and implementation of decision-making workflows. Advanced users/experts design the workflows with different decision-making methods.

C. Data Mining Layer

This layer involves the library with the data mining algorithms available to be used from the advanced users. The data are to be transformed to be used by algorithms. Therefore, in this step, we construct the co-authoring networks, where nodes represent the authors and the edges of the collaboration (co-authoring activity) among them. After constructing the networks for all the faculty members, the graph metrics are calculated for each one based on the network topology.

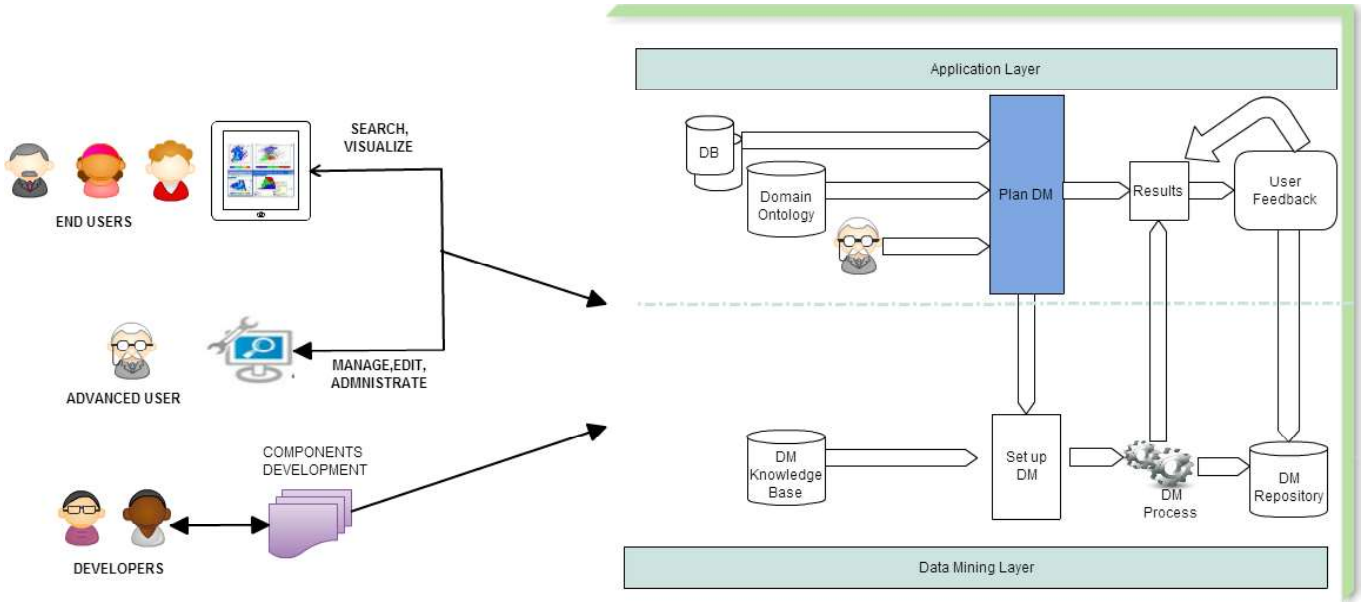

Fig. 1. *System Architecture*

D. Knowledge Discovery (SEARCH-VISUALIZE)

In this layer, the various interactive visual interfaces are integrated to support Knowledge Discovery (KD), which consists of the following:

- Co-authoring Graph, which is created on the basis of the collaboration among faculty members for the publication of a research paper.
- Parallel Coordinators, as an interactive representation, allow the user to apply a set of criteria (dynamic) depending on his objectives.
- Efficiency Line, which is used for the representation of the correlation among indicators.
- Map of Science, where each research area is represented through pie charts.

V. Conclusion

The assessment of the quality of services provided by higher educational institutes is related to the management of educational and R&D activities. Implementing a holistic, integrated decision support system is crucial for the involved stakeholders, as the knowledge extracted from the primary data (educational and R&D) can be apparent and used to inform strategic decision-making at institutional and individual levels. The e-EDURES allow the exploration of data and the discovery of valuable knowledge within the dataset and support the whole spectrum of academic activities. By presenting a selection of feasible alternatives, our system provides the most appropriate solution suited for policymakers' needs without requiring additional skills or knowledge. However, it gives more sophisticated options for expert users. e-EDURES is occupied with two of the most important dimensions of academia, education and research, providing the tools to present, assess and improve academic performance, and by extension, the offered services of a university.

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Sustainable Development Literacy for Educators and Librarians

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Abstract:

Purpose – *This paper aims to present and analyse the experiences and challenges during the development of sustainable development literacy (SDL) implemented in the context of the EDUCABILITY project.*

Design/methodology/approach – *It briefly discusses the methods and tools used to deliver a source mapping for SDL, a relevant Delphi Study, an SDL Curriculum and an e-Learning Module in the EDUCABILITY Virtual Learning Environment.*

Findings – *The systematic review of international literature and the results of the Delphi Study enabled the proposal of an SDL curriculum, including definitions, key concepts and content, learning objectives and outcomes, teaching approaches and evaluation methods.*

Originality/value *- The proposed educational materials enable the capacity of educators and librarians in SDL to apply it to different problems and various aspects of the same problem.*

Index Terms — sustainability, sustainable development literacy, information literacy, educators, librarians.

I. Introduction

According to The Alexandria Proclamation on Information Literacy and Long-life Learning, information literacy ""empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals"" **[1]**. Dealing with a wide range of different types of information implies dividing information literacy into different types of literacies. Mackey and Jacobson **[2]** see information literacy as the essential framework that unifies additional literacy types. However, they also state that ""while the type of information may change from one format to another (from print to Web page to multimedia file, to learning object, to collaborative document), the abilities to determine, access, evaluate, incorporate, use, understand, produce, collaborate, and share information are common considerations" ".

Since we live in an overwhelming information world, educators and librarians, before all others, should be well-educated and skilled in all kinds of literacies. Crary **[3]** states: "The literature review revealed that, in general, teachers have limited understanding of information literacy skills". The survey conducted by this author shows that "teachers responded with a high preference for school librarians to prepare professional development on topics related to information literacy skills for teachers. Teachers then take that information to develop their information literacy skills and lessons to help students develop them"." Educating educators and librarians in information literacy is the basis for disseminating those skills in their communities. Developing different projects, tools, courses, or educational materials helps educators and librarians meet their communities' growing information needs.

Such a project is *EDUCABILITY – Building the Capacity of Educators and Librarians in Information Literacy* (Erasmus+ KA2). Partners of the project are Cyprus University of Technology (CUT), Universidad Carlos III de Madrid (UC3M) – Spain, University of West Attica (UNIWA) – Greece, University of Novi Sad (UNS) – Serbia and Centre for Social Innovation (CSI) – Cyprus. Each partner was in charge of specific literacies and project deliverables, but all partners worked collaboratively. The project aims to train educators and librarians in the basic skills of Information Literacy (horizontal goal) and the skills of six existing and emerging literacies (vertical goal). These six literacies are Critical Information Literacy, Digital Literacy, Mobile Literacy, Media and Information Literacy, Data Literacy, and Sustainable Development Literacy. The project partners developed a complete curriculum for each of the literacies above. All seven curricula were converted into seven e-Learning Modules and integrated into an open-access Virtual Learning Environment (VLE)[1] **[4]**.

This paper aims to present and analyse experiences and challenges during Sustainable Development Literacy (SDL) implementation through EDUCABILITY Project. This part of the project was carried out by UNS-Serbia. UNS-Serbia team members are: Mirjana Brković (team leader), Ivana Ikonić (administrator), Gordana Rudić, Dejan Pajić, Nataša Belić and Ljiljana Matić.

[1] https://vle-educability.uc3m.es/course/index.php

II. MAPPING THE STATE OF RESEARCH IN SDL

Previous research has shown that providing online open-access materials to students significantly improves their understanding of sustainability **[5].** It enables them to make the "paradigm shift" in their awareness of SD's importance and can"" lead to changes in behaviour and the perception of their personal and professional practice. To this end, online courses should provide 'an interdisciplinary approach, consider students' different cultural backgrounds, and enable them to be more involved in online courses by providing practical examples and ways to participate in various SD actions actively **[6]**.

In order to provide an overview of the current research related to SDL, the UNS-Serbia team searched for documents containing the terms ""sustainable development"" and ""literacy"" in the Scopus database. The keywords used in the downloaded articles are depicted below, using VOSviewer, a software tool for constructing and visualising bibliometric networks (see Fig. 1) **[7]**. SDL is becoming an essential aspect of education and one of the key competencies within the broader concept of information literacy. Although researchers seem to focus on environmental issues, the map reveals the broad scope of the SDL that also incorporates health and food literacy, gender equality, economic growth, well-being and other topics that arise from the 17 UN SD goals. Finally, the map also shows that terminology is not fully standardised as terms other than SDL are also widely used, e.g. ""sustainability literacy"", ""SD education"", "and "education for SD"", but also other narrower terms that are often equated incorrectly with SDL, such as ""environmental education"" or ""global change education"".

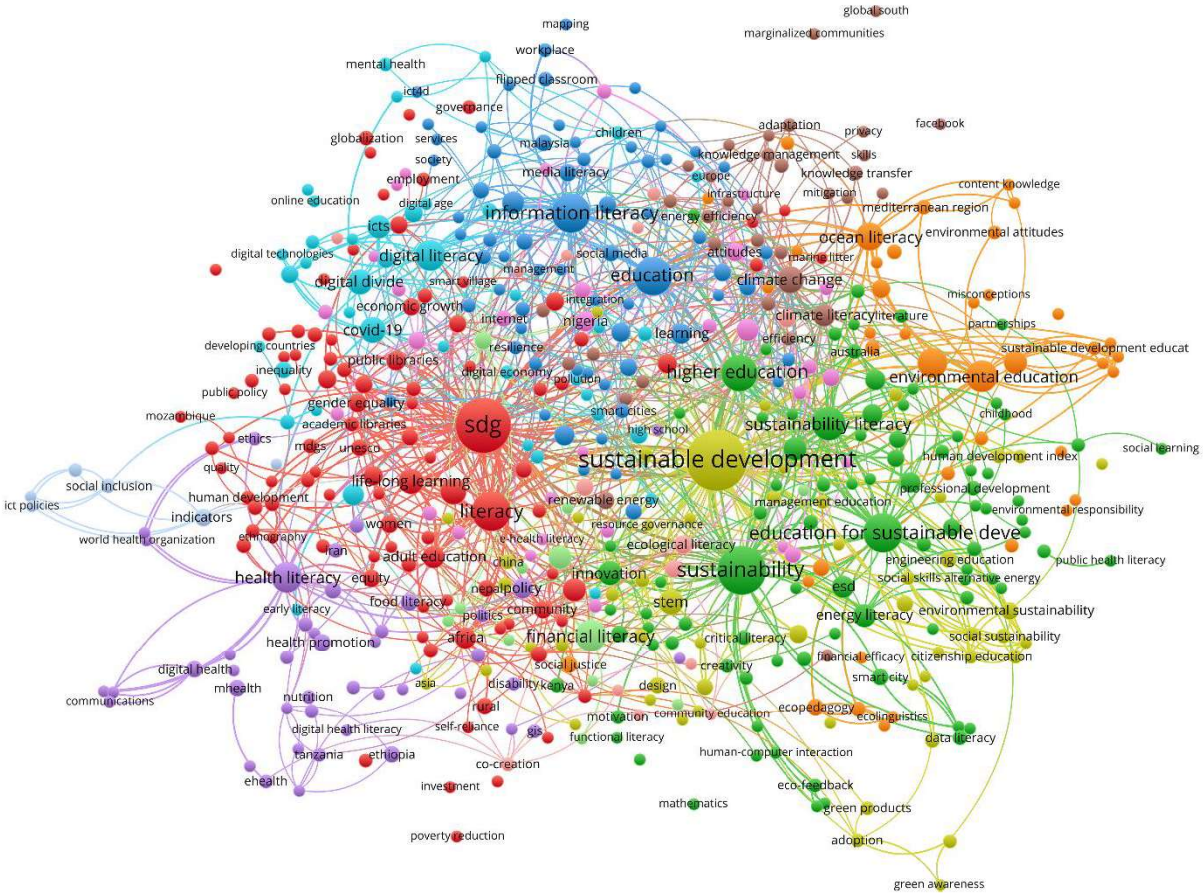

Fig. 1. Bibliographic map of keywords from Scopus articles related to SDL

For the overview of the relevant scientific literature from 2006 until 2021, the UNS-Serbia team also used "Google Scholar" and the "Publish or Perish" software. Searching databases with different keyword queries related to SDL, such as teaching sustainability, methodology, SDL education, and SDL curricula, gave several lists with the search results. The UNS-Serbia team created a final list of one hundred publications by selecting the most impactful ones from those lists **[8]**. The process of selecting publications included several issues, such as the ne'ed to rank the publications according to the number of citations they received and the relevance and importance of their content for the desired goal. After that, team members studied and analysed the scientific material from this list in-depth, according to the following aspects: definitions of SDL, key concepts and content, learning objectives and outcomes, and teaching approaches and evaluation methods.

Definitions of education for sustainable development are present in 77 reviewed scientific papers, while only 23 scientific papers do not quote a specific definition of SDL or refer to other authors who defined this literacy. Common to all the definitions of SDL is the demand for different skills

and abilities: identifying problems at the macro level, reflection, continuous and interdisciplinary action, finding solutions, and solving the issues at the local level.

Analysis of relevant literature also provided insight into the key concepts concerning SDL. Team members recognised ten (10) key concepts and proposed a set of learning objectives and outcomes for each of those concepts. Those key concepts with proposed learning objectives and outcomes are listed below.

1. Introduction to Sustainable Development Literacy (SDL)

Objectives: introducing the main theoretical concepts and the practical outcomes of SDL in connection with achieving the UN SDGs; reducing inequality in access and attainment of education; motivating others to educate themselves; recognising 'one's needs for education.

Outcomes - trainees will: understand the connection between SDL and achieving the UN SDGs; become aware of inequality in access to and attainment of education, particularly between girls and boys and in rural areas, and about reasons for lack of equitable access to quality education and lifelong learning opportunities; be able through participatory methods to motivate and empower others to demand and use educational opportunities; recognise the intrinsic value of education and analyse and identify their own learning needs in their personal development.

2. Interdisciplinary approach to SDL teaching and learning in specific age groups

Objectives: introduction of an interdisciplinary approach to the SDL teaching and learning in specific age groups; to speak up against all forms of age discrimination and debate the benefits of full empowerment of all age groups; to advocate for the life-long learning (LLL) possibilities; to introduce different forms of education (formal, nonformal, informal) for achieving SDL.

Outcomes - trainees will: become familiar with an interdisciplinary approach to SDL teaching and learning in specific age groups; become the agents of annihilating age discrimination; understand the critical role of education and lifelong learning opportunities for all; accept the formal, nonformal, and informal learning as the main drivers of sustainable development and in achieving the UN SDGs.

3. Teaching the connection between environment, society, and economy

Objectives: teaching the connection between environment, society, and economy; explaining basic physical, social, and psychological human needs and identifying how these needs are currently addressed in their own physical urban/rural settlements; addressing basics of sustainable planning and building; teaching how to decouple economic growth from natural hazards and natural degradation.

Outcomes - trainees will: understand the connection between environment, society, and economy: become agents of change towards sustainability since they realise how innovation, entrepreneurship, and new job creation can contribute to decent work and a sustainability-driven economy in their community; support the sustainable planning and building; be able to understand the principles of decoupling of economic growth from the impacts of natural hazards and environmental degradation.

4. SDL as the tool for critical thinking and empowering students with sustainability competencies

Objectives: introducing SDL as the tool for critical thinking; empowering students with sustainability competencies like Systems thinking, Anticipatory thinking, Normative thinking, Strategic thinking, Collaboration thinking, Self-awareness, Integrated problem-solving; explaining how to identify a problem, organise and express ideas, synthesise information from more than one source; show the trainees how to critically assess issues of peace, justice, inclusion, and strong institutions in their region, nationally and globally; teaching how to recognise and reflect on 'one's demands on the local infrastructure such as carbon and water footprints and food miles.

Outcomes - trainees will: recognise SDL as the tool for critical thinking; from more than one source; critically assess issues of peace, justice, inclusion, and strong institutions in their region, nationally and globally; recognise and reflect on their demands on the local infrastructure such as carbon and water footprints and food miles; become self-aware and realise that they are the agents of change; learn the integrated way of problem-solving.

5. Filling the gap between social groups and reducing inequalities to foster equitable social development and inclusion

Objectives: teach the students about the indicators that measure and describe inequalities; show the local, national, and global processes that both promote and hinder equality; teach the ways of filling the gap between social groups; raise awareness of and reducing the inequalities; negotiate the rights of different groups based on shared values and ethical principles; fostering equitable social development; inclusion of minority groups.

Outcomes - trainees will: be able to recognise the inequalities in their surroundings as well as in the broader world and recognise the problematic consequences; know to recognise the local, national, and global processes that both promote and hinder equality; be ready to become agents of filling the gap between social groups; become aware of inequalities and recognise the need of reducing the inequalities; be ready to negotiate the rights of different groups based on shared values and ethical principles; change the attitude from passive to active in fostering equitable social development; be able to plan, implement and evaluate strategies to include minority groups in their working space, schools.

6. SDL and promoting the integrated and sustainable management of natural resources and ecosystems

Objectives: promoting the integrated management of natural resources; maintaining the sustainable development of ecosystems; explaining the production and consumption patterns and value chains and the interrelatedness of production and consumption; teaching the strategies and practices of sustainable production and

consumption; promoting different lifestyles; explain differences between needs and wants and reflect on the students own individual consumer behaviour in light of the needs of the natural world, other people, cultures and countries, and future generations; teach how to evaluate, participate in, and influence decision-making processes about acquisitions in the public sector.

Outcomes - trainees will: understand the need for integrated management of natural resources; become advocates for maintaining the sustainable development of ecosystems; be able to understand the production and consumption patterns and value chains and the interrelatedness of production and consumption; accept the strategies and practices of sustainable production and consumption; become promoters of different lifestyles; be able to differentiate between needs and wants and to reflect on their consumer behaviour in light of the needs of the natural world, other people, cultures and countries, and future generations; be able to evaluate, participate in, and influence decision-making processes about acquisitions in the public sector.

7. Ethical approach to complex problems and ambivalent situations

Objectives: enabling the ethical approach to complex problems and ambivalent situations; learning how to respect other 'people's opinions, emotions, cultural values, ways of living, and political attitudes; teaching the trainees to act ethically, i. e., to do in any situation whatever will produce the best outcomes taking into consideration the interests of all concerned parties; discuss what kind of people or organisations we want to be, and what kind of ethical examples we ought to follow; teach a complex set of interrelated perspectives that emphasise interpersonal concerns (caring, interdependence), and the ethical requirements of particular relationships.

Outcomes - trainees will: accept the attitude which enables the ethical approach to complex problems and ambivalent situations; know how to respect other 'people's opinions, emotions, cultural values, ways of living, and political attitudes; be able to act ethically, i. e. to do in any situation whatever will produce the best outcomes taking into consideration the interests of all concerned parties; recognise what kind of people they want to be or in what kind of organisation to work in, and what kind of ethical examples they ought to follow; become aware of a complex set of interrelated perspectives that emphasise interpersonal concerns (caring, interdependence), and the ethical requirements of a particular relation.

8. Transformative learning for changing unsustainable to sustainable patterns

Objectives: Introducing transformative pedagogy as the key driver for delivering SDGs in the classroom; combining the elements of constructivist and critical pedagogy; empowering students to examine their beliefs, values, and knowledge critically; developing a reflective knowledge base; acquiring an appreciation for multiple perspectives; to develop a sense of critical consciousness and agency.

Outcomes - trainees will: be able to use transformative pedagogy as the key driver for achieving SDGs; be ready to combine the elements of constructivist and critical pedagogy in their classrooms; be eager to examine their beliefs, values, and knowledge critically in order to change them if necessary, develop a sense of self-examination and redefinition of oneself; develop a reflective knowledge base and learn how to use it; acquire an appreciation for multiple perspectives; have a developed sense of critical consciousness, social critique, social advocacy, and agency.

9. Responsibility for the decision-making and behaviour

Objectives: explain the responsibility of each person for their decision-making and behaviour; promote the development of productive and socially responsible individuals; teach trainees to become agents of change in local decision-making, speaking up against injustice; explain how to evaluate and participate in and influence decision-making related to management strategies of local, national, and international enterprises concerning poverty generation and eradication; how to participate in decision-making related to public policies concerning the combat against hunger and malnutrition and the promotion of sustainable agriculture, gender issues, well-being, climate change.

Outcomes - trainees will: accept responsibility for the decision-making and behaviour; become productive and socially responsible individuals; know how to evaluate, participate in, and influence decision-making related to management strategies of local, national, and international enterprises concerning poverty generation and eradication; know how to participate in decision-making related to public policies concerning the combat against hunger and malnutrition and the promotion of sustainable agriculture, gender issues, well-being, climate change.

10. SDL and raising basic standards of living and enhancing economic growth in order to eradicate poverty

Objectives: promotion of well-being for all at all ages; explaining the best ways of raising basic standards of living; showing the socio-political-economic dimensions of health and well-being; explaining the relationship between employment and economic growth and knowing about other moderating factors like a growing labour force or new technologies that substitute jobs; teaching the relevant prevention strategies to foster positive physical and mental health and well-being; to teach how the SDL helps to end poverty in all its forms everywhere; teaching how to advocate prevention strategies and promoting health and well-being.

Outcomes - trainees will: know how to promote well-being for all at all ages; recognise the best ways of raising basic standards of living and act accordingly; know the socio-political-economic dimensions of health and well-being; know the relation between employment and economic growth and knows about other moderating factors like a growing labour force or new technologies that substitute jobs; accept the relevant prevention strategies to foster positive physical and mental health and well-being and plan, implement, evaluate and replicate those strategies; learn how the SDL helps to end poverty in all its

forms everywhere; learn not only to advocate prevention strategies and to promote health and well-being but also to perceive when others need help and to seek help for themselves and others.

Learning objectives and outcomes in chosen literature mainly recognise SDL's primary goal of empowering learners to take responsible actions for environmental integrity, economic viability, and just society. It is also essential to enable students to become system problem solvers, change agents, and transition managers towards more sustainable development of our society in different areas and to develop leadership skills.

In the analysed literature, several different teaching approaches were recommended, such as problem-based learning (the most often suggested), interdisciplinary, transformative, and learning through group work. The approach to teaching SDL should be holistic, transformative, multi-faceted and multi-level, interdisciplinary and transdisciplinary, and hands-on.

III. DELPHI STUDY

Through the Delphi Study method, which is internationally suitable for developing educational programs, the aim was to achieve the maximum possible consensus of an expert group in assessing the proposed curriculum in Sustainable Development Literacy.

The project's partners chose the online survey platform Welphi to implement this method'.

Sixteen (16) participants engaged in the Delphi Study from the University of Novi Sad. Half were professors, six (6) were librarians, and two (2) were policymakers. Two professors and one librarian could not start the Delphi Study, so the University of Novi Sad gathered thirteen (13) experts.

The study was conducted in two rounds to achieve the maximum possible consensus of experts in the group.

UNS Project Team conducted a study using a Delphi Study Questionnaire about the definitions, key concepts, learning objectives and outcomes for each key concept, and teaching approaches and evaluation methods.

UNS expert group assessed ten (10) proposed SDL definitions rating them in order of importance for inclusion in a course for educators and librarians, from one (1) for the most important definition to ten (10) for the least important.

The experts evaluated the offered list of key concepts using the drag-and-drop option, whereby they transformed the list so that the most important concept was in the first place and the least important concept was in the last place. Similarly, experts evaluated proposed teaching and evaluation methods concerning SDL.

Using 'Likert's four-point scale (from Completely Agree to Completely Disagree), experts evaluated each set of learning objectives and outcomes attached to a specific key concept. In addition, they had an opportunity to comment each of these sets.

Experts generally showed a low level of consensus on the importance of definitions. One of the two highly graded definitions focuses on ecological and ethical aspects, while the second addresses SDL's ecological, economic, and educational aspects. Those two definitions are:

1. Sustainability is a concept, a goal, and a strategy needed for the reconciliation of social justice, ecological integrity and the well-being of all living systems on the planet. The goal is to create an ecologically and socially just world within the means of nature without compromising future generations. Sustainability refers to the process or strategy of moving towards a sustainable future.
2. The basic premise of sustainable development is that human and natural systems are dynamically interdependent and cannot be considered in isolation to resolve critical issues. Human societies and ecological systems are so interconnected that they are co-adaptive. Sustainability is the doctrine that economic growth and development must occur and be maintained over time within limits set by ecology in the broadest sense – by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it. Environmental protection and economic development are complementary rather than antagonistic processes. By embracing societal, environmental, economic, and cultural dimensions of sustainable development in a holistic and integrated manner, education for sustainable development enables all individuals to fully develop the knowledge, perspectives, values and skills necessary to take part in decisions to improve the quality of life both locally and globally on terms which are most relevant to their daily lives.

A high percentage of experts ranked the key concept 1 (Introduction to Sustainable Development Literacy) as the first most important (69% experts), concept 4 (SDL as the tool for critical thinking and empowering students with sustainability competencies) as second (69%), and concept 3 (Teaching connection between environment, society, and economy) as third (69%), which implicated putting them at the beginning of the future course. Key concepts 6 (SDL and promoting the integrated and sustainable management of natural resources and ecosystems) and 10 (SDL and raising basic standards of living and enhancing economic growth in order to eradicate poverty) were ranked last (eighth position or less) by 54% and 46% of experts respectively. Key concepts 7 (Ethical approach to complex problems and ambivalent situations) and 9 (Responsibility for the decision-making and behaviour) had the most disperse distribution of rankings, which indicates that these issues are of general importance and should be tackled within practically all other lessons as they concern issues of responsibility and ethics. Key concepts 2 (Interdisciplinary approach to the SDL teaching and learning in specific age groups), 5 (Filling the gap between social groups and reducing inequalities to foster equitable social development and inclusion), and 8 (Transformative learning

for changing unsustainable to sustainable patterns) had the largest proportions of medium ranks.

The results of both rounds show that many experts agreed with the proposed learning objectives and outcomes for each key concept, so their most common answers were Agree and Completely Agree. In the second round, experts reached a higher consensus - the vast majority of experts answered Completely Agree for concepts 8 and 9 (69%), 6 and 7 (77%), 3 and 5 (85%), and 4 (100%). Three experts constructively commented on some concepts in the first round (concepts 1, 2, 4, 5, 7-9). There were no comments in the second round. The experts answered Disagree in a small percentage for the following concepts: 2 and 8 (15%), 7 (8%), and 9 (23%). No expert answered Completely Disagree.

Ultimately, experts ranked the relevance of key teaching and evaluation methods for a future course. They showed a high level of agreement when assessing the importance of key teaching and evaluation methods, even during the first round. This agreement was further improved in the second round. Two key teaching methods were graded as the most relevant. One gives a comprehensive core overview of definitions related to sustainable development, while the other deals with searching and retrieving information on a specific sustainable development topic. The teaching method ranked third indicates 'experts' opinion that courses should be supplemented with appropriate quizzes and interactive feedback on learning achievement. The following teaching methods, in order of relevance, indicate that:

- courses should also include activities that would make students more active and involved in the teaching process, and students should explore SDG topics on their own and make reports and presentations that their peers will evaluate,
- students should be asked to think of keywords that will help them find useful information (to help them think of the appropriate terms, they should be given a list of pertinent keywords) and to complete an e-crossword of broader, synonym, narrower terms,
- students should be asked to study their retrieved information and to write an adequately cited short answer to a question,
- students should be presented with a video lecture, which is automatically paused for a question and continued when students answer a question,
- students would be expected to read at least one of the proposed references linked to the course and write the summary,
- students should be constrained in advancing the course based on their achievement in previous course units.

The two teaching methods evaluated as the least important showed 'experts' opinions that they would not be appropriate for the future course. So, they were excluded and not used in the course. Other methods were considered for use.

IV. SDL COURSE

To prepare an SDL course, the UNS-Serbia team had to deal with 17 sustainable development goals described in the UNESCO documents **[9].** It was a big task for one teaching course and demanded a holistic, interdisciplinary, transdisciplinary, and transformative approach to this literacy. To teach the SDL, we needed educational content applicable to different problems and various aspects of the same problem. 'Developing students' critical thinking, understanding complex systems, imagining future scenarios, and making participatory and collaborative decisions were essential.

SDL course[2] begins with general information and the course introduction. The course consists of six modules: M1 - Introduction to the SDL; M2 - SDL as a tool for critical thinking; M3 - Teaching connection between environment, society and economy; M4 - Ethical approach to complex problems and ambivalent situations; SDL M5 - Filling the gap between social groups and reducing inequalities; and M6 - Applying an interdisciplinary approach to the SDL teaching and learning in specific age groups.

Each SDL module contains information about learning objectives and outcomes for that module, a set of activities, and a list of complementary materials. The activities are adapted for the education of educators and librarians, but they also contain some simple exercises that they can assign to their students.

Module 1, which introduces students to SDL, consists of three activities. Students firstly can see the summary of 17 Sustainable Development Goals (SDG), two introductory videos (about 17 SDGs and The 2030 Agenda for Sustainable Development), then answer questions in the quiz regarding information from the videos and restore the puzzle about the danger of climate change. The second activity contains the video about the gender gap and the quiz about that theme. Finally, students can solve a memory card game about pollution.

SDL as a tool for critical thinking is introduced in Module 2. After explaining the IDEALS model for developing critical skills, students are asked to watch a video about declining ecosystems and consider six questions regarding the video using the proposed model. The second activity gives a list of competencies for educators in education for sustainable development. After watching a video about artificial intelligence used for sustainability, students have to solve the appropriate crossword. The next activity is about key sustainability competencies, and students can learn about them from the proposed book chapter and use accordion cards with explanations of those competencies. In the last activity, students learn about carbon footprint through a cartoon that explains it, and after that, they should solve the related memory card game.

At the beginning of the third module, Teaching Connection between Environment, Society, and Economy,

[2] https://vle-educability.uc3m.es/course/view.php?id=266

students are asked to read a section from the scientific paper about SD as a contested concept and to try to answer some questions about the topic. After watching a video about the environment in our life, students should think about the motto, associations, and keywords related to the video. They should also answer questions in a quiz after watching a video about microplastic pollution. The next task is to complete a text connected with broader, synonym, and narrower terms and keywords regarding the connection between economy, ecology, and human society. Finally, they should determine the type of pollution in a few pictures and mark the correct answer.

Module 4 deals with an ethical approach to complex problems and ambivalent situations. After the introductory video, students should take a short quiz. The next activity also contains a quiz, which trainees should complete after reading an article on sustainable development and ethics. Then, an accordion presentation introduces new terminology to teach Sustainable Development Literacy, reflecting on the educational process, such as foreseeing or forecasting the sustainable future. Finally, there is a jigsaw puzzle photo about environmental ethics for recovering.

Filling the gap between social groups and reducing inequalities is the topic of Module 5. After watching an introductory video about SDG 10 (Reducing inequalities), students must think about keywords connected with the topic. To expand the set of considered keywords, they are given a list of pertinent keywords to consider their meanings. Then, they can read possible explanations for each (in the form of dialogue cards) and complete the crossword with the given keywords. In the third activity, there is an accordion with the targets of SDG 10 and strongly connected SDGs 1, 2, 3, 4, 5, and 8 since the term "reducing inequalities" covers different types of inequalities among people, social groups, countries, economies, education. After reading these targets, students should fill in the missing words or choose the correct word or value in the text that contains some of them. Finally, students should read an article about reducing inequalities and insert missing words in related text using the drag-and-drop option.

Module 6 is about Applying an interdisciplinary approach to SDL teaching and learning in specific age groups. Firstly, an introductory video about the need for a transdisciplinary approach to solving relevant, sustainable development issues is given. Students should choose the correct answer to a question about the main principles of that approach and analyse the comments for each answer, both correct and incorrect. In the second activity, students should read the provided article and, using the drag and drop option match SDGs with the proper action that scientists in various disciplines can take to deal with some of the sustainability issues. Then they are asked to sort 'students' roles by the level of curriculum integration and interdisciplinarity and, ultimately, to choose a random sustainable development issue and search online sources for various approaches to solving the problem from the perspective of different scientific disciplines. The next three activities (3, 4, and 5) deal with gender equality, reducing ageism, and lifelong learning, respectively. After introductory texts and videos, students should do the following tasks: fill in the missing words in the list of six targets related to SDG 5 (Gender Equality); read the proposed text and think of ways to create an age-friendly environment, and use the flipping cards to view some of the possible solutions; and to answer the quiz questions about the lifelong learning.

After finishing all the activities in six SDL modules, students should answer eleven (11) questions in the Final quiz.

V. CONCLUSION

This paper aims to present and analyse experiences, challenges, and doubts during the work on the part of the project EDUCABILITY - Building the Capacity of Educators and Librarians in Information Literacy, which is related to Sustainable Development Literacy (SDL).

Discussing who will teach the teachers in the field of sustainability, Howard **[10]** states that one of the major thrusts of Education for Sustainable Development (ESD) is to reorient education at all levels to address sustainability issues. It means rethinking and revising education from nursery schools through university to include principles and skills, knowledge, and values related to sustainability. Regarding librarians, it is vital to their role in raising users' information literacy levels. Hauke **[11]** states that moving from teaching information literacy to educating sustainability literacy seems to be the 'libraries' meaningful contribution to help achieve the Agenda 2030 goals. Training teachers and librarians in sustainable development literacy helps to raise this kind of literacy within the population.

One of the main objectives of the project EDUCABILITY – Building the Capacity of Educators and Librarians in Information Literacy, was to create an online, free-of-charge training for educators at all education levels and librarians in the basic skills of Information Literacy. An innovative approach to the curriculum design was creating six modules concerning six types of emerging literacies within the concept of Information Literacy. One of those literacies was Sustainable Development Literacy (SDL), so the appropriate 'module's curriculum design took into consideration a variety of learning theories and teaching approaches to provide end users with various educational approaches of high quality for the development of SDL skills. The proposed educational materials enable raising the capacity of educators and librarians in SDL and can be applied to different problems and various aspects of the same problem.

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VII. AUTHORS

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