Foreign Research
Чуждестранни изследвания

THE CASE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT APPROACHES IMPLEMENTATION AT ENGLISH LANGUAGE CLASSES AT THE TECHNICAL UNIVERSITY IN UKRAINE

Yuliana Lavrysh, Irina Lytovchenko
National Technical University (Ukraine)

Abstract. The paper highlights the importance of ESD implementation at Ukrainian universities and explains reasons for its restriction. The authors intended to demonstrate possible ways of ESD values and principles introduction into English language classes for engineers in order to facilitate the interdisciplinarity and sustainability values throughout the curriculum. The research suggests strategies to bridge the gap between science and humanities. The study is aimed at analyzing of practical experience of ESD approaches efficiency at English language classes. The application of following approaches is described: ecocomposition, placed-based learning and interdisciplinary project-based learning. The survey was conducted at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". The mentioned approaches are analyzed in terms of learning outcomes, level of interdisciplinarity, advantages and limitations. Results proved that some of the proposed approaches increased students' sustainability awareness, fostered language learning and enhanced students' level of motivation.

Keywords: sustainability; ecocomposition; placed-based learning; interdisciplinarity; project-based learning.

Introduction

Current challenges in Ukraine require the implementation of urgent measures to create a new concept of the country's sustainability development which is defined by the introduction of sustainability principles and values into humanitarian, social, economic and ecological sectors. Such transformation is impossible without the educational system changes since the reformation strategy involves the evolution of morality, perception, and enlightenment.

We should take into consideration that Education for Sustainable Development (ESD) in Ukraine is aimed at sustainable development but does not teach or explain the essence of it. Educators have to teach how to act sustainably during the life on the transformational pathway from new values formation to better life quality,

from a short-time reactor to a long-time evaluator. It is a new dare for educators to develop "sustainable mentality and responsibility" which is the background for a sustainable future. Thus, in our opinion, the main goals of ESD in Ukraine are:

– to clarify the concept and values of sustainable development in order to raise community awareness of the issue;

– to analyze, suggest and improve the educational tools and techniques in order to integrate the sustainability concept and values into the process of training;

– to strengthen the process of the cooperative, interdisciplinary learning through all course subjects.

With intent on achieving these goals, the reorientation of curricula and subjects contents of higher education towards sustainable development is an urgent requirement of Ukrainian society. Due to sustainable development diversity, it is obvious that the issue should be introduced through the inclusion of different subjects into integrated study modules. Furthermore, not only professional degree subjects should be revised, but also the subjects of social and humanitarian fields of study since they represent the socio - cultural domain of sustainability.

Unfortunately, in Ukraine, there is a restricted comprehension of ecological and economic components of sustainability as dominant areas over socio-cultural one. However, we should not forget that the successful sustainable future is impossible without sustainable community in which people are able to find compromises and to create the humanistic and equal society where every person's rights, culture and religious believes are respected. This issue emphasizes the significance of intercultural education for sustainability which is possible through language education means. At this point, the processes of international communication and negotiation teaching require special attention. As a response to the concern, the need to reconsider the content and techniques of English language teaching at Ukrainian universities regarding sustainability has been recognized.

The paper **aims to** present the pedagogical approaches applied at English language classes in the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" and to discuss learning outcomes of these approaches for teaching of English language for specific purposes. Within the frame of our research, we will recommend a solution-oriented concept of engineering and humanities combination aimed at the creation of the "sustainability development entirety" awareness.

Theoretical background

This paper identifies the key issues and looks into the current experience associated with the implementation of ESD principles into higher education system particularly through such approaches as ecocomposition, placed-based pedagogy and interdisciplinary project-based learning.

To begin with, we have to admit that there is a variability of terms used to denote the education connected with sustainability in scientific resources: education about,

education in and education for sustainability. Sterling's (2013) research provides us with the explanation of this difference. The scientist claims that education about sustainability is the representation of factual information; education in sustainability implies experimental and practical approaches to acquire new skills and knowledge; education for sustainability is focused on personal transformation when students adopt sustainability values and principles into their lives. In our research we will discuss the education for sustainability since we deem it as a holistic notion.

Higher education plays the key role in the dissemination of the sustainable development principles and values by providing upgraded interdisciplinary learning opportunities and educational resources. However, the implementation of ESD curriculum in higher education requires advanced methods of teaching, educational resources, and attributes to eventuate in sustainable society.

Despite of the ESD significance, we come across with obstacles which restrict the implementation of the approach into higher education. Among the most common barriers of ESD, embedding in higher education, researchers (Matthew, Rolls, 2016; Kopnina, Meijers, 2014) have defined the following: curricula are stuffed with too many subjects; lack of academic staff awareness regarding sustainability; imperceptions of educational strategies of interdisciplinary implementation. Australian educators Matthew Marchesi and Nicola Rolls (2016) grouped these barriers "...into institutional (governance, management, policies), structural (disciplines, administration, academic development), and learning and teaching (teaching practices, pedagogy, professional development)".

In Ukraine we experience the same barriers but we would like to highlight one more barrier that is community's sustainability illiteracy. Among the most valuable recommendations to overcome these barriers we have outlined the following ones: to create an adequate connection of some subjects contribute to ESD embedding by creating space for new subjects; to provide with relevant scientific and teaching materials that can enhance staff understanding and acceptance; to develop interdisciplinary, real-world projects beneficial for university, enterprises and community.

In addition to all mentioned above, higher education establishes a more effective framework for mental and cognitive behavioral patterns of a personality transformation. It means that ESD is far beyond the traditional curricula or professional training. Complex professional problems which graduates face at their workplaces address mental, emotional and spiritual components of a personality and demand deeper understanding of the issue. Therefore, it is sensible to view the sustainability pedagogy as a complex concept of cognitive, somatic, affective and moral constituents, as suggested by Marie Eaton, Kate Davies, and Sarah Williams (2016). According to their point of view, cognitive aspect means the application of critical thinking skills for logical analysis, synthesis, comparisons, measuring and observations to understand the complex of causes and consequences of sustainability

problems to find solutions. Somatic aspect implies the capability of a person to develop, change and evolve at any age and under any circumstances. There should not be the body-mind split because of inner conflicts. The principles of life-long and transformative learning are the reflection of this aspect. Affective aspect is about behavior and attitude which are the basis for commitment and responsibility. It is always easier to learn about a subject, analyze or compare, whereas changing the attitude and respond to emotionally complex problems is not the goal of traditional curricula. Educators should understand that acquired knowledge and skills do not always mean sustainable behavior.

In reviewing the literature on cross-boundary methods of sustainability study, we have found out that under the umbrella of integrated learning, three concepts (inter- multi- and transdisciplinarity) are interchangeably used. However, this paper advocates the interdisciplinary approach for some reasons. Firstly, it is a standard practice of interdisciplinary research involving natural and social disciplines. The second reason is that interdisciplinary approach prevails in practice of ESD. And finally, our research is connected with English language learning which is integrated with its nature as it connects four main domains: listening, speaking, writing and reading.

Interdisciplinary learning has been introduced as a key educational strategy to promote sustainability knowledge (Barth & Timm, 2011; Sterling, 2013; Coops et al., 2015). Another confirmation for our choice is justified by Ukrainian educator and scientist Golub (2015) who argues that "the stereotype of dividing the world into self and others" limits our possibilities to find solutions for sustainability. The system of higher education should opposite self-subject knowledge to interdisciplinary knowledge.

"The stereotype "self – others" prevents the spread of outward-oriented active learning and results in the contraction of the professional and civil liability and their correlation with the tasks facing modern society, the most important of which is sustainable development" .

Rūta Petkutė (2012) also underscores that interdisciplinary approach is relevant and the most efficient tool towards sustainability. She offers cross-curricular teaching model in which teachers can choose and combine any strategy or educational environment to foster students' awareness of disciplines and goals correlation.

"Interaction with other disciplines helps to go beyond traditional curriculum, which eventually adds to a broader understanding of a subject. Thus, special attention to how such interdisciplinary approach could be efficiently integrated into curriculum should be given".

The aspect of teaching sustainability through English classes arises in the research of Tomas Zygmunt (2016) who has concluded that language education enhances sustainability development by providing with the opportunity to communicate, discuss and negotiate. Therefore, he indicates that people alone in their countries

are not able to build sustainable future. Only mutual understanding and solution of environmental problems can be beneficial. Zygmunt's ideas are justified by Pipere, Veisson & Salite (2015) who state "Mutual understanding, tolerance and respect can give guidance to a successful construction of the social environment and its protection". While interacting, people exchange knowledge and experience, find explanation and solutions to culturally rooted difference and behavior. Loyalty and tolerance are urgent competences for Ukraine which can be taught through language education as a part of socio-cultural competence. Therefore, we could not agree more that common shared means of communication are crucial for personal, cultural, intellectual and sustainable development.

Approaches to ESD through English language education

Speaking about the connection of English course and sustainability, we have to admit that it is a challenge for teachers. A great number of sustainable development terms and definitions, derived from environmental and economic sciences, match neither vocabulary nor language education concerns. Moreover, the connection of science and language education is not a simply done matter. However, the multidimensional nature of a language and multifunctional learning activities allow to neglect all boundaries of science and humanities. We have found out the possible strategies to connect these issues, which are experienced by English language teachers worldwide. In this paper, we will share our experience of applying some of the strategies and comment on results.

Educators Opperman (2011), Martin (2008), Kopnina (2014), Gallegos (2013) suggest the following common strategies for the "greening" of English classes: ecocompositons, placed-based pedagogy, interdisciplinary project-based learning.

One of the most innovative approaches to connect sustainability and language is by means of ecocriticism. This trend is a sub-discipline within the frame of English language and literature which is aimed at the connection of language, literature, culture, and principles of sustainable development. Ecocriticism gave origin to ecocomposition as a field of relationships between a writer and environment through culture, discourse, and language. The researchers of ecocomposition (Dobrin & Weisser, 2001) claim that ecocriticism is connected with the text interpretation and is a reproductive activity, whereas ecocomposition is associated with writing which is a productive activity as it focuses on production rather than interpretation of written discourse. But the common value of these activities is their primary goal to bring nature into the English language education. Ecocomposition is an excellent tool to bridge the gap between professional subjects and language education.

Real world writing assignments are considered as the main teaching ecocomposition strategy. However ecocomposition is not simply about nature or recycling. It emphasizes the connection of human and nonhuman life in the medium of nature without a split of nature and a human, nature, and culture, natural and

manmade. Ecocomposition is regarded as an active and participatory educational strategy because students can understand their role and influence on community while writing. It is important not only to describe the problem but to be involved in it, to place yourself in that environment. So, ecocomposition suggests a holistic view of human in nature.

Placed-based pedagogy uses a place where the learning is located as a main source for the information and study. Therefore, parks, museums, campus, historical places, enterprises, facilities are the extension of the classroom. Students are involved in local real world context rather than the global which is understandable, tangible and meaningful to everyone. According to Clark (2008) place-based education is described this way:

"PBL can be understood as environmental education gone completely local, wholly integrated with the learning standards and expanded beyond the natural environment to include the cultural, social, and economic conditions of a place. …..This is a values-driven approach, designed to advance educational goals together with locally identified social, economic and environmental objectives".

Interdisciplinary project-based learning is aimed at the problem or an issue rather than at the separate discipline at a time. It emphasizes more complex and expanded awareness of the topic. A range of information source from different disciplines, active engagement, and integration of necessary skills allow students to acquire innovative and unexpected results. Furthermore, when students apply a variety of skills and perspectives, they admit the sense and value of what they are studying. The nature of PBL resembles the character of sustainable development which is also multidimensional and integrated. Due to the implementation of the strategy, students define sustainable problems, develop controversial discussion, find supportive evidence, acquire and process necessary information from a variety of resources and create argument-based solutions.

Experience of implementation of ESD approaches

All these approaches proved their efficacy when were implemented in educational institutions worldwide. However, we decided to check and evaluate their validity in order to implement the best ones. In our opinion, language education medium is a great connecting point of mentioned ESD approaches implementation.

We have carried out a case study among the students of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". The students included in our study belonged to a variety of mechanical engineering majors. The overall number of students comprised 48 students from the first year to the fourth year of study. This variety is explained by the level of task complexity and students engineering and sustainability background. The students' proficiency level of language ranged from pre-intermediate to intermediate. They attend the class of English for Technical Purposes once a week and have a 90 min session per week.

The study was conducted in 3 stages through one academic year. On the first stage students had to answer the questions connected with the content and values of sustainability; the second stage was the participation in an activity from one of ESD approaches; the third stage was the final assessment of changes by means of a final questionnaire and a reflection assignment. Two questionnaires that we designed were similar in the context so that they allowed to look closely at reflections and transformations that developed after a year of ESD approaches implementation. Students were asked to display their personal understanding of sustainability definitions, components, values, and principles.

This research is limited to specific areas of interest: students' needs, ESD approaches, languages education issues. The students' needs were validated by analyzing the information on their understanding the term of sustainability and its domains while completion of the initial questionnaire. After the questionnaire, students participated in different learning projects mentioned above.

As for eco-writing, we consider the connection of ecocriticism and eco-writing to be a purposeful decision especially for the third and fourth years study students as they have certain sustainability background and an intermediate level of language writing skills. The same approach is justified by Sidney Dorbin (2001). Furthermore, the mentioned above approaches are rarely used solely as their efficiency increases in combination. For the students of the first course, we suggest writing short essays or articles. For instance, students wrote about a place which matters for them and problems connected with this place according to the principles of a place- based learning. As Derek Owens (2001) advises on the first stage of eco-writing teaching the main goal is "…to describe this place so that your readers can form a detailed and relatively accurate picture in their heads of what it is (or was) like, and of its influence on you".

Another thought-provoking topic for ecocomposition teaching and project-based learning is Sustainable Development Goals which were identified by United Nations. The most beneficial project was performed on the twelfth goal "Responsible Consumption and Production". We combined some subjects to investigate the suggested topic. We asked students of the first year of study to find information in English media on digital technology, its benefits and impacts and decide whether technology was a cause of a problem or a solution. During lessons on Engineering Materials students learnt more about green materials and materials recycling as a solution. By applying knowledge of mathematical analysis students calculated the average length of a device performance in order to decrease the enormous production of the technology. And at Chemistry classes they composed the table of harmful chemicals which should be eradicated or changed.

A beneficial example of interdisciplinary project-based approach is fourth-years students' presentations related to their majors or future engineering carrier in terms of sustainability. It is worth mentioning that when students search for information relevant to their career, they are more motivated. For instance students were sug-

gested topics for their choice: perform a sustainability audit for a campus, develop a plan for deconstruction of old university buildings or campus, develop programs for energy consumption reducing, develop green device or technology, develop and recycling and composting program for campus facilities, develop a sustainability Web site to coordinate and enhance students sustainability actions, provide guidelines for greening their future products manufacturing or tools design. At the beginning of a year, students were divided into groups of 3 – 4 and had 2 months for the project developing. Then during last two lessons, students presented their projects to a jury of English teachers and major discipline teachers. The work on the project was performed by students themselves if they needed consultations teachers of major discipline organized such consultations. However, every English class students had to prepare a short report on actions which had been done. We developed a plan for students to organize the work on a research. It consisted of 3 sections:

1. Research summary:
– Define a problem;
– Highlight objectives and outcomes of a project;
– Outline the benefits of the product from being more sustainable;
– Evaluate necessary resources;
2. Research development:
– Perform initial sustainability assessment (using international assessment methods);
– Consider feasibility of a project and barriers that could affect the research;
– Develop a plan for implementation;
– Analyze results from other similar research;
– Think of monitoring measures;
3. Research Outcomes:
– Focus on benefits of the research;
– Present your vision with significant evidence;
– Provide data, resources, and presentation.

Our jury supported some student's research which might be implemented: web site on sustainability at university, sustainable campus and sustainable laser technologies.

Results and Discussion

The discussion about the mentioned above pedagogical approaches success was based on the degree of students engagement and feedback as well as teachers responses. At the beginning of our case study implementation students were offered an initial questionnaire:

1. Which terms are associated with sustainability from the list of terms: ecology, recourses, population, engineering, society, energy, career, pollution, e-wastes, everything on the list.

2. What is the most appropriate sustainability definition?

a) A system focused on protecting the environment.

b) A system focused on sustaining the society and ecology in balance.

c) A system focused on conservation of natural resources.

d) A system focused on balancing the ecology, economy, society, and culture for the future sustainability.

3. When you are a graduate, is the sustainability of your future job or company important for you?

4. Are our campuses and university sustainable?

5. What is the connection between language learning and ecology?

The results differentiated among students of different courses but in general, they were similar. Answers to the first question about the terms connected to sustainability showed that students associated sustainability mainly with ecology (86%), energy (57%), pollution (60%) and e-wastes (50%). Students of senior courses added population and engineering.

The results of the same questionnaire, after a year of ESD approaches implementation, significantly changed: almost 93% of students chose the variant "everything on the list" which was a true answer, consequently students did not regard this term as being connected only with ecology.

Speaking of sustainability definitions, only 23% of all participated students chose the correct variant D on the initial stage and 91% chose this variant after the year of studying. We consider it as a valid confirmation of fundamental understanding of the sustainability issue. The survey also indicated that students valued the practical sustainability implementation in real world situations connected with a future career. It is proved by answers on the third question. Initially, 68% of students answered "I don't care", but on the final evaluation students changed their opinion towards sustainable engineering. Answers to the fourth question did not differ much since students guessed the right answer due to the general context of a questionnaire.

The most unexpected results we obtained from answers to the last question about the connection of language learning and ecology. Students assumed that as the ecological crisis is a global problem, the solution should be searched internationally. Thus, knowledge of foreign languages can help in making decisions and developing strategies. And the answers of final questionnaire did not differ much.

The survey results indicated students' positive changes towards sustainability awareness. Students learnt the values, and principles of sustainability and how to act and work in terms of sustainability. However, the most valuable and valid results we gained from a reflection essay at the end of an academic year. In order to help students organize their thoughts and views, we developed a set of questions to get a clear picture of the survey.

The questions for the reflection assignment were as following:

1. What are the most valuable things you have learned?

2. What challenges did you face? How did you overcome them?
3. Which approaches and resources did you find the most and the least helpful?
4. In your opinion, why was this survey conducted at your university?
5. What would you like to change in studying sustainability?
6. How will knowledge gained during the lessons impact your professional future?

In the reflection essay, almost all students mentioned specificity of the experience they had during this experiential learning approach. Also, they noted changes in their understanding of sustainability concept from solely ecological towards the more holistic view. This observation is consistent with results of most surveys on the integration of sustainable development pedagogy into curricula or separate courses (Barth, Timm, 2011; Chalkley, 2006; Coops, Robinson, 2015).

The most challenging for students was a lack of interdisciplinary through curricula within the frame of sustainability. A lot of students knew about this issue for the first time only at English classes. It is the main drawback of Ukrainian universities to suggest sustainability courses mostly for Master degree students.

The result of this deficiency was observed during projects presentations since some projects were unfeasible or without sustainability background. Almost all students noted difficulties in the process of project development as it demanded time, specific knowledge, skills of critical and creative thinking and team work.

Some students found it difficult to write reports and eco -essays because of a low level of language knowledge, lack of writing experience and writing skills in general. But well-versed modes of ecocompositions, as well as class discussions and critical reading classes, were of great help for students. As a result, at the end of a year, they could deliver arguments in a variety of controversial topics to peers.

Speaking of place-based approach, students showed active involvement describing their places. Students' responds of our survey concur with studies performed by Theresa Martin (2008) on composition, whose students identified such assignments as enjoyable and influential ones due to clear and related to their personality topic. More familiar and personalized discourse of compositions eliminates their fears of writing, and they do not feel novice or incompetent.

An important implication of these findings is that we could assess the efficiency of the analyzed ESD approaches for language education by means of comparative analysis. These observations are limited to the reality and attributes of students and classes at our university. We conducted the analysis according to such criteria: learning objectives (corresponded both to ESD and language education goals); a level of interdisciplinarity (Stock, Burton, 2011); benefits; disadvantages and limitations.

1. Ecocomposition

Objectives: to provide students with foundation of ecocomposition; to implement writing as a tool for communication and learning; to understand the relation of language, culture, and sustainability;

The level of interdisciplinarity is high as students apply knowledge from different subjects to write a meaningful composition.

Benefits: bridges the gap between humanities and science, demonstrating a holistic study of the relationship between discourse and environment; due to enough amount of time for thinking and analyzing, students feel more confident in writing; allows to trace causes and consequences; clear and distinct criteria for the assessment; develops critical and systemic thinking; helps move the notion of environment from abstraction to a tangible concern; students write critically about their environments, and consider what effect their writing and literacy have on those environments.

Limitations: not interactive, requires strong motivation tools and developed rubrics for the assessment, time-consuming

2. Placed-based pedagogy

Objectives: to facilitate ecological integrity and students' engagement into the problems of their place; to enhance the relevance of obtained interdisciplinary knowledge and skills.

Level of interdisciplinarity is high due to integration of different areas of professional subjects to evaluate the whole scope of a problem objectively.

Benefits: improvement of academic achievements due to students' involvement and enthusiasm; real topics for discussions; rising of motivation level; the connection of students' academic and non-academic lives makes the learning processes more harmonic and balanced.

Limitations: it is context locally specific; difficult to evaluate without previous investigation of a problem; requires nonstandard assessment tools.

3. Interdisciplinary project- based learning:

Objectives: to involve students into an investigation or real-world sustainability problems; to acquire skills for information processing; to develop critical thinking and problem solving skills; to combine theoretical knowledge with practical application.

The level of interdisciplinarity is high since without efficient combination of theoretical knowledge the project will be irrelevant.

Benefits: real-world topics for projects; development of analytics and synthesis skills; better understanding of students interests; freedom and flexibility of choice for students; develops independent learning and investigation strategies; the combination of theory and practice which transforms the attitude toward studying.

Limitations: unfamiliar topics for English language teachers; possible loss of curricula covering due to students' freedom of choice; time-consuming preparation; specific authentic evaluation tools; the unpredictability of a process and its results; unusual instructional strategies.

According to the opinion of our students and teachers who experienced these approaches, placed-based and interdisciplinary project-based learning were chosen as the best suited. These approaches demonstrated higher motivation to study language and better results of language learning. However, ecocriticism

and ecocomposition are effective in combination or additional activities while implementing the projects or places-based learning.

Conclusions

The paper objectives are to overview ESD pedagogical approaches and discuss the efficiency of their implementation and application in English language classes at a technical university. Having analyzed the nature of ESD approaches and features of their application, we have drawn the following conclusions:

1. The integration of sustainability values and issues into university cross-discipline curricula is vital for the training of future engineers. The sustainable future depends on their sustainable advanced technologies and smart solutions.

2. The integration of language learning and ESD facilitates the students' academic achievements as students learn language through real- world situations which refer to sustainable development issues.

3. Due to interdisciplinarity English language classes become more contextualized and relevant to students personal and professional interests. Furthermore, students understand better the interdisciplinary links and collaboration.

4. Language skills are acquired more naturally without memorizing and boring repetitive exercises. Students learn language almost "automatically" as it becomes a necessary tool for communication and problems solutions.

5. All ESD approaches develop high order thinking and learning skills that are easily transferrable for other subject's acquisition.

Further goals for investigation are seen in the area of ESD approaches limitations overcoming and discussing possible assessment tools for these strategies.

NOTES

1. Martin, T. (2008). *Bringing ecocomposition to a multimodal composition course: critical literacy and place at work in English 250*. Retrospective Theses and Dissertations. Paper 15279.
2. Pompos, M. (2015). Investigating Place in the Writing Classroom: Designing a Place-Based Course with a Local Service-Learning Component. Electronic Theses and Dissertations. Paper 709.
3. UNESCO, (2012). Shaping the education of tomorrow. 2012 report on the UN decade of education for sustainable development.
4. Weisser, C. R., & Dobrin, S. I. (Eds.). (2001). *Ecocomposition*. Retrieved from: http://ebookcentral.proquest.com
5. Matthew, M. & Rolls, N. (2016). *Overcoming institutional barriers to interdisciplinary education for sustainability.* Proceedings of the 16th International Australasian Campuses Towards Sustainability (ACTS) Conference, Australia.

REFERENCES

Barth, M. & Timm, J.-M. (2011). Higher Education for Sustainable Development: Students' Perspectives on an Innovative Approach to Educational Change. *Journal of Social Sciences*, 7(1), 13 – 23.

Chalkley, B. (2006). Education for sustainable development: continuation. *Journal of Geography in Higher Education*, 30(2), 235 – 236.

Clark, B., Button, C. (2011). Sustainability transdisciplinary education model: Interface of arts, science, and community (STEM). *International Journal of Sustainability in Higher Education,* 12(1), 41 – 54.

Clark, D. (2008). *Learning to make choices for the future (Manual).* The Centre for place-based learning.

Coops, N., Robinson, et al. (2015). How an entry-level, interdisciplinary sustainability course revealed the benefits and challenges of a university-wide initiative for sustainability education. *International Journal of Sustainability in Higher Education*, 16(5), 729 – 747.

Eaton, M. et al. (2016). Why Sustainability Education Needs Pedagogies of Reflection and Contemplation. In: M. Eaton, H. Hughes (Eds.). *Contemplative Approaches to Sustainability in Higher Education: Theory and Practice* (pp. 5 – 17). Routledge.

Filho, W., et al. (2014). *Integrative Approaches to Sustainable Development at University Level.* World Sustainability Series. Springer.

Gallegos, E. (2013). Mapping Student Literacy: Reimagining College Writing Instruction within the Literacy Landscape. *Composition Forum,* 27.

Golub, T. (2015). The role of Education in Sustainable Development. *Advanced Education*, 4, 13-17.

Kopnina, H., Meijers, F. (2014). Education for sustainable development (ESD): Exploring theoretical and practical challenges. *International Journal of Sustainability in Higher Education*, 15(2), 188 – 207.

Oppermann, S. (2011). *The Future of Ecocriticism: New Horizons*. Newcastle upon Tyne: Cambridge Scholars Publishing.

Owens, D. (2001) *Composition and Sustainability: Teaching for a Threatened Generation*. National Council of Teachers of English, Urbana, IL.

Paterson, J. (2010). Integrating environmental education. *Education Digest,* 75 (7), 38 – 42.

Petkutė, R., (2012) Integrating the concept of Sustainable Development into English Language Curriculum of Environmental Engineering Sciences. *Filologija, Edukologija*, 20, 65 – 74.

Pipere, A., Veisson, M., Salīte I. (2015). Developing research in teacher education for sustainability. *Journal of Teacher Education for Sustainability,* 17 (2), 5 – 43.

Rasmussen, K., Arle, F. (2010) Interdisciplinarity at the Human-Environment Interface. *Danish Journal of Geography*. 110(1), 37 – 45.
Sterling, S. (2013). The Future Fit Framework: An Introductory Guide to Teaching and Learning for Sustainability in HE (Guide). *Journal of Education for Sustainable Development*, 7(1), 134 – 135.
Stock, P., Burton, J. (2011). Defining Terms for Integrated (Multi-Inter-Trans-Disciplinary). *Sustainability,* 3(8), 1090 – 1113.
White, J. (2008). Sustainable pedagogy: A research narrative about performativity, teachers and possibility. *Transnational Curriculum Inquiry,* 5(1).
Zygmunt, T. (2016). Language Education for Sustainable Development. *Discourse and Communication for Sustainable Education,* 7(1), 112 – 124.

✉ **Dr.Yuliana Lavrysh, Assoc. Prof.**
Dr. Irina Lytovchenko, Assoc. Prof.
Faculty of Linguistics
National Technical University of Ukraine Igor Sikorsky
Kiew, Ukraine
E-mail: yulavrysh@gmail.com
E-mail: irinalyt@ukr.net