

RESEARCH ARTICLE

Landscape Online | Volume 98 | 2023 | Article 1111

Submitted: 23 September 2023 | Accepted in revised version: 16 June 2023 | Published: 10 July 2023

# “Imagine the landscape”: Challenges of online teaching and learning about landscape during the COVID-19 pandemic – Lessons for the post-pandemic period

## Abstract

This paper considers how we can teach and learn about landscape in a virtual world in the post-COVID-19 period. The starting point for this research was the difficulties of teaching and learning about landscape during the pandemic, as at that time it was necessary to conduct education remotely. Online classes forced a reorientation of the hitherto widely used educational strategies and learning methods. This paper analyses students' perceptions of remote education and reflects on the extent to which online learning can replace the real landscape. It involved bachelor's and master's students of Environmental Management at Adam Mickiewicz University in Poznan. These students participated in three landscape-oriented courses: 'Development and Planning of Rural Areas', 'Cross-border Environmental Management' and 'Landscape Ecology'. Raw data was gathered using post-course surveys and both qualitative and quantitative research methods were used to analyse the data. The values that students gained from online learning of landscape were assessed, and concepts and teaching methods that might be useful in blended teaching and learning about landscape in the post-pandemic period were proposed.

Iwona Markuszewska

Adam Mickiewicz University, Faculty of Geographical and Geological Sciences, Department of Environmental Remote Sensing and Soil Science, Krygowskiego Street 10, 61-680 Poznan, Poland. Email: iwona.markuszewska@amu.edu.pl

Iwona Markuszewska  
 <https://orcid.org/0000-0003-3615-1313>

## Keywords:

landscape-oriented courses, online education, blended learning, COVID-19 pandemic, Poznan

<https://doi.org/10.3097/LO.2023.1111>

© 2023 The Authors. Published in Landscape Online – [www.Landscape-Online.org](http://www.Landscape-Online.org)

Open Access Article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## 1 Introduction

---

Virtual education is used by an increasing number of individuals and institutions worldwide (Lowenthal & Leech 2009, Barbour 2015, Bovermann et al. 2018, Kumar Basak et al. 2018, Carvalho et al. 2020). Universities are providing more online courses, and ever larger numbers of students are taking up the opportunities afforded by distant learning (Markuszcwzka et al. 2018, Kienast et al. 2020). However, the groundwork for such courses requires classroom management procedures that are different to those used in traditional face-to-face approaches (Smith et al. 2008, Anderson 2020, Moorhouse 2020). Educators and learners are faced with technological prospects and specific solutions that need to be implemented into education systems and study programs to meet the requirements of different curriculums (Bernard et al. 2004, Dellinger 2007, Leighton et al. 2018).

Online education reshapes the understanding of space, time, and human aspects (such as students' learning preferences) (Horváth et al. 2022). Distance education provides flexibility in teaching and learning (Lee et al. 2022). Remote learning highlights people's individual preferences and the differences between learners across various studying formats (Kee 2021). In addition, some studies have revealed the difficulties in adapting to virtual environments due to computer literacy (Bovermann et al. 2018), learning preferences and habits (Leighton et al. 2018); and some have even discouraged people from undertaking virtual learning (Willging & Johnson 2004).

The COVID-19 pandemic led to the suspension of face-to-face classes in mid-March 2020. This was a difficult, sudden and unexpected situation that forced schools and universities to organise fully remote education at very short notice (Alturise 2020, Iivari et al. 2020, Piyatamrong et al. 2021). Furthermore, many courses had to be run in specific conditions such as laboratory classes and out-door classes. Courses affected this way included landscape-oriented courses, since teaching and learning about the landscape in an online setting was a challenging experience (Carvalho et al. 2020, Cisani et al. 2022).

With the above in mind, this article attempts to answer the following questions: 1) Can a hybrid format be an appropriate way of learning about landscape? 2) What are the appropriate ways of working together (teachers and students) in a blended teaching format?

## 2 Material and methods

---

### *2.1 Focusing on online teaching and learning methods*

The aim of this research was to investigate the students' assessment of online teaching and learning about landscape during the COVID-19 pandemic. The findings supported the answers to questions about how online education can improve teaching and learning about landscape the post-pandemic period.

The research involved bachelor's and master's students of Environmental Management from the Faculty of Geographical and Geological Sciences at Adam Mickiewicz University in Poznań. The students participated in 'Landscape Ecology', 'Development and Planning of Rural Areas', and 'Cross-border Environmental Management' courses. These three landscape-oriented courses were held at different times during the COVID-19 pandemic: in the spring semester of 2019/2020 and during the 2020/2021 academic year (Table 1). Information about the various educational strategies used on landscape-oriented courses is found in section 3.1.

To gather the raw data, a survey was conducted after each course had finished. 69 students responded to the online survey. This is around 68% of the total sampled population (N=102) of students that participated in all the courses. To analyse the data, both qualitative and quantitative research methods were used.

The questionnaire was composed of 14 closed questions relating to the following aspects of online education on landscape: 1) students' (un)favourable attitudes towards online learning about landscape, 2) students' perception of and engagement in online classes, and 3) students' assessment of teaching

**Table 1.** The basic information about landscape-oriented courses

Name of landscape-oriented course	Development and Planning of Rural Areas	Cross-border Environmental Management	Landscape Ecology	Development and Planning of Rural Areas	Cross-border Environmental Management
Course duration	spring semester 2019/2020 (April-May)	spring semester 2019/2020 (September)	winter semester 2020/2021 (October-January)	spring semester 2020/2021 (March-May)	spring semester 2020/2021 (September)
Level of students' study	Bachelor's degree	Master's degree	Bachelor's degree	Bachelor's degree	Master's degree
Selected learning methods	lecturing, learning by experiencing, problem-based learning, project-based learning	lecturing, problem-based learning, project-based learning, online meetings	lecturing, discussion, brainstorming, buzz group, learning by experiencing, problem-based learning, project-based learning	lecturing, discussion, brainstorming, buzz group, learning by experiencing, problem-based learning, project-based learning	lecturing, discussion, brainstorming, buzz group, learning by experiencing, problem-based learning, project-based learning, online meetings

methods. The items were answered using a 5-point Likert scale format, ranging from “1” (strongly disagree) to “5” (strongly agree). The following scale was used to interpret the data: strongly disagree (1.00-1.79), disagree (1.80-2.59), undecided (2.60-3.39), agree (3.40-4.19), and strongly agree (4.20-5.00). These data were analysed statistically using SPSS. Arithmetic mean, standard deviation, frequency count, and percentages were used to describe the data. The 14-item scale had a Cronbach's alpha as follows: .563 ('Development and Planning of Rural Areas' 2019/2020), .305 ('Cross-border Environmental Management' 2019/2020), .117 ('Landscape Ecology' 2020/2021), .395 ('Development and Planning of Rural Areas' 2020/2021), and .217 ('Cross-border Environmental Management' 2020/2021).

In addition, to explore a multifaceted view of online education, the survey also included open questions about the pros and cons of distant learning about landscape. Additionally, it was also possible for the students to make further comments if they so desired. The content analysis of the students' responses aimed to indicate: 1) whether a hybrid format can be an appropriate way of learning about landscape, and 2) what the appropriate ways of working together (teachers and students) in a blended teaching format are. The students' answers and comments were coded: they were given a number, an abbreviation of the first letters of the course name, and the academic year was added.

## 2.2 Focusing on learning outcomes

To assess the learning outcomes, the findings of an experimental task conducted among the students

of the 'Development and Planning of Rural Areas' course (academic year 2019/2020) were presented.

The students had to prepare a collage along with a short description. By doing this task, the intention was to test to what extent the lockdown, the limitations of moving around, and the inability to be in a real landscape influenced the students' perception of the landscape. This task was preceded by a theoretical introduction to familiarise the students with the concept of the multifunctional development of rural areas and the expeditionary learning method, which was new for them.

In total, 23 students were involved. The projects were completed in working teams (with the exception of one project that was prepared by a single student). Seven teams (randomly named groups A, B, C, D, E, F, and G) worked on this in April 2020, during the COVID-19 lockdown (Fig. 1).

After the projects had been completed, a content analysis of the projects' descriptions was conducted. Thematic analysis of words and phrases in their textual context focused on the following questions: 1) How do students imagine the future rural landscape? and 2) How does their vision contribute to the multifunctionality of rural areas? To analyse the meanings of the content within texts, a qualitative approach was used. The relational analysis aimed to determine the presence of certain words and phrases that refer to the following contexts of multifunctionality of rural landscapes: use of farmland, preferences in farming production, job opportunities, social needs. A coding scheme developed for this purpose (words such as hobby farming, monocultures, care farming) was also used for constructing a model of the multi-





Figure 1. Students' collages on multifunctionality of rural areas

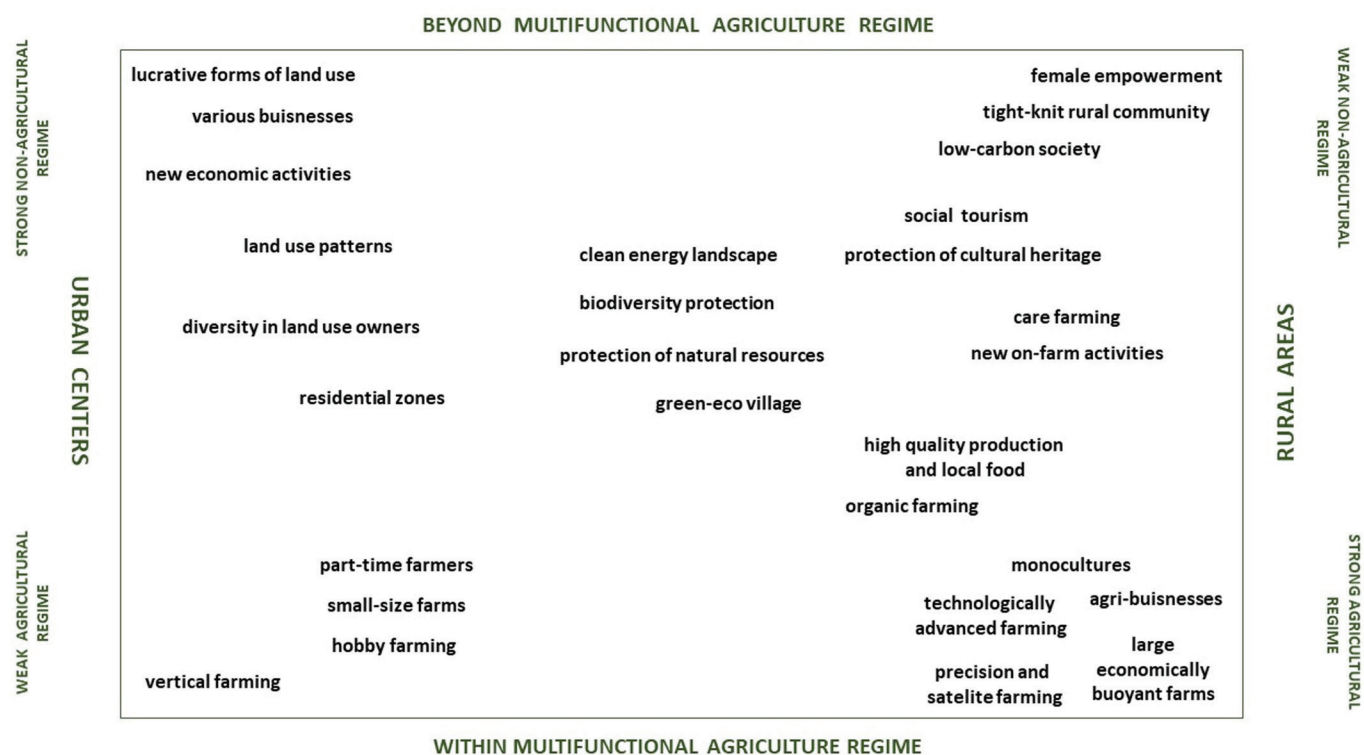


Figure 2. The model of multifunctionality of the future of rural areas

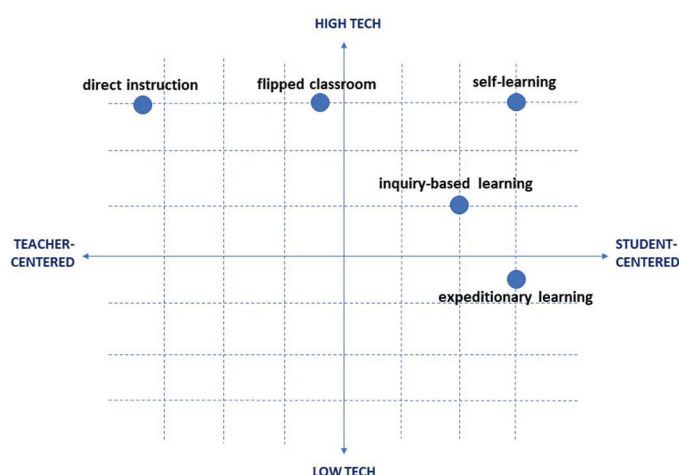
functionality of rural areas (Fig. 2). The components of multifunctionality were placed in the model depending on the significance of their agricultural regime. Specifically, multifunctionality was evaluated based on the presence of agricultural and non-agricultural activities, following the stated rules (e.g.: OECD 2001, van Huylenbroeck et al. 2007, Wilson 2008, Haaland et al. 2011). For instance, the intensity of farming depends on the proximity of urban centres. This means that within the sub-urban area, non-farming or soft-farming actions were proposed (which was also in line with the proposals presented by the students). The closer landscapes are to being open and peripheral, the more traditional farming stands out (following students' suggestions, too).

### 3 Results and discussion

#### 3.1 From offline to online teaching and learning

During the COVID-19 pandemic, the education process was conducted remotely and supported by high-tech approaches. On landscape-oriented courses, both student- and teacher-centred teaching strategies (Fig. 3) and learning methods (Table 1) were applied.

Direct instruction (the lecture method) relies on explicit teaching through lectures and teacher-led demonstrations. Despite its advantages, this teacher-centred method has significant limitations, es-



**Figure 3.** Teaching strategies used during online landscape-oriented courses

pecially during online courses. For instance, it only involves one-way teacher involvement and has limited feedback from the student audience. Bearing in mind that maintaining one's attention while listening (even when physically present with someone) can be difficult, discussions and informal talks during online lectures were implemented. The intention was to establish real-life interactions with the participants and give them a more active learning experience. In addition, the feedback from the discussions informed the teacher how far the information being presented was understood by the students.

The students were also encouraged to actively participate in classes via brainstorming sessions. Brainstorming was invaluable in producing ideas during problem analysis. The students openly and spontaneously shared their ideas, as they were not judged on the ideas they proposed. However, more reserved students did not feel sufficiently encouraged to join in and present their contributions. Therefore, the students were divided into smaller groups and allocated to separate TEAM rooms. As the activity supervisor, the teacher had the chance to listen to the students when they were more relaxed and confident. In these more comfortable and intimate conditions, everyone was able to share and express their opinion on the topic being discussed. After discussing the topic in sub-groups, the leaders reported the main ideas to the entire group.

Nevertheless, as the results of the survey show, the students benefited most from student-centred approaches to learning. For instance, project-based learning (inquiry-based learning) offered a wide range of opportunities for the students to show off their creative thinking skills in solving tasks and finding solutions. In some tasks on the 'Landscape Ecology' course (e.g., sensation curve, soundscape, and emotionscape), projects were linked with individual outdoor activities. During field trips, the students observed the landscape, collected certain data, and compiled photographic documentation. The learning expeditions and case study analysis engaged them in in-depth studies of given topics.

In addition, expeditionary learning methods (involving learning by doing, learning by experiencing, and learning by discovering) proved to be of considerable educational value in getting students out of their

homes to engage them in specific studies related to landscape. In particular, the students were able to apply their theoretical knowledge in practice, rather than learning through the virtual world. The findings of the survey (see the sections below) confirmed that these methods did indeed boost the remote learning process.

It should be noted that inquiry-based learning and self-learning offered students much greater independence. The role of the teacher was to offer support and guidance while the students developed their own ways of working, for instance, carrying out research projects which culminated in self-made presentations. Undoubtedly, inquiry-based learning motivates students to acquire individual knowledge. However, for students who prefer collaborative learning, individual learning was not the best solution.

### 3.2 Assessment of online teaching and learning methods

#### I. Students' (un)favourable attitudes towards online learning about landscape

To get students' feedback on their attitude towards online learning about landscape were favourable or not, several questions survey were posed (Tab. 2). The students' responses showed quite clearly that the online version cannot replace the real landscape. The least satisfied group of students were participants of the 'Cross-border Environmental Management' course. This course operates as field

classes. However, during the COVID-19 pandemic, this course could not be organised outdoors.

Generally, the students stressed that what they missed most during online learning about landscapes was the landscape itself. This opinion was mentioned in almost every survey form. Here are several of the comments and recommendations made:

*"What we need to do is go out into the field to see the real landscape with our own eyes."* [12DPRA2019/2020]

*"The biggest thing we are missing is contact with the landscape for example through field work, but as you know, it is limited by the situation."* [7DPRA2019/2020]

*"Going out into the field and observing processes which take place in the 'real' landscape."* [2DPRA2019/2020]

*"Going out in the landscape is very useful, and by using additional stimuli (smell, touch), we can remember more things."* [5DPRA2019/2020]

*"In an open landscape, you can see, feel and develop your environmental awareness more because it is the 'observer' who gets to know the landscape."* [16DPRA2019/2020]

*"I believe that the classes were conducted as well as they could have been using the imposed online format. However, in my opinion, the online version is not a substitute for real field work, so I missed being able to physically go out and see the landscape we were talking about."* [2CEM2019/2020]

**Table 2.** Students' (un)favourable attitudes towards online learning of landscape (AM – arithmetic mean, SD – standard deviation)

	Development and Planning of Rural Areas (spring semester 2019/2020)		Cross-border Environmental Management (spring semester 2019/2020)		Landscape Ecology (winter semester 2020/2021)		Development and Planning of Rural Areas (spring semester 2020/2021)		Cross-border Environmental Management (spring semester 2020/2021)	
	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD
Can the online version replace the real landscape?	1.83	.857	1.60	.998	2.12	.600	1.94	.998	1.54	.877
Is the online method a suitable approach in learning about landscape?	3.39	1.145	3.20	.655	3.76	.752	3.81	.655	2.77	1.092
Can learning about landscape be provided solely online?	1.89	.900	1.60	1.065	2.18	.809	2.25	1.065	1.46	0.519
Did online classes positively affected your perception of landscape?	3.22	.732	3.60	1.147	3.47	.874	3.38	1.147	3.00	1.080



**Table 3.** Students' perception of and engagement in online classes (AM – arithmetic mean, SD – standard deviation)

	Development and Planning of Rural Areas (spring semester 2019/2020)		Cross-border Environmental Management (spring semester 2019/2020)		Landscape Ecology (winter semester 2020/2021)		Development and Planning of Rural Areas (spring semester 2020/2021)		Cross-border Environmental Management (spring semester 2020/2021)	
	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD
Did the online version of learning about landscape increase your activity in classes?	2.22	1.309	3.00	1.000	2.24	.903	2.50	.894	2.38	1.193
Did the online version of learning about landscape discourage you from active participating in classes?	2.56	1.381	2.60	.894	2.82	1.131	2.94	1.124	3.08	.954
Did you easily lose interest in online classes?	3.17	1.043	2.40	.548	3.29	1.213	3.25	1.065	3.23	1.092
Did you miss out-door activities during online classes?	4.28	.958	4.80	.447	4.12	.928	3.94	1.124	4.54	.877
Would you be more involved in classes in the real landscape?	4.22	.732	4.00	1.225	3.59	1.176	3.50	1.155	4.00	.707

*"I must honestly admit that I am a landscape explorer. I would definitely prefer classes to be in a 'real' place. Nevertheless, the form of the classes presented by the teacher was interesting. It allowed us to get acquainted with the most important elements that we would normally learn during outdoor classes."* [4CEM2019/2020]

## II. Students' perception of and engagement in online classes

There is a common belief that students are less involved in online classes and very easily lose interest in what is going on (see Willging & Johnson 2004). Being willing to revise this, the students were asked about their engagement in online classes and what strengthened their participation (Tab.3).

Most of the respondents disagreed with the statement that the online version of landscape learning increased their activity in. The comment below clarifies the students' preferences:

*"I think that for the majority of students (including me), offline learning is always a kind of springboard from the 'classic' tasks. Besides, this allows us to be more involved in classes than during online meetings."* [5LE2020/2021]

What was interesting was that the students agreed and strongly agreed that they would get more involved in classes during outdoor activities. The

highest score was achieved among the students of 'Development and Planning of Rural Areas' (spring semester 2019/2020) (AM=4.22), who first experienced lockdown in March-April 2020.

## III. Students' assessment of the teaching methods used

Via the survey, the students evaluated teaching methods that required: i) going out into the field and experiencing the landscape via the senses (task: 'sensation curve' on the 'Landscape Ecology' course, Table 4), ii) using the imagination to construct a vision of the future landscape of rural areas (task: 'imagine the landscape' on the 'Development and

**Table 4.** Students' assessment of teaching methods used at 'Landscape Ecology' course (AM – arithmetic mean, SD – standard deviation)

	Landscape Ecology (winter semester 2020/2021)	
	AM	SD
Did the task about the 'sensation curve' positively reshape your perception of the landscape?	3.94	.899
Did the task about the 'sensation curve' encourage you to undertake a more careful observation of the landscape?	4.00	.791
Was the task about the 'sensation curve' a stepping stone from the constraints of the COVID-10 pandemic issues?	3.41	1.228
Were the instructions presented during online meetings or delivered via e-mails sufficient to complete the homework?	4.29	.920

**Table 5.** Students' assessment of teaching methods used at 'Development and Planning of Rural Areas' courses (AM – arithmetic mean, SD – standard deviation)

	Development and Planning of Rural Areas (spring semester 2019/2020)		Development and Planning of Rural Areas (spring semester 2020/2021)	
	AM	SD	AM	SD
Did the 'imagine the landscape' task positively reshape your perception of the landscape?	4.06	1.110	4.13	.957
Did the 'imagine the landscape' task encourage you to a more careful observation of the landscape?	4.22	1.003	4.31	.793
Was the 'imagine the landscape' task a stepping stone from the constraints of COVID-19 pandemic issues?	3.50	1.383	3.38	1.204
Were the instructions presented during online meetings or delivered via e-mails sufficient to complete the homework?	3.78	.943	4.37	.957

**Table 6.** Students' assessment of teaching methods used at 'Cross-border Environmental Management' courses (AM – arithmetic mean, SD – standard deviation)

	Cross-border Environmental Management (spring semester 2019/2020)		Cross-border Environmental Management (spring semester 2020/2021)	
	AM	SD	AM	SD
Can documentary films be an appropriate tool in learning about landscape?	4.31	.957	3.38	.650
Can documentary films replace the real landscape?	4.31	.793	1.46	.519
Can video conferences be an appropriate tool in learning about landscape?	4.19	.750	1.92	.641
Did the online classes encourage you to individual landscape exploration?	3.38	1.204	4.38	.506
Were the instructions presented during online meetings or delivered via e-mails sufficient to complete the homework?	4.37	.957	4.08	1.115

Planning of Rural Areas' course, Table 5), and iii) replacing field excursions with watching documentary films and organising video conferences (task: 'visiting case studies' on 'Cross-border Environmental Management' course, Table 6).

Regarding the students' opinions on the 'sensation curve', the respondents agreed that this task positively reshaped their perception of the landscape (AM=3.94), made them more careful in performing personal landscape observations (AM=4.0), and was a stepping stone from the constraints caused by the COVID-19 pandemic (AM=3.41). This method was assessed as follows:

*"The task on the 'sensation curve' was interesting; it was nice to be able to do the task in practice in our surroundings and see what landscape ecology really is all about."* [7LE2020/2021]

The participants of 'Development and Planning of Rural Areas' agreed that the task 'imagine the landscape' was an open-minded experience (AM=4.06 and AM=4.13 respectively in 2019/2020 and 2020/2021 academic years). The students strongly agreed that this project made them more curious about landscape observation (AM=4.22 and AM=4.31). However, above all, the lockdown influenced the students' attitudes towards this method:

*"What I liked the most about this project was that we were able to be creative and that we were free to complete the project on our own."* [8DPRA2019/2020]

*"Each of us could describe our ideal vision of the future landscape, express our emotions, and 'play' in some way as an artist."* [3DPRA2019/2020]

*"Making a collage made me realise that I like to create these types of things; combine things together, stick things together, alter things, and play with colours and shapes."* [11DPRA2019/2020]

*"It was certainly a new experience for most of the people in my group."* [1DPRA2019/2020]

*"Thanks to this task, some of us discovered how sensitive we are, and that we are dreamers of a sort because, in some way, we were describing the perfect place for us to live."* [4DPRA2019/2020]

*"In some way, creating this project allowed us to take our thoughts away from the issues of the pandemic"*



*for a while, and we could have a nice time but also be very creative.” [18DPRA2019/2020]*

The greatest discrepancies were observed among the participants of ‘Cross-border Environmental Management’. Answering the question: ‘Can documentary films replace the real landscape?’, the students who had experienced lockdown limitations strongly agreed (AM=4.31), while the participants of this course in the next academic year (2020/2021) strongly disagreed (AM=1.46). A similar result was observed in the case of the evaluation of the usefulness of videoconferences (AM=4.19 and AM=1.92, respectively) and documentary films (AM=4.31 and AM=3.38). Students who experienced lockdown restrictions (academic year 2019/2020) were enthusiastic about the learning methods used. But the participants of this course in the next academic year already had a year and a half of remote education behind them, so educational films were not attractive to them. With regard to increasing interest in individual landscape observation after attending online classes, the opposite attitude was observed (AM= 3.38 and AM=4.38), which is difficult to explain, however.

#### **IV. ‘Imagine the landscape’ – the assessment of learning outcomes**

The above subsections of this chapter dealt with a student assessment of the learning methods that were used in landscape online courses during the COVID-19 pandemic. In this subsection, the assessment of learning outcomes is presented. In particular, this applies to the task (‘imagine the landscape’) completed by participants of ‘Development and Planning of Rural Areas’ course during the lockdown. This task tested how the inability to be in a real landscape influenced the students’ perception of the landscape, and additionally, how students imagine the future rural landscape, and how their vision contributes to the multifunctionality of rural areas. The usefulness of the expeditionary learning method (see Markuszcwaska et al. 2018) was also tested.

Students’ proposals for future rural landscapes were understood in various ways (Fig. 1). Nonetheless, a reference to the main directions that support achieving a balance between economic growth, social well-being and environmental quality in direct-

ing multifunctionality were detected. The proposals were influenced by the factors that generally impose a change in rural landscapes (such as globalisation, technological innovations, changes in lifestyles of individuals, climate change, energy crisis), and reinforce the need to develop new approaches and practices promoting different forms of social assistance and responsibility. In this regard, there are many discrepancies with the European model of multifunctional development of rural areas (see Howley et al. 2014, Manson et al. 2016, Kamvasinou & Stringer 2019).

Students perceive the future countryside as an idyllic space with the image of a stork (group G), although, the future village is a very modern village:

*“The project of the vision of our village does not allow the places that give bliss to disappear. This will not be prevented by the modern technology, but rather will help it.” (group E).*

As a reaction on the modernisation paradigm, students presented a vision of modern and technologically advanced villages. Students (group C) suggested using drone equipment (‘technological aids’ as they called them) that will be particularly necessary in precision agriculture, as well as vertical farms and other alternative forms of food provision (e.g., breeding edible insects) in densely populated peri-urban areas. Large-size fields will be operated entirely automatically (sowing, harvesting, watering and fertilising) with machines and robots that are remotely controlled and powered by solar panels. Students also raised concerns, however, regarding non-farming land use (group A). The accuracy of the students’ assessment of the harmfulness of the loss of rich soil (de-farming) within sub-urban areas (urban sprawl) has been proved by many scholars (e.g.: Antrop 2004, Pedroli et al. 2007, Overbeek 2009, Zasada 2011, Ives & Kendal 2013, Spataru et al. 2020).

The settlement arrangement refers to the concept of an eco-green village. As an example, the eco-village described by group C is a small-size energy and self-sufficient hamlet based on locally produced renewable energy. This team proposed blending the buildings into the landscape via green roofs and organic materials. The building materials are recycled,

environmental-friendly and locally available (straw and wood) and referring to local design. In this way, the students emphasised the importance of regional traditions.

In addition, the future countryside is perceived as self-sufficient unit in terms of energy. Photovoltaic and wind farms will enrich the clean energy landscape (group F). Farmsteads will be supported by heating and electricity gathered from solar panels (group E). Students also highlighted the importance of a closed water circulation system (for example, using rainwater for irrigation). Moreover, several solutions for blue and green infrastructure were suggested (openwork sidewalk and streets). Water balance is required in a more sustainable agricultural system and brings social benefits as well (see Ricart et al. 2018). On the other hand, none of the working teams found the utility of biomass as locally produced waste that is perfectly suitable for energy purposes.

The students emphasised a manifestation of multifunctionality as high-quality food self-sufficiency (provided by organic farms). The local market in each village with freshly and locally produced commodities (groups A and D), and short supply chains guarantees economic benefits (jobs providing, transport costs reduction), as well as building a sense of place identity (group F). A new low-carbon community that respects local products was especially important in students' vision of the future countryside.

Within the students' projects, reference to the social/care farming was made. Research has proved that these innovative organisations can satisfy economic and social needs and can play relevant role in the multifunctional development of rural areas (Lanfranchi & Giannetto 2014, Leck et al. 2014). Activities for social purposes that use agricultural resources in order to promote education, social inclusion, rehabilitation and other social services in rural areas were mentioned by the students. For instance, group D proposed educational farms that offer activities and play a key role in training related to well-best farming practices. The students offered agricultural nurseries for children of preschool age and extra-curricular activities for school children and adolescents. Several options for socio-psychological rehabilitation (garden therapy, pet therapy) and el-

derly integration (hobby clubs) were proposed too. To ensure the safety and comfort of pedestrians, mothers with children or people with disabilities, the students focused on suitable pavements' infrastructure, and additionally, an evenly distributed network of services was especially important for the elderly and disability people. The students summarised thus:

*"Our imagine of the future village is an idea of how good living conditions can create a place for people of all ages: from babies to the elderly".*

There was also a project presented by group B that concerns care farming. This project was named Nothing More, which means:

*"A sense of security and peace, access to healthy food, human kindness and goodness, and the beauty of the surrounding nature, there are the things that make nothing more count, and therefore nothing more is needed for happiness".*

This vision follows the feminist convention, where after the Coronavirus revolution, the governments of the countries have been taken over by women, whose idea is to treat others with respect and empathy, regardless of gender, origin or wealth. The future countryside is perceived in a sensory and symbolic context. A strawberry symbolises care for crops and food; a pie chart is a symbol of the need what should be changed to improve living conditions in the countryside; a *Monstera deliciosa* symbolises the order and beauty of nature and the coherence of the elements despite their separation; fire symbolises the bonds between residents, and warmth and kindness among the local community; a hand that repays the *Monstera* means a strong attachment to nature. The authors of this project saw the efficient organisation of the local rural community through socialising that will improve neighbourly help and care for the common space.

When planning and managing the rural space, the students stressed social well-being, environmental quality and landscape aesthetics. For example, several proposals with reference to the theory of garden cities appeared in the project by group E. To provide comfort to residents, the residence zone is separated from production agricultural space via green acoustic screens. All the services and recrea-

tion zones are places at a suitable distance from the residential area. Gardens and orchards accompanied the farms. The spatial arrangement and sustainable planning summarise what the students from group A wrote:

*"We believe that students and specialists in the field of environmental management and spatial planning should intensively search for tools, strategies and legal solutions that will allow for proper development of the countryside and reasonable management and protection, because it is worth maintaining plant and animal species that support human well-being."*

The powerful social context signaled here is strongly related to the limitations of social relations imposed by the pandemic and lockdown. That was certainly the reason why social issues were so important for the members of this group.

Social tourism, recreational activities, and exploring nature, to which the students paid great attention, refer to the concept of societal relations regarding nature. The above mentioned students' observations refer in the main determinants of this theory: nature and society are spheres that are closely linked to each other, have no fixed borders, and are subject to dynamic change over time and guarantee sustainable development (Burandt & Mölders 2017). On the other hand, the projects presented contained many references to the concept of Corporate Social Responsibility (CSR), particularly in reference to sustainable development based on reasonable land management, smart growth achieved through innovation in agriculture and the application of modern technologies, inclusive growth through good agricultural and environmental practices, creating new jobs and developing local markets.

The last remark concerns the comments on the teaching method used. Expeditionary learning method turned out to be effective in conducting this task and received a positive response from the students themselves. This intuitive work done by students fits in with freedom of expression and authenticity, the postulates of sustainable and multifunctional development of rural areas, and also the substantive accuracy of the proposals that were presented. For this reason, this method should be more widely promoted in education for sustainable development.

## V. Dilemmas: e-learning or real-time online classes

Remote models ranged from distance learning, which provides study materials for independent self-paced study (all e-learning modules), to online and interactive courses, where teachers and students communicate with each other in real time. The first offers asynchronous formats of learning, while the second is synchronous (see Hrastinski 2008).

As the survey findings revealed, asynchronous e-learning courses (available on the Moodle platform) did not fully meet the students' expectations. Although e-learning offered a more flexible time frame, in the opinion of the students, it was time-consuming and had a lack of face-to-face interaction with the teacher that was disheartening. Yet e-learning courses were enthusiastically accepted by those students who preferred individual learning (similar findings were discovered by Octaberlina & Muslimin 2020).

In turn, the Teams application made synchronous learning more accessible; the courses were given in real-time, and the participants could interact at the same time. (It is important to note that although the Skype and Zoom applications also allow one to organise virtual classrooms and support both teachers and students to be online and work collaboratively, the university did not endorse these remote learning tools.) So, for the following three semesters (spring 2019/2020 and winter and spring 2020/2021), online real-time live learning was the predominant method of active communication between teachers and students.

The students' opinions present an overview of their preferences. Adherence to online synchronous classes was beneficial for communication flexibility, as the students experienced difficulties interacting with both the teacher and their peers:

*"I definitely prefer real-time online learning. This provides easy communication with the teacher and other students and encourages active participation in classes. It's more effective in expanding knowledge of the subject matter that is offered."*  
[3LE2020/2021]

*"In this way, we can better understand the content provided by the lecturer. In case of any doubt, we*



*can ask the teacher and receive a quick answer.”* [2DPRA2019/2020]

*“I prefer real-time online versions to self-analysis because during ‘live’ meetings, I can ask the teacher about issues which I haven’t fully understood or ask for suggestions and get opinions on the content of my contribution.”* [12DPRA2019/2020]

*“At any time, we can count on the support from the lecturer about issues which are unfamiliar to us.”* [6DPRA2019/2020]

*“Our effort in real-time classes is more efficient than doing the task ‘outside’ of the class. You have the impression that you take twice or even three times as long to do something that could be done more quickly in real-time.”* [8DPRA2019/2020]

The limited social interaction was reported, and awkwardness was stated as a weak point of online classes. Due to team working, the lack of direct contact with students made communication troublesome as:

*“[it] extended the length of group tasks.”* [5LE2020/2021]

*“It is a hindrance in online classes because it is much easier to lose interest while sitting ‘alone’ in front of the monitor, without having real contact, which in my opinion makes communication much easier.”* [8DPRA2019/2020]

On the other hand, students who relied on self-learning were in favour of e-learning, arguing their choice as following:

*“I prefer to receive instructions and materials to be developed by a designated date and be able to contact the lecturer by e-mail in the event of problems and ambiguities.”* [12LE2020/2021]

*“Personally, I prefer self-analysis because I like working individually. In this way, I perform tasks much faster and more efficiently.”* [18DPRA2019/2020]

*“In my opinion, sending materials for self-analysis is more efficient. If I have any questions, I can contact the teacher via email.”* [13DPRA2019/2020]

*“Self-study is very easy in the current age of the Internet, and students can easily find interesting materials on their own. The materials for self-anal-*

*ysis allow you to focus more on certain problems.”* [7CBEM2020/2021]

In addition, combining both formats was recognised as being beneficial. As was suggested by the students, lectures and theoretical background should be provided in synchronous online learning, whereas practical classes should serve two purposes: firstly, to give a short online explanation of a given task and, secondly, to provide materials for independent work through an e-learning platform. This option can be considered in blended learning:

*“I like online classes, because if I have any doubts, I can consult my teacher. The best way, however, would be to combine synchronous with asynchronous: starting with discussing the material in real time and continuing further in individual study and self-analysis.”* [9LE2020/2021]

*“Combining both techniques seems to be the best option, giving the possibility of ‘communing’ with teachers and lecturers, asking questions, and listening to comments, anecdotes, and interesting facts.”* [3CBEM2020/2021]

## **VI. Building capacity for improvement – teaching and learning about landscape in the post-pandemic period**

Online education during the COVID-19 pandemic was not favourable for teaching and learning about landscape. However, what we can learn from this is how best to utilise distant education about landscape and how to implement new solutions in blended learning in the post-pandemic period. In this section, suggestions were made on how we can progress in teaching and learning about landscape in the post-coronavirus period via analysing challenges and opportunities, and by presenting the appropriate ways of working together in a blended format.

The online format increases the feeling of social isolation and decreases the intellectual outputs too (see Linton & Klinton 2019). As the findings of this paper confirm, the biggest drawbacks of remote learning are reduced student engagement in active participation in classes and a lack of socialisation with other students from the group:

*"[...] for us, as humans, interaction with other people is invaluable in the education process."* [10CBEM2020/2021]

*"There was a lack of a slightly looser, more open form of conducting classes. The classes should be arranged in such a way that the students would to a large extent conduct discussions among themselves."* [1CBEM2019/2020]

Limited socialising may result in difficulties in developing social skills and collaborative competences (Feliu et al. 2019). In fact, after coming back to the offline format, students who had no experience of face-to-face studying complained about undeveloped social skills in collaborative team activities. In addition, the students admitted difficulties in adapting to the 'studying discipline' in the university environment because they were used to comfortable home conditions. Therefore, when creating new blended spaces for landscape education, active, in-person cooperation among students should be a priority.

Maintaining the students' involvement in online classes was a big challenge, too. They suggested visual tools that, in their opinion, could work in their favour:

*"I would like to participate in classes conducted through a virtual walk, e.g., through Google street view, so that the teacher could implement the theory in practice."* [15DPRA2019/2020]

*"More photos visualising case studies of certain landscapes in a slide show would be an alternative to the topic discussed. Although this requires more effort from teachers, visual presentation makes the perception of the theoretical content more attractive through the senses and helps us to maintain attention. I believe that this could also build a kind of 'attachment' to the analysed area, which in turn has a positive impact on the learning process."* [10CBEM2020/2021]

In fact, practice shows that technology can be a very helpful tool in landscape studies (Wang et al. 2015), and such technology as the Virtual Landscape Theatre (VLT) may be used in remote learning about landscape. Numerous other digital techniques have proved their usefulness too. For instance, Virtual Outcrops - V3Geo (originally developed by geoscientists from the University Aberdeen) that provides 3D virtual geoscience models, with a focus on virtual geological outcrops. Moreover, the usefulness of photographs in geographical online learning and their role in replacing the real landscape was proved by Dulamă & Ilovan (2020). Surely, visual tools could be integrated into reaching programs in landscape-focused courses in more differentiated and intensified ways. Following this, however, one of the students' comments puts documentary movies in a different light – it juxtaposes movies and virtual meetings and articulates their benefits of the latter:

*"Meetings with guest speakers should be more interactive, e.g., students should have a chance to ask questions regarding the issues they are interested in, which cannot be provided by a movie from commercial websites."* [2CBEM2019/2020]

Online meetings gained the interest of other students as well:

*"The number of online meetings with 'local' specialists (that we would have met in a 'real situation') could be greater – this makes the method of conveying knowledge even more attractive and brings us closer to specific places and landscapes."* [8CBEM2020/2021]

The use of community or/and local resources in problem-solving activities is of greater educational value than textbook assignments. Moreover, it combines theoretical knowledge with practical experience to build the conditions for reflective panel discussions so that students can learn first-hand. In cases like this, the online option sounds optimal, as it allows students and teachers to achieve substantive goals without having to move out and organise a meeting in real condition. It saves time as well.

During online classes, the flipped classroom was used in a narrow sense. The key issue of the flipped classroom is that students get the essential instructions and materials in advance (before classes). The out-of-class delivery includes instructional content, which is spread by the teacher via emails or an e-learning platform. A key benefit of the flipped classroom approach is that students can work at their own pace before classes and during the meeting, students are more actively engaged (Bergmann & Sams 2012, Sparks 2013, Gewin 2020). The stu-

dents' positive reaction contributed to an increased preference for hybrid teaching and learning about landscape:

*"The earlier familiarisation with the topic was a good opportunity to acquire knowledge ourselves. It was definitely helpful in understanding the issues discussed during the classes. As well as this, presenting the essay by ourselves and listening to our colleagues, discussing, and asking questions was a very good way to learn."* [7CBEM2020/2021]

Another way to increase learners' interest in landscape can be the hybrid approach that combines campus meetings, field classes, and remote classes. These can be student-conceived projects supported by expeditionary learning methods and obligatory outdoor activities. The learning outcomes could be disseminated as student presentations, posters, or could be provided by a series of student podcasts. As it was in relation to 'imagine the landscape' task, students' involvement in doing hands-on activities increased due to the freedom of expression, thus a similar interest is expected towards projects devised by students (see Markuszczyńska et al. 2018).

Related to the above, blended learning can provide the basis for a potential approach in the post-pandemic period of education on landscape. Blended education can be conducted by reducing the number of in-person classes in favour of online distance learning and field classes. With reference to technical approaches, blended learning has already been implemented in the educational system as we use computers, laptops, GIS, drones, and other equipment to collect, process, and analyse data about landscape. However, post-pandemic education will need methods that make advanced digital technologies more useful in teaching processes. Additionally, hybrid education should offer flexible conditions for tutors and learners (Scull et al. 2020). Finally, the learning process should be adapted to the variety of students' needs – considering individual students' learning paces and their motivations for attending landscape classes.

Blended learning can involve the flipped classroom and self-learning (in special cases – personalised learning). These high-tech teaching and learning strategies maintain computer-based communication

to allow contact between teacher and student and amongst the students themselves. Both methods enable teachers and students to be flexible in education. Moreover, students can become acquainted with the theoretical framework before offline classes about landscape, including field classes. Students can look at the material at home at their own preferred pace by watching or reading lessons on their computers. During offline meetings and outdoor classes, students can consider questions and what they do not understand, which will provoke reflective discussion. After clarifying their doubts, students can do practical tasks: they can complete assignments, do problem-solving exercises, and conduct research projects. Videos and instructions pre-prepared by teachers are available online. By becoming acquainted with a certain topic, students can explore and develop their independent interests (self-learning) for a particular case study, which could provoke them to create ties with the landscape (this was one of the students' suggestions for improving landscape-oriented courses). Students can also deepen their knowledge individually from online resources, and, in this respect, each student's interest goes beyond the traditional learning format and the standard curricula, thus becoming focused on an individual and personal learning plan (personalised learning). By doing this, these alternative learning models can be used to make students more willing to participate actively in classes. In this way, teachers can get students interested in landscape using a hybrid approach combining learning at university with distance learning.

## 4 Conclusions

---

The results of this study contribute to understanding and improving teaching and learning about landscape in the post-pandemic period using a hybrid formula. This, however, required a critical look at pre-pandemic concepts and teaching methods for landscape, as well as the experience of online education on landscape during the COVID-19 pandemic.

With regard to education and the benefits of hybrid learning, blended learning can be the future of learning about the landscape in academic educa-



tion. As the findings of research show, although online education and virtual landscape will not be fully replaced with the real landscape and face-to-face interaction in collaborative learning and team-building exercises (for which offline classes provide the best conditions), online and offline educations can complement each other.

The post-pandemic reality and the return to traditional offline education confirmed that it is possible to enrich hybrid solutions in landscape learning. However, considering the educational experience gained during the COVID-19 pandemic, the following aspects require more in-depth analysis and considerations: 1) creating tools to improve students' amenability towards online learning, 2) stimulating the perception and engagement in online classes with student-centered learning, 3) developing methods to organise and represent learning outcomes in online scenario, and 4) identifying the differences and the truly contribution of e-learning and real-time online classes.

## Acknowledgments

I would like to thank Dr. hab. Inż. Jarosław Janus for carrying out the statistical analysis.

## Declaration of Competing Interest

No competing interests to declare.

## References

- Alturise, F. 2020. Difficulties in teaching online with blackboard learn effects of the COVID-19 pandemic in the Western Branch Colleges of Qassim University. *International Journal of Advanced Computer Science and Applications*, 11(5), 74-81. <https://doi.org/10.14569/IJACSA.2020.0110512>
- Anderson, V. 2020. A digital pedagogy pivot: Re-thinking higher education practice from an HRD perspective. *Human Resource Development International*, 23(4), 452-467. <https://doi.org/10.1080/13678868.2020.1778999>
- Antrop, M. 2004. Landscape change and the urbanization process in Europe. *Landscape and Urban Planning*, 67, 9-26. [https://doi.org/10.1016/S0169-2046\(03\)00026-4](https://doi.org/10.1016/S0169-2046(03)00026-4)
- Barbour, M. K. 2015. Real-time virtual teaching: Lessons learned from a case study in a rural school. *Online Learning*, 19, 54-68. <https://doi.org/10.24059/olj.v19i5.705>
- Bergmann, J., Sams, A. 2012. Before you flip, consider this. *Phi Delta Kappan*, 94(2), 25-25. <https://doi.org/10.1177/003172171209400206>
- Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L., Walset, P. A., Fiset, M., Huang, B. 2004. How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, 74(3), 379-439. <https://doi.org/10.3102/00346543074003379>
- Bovermann, K., Weidlich, J., Bastiaens, T. 2018. Online learning readiness and attitudes towards gaming in gamified online learning—a mixed methods case study. *International Journal of Educational Technology in Higher Education*, 15(1), 1-17. <https://doi.org/10.1186/s41239-018-0107-0>
- Burandt, A., Mölders, T. 2017. Nature—gender relations within a social-ecological perspective on European multifunctional agriculture: the case of agrobiodiversity. *Agriculture Human Values*, 34, 955-967. <https://doi.org/10.1007/s10460-016-9763-7>
- Carvalho, M., Nicholson, T., Yeoman, P., Thibaut, P. 2020. Space matters: framing the New Zealand learning landscape. *Learning Environments Research*, 23, 307-329. <https://doi.org/10.1007/s10984-020-09311-4>
- Cisani, M., Castiglioni, B., Sgard, A. 2022. Landscape and education: Politics of/in practices. *Landscape Research*, 47(2), 137-141. <https://doi.org/10.1080/01426397.2022.2039111>
- Dellinger, A. B. 2007. Toward a unified validation framework in mixed methods research. *Journal of Mixed Methods Research*, 1(4), 309-332. <https://doi.org/10.1177/1558689807306147>
- Dulamă, M. E., Ilovan, O. R. 2020. Online university education during the COVID-19 pandemic. How efficient are the adapted instruction models? *Journal of Educational Sciences & Psychology*, 2, 92-111.
- Feliu, J., Inkeroinen, P., Markuszcwiska, I., Tanskanen, M., Nuss, S., Vila-Subirós, J. 2019. Defining competences for future geography students in relation to low carbon societies. *Journal of Geography in Higher Education*, 43(4), 1-16. <https://doi.org/10.1080/03098265.2019.1660863>
- Gewin, V. 2020. Into the digital classroom. Five tips for moving teaching online as COVID-19 takes hold. *Nature*, 580(7802), 295-296. <https://doi.org/10.1038/d41586-020-00896-7>
- Haaland, Ch., Fry, G., Peterson, A. 2011. Designing farmland for multifunctionality. *Landscape Research*, 36, 41-62. <https://doi.org/10.1080/01426397.2010.536202>
- Horváth, D., Ásványi, K., Cosovan, A., Csordás, T., Faludi, J., Galla, D., Komár, Z., Markos-Kujbus, E., Endre Simay, A. 2022. Online only: Future outlooks of post-pandemic education based on student experiences of the virtual University. *Society and Economy*, 44(1), 2-21. <https://doi.org/10.1556/204.2021.00026>
- Howley, P., Yadav, L., Hynes, S., Donoghue, C., Neill, S. 2014. Contrasting the attitudes of farmers and the general public regarding the 'multifunctional' role of the agricultural sector.

- Land Use Policy, 38, 248–256. <https://doi.org/10.1016/j.landusepol.2013.11.020>
- Hrastinski, S. 2008. Asynchronous & synchronous e-learning. *Educause Quarterly*, 31(4), 51-55.
- Iivari, N., Sharma, S., Ventä-Olkkonen, L. 2020. Digital transformation of everyday life – How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management*, 55, 102183. <https://doi.org/10.1016/j.ijinfomgt.2020.102183>
- Ives, Ch., Kendal, D. 2013. Values and attitudes of the urban public towards peri-urban agricultural land. *Land Use Policy*, 34, 80– 90. <https://doi.org/10.1016/j.landusepol.2013.02.003>
- Kamvasinou, K., Stringer, B. 2019. The politics of rurality. *Landscape Research*, 44(7), 783-786, <https://doi.org/10.1080/01426397.2019.1641260>
- Kee, C. E. 2021. The Impact of COVID-19: Graduate students' emotional and psychological experiences. *Journal of Human Behavior in the Social Environment*, 31(1–4), 476–488. <https://doi.org/10.1080/10911359.2020.1855285>
- Kienast, F., Gosteli, S., Edwards Jr. T. C., Martius, G. 2020. Lessons learned from the first worldwide accessible e-learning in *Landscape Ecology*. *Landscape Online*, 83, 1-14. <https://doi.org/10.3097/LO.202083>
- Kumar Basak, S., Wotto, M., Belanger, P. 2018. E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-learning and Digital Media*, 15(4): 191–216. <https://doi.org/10.1177/2042753018785180>
- Lanfranchi, M., Giannetto, C. 2014. Sustainable development in rural areas: The new model of social farming. *Quality – Access to Success*, 15, 219-223.
- Lee, K., Fanguy, M., Bligh, B., Lu, X. S. 2022. Adoption of online teaching during the COVID-19 Pandemic: a systematic analysis of changes in university teaching activity. *Educational Review*, 74(3), 460-483, <https://doi.org/10.1080/00131911.2021.1978401>
- Leck, C., Evans, N., Upton, D. 2014. Agriculture – Who cares? An investigation of 'care farming' in the UK. *Journal of Rural Studies* 34, 313-325. <https://doi.org/10.1016/j.jrurstud.2014.01.012>
- Leighton, J. P., Tang, W., Guo, Q. 2018. Undergraduate students' attitudes towards mistakes in learning and academic achievement. *Assessment & Evaluation in Higher Education* 43(4), 612-628. <https://doi.org/10.1080/02602938.2017.1387230>
- Linton, G., Klinton, M. 2019. University entrepreneurship education: a design thinking approach to learning. *Journal of Innovation and Entrepreneurship*, 8(3), 1-11. <https://doi.org/10.1186/s13731-018-0098-z>
- Lowenthal, P. R., Leech, N. 2009. Mixed research and online learning: Strategies for improvement. In: Kidd, T. T. (ed.), *Online education and adult learning: New frontiers for teaching practices*. Hershey, PA: IGI Global, Pennsylvania, pp. 202-211.
- Manson, S., Jordan, N., Nelson, K., Brummel, R. 2016. Modelling the effect of social networks on adoption of multifunctional agriculture. *Environmental Modelling & Software*, 75, 388-401. <https://doi.org/10.1016/j.envsoft.2014.09.015>
- Markuszcwzka, I., Tanskanen, M., Vila Subiros, J. 2018. New ways to learn geography – challenges of the 21st century. *Quaestiones Geographicae*, 37(1), 37-45. <https://doi.org/10.2478/quageo-2018-0004>
- Moorhouse, B. L. 2020. Adaptations to a face-to-face initial teacher education course 'forced' online due to the COVID-19 pandemic. *Journal of Education for Teaching*, 46(3), 1-3. <https://doi.org/10.1080/02607476.2020.1755205>
- Octaberlina, L. R., Muslimin, A. I. 2020. EFL students perspective towards online learning barriers and alternatives using Moodle/Google Classroom during COVID-19 pandemic. *International Journal of Higher Education*, 9(6), 1–9. <https://doi.org/10.5430/ijhe.v9n6p1>
- OECD 2001. Multifunctionality. Towards an analytical framework. [https://www.oecd-ilibrary.org/agriculture-and-food/multifunctionality\\_9789264192171-en](https://www.oecd-ilibrary.org/agriculture-and-food/multifunctionality_9789264192171-en) [Access 22 August 2022]
- Overbeek, G. 2009. Opportunities for rural–urban relationships to enhance the rural landscape. *Journal of Environmental Policy and Planning*, 11, 61–68. <https://doi.org/10.1080/15239080902775058>
- Pedroli, B., van Elsen, T., van Mansvelt, J. 2007. Values of rural landscapes in Europe: inspiration or by-product?. *NJAS Wageningen Journal of Life Sciences*, 54, 431–447. [https://doi.org/10.1016/S1573-5214\(07\)80014-5](https://doi.org/10.1016/S1573-5214(07)80014-5)
- Piyatamrong, T., Derrick, J., Nyamapfene, A. 2021. Technology-mediated higher education provision during the COVID-19 pandemic: A qualitative assessment of engineering student experiences and sentiments. *Journal of Engineering Education Transformations*, 34, 290–297. <https://doi.org/10.16920/jeet/2021/v34i0/157158>
- Ricart, S., Kirk, N., Ribas, A. 2018. Ecosystem services and multifunctional agriculture: Unravelling informal stakeholders' perceptions and water governance in three European irrigation systems. *Environmental Policy and Governance*, 29, 23–34. <https://doi.org/10.1002/eet.1831>
- Scull, J., Phillips, M., Sharma, U., Garnier, K. 2020. Innovations in teacher education at the time of COVID19: an Australian perspective. *Journal of Education for Teaching*, 46(4), 497-506. <https://doi.org/10.1080/02607476.2020.1802701>
- Smith, G. G., Heindel, A. J., Torres-Ayala, A. T. 2008. E-learning commodity or community: Disciplinary differences between online courses. *Internet and Higher Education*, 11(3-4), 152-159. <https://doi.org/10.1016/j.iheduc.2008.06.008>
- Sparks, R. J. 2013. Flipping the classroom: An empirical study examining student learning. *Journal of Learning in Higher Education*, 9(2), 65-70.
- Spataru, A., Faggian, R., Docking, A. 2020. Principles of multifunctional agriculture for supporting agriculture in metropolitan peri-urban areas: The case of Greater

- Melbourne, Australia. *Journal of Rural Studies*, 74, 34–44. <https://doi.org/10.1016/j.jrurstud.2019.11.009>
- van Huylenbroeck, G., Vandermeulen, V., Mettepenningen, E., Verspecht, A. 2007. Multifunctionality of agriculture: a review of definitions, evidence and instruments. *Living Reviews in Landscape Research*, 1, 5-43. <https://doi.org/10.12942/lrlr-2007-3>
- Wang, Ch., Miller, D., Brown, I., Jiang, Y., Castellazzi, M. 2015. Visualisation techniques to support public interpretation of future climate change and land-use choices: a case study from N-E Scotland. *International Journal of Digital Earth*, 9(6), 586-605. <https://doi.org/10.1080/17538947.2015.1111949>
- Willging, P. A., Johnson, S. D. 2004. Factors that influence students' decision to drop out of online courses. *Journal of Asynchronous Learning Networks*, 8(4), 105-118. <https://doi.org/10.24059/olj.v13i3.1659>
- Wilson, G. 2008. From 'weak' to 'strong' multifunctionality: Conceptualising farm-level multifunctional transitional pathways. *Journal of Rural Studies*, 24, 367–383. <https://doi.org/10.1016/j.jrurstud.2007.12.010>
- Zasada, I. 2011. Multifunctional peri-urban agriculture A review of societal demands and the provision of goods and services by farming. *Land Use Policy*, 28, 639– 648. <https://doi.org/10.1016/j.landusepol.2011.01.008>