Teaching in the Garden: School Gardens as a Space for Environmental and English Learning

Bärbel Turner-Hill
Pädagogische Hochschule Karlsruhe, Germany
baerbel.turner-hill@ph-karlsruhe.de

Christian Ludwig
Freie Universität Berlin, Germany
christian.ludwig@fu-berlin.de

Lena Böttger
Pädagogische Hochschule Karlsruhe, Germany
lena.boettger@stud.ph-karlsruhe.de

DOI: HTTPS://DOI.ORG/10.37536/ECOZONA.2021.12.1.4007

ECOZON@ | Vol 12, No 1

Abstract

School gardens as settings for learning outside the classroom are becoming increasingly popular. They allow students to learn in an authentic way as they engage in a variety of activities and materials. More importantly, they also represent a powerful place and tool for environmental education as students are not only exposed to nature but also gain positive environmental experiences. This paper examines school gardens as a place for both enhancing students' English language competences and fostering critical environmental literacy. The first section of the paper focuses on garden-based education as a type of learning outside the classroom. The ensuing section then provides a brief discussion of school gardens as learning spaces across the curriculum, arguing that school gardens are far more than places for learning about nutrition and healthy living. Following this, the next section then argues for using school gardens also for learning English as a foreign language. Here Gardner's multiple intelligences model serves to illustrate the potential of school gardens for differentiated instruction regarding content, processes, and products in today's increasingly diverse learning groups. The main part of the paper then concentrates on garden-based education in the context of EFL teacher training. At the University of Education Karlsruhe (Germany) students have the opportunity to attend a school garden-based seminar which allows them to experience first hand the benefits of learning English as a foreign language in the school garden. The paper concludes by taking a glimpse into the future of school garden learning by reporting on the authors' experiences with using technology in the context of garden-based education.

Keywords: Garden-based education, school gardens, critical environmental literacy.

Resumen

Los huertos escolares como escenario para el aprendizaje fuera del aula son cada vez más populares. Permiten que los estudiantes aprendan de una manera auténtica mientras participan en actividades que implican una variedad de actividades y materiales. De forma más relevante, estos también representan un lugar y una herramienta poderosa para la educación ambiental, ya que los estudiantes no sólo están expuestos a la naturaleza, sino que también recogen experiencias en la naturaleza, lo que les permite obtener experiencias ambientales positivas. En este documento se examinan los huertos escolares

como un lugar para mejorar las competencias de los estudiantes en el idioma inglés y fomentar una alfabetización ambiental crítica. La primera sección del documento se centra en la educación basada en los jardines como un tipo de aprendizaje fuera del aula. A continuación, se ofrece un breve análisis de los huertos escolares como espacios de aprendizaje en todo el programa de estudios, argumentando que los huertos escolares son mucho más que lugares para aprender sobre nutrición y vida saludable. A continuación, en la siguiente sección se argumenta que los huertos escolares también sirven para aprender inglés como lengua extranjera. Aquí el modelo de inteligencias múltiples de Gardner sirve para ilustrar el potencial de los huertos escolares para la instrucción diferenciada en cuanto a contenido, procesos y productos en los grupos de aprendizaje cada vez más diversos de hoy en día. La parte principal del trabajo se centra entonces en la educación basada en los huertos en el contexto de la formación de profesores de EFL. En la Universidad de Educación de Karlsruhe (Alemania), los estudiantes tienen la oportunidad de asistir a un seminario sobre huertos escolares que les permite experimentar de primera mano las ventajas de aprender inglés como lengua extranjera en este espacio. La contribución concluye echando un vistazo al futuro del aprendizaje en los huertos escolares, informando sobre las experiencias de los autores en el uso de la tecnología en el contexto de la educación basada en los huertos.

Palabras clave: educación basada en la jardinería, huertos escolares, conocimiento ambiental crítico.

Introduction

Changing patterns of leisure time and the pushing back of nature in some urban areas have led to a situation in which children spend less time in nature, depriving them of the unique and vital opportunity to gain meaningful experiences in and with nature (e.g. Benkowitz "Schulgartenerfahrung" 141). Research suggests that "experiences in nature significantly influence the development of lifelong environmental attitudes and values." (Strife)

This is not only problematic with regard to health, but also on the grounds of the increasing need for environmental awareness as we are passing the tipping point at which global climate change will be irreversible (IPCC 5–7; FAO xviii; United Nations 19, 25). As combating changes in weather patterns is not only the responsibility of world leaders but each and every individual, environmental issues also need to be embedded in education across the curriculum (Deetjen and Ludwig 9–26), including English as a foreing language (EFL). As Mayer and Wilson put it:

> The classic objectives of environmental education – the creation of awareness and concern about the environment, the creation of environmental knowledge and the acquisition of skills to identify, evaluate and solve environmental problems – must also be reached by means of education in the various disciplines of the humanities, among them the fields of language teaching, literary and cultural studies. (1)

In other words, English as a foreign language classrooms should offer an education which allows the younger generation to make references to the world beyond the four walls of the classroom and provide engaging situations and materials that allow them to learn more about environmental issues and their personal roles in protecting the environment (UNESCO 40). Here, textbooks, which still represent one of the most widely used resources in EFL, may not be enough as they, as Kuhn-Deutschländer points out, by and large still rely on transmitting knowledge rather than raising students' awareness of their

decisive role in helping the environment and making life more sustainable as global citizens and consumers (36).

Against this backdrop, this article explores the school garden as a space for both environmental and English as a foreign language learning. Thus, it brings together the theory, research, and practice of garden-based education, environmental learning, and English as a foreign language teaching. The first part provides the theoretical framework for the argument made in this paper, mainly focusing on the concept of garden-based education, which, according to Desmond, Grieshop and Subramaniam, can be defined as an "instructional strategy that utilizes a garden as a teaching tool" (20). The following part then discusses the potential of school gardens for both environmental and English as a foreign language education. The main part of the paper then illustrates these theoretical considerations by providing practical examples from the school garden of the University of Education Karlsruhe (Germany), a garden which offers students the opportunity to experience a school garden as a living classroom. The paper concludes by providing a glimpse into the future of garden-based education by illustrating how digital technology is slowly altering the students' direct experiences of nature.

The School Garden as a Place for Learning

Although the classroom remains the main place for learning, there is a growing awareness of the fact that learning experiences beyond the four walls of the classroom can play a vital role in education, leading, for example, to more motivation and better performance (Claiborne et al.). In very simple terms, learning outside the classroom (LOtC) describes the "use of places other than the classroom for teaching and learning," (Council for Learning Outside the Classroom) including, for example, the school grounds, the street, museums, and, more recently, digital environments. What all of these places have in common is that they aim to enhance students' individual learning experiences and provide them with engaging real-world experiences to help them learn. One out-of-class setting for learning which has gained increasing prominence in recent years is the garden.

The concept of garden-based education is not new and can be traced back to the early nineteenth century (Desmond et al. 28) partly in response to the educational reform movements of that time. Since then, garden-based education has become a growing phenomenon, especially in countries such as the United States and the United Kingdom. In formal educational contexts, garden-based education is mostly realised through the use of school gardens as a foundation for integrated and experiential learning, allowing students not only to relax but also to encounter nature and engage in hands-on, meaningful, and authentic activities (Lehnert et al. 11).

The kind of learning being experienced in the garden also requires changes in the roles of both the teacher and the learners. This means, for example, that it is part of the teacher's responsibilities to nurture children's curiosity about nature and, one may add here, to help them discover the foreign language learning opportunities it offers. While this means that teachers should share their knowledge about the environment with their learners, which may also involve some 'show and tell', there should also be space for

ECOZON@ | Vol 12, No 1

pedagogical practices that allow learners to explore the garden themselves. In other words, it is the responsibility of the teacher to ensure that learning happens, especially in environments that differ drastically from the traditional classroom. Thus, one of the core responsibilities of the teacher is to take a broader approach to the foreign language curriculum by finding anchor points for garden-based learning and design feasible activities.

Gardens come in many different forms and shapes (Lehnert et al. 14–17), and garden design has undergone many transformations throughout the centuries. As one example of many, the much more formal French garden style à la Francaise, based on the idea of geometry, symmetry, and uniformity with its origin in the Italian Renaissance gardens of the fifteenth century, was replaced by the more informal and naturalistic style of the English landscape garden from the end of the eighteenth century (Brown; Hobhouse; Uglow). Both forms are still evident in British, French, and other European gardens to the present day and have influenced contemporary garden designs. These examples not only illustrate that garden designs reflect history and culture but also allude to the various functions or uses of gardens, namely aesthetic, functional, and recreational uses, resulting in many different garden types, such as flower, woodland, and water gardens (recreational use); Chinese or Bonsai gardens (aesthetic use); and kitchen or vegetable gardens (functional use), with school gardens belonging to the last of the three categories.

The term school garden is a broad term which covers a wide range of settings as school gardens come in different designs and serve different purposes, depending on the type of institution they belong to or the premises on which they are located. Thus, a school garden can include anything from an uncultivated plot of land to sensory gardens. Furthermore, the garden may belong to the school or the local community or be a joint project between a school and the local community (Ibid. 11). An ideal school garden should have the following characteristics:

- open spaces that allow children to move around freely and encourage playful activities in nature,
- natural elements—such as deadwood or dry stone walls—that regulate themselves without human interference and constitute a habitat for animals,
- patches that can be cultivated by individual learner groups, and
- a space for lessons that take place in the school garden (Möller and Giest 91–92).

While school gardens provide ample opportunity to integrate gardening in a number of subjects, including science, mathematics, and history, they may also be used in English language education to learn about language, culture, and the environment (Cutter-Mackenzie 122–135) as discussed in the following section.

School Gardens in English Language Education

There is a growing recognition of the fact that school gardens provide an engaging learning space. As Kuo et al. observe, "[n]atural settings may affect learning both by directly fostering a learner's capacity to learn and by providing a more supportive context

ECOZON@ | Vol 12, No 1

for learning" (4). According to their findings, nature can act as enabling in improving attention, self-discipline, motivation, enjoyment, engagement, physical activity, and fitness and relieving stress in learners, as well as providing "calmer, quieter, safer contexts for learning" and "foster[ing] warmer and more cooperative relations." (Ibid.) The school garden therefore presents a learning environment suited to many subjects, not only natural science but also English.

This is especially true as EFL has been moving toward more holistic approaches to learning, engaging all aspects of the learner and recognising the inherent right to self-determination as summarised in Figure 1.

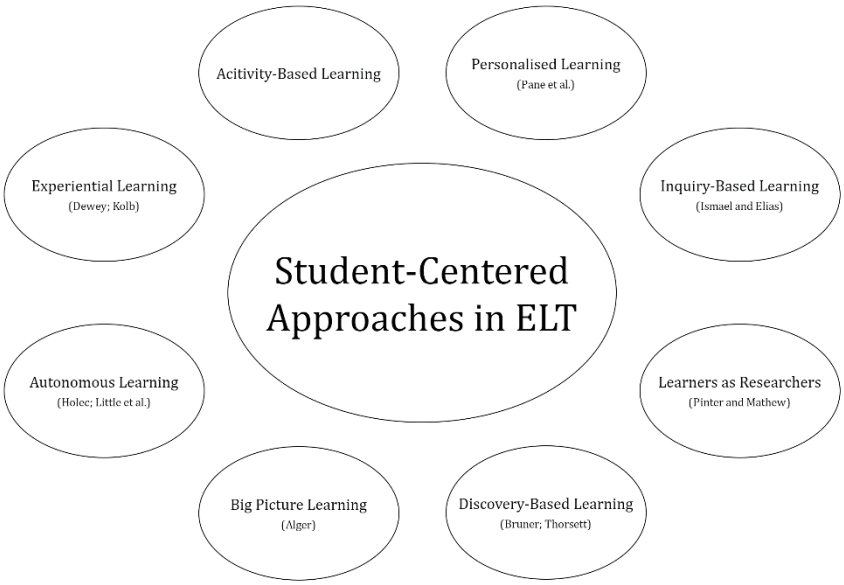

Figure 1: Student-Centered Approaches in English Language Teaching.

What all these approaches have in common is that they provide effective, meaningful, and individualized learning experiences which keep students engaged and allow for agency, creativity, and reflection in authentic contexts. Furthermore, these learner-centered approaches put emphasis on the different interests, abilities, and potentials learners bring to the classroom. One theory, although highly criticized (e.g. Gaeke), that accommodates individual differences in students is Gardner's theory of multiple intelligences which is based on the idea that human intelligence has multiple, native dimensions (Gardner "Frames of Mind") and that these native dimensions work together, with some of them being active while others are dormant. Gardner's model offers the possibility to provide a more holistic, whole-person, and multi-sensory approach to learning English as a foreign language, particularly with regard to the growing diversity in today's English language classrooms (Eisenmann).

Table 1 provides an overview of Gardner's original seven intelligences, illustrating how selected foreign language activities in the school garden reflect and cater for one or several of Gardner's intelligences.

Intelligence	**Explanation**	**Activities in the garden**
Bodily-kinesthetic (body smart)	Learn best through movement and hands-on activities	Barefoot trail, sowing seeds, potting plants, feeding, (compost), watering, weeding, harvesting, processing fruit and vegetables into meals and preserves, composting organic waste
Visual-spatial (picture smart)	Process and express information in pictures and images	Using photography and art techniques, identifying and recording recurrent patterns in flowers, like the spiral in plants, spider webs, snails, structures of snowflakes, fractals, mapping the garden
Verbal-linguistic (word smart)	Process and express information through words	Writing a short story about the life cycles of insects or butterflies, "my pet", creating poems for a school magazine, a poetry collection, a poetry slam, telling a story to the class, participating in debates about designing new flower- or vegetable beds, about restructuring the school garden, debating and decision-making processes about workshops on the open school garden day
Logical-mathematical (math smart)	Enjoy working with numbers	Designing and planning out individual plots, recording growth patterns for sunflowers, measuring weekly, monthly, or annual precipitation, following recipes, recognizing that a great variety of natural phenomena can be mathematically explored (fractals, spirals)
Interpersonal (people smart)	Possess strong natural ability to interact with other people, enjoy interacting with others and barrier-free group and team work	Sharing various responsibilities within a team (e.g. watering schedule, harvesting calendar), accepting different abilities in physical practical tasks in the garden, giving and receiving instruction for new tasks, carrying out nature-based projects

Intrapersonal (self smart)	Enjoy working alone	Focusing on a task independently, problem solving, developing strategies and resilience in stressful situations in the outdoors (heat, drought, cold and wet weather)
Musical-rhythmic and harmonic (music smart)	Process and express information through sound	Listening to birdsong, to buzzing bees and croaking frogs, identifying natural sounds, wind, water, biophony and geophony, reproducing sounds with materials found in nature (sticks, stones, grasses, seeds)

Table 1: School garden activities based on Gardner's Multiple Intelligence Model ("Intelligences Reframed").

In 1995, Gardner proposed an eighth intelligence, a naturalistic intelligence (nature smart), emphasising the role of the individual within earth's ecosphere. To quote Gardner himself:

> If I were to rewrite Frames of Mind today, I would probably add an eighth intelligence – the intelligence of the naturalist. It seems to me that the individual who is readily able to recognize flora and fauna, to make other consequential distinctions in the natural world, and to use this ability productively (in hunting, in farming, in biological science) is exercising an important intelligence and one that is not adequately encompassed in the current list. ("Reflections" 206)

Nature smart learners particularly enjoy being outside, working with plants, engaging with natural surroundings, and protecting the environment. This eighth intelligence demonstrates the close connection between garden-based and environmental education (cf. definition of environmental literacy in the introduction to this section). Learning in the school garden offers students the opportunity to make first-hand experiences with nature, develop a closer and more personal connection with nature (Mayer-Smith et al. 82), assume a more positive attitude toward nature (Schenk 11; Möller and Giest 89; Benkowitz 13), and develop environmental ethics (Wilson 5). This is also expressed in the following statement by Maria Montessori: "[w]hen he knows that the life of the plants that have been sown depends upon his care in watering them ... without which the little plant dries up, ... the child becomes vigilant, as one who is beginning to feel a mission in life" (Montessori 145).

However, school gardens not only allow for learning about nature, agriculture, and healthy living (Graham et al.) but also pursuing more English as a foreign language related learning objectives. Table 2 provides a more detailed overview of how key English as a foreign language competence areas can be fostered in school garden-based education.

ECOZON@ | Vol 12, No 1

Competence area	**Themes and topics**	**Sample projects and activities**
Lexical competence	Vocabulary, e.g. eating and drinking, food shopping, preparing food, fruit and vegetables, herbs and spices, nature, animals (pets, farm animals), colours, the weather, numbers, free time, sensory verbs and adjectives	A shopping list, recipes, 'my pet' (writing a profile, presentation), picking herbs and vegetables in preparation for a picnic, recording the ingredients and procedure for a recipe booklet, visiting a local farm, making a simple weather chart that includes the locations of the different nationalities in class
Speaking competence	Politeness at the table, diversity of national and international food preferences and table manners	Discussing preferences for food (I love/I hate, my favourite food is...). Giving reasons for dietary decisions (religious reasons, vegetarianism, veganism, food allergies)
Writing competence	Recording nature observation with all senses, documenting experiments	Writing poetry about the school garden experience, recording recipes for a cookery booklet, describing the process of a nature-based craft activity, a nature diary, a day in the life of a hedgehog, keeping a garden journal/diary
Audio-visual competence	Films about nature	Watching and analysing nature documentaries, creating a video about the school garden
Listening competence	Animal sounds, songs about nature, listening to the sounds of garden	Listening to and identifying the sounds of nature, writing songs about the school garden
Reading competence	Biodiversity, sustainability, the diversity of landscape and habitat, threats to the natural world, consumer awareness (avoid, re-use, recycle versus over-consumption)	Picture books, written texts, newspaper articles, Web sites, reports of environmental organizations, cookbooks, poetry
Grammatical competence	Future, past, present progressive, passive, prepositions, demonstrative pronouns, comparatives	Predicting the weather, comparing historical to present day landscapes/maps, speculating about future climate changes, making suggestions for positive changes
Mediation	Mediating words and sentences, e.g. plants, trees, verbs for gardening, gardening tools	Developing plurilingual materials for the school garden (a manual of instruction, a map of the garden grounds, a seasonal chart for flowers, fruit and vegetables)

ECOZON@ | Vol 12, No 1

Transcultural competence	Food cultures Festivities, holidays and festivals (Easter, Thanksgiving, Harvest Festival, Halloween, summer and winter solstice) Comparing local plants to those from foreign countries (Lehnert et al. 181). Analysing collective images of nature Garden designs (English gardens) Symbolism of plants (cf. The School Garden as a Place for Learning) Proverbs and sayings, Weather prediction through weather lore ('folk sayings')	Inclusive school project "Living together" (documenting geographical location, climate, typical crops, food) including food preparation and communal eating, seasonal craft activities (dyeing eggs with natural materials, pumpkin carving, exploring the significance of evergreen plants used at Christmas and other festivals (Easter lilies, Valentine's day roses)
Global competence	Discussing global issues such as weather conditions, global warming, sustainability, biodiversity, globalisation, fair trade, and the consequences of individual consumption, veganism	Exploring and documenting: Fast Fashion, recycled materials as a means of reducing depletion of resources and environmental pollution, organising a jumble sale and / or a clothes swap at school, repurposing packaging materials for art projects and in the garden, producing and selling products from the garden and donating the proceeds for environmental charity projects in other countries (seed packets, jams and chutneys, herb vinegar, lavender sachets, herbal soaps)
Literary competence	Nature in fiction and poetry, concepts of garden, children's literature	Picture books, (Beatrix Potter, Aesop's fables), nursery rhymes, examples of classic British children's literature (J.M.Barrie *Peter Pan*, F.H.Burnett *The Secret Garden*)
Plurilingual competence	Naming plants and other objects in the garden in the students' various home and dominant languages	Labelling plants decoratively on slate tablets (in English, alternatively in Latin or other languages)
Political competence	Democracy, making decisions about planting individual and team beds, redesigning certain areas of the garden, future projects, charity work.	Group discussions, mini lectures, visiting a local animal shelter, helping out as 'buddy' in school projects for migrant children

Table 2: School Garden-Based Activities to Foster Foreign Language Competences.

ECOZON@ | Vol 12, No 1

As the overview in Table 2 illustrates, school gardens provide ample opportunity for learning English as a foreign language, and train learners' language-specific skills and competences in a contextualized and authentic way. Here is one very concrete example of an activity, focusing on prepositions and enhancing learners' receptive as well as productive skills. A scavenger hunt allows learners to practice vocabulary such as colours or forms as well as grammar vocabulary such as demonstrative pronouns, or modal verbs and use their environment for learning in an engaging way. The basic idea of a scavenger hunt is that students solve a problem or mystery by following a series of clues, often in the form of coded messages. The following scavenger hunt, which can be adapted depending on the learners' age, interests, and the topic of the lesson, focuses on gardening objects and prepositions. Before the beginning of the scavenger hunt, the teacher tells the student that they are going to look for gardening tools and revises selected prepositions and/or gardening tools with them. Each group then gets a set of cards, with each card having a "Who am I?" description written on it such "You can use me to water the lawn, flowers, and plants. I am not as thin and long as a gardening hose but thick and small. I am usually green or yellow." Alternatively, for groups of learners who are yet unfamiliar with written forms of the foreign language, these clues can be given verbally, supported by gestures. The groups then 'go hunting'. Once they have identified and found the gardening tool described on the card, in this case a watering can, they write a sentence about where they found the object on the other side of the card, for example: "The watering can is under the shed roof."; "The watering can is in the wheelbarrow."; "The watering can is next to the lawn mower." Once they have found all their tools and completed their cards, they get back together and share their 'findings', for example by reading out the sentences on their cards. In addition, the tools could also be compared or grouped. The activity can easily be differentiated, for example by providing almost complete sentences only leaving out the gardening tool and the preposition, a list of gardening tools (with or without images), or a list of prepositions. Also, help cards could offer additional information on the tool the learners are supposed to find. If no garden is available or the garden only offers a limited number of tools, an adapted scavenger hunt could also be carried out in the schoolyard or even in the classroom, or could focus on a different group of objects.

The following section describes the school garden of the University of Education Karlsruhe in more detail and discusses three school garden projects in an exemplary fashion, illustrating how school garden practices can be an integral element of teacher education

The University of Education Karlsruhe School Garden

The ecological school garden of the University of Education in Karlsruhe was founded in 1985, and has since moved forward in leaps and bounds. Having moved from a small plot near the university campus onto a much larger terrain in 2009, it now offers a variety of different habitats from an area cultivated with fruit and vegetables to untouched woodland with mature trees and heathland. Further segments of the garden are devoted to raised beds, which are example areas for urban gardening. These areas

ECOZON@ | Vol 12, No 1

also allow easy access for wheelchairs. Teaching and studying in the ecological school garden of the University of Education in Karlsruhe makes a welcome change from the usual lecture rooms on campus. A covered pergola with benches and tables arranged in one large rectangle with open sides planted with vines offers some protection from the elements and is known as the 'Green Classroom'. Even though the natural environment of the garden provides a more relaxed atmosphere, teaching in the Green Classroom has its own challenges owing to the acoustics and to a lack of the usual electronic classroom equipment. However, amenities like electricity, running water, a toilet, and a basic kitchen as well as a small reference library in an adjacent small building are a welcome and necessary part of the teaching and learning experience. The garden covers a ca. 9000 square meter large area with many different habitats for plants, birds, small mammals, and insects and is known for its inherent biodiversity. A large pond, a small creek, a wildflower meadow, a wilderness area, beehives, a bee hotel, a barefoot trail, fruit trees, a vegetable plot, flower beds, rose arches, a herb spiral and herb garden, raised beds, a greenhouse, a bread and pizza oven, and an extensive composting area as well as toolsheds as are just some of the many different features the school garden has on offer. Indigenous as well as exotic plants and trees are an integral part of the planting concept. There is ample opportunity for barrier-free group and team work in the different parts of the garden, whereas plenary sessions are best conducted in the Green Classroom.

The garden is run by the Department of Biology and is cared for and maintained by staff and students according to the principles of biodiversity, promoting education for sustainability. The cooperation of the English Department with the Department of Biology is mutually appreciative and rewarding for both sides, which is a crucial prerequisite for the fruitful conducting of projects on campus and in the garden.

Students studying English as a foreign language as well as Erasmus students from other countries regularly participate in a "Nature-Based Tasks in the EFL Classroom" seminar that has been offered for a number of years by the English Department. The natural environment offers many opportunities of linking language learning, literature, and culture with fieldwork as well as a chance of advancing students' ecocritical awareness. The most appropriate time for teaching outdoors in the ecological school garden is the summer term when some project results are then presented as part of the annual Open Day of the school garden. Students of English have the opportunity not only to connect their various research tasks with hands-on activities in the school garden, thus furthering their understanding of nature beyond its representation in culture- and literature-based research, but also to examine their ecocritical attitudes at the same time. The subject area of nature, literature, and culture lends itself ideally to the utilisation of a cross-curricular approach and can include science subjects as well as the arts and music. Reading assignments may consist of poetry, narrative nonfiction, and fiction with related research questions and are frequently undertaken in several sub groups, leading to presentations of content-based information in plenary sessions including peer feedback. A preliminary guided tour of the garden as well as the students' individual explorations prepare students for nature-based research tasks *en plein* air, which aim to establish links between their reading assignments and the natural environment.

ECOZON@ | *Vol 12, No 1*

The development of tasks for the secondary EFL classroom derived from the university students' research results are another aspect for the above mentioned seminar. Concluding projects, an exhibition-cum-gallery walk based on their research, are designed to take place on campus and also regularly contribute to the annual Open Day of the school garden.

The school garden is also a place for cross-curricular and university-wide projects such as the English Department's "Gardens in Art. Art in the Gardens" Project which took place in cooperation with the Art Department of the University of Education Karlsruhe. Other co-operations so far have included a collaboration of the English and the German departments of the University of Education Karlsruhe with the Karlsruhe Institute of Technology (*KIT*) Botany Institute to celebrate 400 years of Shakespeare. "Poetry Meets Botany: Shakespeare in the Garden" took place in the *KIT* Botanic Gardens, located next to the PH Garden, and included a performance of a medley of Shakespeare scenes, performed in both English and German, based on the symbolic use of selected flowers and plants in William Shakespeare's oeuvre. As part of the same event, these plants and flowers were presented and discussed in more detail and in their historical symbolic context in a talk given by the Botany Institute. A regular fixture in the school garden calendar is the event "Poetry in the Garden", organized by the Department of English of the University of Education Karlsruhe, which is open to the public and takes place in early June. Students, lecturers, alumni, and guests are invited to perform and enjoy poetry in the atmosphere of the midsummer garden.

The authors of this article appreciate the fact that school garden designs may differ from country to country, depending, for example, on climate types and climate zones, temperatures, availability of adequate soil, access to water, or length of growing seasons. These factors not only influence the design of the garden or the types of plants but also the topics to be covered in the school garden. For example, school gardens in developing countries could focus on topics such as nutrition, ecological planning, or sustainable local practices (e.g. Wolsey and Lapp 53–60). Furthermore, especially cities may offer limited space for school gardens, reducing the school garden to containers with plants in the school grounds (FAO).

ECOZON@ | Vol 12, No 1

Examples of EFL School Garden Projects at the University of Education Karlsruhe

Nature-based projects as an integral part of language teacher education offer a wide array of opportunities that by far exceed the constraints of merely textbook-orientated foreign language teaching and learning activities. The following section outlines three projects that teacher training students undertook during a seminar in the school garden. In each project a preparatory phase was followed by a process of experimentation with the respective techniques and materials before they entered into a production phase. Evaluation (stage 3) and reflection (stage 4) concluded the project (cf. Figure 2).

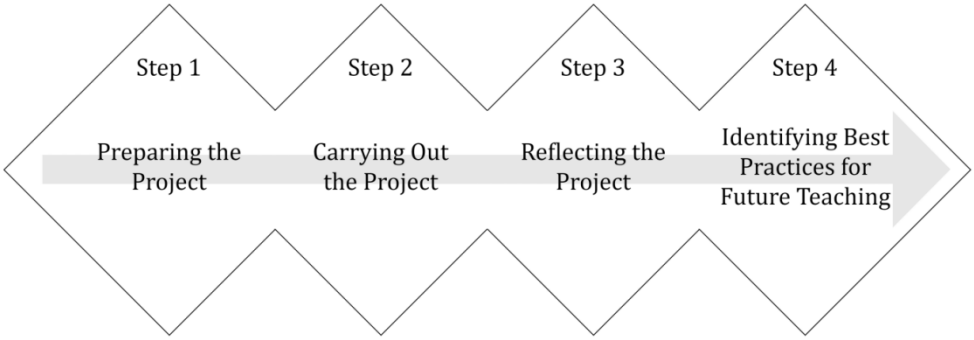

Figure 2: Integrating the School Garden into English Teacher Education.

The process as such was as important as the application of the newly acquired skills and techniques to a finished end product. The analysis, presentation, and discussion of their own learning experiences offer a valuable insight into the implications for their future classrooms at school. These learning experiences are in line with Gardner's suggestion for another intelligence to be added to his model, i.e. teaching-pedagogical intelligence ("Intelligences in the Classroom"), which allows us to be able to teach other people successfully.

Project 1: The Herb Project

This project addresses the topic areas of nutrition and healthy eating and aims to introduce the classification and the culinary as well as medicinal benefits of herbs in daily life. Throughout the process of students identifying and getting to know herbs with all senses (cf. Figure 3) the competences with regards to language learning cover the areas of vocabulary (nouns, verbs, adjectives and adverbs of the senses,), speaking, and writing. At the outset, the students' previous knowledge on herbs and their culinary and medicinal uses is ascertained before a guided walk through the school garden leads to discovering the various habitats of herbs. The location of the various herbs, of companion planting in the vegetable beds (e.g. tomatoes and basil) and in the flower beds (e.g. roses and lavender), and the tiered structure of the herb spiral offer insights into the variety of possibilities for planting herbs, while the "wild" herbs in the wildflower meadow introduce the opportunity of "foraging", of finding food for free, which has become popular in recent years in rural as well as urban environments. Naming the herbs in the students' mother tongue as well as finding out the equivalent in English is accompanied by exploring the herbs by touch, smell, and by taste. The task of gathering some of the herbs to take back to the Green Classroom offers the opportunity for further tactile, visual, olfactory, and gustatory examination, followed by research and discussion on the various uses and the culinary and medicinal benefits as well as possible risks of herbs. Students are encouraged to contribute their experience of herbs and spices in other countries. The preparation of a taste test includes rinsing the plants lightly, chopping or tearing the herbs and tasting them on lightly buttered slices of bread, which allows a pleasant experience of the sometimes delicate, sometimes more pungent flavours. Mixing chopped herbs with cream cheese is another option, and herbal teas can be prepared by infusing suitable

 ISSN 2171-9594

herbs with boiling water. A suitable home assignment of compiling a plurilingual table of herbs, together with an illustration/drawing/ photo and the possible culinary and/or medicinal uses, consolidates this foray into the world of herbs. An excursion to a botanic garden specially designed for medicinal and culinary herbs and particularly adapted to visitors who are visually impaired will serve to further increase the awareness of the many uses of herbs.

Figure 3: Identifying Herbs in the School Garden ©Bärbel Turner-Hill (2020).

Cross curricular cooperation with the subjects Biology and Home Economics is seen as a further opportunity in this context, and adapting the various activities across different age groups will offer new challenges for the teacher training students' future classrooms.

Project 2: A Seasonal Craft Activity with Natural Dyes

Using natural dyestuffs derived from organic sources like minerals, plants, and even insects to dye textile materials or in the production of paint has a long history dating back thousands of years. With a rising awareness with regard to the environmental and health impacts of synthetically produced materials since the late twentieth century came a resurgence of interest in using more environmentally friendly materials and in re-discovering ancient techniques of extracting dyes from natural materials like tree bark, roots, berries, and other plant-based matters as well as mineral sources (soil, rock) and also animal-based dyestuffs. Prehistoric cave paintings show the use of minerals but also burnt animal bones and charcoal and can serve as a starting point in an explorative journey of natural dyestuffs. Challenging students to draw, paint, or print on paper without commercially available art materials results in a quest to source appropriate materials. Since the school garden offers a limited supply only of these raw materials, the

ECOZON@ | Vol 12, No 1

participants' resourcefulness is challenged, and providing basic organic dyestuffs is advisable at this point. Nevertheless, this experimental phase allows for much discussion in class and is based on mutual support, resulting in often surprising 'artworks'. Again, the process is as important as the possible outcome of the activity. As the majority of plant- and mineral-based dyes are fugitive and not long lasting unless a treatment with mordant accompanies the dyeing process, a second step of this project combines a seasonal traditional craft with nature-based materials. Taking inspiration from the ancient Indonesian Batik technique of creating pattern on textiles by using wax as a resist before applying plant dyes (designated by the UNESCO as a part of the country's Oral and Intangible Heritage), a simpler process is used to dye Easter eggs with vegetable dyes. With this technique the impermanence of the dye matter is not an issue since the eggs are destined for speedy consumption. The required materials (chicken eggs, onion skins, leaves and grasses, gauze material, elastic bands or string) are easily available and inexpensive, and the process itself is not very time consuming and leads to often pleasantly surprising results. Procedure: Leaves and grasses suitable in size and consistency are collected in the school garden, applied like a template to the raw egg and secured with the help of thin stretchy material and rubber bands before being simmered for ca. 15 minutes in a decoction of water and a few handfuls of brown or red onion skins. Manual dexterity as well as patience and careful handling are a prerequisite for a successful result in this task. The wrapped eggs are then briefly rinsed in cold water and unwrapped carefully, revealing a more-or-less perfect image of the template on a mahogany brown background. A sparing application of olive oil produces an attractive shine. Further possibilities for dyestuffs in this task are red cabbage, spinach, nettles, the outer layers of green walnuts, ground leaves of the henna plant *(Lawsonia inermis*), or spices like turmeric. Students are regularly enthusiastic about this simple, low cost but very effective way of crafting a unique handmade product in the school garden (cf. Figure 4).

Figure 4: The Ecological School Garden, University of Education Karlsruhe ©Bärbel Turner-Hill (2020).

More options for simple natural dyeing processes suitable for the classroom include tie-dyeing reusable cotton shopping bags as a modern way of producing batik-like effects, and exploring traditional body painting methods with henna paste, also known as Henna Tattoos, a technique originating from ancient India and referred to as Mehndi (Subjects: Art Education, Biology, English). Regarding this project, observations were made in the reflection step that the task was less suitable for young pupils, and that a certain amount of teacher-led assistance was thought to be necessary in the classroom.

Project 3: Plurilingual Labels for the School Garden

This project was developed in cooperation with the Department of Biology of the University of Education Karlsruhe. Traditionally, botanic gardens have always displayed a nomenclature on their trees and plants enabling visitors to not only admire and enjoy nature within a framework of carefully orchestrated collections of plant life, sometimes within a reconstruction of their natural habitat or landscape, but also as reference points for scientists and scholars. Thus, the plant collections serve as living reference material supplying information that can range from the most basic information, the name of the plant or tree in the respective language of the country, to more complex information in Latin which is used as a common global language accepted by international organizations. Often both names, the common name and the Latin name, are displayed.

Figure 5: Working in the Green Classroom of the School Garden ©Bärbel Turner-Hill (2019).

As the ecological school garden in Karlsruhe is situated in the grounds of the Botanic Garden (established 1879) of the *KIT*, many of the older trees and plants are still labelled in German and Latin. The "new" ecological school garden contains many new areas, which are being consecutively labelled in German. Some of the areas which are replanted on an annual basis (mainly the vegetable garden, herb sections, and occasionally newly designed areas) are the subject of an ongoing project supplying labels in English as a convenient way to impart information about the plant in more than one

language. After some research in order to source durable, environmentally friendly markers that should ideally make use of recycled material, and potentially have to withstand the cold German winters, the project team was fortunate in locating roof tiles made from slate which were ideal for the purpose. The process involved cutting the slate fragments to a suitable size, finding metal rods to support the slate tablets in the various locations, and experimenting with a variety of markers with which to inscribe the labels. Research on the lexically correct translation of the German names was followed by trying out a selection of handwritten fonts, and finally inscribing the tablets before they were installed in situ. The whole process involved the students in various activities and tasks, from locating the plants, identifying the plants either with the help of the reference library in the garden or by app, designing the fonts (cf. Figure 5), applying the lettering, and distributing the finished plant labels in the correct location. At present English is the language of choice, but other languages, appropriate to the areas where the school gardens are located, are always an option (Turkish, French). This labelling in a different format could also take the form of signposts pointing out the barefoot trail, the composting area, the wildflower meadow, and so forth. Plants are subject to change seasonally: some annuals disappear after a period, and biennial and perennial plants will resurface in the same spot in the following growing season, so the plant labelling project may need annual refurbishment as well as requiring a continuity throughout the seasons, and longer. Up until now, the Labelling Project has included the herb garden, the vegetable plot, and a habitat for drought loving Mediterranean plants, but, new areas are already in their early planning stages.

A Glimpse into the Future: Using Digital Technology as an Interface Between Humans and Nature

In recent years, digital tools have been increasingly used in EFL (De Florio-Hansen; Lütge and Merse; Ludwig "Digital Teaching"; Bündgens-Kosten and Schildhauer). Although research indicates that digital technology does not per se improve the learning experience or automatically lead to better learning outcomes (Hattie), there is empirical evidence that digital technology has the capacity to support pedagogical transformation and, for example, help students to achieve better learning results and increase their motivation. Furthermore, digital media helps bridge the gap between students and teachers, thus creating more collaborative and student-centred learning environments (Ludwig and Van de Poel). More recently, emphasis has been put not only on how individual tools can be used inside the classroom, for example, to improve students' language and communication skills, but also on how technology can be used outside the classroom, how in- and out-of class learning can be better connected with each other, and how technology can help to create learning ecosystems. Here, concepts such as Mobile-Assisted Language Learning (MALL) (Reinders), situated learning (Reinders and Pegrum), informal learning (Coffield), and personalised learning environments (PLEs) (Falk) are worth investigating. What all these concepts have in common is that they stress the importance of (foreign language learning) experiences thatstudents can have outside

ECOZON@ | Vol 12, No 1

structured and formal classroom environments, ultimately making learning more engaging, more authentic, and also more individual, by allowing students to learn according to their intelligences. In 2004, Nan B. Adams proposed extending Gardner's intelligence model by adding a ninth intelligence, namely digital intelligence, arguing that digital smarts draw on several intelligences to face the challenges and demands of digital technology.

During the summer term 2020, when all face-to-face classes at German schools and universities were suddenly moved online to help reduce the spread of the COVID-19 virus, the aforementioned seminar was equally affected by the transition to distance learning as the school garden was no longer open for students.

In order to mitigate the effects of the garden closure, the school garden course was redesigned, combining elements of synchronous and asynchronous learning and making use of the fact that during the lockdown the majority of students were confined to their homes but going for walks and exercising outside were still allowed. In order to foster an emotional connection to nature and help students reflect their time outside, they were asked to keep a nature diary in which they collected and recorded their encounters with nature and shared it with the class on the course platform. Furthermore, all course participants were asked to download self-chosen plant identification apps, allowing them to have a more guided experience of nature. While students used different apps in German and in English (cf. Figure 6), among others *Flora Incognita*, *Plantsnap*, and *PlantNet*, all apps shared some common features, such as identifying (indoor and outdoor) plants, herbs, and trees simply by photographing them with their smartphones. Once the apps have identified the plant, the user can access a species profile page, providing detailed information about the plant such as characteristics, properties, distribution, and protection status. Furthermore, the text is hyperlinked which allows for further research and has a notes section where students can write own their ideas and questions. Also, users can share their plant observations with other users via social media. Although the apps do not have an "underlying conceptual or pedagogic framework," (Read et al. 224) they allowed students not only to learn in more informal contexts but also on the spot.

ECOZON@ | *Vol 12, No 1*

Plant type: herb

Lifespan: annual

Bloom time: summer

Called "spreading" hedgeparsley as it spreads faster than grass weed

Figure 6: Example of an App Result Taken from a Student Nature Diary.

Moreover, the use of the apps was embedded in a more specific task design as students were given the following task: Please find five (or more) trees/ shrubs/ flowers/ herbs you come across on your walks, and record your findings in the next section of your nature diary, including names, location, description, usage (if applicable), and a photo. Access other internet sources for support if you wish.

The diary results and students' reflections show that most students used one of the plant identification apps to complete this task, allowing them to not only identify but also instantaneously learn more about the plant or tree they had encountered. Furthermore, the results indicate that using the apps was motivating ("It was so much fun using these apps because I've never tried anything like that before") and students also appreciated the fact that naming plants and finding out more about them was much quicker and much easier. Students' use of the apps was quite diverse and often concentrated on their personal interests and knowledge gaps. For example, one student particularly focused on the healing powers of plants (in former times and today) as well as the symbolism of certain plants and flowers as the image depicted in Figure 7 shows:

ECOZON@ | Vol 12, No 1

Figure 7: Symbolism in Nature.

Overall, the more conscious perception and experience of nature helped them "realise how much variety is around us" (Resp. 10) and relate to nature, for example, through finding out which plants were edible, toxic, or used for medical purposes. However, it should be noted that the correct identification of plants depends on the quality of the photo.

In addition, students were asked to reflect their use of the app with regard to their future teaching profession. The results indicate that students especially appreciated the opportunity of plant identification apps to bring digital elements into nature-based/garden-based education and pursue learning aims which are close to the ones of environmental learning as the following quote illustrates:

> I think these apps are a great way to combine nature and technology. Nowadays, basically everyone has a smartphone with camera function, and I feel like it is safe to say that most of us bring their phone everywhere. Therefore, it would be easy to include this on a field trip or a walk with the class. The students automatically learn e.g. which plants are in danger of extinction and what could be done to prevent that from happening. They also might learn which plants are edible and if so, what meal can be made from them. (Respondent 6)

Furthermore, the students also identified opportunities for connected in- and out of classroom learning, for example enabling them to write up their class observations in the classroom or to give short presentations on their findings.

ECOZON@ | Vol 12, No 1

Conclusion

School gardens offer a space for closing the widening gap between nature and children (Beames et al.) by providing real-life learning experiences in nature. However, school gardens also offer a cornucopia of opportunities to develop students' English as a foreign language competency, especially as environmental education is increasingly incorporated into teaching English. The school garden projects described in this article illustrate how learning about environmental issues and learning English can be brought together as students not only think and act green but do so in English. Furthermore, the examples illustrate how school gardens allow for learner-centred learning environments in which students' individual intelligences and differences can be catered for, especially as the teacher hands over power and responsibility to the learners. The three projects conducted in the garden of the University of Education Karlsruhe as well as the use of the plant identification apps and nature diaries offer a glimpse into the future of nature- and garden-based education, especially as the used plant identification apps functioned as a simple interface between individual students and nature. Environmental education and promoting students' critical environmental literacies need to become integral elements of English language education, which is also promoted through teaching children in the school garden.

Submission received 24 September 2020 Revised version accepted 2 February 2021

Works Cited

Adams, Nan B. "Digital Intelligence Fostered by Technology." *Journal of Technology Studies,* vol. 30, no. 2, 2014, pp. 93–97.

Beames, Simon, et al. *Learning Outside the Classroom: Theory and Guidelines for Practice*. Routledge, 2011.

Benkowitz, Dorothee. *Wirkung von Schulgartenerfahrung auf die Wahrnehmung pflanzlicher Biodiversität durch Grundschulkinder*. Schneider-Verlag Hohengehren, 2014.

---. "Schulgelände als Ort einer Bildung für nachhaltige Entwicklung." *Ganztagsschule und Umweltbildung. Erste Tagung des Umweltbildungsprojektes* NaDiQuAK, edited by Andreas Martens, Schneider Verlag Hohengehren, 2016, pp. 49–57.

Brown, Jane. *The Pursuit of Paradise: A Social History of Gardens and Gardening*. HarperCollins, 1999.

Büdgens-Kosten, Judith, and Peter Schildhauer, editors. *Englischunterricht in einer digitalisierten Gesellschaft*. Beltz Juventa, 2021.

Claiborne, Lily, et al. "Teaching Outside the Classroom." *Vanderbilt University.* 2020, cft.vanderbilt.edu/guides-sub-pages/teaching-outside-the-classroom/. Accessed 23 Sep. 2020.

Coffield, Frank. *The Necessity of Informal Learning.* Policy Press, 2000.

Council for Learning Outside the Classroom. "What is LotC." *Council for Learning Outside the Classroom*, 2020, www.lotc.org.uk/what-is-lotc/. Accessed 22 Sep. 2020.

Cutter-Mackenzie, Amy. "Multicultural School Gardens: Creating Engaging Garden Spaces in Learning about Language, Culture, and Environment." *Canadian Journal of Environmental Education*, vol. 14, no. 1, 2014, pp. 122–135.

Deetjen, Claudia and Christian Ludwig, editors. "Introduction – Developing Students' Critical Environmental Literacies in the ELT Classroom." *Developing Critical Environmental Literacies in the EFL Classroom.* Winter, forthcoming 2021, pp. 9-25.

De Florio-Hansen, Inez. *Teaching and Learning English in the Digital Age*. UTB, 2014.

Desmond, Daniel, et al. *Revisiting Garden-Based Learning in Basic Education.* Food and Agriculture Organization of the United Nations/International Institute for Educational Planning, 2004.

Eisenmann, Maria. *Teaching English: Differentiation and Individualisation*. UTB, 2019.

Falk, Simon. *Mobile-Assisted Language Learning: Eine empirische Untersuchung zum Einsatz digitaler Endgeräte im Kontext des Fremdsprachenunterrichts*. Narr, 2019.

FAO. "School Gardens." *FAO*, 2006, www.fao.org/schoolgarden/. Accessed 17 Nov. 2020.

FAO et al. *The State of Food Security and Nutrition in the World 2020. Transforming Food Systems for Affordable Healthy Diets*. *FAO*, 2020, doi:10.4060/ca9692en.

Gaeke, John. "Neuromythologies in Education." *Education and Neuroscience: Evidence, Theory and Practical Application*, vol. 50, no. 2, 2008, pp. 123–133.

Gardner, Howard. *Frames of Mind*. Basic Books, 1983.

---. "Intelligences in the Classroom." Home page, 2016. Accessed 24 Sep. 2020.

---. *Intelligence Reframed*. Basic Books, 1999.

---. "Reflections on Multiple Intelligences: Myths and Messages." *Phi Delta Kappan*, vol. 77, no. 3, 1995, pp. 200–209.

Graham, Heather, et al. "Use of School Gardens in Academic Instruction." *Journal of Nutrition Education and Behavior*, vol. 37, no. 3, 2005, pp. 147–152.

Hattie, John. *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Routledge, 2009.

Hobhouse, Penelope. *The Story of Gardening*. Dorling Kindersley, 2002.

IPCC. "Summary for Policymakers." *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, edited by Valerie Masson-Delmotte et al., 2018.

Kuhn-Deutschländer, Janina. "Teaching for Environmental Justice: Environmental Education and the EFL Classroom." *Developing Critical Environmental Literacies in the EFL Classroom,* edited by Christian Ludwig and Claudia Deetjen. Winter, forthcoming 2021, pp. 27–43.

Kuo, Ming, et al. "Do Experiences with Nature Promote Learning? Converging Evidence of a Cause-and-Effect Relationship." *Frontiers in Psychology*, vol. 10, 2019. *Crossref*, doi:10.3389/fpsyg.2019.00305.

Lehnert, Hans-Joachim, et al. *Schulgärten. Anlegen, pflegen, nutzen.* Verlag Eugen Ulmer, 2016.

Ludwig, Christian, and Kris Van de Poel. *Collaborative Learning and New Media: New Insights into an Evolving Field*. Peter Lang, 2017.

Ludwig, Christian. "Teaching Literature with Digital Media." *Digital Teaching and Learning: Perspectives for English Language Education,* edited by Christiane Lütge and Thorsten Merse, Narr Francke Attempto, 2021, pp. 209-232.

---. "'The Future is Now' — Virtual Reality im Englischunterricht." *Englischunterricht in einer digitalisierten* Gesellschaft, edited by Judith Bündgens-Kosten and Peter Schildhauer, Beltz Juventa, 2021, pp. 175-187.

Lütge, Christiane, and Thorsten Merse, editors. *Digital Teaching and Learning: Perspectives for English Language Education.* Narr Francke Attempto, 2021.

Mayer, Sylvia, and Graham Wilson. *Ecodidactic Perspectives on English Language, Literature and Culture*. Wissenschaftlicher Verlag Trier, 2006.

Mayer-Smith, Jolie, et al. "Teaming Children and Elders to Grow Food and Environmental Consciousness." *Applied Environmental Education and Communication. An International Journal,* vol. 6, no. 1, 2007, pp. 77–85.

Möller, Rainer, and Hartmut Giest. "Beispiele für die Anlage und Nutzung von Schulgärten in Brandenburg und Berlin." *Umweltbildung und Schulgarten. Eine Handreichung zur praktischen Umweltbildung unter besonderer Berücksichtigung des Schulgartens*, edited by Hartmut Giest, Universitätsverlag Potsdam, 2010, pp. 87-94.

Montessori, Maria. *The Montessori Method. The Origins of an Educational Innovation: Including an Abridged and Annotated Edition of Maria Montessori's The Montessori Method*, edited by Gerald Lee Gutek, Rowman & Littlefield Publishers, Inc., 2004.

Read, Timothy, et al. "Exploring the Application of a Conceptual Framework in a Social MALL App." *New Perspectives on Teaching and Working with Languages in the Digital Era*, edited by Antonio Pareja-Lora, et al., Research-publishing.net, 2016, pp. 223–232.

Reinders, Hayo. "Contemporary Computer-Assisted Language Learning." *Contemporary Studies in Linguistics,* edited by Micheal Thomas and Mark Warschauer, Bloomsburry, 2014.

---, and Mark Pegrum. "Supporting Language Learning on the Move: An Evaluative Framework for Mobile Language Learning Resources." *Second Language Acquisition Research and Materials Development for Language Learning,* edited by Brian Tomlinson, Routledge, 2016, pp. 116–141.

Schenk, Inge. "Wege zur Naturerziehung als generationsübergreifende Aufgabe." *Umweltbildung und Schulgarten. Eine Handreichung zur praktischen Umweltbildung unter besonderer Berücksichtigung des Schulgartens*, edited by Hartmut Giest, Universitätsverlag Potsdam, 2010, pp. 11–22.

Strife, Susan, and Liam Downey. "Childhood Development and Access to Nature: A New Direction for Environmental Inequality Research." *National Center for Biotechnology Information,* 2009, doi: 10.1177/1086026609333340. Accessed 23 September 2020.

Uglow, Jenny. *A Little History of British Gardening*. Random House, 2005.

UNESCO. *Global Citizenship Education: Preparing Learners for the Challenges of the 21st Century*. UNESCO, 2014.

United Nations. *Transforming our World. The 2030 Agenda for Sustainable Development. A/RES/70/1*. United Nations, 2015.

Williams, Dilafruz. "Garden-Based Education." *Oxford Research Encyclopedias.* 2018, doi: 10.1093/acrefore/9780190264093.013.188. Accessed 22 September 2020.

Wilson, Ruth. *Nature and Young Children. Encouraging Creative Play and Learning in Natural Environments*. Routledge, 2007.

Wolsey, Thomas Devere, and Diane Lapp. "School Gardens: Situating Students Within a Global Context." *The Journal of Education*, vol. 194, no. 3, 2014, pp. 53–60.