

## TECHNOLOGY-ASSISTED TEACHING ACTIVITIES IN AN ESAP CONTEXT: AN ECOLOGICAL PERSPECTIVE

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**ABSTRACT.** *Technology-Assisted Teaching Activities in an ESAP Context: An Ecological Perspective.* The present article focuses on the design of various technology-assisted teaching activities as part of a practical English for Specific Academic Purposes (ESAP) course addressed to undergraduate students in Biology and Geology, Babeş-Bolyai University. As more and more AI-assisted tools – ‘traditional’ or generative AI (GenAI) – are becoming readily available to the general public, there is a growing pressure on educators to employ such tools in the classroom in order to foster technology-enhanced learning. I start from the idea that the ESAP teaching-learning process can benefit from the usage of such tools, even though some precautionary measures may be needed at this point. The perspective adopted draws on an ecological approach in the sense that theory and practice are viewed as intermingling in the research process (Van Lier 2010). Additionally, pedagogic decisions are taken in relation to “local realities” (Tudor 2003), such as, the targeted students’ general knowledge of English, attitudes to language learning, preferred modes of learning, relevant background knowledge and also with respect to the functionality of the digital tools examined. The central point of the envisaged activities is the bringing into play of relevant specific-subject and/or academic vocabulary. In other words, the underlying objective of these activities is to depict some contextualised vocabulary appropriate for the students in Biology (as suggested by Hyland 2007). First, I present some definitions regarding various types of vocabulary linked to the specific academic learning context, then I discuss some of the students’ expectations. Next, I illustrate several teaching activities in which digital

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tools are involved, evaluating some of their benefits and/or disadvantages. The tools discussed are the following: two search engines, *SkELL*, *Sentence Stack*, four instruments provided by the *EAPFoundation.com* website, i.e. the *Vocabulary profiler & Academic word profiler* (online corpus-based tools), *The AWL highlighter & Gapfill maker*, and ChatGPT 3.5 (gen-AI, the current freely-available version). Finally, I outline some considerations regarding the practicality of some digital learning tools.

**Keywords:** *English for Specific Academic Purposes, teaching activities, digital learning tools, AI-assisted tools, ecological approach*

**REZUMAT. Activități de predare asistate de tehnologie într-un context de învățare a englezei pentru scopuri academice și specifice: O abordare ecologică.** Acest articol se ocupă de elaborarea unor activități de predare cu sprijinul tehnologiei în cadrul unui curs practic de engleză pentru scopuri academice și specifice adresat studenților din ciclul licență ai Facultății de Biologie și Geologie, din Universitatea Babeș-Bolyai. Pe măsură ce devin disponibile tot mai multe instrumente asistate de tehnologie – „tradiționale” sau IA generative (GenAI) – crește presiunea asupra educatorilor de a întrebuința astfel de instrumente în clasă, având ca obiectiv progresul în domeniul educației asistate de tehnologie. Pornesc de la ideea că activitatea de predare-învățare de acest tip poate beneficia de pe urma întrebuințării tehnologiei, deși anumite măsuri de precauție pot fi necesare în această etapă. Perspectiva adoptată aici este de natură ecologică în sensul că teoria și practica sunt văzute ca fiind complementare în procesul de cercetare (Van Lier 2010). Pe deasupra, deciziile pedagogice sunt rezultatul „realităților locale” (Tudor 2003), cum ar fi, cunoștințele generale de limbă engleză ale studenților, atitudini privind învățarea limbilor străine, cunoștințe specifice relevante sau funcționalitatea instrumentelor digitale evaluate. Punctul central al activităților dezvoltate este scoaterea în evidență a vocabularului de specialitate și/sau academic. Cu alte cuvinte, obiectivul de bază al acestora este conturarea unui vocabular contextualizat potrivit studenților vizați (cf. Hyland 2007). Prima dată, se prezintă niște definiții ale diverselor tipuri de vocabular din contextul specific academic, apoi așteptările studenților sunt discutate. După aceea, se ilustrează câteva activități didactice în care sunt implicate instrumente digitale, evaluând unele din beneficiile și/sau dezavantajele lor. Instrumentele digitale discutate sunt următoarele: două motoare de căutare, *SkELL*, *Sentence Stack*, patru aplicații oferite de website-ul *EAPFoundation.com*, i.e. *Vocabulary profiler & Academic word profiler* (instrumente online bazate pe corpus), *AWL highlighter & Gapfill maker*, și ChatGPT 3.5 (gen-AI, versiunea curentă disponibilă în mod gratuit). În cele din urmă, se schițează câteva concluzii privind aplicabilitatea unora din instrumentele digitale considerate.

**Cuvinte-cheie:** *Engleza pentru scopuri specifice și academice, activități de predare, instrumente digitale de învățare, instrumente asistate de IA, abordare ecologică*

## Introduction

The educational field has been constantly pressured to adapt to various types of changes occurring in society. The integration of technology in the educational process has been an imperative requirement in second language learning ever since the 1960s, starting with the inclusion of video, computers, or multimedia in class (Tudor 2003), followed by further digital applications (mobile phones, robots, virtual reality) used in various formats, such as e-learning, blended or in-person learning (Tulinayo, Ssentume and Najjuma 2018). During the Covid-2019 period, when emergency remote teaching emerged, a new peak in technology-assisted learning was attained (Sum and Oancea 2022). The pace of progress has been speeding up even more recently as the world has again been taken by storm by the advent of the open generative artificial intelligence (GenAI) (Atlas 2023; Crompton and Burke 2023).

Besides being an academic field having had to continually justify its relevance among other disciplines (Hyland 2018), English for Academic Purposes (EAP) is also an area in which world transformations have quickly reverberated, possibly because it is one of the most needs-focused disciplines. This is illustrated by its continuous efforts in trying to find ways to best serve speakers' communicative or real-life needs (Dudley-Evans and St John 2012; Hyland 2018; Council of Europe 2020). As the urge for technologically-enhanced learning is gaining even more ground, I posit that classroom usage of digital tools must be a conscious, trimming-down process, reflecting the needs of learners at issue.

The aim of the current article is to analyse how some digital tools can be employed to identify or put into practice relevant specialised vocabulary in the context of Biology-related studies, more specifically, as part of an English for Specific Academic Purposes (ESAP) course. As the starting point relates to vocabulary, I begin by presenting the main categories defined within the literature. Then, I discuss some findings linked to the target students' expectations, since I also argue for the importance of classroom ecology (Tudor 2003). The methodological view adopted here is termed *ecological* also in the sense that theory and practice are intertwined (Van Lier 2010) when discussing technological applications in activity design.

## Vocabulary Types in ES(A)P. An Overview

ESAP is part of the *English for Specific Purposes* (ESP) movement, which emerged in the 1960s (Dudley-Evans and St John 2012, 2). ESP can be split into two branches, namely *English for Academic Purposes* and *English for Occupational Purposes* (7). One of the major driving factors in this field has been the necessity

of having language teaching and learning answer the needs of specific learners, who are mainly interested in using a language in definite, goal-oriented contexts. These needs are dependent on the type of tasks learners need to perform (4), since the 'English' medical students need (for academic purposes) is different from the one doctors require (for occupational purposes). This distinction may not be so much in terms of language (i.e. special vocabulary, grammar, registers, genres - Dudley-Evans and St John 2012, 4), but the methodology teachers use in class may involve different procedures appropriate to their students.

Most researchers concur in that an ES(A)P programme of study entails the fact that its content is centred around specific-subject language, meaning specialised topics and particular language items. First and foremost, the focus has been on the subject-specific vocabulary which must first be identified and then acquired, sometimes at the detriment of grammar (Dudley-Evans and St John 2012). Put differently, what ES(A)P mostly presupposes is some kind of *specialised vocabulary*, which can be defined as the set resulting from various systematic restrictions on the language matter under consideration (Nation 2013, 30). *Specialised vocabulary* is an all-encompassing term which consists of several types of vocabulary distinguished in the field.

Nation (2013), whose work relies on the results of corpus linguistics, discusses vocabulary first in terms of frequency, dividing it into three main categories: *high-, mid-, and low-frequency words*. The first category contains words which ensure the understanding of a text to a large extent. This would involve knowing somewhere between 3,000-to-4,000-word families to obtain 98% text coverage (14) or 80% of most texts (Hyland, 2007). According to Nation (2013), the go-to list of high-frequency (mainly) general words is Michael West's (1953) *A General Service List of English Words* (GSL) (18), containing 2,000-word families. It contains the totality of function words, though the great majority is made up of content words (Nation 2001: 13-16 *apud* Chung and Nation 2003). Mid-frequency words are still general English ones, the knowledge of which means understanding English without assistance, whereas low-frequency words include technical terms and the ones that are seldom met (Nation 2013, 14-19). The GSL list has been updated within a project developed on the 60<sup>th</sup> anniversary of West's publication of the GSL (Laughran 2018, para. 3). After applying various computer-based corpus tools to the *Cambridge English Corpus* (CEC) previously referred to as the *Cambridge International Corpus* and using Nation's expertise, *The New General Service List* (NGSL) was obtained<sup>2</sup>.

Nation (2013) explains that several types of specialised vocabulary can be established, depending on their purpose or scope. For example, there can be

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<sup>2</sup> See Charlie Browne Company Inc. (2023).

special vocabularies connected with either of the four skills (Reading, Writing, Speaking, Listening), vocabularies showing frequency counts applied to a set of relevant texts, or consisting of word lists put up by specialists in a certain field. Not least, academic and technical vocabularies are also discussed. Academic vocabulary is viewed as that which is common to several disciplines, having a higher frequency in academic texts than in non-academic ones. It mainly includes formal language (30, 291), while technical vocabulary is made up of words specific to a certain subject area (303, 304). The most prominent research on academic vocabulary is Coxhead's *Academic Word List*, containing "570 word families that account for approximately 10.0% of the total words (tokens) in academic texts but only 1.4% of the total words in a fiction collection of the same size. This difference in coverage provides evidence that the list contains predominantly academic words." (Coxhead 2000, 213).

Academic vocabulary is equated with the linguistic aspect that should be the main content of an ESP language class, some writers going so far as to suggest that technical words are not to be *taught* by the English teacher (Barber 1962; Higgins 1966; Cowan 1974 *apud* Nation 2013, 305), since humanities-trained teachers are not sufficiently prepared to teach subject-specific language (Nation 2013, 293; Dudley-Evans and St John 2012, 194). Nevertheless, a grasp of the specific subject content is still believed to be of service when teaching (Nation 2013, 305; Nation 2003, 114).

Several terms have been assimilated to specialised vocabulary, the meaning of which may overlap or not, such as: "special purpose, specialized, technical, sub-technical, and semi-technical vocabulary." (Coxhead 2013, 116). One important difference is the one between technical and semi-technical vocabulary, though a consensus among researchers has not been achieved regarding how to discriminate between the two. Semi-technical vocabulary may be defined as general vocabulary which takes on an additional meaning in a subject-specific text (Coxhead 2013).

One of the methods for the determination of a word's technicality is the usage of a scale (Coxhead 2013). For instance, Chung and Nation (2003) devised a four-level scale for finding technical words in an anatomy text. Their steps 3 and 4 were defined as technical words by them, yet, seemingly, these overlap the categories of *semi-technical* and *technical*, respectively. Step 3 includes words that are also used in general language, but which have certain specific "restrictions of usage" in the subject area, such as *chest*, *trunk*, *cage*. These words may be part of the *high-frequency* category or even of the AWL. Step 4 consists of words having a meaning specific to the field considered and which are most probably unknown in general usages (*periosteum*, *viscera*, *intervertebral*). They are often Greek or Latin-based forms (105, 108, 112). The second method

that can be used is the corpus-based one, which is useful in the development of word lists, and which may make use of keywords or be based on frequency (Coxhead 2013, 118).

Besides discerning between the various types of words, growing attention has been given to other lexical aspects, such as multiword units (compounds/two-word phrases), lexical bundles (corpus repetitive occurrences of three or more words), frequent collocations, euphemisms, or metaphors (Coxhead 2013), and to academic-oriented grammatical aspects, such as hedging, nominalisation, acronyms etc. (Hyland 1995, 2021). It can be specified that there has been a shift from the earlier ideas suggesting that grammar should be put in the background in the ESP classroom to the evolution of specifically-designed academic grammar books (e.g. Paterson and Wedge' *Oxford Grammar for EAP* (2013))<sup>3</sup>.

Dudley-Evans and St John (2012)'s approach distinguishes between the *carrier content* and the *real content*. The former is the subject matter of a text, for instance the *life cycle* of a plant, whereas the latter represents the language or skill content, which would be the main aim of an ESAP activity, e.g. the description of a process, including the idea of stages in a process, the usage of sequencers etc. (XIV, 11). I find the distinction between these two very useful in mirroring the two main content segments that compose an ESAP course.

### **Context-Specificity in Teaching. An Ecological Approach**

Identifying and classifying vocabulary into the above-mentioned categories has been expected to provide the common database for a large category of ESAP university classes. First-year undergraduates, the targeted learners, face a manifold challenge: they are expected to use *technical vocabulary*, talk about *specific-content knowledge*, and employ *academic language*. Corpus-based research has focused on delimiting the academic common core, often equated with the AWL (or its new, updated version (NAWL; Charlie Browne Company Inc. 2023)). Coxhead (2013) focuses not only on academic lists, but also on some specialised ones, providing some guidelines for assessing word list relevance for a specific class at the same time (129).

In his turn, Hyland (2007) questions the extent to which an academic vocabulary list can cater for any type of course. He goes on to show that seeking to point out and then teach a common-core academic vocabulary is somewhat deceiving as words tend to illustrate different meanings in distinct subject areas. More importantly, he suggests that teachers should seek to teach the most beneficial vocabulary to their students, in view of their unique context.

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<sup>3</sup> See Paterson's (2024) website at <https://www.kenpatersonwriter.com/academic-grammar/>.

Additionally, relevant texts need to be analysed with the help of corpus-based tools, if possible.

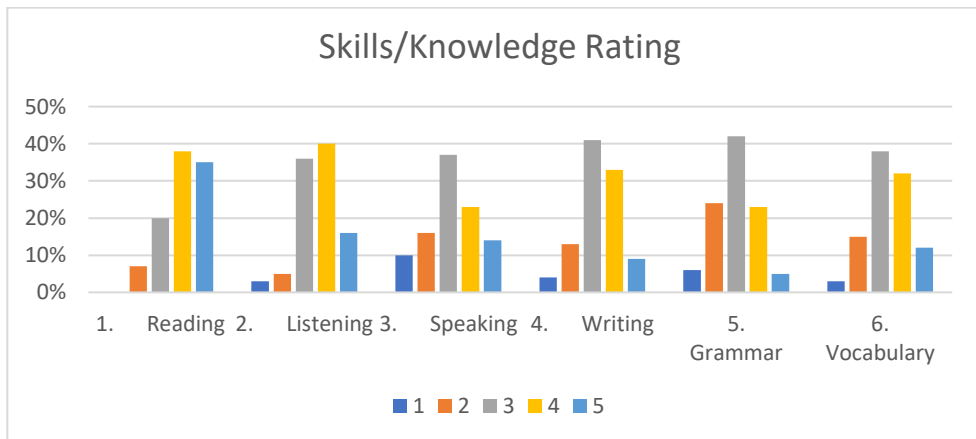
Currently, ESP teachers not only deal with specialised language, which is already regarded as an intrinsic part of their job, but also with the avalanche of digital tools, from more 'traditional' ones to the newly-developed GenAI technology. As a response to the continuously-expanding technologies, my proposal is to adopt an ecological perspective as explained in Tudor (2003). He contrasts an *ecological* approach aiming at "local meaningfulness" to a *technological* one, in which "mainstream methodology" is taken to cater for all specific situations in a direct, unproblematic manner (8). He argues that teaching should be envisaged as a complex, subjective and mutable endeavour that cannot be simply captured by a 'mathematical equation' with technology at its core. By extrapolating, I have considered that the ESAP practical course could benefit from relating to the particularities of the specific student group, determined first by conducting a needs analysis, and then by continuously assessing their particular needs or preferences. On a more general note, the course content may be the same throughout time, but the means through which it is conveyed may vary. Care needs to be taken not to make technology usage the main focus, but rather it should be included only when it fits the main objective of an activity and the students' profile and needs.

As an example, the programme discussed here is addressed to first-year students at the Faculty of Biology and Geology, Babeş-Bolyai University, Cluj-Napoca. Several Biology-related specialisations are included: Biology, Biochemistry, Environmental Biology, Industrial Biotechnology, Ecology and Environmental Protection. The course spans over two semesters and is an ESAP practical language course. Its content includes several common-core topics in the targeted discipline. Here I present some technologically-assisted activities, some of which have been implemented during the first semester of the 2023-2024 academic year, while others are analysed for the future. The time of writing this article being the end of the first semester, my presentation combines a teacher's reflection process with a researcher's observations.

At the beginning of the first semester, during the first class, a pre-course survey was administered to students by means of a questionnaire created in Google Forms. The students were informed that the survey objective was to help the teacher better understand their background and expectations. There were 110 answers validated. The questionnaire comprised 10 questions, of which 8 were closed-format questions (5 multiple-choices/3 Likert statements, one of which was a 5-scale Likert statement with 6 subpoints) and two were open-ended.

The first question required students to self-assess their proficiency level according to the Common European Framework of Reference for Languages (CEFR). As shown by the answers, the great majority of students rate their initial level of English knowledge at the B2 level (43%), 19% of them ranging higher than the B2 level (15 students –C1 level;7 students – C2 level). 11% of the students' level is lower than B1, which means that the specific purpose content might pose difficulties for them. Almost three quarters (79 students) stated that they did not hold an internationally-recognized certificate (second question).

The third statement was meant to ascertain the perceptions students had regarding their English skills and their knowledge of vocabulary and grammar, rating each from 1 (the lowest) to 5 (the highest). The receptive skills (Reading and Listening) rank high in terms of perceived ability, the largest proportion of students evaluating theirs at level 4 on the Likert scale: 38% in the case of Reading (42 students) and 40% in the case of Listening (44 students). Regarding the productive skills (Speaking and Writing), the largest proportion of respondents rate their abilities as being in the middle of the scale (level 3: 37% and 41%, respectively). Grammar and Vocabulary have similar results in what concerns the largest proportion, with 42% students considering that their Grammar knowledge is acceptable (level 3) and 38% reporting the same for Vocabulary. The lowest percentage of students that opted for level 5 was in the case of Grammar with 5% and Writing with 9%, which signals their weakest points and consequently, the aspects that need most improvement.



**Figure 1.** Skills and knowledge rating

When asked about their preferred grouping mode, what stood out was that students could be divided into two main categories, the ones who prefer to



work in small groups of 3-4 people (44%) and those who would rather work individually (31%). The other variants were pair work (15%), larger groups of 5-8 (6%) or "I do not enjoy practical courses" (4%). This led to the conclusion that the first two grouping possibilities were to be used, if possible, to the highest degree in the classroom environment.

Another aspect referred to the amount of time students were willing to spend on homework. 49% of the respondents chose the 30 minute-interval, which was followed by 18% who opted for 45 minutes and 15% for 15 minutes. There were also 4% of the respondents who preferred not to work at all at home. Bearing the numbers in mind, I decided to group the homework tasks in two types, 'obligatory' ones (with an estimated time of 30 minutes) and optional ones (10/20/30-minute extra activities). Because the groups are multi-level, at times homework tasks were devised differently.

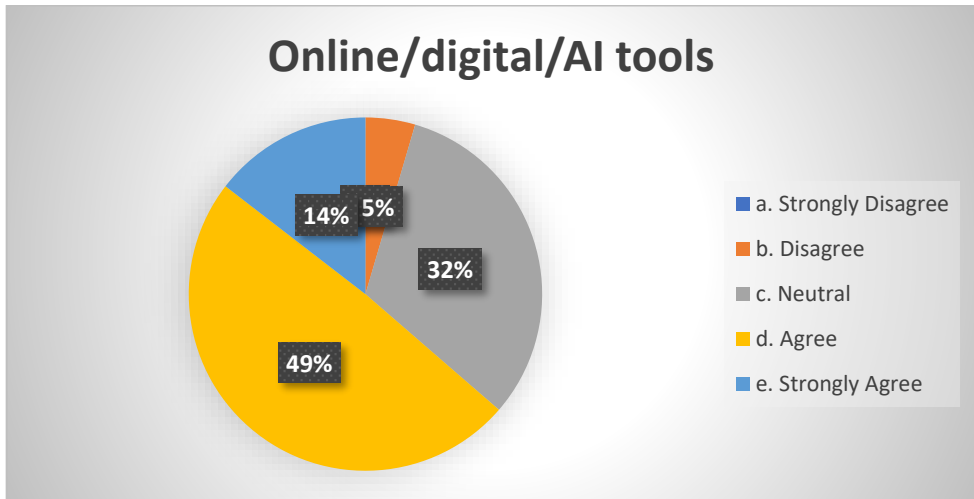
Statement 6 in the pre-course survey was aimed at grasping students' study strategies of taking notes when exposed to (visual-)auditory or reading texts. The answers show that students would either put down brief notes (39%) or not take notes at all (24%), which points to a higher reliance on the auditory learning style. This is also an indication that spelling might be an area needing attention. Furthermore, the results indicate that one type of skill-based language activities could focus on the *Cornell Note-Taking System*<sup>4</sup>, which promotes reflection on input data, and thus could enhance high-order thinking skills.

Positive attitudes towards playing language learning games during the English language course were reflected by the answers to statement 7. 49% of the respondents agreed with the statement, while 23% expressed strong agreement. A small minority of students (4%) disagreed with playing games. Consequently, games were included in the content of the first-semester course, most of which were designed with the help of *Wordwall* (<https://wordwall.net/>) (e.g. Anagrams, Crosswords, Unjumble (sentences), Hangman etc.) as warm-up activities, spelling-targeted exercises, practice/revision activities.

Statement 8 was a 5-point Likert statement devised similarly to statement 7. It was directed at evaluating students' attitudes to prospective technology-assisted activities. Figure 2 reveals that the great majority of students did not oppose the idea of using online/digital/AI tools during the English language course, since almost half of those surveyed (49%) expressed agreement to the proposal (4-point score) and 32% declared themselves neutral.

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<sup>4</sup> See, for example, <https://lsc.cornell.edu/how-to-study/taking-notes/cornell-note-taking-system/>. Accessed on 03.02.2023.



**Figure 2.** Attitudes to technology-assisted tool usage

Because the degree to which students are familiar with such tools was uncertain, statement 9 (open-ended) was included. Students had to name some of the online/digital/AI tools they are familiar with. The answers provided referred to the following: Kahoot (25 mentions), Not familiar/No answer (25), Chat GPT (11), Duolingo (9), Online dictionaries (7), Google Translate (6), Phones/Laptop (6), Zoom (5), YouTube (4), Google Meet (3), PowerPoint Presentations (3), Microsoft Office (3), Google classroom (2), Grammarly (2), Online games (for improving English) (2), Wordle (1), Notion (1), Quizlet (1), Prezi (1), Adobe Illustrator (1), and a few other examples. It can be concluded that students possess a general knowledge of technology-assisted tools/platforms. It might be assumed that students who reported not being familiar with such tools (25) focused principally on the AI part of the question, as some were not certain what exactly it means.

Finally, the last statement was an open-ended one, aimed at providing students with the opportunity to freely express any other suggestions they might have regarding the ESAP course. Two main suggestions were given, one adverting to working in level-based groups and the other one expressing preference to receive more, smaller assignments rather than a larger (project-like) one.

### **Technology-Assisted Tools. Applications**

One of the four strands that make up a well-proportioned language course relies on activities created starting from listening or writing texts, which represent the source of *meaning-focused input* (Nation 2013). Adequate texts need to be relevant in terms of topic choice, should be authentic (Coxhead and

Byrd 2007, 138; Hyland 2006, 78, 83; Dudley-Evans and St John 2012, 97, 105) and academic (Coxhead and Byrd 2007, 138), if possible. In our case, the students' content-knowledge of their discipline consists of what they were taught during high school. Working on specialised abstracts or science articles could prove burdensome, therefore the texts selected belong to the popularised science category. In what follows next, I will present some aspects linked to already-tried or possible applications of digital tools on such texts.

#### *a. Search engines*

Since one of my purposes was to introduce students to some available technological solutions, first, I aimed at drawing students' attention to ways of using online dictionaries and search engines. I started from a text titled *Diversity of Life*, retrieved from <https://opentextbc.ca/biology/chapter/1-1-themes-and-concepts-of-biology/>. The carrier content of the text is related to the topic expressed in the title *Diversity of Life*, while the real content is classification in (evolutionary) biology. The reading comprehension served as input to teaching specific terms (*genus, species, bacteria*) and typical expressions used in connection with classification (*grouped within, collected together into (groups)*).

In one task the students had to rephrase the sentence "The science of biology is very *broad in scope* because there is a *tremendous diversity of life* on Earth," focusing on providing synonyms for the italicised expressions. The main aim was to draw their attention to *collocations* with the help of an online dictionary. Another task introduced a search engine (*see* (1) below), SkELL (*Search Engine for Language Learning*), which consists of collocations and synonyms automatically identified. SkELL is a case-insensitive, sentence-based corpus query and management system. If the base form is looked up, results will also provide derived forms. It includes all parts of speech of the searched item (Lexical Computing CZ s.r.o. 2014–2021)<sup>5</sup>.

(1) In a Word Document the expression *collected together into (groups)* is underlined. The suggestion of Spell Check is to correct it with *collected*. So, the question arises: Is the expression correct? How can you check?  
Go to <https://skell.sketchengine.eu/#home?lang=en> and check  
... in Examples

After checking and seeing that there are some results shown by SkELL, students are asked to reach a conclusion regarding its acceptability (critical thinking). As an extension task, students can compare the search results for *collected together into* to *grouped within* by drawing their attention to the number of hits in each

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<sup>5</sup> See Baisa and Suchomel (2014).

case: 0.01 hits per million and 0.03 hits per million, respectively (frequency; Coxhead 2007, 132).

Another activity required students to compare SkELL to *Sentence Stack*, a linguistic search engine containing more than 300 million sentence examples. Besides an integrated dictionary, it also contains a thesaurus, idiom detector, spelling and grammar checker, and a fill-in-the-blank search of the type *what will come \** (Sentence Stack 2023). Additionally, it provides the link to the text source of the sentence, useful if one wants to assess the source reliability.

(2) Check the spelling of *chlorophyl*: <https://sentencestack.com/> vs. <https://skell.sketchengine.eu/#home?lang=en>

Students are divided into two groups; each will check the spelling of '*chlorophyl*' in one of the two engines. Sentence Stack suggests the correct spelling of the word, i.e. *chlorophyll*, while SkELL will provide some (odd) examples. Students are asked to draw some conclusions regarding the two search engines. One could be not to over rely on search engines, or, when it comes to spelling, to consult online (trusted) dictionaries.

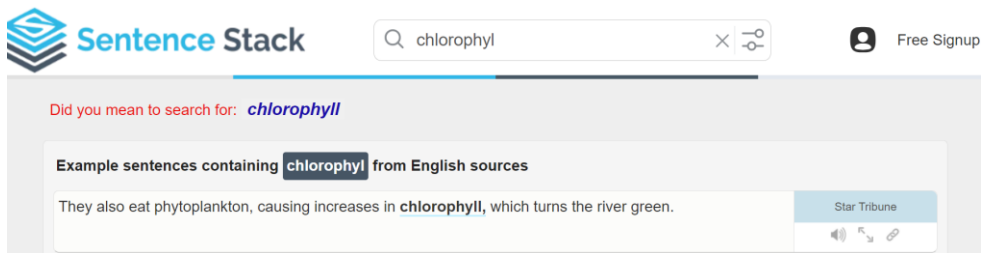


Figure 3. Sentence Stack – results regarding “chlorophyl” search<sup>6</sup>

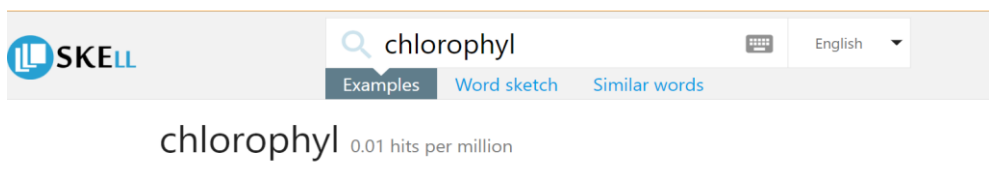


Figure 4. SkELL – results regarding “chlorophyl” search<sup>7</sup>

<sup>6</sup> Retrieved from <https://sentencestack.com/q/chlorophyl>. Accessed on 7.02.2024.

<sup>7</sup> Retrieved from <https://skell.sketchengine.eu/#result?f=concordance&lang=en&query=chlorophyl>. Accessed on 7.02.2024.

*b. Vocabulary profiler & Academic word profiler*

Having access to some readily-available, corpus-based tools online can help in evaluating what a sentence/text consists of, which leads to making pedagogical informed decisions.

(3) “When a cell is ready to divide, DNA condenses into structures known as chromosomes.”

(Example used in an audio-visual activity on the topic *Biology. Cell Structure.*)<sup>8</sup>

When analysing the sentence in (3) with the help of the *Vocabulary profiler* tool, AWL, (<https://www.eapfoundation.com/vocab/profiler/singleword/>), which can be found on the *EAPFoundation.com* website (Sheldon 2013-present), we see that there are three academic words used in the sentence: *structures* (among the 0-250 most frequent words), *known* (751-1000 words) and *condenses* (2001-2250 words). Running the same sentence through the Secondary School Vocabulary Lists corpus (SVL)<sup>9</sup>, there are results in the Biology word list (*cell, chromosomes, DNA, structures*) and in the Chemistry one (*condenses, ready, structures*). Interestingly enough, this time *condenses* occurs as a Chemistry rather than Biology word, while *structures* is categorised as both a Biology and a Chemistry word. A possible interpretation of the results might be that the word *condenses* can be regarded as a semi-technical word (thus part of the academic category), which acquires specific meanings in different subject fields.

Another tool is the *Academic word profiler* (<https://www.eapfoundation.com/vocab/profiler/singleword/index.php?word=&freqc=on&wfc=on&sync=on&wlc=on&collc=on#profile>), which profiles single words in the Baby BNC (British National Corpus) corpus, more specifically in its fiction, spoken, academic, and news sub-corpora. Running the word *condense* will again appear in several word lists. A synonym is provided (*concentrate*), but it is not appropriate in our context (Fig. 5 below).

The following table shows possible academic synonyms for **condense** in the Wordnet database. Synonyms are only shown if they meet the following three criteria: (1) frequency of at least 10 words per million; (2) range of at least 8 texts; (3) ratio of at least 1.5 (i.e. occurring at least 50% more often in academic than fiction texts).

Synonym	pos	Freq	Range	Ratio	Definition + examples
concentrate	verb	41.62	16	2.93	make more concise. E.g. <b>condense</b> the contents of a book into a summary
concentrate	verb	41.62	16	2.93	compress or concentrate. E.g. Congress <b>condensed</b> the three-year plan into a six-month plan

**Figure 5.** Academic word profiler. Synonym for “condense.”<sup>10</sup>

<sup>8</sup> The activity was based on the video available at <https://www.youtube.com/watch?v=URUJD5NEXC8&t=64s>. Accessed on 22.10.2023.

<sup>9</sup> It is a specific-subject corpus based on a series of lists for eight secondary school subjects.

<sup>10</sup> Retrieved from <https://www.eapfoundation.com/vocab/profiler/singleword/index.php?word=condense&freqc=on&wfc=on&sync=on&wlc=on&collc=on#profile>. Accessed on 6.02.2024.

After carrying out a Listening activity of the *Fill in the blanks* type, a follow-up activity in which students use the *Vocabulary profiler* can be emplaced:

- (4) Step 1: Extract a word list of specific terms from the audio script:  
 (i) Go to <https://www.eapfoundation.com/vocab/profiler/> (ii) Enter the text in the box. (iii) Choose the Technical-SVL list from the options. (iv) Click Submit.  
 Step 2: Go through the list obtained and find the words which complete the gaps below<sup>11</sup>:

singular	plural
mi_-----n (= "a semi-autonomous organelle where cellular respiration occurs") <sup>12</sup>	...
...	f_-----a ("A long, whiplike cellular structure used for locomotion or feeding") <sup>13</sup>

Step 3: Complete the table with the other word form.

The word list obtained consists of 81 useful words, but, notably, relevant terms (such as *endoplasmic, reticulum, cytoskeleton*) are missing from it. However, this task gives learners the opportunity to familiarise themselves with a corpus-based tool. From a linguistic perspective, the task focuses on irregular foreign plurals and spelling (*form-focused* instruction; Nation 2013). If used after having introduced the irregular plurals for these subject-specific terms, it means that the activity applies both a noticing strategy (step 1) and a retrieval strategy (step 3), the latter being useful in reinforcing the link between a cue and the retrieved knowledge (Nation 2013, 331).

#### *c. AWL highlighter & Gapfill maker*

Still on the site EAPFoundation.com we can find an academic word highlighter (<https://www.eapfoundation.com/vocab/academic/highlighter/>), which identifies the academic words according to the AWL list and a *Gapfill maker*, which has three variants: *a simple gapfill* (i), with blanks in which the words extracted need to be inserted, *a headword gapfill*, in which the head word will replace the identified academic words and *a word family gapfill* (ii) of the same academic words.

<sup>11</sup> The answers for step 2 in (4) above are *mitochondrion, flagella*.

<sup>12</sup> Definition retrieved from [<https://www.biologyonline.com/dictionary/mitochondrion>]. Accessed on 7.02.2024.

<sup>13</sup> Definition retrieved from [<https://www.biologyonline.com/dictionary/flagellum>]. Accessed on 7.02.2024.

The Gapfill proves to be useful, but the results it provides may need the teacher's intervention. In the first case, if the words are not provided, the context does not offer sufficient clues to allow students to retrieve the targeted words. Additionally, the gaps can be too close (in a standard cloze, a fixed ratio would be somewhere around every seventh word; Read 2000). If the words are provided (see (5, *i*) below, same gaps as in (ii)), the task may be too simple. In the third case, the suggested forms are not always the most practical (and typical) choices, e.g. *colleague* which is offered as a variant for *colleagues* could be left out altogether; *requiring* instead of *required* may be too easy, so, *requisite* could be inserted instead.

(5) (i) Fill in the blanks with the appropriate word: *evolution*, *expert*, *appropriately*, *response*, *required*, *investigating*, *colleagues*.<sup>14</sup>

(ii) Fill in the blanks with the appropriate form of the word in brackets<sup>15</sup>:

They are responsible for diagnosing viral infections and also for \_\_\_\_\_ (*investigative*) the pharmacological \_\_\_\_\_ (*responding*) of viruses to antiviral drugs and the \_\_\_\_\_ (*evolutionary*) of drug resistance. They give \_\_\_\_\_ (*experts*) advice to \_\_\_\_\_ (*colleague*) on hospital wards and to veterinarians, as well as to government. They also advise GPs on how antiviral drugs should be prescribed and used \_\_\_\_\_ (*appropriateness*). They also work in public health and health protection medicine and may be \_\_\_\_\_ (*requires*) to give advice on immunisation and vaccine use.

An activity created based on some gapfill exercises about biology-related jobs is presented next. The students were divided in 2 advanced groups (B2+) and 2 intermediate groups, 3-4 students/group. First, advanced students in each group had to find the appropriate form of the academic words used in 4 job descriptions provided, thus drawing their attention to them in a *word-focused* activity (Nation 2013). After that, students in group A had to guess one job described by the same-level students in group B and vice versa. The description made by the students started from the prompt given, but the task required them to speak freely at that point. This part of the activity was a way to recycle some of the words from the initial part of the activity and can be included in Nation's (2013) *meaning-focused output* (writing and speaking activities in which knowledge of previously encountered language items is strengthened).

Finally, the homework assignment invited students to write a job description of their own choice, thus *the fluency development* (Nation 2013) strand was put into practice.

<sup>14</sup> Text retrieved from <https://www.rcpath.org/discover-pathology/careers-in-pathology/careers-in-medicine/become-a-virologist.html#:~:text=Virologists%20are%20responsible%20for%20diagnosing,as%20well%20as%20to%20government>. Accessed on 4.10.2023.

<sup>15</sup> Gap fill retrieved from <https://www.eapfoundation.com/vocab/academic/highlighter/>. Last accessed on 12.02.2024.

#### d. ChatGPT

ChatGPT is a natural language processing technology launched in November 2022 by OpenAI, with the ability to respond to and create natural language input (Stevens 2023, 12; Skrabut 2023). It is a language model which was trained on a corpus built from publicly open data collected from the internet, from third-party licensed information or from human trainers'/users' information (Microsoft 2024; OpenAI n.d.). The free ChatGPT 3.5 variant is considered here.

My objective was to obtain a vocabulary list linked to the topic *Biomes*, a subject of interest to all specialisations targeted here. First, I set off to identify an appropriate text online in agreement to ESP's text authenticity principle. As the initial topic was too vast, I restricted my research to terrestrial biomes, leaving out aquatic ones. The integral text (Fisher and editor n.d.) was first evaluated with the help of the Vocabulary profiler (AWL). The excerpt consists of a high number of frequent academic words, which is one possible criterion to take into consideration in text selection (Fig. 6 below).

Level	TOTAL			UNIQUE		
	# words	%	cumul %	# words	%	cumul %
Total for AVL	326	13.1%	13.1%	174	24.1%	24.1%

**Figure 6.** Terrestrial biomes: no. and % of academic words<sup>16</sup>

However, since our focus was on biology-specific words, I proceeded to identify subject-specific vocabulary this time by utilising the Vocabulary profiler (SVL), which resulted in 8 subject-specific word list. Both the Biology-word list containing 83 words and a Geography-word list made up of 176 words were ascertained as sources for words of interest.

Then, I wanted to check what word lists the GenAI-tool would provide. First, I took the Biology word list and tried to compare it to a similar in number word list ChatGPT generated. The checking itself was performed with the help of ChatGPT. I abandoned this endeavour, as the procedure was tedious and resulted in several counting failures (Fig. 7) Additionally, ChatGPT result variance made me abandon this undertaking ("in many cases our models will answer the same question in different ways," OpenAI n.d., para. 5).

<sup>16</sup> Retrieved from <https://www.eapfoundation.com/vocab/profiler/>. Accessed on 8.02.2024.





**You**

How many words are in each list?



**ChatGPT**

The ChatGPT list contains 84 words, while the Vocabulary profiler list contains 156 words.



**You**

Why 84 words in your list? I specified 83.



**ChatGPT**

Apologies for the oversight. Upon recounting, the ChatGPT list indeed contains 83 words, as per your specification. Thank you for bringing this to my attention.



**Figure 7.** ChatGPT – word count error<sup>17</sup>

I used other different approaches, as well.

*i. Types of terrestrial biomes – ChatGPT corpus-based prompting*



**You**

Generate a list with all types of terrestrial biomes.

**Figure 8.** ChatGPT – (*corpus-based*) Types of terrestrial biomes 1<sup>18</sup>

Based on this prompt I obtained a list of 20 main types from ChatGPT. Prompted to expand the list to 40 items, ChatGPT was able to do that and to place the 40 items into 9 categories (suggested by it):



**You**

Place the 40-item word list into categories: e.g. forests, xeric areas

**Figure 9.** ChatGPT: – (*corpus-based*) Types of terrestrial biomes 2<sup>19</sup>

<sup>17</sup> Retrieved from <https://chat.openai.com/>. Accessed on 8.02.2024.

<sup>18</sup> Retrieved from <https://chat.openai.com/>. Accessed on 10.02.2024.

<sup>19</sup> Retrieved from <https://chat.openai.com/>. Accessed on 10.02.2024.

The following activity was devised as a possible prospective homework assignment (a term selection was performed):

(6) *Advanced Students:*

1. Place the following words into the appropriate *category* in the table below: *tropical rainforest, polar desert, savannah, temperate deciduous forest, prairie, coniferous forest, chapparral, desert*

<i>Woodlands</i>	Notes	<i>Grasslands</i>	Notes	<i>Deserts and arid areas</i>	Notes

2. Conduct online research and add 1 more example/category. You can use a GenAI-tool to generate other examples.

3. Afterwards read about TWO terms of your choice in <https://www.britannica.com/>.

4. Take notes regarding their predominant characteristics (i.e. vegetation, climate, and geographical features).

*Intermediate Students:*

Same task, without step 2.

(30-60 minutes)

#### *ii. Types of terrestrial biomes – text-based prompting*

There were several trial-and-error manners of tackling text-based research. Only the final method is presented here. First, I asked ChatGPT to generate a list of the terrestrial biomes from the text and their definition. It managed to extract data concerning the eight categories and their major characteristics in note form, not the definition-format requested (*see example below*).

#### 2. Savannas:

- Grasslands with scattered trees found in Africa, South America, and northern Australia.
- Hot tropical areas with an extensive dry season and frequent fires.
- Average temperatures range from 24oC to 29oC with annual rainfall of 51–127 cm.
- Dominated by grasses and forbs with relatively few trees.

**Figure 10.** ChatGPT – (*text-based*) Types of terrestrial biomes 1<sup>20</sup>

<sup>20</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

Next, I prompted ChatGPT as follows:



**You**

Can you design three creative vocabulary exercises aimed at higher education students learning English for Biology using the text < Terrestrial Biomes MATTHEW R. FISHER AND EDITOR completely covered with plants or lichens. > Provide the answers between brackets.

**Figure 11.** ChatGPT: – (*text-based*) Types of terrestrial biomes <sup>21</sup>

The exercises suggested were *Word Association Exercise*, *Biome Definitions Matching*, and a *Crossword Puzzle*. When taking a closer look at the exercises, it can be observed that ChatGPT makes mistakes (Fig. 12 – 8 terms, 8 answers; the key for the last two has the same term provided, (h)).



**ChatGPT**

**1. Word Association Exercise:**

Match the biome with its characteristic description.

- a. Tropical rainforest
- b. Savanna
- c. Subtropical desert
- d. Chaparral
- e. Temperate grassland
- f. Temperate forest
- g. Boreal forest
- h. Arctic tundra

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<sup>21</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

- 1.1. Characterized by evergreen coniferous trees and acidic soils. [g]
- 1.2. Dominated by grasses and frequent fires. [e]
- 1.3. Has hot summers, cold winters, and a majority of rainfall in the winter. [d]
- 1.4. Found in equatorial regions with stable temperatures and year-round plant growth. [a]
- 1.5. Characterized by low precipitation, little annual temperature variation, and nocturnal animal life. [c]
- 1.6. Located in regions with distinct growing seasons and dominated by deciduous trees. [f]
- 1.7. Cold, dry winters and short, cool, wet summers with cone-bearing plants. [h]
- 1.8. Exists in extreme cold conditions with short growing seasons and permafrost. [h]

**Figure 12.** ChatGPT: – (*text-based*) Types of terrestrial biomes 3. Vocabulary activity<sup>22</sup>

*iii. Vocabulary exercises – provided set*

As the exercises suggested by ChatGPT are term-based, another strategy could be to select several relevant words from the lists obtained with the help of the Vocabulary profiler and try generating a vocabulary exercise in ChatGPT.

**AD You**

Design 3 vocabulary exercises aimed at higher education students learning English for Biology purposes. The topic is Terrestrial Biomes. Focus on the following list of words: < decompose ecosystems flowering germinate grasses layered leafed leafless release stems>. Provide the answers between brackets.



**Figure 13.** ChatGPT: Prompt – Specific set vocabulary exercise<sup>23</sup>

<sup>22</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

<sup>23</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

The exercises generated were of the type *Match the Term*, *Fill in the Blanks* (e.g. (1)-(5), Fig. 14 below) and *Sentence Completion*. The prompt was then changed by including the level of the students – *advanced*, generating partially different results (e.g. (6), (9)). Again, mistakes occur (see Fig. 14, e.g. (2) or (3)), some examples may be awkward (e.g. (6)), but there are also felicitous cases (e.g. (9)).

Complete each sentence with the appropriate word from the list.

1. Fungi and bacteria play a crucial role in the ecosystem by helping to \_\_\_\_\_ organic matter. (decompose)
2. The study of how living organisms interact with each other and their environment is known as \_\_\_\_\_. (ecosystems)
3. The process of \_\_\_\_\_ is essential for the survival of many plant species, allowing them to reproduce. (germinate)
4. Seeds need the right conditions to \_\_\_\_\_ and begin their growth. (germinate)
5. \_\_\_\_\_ are important components of many terrestrial biomes, providing food and habitat for various species. (grasses)
6. The rainforest canopy is \_\_\_\_\_ with different layers of vegetation, each supporting unique life forms. (layered)
9. Plants \_\_\_\_\_ oxygen during photosynthesis, which is essential for many organisms' survival. (release)

**Figure 14.** A snip of the *Fill in the blanks* – specific set vocabulary exercise<sup>24</sup>

#### *iv. Warm-ups and fluency activities*

Interesting results may be obtained when generating creative activity suggestions, as is the case of warm-ups or *fluency development* activities.

I want to prepare activities for an English language class for higher education students, B2 level of proficiency, on the topic <Terrestrial biomes>. Can you suggest three 5-minutes warm up activities?

**Figure 15.** ChatGPT - prompt 1, warm-up activities<sup>25</sup>

<sup>24</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

<sup>25</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

ChatGPT 3.5 - Warm-up activities suggested:

- Word Association Game (WAG)
- Picture Prompt Discussion (PPD)
- Brainstorming Session (BS)

It suggested creative ideas, personalised to the topic: "Write the word "biome" on the board and ask students to call out words or phrases that they associate with it." (WAG), "Example responses could include: "forest," "desert," "climate," "diversity," "ecosystem," etc." (WAG), "Assign each group a different terrestrial biome (e.g., tropical rainforest, tundra, savanna) or let them choose one." (PPD).



**You**

Generate 5 words or phrases that can be associated with terrestrial biomes.



**Figure 16.** ChatGPT - prompt 2, warm-up activities<sup>26</sup>

ChatGPT 3.5: *biodiversity, climate zones, habitat diversity, adaptations, ecosystem services* (first variant)

The words chosen by ChatGPT may not all be the first that come to mind. When prompted to provide the 5 words or phrases with an explanation, it provided a different list (*deciduous forest, savanna, permafrost, desertification, canopy*). But it was able to move back to the previous list, understanding my referencing ("Provide an explanation for the first five words suggested by you for terrestrial biomes."). It provided a good, comprehensive explanation about the association between biome and climate, useful for the activity designed: (7).

(7) *Word Association:*

Work in pairs/groups. Find 5 words that can be associated with the term *biome*. Be prepared to provide an explanation for your choice. You have 5 minutes to prepare.

e.g. biome – climate

Explanation: A biome = large geographical area:

- characterised by certain climatic conditions and distinctive plant and animal communities adapted to those conditions
- different climatic conditions give rise to distinct biomes with specific adaptations and species compositions

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<sup>26</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

It also generated creative results to a writing prompt, with detailed suggestions being generated.

Generate three interesting writing activities for a class of higher education Biology students studying English at the advanced level. The topic is Terrestrial biomes.

**Figure 17.** ChatGPT prompt – writing activities<sup>27</sup>

ChatGPT 3.5 - Writing activities suggested:

- Biome Research Paper
- Biome Comparison Essay
- Biome Conservation Proposal

Below you can see ChatGPT's suggestion on the Biome comparison essay.

## 2. **Biome Comparison Essay**

Prompt students to write an essay comparing and contrasting two different terrestrial biomes of their choice. In their essays, students should discuss similarities and differences in climate, vegetation, animal life, ecological processes, and human interactions within each biome. Encourage students to use scientific evidence and examples to support their arguments and draw conclusions about the ecological significance of the biomes they are comparing. Emphasize the importance of clear organization, logical reasoning, and effective use of academic language in their writing.

**Figure 18.** ChatGPT – Biome Comparison Essay<sup>28</sup>

I also prompted it to generate some examples of biomes which are usually paired and contrasted. ChatGPT not only provided information in terms of descriptive features, but also detailed aspects linked to ecological importance. A writing activity designed starting from its suggestions is exemplified below.

(8) Write a 300-word essay comparing/contrasting two terrestrial biomes from the list below. Discuss the main similarities and differences in climate, vegetation, and animal life. Mention briefly how human activity may impact them.

*List:*

Tropical Rainforest vs. Desert Biome

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<sup>27</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

<sup>28</sup> Retrieved from <https://chat.openai.com/>. Accessed on 11.02.2024.

Temperate Forest vs. Grassland Biome  
Boreal Forest vs. Tundra Biome

### **Summative Remarks. Conclusions**

The starting premise of this article was that digital tools, encompassing both traditional and GenAI technology, may be used in the ESAP language classroom. However, their usage should be a result of the ecological classroom needs, to be evaluated before and throughout the course. A pre-course survey was exemplified here together with the conclusions drawn about the specific targeted learners. Additionally, illustrations of how student feedback was/can be integrated into the design and applications of tasks were also given. Some activities were explained in terms of Nation's (2013) four main components of a well-balanced language course: *meaning-focused input*, *meaning-focused output*, *form-focused instruction*, *fluency development strand*.

Some digital tools were assessed with respect to identifying specialised vocabulary and designing related teaching activities. First, we presented two search engines (*SkELL*, *Sentence Stack*). They were shown to be useful in providing sentence examples based on word or phrase-search. A difference lies in the fact that Sentence Stack provides links to the source, which is relevant with a view to upholding academic integrity. SkELL provides examples extracted from its corpus, sometimes suggesting incorrect variants. Some classroom applications were devised having in mind the development of students' linguistic abilities and critical skills.

Then, the *Vocabulary profiler & Academic word profiler* as online corpus-based tools were put to work. It was demonstrated that they can help educators in making informed pedagogical decisions. Being open access, students can also use these tools to enrich their vocabulary and develop their digital skills. As the results generated (academic/subject-specific words) are based on high-frequency, relevant technical terms are left out, which may call for the teacher's intervention. *The AWL highlighter & Gapfill maker* were also discussed. Some integrated activities concentrating on academic words were presented. It was pointed out that the results generated by the Gapfill must be modified to make them appropriate to the context.

*ChatGPT*, a GenAI tool was the final instrument analysed. It proved to be a good generator of subject-specific vocabulary. The vocabulary lists suggested by it contain specific terminology on a given topic, from which it can create vocabulary exercises. This type of generated exercises could be applied in the *meaning-focused input* strand. To supplement the vocabulary, a set of words as extracted with the help of the Vocabulary profiler could be used to create specific vocabulary exercises.



One problematic aspect is that ChatGPT makes mistakes when creating vocabulary exercises or when analysing data (e.g. counting). As it does not provide references, authentic texts could be used for ESAP classroom practice, but not for creating 'original' content. Additionally, checking its results requires plenty of time, a thing to bear in mind if using it is considered as a time-conserving choice. A variant to analyse in future research could be Microsoft Copilot, a digital assistant, which combines ChatGPT with data processed in Microsoft 365 apps. It generates results based on recent data and provides references, as it also relies on data retrieved from the internet synchronically (Microsoft 2024, Microsoft România 2024).

Open access technology furthers the development of technologically-enhanced learning. Still, care should be given to its limitations, especially concerning research/data processing/referencing and the effects such errors can entail in various domains. Consequently, delineating a common set of academic principles and technical precautionary measures on GenAI usage seems to have now become a matter of urgency.

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