Mind-Mapping as a Tool in Teaching ESP/CLIL Presentations

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Abstract

At present, preparing presentations in foreign languages tends to be an integral part of teaching academic skills both in ESP and CLIL environments. One of the most important tools in achieving successful development of ideas in designing a presentation is through mind-mapping techniques. This method based on psychological theory was developed in 1970s by Tony Buzan, and later investigated by other educational specialists, as a powerful tool for enhancing learning process by building natural connections between different concepts and associations. It enables the students to organize the facts, visualize their ideas and find logical connections between various items. In language learning, mind-mapping technique can be used at lower levels, for example when teaching grammar, or presenting basic vocabulary in different ESP fields, such as physics, geometry, materials. However, it may become a powerful tool in making presentations in more complex Content and Language Integrated Learning, as well as teaching English for specific purposes. A non-linear graphical lay-out is used to create a web of relationships around the central concept, idea or problem. It might be employed in collaborative brainstorming, creative problem-solving, project planning and note-taking. As a result, mind-mapping may be also applied to the design of teaching materials to be used within the classroom, but students can use them also individually, for designing projects and making presentations. This can be pursued through designing slides with mind-maps during the e-learning process, which might boost motivation in the second language acquisition. In this study several examples of using mind-maps in ESP and CLIL environment are presented.

Keywords: *academic language skills, ESP, CLIL, cognition, brainstorming, e-learning, mind-mapping, motivation, scaffolding.*

A picture is worth a thousand words.

1. Introduction

Enhancing speaking competence linked with the ability to deliver presentations has been traditionally accepted as one of the most vital elements in foreign language instruction. Its mastery is required not only by the job market, but also by the global needs [1]. As opposed to "receptive" skills of listening and reading, speaking and writing represent two productive skills, which, however, in common practice of organized ESP classes in secondary and tertiary education are not always evenly distributed [2]. This often results either in a grammar-centred approach in EAP or ESP curricula, or a text-based approach where students are over-exposed to reading long chunks of "genuine" scientific texts from specialized fields of science with limited opportunities to speak the language they have learned in a variety of exercises. Although learning of specialized vocabulary via e-learning as opposed to traditional methods has been also proven effective [3], it should not be forgotten that cognitive processing of information in ESP/CLIL classes might differ with respect to the language level of the class examined, i.e. take longer with lower language competence classes and/or with lower grades of secondary and university students, both of which represent a sample in our experiment.[1]

Delivering presentations represents a common practice across a variety of job positions but professionals working in technical areas find producing them particularly difficult [4]. We have been trying to implement several new techniques to facilitate ESP learning at the Faculty of Mechanical Engineering, STU. One of them, the mind-mapping technique, which is originally known from business, management and project planning [5], has been introduced as an innovative teaching

[1] A long-term pursuit of similar one-sided language teaching practices favouring training of one or two skills, might, in consequence, lead to a loss of motivation to learn a foreign language and willingness to take action outside of the class.

method in undergraduate classes. Surprisingly, not many of the studies on mind-mapping deal with its application in language learning [6].
Two language experiments have been made at different levels, both dealing with professional language: in an ESP environment with the university students, and in CLIL teaching at secondary level. The goal of this paper is thus to verify whether mind-mapping has a potential to trigger interest in highly specialized ESP and CLIL technical language classes, and if it improves student speaking skills. The paper presents certain suggestions about the differences in student approach towards mind-mapping techniques used in ESP classes based on both audio and reading inputs.

2. Theory and methods

A mind map is a diagram structured linearly or hierarchically, whereby the information is presented in a visually stimulating way. Not only can it be used in brainstorming or problem-solving for generating new ideas, or structuring thoughts in task planning, but also in a learning process where it facilitates recall of newly acquired knowledge, e.g. in note-taking [7]. As it shows how the main concept can be broken down into specific information, the students´ knowledge may be progressively mapped. This could be employed in testing the effectiveness of learning, e.g. measuring the impact on higher test scores as pointed by Horton (ibid) or motivation, depending on whether students are involved in descriptive or integrative tasks, as pointed by Leonidas A. Zampetakis in his research [8].
The mind-mapping approach draws on the cognitive theory that the human brain centres around one focal point around which other ideas are generated, therefore a mind map may convert a long list of monotonous information into a colourful and highly organized diagram to help lexical processing [9]. This provides an opportunity to compare the ease of processing and recall of the lexical items from the audio inputs with that of reading inputs, and their influence on students´ speaking competence, which is a productive skill traditionally considered as intertwined with listening [10].
Furthermore, using mind maps could be of significant benefit to students learning English in the field of technical or scientific discourse. This, according to Trimble [11], consists of a high number of definitions, diagrams, description of procedures that are on a sentence level mostly represented by syntactically complex clauses. It is thus hypothesized that irrespective of the a) type of input and b) language level of the class, a regular employment of mind maps in ESP/CLIL environment could stimulate students to use different mind maps to improve their speaking competence. For this purpose, two questionnaires were distributed in ESP classes to obtain the students´ feedback at the end of lessons. During each lesson teachers also took down the notes on the number of students involved in speaking and the simplicity/complexity of language structures they used with and without the mind-maps.

3. Mind mapping experiment in ESP classes

The research was carried out in 4 groups of 2nd year students during their ESP classes of mechanical engineering at the Slovak University of Technology, the Faculty of Mechanical Engineering, Bratislava during the summer semester of 2019. The total of 20 intermediate students was split into 2 smaller groups of 9 and 11 members, together with the total of 30 advanced students further subdivided into two groups of 16 and 14 students. These met on a regular basis for ten 90 minute- sessions of ESP classes per week with two different English teachers covering the same topics- a) mathematics: types of measuring units, b) physics, e.g. forces, stress and strain, gravitation and c) engineering materials. Throughout the course, mind maps were used in response to two audio and two reading inputs, in combination with warm-up exercises introduced at the beginning of each class, and revision exercises. In the final session students were asked to create their own mind-map which they could incorporate in their power-point presentation on an engineering topic.
Both teachers observed increased student participation and longer speaking time after using a mind-mapping technique with at least one central idea provided and one “radiating” association in all audio, warm-up and revision exercises. In addition, there was one type of exercise where the students were asked to create their own mind-map during the lesson based on the text. At the intermediate level, where students worked in smaller groups, motivation dramatically increased (by 50% on average) showing features of intensive collaboration with other students, which was also reflected in their survey responses. The advanced students, being grouped in larger classes, were not particularly impressed with this activity and only 8 students out of 30 were able to retell and sum up the text based on their own map (cf. Fig. 1). Despite that, according to the questionnaire, their engagement was higher by 40 % on average than after merely reading the text.

An interesting result of teachers' observation, further supported in our student survey, was that the student speaking time increased in both levels after the 2nd hearing of audio recordings with the usage of the mind-map. Only a few students in advanced classes took the opportunity to retell the topic of the audio on their own without further scaffolding of the mind-map made by the teacher to stimulate student presentations. This might have been caused by the fact that the audios were long, lecture-like (3.20 min, 2.15 min), and descriptive, which supports the evidence of Leonidas et al. about the reaction of engineering students [ ]. Both levels benefited from the teacher´s provision of basic language cues, e.g. "be divided into", "be classified into", "includes", "(sub) divides". These proved to help segmentation of the audio meaning and served as a valuable speaking aid.
Finally, a higher percentage of intermediate students (70 %) actually used a mind-map in their own power point presentation to at least one classification of a technical concept based on their topic (cars, bicycles, engines, nuclear power reactors, etc.) than in advanced classes (56, 6%). This might be connected with certain distrust of some of the advanced students towards creating mind-mapping technique as they "hardly contributed to their learning process". However, based on our survey results, even in these remaining cases where advanced students did not use a mind-map of their own, mind-mapping of certain sort was still used by students, at least in the process of their project research, e.g. in note-taking and brainstorming for the final delivery of the presentation.

4. Mind-mapping in Content and Language Integrated Learning

Content and Language Integrated Learning (CLIL) represents an integration concept. It has been regarded as an effective symbiotic fusion of studying particular academic subject matter through, not in, a foreign language [12]. Didactics of both the foreign language and academic subject matter are integrated within the specific type of education. A dual-focused educational approach assumes closer cooperation among teachers, resulting in cross-curricular link development.
For better understanding of the importance of the comparative ESP/CLIL experiment, some CLIL principles are presented in the context of secondary vocational education in mechanical engineering. The objective is to clarify how mind-mapping can be implemented into CLIL-type education as a powerful tool in lexical acquisition and communication skills, thus providing an efficient system that makes presentation more attractive for students.
The best approach to promote language proficiency simultaneously with subject-based lexical competence acquisition is implementing language learning into academic subjects, which favours cognitive skills development through activity-based learning. It provides a learner-friendly educational environment fostering self-learning in students through Vygotsky's scaffolding concept [13], whereby the support is offered to the student by the teacher.
In secondary general and vocational education, growing interest in CLIL has been recorded recently, though not much research has been carried out to provide complex research results. Increasing graduates' chances in the labour market is a significant factor of motivation. The ability to combine foreign language and vocational competences is becoming crucial in students of secondary vocational schools in Slovakia.

4.1 Mind mapping experiment in CLIL courses

The objective of the CLIL research carried out at the Secondary Technical School of Mechanical Engineering in Bratislava (Slovak Republic) was to increase content-based lexical acquisition and motivation in students of the second grade of study. An experiment was carried out to measure the effectiveness of mind mapping techniques in teaching Mechanics - strength and elasticity in mechanical engineering.
Two groups of 16 and 17-year-old students were involved in the experiment to compare the outcomes of the experiment, as well as the attitude towards studying English by this approach in both CLIL and control groups of students. CLIL classes were carried out in cooperation with the teacher of the respective technical subjects and it was preceded by initial selection of the content to be studied with regards to the school´s curriculum objectives. The selected subject-related topics included: a) mechanical properties of materials in engineering, b) shear stress and shear strain, c) Hooke's law in shear, d) torsion loading of circular and noncircular shafts. Instructional scaffolding and K-W-L principles were applied along with the mind mapping approach.
Through instructional scaffolding the teacher helped students to achieve mastery in the scientific area. K-W-L charts helped the students organize knowledge in compliance with: what I know (K), what I want to find out (W), what I learned about the problem (L). Mind-mapping was one of the strategies applied to develop students' motivation and speaking skills while achieving both content and language

objectives. Collecting ideas around a particular topic was common for both K-W-L and mind-mapping methods, with an added value of clustering ideas and defining relationships in the latter one.
The lessons were conducted in the *soft CLIL* way, whereby the teacher concentrated on the use of tools with the focus on linguistic objectives. The lessons were planned for a short period, over which the students acquired content knowledge despite the primary focus being on lexical and communication acquisition [14]. Brainstorming was supported by mind-mapping in order to find logical connections between the content they had studied previously. An example of mind-mapping being gradually produced by students over the classes, through instructional scaffolding, is shown in Fig.1.
Based on the results (pre-test, post-test, group activities, short presentations), the research supported the hypothesis that CLIL classes are beneficial for secondary school learners. The data collected from a short questionnaire revealed the motivation and interest in students to incorporate more technical subjects into a curriculum implementing CLIL models of education.

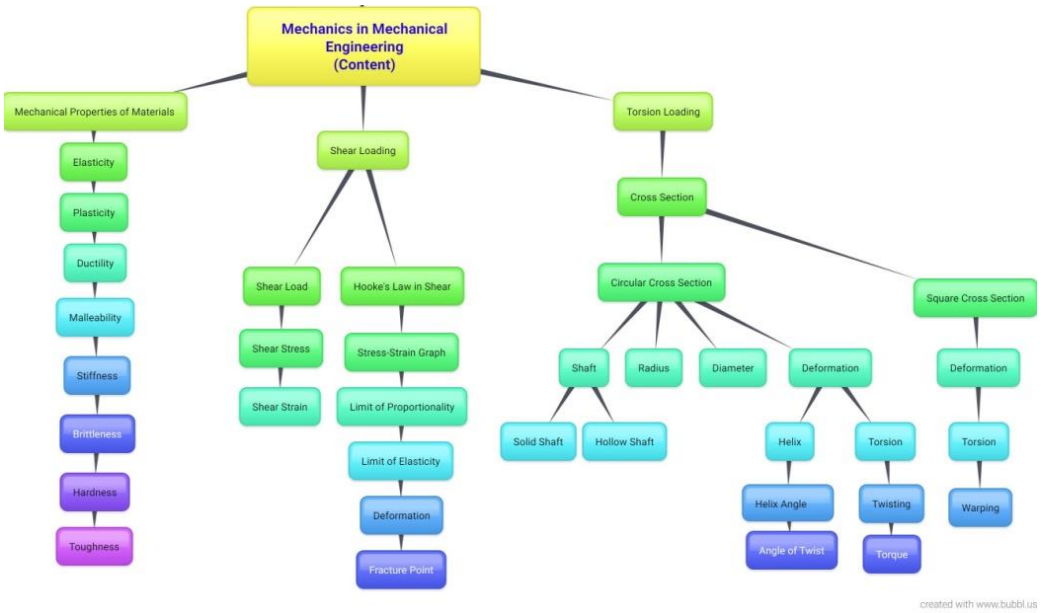

Fig. 1: Mind-mapping in CLIL-type education – content and discipline-specific terminology

5. Conclusion

The study has shown that mind mapping has been one of the most efficient aids in note taking and organizing new technical vocabulary based on listening, and in stimulating oral presentations of the new materials with technical students. The research also proved that the results were better in less advanced classes, where the students appreciated the visualization of difficult material, while it was less stimulating in advanced classes, as the students understood the content better even without the support of mind maps. Properly used mind-mapping techniques give more variety to both students and teachers, and stimulate real communication patterns in the classroom both in ESP and CLIL environments.

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