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POSSIBLE PLANNING TECHNIQUE IN CONTENT BASED INSTRUCTION

Introduction

In this paper, I would like to introduce a possible teaching method used in bilingual education linked to a compulsory secondary subject, biology. This technique focuses on the most optimal sequence of the given teaching matter as well as its technical terms. I also present some example of testing the content knowledge in a foreign language. These methods were implemented at Varga Katalin Grammar School in Szolnok, Hungary. The English-Hungarian Bilingual Programme started here in 1988. The objective of the programme is the acquisition of a high level of English. For this sake students acquire professional vocabulary in Mathematics, Physics, Biology and History by being taught these subjects in English by Hungarian teachers who have received an American teaching experience with the Fulbright Teacher Exchange Scholarship. I hypothesized that this bilingual method would help bilingual students to reach both the English language proficiency and a high standard of academic knowledge in different subjects such as biology.

Teaching in bilingual classes

To select the well prepared and motivated students for this educational program, we introduced the entrance exam in Hungarian literature and grammar in the written form, focusing on grammatical and communicational skills, as well as in mathematics, also in a written form, focusing on the skill of logical deductions and in the English language both in written and oral forms. We chose these subject-based tests because we assumed that if a child receives a good education in the primary language, we would be able to give him knowledge that makes English input more comprehensible. A child who understands science or history, thanks to thorough science and history instruction in the first language in their primary education, will have a better chance to understand science or history taught in English in a secondary bilingual programme than a child without this background knowledge. Teaching sciences in English seemed to be an effective choice for this educational program. Even from infancy, children are natural scientists. They would like to know more about the world which they live in. On the other hand most of the newly released professional information is available in English in science. This also can be another important promoter of studying biology in English. Science teachers are becoming increasingly aware of the importance of foreign language in the classroom. Nevertheless, the language of science is difficult and often obscure, even for native speakers. It requires careful and precise explanation in order to ensure a shared meaning between the participants in classroom discourse. Communication in science relies heavily on context. The academic success of second language students in school subjects is more closely related to the type of proficiency (Cognitive Academic Language Proficiency or CALP) than the more easily acquired Basic Interpersonal Communication Skills (BICS). At the same time, research in second language acquisition has led to the development of an approach known as Content Area Instruction which has been widely adopted as an element of English as a Second Language (ESL) instruction. The success of content area instruction can be attributed to the fact that it is

likely to contribute specifically to the development of CALP¹. In recent years, especially in the last decade, increasing numbers of language teachers have turned to content-based instruction to promote meaningful student engagement with language and content learning. Through content-based instruction, learners develop language skills while simultaneously becoming more knowledgeable experts in a chosen academic field. In this method, professional teachers tend to create vibrant learning environments that require active student involvement, stimulate higher level thinking skills, and give students responsibility for their own learning.

When the instructors of biology present the bases of natural science and form the abilities of their students, the notions of nature are discussed in a foreign language. This method of science teaching requires a well-planned and constructed explanation. The formation of the given notion in the students' minds depends upon comprehensible vocabulary and many-sided explication and interpretations. By using these techniques in a daily routine, we can reach the double imprinting – memorising and understanding notions in English and in Hungarian as well - as the technical terms appear in two forms in the learners' lexicon. The newly formed notion creates an image in the mother-tongue while building a logical approach in both languages and links to its definition in any of the languages that can augment memory retention. Education is becoming more international, multilingual, and multicultural. More students are spending time learning through another language: reading a textbook, newspaper, or a journal in another language, having some or all their curriculum taught in another language, accessing foreign language material on the internet, communicating in a foreign language with native speakers in other parts of the world, learning about another culture through musical lyrics in a foreign language, acting out some parts of dramas or musicals in their second language, and so on. These essential goals in our new century can be attained with the method of content based instruction. Three fundamental assumptions support these attainable and desirable achievements:

1. Language is a matter of meaning as well as of form.
2. Discourse does not just express the meaning of the notion but can help to create meaning in the mind.
3. As we acquire new areas of knowledge, we acquire new areas of language and meaning.

Methodology

Initially we attempted to establish an educational programme upon our hypothetical output of this educational method. Three content teachers – including myself – worked with language teachers to find the common intersections on which the final goal of Content-based instruction (CBI) could be achieved. This preparation period was time-consuming but outstandingly effective and seemed to be mutually advantageous for both ESL teachers and content-based instructors such as ourselves. Each educator could get an outlook that widened his or her professional interests and knowledge. This preparation targeted the fusion of language improvement and of subject matters acquisition during the same teaching period. In this chapter, I am taking a sample of teaching biology alongside an entire chapter of Self Maintenance (Human Biology). There are 9 new topics which are related to human anatomy and physiology. Structures and functions are taught in this chapter that also covers our exocrine, motion, nutrition, breathing, blood, immune system, circulation, heart as the centre of this system and excretion. These new teaching materials are always supplemented with experimental periods and classes on human healthcare. This chapter takes 17 periods altogether and taught to 11th graders in two 45 minute periods per week. It highlights the

¹ Krashen, S. (1982). Principles and practice in second language acquisition. Oxford: Pergamon.

functional properties of different organs in humans therefore it emphasises that the external cover of humans and all vertebrates is the skin. Its upper layer is the epidermis, the topmost layer that peels off by forming scales and is gradually replaced by constant division. Below the epidermis lies the connective tissue with different glands, nerve endings and hair follicles. The adipose tissue layer is also found in the skin for better thermal and mechanical insulation. The skeletal system serves to protect and define the shape of the body and, in most cases, it constitutes the passive organ of movement while the active movement organ of all vertebrates, including man, is the external muscle system built on an internal skeleton. In this topic, our students learn that the basis of the operation of the skeletal muscles is the contractible property of the protein strands which action requires energy derived from the degradation of ATP molecules. The human material transport shows similarities with highly developed vertebrates as it is also a closed system in which blood flows. While our students understand the major differences between arteries and veins, they also get acquainted with the blood and its plasma and cellular elements. These elements perform outstandingly important, vital functions in transportation and immune responses. The human nutrition, breathing and excretion also give excellent examples for recognizing important logical links between the structural properties and functional performances of human anatomical organs. My present survey focuses on the content-based instruction as one of the possible ways of second language acquisition. The preparatory first step of a given chapter in biology starts with the grouping and analysing of technical terms, words essentially needed for successful comprehension and cognitive development. Practically, one should create a chart (Table 1) of these new words/expressions that contains all these terms classified into three levels of acquaintance. The first level contains the terms which are brand new nouns and therefore must be interpreted and clearly explained within the chapter. These terms should be formulated as concisely as possible with the knowledge of previously acquired lexicon in sight. The second level involves technical terms already studied in the mother tongue in previous monolingual classes. The final group comprises those terms which are known in both Hungarian and English. These words/expressions have a key importance in teaching progress and help students understand the logical links between the scientific facts.

Table 1. Groups of technical terms classified into three levels of acquaintance

New technical terms	Already known terms in Hungarian	Already known terms in English and in Hungarian
Keratin (1)	Epidermis (1)	Skin (1)
Melanocytes (1)	Dermis (1)	Blood vessel (1)
Melanin (1)	Subcutaneous layer (1)	Capillaries (1)
Sweat gland (1)	Nail (1)	Connective tissue (1)
Hair follicle (1)	Maintaining homeostasis (1)	Insulation (1)

In the phase of chapter preparation, it is useful to arrange these words in alphabetical order to help find the new lexical items more efficiently. The number in brackets shows the sequence of the unit, in which the given word/expression occurs. New technical terms must be introduced in a special teaching technique as the second language learners usually have difficulty with the cognitively demanding, context-reduced language of academic texts. Therefore, new input must be delivered with a slower rate of speech, clear pronunciation, and with a well designed and

controlled vocabulary which tries to limit the initial use of idioms. Sometimes the dramatization of meaning plays an important and indispensable role in comprehension. These gestures and facial expressions are important. As the progress of second language acquisition requires the parallel development of basic skills, different visual aids such as pictures, models, slides, overhead slides, diagrams are also essential. The introduction of a new technical term and its definition need repetition, restatement and exemplification. Opening and closing activities, directions and homework assignments are also very important within a teaching period so that students can comprehend the context even if they do not understand spoken instruction. The base of the new lexical item is the already known term which has been taught in English and studied in both languages. This review of technical terms helps to create clear definitions which are easy to understand. The following include some examples of important definitions related to human organisms and try to follow the steps of expanding students' vocabulary. If one examines the logical relationships among technical terms (Table 2) one can see the possible sequence of the presentation. In this way, we can create a linear structure of lexical items. The successful comprehension of these definitions should be checked immediately, right after their introduction with different oral and written activities such as group work, model description, gap filling, puzzles, etc.

Table 2. Sequencing of technical terms

New technical terms	Already known terms in Hungarian	Already known terms in English and in Hungarian
Keratin (1)	Epidermis (1)	Skin (1)
Melanocytes (1)	Dermis (1)	Blood vessel (1)
Melanin (1)	Subcutaneous layer (1)	Capillaries (1)
Sweat gland (1)	Nail (1)	Connective tissue (1)
Hair follicle (1)	Maintaining homeostasis (1)	Insulation (1)

Students know the meaning of the word skin so the building of the students' lexicon can be based on this term. The outer layer of skin is called the epidermis which is composed of many layers of cells. Its top region consists of 25-30 layers of flattened, dead cells that are filled with keratin, a special protein, and are continually shed. In the deeper layers of the epidermis, cells called melanocytes are present, which produce a brown-black pigment, the melanin. The melanin gives the skin its colour and protects the cells beneath from damage by solar radiation absorbing ultraviolet wavelength. The dermis is the inner, thicker portion of the skin tightly connected to the epidermis. It is mostly connective tissue that cushions the body containing blood capillaries that supply both the epidermis and the dermis with food and oxygen. The dermis also plays an important role in thermoregulation.

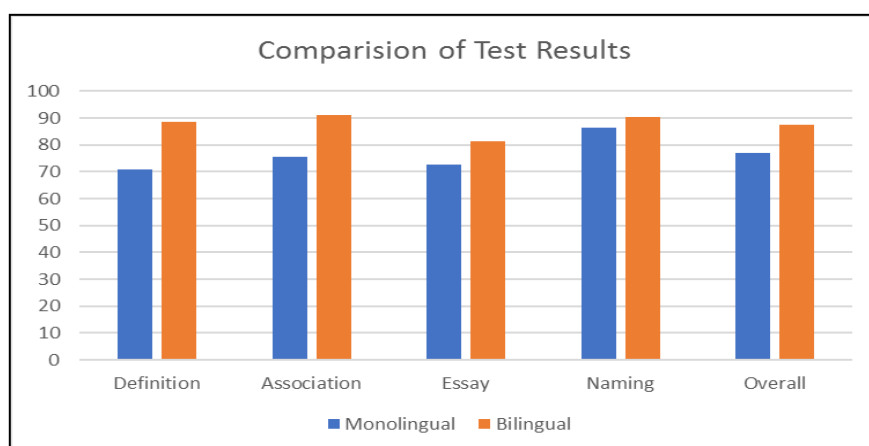
Another way of forming definitions is by finding parallelism in the structural or functional features of key notions. The following example of definitions shows the parallel introduction of pharynx. „The tongue pushes the bolus into the pharynx, a common passageway of the food and air.” In this definition, each word is already known. If the presentation is completed with visual aids such as pictures, models, slides, the comprehension will be much easier and more successful. Additional sentences, which are tightly linked to our present example, can build on even larger vocabulary in students' lexicon. „The trachea, or windpipe, conducts air from

the nose through the pharynx to the lungs, while the esophagus² behind it carries food downwards. In this sentence, the students' lexicon is strengthened as they have already studied that the pharynx is a kind of intersection between the passageways of nutrition and breathing. There are two new anatomical notions in the above example. They both can be identified easily by using the previous knowledge students received in monolingual classes. The meaning of term #1a agrees with term #1b and they are both connected to the passageway of air conduction while term #2 is linked to nutrition. These two terms are related to the key noun, pharynx. From these examples, one can identify two possible ways of teaching technical terms in Content-based instruction – by classification and parallelism.

Results

As a teacher of science at Varga Katalin Grammar School, I had the chance to teach biology in English in a bilingual class and parallel with this in a monolingual class as well. This opportunity gives me an excellent chance to evaluate students' success in the subject by comparing their learning achievement. 27 Monolingual students and 33 bilingual ones took the summative test on Self- Maintenance. Both classes studied this chapter in 17 periods. Students in these classes used the same text book (in English for bilingual students, in Hungarian for monolingual ones). The teaching methods used in classes were similar and the learning environment was also the same. The only substantial difference was the size of the class. At Varga we always taught bilingual classes divided into two equal sized groups. This size differentiation ensured a significant advantage for bilingual students as the smaller sized class provides more appearance and activities for learners. The final summative test verifies test criteria. These tests contain different varieties of testing methods. The first exercise asks students to define certain technical terms properly. The second exercise includes an everyday situation which contains some biological phenomena as well. Students are asked to explain these processes in a brief essay form. The third exercise offers short statements and students must decide which notion matches the given statement. The final exercise contains diagrams (lungs or human skin). Students are asked to identify each organ and name the labelled parts with the proper technical term. The test results (Table 3) indicated that each problem was more successfully solved by bilingual students than monolingual ones. The smallest difference is found in the last exercise – naming of organs – while the largest one can be seen in the first question – defining technical terms. The overall performance also shows striking differences between these two classes.

Table 3. Monolingual and bilingual test results



Cocclusions

As a bilingual student becomes more proficient in two (or even three) languages, the ability to tune in and inhibit unrelated words becomes stronger. Using two brain parts at the same time and switching back and forth require executive functions in the brain. The content-based instruction develops our students' attention and inhibition processes. Thus, these bilingual students tend to be more adept at switching between two tasks and making decisions in the face of conflicting information. In this article, I wanted to highlight some benefits of the content-based instruction, used in bilingual education with an example of the planification of teaching a chapter in biology. As the teacher of the students who participated in this CBI learning process became more adaptable and flexible in a changing environment in their adulthood. The improvements in cognitive and sensory processing driven by bilingual experience may have helped them to better process information in the environment, leading to a clearer signal for learning. These students had better memories and they are more cognitively creative today than single language speaking counterparts. They work in different parts of the world and they are ready to adapt themselves to the newer professional and personal challenges. This output was based upon their bilingual education with different subject-based instructions. This is the reason why we should improve the methods of content-based instruction in bilingual teaching and learning proceeding.

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