A NEW WAY TO ATTRACTIVENESS OF LEARNING PROCESS IN PRIMARY SCHOOLS IN SLOVAKIA

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Abstract
Mathematics teaches students to think logically, solve real-world problems, and be accurate. Despite the fact that it is needed in every area of life, it is often uninteresting and incomprehensible for them. Teachers are constantly looking for new possibilities and ways how to bring mathematics closer to students and how to win their favour for mathematics. They realize that no reform in education will improve this situation. They themselves have to use their creativity and ability to apply new methods and forms in the learning/teaching process.

Present reality speaks for the fact that students who enter the universities are less and less prepared for studying mathematics. Our university prepares also teachers of Mathematics and English for their future career. During their lessons of didactics, they are trained how to present mathematic tasks in an attractive way, using also their good knowledge of English.

CLIL and using mathematical corpus when learning mathematical terminology and relations are considered to be inspiring activating methods in teaching mathematics at our faculty and university. CLIL as such has already been used in the teaching process in three primary schools in Žilina.

Based on our fruitful cooperation with Martinská and St. Gorazd primary schools in Žilina, we evaluated the teachers’ experience with these methods of teaching mathematics when working with pupils of all different forms of study. An online survey questionnaire sent to more than 70 primary schools existing in the region of Žilina aimed to find out if the teachers of Mathematics working in these schools have at least the basic knowledge of CLIL as well as mathematical corpus analysis. During the process of the data analysis we were also observing implementation of this knowledge into the educational environment of primary schools, interest of the teachers in these methods, support given to the teachers by their superiors and possibilities of future training of teachers aimed at acquiring competencies to work with the mentioned teaching/learning methods and approaches.

On the basis of the obtained research results we have come to the conclusion that applying methods of CLIL and mathematical corpus analysis in the process of preparation of future teachers, especially those who are specifically qualified to be teachers of Mathematics and English Language and Literature, can become a motivating, inspiring, refreshing and promising factor.

Keywords: education, Mathematics, teaching, language, CLIL, mathematical corpus.

1 INTRODUCTION
Mathematics is an integral part not only of the scientific and technical world, but also of art, sociology, archeology, biology and sports. Its applications point to the fact that without the use of mathematics we would often fail to solve even simple life situations. Mathematics accompanies us in everyday situations – during doing shopping, travelling, working, but also playing games (e.g. billiards), and doing various hobbies (e.g. playing musical instruments). Mathematics teaches students how to think logically, how to look for the combinations when solving problems. It also teaches us to be accurate. Despite this fact, many people consider mathematics to be their lifelong problem. Primary, secondary as well as university teachers of Mathematics frequently have to answer the questions: “Why do we need to learn Mathematics?” “What use is Mathematics in everyday life?” These questions are especially surprising when asked by university students. They should be clear about the importance of Mathematics when they choose to continue in their studies of Mathematics at the university [1].

Teaching foreign languages encounters similar problems. The initial euphoria to introduce English language as a compulsory subject in Slovak schools quickly began to melt after finding out that there are not enough qualified teachers to ensure teaching of a required quality. In 2009 75% of the total number of teachers who taught English language at primary schools were teachers without required
qualification. Even 45% of the total number of English language teachers having taught pupils aged 11-15 did not have the right qualification. This situation was not improved by the efforts of so called crash courses organised by the Ministry of Education, Science, Research and Sport of the Slovak Republic (MŠVVaŠ SR). Their aim was to train qualified teachers of English language. As those quickly trained teachers still have problems with the language as such, for majority of them it is difficult to motivate their pupils to learn English language with enthusiasm. Therefore, to motivate pupils to study both Mathematics and English language has become a difficult task for many teachers. They should know how to bring fun and enlightenment to their classes. ICT (information and communication technologies) and various applications that students already have on their smartphones can be of great help to them. Also using CLIL (Content and Language Integrated Learning) and corpus analysis programmes in the teaching/learning process will support intersubject relations (Mathematics and English), strengthen the ability of their students to think logically and see important phenomena in context.

2 MODERN TRENDS IN EDUCATION

Development of individual and creative work of pupils is one of the most important aims of the educational process. Contemporary education in Slovak schools is still very often influenced by the use of traditional didactic methods, forms and aids. Emphasis is placed on interpretative and illustrative methods with a low degree of pupils’ activities. Learning materials and teaching aids are almost exclusively represented by textbooks. A great amount of information takes the time which pupils need for thinking and learning. There comes a paradoxical situation – while young people are prepared to solve problems, discover relationships and ask various different questions independently, at schools they have to learn so many facts that all their learning process is becoming just memorization. They use only one active mental process – a mechanical memory [2]. As a result, pupils remember the information they have received only until they take the test or exam. Then they quickly forget what they have learnt. Therefore implementation of new progressive methods and forms into the classroom can be one of the ways by which we can make a learner more active and self-directed towards active work.

Digital environment is a natural part of the life of present generation of young people. The veracity of the fact that the integration of computers into the educational process represents more effective teaching and learning is evidenced by many researches working in this field both here and abroad. Their results confirm the hypotheses that computers have the potential to radically change rigid and deep-rooted pedagogical approaches and subsequently improve students’ outcomes. Computer technologies with their potential can create suitable environment and conditions for active and creative learning. For these reasons, present as well as future teachers of Mathematics and English, need to know which methods and forms of work (possibly with ICT support) they should use to increase the efficiency of teaching of both subjects. Integrating new teaching practices supported by ICT into an educational process will eliminate multiple perceptual and emotional barriers to creativity.

ICT technologies are nowadays attractive tools for presenting curriculum and for incorporating new methods into an educational process. They can be used at every stage of this process; they encourage motivation, original thinking and creativity of pupils and eliminate monotonous non-creative activity in the classroom. A computer, like other ICT tools, can therefore be seen as a "universal tool greatly expanding the possibilities for pupils to create and learn" in the spirit of the constructivist philosophy of education. However, many researches done in this sphere show that the use of multimedia does not itself increase the efficiency of the teaching/learning process. Only on the basis of certain media-didactic principles, thoroughly designed and implemented applications will help increase its efficiency [3]. There are questions we have to find answers to – how can we use these applications and principles effectively to improve learning, and what impact will this have on the content of the course?

Except of ICT technologies there exist also other motivational and attractive methods and approaches to learning for pupils who study Mathematics and English language. They include CLIL – based approach and corpus analysis. When we use them in practice, it is necessary to keep in mind development of competences which are important for pupils and which have been formulated by the International Society for Technology in Education [4]: the creativity and sense of innovation, communication and cooperation, scientific thinking and work with information, critical thinking, problem solving and decision-making, digital citizenship and lifelong learning, and digital literacy.
To achieve necessary competences, new activating methods should be used in teaching. All new methods we apply into a teaching/learning process, have common the following common aims: guide pupils to understand the need of Mathematics and English in common life, build and develop their computer literacy, consolidate mathematical terminology (in Slovak and in English), strengthen pupils' confidence in their own abilities, mediate pupils the acquisition of basic mathematical knowledge in an interesting form, remove the fear of failure, and have joy of learning.

These aims come from the model teaching pupils skills. Its name is EDUCARE? and is actually based on a mnemonic device:

- E - explanation
- D - doing - detail
- U - use
- C - check and correct
- A - aide memoire
- R - review
- E - evaluation

For pupils to be able to learn actively, it is necessary to create precise rules and set conditions. Pupils will be willing to learn during their lessons if they are allowed to decide freely if they have the choice, if they learn at their own pace, according to their own learning style, learn topics which interest them while using creativity and learn together with classmates. Pupils should be allowed to ask and express dissatisfaction without the fear of threats and correct what they did wrong without fixing this error. They should have a chance to be successful, have enough time to learn before being tested, and have enough learning sources and aids appropriate to their abilities. They should be allowed to expect that recognition and reward will follow their hard work, find out what they have learned, realize that what they learn is meaningful to them, know what is expected from them, know what, how and when is evaluated and be assessed in relation to themselves and not in comparison with others. They should always experience a pleasant social climate and be in an environment, in a class which is aesthetic, pure and stimulating [6].

3 CLIL-BASED APPROACH TO LEARNING

School age is optimal time for learning a foreign language. Majority of parents realizes this fact and so they want from schools to ensure teaching foreign languages since the first year of their children’s school attendance. The use of CLIL appears to be appropriate for all age groups. Compared to other approaches and methods that we commonly apply to teaching, CLIL is extremely effective in meeting the following needs of pupils and students:

- a foreign language is taught under natural conditions, not only in artificially induced situations,
- they do not focus primarily on the language as such but on the content they want to talk about.

If we allow pupils to perceive English language only as a school subject, it may become scary for them. But if we use it for what it is destined to be – for communication, it will become a pupil's assistant, and his/her fear of failure will be greatly diminished. Therefore, a foreign language should have the same role in the teaching/learning process as a mother tongue. It should become an inherent part of education.

Properly organized and applied CLIL methodology is motivating for pupils. If pupils likes teaching/learning through CLIL - based approach, the burden associated with it will not be considered by them as a problem. It is possible that at the beginning this way of learning will be perceived as "more demanding" than so called classical form of learning because listening, reading and speaking in a foreign language is often tedious. Here comes the role of the school which should ensure and keep an acceptable level of education maintained by this approach. There are always children with different knowledge of a foreign language but also different abilities and skills in classes with CLIL-based approach to teaching and learning. One of the key elements of CLIL methodology must be adhered to – this is the requirement for the learners to use the language actively among themselves in the classroom and thus learn from each other. An active and immediate use of a foreign language will ensure that all pupils benefit from CLIL approach, not only those ones about who we think they are
"good at languages" [7]. The use of this method in practice is based on the interest in increasing the effectiveness of teaching/learning process and the achievement of objectives which are also enshrined in the National Educational Programmes. CLIL gives the learners possibilities to use acquired language skills in natural and meaningful communication and to use the target language as a means of communication as well as a means of learning. It focuses both on the pupil's receptive and productive abilities and skills.

Characteristic features of CLIL:
- application of various innovative methods,
- individual approach to pupils,
- possibilities for group work,
- support of pupils' self-reflection and creativity,
- contribution to the socialization of pupils,
- development of interpersonal competences of pupils,
- contribution to the development of pupils' key competences and their autonomy [8].

CLIL is a pedagogical-didactic term referring to the method of teaching foreign languages, in which educational content of different subjects (e.g. Mathematics) is mediated to pupils in other language than their mother tongue is. This will enable students to acquire basic knowledge and skills in the specific subject terminology. This integration to different subjects with respect to the educational content of the specific subject as well as the foreign language will be meaningful if a precise definition of the content of the output is done. At the same time, the expected outputs of both educational modules must be taken into consideration. Teachers are also expected to be able to work with their colleagues, especially in the process of planning lessons.

CLIL methodology is suitable both for primary and secondary school pupils. It is based on the fact that:
- learning curriculum and formulating the tasks of a specific subject are conducted in a foreign language,
- pupils respond to their teacher both in their mother tongue and the foreign language,
- materials can be searched in both languages,
- grammatical phenomena of a foreign language are explained in both languages,
- idiomatic expressions and linguistic styles are introduced by the teacher in a foreign language, resp. in the mother tongue of pupils,
- pupils use specific terms not only in foreign language but also in their mother tongue.

Implementation of CLIL into an educational process cannot be done in an unnatural form. If the teachers want to catch the pupils' attention, a short motivation at the beginning of the lesson is sufficient. For example:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Language level</td>
<td>A1</td>
</tr>
<tr>
<td>Grade</td>
<td>5th</td>
</tr>
<tr>
<td>Time allocation</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Topic</td>
<td>Plane shapes, circumference and area</td>
</tr>
<tr>
<td>Content aims</td>
<td>Pupils are able to name plane shapes</td>
</tr>
<tr>
<td></td>
<td>Pupils are able to count circumference and area of the plane shape</td>
</tr>
<tr>
<td>Language aims</td>
<td>Pupils will match English terms to the plane shapes</td>
</tr>
<tr>
<td></td>
<td>Pupils will understand the task given in English language</td>
</tr>
<tr>
<td>Materials and aids</td>
<td>cards, worksheet, crossword puzzle</td>
</tr>
</tbody>
</table>
Table 2. Methodology.

Teaching methodology

A teacher hands out one card to each pupil. There is either an English term or a picture of a flat figure in the card (see Fig. 1). Pupils are instructed to start looking for the classmate who owns the card which forms a matching pair with their card. The pairs of pupils formed this way will be working together during the activities. They will receive a worksheet (see Fig. 2) with Tasks 1, 2 and 3. During their work the teacher monitors the activity in the classroom, gives advice, feedback, and encourages pupils to work. Then he/she will check pupils’ results. Pupils can be helpful in this process. Finally they will obtain a crossword puzzle (see Fig. 3), and will be looking for the English terms which they have learnt during the previous activity. Their Slovak equivalents are written in Slovak on both sides of the crossword puzzle.

Figure 1. Cards.

Worksheet

1. How do you count the area of the rectangle and the square?
   
   **Rectangle**
   
   **Square**
   
   **Formula:**
   
   **Formula:**

2. Make the rectangle ABCD. |AB| = 7 cm, |BC| = 5 cm. Count its area and perimeter.

3. Write how long are the sides and count its perimeter.

Figure 2. Worksheet.
CLIL – based approach to learning and teaching has become better-known and more widely used in Slovakia since 1998. At that time in Bratislava the School for Gifted Children together with Secondary Grammar School were created as the first ones using CLIL in the Central Europe. The project of dr. Jolana Laznibatová – APROGEN – Alternative Care for Gifted Children – has become the basis for the network of 29 primary schools using CLIL.

In 2013, the Slovak State Pedagogical Institute started to implement an experimental verification project of CLIL in lower secondary education, which follows the project Didactic effectiveness of CLIL at primary school level in the teaching of foreign languages. This project is scheduled for 2013/2014 - 2017/2018 school years. It involves 14 primary schools from all over Slovakia, three of them from Žilina region – Primary School Martinská, Primary School of Saint Gorazd (a school for gifted children) and Private Primary School Oravská cesta. Since we have been cooperating with the first two schools for quite a long time, we decided to make a small survey on their teachers’ experience with CLIL as well as other innovative methods.

Primary School Martinská began using CLIL (also in Mathematics courses) in the school year 2012/2013. In the last two years Mathematics is not taught by this method in 5th -9th forms any more. The reason is that young female teachers with good knowledge of both Mathematics and English language after a year or two of their work went for maternity leave. Senior teachers working at this school are not usually able to teach Mathematics in English. Thus, CLIL is used in the teaching process, but only when teaching citizenship education. Another problem is that the school has to "fight" with the leaving of the top pupils in the 6th form of their study to secondary grammar schools.

At Primary School of Saint Gorazd teachers have been teaching with the help of CLIL since 2008. They gradually started to apply it in all forms of study. In the classes including intellectually gifted pupils from the entire districts of Žilina and Kysucké Nové Mesto only Geography and Natural Science are taught by using CLIL nowadays. One of the reasons why other subjects (e.g. Mathematics, Physics, History, etc.) are not taught this way is the lack of young teachers of these subjects with a good level of English who would be able to teach their specific subjects (at least some thematic parts) in English. Another reason is that again the top pupils leave to study at secondary grammar schools in the 6th form of their studies. What is more, pupils from “classical” classes as well as their parents are not interested in CLIL – based approach to learning.

With the help of the headmasters of the above mentioned schools we made a simple survey among their teachers of mathematics. We were asking about their experience with CLIL and their willingness and ability to use it in their teaching process. 85% of them are convinced that they would need more lessons of Mathematics a week to be able to teach it by using CLIL. 90% of them believe that CLIL would slow down teaching of Mathematics. 50% of them even think that the study results of their pupils would be worse.

As regards language competences of teachers and their pupils, 19% of teachers state that their knowledge of English language is sufficient for CLIL teaching, and 14% of them claim that they have...
sufficient knowledge of mathematical terminology in English language. Only 5% of them expect that their pupils are so good at English language that they can be taught by using CLIL. Only 15% of teachers would be willing to teach Mathematics in 5th-9th forms by using CLIL and only 7% of them would be willing to undertake a CLIL training course.

We can conclude that the results obtained by this survey were caused also by misconception that the teachers who are involved in CLIL teaching must necessarily have excellent knowledge of a given foreign language. Teachers did not take into consideration the possibility of cooperation with foreign languages teachers.

3.1 Corpus and mind maps

Application of corpus linguistics to the teaching/learning process in primary school conditions is still very rare and unique. However, teaching languages through a suitably chosen corpus can be a welcoming and useful change not only for the pupils but also for their teachers. A direct application of corpora into the teaching/learning process is often rejected because of the generally accepted idea that it is financially and professionally demanding. Teaching through corpus requires a trained teacher who has motivation to change his/her teaching methods. When working with corpus, teachers prefer an inductive, discovery-based approach when pupils first, under the guidance of a teacher, and later on independently, develop their own rules and discover different possibilities of using language structures from the provided data. Similarly, it is possible to use a specialised corpus in teaching/learning of other subjects, Mathematics included. A suitably chosen corpus can be helpful in the process of creating so called mind maps which help to enhance memory and are understandable for majority of primary school pupils. Furthermore, search engines processing specialised corpora can find and identify many interrelations and interconnections among individual elements being under study and encourage development of logical thinking which makes new knowledge in the specific area easier to remember.

4 QUESTIONNAIRE AS A RESEARCH INSTRUMENT

The main aim of our research was to identify the level of awareness and knowledge of CLIL and mathematical corpus by primary school teachers as well as the level of their implementation in the educational process with respect to pupils’ interests and mathematical competences. Our partial aim was to analyse the interest of teachers in further education in the area of the observed innovative approaches to teaching/learning. For this reason we created a questionnaire and distributed it to 57 primary schools existing in the city of Zilina. The questionnaire was anonymous and the respondents were teachers of Mathematics at these schools. Due to the low number of the respondents’ responses (210 out of more than 500 respondents filled in the questionnaire between January and March 2017) caused by a lot of teachers’ duties in the spring months, we decided to prolong the time of the survey until June 2017. Newly obtained research results will be added to already known ones and described in the subsequent research study. Graph 1, Graph 2 and Graph 3 illustrate sex and specialization of individual teachers of mathematics as well as the age groups of their pupils.
The survey results have shown the absence of qualified teachers who would be able to teach a non-linguistic subject in a foreign language. Only 33.9% of teachers would be able to teach Mathematics in English language. Practical experience with implementation of CLIL was agreed by 17% of respondents (see Graph 4). 10.7% of teachers were familiar with the concept of the mathematical corpus, but only one teacher used it during his preparation for the lessons (see Graph 5).

On the basis of the general statement that CLIL is well known and widespread among the teaching community [9], we assumed that the level of knowledge and perception of this method, as well as its contribution to the development of mathematical competences of pupils would be high. The survey results can be seen from Graph 6 and Graph 7.

The obtained results could be influenced by the fact that the respondents have already been informed about CLIL approach when participating in various forms of further teacher trainings. On the other hand, they were not offered any courses of work with mathematical corpus and could get knowledge of it only by self-study. Graphs 8 and 9 illustrate factors which, in terms of difficulty, influence the teacher when applying CLIL and mathematical corpus in the teaching/learning process.
Graph 10 and Graph 11 illustrate teachers’ inclination to innovative methods in teaching Mathematics as well as possible ways how to make Mathematics more attractive.

If the responding teachers could choose one teaching method which would suit them the best, they would decide as follows (see Graph 12):

If teachers want to teach non-linguistic subjects in the language that is not their mother tongue, they must be equipped with special abilities and skills. These competences can not be obtained without training and so CLIL and work with educational softwares should be taught at universities that prepare future teachers. The fact that even present-day teachers are interested in further education related to CLIL and corpus analysis are interpreted in Graph 13 and Graph 14.

5 CONCLUSION

Teaching through CLIL is relatively new in Slovakia and its implementation into primary and even secondary schools is very slow. One of the reasons is that there are almost no courses or college programmes in CLIL for teachers to be qualified to teach their subject in a foreign language. So teachers do not have skills that would allow them to develop their pupils’ communication skills [10]. If the school is considering the implementation of CLIL in its educational process, the headmaster has to take into consideration his/her teachers’ expertise, readiness and motivation. Teachers’ motivation and willingness are prerequisites for introducing CLIL into teaching/learning process because preparation for CLIL-based courses is time-consuming and requires a strong commitment from the teacher. Introduction of CLIL into an educational process is slowed down also by teachers’ fear of its application in practice. They usually have a lack of knowledge about the method, insufficient knowledge of the foreign language or do not know how to prepare and organize the courses.
We believe that CLIL activates thinking and creativity of pupils and give them the opportunity to participate in the management of the teaching. It strongly motivates pupils and contributes to their autonomy and creativity in the learning process. CLIL understands the pupil as a subject of an educational process which is oriented on a pupil and which takes into account his/her needs and feelings. Teachers using CLIL strongly believe that their pupils will remember more if they work with the material independently, if the material elicits their emotional response.

Classroom activities using corpus analysis can represent another way how to make learning Mathematics in English language more attractive for pupils. Questionnaire results have confirmed the interest of teachers to learn more about this relatively new method of teaching/learning.

Based on the results obtained, we can deduce that teachers generally want the educational process to be innovated. However, they should be offered more high-quality training courses in which they would learn how to use mobile apps, computer softwares and perspective teaching methods – CLIL including. Moreover, they should be properly motivated, supported, encouraged and finally awarded by their employers, headmasters and parents of their pupils – they should be undoubtedly supported by the whole society. Slovak universities will have to train and educate teachers who will master at least one world language on C1 level, will have very good IT skills and be able to use innovative didactic methods and approaches in their future teaching career.

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