A REFLECTION ON THE INTEGRATION OF STEM ACTIVITIES
IN THE FOREIGN LANGUAGE CLASSROOM

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Abstract: *The language education process is sometimes approached from the perspective that learning should be fun and easy. Undeniably, these two factors substantially contribute to the increase of learners' motivation. Yet, they are not necessarily part of the deep learning processes, which are necessary when a language is taught as a foreign language. The article analyzes the possibility of the use of STEM activities in an English language classroom within the communicative approach to foreign language education. It is based on the observations made during the lessons where learners were encouraged to do STEM activities. Similarly, the observations made at various formal and informal meetings with language teachers were considered here. The findings seem to indicate that STEM activities done at the lesson of English would little contribute to the development of communicative skills in English. Thus, the primary goal of language education would not be realized. However, such activities could be done as extracurricular activities, where the focus is not on the development of language skills.*

Keywords: *STEM, communicative approach, post-method, thinking system, communicative activity.*

The purpose of language education has long ceased to be teaching the formal aspect of the language through drilling and translation exercises as in the times of the Grammar Translation method (Ur, 2012, Kumaravadivelu, 2003, Nunan, 2004, Condrat, 2018). Moreover, teachers and scholars have argued for the need to adopt an integrated-skills approach to language teaching claiming that focusing on one, maximum two skills is extremely inefficient as learners don't develop the skills they need to appropriately communicate in the foreign language they learn. This led to the appearance of the Communicative Approach (hereafter CA) to language teaching in the second half of the 20th century which emphasized the importance of learning a language through interaction (Widdowson, 1978). Learners were encouraged to use the language to communicate real meaning, whereas the formal aspect of the language was supposed to be acquired rather implicitly through constant use and exposure to the language (Nunan, 2004).

Such a paradigm shift was necessary in the language classroom as the formal way of teaching a foreign language did not seem to yield positive results. Learners were not able to use the language appropriately in real-life situations. In addition, they appeared to lack confidence while communicating their ideas in the foreign language they were learning.

When CA started being used in the English classroom, there appeared to be an increase in the learners' confidence to speak in the foreign language. This approach became quite popular and both teachers and scholars spoke in favor of using it in the language classroom. To a certain extent, this implied ignoring the body of previous research related to the other methods existing in language teaching.

CA was advocated to be used in the context of the Republic of Moldova as well (Limba străină: Curriculum național: Clasele 5-9, 2020). When people started talking about it, they had a vague idea of what such an approach actually is. I am inclined to believe that it still causes confusion based on the observations I made from my interaction with school teachers at various formal and informal professional development gatherings. They definitely are aware of the primary focus of the CA, i.e. language should be used to enhance meaningful communication among learners so that they can gain the confidence to appropriately use it in various contexts. They also appear to be aware of the benefit of pair work and group work to achieve that. However, they do not seem to realize that CA offers the theoretical framework for the several methods that have been developed throughout time.

Thus, in one instance one teacher was unable to define Task-Based Instruction as a method developed within the CA. In fact, it is rather difficult for them to identify what other methods have been developed subsequently. They know that they should use communicative activities, yet, the use becomes hectic and sometimes ineffective in realizing their learning objectives.

Another interesting observation is that the results I get from the question I always ask the students in my language education class seem to contradict the teachers' stance that they use CA in their classroom. Until now only 30% of students admitted that CA was used at their lessons of

English. I do understand that they had different teachers, and that I have not interacted with the teachers of the other 70%. However, another observation of mine results from the students' graduation papers and Master's theses. Quite often they resort to surveys as their research tool. In their questionnaires they often touch upon issues related to CA and its use in the language classroom. They usually ask teachers to give answers that would imply that they use CA in their EFL classrooms. (Examples of questions are: "What communicative activities boost learners' speaking skills? Give examples." "What kind of activities do you include in your lesson plan to promote interaction in the classroom?" "How do you think, interaction can help students in developing their speaking?")

The conflicting findings can be assumed to result from either the social desirability bias (it can occur when the participants want to meet the researchers' expectation) or a version of the Hawthorne effect (this is when the respondents modify their behavior when being observed, in this case they modify their answers which they perceive as potentially right and good, not necessarily using the CA approach in their classrooms). These are two main threats to research validity and probably this is why it is still challenging to arrive at valid conclusions with the data gathered in the Moldovan context.

I would like to point that I do not put the blame on the teachers for the confusion surrounding the CA and its use in their classroom. I am inclined to think that teachers need more practical assistance in getting a better understanding of the concepts. On the other hand, they can be blinded by the desire to conform with what is generally accepted without fully believing in it. I would also add here the constant addition of other methods to be considered in their language classroom (e.g. the use of STEM).

This was the conclusion I drew after having spoken on transdisciplinarity at a recent professional development meeting. The teachers wholeheartedly agreed that they use pair-work in their classrooms, yet, they pointed to the students' use of their mother-tongues while doing a task or working on a project. Moreover, they drew attention to the fact that they themselves would shift to their native languages while working in small groups at the meeting.

This means that CA is not the panacea as it was initially presented. Moreover, in her short speech on The Future of Professional Development, Penny Ur (2017) mentions that there are not conclusive results that will clearly state that the use of CA helps develop the skills necessary to communicate appropriately and efficiently in a foreign language.

Many more scholars have come out to point to some of the disadvantages of the CA in the language classroom. For instance, they say that because of the focus on fluency, accuracy is overlooked and as a result learners do not possess the necessary grammar and vocabulary foundation on which to construct their utterances in a fluent way. They do not have enough grammar and vocabulary knowledge that would enable them to appropriately communicate in English.

One of my former students was extremely fluent, but they were not accurate at all. They acquired the language while playing games online with other people from different countries, whose native language was not necessarily English. The student was confident and spoke a lot during the lesson, but the problem was that they were incomprehensible in most of the cases. Moreover, the student loved challenges and would enjoy a STEM activity to do at the lesson. Yet, that had not resulted in any significant improvement of their English.

The use of STEM has been widely popularized in the Moldovan educational context, including in the language education context. It appears to be the optimal way of helping learners gain the knowledge they need to solve real problems through experimentation. Yet, how does that help them develop their English skills and enhance their communication in English?

STEM supporters might be blinded by the confirmation bias, and advocate for its use in the language classroom, sometimes ignoring the actual results of their students. As said, English is learned to be appropriately used in context. Using CA, students are expected to learn English through English. In the foreign language classroom this is an extremely challenging endeavor, and teachers alongside scholars stating that English can be acquired (nota bene, acquired, not learned) in such a classroom can be subjected to overconfidence, i.e. the natural tendency humans have to overestimate their true abilities.

It is important to emphasize that this article does not intend to prevent teachers from using CA in their practice. Its primary purpose is to raise awareness of the factors influencing the learning process that need to be taken into consideration while deciding on a method to be used in the classroom. For example, the fact that English is taught as a foreign language should play a key role in

the decision making process. When English is taught as a second language it is possible to talk about the learners' **acquiring** the language. Apart from the exposure they have in the classroom, they get exposed to it outside the classroom as well. Thus, the constant exposure to English contributes to their picking on patterns and structures on an unconscious level, the way it happens when children acquire their first language.

In a foreign language context, the situation is more complex as children are exposed to English twice a week in most schools of the Republic of Moldova. Most of the children do not have other ways of exposure to the language. Definitely some play computer games or listen to songs in English, but that is not similar to the exposure learners of English get when learning it as a second language. So, if the teacher has this limited amount of time and curriculum guidelines to follow, how effective the use of STEM would be in the English classroom?

Another key factor influencing the decision making process deals with the age of the learners. Can CA be used with young learners? Scholars say that young learners should be exposed to a lot of drilling and memorization because their abstract thinking has not developed yet. However, overexposure to drilling and memorization can lead to demotivation. This is why teaching should be done through games, which children enjoy doing (Ur, 2012). It is not by accident that TPR is rather effective with young learners. They seem to acquire the language through games without being explicitly exposed to the chunks of language they have to memorize. However, even more communicative activities like role-play can be a success with younger learners. For example, they first get exposed to the language used when shopping and then they are encouraged to role-play the situation using the vocabulary they learned (it can be a good idea to consider using realia for such a role play). Although the learning of the language is rather implicit with this age group, we cannot say that this is the result of CA as it is primarily based on drilling and memorization.

When it comes to adolescents, they can already think abstractly and independently. They can deduce the rule from the examples that are being discussed in the classroom. Yet, a lesson has 45 minutes, and constantly advocating for deducing the rule can not necessarily lead to the students' understanding of the rules. Moreover, the older the learners get, the more they need clarity. They want to put everything in order and explaining a rule might be this nudge that will help them get that understanding.

Both age groups (I will argue that even some adult learners) can love STEM activities and learn through them. But will they improve their English skills? From the observations I had, this is unlikely to happen.

I had the opportunity to observe the training of a group of 40 Moldovan children during the courses they attended at their summer camp in the children's village Pestalozzi from Trogen, Switzerland. The summer camp was part of the project *Promoting and developing intercultural education (ICE) for pre-service teacher training (Phase II)* implemented by PRO-Didactica Educational Centre from the Republic of Moldova with the support of the Pestalozzi Children's Foundation, Switzerland.

The children were 13 and 14, and underwent a selection process. One of the requirements was good knowledge of English as the course instructors will have the classes in English. Thus, English was the only medium of communication between Moldovan children and the instructors. It is essential to note that the courses they attended were designed to develop their intercultural competence, focusing on such issues as identity, teamwork, tolerance, and equality. Similarly, the education process itself was done in an informal way. The children were not expected to come to classes and take notes and do homework. Instead, they were expected to develop intercultural competence through the interactive activities they did every day during their courses. It is also crucial to mention that the primary goal was not to help them improve their English.

The instructors also integrated some STEM activities to help students build teamwork skills and work collaboratively to solve problems, and come up with creative solutions to the set challenges. The majority of the students (75%) enjoyed being involved in such activities. These results undeniably show the potential of STEM activities in arousing the students' motivation, on the one hand, and helping them apply the abstract, theoretical knowledge they have in practice, on the other. They were quite invested in the process and were considering various solutions to solve the set problem.

When it comes to the development of English skills, they were little developed. After having listened to the instruction in English, they would start working in groups and immediately shift to the

Romanian language. They would use their mother tongue to solve the problems. For example, during the *Marble Run* activity they divided the work they should do and interacted exclusively in Romanian. They were very passionate about the run, and were very competitive. It appears that the competitive aspect of the activity added to their motivation. However, the degree of motivation was different. One observation was that the younger the participants were the more motivated they were. So the 13-year-olds appeared to be more motivated than the 14-year-olds. Just one year difference, and yet the difference in their attitudes was quite prominent.

One would argue that if the children had to interact with foreigners, the situation would be totally different – they would have no other choice but to use English. It is not quite so. One of the main prerogatives of the project was to bring together two cultures so that both groups were able to boost their intercultural competence. During the second week of the summer camp, the children worked with their peers from Switzerland. They started by getting to know one another as a whole group. Definitely they used English for that.

However, when they were supposed to do some group activities that would involve doing something together, the situation was different. When they had to build a bridge of paper to hold weight, groups were formed form Moldovan and Swiss children. They showed enthusiasm, and were very competitive. The group dynamic was rather positive. Children worked as a team. Yet, I would argue they did not communicate much in English. They distributed the roles and started working to accomplish the task. They resorted to their mother tongues to give some instructions to their peers who spoke the same language as they did. They did not purposefully ignore the peers speaking another language. They were rather too competitive and in the heat of the moment they did not realize that they were excluding the others. I deliberately did not specify in what language because both the Moldovan and Swiss children had the same behavior. They would only resort to English when they really needed something to be done by the kids speaking another language. This STEM activity was definitely a success, yet again it did little to the development of English skills. (I would like to emphasize that this was not the purpose of the project. I simply use my observation to validate my previous observations on the use of STEM activities in the language classroom.)

During previous observations I noticed that learners who were involved in a STEM activity did not use English to solve the problem. Moreover, they would not even communicate a lot. What children tend to do is to quickly define their roles within the group and start working. They would use their mother tongues to give some instructions or report on their progress. This can lead to the conclusion that STEM activities are more appropriate for science classes. Within 45 minutes they can solve a problem in which they would have to apply their acquired knowledge or maybe come up with a creative solution that would turn into a learning opportunity.

When it comes to the English language classroom, the development of the primary goal of learning the language is unlikely to happen. The students will do something, some would enjoy that tremendously, but in terms of language learning little will happen. Probably such activities can be used in extracurricular activities where the primary focus won't be on the language, but on the development of teamwork and collaboration skills.

It is true that similar situations can occur when students work in pairs or in small groups. However, this time the teacher can be more alert to the linguistic aspect, and constantly remind learners to use English in their interaction, something rather impossible when they do a STEM activity as what language they use will be the last thing they will think of. Moreover, they can be annoyed, and become demotivated when constantly shifting their attention from the process they are in to the language they use.

The biggest problem thus appears to be the learners' resistance to the use of the foreign language (even in their interactive language-related pair/group-activities)? The answer has little to do with their desire to learn the language. It is rather connected with the two systems of thinking as defined by Daniel Kahneman (2011). In the scholar's opinion, System 1 of thinking refers to our automatic thinking system which unconsciously reacts and makes decisions fast. Whereas, System 2 is slow and refers to the conscious effort put into ordering ideas and constructing thoughts. Both systems are important. Moreover, intuition is to a certain extent the knowledge that was elaborately learned and trained in System 2 and passed to System 1; this is the source of the gut feeling. The

same can be said about the skill development process. For a skill to become mechanical (System 1), one needs to practice and put consistent effort first (System 2).

In their book *Nudge*, Thaler and Sunstein (2021) while explaining the differences between the two systems make an insightful remark that could explain the natural tendency learners of a foreign language have to turn to their mother tongues: the skills of speaking in a foreign language has not been automatised yet, i.e. it is part of System 2, it still requires substantial effort from them. In fact, the scholars renamed the two systems as "Reflective System" and the "Automatic System", and their characteristics can be seen in Table 1.

AUTOMATIC SYSTEM	REFLECTIVE SYSTEM
Uncontrolled	Controlled
Effortless	Effortful
Associative	Deductive
Fast	Slow
Unconscious	Self-aware
Skilled	Rule-following

Drawing on this information it becomes clear why CA cannot be considered as the best approach to language learning. Moreover, scholars (Kumaravadivelu, 2003) eventually spoke in favor of a post-method approach to language education where the learners' actual needs inform the language educator in terms of decisions to be made regarding the language education process. Foreign language learning is the process requiring deep thinking and effortful mental activities from System 2. Once the language has been internalized, learners can be nudged to do more complex activities in English.

This can happen when a learner unconsciously shifts from one language to the other. In our context this can refer to some people's ability to shift effortlessly from Romanian into Russian. This ability has been developed due to the context of the Republic of Moldova in which Russian is still spoken by a large majority of the population. It is also true that the language was acquired through constant exposure to the other language rather than consciously learned. This seems to indicate that if English has been taught as a second language, we might have had similar results. Yet, English is a foreign language, and the exposure the large majority of learners have is in the classroom, and sometimes online. Otherwise they are either exposed to Romanian or Russian. It is unlikely to get English from System 2 to System 1 if there is no constant effort put to it.

To conclude, foreign language learning is an extremely complex process requiring a lot of committed effort and practice. I think that the main cause of the learners' demotivation can be the result of their inability to stay focused for a long period of time. Their expectations to get something without putting much mental effort clashes with the process of learning a foreign language. This is why, language educators should be aware of the factors influencing the learning process, on the one hand, and the methods that could best suit their learners' actual needs, on the other. They should find the balance in their teaching that will allow them to develop their English language skills targeting both fluency and accuracy. They should balance the modern methods with the more traditional ones in order to help learners develop the skills they need to become confident speakers of English. Undeniably, they should bring diversity and fun in the language classroom, but it should be balanced with the more formal aspects that deep learning requires.

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