# CHAMSA: Five Languages Citizens of an Increasingly Technological World Should Acquire

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The increasingly dynamic technological world, which recently has encouraged globalization in many domains, poses new educational challenges regarding preparing individuals to become well-educated and beneficial citizens who are capable of simultaneously functioning on personal, national, and global levels. One main goal of an educational system is to promote an environment in which youngsters can acquire and develop their ability to communicate meaningfully with others. We suggest that youngsters acquire five basic languages as tools for communication: a mother tongue, an elective international foreign language, a language of science, a language of art and body, and a language of technology, each of which is used to express themes and ideas or feelings associated with specific domains and contexts. We believe that long-term study of these languages, along with intelligent practice and utilizing communication skills, is highly useful for citizens to function successfully on personal, national, and global levels.

## 1 INTRODUCTION

The increasingly dynamic technological world, which recently has encouraged globalization in many domains, poses new educational challenges regarding preparing individuals to become high-quality and beneficial citizens who are capable of simultaneously functioning on personal, national, and global levels. Throughout the history of any culture, parents have expected their children to be educated literally "to become like them" in the cultural context, and "to become more qualified than themselves" in maintaining the ability to meet present and future challenges related to an increasingly global economy and to increasingly available technological advancements [14].

One specific challenge that educational systems face is to enhance individuals' basic skills as well as the general competencies needed for effective functioning that characterize each distinct level (personal, national, and global). Moreover, educational systems should provide students with the tools needed to maintain balanced, optimal functioning that interleaves between these levels.

Milutinovic [12, p.102] describes three dimensions of human intelligence, manifested as the ability to create knowledge: (a) a vertical dimension, which relates to deep professional knowledge, (b) a lateral dimension, which relates to the knowledge of other scientific fields, generations, cultures, and languages, and (c) a longitudinal dimension, which relates to the ability to anticipate problems and opportunities, each of which should be gradually developed to promote professional and social success.

Educators have long advocated that youngsters should develop a wide range of cognitive capabilities and practical skills, independent of specific technologies, to enable them to perform lifelong learning and to adapt to new environments and practices as stated.

For example, in [15, p.15]: "We can either commit to ensuring that our students have the skills to be participants and innovators in this technological world or resign ourselves to a decreasing international presence in the global economy."

Organizations such as OECD (Organization for economic co-operation and development) collect statistical information on education systems, including measures of the competence levels of individuals (e.g., PISA tests), with the aim of defining global standardization of education for the knowledge required in "every day of a global economy".

With regard to the above considerations, we believe that one main goal of an educational system is to promote an environment in which youngsters can acquire and develop their ability to communicate and effectively (a) express ideas in a meaningful way so that their ideas can be unambiguously understood by others; and (b) comprehend ideas presented by others. In addition, information processing and reasoning skills should be developed to enhance students' ability to solve problems and to present solutions. In this context the "three Rs" basic skills (i.e., reading, writing, and arithmetic) have been often mentioned; recently computational thinking skill (CT) has been recognized as a formative skill no less important than the "three Rs" [7, 17].

## 2 CHAMSA: LANGUAGES THAT SHOULD BE ACQUIRED DURING THE FORMATIVE YEARS

The Chamsa is a palm-shaped amulet popular throughout the Middle East and North Africa (whose aim is to defend against the evil eye). It has long represented blessings, power, and strength and thus is seen as being potent in deflecting the evil eye. For example, in the Jewish faith it is a protective sign and is believed to draw positive energy and to bring its owner happiness, luck, health, peace, and good fortune. [http://en.wikipedia.org/wiki/Hamsa].

Using the allegory of Chamsa, we suggest that youngsters should acquire five basic languages as tools for communication, each of which is used to express themes and ideas or feelings associated with specific domains and contexts. Our approach is compatible with Logan's view of language as both a communication and an informatics tool [9] and his statement, based on this view, that speech, writing, math, science and computing form an evolutionary chain of languages [10]. The languages that we recommend to acquire are as follows: our language (mother tongue), their language (an elective international foreign language), a language of science, a language of art and body, and a language of technology. Long-term study of these five languages, along with intelligent practice while elaborating on utilizing communication skills, is highly useful for successful functioning on personal, national, and global levels. The Chamsa model may support fine-tuning of comparative international exams as well as finding the delicate path between localism and globalization in the context of educating the tomorrow's citizens.

### 2.1 Our Language

Besides enabling basic communication between family relatives and between individuals within the community, the native language reflects one's national culture. In the wider context of learning a mother tongue at school, this includes becoming acquainted with national literature and poetry, national history, and with leaders who have had a substantial impact throughout the national history, as well as reflecting on national tradition

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### 2.2 Their Language

Every person should learn at least one foreign language before graduating from high school to be better diversified in today's world. Learning foreign languages is very worthwhile and beneficial in the context of producing better-educated students, gaining international respect, attaining enhanced ability to do business on a global level, and attaining cultural enrichment [12].

Importantly, various studies have shown that people who learn another language acquire better language skills overall and develop higher cognitive skills and better critical thinking skills and are better able to reason and think creatively [13]. The sooner children learn these skills, the better prepared they will be when they enroll in higher education programs and finally apply for jobs and pursue careers.

In view of the fact that in recent decades the world has become a "global village", it seems to be advantageous for students to be familiar with and become competent in speaking several different languages. One main benefit of learning a second language is a deeper appreciation for and understanding of different cultures [12]. Language serves as a powerful tool in melding diverse cultures into one. It will either bind people together or hopelessly separate them. For example, knowledge of foreign languages it is especially useful for young people who travel around the world soon after leaving school: their experiences will be enhanced by being able to speak the native language in countries they visit.

Last but not least is the issue of a common international language (e.g., English) that serves as a means for global communication related to various aspects of the "global village."

CHAMSA: Five Languages Citizens of an Increasingly Technological World Should Acquire

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## 2.3 The Language of Science (Mathematics)

According to Galileo Galilei, "Mathematics is the language with which God has written the universe". "Mathematics is pure language - the language of science. It is unique among languages in its ability to provide precise expression for every thought or concept that can be formulated in its terms" [1, p.435]. It can be used to explain scientific phenomena as well as to help people solve everyday problems and in making decisions. Specifically, it has been recognized as the language of physics. Based on the above, mathematics has been widely recognized around the world and has been established as a compulsive school subject in formative education.

## 2.4 The Language of Art and Body

Usually formative educational systems give high priority to and emphasize teaching practical subjects that establish solid foundations to learning science, technology, economics, and other essential fields. However, particularly in the context of dynamically developing a technological and commercial "global village", it is important to also develop personal emotional communication skills and to raise one's awareness of physical health. Special resources should be devoted to teaching youngsters the language of art and the language of body. Regarding communication, words cannot always express everything. For example, sometimes we cannot explain why tears flood our eyes when we hear beautiful music. A painted picture can bring more insights than an ocean of words. Dancing is something that we do to express our deeper feelings. Body language is the most effective means of communicating unspoken emotions, a non-verbal way to impart your thoughts without verbalizing it; it is a part of our everyday dealings with people who are in our social circle, or those who we must meet for business functions or job-related assignments. Even in ancient times, art was a means of communicating through dancing, singing, and playing music. For ancient tribes it was a way to announce special life-changing situations (e.g. emergency or war).

Studying art and sport may benefit with the emotional, psychological, and physical profile of a person, and may contribute to the quality of our life as well as enhance better communication within society; moreover, it may reinforce the foundations for better functioning in other areas [2]. It is recommended that students learn to appreciate, evaluate, and produce art and to express their themes and feelings through doing art. Similarly, participating in sports activities and in art associated with physical education (e.g., dancing) may enhance body language communication.

## 2.5 The Language of Technology (Computer Science)

Computers are part of almost every aspect of our lives and therefore it is vital that we understand both their capabilities and limitations. Similar to the more traditional sciences, computing provides us with an essential understanding of the world around us. Hence, it is not surprising that computing has increasingly become a core knowledge requirement for all those who intend to become educated citizens. In particular, computer science, being the basis of computing, is constantly contributing to other fields by demonstrating how their processes can be modeled as information processes [5]. Besides being a science in its own right, computer science serves as a platform for applying scientific and other knowledge to practical tasks: "Conceptual and technological tools developed within computer science are … starting to have wide-ranging applications outside the subject in which they originated, especially in sciences investigating complex systems" [16, p.8]. Scientists state that computer science is "poised to become as fundamental to science, and in particular the natural sciences, as mathematics has become to science, and in particular the physical sciences" [16, p.26].

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Based on these arguments, we recommended in a previous paper that computer science be recognized as a language of technology. Since computational concepts are deeply embedded in everyday thinking in many fields [16], the proper use of language facilitates doing and understanding technology. More specifically, the language describes structures, processes, relationships, and communications. It supports abstraction, formalization, and knowledge representation. This view expands the responsibility of computer science in the contemporary world and legitimates its status as a basic language that is essential for acquiring scientific and technological literacy [4].

Regarding educating future citizens, the computer science education community has stated that computer science provides the knowledge and skills foundation for contemporary technological advances. For example: "Maintaining our ability to meet present and future challenges requires us to acknowledge computer science as a core element of all STEM (science, technology, engineering, and mathematics) initiatives" [14, p.15]. With respect to computer science as a means of enhancing cognitive skills, Jeannette Wing's call for teaching computational thinking [17] as a formative skill on a par with reading, writing, and arithmetic places the core of computer science as an important study subject. Specifically, information representation and retrieval, efficiency, and heuristics are recurring themes that arise in ordinary activities on a daily basis.

"Dealing with these themes does not require specialized career skills. On the contrary, just as proficiency in basic language arts helps us to effectively communicate, and basic math helps us to successfully quantitate, proficiency in computational thinking – what we synonymously call basic computer science – helps us to systematically, correctly and efficiently process information and tasks" [11].

Strengthening the status of computer science as a full-fledged and self-contained subject in educational systems is most important, and it is expected that (like mathematics) it should be taught as an essential core subject [15].

## 3 EDUCATING FUTURE CITIZENS - AN INTEGRATIVE VIEW

The languages described above contribute, individually and collectively, to educating future citizens who can function better in our increasingly technological contemporary world. Combining these five languages literally provides a Chamsa in the sense of establishing a solid foundation of the knowledge and skills essential for their personal, national, and global involvement, as well as in contributing to their success in becoming scientifically literate citizens [6,12]. The languages should be acquired in a wide context of communication, while simultaneously developing skills involving knowledge comprehension, knowledge representation, problem solving, and creativity. Linking languages to describe and explain various phenomena could enhance their use as a means for effective communication. The idea of teaching the five languages in that way could be the basis for international comparative tests aimed at assessing students' skills and abilities regarding various dimensions (personal, national, and global) as well as their performance in various contexts.

Specifically, as computer science educators, we must underscore the importance of computing education, and state that computer science must be a compulsory core subject. Computer science provides the basis for knowledge and skills essential for contemporary and continued technological advances [15] and may enhance our understanding of other subjects as well [17]. It should be considered as a high-level scientific language for problem solving, knowledge representation, and formalization of processes, as well as a language for better understanding technology and for performing technology-related processes [4]. Importantly, it can be easily linked to the other languages to solve problems in various domains.

## 4 CONCLUDING REMARKS

The increasingly technological, contemporary world, which recently has encouraged globalization in many domains, poses new educational challenges regarding preparing individuals to become literate and high-quality citizens who are capable of simultaneously functioning on personal, national, and global levels. Educational systems should promote youngsters to develop their ability to solve problems and to share ideas with others meaningfully. We suggest that during their formative years students should acquire five basic languages, one of which is computer science, as tools for communication and for processing information. The languages are a mother-tongue, an elective international foreign language, a language of science (mathematics), a language of art and body, and a language of technology (computer science), each of which is used to express themes, ideas and ways of thinking associated with specific domains. Besides enabling basic communication and formalization of ideas and solutions to problems in various contexts, these languages reflect a range of cultures as well as approaches and norms of different communities of practice. We believe that integrative long-term study of these languages is important for establishing a solid foundation of essential knowledge and skills and is highly useful for citizens to successfully function and communicate on personal, professional, national, and global levels. **Ir**


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