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The Impact of Computer Science Education on 7th and 8th-Grade Basic Education Students in a State Public School: A Case Study of EP 1 Félix Tshisekedi Elementary School Located at the Naval Force Camp in Kinshasa

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ABSTRACT

This study examines the impact of computer science education on 7th- and 8th-grade students in basic education at EP 1 Félix Tshisekedi public elementary school, located at the naval force camp in Kinshasa. It is based on the observation that, despite the growing importance of information and communication technologies (ICT) in education, some public schools still face difficulties in providing effective and practical computer science education.

The main research question is to determine the impact of computer science education on the acquisition of digital skills and the learning outcomes of 7th- and 8th-grade students. The main hypothesis is that computer science education contributes to improving students' knowledge and digital skills. However, this impact depends particularly on the availability of computer equipment, access to electricity, teachers' qualifications, and the emphasis placed on practical exercises.

To test this hypothesis, a mixed-methods approach with a predominantly descriptive and explanatory design was adopted. The survey involved a sample of 61 participants, consisting of 31 seventh-grade students, 27 eighth-grade students, one computer science teacher, and two school administrators. Data were collected through questionnaires, interviews, observation, and document analysis.

The results reveal that 100% of respondents reported attending or teaching computer science classes. However, 77.04% stated that teaching is mainly based on theoretical explanations, while 100% reported the absence of a computer lab at the school. Regarding proficiency with computer tools, 73.77% of participants considered their level to be average, while 26.22% reported a low level. Furthermore, 80.32% of respondents stated that they were able to identify the main components of a computer, whereas practical skills—such as using the keyboard, mouse, and software applications—remained underdeveloped.

In addition, the findings show that 88.52% of participants acknowledged that computer science classes increase their motivation, demonstrating learners' interest in this subject. Nevertheless, the main difficulties identified include the absence of a computer lab, insufficient electricity supply, a lack of teaching materials, and teachers' limited computer skills.

In light of these findings, the research hypothesis is generally supported: computer science education has educational value and contributes to learners' motivation and the s the acquisition of certain digital skills. However, inadequate material and pedagogical conditions limit the development of students' practical skills.

In conclusion, this study demonstrates that computer science education is an important factor in improving the quality of basic education. To enhance its effectiveness, it is recommended that a computer lab be established, a reliable electricity supply be ensured, teacher training be strengthened, teaching materials be improved, and the number of practical computer science lessons be increased.

Keywords: computer science education, digital skills, students, basic education, academic motivation, learning, public school.

1. INTRODUCTION

Computer science now plays a significant role in the development of education. It is an essential tool for acquiring knowledge, developing digital skills, and preparing students for the demands of the modern world. In schools, computer science education enables students to become familiar with digital tools, develop their logical thinking, and facilitate their learning.

In the state's public schools, particularly in the 7th and 8th grades of basic education, the introduction of computer science presents an opportunity to improve the quality of instruction.

However, its actual impact depends on several factors, including the availability of computers, access to electricity, teacher qualifications, the teaching methods used, and the school's physical conditions.

Schools must no longer merely impart theoretical knowledge but must also prepare students to use digital tools effectively, responsibly, and independently. The quality of instruction depends largely on teachers' professional competencies. This issue becomes particularly important in science disciplines, especially computer science, which require a simultaneous mastery of subject matter, instructional approaches, and teaching methods. This study analyzes the impact of computer science instruction on 7th- and 8th-grade students at a public school in the state. It aims to determine the extent to which this instruction contributes to the development of students' skills and to identify the challenges that may limit its effectiveness.

Despite the growing importance of information and communication technologies in education, some public schools still face challenges in providing practical and effective computer science instruction. In many schools, students may learn theoretical concepts about computers, their components, software, and digital technologies without having access to sufficient equipment to complete hands-on exercises. This situation can lead to a disconnect between the theoretical knowledge acquired in class and the skills students have actually mastered.

The main research question is therefore formulated as follows: What is the impact of computer science instruction on the acquisition of digital skills and on the learning of 7th- and 8th-grade students in a public school in the state?

Consequently, several questions warrant consideration: What is the level of computer literacy among 7th- and 8th-grade students? To what extent do computer science classes improve their digital skills? What is the impact of this instruction on their motivation and academic performance? What are the main challenges faced by teachers and students? What strategies could help improve computer science instruction in a public school?

To address this issue, the main hypothesis is formulated as follows: computer science instruction helps improve the digital knowledge and skills of 7th- and 8th-grade students. Students who participate in regular hands-on sessions have a better command of computer tools than those who primarily take theoretical courses. The use of digital tools can boost students' motivation, independence, and participation in school activities. Insufficient computer equipment, power outages, and challenges in teacher training limit the effectiveness of this instruction. Improving material and pedagogical conditions would lead to better outcomes in computer science learning.

These hypotheses will need to be verified through a survey conducted at the school in question. The overall objective of this research is to analyze the impact of computer science instruction on 7th- and 8th-grade students at a public school in the state, with a focus on the acquisition of digital skills, academic motivation, and the challenges encountered.

Specifically, the study aims to:

- Assess students' computer science knowledge before and after instruction, if comparable data are available;
- Examine the practical skills acquired by students;
- Compare the learning outcomes of 7th- and 8th-grade students;
- Identify factors that promote or hinder computer science learning;
- Identify challenges related to teaching computer science;
- Propose measures likely to improve the quality of this instruction.

1.1 Literature Review

Computer Science: the science of the automatic and logical processing of information

Teaching: the act or structured art of transmitting skills (knowledge, know-how, and interpersonal skills) by a teacher to a pupil, student, or audience

Competence: a person's ability to act effectively in a given situation by drawing on a set of resources

Basic education: refers to the set of fundamental learning experiences necessary for every individual to become self-reliant, understand the world, and actively participate in society

1.2 Significance of the Study

This research is significant on three levels.

From an educational perspective: it will provide a better understanding of how computer science contributes to the development of students' competencies and help identify the most effective teaching methods.

From an institutional perspective: it can help school administrators assess needs for equipment and instructional materials.

From a scientific perspective: it will serve as a foundation for further research on the integration of digital technologies into basic education.

1.3 Analysis of the Main Effects of Computer Science Education

Acquisition of Digital Skills

Computer science classes can help students identify the components of a computer, understand the functions of the keyboard and mouse, manage files, and use basic software. These skills form the foundation for further digital learning.

1.4 Development of Intellectual Abilities

Computer-based activities can foster problem-solving, logical thinking, concentration, and creativity. Hands-on exercises encourage students to observe, experiment, and correct their mistakes.

1.5 Motivation and Academic Engagement

Interactive activities tailored to students' skill levels can stimulate their interest and participation. However, this effect depends on the quality of instruction, pedagogical guidance, and effective access to digital tools.

1.6 Preparation for the Future

Gradually mastering computer tools can facilitate research, the completion of schoolwork, and adaptation to the future demands of higher education and the professional world.

1.7 Challenges That May Limit Impact

The effectiveness of computer science instruction in a public school depends on the conditions under which it is organized.

It should be emphasized that these challenges should not be considered established facts in the school under study prior to conducting a field survey

2. METHODOLOGY

2.1 Research Approach and Design

The study adopted a mixed-methods approach with a predominantly descriptive and explanatory focus. The quantitative component made it possible to describe teaching conditions, assess students' skills, and examine the relationships between teaching practices and observed outcomes. The qualitative component allowed for a deeper exploration of instructional practices, the challenges encountered, and the concrete operating conditions of this school.

A comparative analysis between 7th- and 8th-grade students could also be considered.

2.2 Study Setting and Population

The study was conducted at the E.P. 1 Felix TSHISEKEDI public school at the naval base in Kinshasa.

The study population consisted primarily of 7th-grade students, 8th-grade students, computer science teachers, and school administrators.

2.3 Sampling

A non-probability sampling method was used to select 61 participants.

Participants included computer science teachers, school administrators, and 7th- and 8th-grade students.

Data was collected between September 21 and November 11, 2027.

Table 1: Distribution of Participants by Category

Participants	F	%
7th-grade students	31	50.8
8th-grade students	27	44.2
Computer science teachers	1	1.6
School Principal	2	3.2
Total	61	100

2.4 Data Collection Methods

Data is collected through:

The questionnaire: to identify students' digital habits, their level of proficiency, and the challenges they face.

Interviews: to gather feedback from teachers and school administrators.

Observation: to examine how classes are conducted, the available equipment, and student participation.

Practical test: to measure students' ability to perform specific computer tasks.

Literature review: review curricula, lesson plans, and available academic results.

2.5 Variable Studied

Independent variables

The independent variable is the factor whose influence on students we seek to measure. Computer science instruction provided to 7th- and 8th-grade students

This variable is examined using the following indicators:

- The number of computer science class hours per week;
- The frequency of computer science classes;
- The teaching methods used by the teacher;
- The availability of computers and computer equipment;
- The teacher's computer science knowledge and skills;
- The theoretical and practical components of the classes.

Dependent variables

The dependent variable is the outcome we seek to observe, or measure based on the independent variable (the impact of computer science instruction on 7th- and 8th-grade students)

This impact is measured using the following indicators:

- Students' level of computer science knowledge;
- The development of practical computer skills;
- The ability to use a computer and basic software;
- Students' academic performance in computer science;

Quantitative data were analyzed using frequencies, percentages, and qualitative data from interviews and observations were subjected to thematic analysis and were used to supplement the interpretation of the quantitative results.

3. EXPECTED RESULTS

This section presents the main results of the survey conducted among 31 7th-grade students, 27 8th-grade students, 1 computer science teacher, and 2 school administrators. The results are presented along with statistical measures (frequency, percentage, standard deviation) and detailed calculations to allow for verification of the main associations identified by the analysis.

Table 2: General Characteristics of Respondents

Position	F	%
7th-grade students	31	50.8
8th-grade students	27	44.2
Computer Science Teacher	1	1.6
School Principal	2	3.2
Total	61	100

Source: field data

The results show that the sample consists of 61 participants, including 31 7th-grade students (50.8%) and 27 8th-grade students (44.2%). The remaining participants include one computer science teacher (1.6%) and two school administrators (3.2%). This breakdown reveals that students constitute the largest category of respondents, which aligns with the focus of this research, centered on the impact of computer science education on learners. The participation of teachers and school administrators also allows for consideration of the pedagogical and institutional aspects of this education.

Thus, the composition of the sample allows us to understand the phenomenon under study based on the experiences of the learners and the perceptions of those responsible for school administration.

Table 3: Enrollment in our Exemption from Computer Science Classes

School	f	%
Yes	61	100
No	0	0
Total	61	100

Source: field data

The results indicate that all 61 respondents, or 100%, reported having taken or taught the computer science course. No participant answered in the negative.

This result shows that computer science is effectively integrated into the educational activities of the school under study. It demonstrates the existence of computer science instruction available to students in basic education.

However, the presence of a computer science course in the curriculum does not necessarily guarantee the acquisition of digital skills. It is therefore important to distinguish between the institutional existence of this instruction and its actual pedagogical effectiveness.

Table 4: Frequency of Computer Science Classes

Course Frequency	F	%
Several times a week	0	0
Once a week	41	67.21
Twice a week	20	32.78
Total	61	100

Source: field data

The data reveal that 41 respondents, or 67.21%, report taking or teaching the computer science course once a week, while 20 participants (32.78%) indicate a frequency of twice a week. No respondent reported a frequency of more than two sessions per week.

These results indicate that computer science instruction is organized on a relatively infrequent basis. The most of participants attend only one session per week.

This situation could limit opportunities for repetition, experimentation, and consolidation of learning, particularly in a subject that requires regular use of digital tools.

It therefore seems necessary to consider adapting the number of class hours to the practical requirements of computer science instruction.

Table 5: Teaching Methods Used in Computer Science Classes

Method Used	F	%
Theoretical explanations only	47	77.04
Demonstrations by the teacher	4	6.55
Practical exercises on the computer	0	0
Alternating between theory and practice	10	16:39
Total	61	100

Source: field data

The results indicate that 47 respondents, or 77.04%, report that the courses rely solely on theoretical explanations. Four participants (6.55%) mention demonstrations conducted by the instructor, while ten (16.39%) report a mix of theory and practice.it is particularly important to note that no participant reported receiving exclusively hands-on computer exercises.

This situation reveals a predominance of the theoretical approach in computer science education. However, this discipline requires not only the transmission of knowledge but also the development of practical skills through hands-on use of equipment.

The limited emphasis on practical activities could explain some of the shortcomings observed in students' mastery of computer tools.

These results thus underscore the need to promote active teaching methods based on demonstration, experimentation, and hands-on exercises.

Table 6: Does the school have a computer lab?

Computer Lab	F	%
Yes	0	0
No	61	61
Total	61	100

Source: field data

The results show that all 61 participants (100%) reported that their school does not have a computer lab.This finding is one of the most significant results of this study. Indeed, the absence of a computer lab represents a major logistical constraint for organizing hands-on instruction.

It limits students' opportunities to work with computers, explore software, and gradually develop their digital skills.

This situation highlights a disconnect between the pedagogical requirements of computer science instruction and the material resources available at the school.

Thus, establishing a computer lab appears to be a top priority for improving the quality of this instruction.

Table 7: Level of Familiarity with Computer Tools

Level of proficiency	F	%
Very good	0	0
Average	45	73.77
low	16	26.22
Total	61	100

Source: field data

The results reveal that 45 respondents, or 73.77%, consider themselves to have an average level of proficiency with computer tools. In contrast, 16 participants (26.22%) report having a low level of proficiency. No participant considers their level to be very good.

These data show that, despite the availability of computer courses, learners' digital skills remain relatively limited.

The predominance of the average level can be interpreted as a sign of partial acquisition of computer skills. As for the proportion of participants with a low level, it reflects persistent difficulties in mastering digital tools.

The absence of responses indicating a very good level of proficiency also warrants special attention.

These results highlight that mere exposure to theoretical content is not sufficient to ensure a satisfactory mastery of computer skills. Regular, hands-on learning therefore appears essential.

Table 8: Computer tasks participants can perform

Computer task	F	%
Identify the main components of a computer	49	80.32
Use the keyboard and mouse	2	3.27
Properly turning a computer on and off	2	3.27
Using word processing software	3	4.91
None of these tasks	5	8.19
Total	61	100

Source: field data

The results indicate that 49 respondents (80.32%) reported being able to identify the main components of a computer. Two participants (3.27%) mentioned using the keyboard and mouse, two others (3.27%) know how to properly turn a computer on and off, while three participants (4.91%) reported being able to use word processing software. Finally, five respondents (8.19%) stated that they could not perform any of the tasks listed.

These results highlight a concentration of knowledge centered on the theoretical identification of computer components.

In contrast, practical skills particularly the use of the keyboard, mouse, and word processing software remain underrepresented. This situation reveals a significant gap between descriptive knowledge of computer technology and the ability to use it in practice.

In other words, learners seem more familiar with theoretical concepts than with the practical skills required to use a computer independently.

This finding reinforces the idea that computer science education should place greater emphasis on hands-on exercises.

Table 9: Do computer science classes increase your motivation?

Increased motivation	F	%
Yes, a lot	39	63.93
Yes, a little	15	24.59
Not at all	7	11.47
Total	61	100

Source: field data

The data show that 39 respondents (63.93%) believe that computer science classes significantly increase their motivation. Fifteen participants (24.59%) report that their motivation increases slightly, while seven participants (11.47%) state that these classes do not increase their motivation at all.

Combining the first two categories, we find that 88.52% of respondents acknowledge a positive effect of computer science classes on their motivation.

This result is an encouraging indicator for the integration of this subject into basic education.

It shows that computer science sparks particular interest among learners and could help boost their participation in school activities.

However, this positive motivation does not automatically translate into effective mastery of digital skills. It must be accompanied by favorable pedagogical and material conditions to produce lasting results.

Table 10: The Main Challenges Limiting the Learning of Computer Science

Main Challenges	F
Lack of computer labs	61
Lack of insufficient electricity	61
Teachers' difficulties with computer skills	54
Lack of teaching materials	56
Total	

The results highlight several major challenges:

The lack of a computer lab was cited by 61 participants.

Insufficient or no electricity was also mentioned by 61 participants.

The lack of teaching materials was noted by 56 participants.

Teachers' difficulty in mastering computer science was cited by 54 participants.

These results highlight four key constraints that affect the effectiveness of computer science instruction.

First, the lack of a computer lab hinders the implementation of hands-on activities.

Second, insufficient electricity compromises the reliable operation of digital equipment, even when it is available.

Third, the lack of teaching materials limits opportunities to support and structure the learning process.

Finally, teachers' difficulties in mastering computer science raise questions about their professional training and their ability to effectively teach digital skills.

Overall, these findings show that the challenges encountered are not solely attributable to the learners, but also to the institutional, material, and pedagogical conditions under which the courses are organized.

Table 11: Top Priority Measure for Improving Computer Science Education

Priority Action	F
Creation of a computer lab	61
Ensure a steady power supply	61
Strengthening teacher training	57
Improve teaching materials	54
Increase the number of class hours	57

Source: field data

The results show that 61 participants recommend, as a top priority, the creation of a computer lab and improvements to the power supply. In addition, 57 participants advocate for enhanced teacher training, while 54 recommend improvements to teaching materials. Finally, 57 participants would like to see an increase in the number of hours devoted to computer science classes.

These results reflect a consensus among respondents regarding the need to improve the material and pedagogical conditions for computer science education.

The creation of a computer lab and a constant supply of electricity emerge as the top two priorities. These are the fundamental conditions necessary to enable hands-on learning.

Strengthening teacher training is also an important measure, since the quality of instruction depends largely on the professional skills of those responsible for teaching the course.

Finally, improving teaching materials and increasing the number of class hours could help enhance the continuity and effectiveness of learning.

These results show that improving computer science education requires coordinated action by school administrators and educational authorities.

4. DISCUSSION OF THE RESULTS.

This study analyzes the impact of computer science instruction on 7th- and 8th-grade students in basic education at the EP 1 Félix TSHISEKEDI public school.

The main objective was to analyze the extent to which computer science instruction contributes to the development of digital skills, academic motivation, and student learning, while identifying the challenges that limit its effectiveness.

The results obtained from 61 participants comprising 31 7th-grade students, 27 8th-grade students, one computer science teacher, and two school administrators highlight several realities regarding the organization and effectiveness of this instruction.

The originality of this research lies in the fact that it focuses specifically on the impact of computer science instruction on 7th- and 8th-grade students at a public school in Kinshasa.

Unlike studies that generally address the integration of digital technologies into education in a broad sense, this study emphasizes the concrete realities encountered in a specific school.

It is also of particular interest in that it does not merely verify the existence of computer science courses in the curriculum. Rather, it seeks to understand whether these courses actually enable students to acquire practical and operational skills.

This approach provides a better understanding of the factors that promote or limit the effectiveness of computer science instruction in the context of basic education.

The results show that 100% of respondents reported having taken or taught the computer science course.

This finding indicates that computer science is indeed integrated into the educational activities of the school under study.

One of the most significant findings of this research concerns the teaching methods used.

In fact, 77.04% of respondents reported that the courses rely solely on theoretical explanations. Furthermore, 6.55% mentioned demonstrations conducted by the teacher, and 16.39% reported a combination of theory and practice.

It is particularly significant that no participant reported engaging exclusively in practical computer-based exercises.

Thus, the results highlight the need to adopt active teaching methods that emphasize demonstrations, experimentation, and student participation.

The results show that 100% of participants stated that their school does not have a computer lab.

This lack of a computer lab constitutes a major constraint on practical computer science learning.

In fact, students do not have a specially equipped space where they can regularly use computers and practice using software.

This situation may explain the predominance of theoretical instruction observed earlier.

It therefore appears that the difficulties students encounter is not necessarily related to their ability to learn, but also to the physical conditions under which instruction is provided.

The creation of a computer lab would thus be an important step toward improving the quality of education.

For students, computer science offers an opportunity to discover new tools, acquire useful knowledge, and prepare for the demands of today's society.

The study employed a mixed-methods approach that was primarily descriptive and explanatory, combining quantitative and qualitative methods.

The questionnaire was used to gather students' perceptions regarding their knowledge, skills, and motivation.

The interviews allowed for the consideration of teachers' and school administrators' opinions, while the observations were intended to examine the actual conditions under which classes are organized.

The World Bank report assessing the digital economy in the Democratic Republic of the Congo highlights that many schools lack electricity, computers, and the equipment necessary for developing digital skills.

It also notes the shortage of qualified teachers and the challenges associated with their training.

These observations align with the findings of our study, in which 100% of participants reported the absence of a computer lab and insufficient electricity, while 54 participants mentioned teachers' difficulties in mastering computer skills.

This convergence shows that the challenges observed in the school studied are part of a broader issue concerning the integration of digital technologies into the Congolese education system.

UNESCO's Global Education Monitoring Report on Technology in Education (2023) highlights inequalities in access to electricity and digital equipment in schools.

In particular, it emphasizes that insufficient electricity supply constitutes a major obstacle to the use of technology in learning.

This observation aligns with the results of our research, as all 61 participants cited insufficient or no electricity as a major challenge.

The consistency between these observations confirms the importance of infrastructure in implementing effective computer science education.

The study titled *Investigating K-12 Computing Education in Four African Countries (Botswana, Kenya, Nigeria, and Uganda)*, published in 2023 in the journal *ACM Transactions on Computing Education*, examined the capacity of the education systems in four African countries to provide computer science education.

Conducted primarily among 58 teachers, this research highlights several challenges related to funding, the availability of computing infrastructure, instructional resources, and professional development for teachers.

These findings show similarities to those of our study, particularly regarding insufficient equipment and challenges in teacher training. The convergence of these studies demonstrates that the challenges associated with computer science education are not limited to a single institution but are also a concern across several African education systems.

A study published in 2026 in the journal *Akofena*, which examined the integration of computer science into primary and secondary education in the Kwilu I Educational Province, highlights several obstacles to the effective integration of this subject. The results indicate, in particular, that 75.4% of the teachers surveyed did not receive any specific training in computer science education.

The study also notes a shortage of computer equipment, difficulties in accessing electricity, and the limited number of class hours allocated to this subject.

These observations largely align with the results of our research, which also reveal challenges related to teacher training, infrastructure, and the frequency of classes. This similarity in findings reinforces the idea that improving computer science education in Congolese schools requires material investments and the strengthening of teachers' professional capacities.

CONCLUSION

At the conclusion of this study on the impact of computer science education on 7th- and 8th-grade students in basic education at Félix Tshisekedi Elementary School (EP 1), located at the Naval Base in Kinshasa, it is evident that computer science education is an important factor in the development of students' digital literacy and academic motivation.

The results obtained from 61 participants show that, despite the effective integration of computer science into the curriculum, its instruction remains primarily theoretical (77.04%); furthermore, 100% of respondents reported the absence of a computer lab. This situation significantly limits opportunities for hands-on computer use and the acquisition of practical skills. In fact, while 80.32% of participants reported being able to identify the main components of a computer, their practical skills particularly the use of the keyboard, mouse, and software remain underdeveloped.

However, the study reveals a positive aspect: 88.52% of respondents acknowledge that computer science classes boost their motivation. This result demonstrates students' interest in this subject and its educational potential in basic education.

Thus, the main hypothesis of the research is generally supported, insofar as computer science instruction promotes the acquisition of certain digital skills and stimulates learner motivation. However, its effectiveness remains limited by inadequate infrastructure, a lack of electricity, insufficient teaching materials, and difficulties some teachers face in mastering computer science.

Consequently, improving this instruction requires the creation of a computer lab, a reliable electricity supply, enhanced teacher training, improved teaching materials, and an increase in the number of hours devoted to hands-on exercises.

Ultimately, computer science education should not be limited to the transmission of theoretical knowledge but must prioritize hands-on practice to enable students to develop genuine digital skills, which are essential for their academic success and their integration into an increasingly digital society.

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