



The demand for stereotype-free computing courses for Elementary School Teachers

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Abstract

From the discussion on the insertion of computational concepts in Basic Education in Brazil, there has been a growing demand for support to these teachers in the form of training courses in computing, whether offered by formal bodies or even by independent projects such as the university extension. If, on the one hand, the offer of these courses fulfills the role of helping Basic Education teachers in this challenge of integrating computational concepts in their classroom practice, on the other hand, these training courses also have the potential to engage teachers to attract their students to the area of computing as a profession. We argue that because many girls are rarely exposed to content in this area in particular, and hearing quality clarifications from their teachers can spark previously unexplored curiosities. However, in order to fulfill this second role, it is necessary to discuss how these courses are approached in order to break with certain stereotypes, such as gender, which have long been perceived in this area. In this sense, this article highlights this demand for training courses in computing free of stereotypes, since it identifies a perception that is still stereotyped, a possible reflection of a clear lack of basic education teachers in training courses offered by the TIChers extension project.

Keywords: *Stereotype-free, Computing, Elementary School Teachers*

1 Introduction

The demand for training courses for teachers of Basic Education has grown since 2017, with the beginning of the discussion on including Computing knowledge in the Basic Education curriculum. With the approval of the rules on Computing in Basic Education by the National Educational Council in February 2022 [SBC 2022] this demand became urgent. These training courses for teachers can be offered by different entities, from colleges, NGOs (non-governmental organization), collective groups or even through university extension projects, which together can meet the great demand that has been noticed. However, these training courses can also help in the gap due to the future lack of professionals in the area, since it is at school that children have strong contact with the various areas of knowledge, which later end up being materialized in professional choices. This can happen if teachers are helped to understand the wide range of paths that computing has without reinforcing stereotypes carried by the area as if only “nerd” men can succeed in this area.

The lack of female representation in the field of technology is something very present in current discussions. According to the Higher Computing Education statistics of the Brazilian Computing Society (SBC) [SBC 2019], while the number of male enrollments averages 350,000 per year, the female audience only reaches the 50,000 mark. Furthermore, more than 45,000 men complete their studies each year and only about 5,000 women manage to complete them, showing that the space that Brazilian women occupy

in Computer Science courses is still small. The lack of credibility, situations of humiliation, objectification and prejudice that women who choose to defy statistics can suffer are some of the obstacles in the fight for this space in technology [Semis and Monteiro 2016].

The deconstruction of created stereotypes that “women can not program” and that “Information Technology (IT) is a man’s thing”, since childhood and inside the classroom, can be a good strategy to attract more girls and stimulate them to enter the technology area. The students themselves report that patriarchy, the comparison of women’s skills with men’s skills, the feeling of isolation due to the area being predominantly male and the imposed idea that computing is a man’s thing, are some of the factors that make it difficult for women to enroll in the university in this area [Aires et al. 2018].

For this reason, instructing teachers correctly and clearly on how to introduce computing-related contents inside the classroom environment and, thus, clarifying issues related to the profession, can be an essential factor in gradually attracting those who often would not even think about pursuing a career in the technology field, as will be discussed in Section 2.

There are, at the present moment, several reports of experiences in projects that work with the use of computational thinking or computational reasoning with Basic Education students. However, projects and reports that give visibility to teachers are not so common [Matos et al. 2021].

With that in mind, the university extension project TlChers [Bim and Berardi 2020], offers training courses to Basic Education teachers on various topics, from the most technical ones such as Computational Thinking, Cryptography, Database, Artificial Intelligence as well as topics mainly aimed at reducing stereotypes in the area, such as Communication with Girls, Ethics in Artificial Intelligence, Women's History in Computing and forward. TlChers is a partner of the program Digital Girls (PMD), endorsed by SBC has several partner projects spread across Brazil with the aim of awakening the interest of girls at the end of high school and elementary school in the area of computing [Maciel et al. 2018].

In this context, this article highlights the demand for stereotypes-free training courses for Basic Education teachers. This article extends the article [Amador et al. 2021] that identified some stereotyped views of Basic Education teachers in a Database workshop by increasing the analysis of the perceptions of Basic Education teachers who participated in another training of the TlChers project, on Computational Thinking. It is worth mentioning that an interesting comparison between the teachers' perceptions is possible because in this second group, the participants have a different profile from the first group, even though they are all Basic Education teachers. The second group differs from the first one, explored in the article [Amador et al. 2021], because they are teachers linked to a technology department that provides for schools in a public education network with specific classes on technology. Therefore, the discussions around the teachers' perceptions in these two workshops support the argument that it is necessary for the training courses to be approached in a less stereotyped way so that prejudices are not reinforced.

The insights discussed in this article concern data from two workshops: the first one is a Database workshop and the second one is a workshop on Computational Thinking. Both were taught to Basic Education teachers, with the purpose of introducing teachers to the theme of database and computational thinking. Besides that, both workshops address indirectly during the explanation how important is the diversity of points of view for the problems that computing techniques propose solutions. As a result of this narrative we encourage them to become allies in the correct dissemination of Computing among their students, attracting more girls to the area. The correct dissemination should be free of stereotypes and broadly encompassing, as explaining that a career in computing does not only cover activities related to programming. Through this workshop, it was possible to collect data to identify the teachers' perception of the career and how much each workshop helped to change limited perceptions.

2 Role of Basic Education teachers in career influence

The discussion about the teachers' role, when it comes to influencing careers, is still little addressed. Therefore, references are scarce and, when found, the results for the discussion consider only high school students. It is worth

mentioning that it is necessary to provoke new discussions focusing on this theme.

According to [Buscacio and Soares 2017] research, the opinion of teachers, especially in high school, is relevant when choosing a profession. However, in general, the family works as a primary reference for students.

Likewise, the research carried out by [Neto et al. 2016], with high school students, shows that the teacher's influence on the students' choices is minimal, and that, despite being in a position where the teacher is able to influence, since she/he plays an educator's role, she/he does not take advantage of this situation to motivate hers/his students.

It can be noted that the teachers' influence on high school students, despite existing, is still timid. In this way, actions aimed at Elementary School students can have a more productive effect than for High School students, where most have already made up their decision [Holanda et al. 2017], since all people begin to formulate vocational decisions from childhood [Stanley and Mangiesi 1984 apud Herr and Cramer 1996 apud Ferreira et al. 2009]. In addition, the school and the experiences that take place in it can facilitate significant learning, capable of influencing the process of vocational guidance of individuals.

Finally, [Martins et al. 2019] research brought as one of the factors that attract girls to IT courses "Awakening curiosity about the area in girls since childhood", showing again the need to work and encourage younger students and also those who work directly with them, then, attracting more and more girls to Computing.

3 Methodology

The data used in this article incorporate responses from Basic Education teachers who are part of the training programs that belongs to the Bureau of Education from the city of Curitiba, Paraná, and Basic Education teachers linked to the Department of Educational Technology (DTE)¹ that answers to the Bureau of Education from the city of Florianópolis, Santa Catarina.

The teachers from Curitiba participated in a workshop about Database, which was taught to two different groups of teachers, with 19 participants in the first group and 23 in the second one, summing up to 42 participants. The contents covered in this workshop were the same as in a workshop held with high school students [Berardi et al. 2019], which was adapted for Basic Education teachers. The central theme of the workshop was to show how database concepts can be worked with current themes and, for that, an unplugged methodology was used to explain how the organization of data in a database works. Thus, in order to understand whether the workshop changed the teachers' view of Computing and to carry out a detailed analysis of these results, they were asked to answer an

¹<https://sites.google.com/prod/sme.pmf.sc.gov.br/portaleducacional/dte-espa%C3%A7o-do-professor>

online questionnaire ² at the beginning and another at the end of the workshop. The proposal of the database theme for the teachers was due to the possibility of reusing the workshop carried out with high school students in which the results had shown to be promising to discuss the possible areas of computing, bringing as motivation the data area that is in high relevance at the moment [Berardi et al. 2019]. The choice for the topic of computational thinking was due the demand brought by the DTE as it is a very demanding subject for technology professors. And since this subject can also be an opportunity to talk about computing areas, we indirectly insert the discussion about the different areas and skills that can be developed with computing.

Florianópolis teachers participated in a synchronous remote workshop about Computational Thinking, in order to develop the pillars of Computational Thinking. The central theme of the workshop was to demonstrate the possibility of working with Computational Thinking without the need to use programming such as Scratch or any technological resource, characterizing it as unplugged, despite the meeting taking place online. Around 50 participants were present in the Google Meet room during the workshop and we obtained 30 responses in the online questionnaire requested at the end of the workshop. The questionnaire contained a few different questions from the one applied to the teachers in Curitiba, which even allows a perception comparison between these two audiences.

In the beginning of the first questionnaire, personal questions were asked, such as their age and in which area they teach, in order to outline the profile of the participating teachers. After these, there were questions that aimed to understand what the teachers understood by Computing, Database and Computational Thinking, such as the questions “What do you usually answer when asked about what someone who works with IT/Computing does?” and “Have you studied introductory computing concepts?”. In addition, there were questions that asked the participants' views on the issue of gender in Computing and how they felt when talking about the area with their students. These questions made it possible to identify whether teachers had any stereotyped views on gender and computing.

The second questionnaire aimed to understand the teachers' view of the workshop, what they learned from it and, mainly, to see if their understanding of Computing has changed, as in the question “The experience of participating in the workshop changed your opinion on Computing as a whole?”. In addition, participants were asked how they felt talking to their students about Computing, after the workshop, addressed in the question “Would you feel able to talk about computational thinking with your students?”.

4 Results Analysis

This section presents the results of the questionnaires answered by the participants from the two workshops. The section has 9 subsections, and each one has a question that

helps in the proposed discussion about the demand for stereotype-free training courses. The results analyzed were about the participants' profile, teachers' insights before and after the workshops, the moment when students start to ask about careers, if teachers can help in the dissemination of IT, the importance of workshops aimed at Basic Education teachers, the scope and effectiveness of the courses/workshops that these professors receive, the teachers' view of women in computing and, finally, the evaluation of the SBC's initiative to include computing content in the Basic Education curriculum.

4.1 What is the participants' profile?

The participants' profiles were collected via an online questionnaire before the workshops. Aware of the ethics that we must have with the data from the questionnaires, we inserted the following sentence in the form: “Your identity will be preserved in any publications about the answers to this questionnaire.” The profile of the two groups from the two workshops (Database and Computational Thinking) is highlighted hereinafter.

4.1.1 Database Workshop

The teachers participating in the Database workshop are Basic Education teachers from the Municipal Administration of Curitiba (PMC).

Tracing the participants' profile, the public was formed, mostly, by female teachers, since 97.6% identified themselves with the female gender. In addition, the majority age group is between 30 and 40 years old, representing 53.7% of the participants, followed by the range of 40 and 50 years old, with 34.1%.

Most of the teachers teach only in public schools (97.6%) and work predominantly with the subjects, considering that multiple responses could be selected, Science and Technology with 26.7%, Lighthouses of Knowledge³ with 13.3% and Maker Space and Mathematics with 11.1% each one.

4.1.2 Computational Thinking Workshop

The teachers participating in the Computational Thinking workshop are Basic Education teachers linked to the Department of Educational Technologies (DTE that offers training and pedagogical advice to Education professionals from the Municipal Education Network of Florianópolis. It is worth mentioning that this is a profile with a lot of potential to help attract girls to the IT profession as they are people dedicated to work directly with technology subjects in the classroom. Therefore, they are people who can be allies in the correct, clear and stereotype-free dissemination in the classroom. Not that the other group is not, but the

² Link to the initial questionnaire bit.ly/2oLebz2 e link to the final questionnaire bit.ly/30JMeVq.

³ Lighthouses of Knowledge are neighborhood libraries that promote extracurricular activities for students from the Municipal Education Network of Curitiba and other activities for the community. The Lighthouses also have a maker space, where projects are developed using low technology, in which students learn to prototype, code, collaborate in groups, among other skills developed.

challenges are greater when there is no direct and obvious role in the subject in relation to computational matters.

Mapping the profile of the participants, most of them are teachers who have more than 5 years of experience in teaching, with 60.6% having experience in Basic Education. Although the participants mainly work in the technology area in schools, the teachers also work in the areas of mathematics, physics, history and project maker. Among the participants, 19.4% have already participated several times in workshops that introduce computational thinking and 35.5% participated only once. Likewise, 87.1% answered that they already knew the expression computational thinking, on the other hand, when asked if “Do you know the pillars of the Computational Thinking concept?”, only 25.8% knew for sure what its pillars were and 54.8% had already heard about them but could not say what they were.

It is worth mentioning that when asked about “What is your interpretation of the expression computational thinking?”, there were answers such as: 'Codes', 'I have no theoretical basis to answer this question', 'It is the way a computer can be programmed to solve its functions, which can be applied in other activities' and 'About technology', which focused only on one of the pillars or that approach Computational Thinking only with the use of electronic devices, in addition to people who were unable to define the concept.

Finally, when asked about the challenges of approaching topics related to computational thinking in their classroom practice, answers were obtained such as: 'I need training', 'To make myself understood by the public I work with (elementary school in the early years)', 'Knowing the theory, applying it, adequate resources and tools that enable applicability', 'Having students' attention' and 'Planning, digital resources'. In addition to pointing out the time in the classroom and the number of students as factors that hinder the process of teaching the subject.

4.2. What is the teachers' perception about the IT career?

Analyzing the teachers' responses from the Database workshop, in which they were asked before the workshop “What do you usually answer when asked about what someone who works with IT/Computing does?” a significant divergence was noticed. It is worth mentioning that the options were pre-prepared closed answers in the questionnaire, as shown in Figure 1. The answer considered the most adequate would be “Solve society's problems through technology”. This answer represents a holistic view of IT areas because, regardless of the specific undergraduate course, the skills of professionals range from technical to human, aiming at solving problems that are sometimes more technical, sometimes more of application, but always with a social context, be it in public or organizational (ZORZO et al, 2017).

Of the total number of participants, 53.7% choosed answers focused only on one computing area - like programming - which may reflect stereotypes such as "Works with computers" which reached 24.4% and "Works with programming" with 19.5 %.

10) What do you usually answer when asked about what someone who works with IT/Computing does?

- I do not know
- Works with programming
- Works with computers
- Works with math and programming
- Works with math and computers
- Solve society's problems through technology
- Other: _____

Figure 1. Answers to the question “What do you usually answer when asked about what someone who works with IT/Computing does?”.

It is noticeable that mathematics is considered, in some answers, as essential for the study of Computing and the question is also answered with “Maintenance of computers”. This question shows a very limited view and focused only on computers and programming, which is often not so attractive if the girl does not know what is actually done when programming, such as how to solve problems from different areas. In addition, the question obtained 36.6% for “Solve society's problems through technology”, which would be expected among the options, and 9.8% did not know how to answer or put vague answers such as “I try to make them research” and “All options”.

After the workshop, the answer for the question “Has this workshop changed your perception of what people who work with computing do? were “yes, totally” for 67.5% of the respondents”, “yes, partially” for 30% of respondents, and “no” for 2.5% of respondents. We asked to justify and we highlight here some comments: “Expanded my view of the profession”, “Because at the beginning I thought of only software and hardware programming”, “I had no idea of the breadth that the computing area reaches”.

For the Computational Thinking workshop participants, this question was asked only in the final questionnaire because of limited time between the confirmation and the realization of the workshop. The answer for the same question about what a person who works with IT do, was the expected answer “Solve society's problems through technology” for 63,3% of respondents.

4.3 Did the teachers' perception change throughout the workshop?

The feedback regarding the Database after the workshop was 97.5% positive, with comments such as “It added knowledge and I thought about technology in another way”, “Very good. It helped me to understand who works in the area and to be more interested in the area”, “Very relevant” and “It made me have a new look at Computing, I'm in love”. It also obtained 67.5% in “Yes, totally” and 30% in “Yes, partially” when asked if “Has this workshop changed your perception about what those who work with Computing do?”.

Likewise, in the Computational Thinking workshop, all the people participating answered that they liked the workshop, with 96.7% indicating that the way the content was approached was “Adequate”, highlighting comments such as “Just listening to the topic, I felt that I was going to feel lost and I saw that I can enter this

universe”, “The novelty was to think about computational thinking more broadly and with simplicity” and “(...) it strengthened and encouraged me to work with unplugged computing”. When asked about “Has the experience of participating in the workshop changed your opinion about Computing as a whole?”, 43.3% answered that “Yes, totally” and 50% that “Yes, partially”, with the justification that they are necessary, more practical and who already had knowledge, even if partial, on the subject.

It is important to highlight the answers to the question “What do you usually answer when asked about what someone who works with IT/Computing does?”, which initially there was divergence in relation to the Database workshop, in the end, 90% chose “Solve society's problems through technology”.

On the other hand, in the Computational Thinking workshop, reinforcing that it was a question with the possibility of multiple choice, only 62.5% answered at the end of the workshop that “Solve societal problems through technology”, with 25.1% reporting answers focused only on one area of Computing, as discussed above, where the answer “Works with computers” reached 6.3% and “Works with programming” obtained 9.4%. Despite being interesting results, it is not possible to confirm a change, since the results were only obtained at the end of the workshop.

4.4. When do students start asking about careers?

Analyzing the question “Which period is it most common for students to ask about professions in general?”, it is possible to conclude, based on the answers obtained in the Database workshop, that the fourth and fifth years of Elementary School were indicated with 29.2 % and 36.1%, respectively, as interested in career choices, followed by the second and third years of high school, with 8.3% each. These data show that students' curiosity about professions has existed since elementary school.

When asked to the Computational Thinking workshop teachers, the fourth and fifth years of Elementary School also stood out, with 16.7% and 23.3% respectively. However, the ninth year of Elementary School was mostly contained in the responses, with 25%.

Even so, when doubts arise in the primary years, it is important that teachers are prepared to report as closely as possible about what professionals who work with Computing do, as it is a great opportunity to attract girls to the area.

4.5. Can teachers help in the dissemination of IT?

As discussed in Section 2, teachers are potential allies to promote careers as they are in frequent contact with students during the period when they make the decision, helping with doubts and encouraging them on which path to choose.

A Likert Scale, where 1 meant rarely and 5 meant very often, was used to discuss the frequency that teachers are asked by students about professions in general. 39% of the Database workshop participants stated that they are occasionally asked about the subject and 22% of the teachers are rarely questioned. In addition, the frequency with which teachers receive questions from students about professions in general is low for 22% of the participants. The frequency with which they are asked about Computing (IT) is low for 34.1% of the teachers, while 26.8% of the teachers are rarely questioned and the same percentage occurs for those who are occasionally questioned.

Regarding the Computational Thinking workshop, 36.6% of the participants reported that they are asked about professions in general infrequently and 23.3% are asked occasionally. As for the frequency with which they are approached about Computing (IT), in particular, it happens infrequently for 26.6% of the teachers and occasionally for 23.3% of them, happening frequently for only 20% of the participants. However, even though the frequency reported in the questionnaire is predominantly medium and low, it is necessary for professionals to be prepared for when the students question them.

It must be highlighted that the majority (65.9%) recognizes that the proportion is the same between boys and girls according to those who ask the most questions about professions. In addition, the percentage of teachers who claim to be boys and girls is the same, indicating that the chance of disseminating Computing is equal for both sexes.

4.6. Why do workshops directed to teachers?

Several current projects on Computing end up turning their dynamics towards the students and it is important that there are people welcoming and helping them. However, teachers play an important role in the lives of young people, in a unique way, they end up influencing their life and career paths [Faht 2011]. Therefore, teachers also need support so that the actions have a long-term effect and, thus, have a “continued dissemination” in the classroom, since the investment in continuing education, in research and in the experimentation of new practices are useful not only for professional requalification, but fundamentally for offering new meanings to professionals [Matos et al. 2021].

In the Database workshop, the question was asked “Do you feel encouraged to stimulate your students to follow the area of Computing as a profession?” and, initially, only 68.3% for “Certainly” were obtained, followed by 14.6% of the votes for “Maybe” and 12.2% for “Yes”. After the workshop, the results changed to 87.5% for “Certainly” and 12.5% for “Yes”, showing that there is still a lot to be taught about what computer professionals do and that the teacher is the agent who will build such knowledge with future professionals, being able to attract girls to the area.

Afterward, questions were asked about the experience of participating in the workshop and whether it changed the teachers' opinion about Computing as a whole. 55% of the teachers answered “Yes, totally” and 37.5% answered “Yes, partially”, justifying with answers such as

“Yes, because it demystified concepts, expanded horizons and facilitated the understanding of what computing really is.” and also “That Computing is a simpler thing; I had no idea that women ‘suffered’ abuse for choosing this profession!” It is also worth mentioning the answer “I feel the need for more training”, which meets the question “Would you feel able to talk about computational thinking with your students?”, as shown in Figure 2.

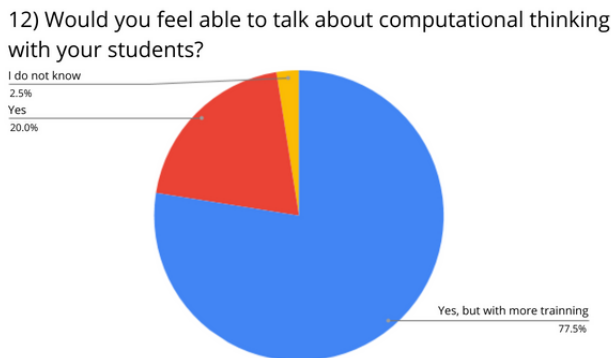


Figure 2. Graph of the Database workshop's responses to the question “Would you feel able to talk about computational thinking with your students?”.

In the Computational Thinking workshop, these questions were asked only after the workshop. The question “Did the situations discussed in the workshop encourage you to stimulate your students to follow the area of Computing as a profession?” got only 66.7% for “Certainly” and 23.3% of the votes for “Yes”.

When asked if participants feel comfortable talking about computational thinking with their students, on a Likert scale, with five being “I feel very comfortable” and one “I don’t feel comfortable”, 83.3% answered five and four, however, 16.6% responded from one to three. To help the team understand the reason for such answers, the participants were asked what was missing for them to consider themselves four or five, and a cloud of words was performed with such justifications, as shown in Figure 3.



Figure 3. Word cloud of answers to the question “If you answered from 1 to 3 in the previous answer, explain what is missing for you to consider yourself a 4 or 5?”.

It is possible to notice that the words “Deep”, “Preparation” and “Knowledge” have a certain prominence, indicating the need for training to talk about the subject. On the other hand, the words “Study”, “Practice”, “Appropriate” and “Explore”, indicate that there is a demand for the practice and internalization of these concepts, so that the participants can replicate with greater confidence. Finally, the words “Ideas” and “Examples” also point out the lack of practices that teach theoretical concepts in a playful and dynamic way, facilitating the appropriation of concepts.

4.7. What is the scope and effectiveness of the courses/workshops that are offered to elementary school teachers?

Even discussing the importance of workshops and projects aimed at teachers, it is necessary to question the scope of the contents presented to these professionals. It was asked in the initial questionnaire if “Have you studied introductory computing concepts?” and, even with so many divergent answers in introductory Computing and Database questions, many have already received previous training, as seen in Figure 4.

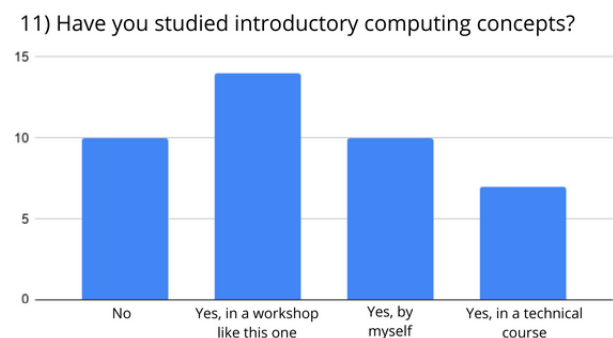


Figure 4. Graph with the responses to the question “Have you studied introductory computing concepts?”.

Only 24.4% of the participants had no previous contact with the area, and, of these, only one gave the answer that best matches what an IT/Computer professional does, that is, “Solves problems in society through technology”. On the other hand, 75.6% already had knowledge in the area through previous workshops, technical courses and studies on their own, and only 45.2% of these responded as expected, that is, less than half of the participants had some prior knowledge. Thus, it is visible that the number of correct answers was low, showing that the teachers have contact with Computing, but that the scope and fixation of concepts, although very important, are not explored with emphasis. It is worth mentioning that the sample has a different profile, considering that the participants are involved with Basic Education initiatives in Curitiba that encourage the acquisition and practice of Computing and Technology concepts.

Regarding the Computational Thinking workshop, the following question was asked: “Have you ever participated in workshops like this that introduces Computational Thinking?”. Of the total number of

participants, 35.5% answered that they had already participated in a workshop on the topic only once, on the other hand, 19.4% answered that they had already participated in workshops on Computational Thinking more than once, and finally, a high number of participants answered that they had never participated in workshops like the one applied, 45.2%, as can be seen in Figure 5.



Figure 5. Graph of the responses from the Computational Thinking workshop to the question “Have you ever participated in workshops like this that introduces Computational Thinking?”.

Concerning the knowledge about the addressed topic, the following question was also asked: “Do you know the expression Computational Thinking?”. A large part reported having knowledge about the expression, 87.1%, while only 12.9% declared not having any kind of knowledge. In regard to what makes up computational thinking, its pillars, more than half, 54.8% have already heard about the subject but would not be able to elaborate and exemplify what these pillars are.

Therefore, the courses/workshops’ lack of scope and effectiveness can result in incorrect or superficial transmission of information to students, focusing only on one area of Computing, keeping ingrained stereotypes. International studies in the technology field indicate a reduction in the women’s participation and associate this scenario with the construction of stereotypes that reinforce this area as a male territory [Souza 2017], showing the importance of focusing on the problem.

4.8. What is the view of teachers about women in Computing?

The question “Do you think that women may suffer some kind of prejudice or discrimination for choosing to work in the Computing area?” obtained diverse answers in the Database workshop, as seen in Figure 6.

15) Do you think that women may suffer some kind of prejudice or discrimination for choosing to work in the Computing area?

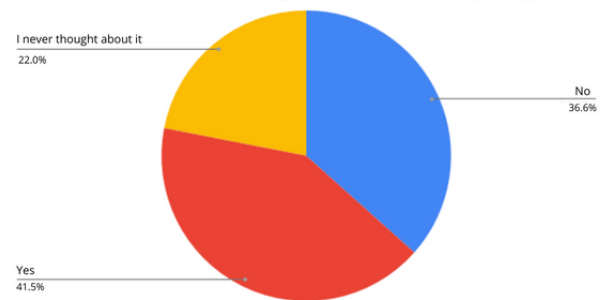


Figure 6. Graph of the responses from the Database workshop to the question “Do you think that women may suffer some kind of prejudice or discrimination for choosing to work in the Computing area?”.

The prejudices mentioned were “Culturally masculine area”, “Underestimating the ability to logical thinking”, “Social superiority, women have no ability” and, among them, “Perhaps they feel isolated in an environment that does not have many women. It needs more encouragement from the teachers.”

The answers’ percentages to this same question, in the Computational Thinking workshop, were close to those of the first workshop, as shown in Figure 7.

Count of "Do you think that women may suffer some kind of prejudice or discrimination for choosing to work in the Computing area?"

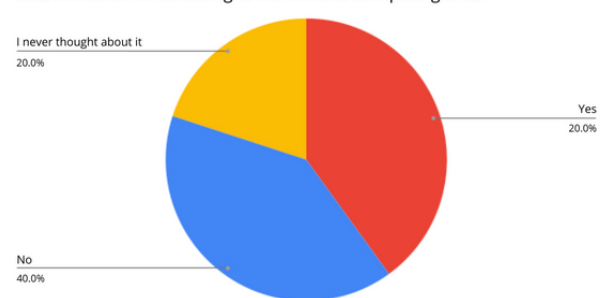


Figure 7. Graph of the responses from the Computational Thinking workshop to the question “Do you think that women may suffer some kind of prejudice or discrimination for choosing to work in the Computing area?”.

As well as in the Database workshop, gender discrimination and lack of capacity and intelligence were mentioned. In addition, one of the participants pointed out “that women are not focused, that they have periods of nervousness, etc.”.

It is worth mentioning that according to the gender of the participants in both workshops, it was noticed that considering only people identified as 'Male', 77.8% answered 'No', whereas for 'Female', 31.3% answered 'No', a similar result when considering all the participants(37,1%). For this analysis, given that the gender in the Computational Thinking workshop was not collected, a library [Alvaro Justen 2010] that provides an Application Programming Interface created based on the Brazilian Institute of Geography and Statistics (IBGE) census database of 2010 was used. This library uses pre-existing frequency of the searched name for male and female genders as a classification criterion. Therefore, despite the

limitation of the analysis and the number of participants who were identified as 'Male' corresponds only 13%, it's still relevant that the stereotypes were more present for this gender, and it's essential questioning why, as well as instigating future research.

On the other hand, the answers to the question "In your opinion, what is the reason for girls not choosing courses in the Computing area?", 61.7% of the participants of the first workshop answered "Lack of knowledge in the area", 19.1% could not answer and 8.5% said that is because "They don't like math". The participants in the second workshop, 50% indicated the "Lack of knowledge in the area", 20% did not know how to answer, 10% indicated that "It is a more appropriate course for men" and 6.7% said "They do not like mathematics" as a reason for girls not to choose courses in the Computing area. It is visible how many teachers point to mathematics and a lack of affinity with the area as factors, but far more girls than boys lose interest in mathematics and science after elementary school [of University Women and the Analysis Group 1994], so could it be that the teachers themselves do carry stereotypes? And how much are they negatively impacting these students?

Thereby, schools can convey gender bias and indicate to girls and boys what is expected from them and these expectations define how they are treated, how they are taught and, ultimately, how they are tracked down different paths through their schooling and even their careers [of University Women and the Analysis Group 1994]. Thus, it is extremely important to work on themes such as women in computing, since teachers have an influence on the construction of beliefs, representations and values, particularly with regard to the field of training and professions [Imaginário 1990, 1995].

4.9. What is your evaluation regarding SBC's initiative to include Computing content in the curriculum?

The teachers' evaluations regarding the SBC's initiative to insert Computing content in the curriculum was very positive, receiving comments such as "Fundamental importance", "Relevant, since the advancement of technology and innovation are giving new meaning to the way of thinking." and "It is essential. The country needs to train citizens for the current context that is demanding immediate immersion in new technologies, mainly because new professions will emerge with the advances that are to come." Emphasizing the comment that "The initiative is excellent, but first it is necessary to train the teachers."

5 Final considerations

It is notable that the strategy of working directly with teachers is still incipient in the Brazilian context [Bim and Berardi 2020], requiring projects that work on raising awareness and training Basic Education teachers on various concepts of Computing, so that they can multiply this knowledge.

On the other hand, it is evident that the teacher, given her proximity to the students, is often sought out as a source of support for vocational doubts and concerns [Ferreira et al. 2009] and that what is said by the professional can influence the vocational choice. In this way, as discussed in Section 2, the teacher becomes a very important agent for the dissemination of Computing and, therefore, there is a need for teachers to work on Computing concepts in Basic Education, so that girls can be positively influenced from young.

Therefore, the analysis of the results, discussed in Section 4, shows that teachers need adequate training to be able to replicate the knowledge acquired about Computing, and actions aimed at teachers are necessary, but with care that they transmit content in a clear and didactic, not reinforcing stereotypes.

In this article we have explored data from workshops with teachers that can show the demand for courses without stereotypes regarding the area itself and also on gender aspects. We can perceive possible stereotype bias in previous courses offered to teachers, which may have explored only the programming aspects of computing. In addition it is also possible to see gaps about gender stereotypes considering the comments given about why girls do not choose computing areas as professions. The initial expectation of comparing the two distinct profiles between the groups was that the group with greater knowledge of technology could demonstrate greater clarity on these aspects, which was not confirmed.

Our study presents limitations like the number of workshops explored, the difference topics addressed in both workshops that hinders possible comparisons, as well as the absence of a pre-workshop questionnaire by the computational thinking group. However, despite those limitations it is an important and relevant discussion on the direction of reducing stereotypes in the computing area, considering Elementary School Teachers as a possible alliance.

As future works we seek to consider more data about other workshops conducted with a more standardized instrument for collecting data. We believe that having the opportunity to interact with more data from teachers that participates from the workshops we can have more reflections about the role of teachers in the influence of their students regarding their careers.

Acknowledgements

TICHERS team would like to thank all the workshops' participants. Also, we thank the Federal University of Technology - Parana (UTFPR) for the scholarship support and to Programa Meninas Digitais - Brazilian Computing Society for all the opportunities of being a sister project.

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