The use of online tools in practical classes on computer programming and systems development (online platforms)

A proposal for alternatives to the pandemic

[1]*Adriano Cilhos Doimo*
School of Electrical and Computer Engineering (FEEC)
State University of Campinas - UNICAMP
Av. Albert Einstein 400, Barão Geraldo, Campinas, SP, Brazil
doimo.ac@gmail.com

[2]Yuzo Iano
School of Electrical and Computer Engineering (FEEC)
State University of Campinas - UNICAMP
Av. Albert Einstein 400, Barão Geraldo, Campinas, SP, Brazil
yuzo@decom.fee.unicamp.com

[3]*Gabriel Gomes de Oliveira*
School of Electrical and Computer Engineering (FEEC)
State University of Campinas - UNICAMP
Av. Albert Einstein 400, Barão Geraldo, Campinas, SP, Brazil
oliveiragomesgabriel@ieee.org

BSTRACT - The idea of using emulators, simulators, virtualizers, websites, mobile applications, and the like, in the area of practical and/or project-oriented education, is not new. Before the pandemic, what was already considered a good practice, but still somewhat optional and even with its importance little recognized or effectively used, during the pandemic, became necessary and in some cases, even mandatory, to minimize the impact negative of the lack of computational resources and more appropriate interaction of remote classes, as well as practical teaching-learning, both for students, and to facilitate a little more remote methodology for teachers. In this way, as in many contexts and/or already known scenarios, teachers started to use them to give more meaning to online practical classes. The purpose of this article is to give the reader some ideas on the use of technologies for remote and even hybrid classes since there will hardly be a break in the short and/or medium-term for their use. And perhaps, we will not only use them more effectively but also appreciate them very shortly, leaving them in a prominent place they deserve, in the educational context. Let's remember that they are just tools, but nowadays, the same in many aspects, they are irremediably the only source for the application of the practice, which makes it minimally necessary for the student. But even so, it does not replace the need for mentoring, monitoring, and the expected interaction of the target audience.

Keywords—hands-on lessons, online tools, online systems development environments, computer programming

I. INTRODUCTION

The pandemic caused by Covid-19 in Brazil is already over a year old and is still far from over and was a watershed not only for our country but for the world. Many companies consider that the home office will no longer be the exception, but the rule, in the modality of work or hiring, especially in the development of services, is just an example of how much we had to reposition in the most varied aspects. In education and the use of technologies, it was no different: digital technology until then, until then placed only as a tool to support teaching-learning, had its importance enhanced and has been more necessary than even imagined, planned and used by the least optimistic educator.

In this line, educational technology is understood as:

Every method, process, technique, methodology, instrument, concrete or virtual apparatus, digital or analog, referring to the domain of education. (EHLERS et al, 2015, p. 253)

Still on educational technologies and as we can see from the previous definition that, it may or may not be "virtual" and/or "digital", we have an even more specific definition, called digital educational technologies (TED), which "refers to to the use of digital technological resources in education, examples of such tools are: videos, applications, games, chats,

virtual environments, hypertexts, among others, which can be used in face-to-face or distance activities (e-learning) and broadcast over the internet, by DVDs, CD-ROMs, television or smartphones, computers, tablets (m-learning), etc." (DARIEL; WHARRAD; WINDLE, 2013; SILVEIRA, COGO, 2017).

As the number and diversity of tools and their applications are very extensive, the proposal is in a specific scope and focused on the area of programming and/or systems development. Since, contrary to what we might think, it is as difficult during the pandemic as any other area of education (both for other non- or less technological courses, as well as for high school, technical, undergraduate, among others).

II. DEVELOPMENT

Many of the environments described here are more specific sites or applications for the area of systems development, which can and do offer many of the resources necessary for teaching-learning, giving more devices to the student, both in the technical aspect, as well as providing the autonomy necessary for the acquisition of knowledge.

In this line, environments and resources have obvious limitations, even because of the very proposal of their design, such as ease of use, not requiring local installations (on their hard disk, not requiring virtualization, among others. And that on the other hand. on the other hand, they do not have many of the intermediate or advanced features that would be interesting for deeper learning in this area, such as graphical interfaces, integration with other platforms/programming languages, among many others.

We emphasize the importance of reflection, but we will not discuss the social conditions and inequalities that were more than highlighted, exposed or evident, perceived early or during the pandemic, in addition to the fact that we may have educational losses in teaching-learning, which can take a lot of time to be revised and even repaired, for this academic generation. Besides, at the moment, it is still unknown what will be the position of the information technology labor market, in the most varied aspects of hard and soft skills. Questions such as: "what", "why", "how", "when" or "when" are still far from being answered, about what is or will be expected by companies, about knowledge, skills, and attitudes of a whole generation of students in the face of these human resources.

It is possible to use some tools, platforms, among others, for the teaching model to assist in classes and activities, regardless of the hardware used, whether desktop, notebook, or mobile devices such as tablet or smartphone, since many of the options are suitable for remote teaching, as below.

A. IDE's ONLINE

Integrated Development Environment (Integrated Development Environment), or commonly called IDE, is part of the area of systems and application development, and that behaves minimally as if the installation of the specific environment were performed locally, and one of the advantages is that work in browsers (many of the options including smartphones, as they are responsive online environments). Among which, we cite just a few of them:

- W3 Schools - https://www.w3schools.com/
- TutorialsPoin - https://www.tutorialspoint.com/index.htm
- Online GDB - https://www.onlinegdb.com/
- Joodle - https://www.jdoodle.com/
- Browxy - https://www.browxy.com/
- CodeChef - https://www.codechef.com/ide
- Replit - https://repl.it/languages/
- Ideone - https://www.ideone.com/

There are numerous other categories of software that work in online environments, such as databases, image / photo editors, circuit simulators, mobile programming, animations, games and other types of needs, such as:

- Tinkercad - https://www.tinkercad.com/
- App Inventor - https://appinventor.mit.edu/
- Scratch - https://scratch.mit.edu/
- SQL Test - https://sqltest.net/
- Fotor - https://www.fotor.com/pt/

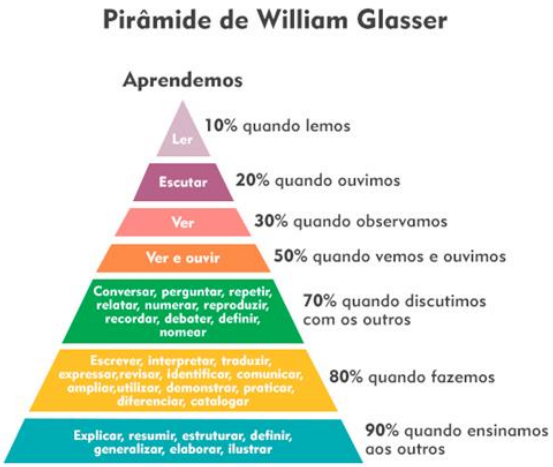
It is interesting to note that some highly complex environments run in the cloud, but with many resources limited due to being specifically enterprise and therefore, to fully activate them, they must be paid, to reach their full resources. In this case, if the student has an institutional account, where some type of agreement is contemplated, some of the resources are released for a limited time or limited traffic, for example. We quote:

- Azure - https://azure.microsoft.com/pt-br/
- AWS - https://www.awseducate.com/
- Oracle Cloud - https://www.oracle.com/cloud
- Google Cloud - https://cloud.google.com/
- IBM Cloud - https://cloud.ibm.com/

III. CONCLUSION

On-site practical classes are essential for good development and their relationship with student learning. It would be premature to say anything as a replacement for this aspect, especially given the short time we had for this adaptation (face-to-face to remote or hybrid). Numerous online environments can be used and that can minimize (but not completely solve) the issue of lack of infrastructure, resources, equipment, among other items, more focused on technical problems, in the remote model for the programming area and/ or systems development. Even so, the teacher must be made aware of the possibilities so that they can adapt their classes and replicate these resources to the students, giving them the necessary direction to achieve the minimum or learning as much as possible in the face of the

pandemic. These are not only but will be increasingly widely used, in support of and following the trends of more modern pedagogy. For illustrative purposes and by William Glasser's pyramid, we have:



Still, there are numerous other possibilities not mentioned, but that would require further studies or a more specific deepening, such as the application of the use of VLE (Virtual Learning Environments), use of internet browser extensions such as Google Chrome and Mozilla Firefox, use from on-premises or cloud virtual machines, specialized computing resources such as applications, websites and entire platforms, among many others. Not only in the technical aspect but also good practices with the achievement of results, in addition to the use of diversified and currently more appropriate teaching methodologies, such as active methodologies or educational technologies represented by learning based on projects, problem-based learning, learning through games, case method or case discussion and solution, and team learning, through models such as Rotation by Stations, Rotational Laboratory and Inverted Classroom, for example

REFERENCES

[1] LAUREANO, M. Máquinas Virtuais e Emuladores. Conceitos, Técnicas e Aplicações. Ed. Novatec 2006.

[2] EHLERS, Ana Cristina da Silva Tavares. TEIXEIRA, Clarissa Stefani. SOUZA, Marcio Vieira de. Florianópolis Educação fora da caixa: tendência para a educação no século XXI / organizadores, SC : Bookess, 2015. ISBN 978-85-448-0239-7.

[3] BACICH, Lilian. II. MORAN, José. Práticas pedagógicas. 2. Metodologias ativas. I, SP. Penso Editora Ltda, 2018. ISBN 978-85-8429-116-8.

[4] DAMASCENA, Samia Carine Castro. DOS SANTOS, Kezia Cristina Batista. LOPES, Geysa Santos Góis. GONTIJO, Paula Vitória Costa. PAIVA, Mirtes Valéria Sarmento. LIMA, Mara Ellen Silva. Uso de tecnologias educacionais digitais como ferramenta didática no processo de ensino-aprendizagem em enfermagem. Braz. J. of Develop., Curitiba, v. 5, n. 12, p. 29925-29939, dec. 2019. ISSN 2525-8761.

[5] GAVIRA, M. O. Computer simulation: a tool to acquiring knowledge. Sao Carlos. 146p. Dissertacao (Mestrado) – Escola de Engenharia de Sao Carlos, Universidade de Sao Paulo.