

Fostering STEM EDUCATION DURING COVID-19

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General Analysis

Whether the type of communication is online or face to face, there are fundamental factors between both setups, such as:

- the instructor,
- teachers or trainers mindsets,
- the culture and learning attitudes of the students.

When we decide to use online tools or using a virtual classroom we need to keep in mind that we are not changing the learning actors, teachers and, students.

General Analysis

When it comes to technology Martinez and Stager framed three potential uses of the computer based on such as:

- a tutor. The computer displays instructions and conducts the assessment;
- a tool. The computer allows the student to perform academic tasks easier or more efficiently;
- a tutee. The student learns by programming (tutoring) the computer.

The first use is similar to the role played by Massive Open Online Courses (MOOCs). As usually most of the MOOCs are designed based on presenting videos to the students. The videos here are considered the teacher to the student. The second use is similar to the concepts of computer-based scaffolds. The third use is the closest one to the constructionism school of learning as the students learn through tinkering and playing.



Main Challenges

As IdeasGym team main focus is STEM capacity building using tinkering and playing, transferring tinkering and constructionism concepts online was a challenge. The team's mission was broader than posting videos or challenges to the students. The complexity discussed within the team was one of the misconceptions among educational services designers which is that once the teacher provides a challenge to the students, the students become engaged. However, practical experience has reflected the importance of designing scaffolds to keep the students engaged and raise their motivations when it comes to a Project-Based Learning (PBL) environment.



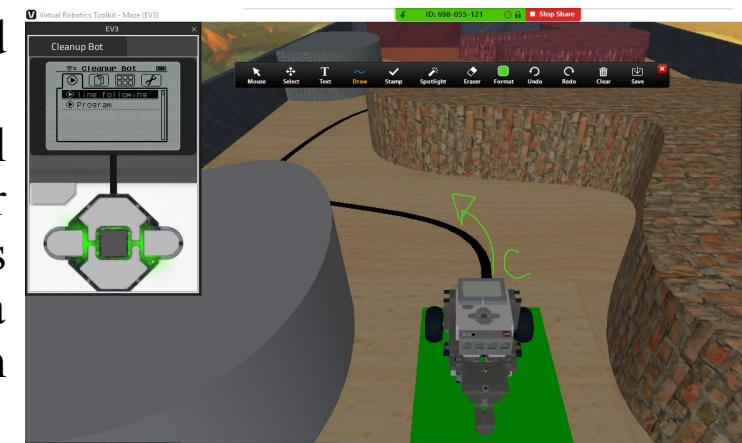
Main Challenges

- Tasks or activities that promote the sense of belonging, raise the desire to engage in a task, and increases the enjoyment of learning from the task.
- In a tinkering or a constructionist learning environment, the teacher in charge should be able to handle the students' emotions.
- Human relationships between teachers to students or between peers should be considered when we are designing a pedagogical frame for students to master certain skills.
- According to [4] motivation and emotional support have been largely ignored in computer-based scaffolds; hence emotional support is ignored in MOOCs, although emotional support has been one of the most important pedagogical aspects used by teachers.



Gamification & Game Based Learning

- According to [8], it is important to understand the interconnected relations between game-based learning, gamification and play.
- Simulations, problem-solving and situational activities can be classified as tools within a broader context of playful practices as they invite students to use varying possibilities. Those activities are a game-based learning approach that is used to align learning goals and standards.
- Gamification, on the other hand, means the implementation of game-elements like badges, high scores, level-structures and other forms of gratification. The provided gratifications have no real-life value but have a personal impact.



Challenges During COVID

During COVID-19, we tackled several challenges beyond content creation as we wanted to approach more students.

- The first challenge was the lack of awareness of how to use online and digital tools among Egyptian parents and students.
 - The second challenge was related to connectivity.
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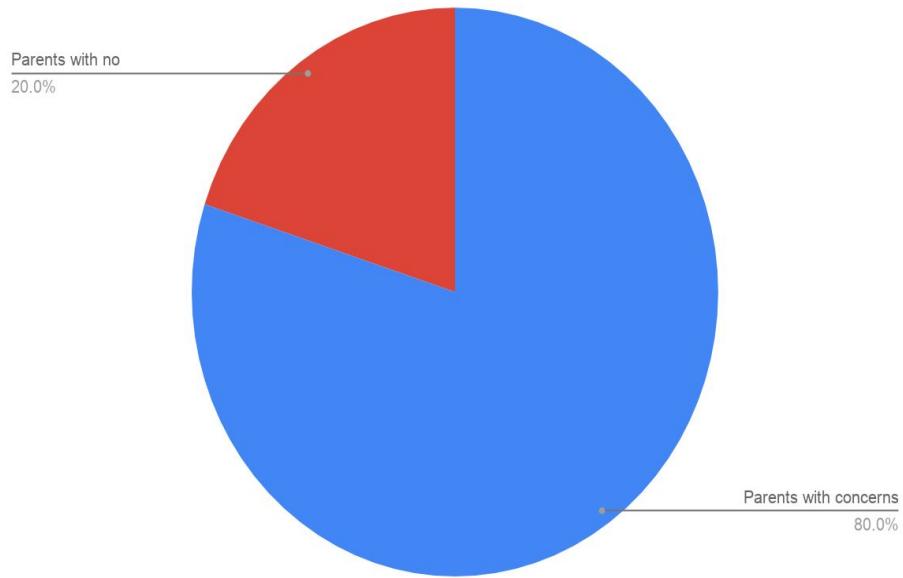
First Challenge

Lack of awareness

Since 2019 till today we had 2000 students enrolled between ages 8 years old to 17 years old on IdeasGym platform. The courses are designed to mix between synchronous and asynchronous activities. All courses include the usage of online digital tools, simulators and direct contact with the trainers through virtual classes and emails. The courses covered, Robotics, Coding, Electronics, Mobile applications, mathematics, scientific research and IoT.

During COVID, our team contacted more than 1200 students and parents through direct phone calls, emails and whatsapp messages to get enrolled in STEM courses. The team conducted around 400 phone calls directly with parents to motivate them to enroll their children. Around 80% of the parents during the direct calls had concerns on the online learning. The reasons varied as follows:

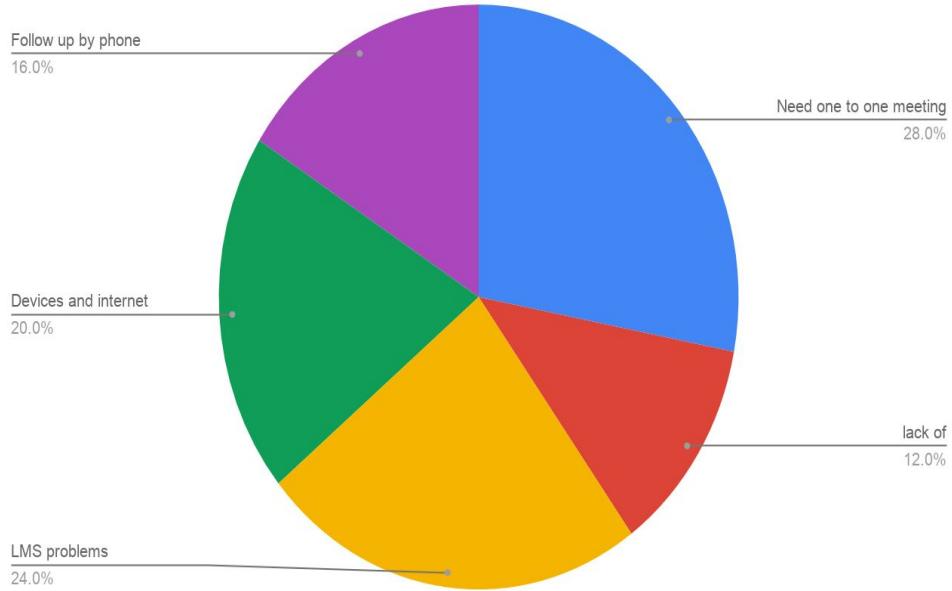
- The fear of troubleshooting and the online hassle.
- The believe that the online learning is not worthy.
- Having a previous bad experience on online learning.
- The lack of knowledge of what is online learning all about.



(Fig.1.) In blue: Parents contacted through phone calls and had concern. In red: Parents motivated to online learning or showed no concerns

For every 100 students enrolled in our courses we had around 25 students who were stumbling to finish their courses. Our research team has traced the cases and reasons beyond stumbling in finishing the courses and the results of those 25% were as follows:

- 28% of the students wanted to have one to one meeting with the instructor when using the simulators.
- 12% lacked motivation and discipline.
- 24% had problems on dealing with the Learning Management System.
- 20% had problems with their devices and internet connection.
- 16% needed follow up by direct phone calls



(Fig. 2) The chart reflects the reasons beyond the slow performance of 25% of the students.

Upon reacting on the reasons of stumbling around 64% of the slow performance students completed their courses.



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Second Challenge

Infrastructure and Connectivity:
Results from our Strategic
Partnership with Vodafone Egypt
Foundation

About Ta3limy:

Ta3limy, first Egyptian Learning Management System, Owned by Vodafone Egypt Foundation. At the end of 2019, Vodafone Egypt Foundation developed Ta3limy, the first Egyptian Learning Management System and the first zero rated, mobile first education platform providing free educational content to build the skills relevant for the 21st century. Ta3limy's vision is to be recognized as the leading digital platform in Egypt that connects and inspires teachers, parents and students using modernized learning tools. Through Ta3limy platform, there are more than 6,870 users who got enrolled in IdeasGym courses, during August and September 2020.

Results from our strategic partnership with Vodafone Egypt Foundation

During the pandemic, focusing on strategic partnerships was highly important. Through our cooperation with Vodafone Egypt Foundation, we managed to post 15 courses on Robotics, Coding and Engineering on Ta3limy platform. The course content was provided for free for all students and it didn't consume from Internet bundle for all Vodafone users (i.e. it was zero rated).

▽ Yasser مرحبا 

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الروبوت - المستوى الأول

تفاصيل الدورة

الروبوت المستوى الثاني

تفاصيل الدورة

البرمجة

البيانات

الموتور

الحساس

الجهاز

الدوال

الطبقة

المنطق

المتغيرات

الرموز

Results from our strategic partnership with Vodafone Egypt Foundation

- The main challenge for our team was to build engaging asynchronous activities that support the learners and keep them engaged remotely without direct interaction with a teacher.
- When designing our pedagogical framework, we utilised the available online simulators as Microsoft MakeCode and TinkerCAD.
- The students started to access the STEM courses on Ta3limy platform since August 2020. The majority of the students are between Grade 10 and Grade 12.
- 75% of the students completed the courses while 25% are still in progress.

Conclusions

- Since mid-2018, our team is developing methods to engage students in interactive online STEM training topics such as robotics, AI and coding. Our mission is broader than posting online videos or challenges for the students.
- Our research on more than 1,200 students during 2019 has reflected the importance of designing scaffolds to raise the students' motivation and keep them engaged. Several pedagogical research studies proved that activities that promote the sense of belonging raise the desire to engage in that particular activity and increase the enjoyment of learning.
- In that respect, the scope of our work focuses on designing activities related to science communication while bridging the gap between educational and care pedagogies, digital tools (as Virtual Robot Toolkit or Microsoft MakeCode), and using technologies as Learning Analytics.

Conclusions

The results were impressive as we reached high completion rates that exceeded 92% with around 2000 students who spent an average between 65 hrs to 105 hrs studying on IdeasGym platform between 2019 and 2020. The tasks were designed to mix between asynchronous and synchronous activities. During COVID-19, we tackled several challenges beyond content creation as we wanted to approach more students. The first challenge was the lack of awareness of how to use online and digital tools among Egyptian parents and students. The second challenge was related to connectivity.

Conclusions

The strategic cooperation between IdeasGym and Vodafone Egypt Foundation platform Ta3limy is an example of effective strategic partnerships during the pandemic. Vodafone Egypt Foundation has helped us reach more Egyptian students through its digital educational platform, Ta3limy. The results so far are promising as 75% of the enrolled students were able to complete their asynchronous courses and learnt how to use the online simulators in Robotics and Coding effectively.

References

- [1] Marwa. (2019, September 1). From Instructionism to Constructionism: the role of tinkering in educational technology. Retrieved January 12, 2020, from ://dspace.ut.ee/handle/10062/65160.
- [2] Martinez, S., & Stager, G. (2013). *INVENT TO LEARN: Making, tinkering, and engineering in the classroom* (1st ed.). CONSTRUCTING MODERN KNOWL.
- [3] Taylor, R. (1980). *The computer in the school: Tutor, tool, tutee*. New York and London: Teachers College Press.
- [4] Belland, B. R., Kim, C., & Hannafin, M. J. (2013). A Framework for Designing Scaffolds That Improve Motivation and Cognition. *Educational Psychologist*, 48(4), 243–270. doi: 10.1080/00461520.2013.838920
- [5] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- [6] Boekaerts, M. (2011). Emotions, emotion regulation, and self-regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of Self-Regulation of Learning and Performance* (pp. 408-425). New York: Routledge.
- [7] Investigating the Potential of MOOCs in K-12 Teaching and ... (n.d.). Retrieved from <https://files.eric.ed.gov/fulltext/EJ1148621.pdf>.
- [8] Tkotzyk, R., & Hebben, K. C. (2019). Gaming And Playful Practices In The 21St Century Learning Environment. *ICERI2019 Proceedings*. doi: 10.21125/iceri.2019.1001

References

www.Ta3limy.com

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Thank You