

Teaching Mathematics with Technology (TMT)

Video - Nature of ICT and Education

Webcam and slide 1

Hello, and welcome back to the first week of the Teaching Mathematics with Technology course. In this video lecture, we will talk about the nature of ICT and its role in Education.

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We will start with an overview of digital technologies and the principles of the ownership and use. We will also explain the need to adopt and promote free and open technologies in education, and also our own use of such technologies in this course.

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Digital technologies are also referred to as Information and Communication Technologies or ICT in short. Digital technologies are not the first Information and Communication Technologies, but they are amongst many Information and Communication Technologies that humanity has used for hundreds of years.

Language can be considered as the first ICT, which was followed by script and then print technologies, then we had mass media. Through language, script, print and mass media, human beings have shared, stored information and communicated with others. Digital technologies can be called new ICTs.

Digital technologies include two components - hardware and software. What makes digital technology so powerful and versatile is this separation, as hundreds of software applications can be created to run on one piece of hardware, each offering different purpose and functionality.

Digital technologies enable the quick and easy sharing of large volumes of information. They allow the creation, modification, storing and instantaneous transmission of information in text, image, audio and video formats. This explains the enormous popularity of digital technologies in society and in education as well.

The computing devices, the software and the internet together have created the World Wide Web of information sharing, processing, storing, and communicating. This has revolutionised methods of information production and transmission. The internet, the web and apps on the web have become extremely important for our processing, accessing and sharing information.

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Yet like other technologies too, digital technologies are not 'value neutral'. The way these technologies are designed and implemented, as well as their ownership have larger socio-political and economic effects, including on education.

One of the key determinants of the impact that ICT have on societal processes is in terms of ownership and access. Merely being able to use an application - either on your device or online - is not adequate for participating in a meaningful and empowered manner.

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To put it in a historical perspective, just as social and economic infrastructure like schools or libraries or health centres are created through public investments, including by governments; public investment has given birth to a significant part of the global digital infrastructure. The Internet, the World Wide Web and many digital applications that we use such as the Firefox web browser or Wikipedia have been created through public investment.

Yet digital technology users often see themselves as users or consumers of applications made available by commercial entities - either free or through payment of license fees - but on terms purely set by the creator.

Such use has two important implications - (i) limiting the possibilities of creation and dissemination of information and (ii) the exploitation of the data that is collected by the applications about the users. Together these have implications for the security, privacy, creative expressions and participation of all members of the society.

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On the other hand, if digital technologies are produced and shared as public infrastructure, they would empower teachers and students not only to access and use, but also to share and modify with others. Here we transcend the paradigm of being 'users' and become 'co-creators' and 'publishers'. This allows more participation in the production of digital goods and services by all, including by teachers, which feeds into a rich 'digital commons'. This can also enable universal and equitable access to digital resources.

The tools for the creation of such commons are available in the form of *Free and Open Source Software (FOSS in short)* and *Open Educational Resources (OER in short)* which can be freely used by all. We know that software and content are two digital artefacts that are important to teachers and learners, hence FOSS and OER are important to adopt in education.

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OER (Open Educational Resources) refers to content that can be freely used, re-used, revised and re-distributed.

FOSS (Free and Open Source Software) refers to software that can be freely studied, modified and distributed.

Both FOSS and OER allow possibilities for greater participation and co-creation, by which we are no longer users but also co-creators and co-owners.

FOSS allows the freedom to study the code, as the software is available in the public domain for scrutiny. Hence, FOSS applications will not be able to steal our data from us, or conduct surveillance, which is possible with proprietary applications. In the case of proprietary applications, source code is not available in the public domain for scrutiny. And hence such confidence is not possible.

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You can make a difference!

As teachers, you can create a free and open digital environment by creating resources which are licensed as OER, for this we need to use the *Creative Commons Licence* for your creations. Add your name as author to the resource and below your name, mention *Copyright as “CC”* (which is short for Creative Commons).

Using the copyright “CC BY” means that those re-using or modifying your creation will need to attribute your creation to creating the resources. CC BY SA licence additionally requires that modified versions must also be released under “CC” licence, thereby ensuring that OER derivatives do not become non-OER. CC BY SA is widely used including by Wikipedia and also by the materials for this course including the video lectures.

So do remember to add CC BY SA as copyright clause to all the files that you will create, including those you will create in this course.

Creating resources is an extremely important responsibility for teachers. IT for Change has produced a toolkit, with support from Commonwealth Of Learning for teachers to create OER using FOSS tools. This toolkit can be used by a teacher to learn many FOSS editors to create and publish open digital content. The url for toolkit is available on the slide, this is also available in the video transcript. <https://tinyurl.com/foss-oer>

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Freedom to access, create and share resources is at the heart of education, as it preserves and promotes the agency of students and teachers in terms of their learning. Further, safety of student data and teacher data is important both from privacy and security points of view.

It is therefore important that digital technologies be freely available to students, schools and teachers. Freely available does not mean “free of cost” alone. It means that teachers and students

are free to use ICT on their own terms without any constraints on their scrutiny, sharing and modification imposed on them by creators.

This course is an example of a Free and Open Technology Environment. The course runs on MOOKIT – a free and open MOOC platform. The mathematics tools we will learn, Geogebra, is a free and open source software application. You can freely download Geogebra on your phone and on your computer. You can use it online as well.

You can contribute to the software as well. For example, the IT for Change team created the user interface for Geogebra in Kannada, a local language spoken in Southern India. Because Geogebra is a free and open source software that allows you to modify the code, you can create a similar interface in your own local language, if not already available.

All the resources you create will be shared as OER and we will upload it in the OER repository. The url of the OER repository is given on the slide <https://geogebra.org> you can find this in the video transcript as well. In order to access Geogebra resources from the Geogebra site, you need to open your browser and go to <https://geogebra.org> site, and then you will get the screen like this; so on the screen you have to click on classroom resources. So, if you click on classroom resources, you will be able to access all the resources that have been uploaded on Geogebra by many teachers like you, and in the search bar you can search for any particular topic that you are interested in. For example, if you type triangle you will get several resources that have been uploaded on Geogebra.org pertaining to the topic triangle. You can see that it is in multiple languages as well. So later in the course we will talk to you about how you can create your own account on geogebra.org and upload your own resources onto the site. Always remember to give the “CC By SA” copyright clause before you upload the Geogebra file to the site. So this website is an open education resource repository of Geogebra files as well as resources and lesson plans associated with the teaching of the topic in mathematics. So we can access materials from geogebra.org and we can also contribute to this repository.

Webcam

In this video we discussed the history and nature of ICT, explored the dominant perspective where we are users of ICT, having no rights other than the right to use. We discussed the alternative perspective of FOSS and OER - where software and content is licensed to allow all of us to study, modify and share with others. We look forward to your joining this journey for creating an enriching, equitable free and open learning environment for all!