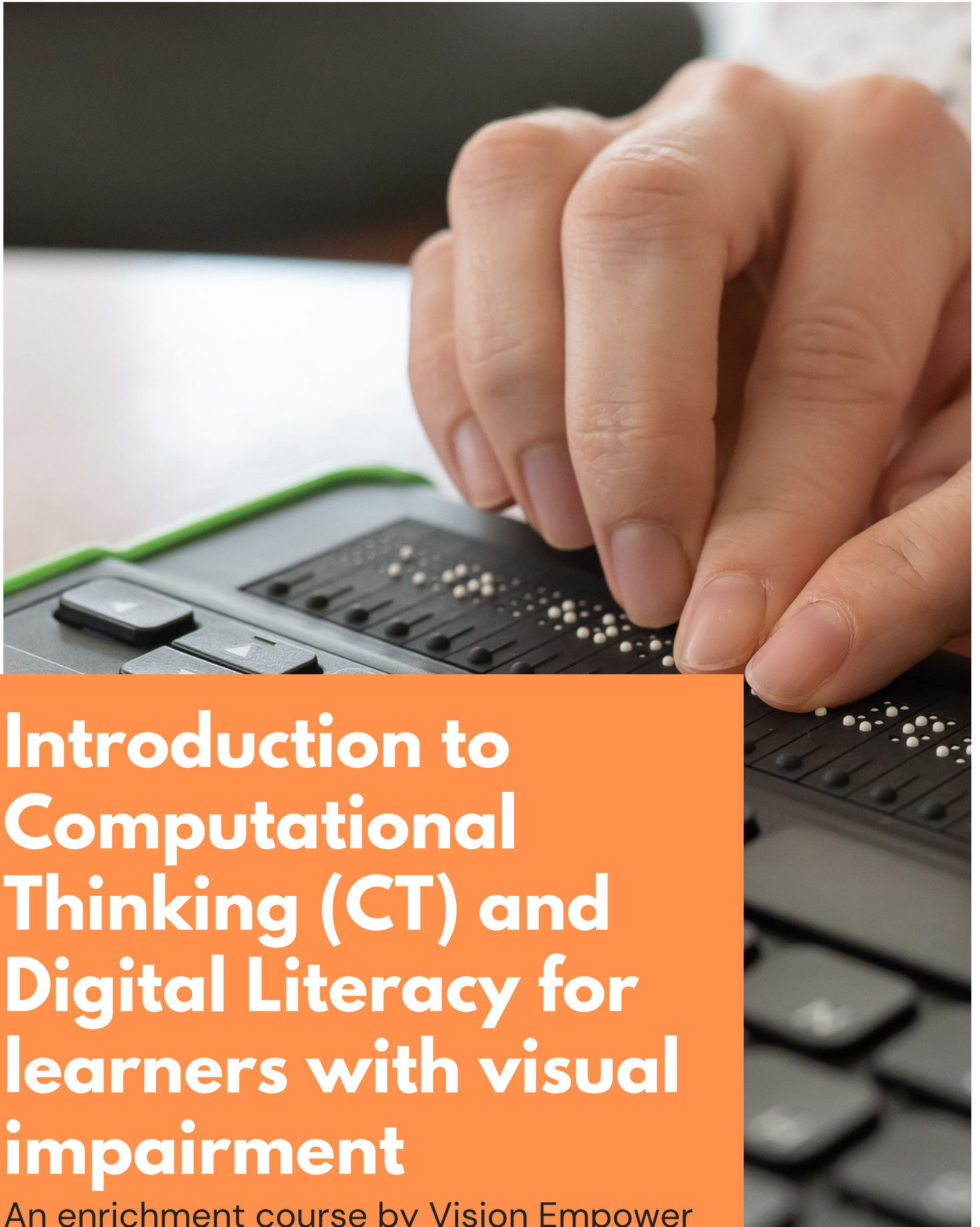




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Introduction to Computational Thinking (CT) and Digital Literacy for learners with visual impairment

An enrichment course by Vision Empower

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Context

The National Education Policy 2020 of India states that "mathematics and CT will be given increased emphasis throughout the school years", coupling CT with mathematics education, and coding.

However, access to computing and digitally-enabled learning is highly inequitable due to the unequal access to digital infrastructure across the Indian school system(1).

This situation is exacerbated in the case of children with visual impairments, who have traditionally been denied access to education in mathematics and the sciences(2). Computing education is not even a priority for these children among educators. The UNESCO(3) report on Children with disabilities makes, as one of its key recommendations "appropriate teacher education and creation of open-access repositories "an important part of facilitating inclusion of all learners (including children with disabilities).

Vision Empower is a not-for-profit trust incubated at IIT Bangalore with a vision to empower children with visual impairment through inclusive education, with a special focus on STEM education. VE interventions at special schools for the blind and visually impaired focus on the creation of accessible content, teacher capacity building and designing technologies which make education inclusive and accessible for students and teachers.

Vision Empower (VE), in collaboration with Microsoft Research, has been designing, developing and transacting accessible curricular modules for CT. These CT modules have been developed in the form of games based on the ACM India curriculum from CS Pathshala(4). Through systematic research, VE has also designed and implemented digital literacy tutorials for adults with visual impairment and a digital literacy curriculum for teachers who are teaching children with visual impairment at schools.

VE will offer a course for B. Ed. student teachers of the National Institute for Education of People with Visual Disabilities (NIEPVD) which will include the key insights and learning from the field-level interventions of VE and research conducted in this domain.

1 Landscape Report on Educational Technology in Schools, Rajaram S. Sharma, Centre for Education and Technology, IT for Change

2 STEM Education for Blind and Low Vision Students -The Socio-Technical Challenge - The Indian Perspective, Dr Sam Taraporevala, St. Xavier's College (Autonomous), India (https://workshop.sciaccess.net/DEIMS2016/articles/k02_Sam.pdf)*

3 State of the Education Report for India 2019, Children with Disabilities (UNESCO)

4 CSpathshala: Computational Thinking Curriculum for K-12

An introduction to the course

This is an enrichment course being offered as an add-on program for strengthening computational thinking and digital literacy for student teachers in collaboration with NIEPVD. This will be a 16-week course offered during the 1st Semester of the B.Ed program.

Objectives of the course

- To introduce student teachers to a variety of accessible digital tools for their own professional development
- To provide an orientation for student teachers to accessible teaching learning resources and practices
- To introduce student teachers to a play-based approach for the teaching of computational thinking based on the principles of Ludic Design for Accessibility (LDA).(5)
- To introduce student teachers to processes of continuous professional development

Course Structure

- The course is being offered as a blended / online course spread over 16 weeks. The course will be delivered through the accessible digital platforms developed by VE and the course platform, combined with mobile-based communities of practice will be a demonstration of a model of continuous professional development of teachers
- The course is delivered through a combination of in-person lectures, special lectures from experts and key resource persons, webinars with faculty members, demonstrations and supported by digital resources, including videos, reading materials, artefacts using various educational tools and discussion forums
- The course is offered through the VE Learning Management System; student teachers will be provided their own user ids created logging in and accessing the courses.

- Each unit has in-person lectures/ webinars to introduce key ideas. This will be followed by resources for self-learning in the form of audio tutorials, reading materials and practice activities.
- The course also has a discussion forum where students and the faculty members will interact and share their comments and questions, on an ongoing basis.
- Each unit in the course has some assignments for the students to complete and turn in
- Many of the course activities can be completed using a smart phone; however, to understand the variety of applications, it is recommended that students have access to a desktop / laptop computing device. These can be on a shared basis, like a computer lab in the college.

Assessment of the course

This is an enrichment course for supporting the student teachers in their eventual professional practice as teachers of children with visual impairment. The curriculum is designed to complement the courses offered in the regular B.Ed program. The students' performance is evaluated based on their attendance, in-class participation (in physical class and online discussion forums), completion of activities and assignments and a term-project. Upon successful completion, participants will get a certificate from VE.

Course outline

The course curriculum will broadly have 4 units – digital tools for self-learning, digital tools for teaching-learning, understanding of computational thinking and a play-based pedagogy for introducing computational thinking. Broadly the course outline is as follows(6). The course curriculum has been drawn based on national curricula in the areas of mathematics, science, ICT and computational thinking.

1

Duration: 3 weeks

Digital technologies for self-learning

- What are digital technologies? What are the various possibilities of using digital technologies?
- An orientation to the VE LMS (Subodha) for the course and enrolling student teachers
- What are the different kinds of tools available and how accessible are they?(7) Tools for accessing information, connecting with one another, and creating learning resources(8)
- Hands-on experience with different tools and methodologies
- Evaluating the information available from the internet and understanding legal and privacy issues when accessing tools and information from the internet*
- Creation of a peer learning community on WhatsApp/ Telegram to share and learn

The emphasis of this module is to help teachers develop an informed perspective of the digital world and to be able to take appropriate safeguards with respect to online privacy and data safety. Teachers' orientation to this aspect is important for them to be able to support children as well.

7 Technology tools for teachers

8 Digital technologies for teachers - a teacher handbook

2

5 weeks

Experiential learning and accessible pedagogies

- What are the various kinds of applications available for learners with visual impairment? How do they change the learning possibilities?
- An introduction to designing lessons, focusing on experiential learning and how this ensures an inclusive learning environment; mapping these pedagogies to an Universal Design of Learning (9)
- Accessible pedagogies for STEM
- Using a refreshable Braille device (Hexis from Vembi Technologies) connected to a content repository through the Antara (software application) – advantages for children and teachers
- Accessible technologies for use in the classroom – accessible tools that are available to support learning of curricular subjects (10)
- Using digital resources and methodologies in the classroom (how can they be integrated in a lesson) – for teaching, for class planning and record-keeping
- Hands-on experience with select accessible digital tools for creating learning resources
- An understanding of open educational resources

9 What is Universal Design for Learning?

10 Creating an Accessible Technology Ecosystem for Learning Science and Math: A Case of Visually Impaired Children in Indian Schools (Supriya Dey, Vidhya Y, Suprgya Bhushan, Mounika Neerukonda)

3

Introduction to computational thinking

- What is computational thinking?(11) How is it related to digital literacy?
- Why should teachers know about computational thinking?
- Computational thinking examples in school curriculum – Tamil Nadu mathematics textbooks (12)
- Accessible curriculum for CT (13)

11 Wing, Jeannette, "Computational thinking." *Communications of the ACM*, 49(3), 33–35, March 2006

12 *Computational Thinking: The New Buzz*, R Ramanujam

13 *Learning through Play: Designing a Game-Based Curriculum to Teach Numeracy Skills*, Aishwarya O, et al

4

4 weeks

Play-based inclusive pedagogies for CT

- Introduction to play as pedagogy for CT based on the Ludic Design for Accessibility Framework(14).
- Presenting a variety of games for clusters of curricular areas.
Understanding the Key Learning Indicators for each game from Project VICT.
- Designing tactile games for different areas of CT to make it accessible

5

2 weeks

Project work and seminar presentations

- Students will explore a digital tool of their choice and explain how they found it useful and what possibilities it provides for them for their learning as well as use in classrooms
- Students will design a tactile game for teaching any CT concept of their choice (group work)



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