TPACK

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Why ICT integration?

- The integration of Information and Communication Technologies in the teaching-learning process helps teachers to create an interesting learning environment and effective learning experiences for the learners.

- ICT integration helps students to actively engage in the learning process. And we know that active involvement in the learning process improves the higher-order thinking skills of the students.

Why ICT integration?

- It is important to motivate students to achieve their goals. ICT integration helps to enhance the motivation of students through ICT tools like interactive e-texts and videos, blogs, augmented reality, e-tests, etc.

- ICT integration helps students to develop new skills. For example, a student using a word processing software to prepare a project report may learn to insert images and graphics, format the page, and design the page within the text document.

Why ICT integration?

- Constructive thinking is another important advantage of integrating ICT in education.
- It allows students to engage in activities requiring cognitive thinking.
- With ICT, learning shifts from receiving information to finding, problem-solving, and effectively communicating ideas.
- ICT integration enhances the students' autonomy in learning by providing personalised learning environments.

Why ICT integration?

- The integration of ICT in teaching and learning is the need of the hour.
- The success of ICT integration varies from curriculum to curriculum, class to class, place to place and depending on the ways in which it is applied.
- The successful integration of ICT depends on both teachers' and students' knowledge of ICTs, training in handling them and a suitable combination of content, pedagogy and technology.

Changing Learning Environments

Teacher-Centred

- In earlier days, teachers used to deliver information in the classroom, and learners were passive listeners.

Learner-Centred

- Now, Students are not passive listeners of knowledge.
- They are active participants in the learning process.
- They engage in the learning activities and construct knowledge on their own.

Changing in Roles

Teacher

- Facilitators
- Designers
- Motivators
- Mentors

Learner

- To construct knowledge, students make use of various learning strategies and techniques such as projects, collaborative learning, etc.
- They also use ICT tools like social media, e-texts, audio-video programmes, online communities, discussion forums, etc.

ICT Integration Models

- **On what basis are you selecting and using ICTs for teaching?**
- Many models (or frameworks) that help teachers select suitable ICTs in the teaching-learning processes have also been developed.

ICT Integration Models

- Apple Classrooms of Tomorrow (ACOT) model
- Pierson's Technology Integration Model
- Technology Integration Planning (TIP) model for teachers,
- Technological Pedagogical Content Knowledge (TPACK),
- Systematic ICT integration model,
- Substitution Augmentation Modification Redefinition model (SAMR)

Among these models, the Technological Pedagogical and Content Knowledge Model (TPACK) is popular. Let us discuss it.

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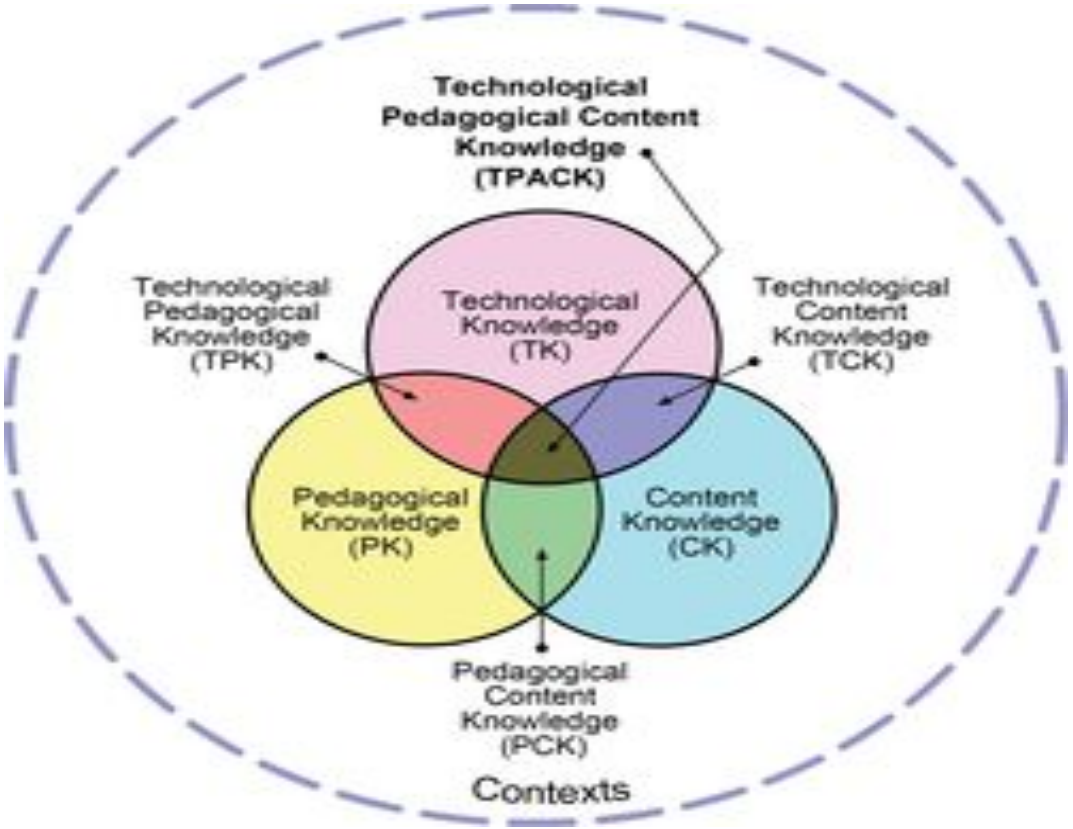
Technological Pedagogical Content Knowledge (TPACK)
Technological Pedagogical Knowledge (TPK)
Technological Knowledge (TK)
Technological Content Knowledge (TCK)
Pedagogical Knowledge (PK)
Content Knowledge (CK)
Pedagogical Content Knowledge (PCK)
Contexts

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Content Knowledge (CK):

A teacher is supposed to have a thorough understanding of the subject/topic that she/he teach, without which they may fail to organise an effective teaching session.

Apart from the content knowledge, the teacher should also have the latest information on her subject.

The teacher's knowledge of the subject matter, such as the terms, facts, concepts, principles, theories, laws, etc., is called Content Knowledge (CK).

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- **Pedagogical knowledge (PK):** A teacher is supposed to possess pedagogical understanding before undertaking the teaching session.
- The pedagogy describes the teacher's understanding of teaching methods, teaching approaches, learning theories, teaching styles, learning styles, classroom management, organisation of learning experiences, evaluation methodologies, latest trends in teaching and learning, psychology of the learners, inclusive practices, etc.
- The teacher's knowledge of various aspects of pedagogy is called Pedagogical Knowledge (PK).

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- **Technological knowledge (TK):** A teacher trying to integrate technology must have sufficient understanding and knowledge of various technologies.
- Technologies such as computers, cameras, mobile phones, application software, social media, etc.) are available for teaching-learning.
- The mere knowledge of technologies is not sufficient; the teacher must be able to operate and successfully use technology for teaching.
- This teacher's knowledge of technology is referred to as Technological Knowledge (TK).

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- **Pedagogical Content Knowledge (PCK): The Teacher is** free to select any teaching method to teach content. But remember, one teaching method is not always suitable to teach all the contents of a subject.
- So, a teacher may select different teaching methods to teach different content. And to select a particular teaching method, a teacher should understand various aspects such as organisation of learning experiences, evaluation strategies, techniques of teaching, etc.
- The selection of appropriate pedagogy suitable to the content is called Pedagogical Content Knowledge (PCK).

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- **Technological Content Knowledge (TCK):** While selecting a technology, a teacher should also consider the content/topic that will be taught.
- For instance, the teacher may teach a topic of Mathematics using the lecture method and ask children to solve some mathematical problems.
- Normally, students solve mathematical problems in their notebooks. But a teacher can also use technology.
- For example, he may use any application software where students can keep changing values (or numbers) and see the results.

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- **Technological Content Knowledge (TCK):**
- This helps students to manipulate values (or numbers) multiple times.
- This also helps students to identify their mistakes in solving problems.
- Thus, technology selection also depends on the content.
- Thus, the teacher's knowledge of the selection of suitable technology for transacting a particular content is termed Technological Content Knowledge (TCK).

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Technological Pedagogical Knowledge (TPK):

- Technology integration requires a wide range of thinking from teachers about the interrelationship between technology and pedagogy.

- This teacher's knowledge is referred to as Technological Pedagogical Content Knowledge (TPK).

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Technological Pedagogical Knowledge (TPK):

- For teaching, you must select a suitable technology by looking at the pedagogy selected for teaching a particular topic.
- One technology may not always be suitable for a pedagogical approach and vice versa.
- So, the selection of technology also depends on various other aspects of pedagogy, like assessment methods, techniques of teaching, etc.

Technological Pedagogical Content Knowledge

Technological Pedagogical Content Knowledge (TPACK) is the basis of good teaching with technology.

According to Mishra and Kohler, 2006, *Technological Pedagogical Content Knowledge requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge.*

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Thus, teachers should understand technology, pedagogy, and content and their interrelationship to successfully select and integrate technology in teaching.

TPACK- Example

- Suppose we plan to teach 'the difference between potential and kinetic energy (a concept in science), then we should know the content.
- If we know the difference between potential and kinetic energy, then it represents our CK.
- The next step is the selection of a suitable pedagogy (teaching method). So, applying our PK and PCK, we can select 'lecture method ' as our pedagogy.

TPACK- Example

Now, in a real teaching session, to start the discussion, you may show the images and ask students to group the images into two categories.

After categorising the images, you can conclude the discussion. Thereafter, you can also give a quiz (use any quiz-making tool) to check students' understanding of the concept discussed.

Thus, while deciding on the technology to transact differences between K.E. and P.E, the TPACK framework is taken into consideration.

The individual component (TK, PK, CK) and combined components (TPK, TCK, and PCK) must be coherently considered during the selection of the technology.

IMPLEMENTING ICT INTEGRATION PLANS

After developing the plan, how can we implement it in the teaching-learning process?

NEP 2020 proposes various recommendations for the integration of ICT in education. The policy recommends a blended mode of learning.

A teacher must judiciously mix face-to-face and ICT-enabled instructions.

In higher education, the University Grants Commission (UGC) allows earning forty per cent credits from online education.

Therefore, students of higher education can earn a few credits from the conventional mode and the remaining from the online platforms.

IMPLEMENTING ICT INTEGRATION PLANS

When implementing an ICT integration plan, follow the steps given below:

i)Selection of the topic: The Teachers must make attempts to teach topics/content of their subject using ICTs. For that, firstly, select the topic/content to be transacted using ICT tools. Teachers are well aware of the topics of their subject. They may try to make a list of those topics that are to be taught with the support of ICT tools.

ii)Development of a plan: Develop a plan (lesson plan or teaching plan) that includes identification of the learning outcomes(s), teaching method(s), teaching technique(s), assessment strategy(ies), etc. During this step, the teachers should also select suitable ICT tool(s) that are required to teach the identified content/topic. we should understand that every topic cannot be taught using the same ICT tool. Say, for instance, an audio programme may not be suitable to teach each of the topics of your subjects. Similarly, teachers may require a 'virtual reality' to teach a particular topic in their subject.

IMPLEMENTING ICT INTEGRATION PLANS

iii)Execution of the Plan: During this step, teachers need to implement their plan of action in the classroom. Before executing plans, they should prepare with all necessary technological infrastructures and ensure that students have access to and availability of the selected technologies.

Say, for instance, if you plan to teach a concept using an OER video, then make sure that there are facilities in your classroom to show it.

IMPLEMENTING ICT INTEGRATION PLANS

iv)Evaluation of the plan: After executing the plan, the teacher needs to evaluate it. He can evaluate various parameters, whether the ICT tools used were effective. Is it suitable to achieve the learning objectives? What were the shortcomings? What are the difficulties that you have faced in implementing it? How can the ICT tool be made more effective?

IMPLEMENTING ICT INTEGRATION PLANS

v)**Modification and finalisation of the plan:**

On the evaluation of your plan, you will be able to identify the shortcomings and faults. Based on that, you should modify and refine the ICT tools and strategies that you have used.

Factors Influencing ICT Integration

- **Selection of suitable ICT tools:** The teacher must select suitable ICT tools, and the selection of these ICT tools depends on the topic to be taught, the teaching method adopted, the learning outcomes, etc.

- **Linkage with learning outcomes:** Whatever ICT resources are selected, they must be able to achieve the intended learning outcomes.

- **Age appropriateness:** The learners' characteristics must be taken into consideration when selecting ICTs.

Factors Influencing ICT Integration

- **Meaningful and life-centric:** During the process of selecting ICT tools, teachers must ensure that they are meaningful and connect to the experiences of the learners to the extent it is possible.

- **Ensuring enriched learning experiences:** It must be ensured that the ICT resources chosen provide learners opportunities to engage actively in the learning process.

Factors Influencing ICT Integration

- **Compatibility:** The ICT resources selected should be compatible for use. Say, for example, if the teacher prepares a video in AVI format, then the students should have a suitable video player to watch it.

- **User-friendly:** The selected ICT resources must be handy and simple to use.

- **Economical:** While choosing and adopting ICT resources, teachers must consider their economic feasibility.

Barriers to ICT integration

- The barriers to ICT integration are classified into three categories.
  - Teacher-level Barriers
  - Students-level Barriers
  - Institution-level Barriers

Teacher-level Barriers

- **Lack of confidence** in teachers draws them back to using ICT.
- Beggs (2000) explains that teachers' "fear of failure" is the primary reason that hinders them from integrating ICTs.
- Balanskat et al. (2006) found that limitations in teachers' ICT knowledge makes them feel anxious about using ICT tools in the classroom and thus not confident to use it in teaching.

Teacher-level Barriers

- **Lack of teacher competence** is also related to the teacher's lack of confidence in using ICT and integrating them into teaching and learning. To successfully integrate ICTs, teachers should have knowledge and competence in various ICTs, pedagogical methods, subject content, etc.

Teacher-level Barriers

- **Resistance to change** and the negative attitude of teachers are the significant barriers to integrating ICT into the pedagogical processes (Gomes, 2005; Bingimlas, 2009).
- Today's generation is digital natives, and they like to learn with the support of ICTs. Therefore, teachers should also try to meet their expectations by using ICT tools in the teaching process.

Student-level Barriers

- **Limited Access to Devices and Internet:** Not all students have personal computers, smartphones, or stable internet at home.
- **Lack of Digital Literacy:** Many students do not possess basic skills to use computers, the internet, and educational software.
- **Lack of Motivation or Interest in Educational Use of ICT-** students are using Technology for entertainment
- **Language and Content Barriers:** Most digital resources are in English, which may be difficult for learners.

Institution-level Barriers

- **Lack of time** is one of the significant barriers to integrating ICTs in teaching-learning processes.
- Several research studies shows that many teachers have competence and confidence in using ICT in the classroom but they do not have enough time to use it.
- If ICT integration is not systematically planned and designed, it may consume the lecture time, and teachers may experience time constraints in completing the subject matter.

Institution-level Barriers

- **Lack of Training in general and particularly solving technical problems,** is the most frequent barrier to integrating ICTs. Teachers need to be trained to use ICTs. However, teachers are not provided with orientation and training to use ICTs. This pulls them back from using ICTs.

Institution-level Barriers

- **Lack of accessibility** includes the unavailability and accessibility to computers and other ICT tools.
- The lack of computers, peripherals, and the internet and the lack of appropriate ICT infrastructure and digital resources are considered barriers to integrating ICTs.

Institution-level Barriers

- Without good technical support in the classroom and school digital resources, teachers cannot be expected to integrate ICT in the classroom effectively.

- Technical barriers may include waiting for website to open, failing to connect to internet, printer not printing and so on.

- Technical faults may discourage teachers from using ICT because of the fear of equipment breaking down during teaching.