Quadrant-I (e-Text)

Details of Module and its structure

Module Detail	
Subject Name	**Education**
Course Name	**ICT in Education**
Course Code	**EDU504**
Module Name/Title	Techno Pedagogical content knowledge: meaning, framework, scope, purpose and approaches to integrating ICT in teaching and learning.
Module Code	IIE012
Pre-requisites	The learners should have Knowledge about and operating common technological devices and various pedagogical approaches/methods
Learning Outcomes	After going through this lesson, the learners will be able to 1. develop skill of technological pedagogical content knowledge (TPACK) 2. Analyse Interrelationship among various components of TPACK 3. Explain TPACK in the education system and select a suitable technology for instructional purpose.
Keywords	Technological Pedagogical Content Knowledge (TPACK), Technology. Pedagogy. Content, TPK, TCK, PCK.

1. Development Team

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Table of Contents

1. Introduction

We use various electronic devices in daily life. For example, to communicate mobile phones are used apart from surfing internet, doing banking transactions, booking tickets, etc. Similarly, we use refrigerator to preserve food items, washing machines to wash clothes, computer for doing tasks like preparing text, searching internet, playing games and so on. Is there any thing common hers? Yes! Technology is being used and it reduces the manual effort. Thus, technology helps to reduce the manual efforts. Now few questions, have you ever used any technology while teaching your students? Do you fail to figure out the technologies for teaching and learning? How will you use technology in the pedagogical process? These are some of the basic and relevant questions that you as teacher should introspect. Is there anything special about the twenty first century teaching and learning? Today technology is being dominantly used by students and we mark them as tech savvy students. In order to meet the learning demands of tech savvy students the teaching learning process has to integrate technologies of various forms in the classrooms.

Why do we need to integrate technology with the pedagogy? It is understood that, the twenty first century learners are different in terms of their learning style and processing information. The learning styles and the way they interact, communicate and collaborate has close relation with the technology. Students prefer to watch video lessons and electronic texts over the traditional lectures and textbooks. Students like to watch video of lessons available on the internet, search internet to complete assignment and projects, etc. Even

students like to clear their doubts by communicating with the teacher over telephones and emails and mobile devices. Thus, the behaviour and learning pattern of twenty first century learners profoundly utilize technology one or the other way. In this context, teachers should seriously think of organising technology-based teaching learning sessions. Thus, twenty first century is the era of techno pedagogy.

There are innumerable number of technologies/electronic devices. The task of the teacher is to select appropriate technology into the lessons and ultimately in the teaching learning process. How a teacher would select a particular technology or any application software from the basket of technologies and application software's? Here comes the relevance of scientific theories or commonly followed practices? Today, a very popular framework called Technological Pedagogical Content Knowledge (abbreviated as TPACK) is used for selecting any specific technology and integrating in the pedagogical process. Also, The SAMR model and TIM is also used for selection of technology but is not popular as TPACK. Now let us understand more about TPACK.

2. TPACK- Meaning and Framework

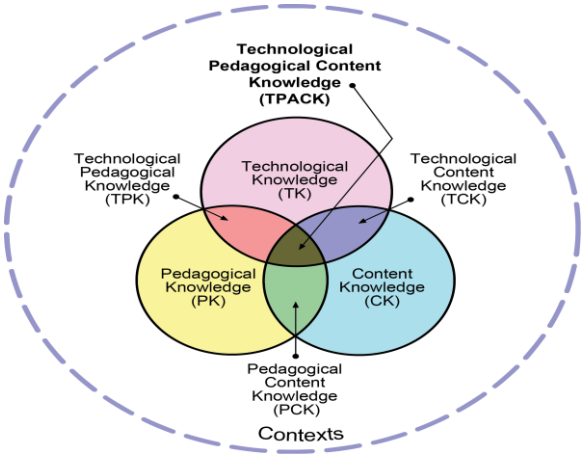
Any teacher developing learning designs definitely has to have mastery over pedagogy and content. The emphasis on these two terms; pedagogy and content lead to the formation of the term pedagogical content knowledge. The twenty first century, also requires technology integration in the teaching-learning process. Thus, a new term technology is also added to the pedagogical content knowledge. Thus, the term Techno Pedagogical Content knowledge or Technological Pedagogical Content Knowledge is formed. Technological Pedagogical Content Knowledge is abbreviated as TPCK which is less appealing to pronounce and therefore 'And' is added in between, resulting to Technological Pedagogical and Content Knowledge which is shortly known as TPACK. Here onwards we will use the abbreviation i.e. TPACK.

As discussed in the beginning, pedagogical content knowledge is central to the teaching learning process. What does it mean? To organise a teaching session, the teacher should definitely have mastery over content and

pedagogical processes. Also, the teacher has to properly integrate pedagogy with the content. These two aspects; the knowledge in pedagogy and content and the successful integration of these two individual components has led to the formation of new terminology called pedagogical content knowledge shortly known as PCK (Shulman, 1986). A successful teacher is someone who has proficient knowledge in both content and pedagogy (Shulman, 1987). Thus, during late twentieth century, PCK has gained much relevance in the teaching learning activities. Later in the beginning of twenty first century, with the emphasis of technology in the pedagogical process, a new term 'technology' is added to Pedagogical Content Knowledge (PCK) transforming PCK to Technological Pedagogical Content Knowledge (TPACK) (Kohler et al.,2007).

TPACK is the framework of teacher knowledge for technology integration. Teacher knowledge is defined as a complex interaction and intersection among three bodies of knowledge within the framework of TPACK; content, pedagogy and technology "(Mishra & Kohler, 2006; Kohler & Mishra, 2008**. TPACK is the knowledge in three identical elements; Technology(T), Pedagogy(P), Content(C) and interconnected elements; Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK) and Technological Pedagogical Content Knowledge (TPACK).** The knowledge in basic elements constitutes Technological Knowledge (TK), Pedagogical Knowledge (PK) and Content Knowledge (CK). TPACK helps teachers to select technologies and integrate them in the teaching learning process by considering the pedagogical aspects and the nature of content. Thus, TPACK consists of the following constituents/elements;

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



(Source: http://matt-koehler.com/tpack2/using-the-tpack-image/)

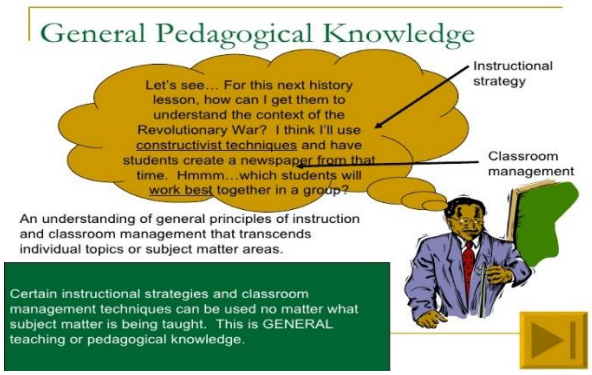
As discussed TPACK framework helps teacher for successful integration of technologies in the classroom instructional process. And the successful selection and integration of technology requires knowledge in the seven components described above. Let us now briefly understand the meaning of these components.

Technological Knowledge (TK): It describes the understanding about various technologies i.e. knowledge about various technologies. The technologies may be computer, laptop, mobile devices and cellular phone, camera, tablets, etc. The teachers are supposed to understand the parts of these devices and functioning at least at a peripheral level required for carrying teaching. TK is not only limited to knowledge about electronic equipment's but also knowledge of various application software's. Why it is required? In the technology era, e-learning is gaining importance. To practice e-learning, teachers need to have understanding of various e-learning tools like, tools for communication, developing e- contents, etc.



Source: https://www.freeimages.com/photo/laptop-1242493,https://unsplash.com/photos/kknrCfZHsyo), ttps://unsplash.com/photos/hfk6xOjQlFk)

Pedagogical Knowledge (PK): Pedagogy in simplest terms is the art of teaching. Then what dose teaching involves? Teaching involves the use of various teaching methods, planning of instruction, classroom management techniques, understanding about children's learning and behavioural pattern, awareness about the usage of teaching-learning aids and its effective integration, assessment strategies, etc. Thus, the pedagogical knowledge in TPACK implies the knowledge of the teacher about various pedagogical aspects. A teacher having clear understanding about the various aspects of pedagogy would be able to successfully organise a teaching session and the failure results in ineffective learning.



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Content Knowledge (CK): A teacher is supposed to possess mastery over the subject that he/she is teaching. Techers with insufficient and lack of knowledge on the latest developments in the subject is doing injustice to his/her students. In the present context of constructivist approach of teaching learning, students develop subject knowledge and conceptual understanding through self-learning. During the process of generation of knowledge, students make use of previous experiences and analyse the learning situations critically. The critical analysis would generate imbalance in the cognitive structure and thereby pose questions to the facilitator of learning i.e., teacher. In such a situation a teacher must be able to answer the queries of the students. Thus, the knowledge in subject and content is of critical importance to the teachers. The knowledge of content is referred to as the content knowledge in TPACK. The content knowledge in any subject

includes understating and knowledge about terms, facts, concepts, theories, principles, laws, axioms, etc. In order to develop the content knowledge, the teacher must update themselves and use them for their teaching-learning sessions.

Technological Pedagogical Knowledge (TPK): As we know, teaching is a complex process involving three components; teacher, students and teaching-learning process. In the technology era, the traditional aids are also supplemented with the use of modern technologies and software applications. It is good that, if a teacher is able to successfully convey the conceptual knowledge through commonly used pedagogical approach i.e. lecturing. But how about supplementing lecture with presentations software. Such a classroom learning atmosphere would be more meaningful as the students feel interested watching the presentations that involves multimedia elements such as audio, video, animations, etc. Even the teachers feel confident to deliver the classroom lectures. Thus, there are instances in which a particular pedagogic style can be supplemented with suitable technologies. This understanding leads to technological pedagogical knowledge of TPACK. The Technological Pedagogical knowledge (TPK) refers to the knowledge of teacher in selecting specific technology suitable to specific pedagogic style. For example, the experimental method of teaching can be supplemented with showing a readily available video during the teaching learning process.

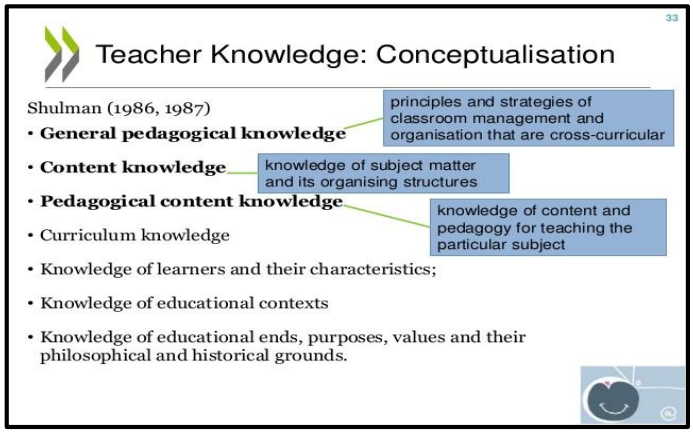
Technological Content Knowledge (TCK): Is the content knowledge sufficient for teachers to organise a teaching session? No! Together with content the delivery style also matters. A teacher planning to organise a group activity in a classroom having 50 students would be more successful, if she/he makes a group consisting of 4 or 5 students in each group. Not only the number decide the effectiveness of group activity. The teaching learning aids also plays a bigger role. In such situations the teacher has to organise the learning activity based on the content transacted. For example, while teaching the concept of 'map', verbal lecture will not be sufficient. At this stage, may be the teacher can make use of "Google Earth'; a free software application. The Google Earth can be installed and students may be asked to

explore the same in the computer lab. Thus, the teacher makes use of both the content knowledge and technology. Thus, the knowledge of teacher in selecting a technology suitable to the content is called as Technological Content Knowledge (TCK). The TCK in TPACK refers to the knowledge of teacher in both content and technology. Thus, a teacher trying to integrate technology in the pedagogical process is also supposed to have sufficient knowledge in content and various technologies. Also, the teacher should be able to select suitable technology according the nature of the content.

Pedagogical Content Knowledge (PCK): In the constructivist teaching approach, the role of the teacher is that of a facilitator. Teacher uses various pedagogical approaches that facilitates and supports students in construction of knowledge or developing conceptual understanding. In this context, a rigid lesson planning wont work. The classroom dialogues and critical analysis of learning activities by the students' needs to be monitored and they must be assisted in developing the knowledge by their own. Thus, the whole teaching learning process depends on two major aspects; the content and pedagogy. If the teacher fails to select appropriate pedagogical approach suitable to content, students fails to develop the concept as desired by the teacher. Thus, the knowledge of teacher about content and pedagogical approaches are important in the teaching learning process. The knowledge of teacher in content and pedagogy refers to the Pedagogical Content Knowledge (PCK). For example, for transacting 'poem' in language classrooms, rather than using lecture method, recitation is more suitable. Thus, the teacher should be able to select appropriate pedagogy suitable for concepts in her/his subject.

Technological Pedagogical Content Knowledge (TPACK): The primary concern of any teacher is identifying the appropriate technology and pedagogy suitable for content that is going to be transacted. We know that, the concept of 'organisation of data' in mathematics can be taught verbally. But is that the effective method of teaching? Certainly not! In technology era, various tools and software's are available for the teaching learning purpose. In such a case, why don't the teacher think of using technology to teach the concept of 'organisation of data'. But the question is about the selection of appropriate

technology for teaching that particular concept. Here comes the relevance of Technological Pedagogical Content Knowledge (TPACK). TPACK is the knowledge of teacher in selecting appropriate technology and pedagogical approach suitable for transacting a specific content. Thus while choosing a technology/software application, the teacher has to reflect on the pedagogy and content. Apart from that, also the interconnections among these three independent entities needs to be considered. This helps teachers to select and integrate appropriate technology in the teaching-learning process.



(Source: https://www.slideshare.net/OECDEDU/knowing-what-teachers-know-about-teaching)

3.Purpose of TPACK

Effective teaching is the result of systematic planning and creative implementation. While planning for instruction, the teacher has to consider numerous points related to the subject, classroom context and learning process. The subject includes the skill of the teacher in analysing the content for which the teacher has to identify the terms, facts, concepts, theorems, laws, etc. The classroom context includes, management techniques of controlling the learners in the classroom during the delivery of instructions. The third component learning process involves understanding of the teacher in teaching methods and learning styles of the students. While organising a teaching session a teacher has to give due consideration to these points and that helps him/her to develop an effective classroom climate and meaningful learning session.

But in a technology enabled classroom, the teacher has to creatively think of integrating technologies in the pedagogical process. There are innumerable number of technologies and application software's. Then the question for the teachers would be identifying the suitable technology for his/her classroom instruction. For example, using presentation in each class is an unfair means engaging technology. But a teacher using technologies like computer, mobile, camera, tablet smart boards and various learning apps is a creative way of planning pedagogy. In order to select the appropriate technology, the TPACK framework would be of much help to teachers. Below given are some of the purposes of TPACK;

1) **Selection of Technology**: The primary and foremost objective of using TPACK framework is for helping teachers to select a technology for teaching and learning. For example, using a mobile device like smartphone for delivering instruction is a kind of selection of technology. But while selecting mobile devices the teacher also needs to consider other factors such as pedagogy and content. Thus, TPACK help in selection and effective integration of technologies for teaching and learning.
2) **Development of Knowledge in Technology, Content and Pedagogy:** TPACK framework help teachers to develop an understanding and knowledge of three aspects; technology, content and pedagogy. Technology knowledge includes the awareness about various technologies and its applications. Content knowledge includes the deeper understanding about the contents in his/her subject of teaching. Pedagogy knowledge involves the awareness and utilization of pedagogical process.
3) **Identification of Technology Suitable to Content:** The teacher has to select a technology suitable for each content. TPACK framework guides the teachers to accomplish the task of identifying the technologies in tune with the content going to be transacted.
4) **Identification of Technology suitable to Pedagogical Approach:** While identifying and integrating technologies, the pedagogy also matters.

Technology matching with a particular style may not work for other teaching method/teaching technique. Thus, TPACK framework help teachers to select technologies suitable to various teaching methods.

5) **Development of Knowledge in Pedagogy and Content:** A teacher has to have clear understanding about the pedagogies suitable for teaching a particular content. This in turn help teachers to identify appropriate technologies.

4. Scope of TPACK

The traditional teaching style emphasising chalk and talk method comparatively fails to **attract the students and engage them in meaningful learning**. With the use of technology in pedagogical processes, students are motivated to learn and learning is an active process of knowledge construction. Learning is an active construction of knowledge by the students themselves (NCF,2005). To make students active leaners, learning experiences of varied nature needs to provided and 'technology enabled learning' paves way for providing learning experiences that arouse interest among the students and learn their own. The knowledge construction among the students is as a result of active involvement and guidance form the teachers and such a pedagogical approach is termed as constructivist approach. In constructivist approach, teachers organise the learning environment accommodating the individual needs of the students in the classroom. While designing learning experiences for the constructivist approach, TPACK framework also plays a major role by selecting the appropriate **technology for classroom activities.** Thus, TPACK framework helps to **select and integrate suitable technologies in the pedagogical processes**.

As discussed, TAPCK framework guides teachers for selection of technology in the teaching learning process. At the same time, organising a technology enabled teaching session or integrating technologies in the learning design has much more implications on the long run. In the constructivist approach of teaching, the role of teacher is that of facilitator rather than transmitter of knowledge. Thus, the teachers need to organise such a learning environment

that would help students in construction of knowledge of their own. While designing such learning environment, the previous experiences of the children gained from various circumstances and places also has to be considered. Then learning is more of an individual activity. TPACK framework **supports the learning styles of children** by the selection of appropriate technologies suitable to the individual learner.

The TPACK framework describes the seven knowledge constituents of teachers requiring for integrating technology. During the process of selection and integration of technology, teachers should take care of the nature of content, pedagogy and decide a technology suitable to pedagogy and content. Thus, utilizing TPACK framework also helps teachers **enhance and develop there understanding of content and various pedagogical approaches**. When the technology for teaching is finalised, then at the implementation stage ultimately children engage in the technology enabled learning situations. This helps children to **develop twenty first century skills**; life and career skills, learning and motivation skills, information, media and literacy skills.

A teacher is required to design learning experiences that engage students in active learning. In the active learning process, children critically analyse the learning situations and develops subject knowledge (concepts) themselves. This constructivist approach and self-learning habit of children is easily achievable with the use of technologies in the classroom. Thus, TPACK framework provide a scope for supporting constructivist learning approach by **organising technology supported learning experiences.** A teacher is successful only when developing learning experiences that facilitate students self-learning and TPACK paves way for it.

The traditional behaviourist approach that considers students as receivers of knowledge has been replaced with the constructivist practices and there the role of the teacher is to organise multiple learning experiences. Designing learning experiences **are easy and meaningful with the use of TPACK framework.** This brings **confidence and boost the teaching abilities of teachers**. Also, as an end result the **time, energy and resources are**

meaningfully saved while designing technology supported learning activities. On the long run, the digital teaching learning resources developed for local purpose could be **converted to Open Educational Resources (OERs)** and made available to larger audience.

5. **Approaches of Integrating ICT in Teaching and Learning-Examples**

In the beginning of the module, it is mentioned that, TPACK is not the only framework guiding teachers for selection and integration of technology. It is the role of the teacher to select appropriate framework suiting to their local classroom purposes. But TPACK framework is the most popular guiding teachers for ICT use. It is reminded that, while selecting the technology, the teacher has to consider many factors that directly and indirectly affect the students learning. Let us discuss few examples of utilizing TPACK framework in the real classroom teaching context.

Example 1: A teacher of Science is planning to teach the concept 'Distance' in her class. If that the case, of course the teacher should possess the content knowledge (CK) i.e. knowledge of the concept 'distance'. The knowledge of; distance is not limited to the definition of concept but the related terms, facts, etc. Thus, this would be content knowledge (CK) as described in the TAPCK framework. Next is about identifying a suitable pedagogical approach. Among the list of pedagogical approaches (teaching methods and techniques of teaching science), the teacher selects collaborative learning approach as the instructional method. In such a case, the teacher would make the students sit in groups and provides computer and ask children to read the text prepared in the text making software (popular is Microsoft Word). At this stage the technology also comes into picture. While developing text in word software, she prepares text in such a way few statements along with supporting pictures that helps children deduce the concept of distance. If students ask any doubts in between, teacher may again use both pedagogical knowledge and content knowledge (PK and CK) to clear. The technologies used are Computer and Application software. Selection of collaborative approach for teaching the concept 'distance' underline the teachers use of pedagogical content knowledge. Similarly, the use of computers and software applications

underline the teachers use of her technological content knowledge. Similarly, the use of computers in collaborative approach underlines the application of technological pedagogical knowledge. This way TPACK is employed for selection of technology.

Example 2: The English teacher is helping her students to understand the meaning of a particular 'poem'. Then definitely the teacher must understand the poem and its meaning, this refers to the content knowledge. The pedagogical knowledge of teacher helps her to select dramatic style teaching method. Along with the presentation of the poem teacher also projects the visuals in LCD projector. The visuals may be collected from intent and if not available. After presentation of the poem, the teacher asks students to identify the meaning by searching internet for which internet connected computers may be made available. Thus, the traditional teaching pattern of directly explaining poem to the students are replaced with constructivist process of developing meaning themselves utilizing technology. Here the technologies used are computer, LCD projector and internet. This is the technological knowledge. While selecting these technologies teacher also applies her technological pedagogical and technological content knowledge.

6. Summary

The teaching learning in the twentieth century is technology enabled owing its strength in developing skills and competencies required for the present generation learner. The impact of technologies can no way be omitted and pedagogy must supplement the traditional teaching methodologies with emerging electronic devices and software's. This develops an interesting learning atmosphere and leaner's in an active learning environment. To integrate technology effectively, the teaching community may make use of the TPACK framework. TPACK framework describes the seven knowledge that teachers need to possess and consider while integrating technology. The scope and purpose of TPACK are unlimited while selecting the technology for the pedagogical purposes.

Quadrant-III - (Learn More / Web Resources / Supplementary Materials):

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Books, articles, research papers, journals, case studies etc.:

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Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017-1054. http://dx.doi.org/10.1111/j.1467-9620.2006.00684.x

Links to web sites giving additional readings, Wikipedia, blogs, open source content etc.:

- https://tpacktools.wordpress.com/2016/09/13/benefits-of-tpack/
- http://www.tpack.org/
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- https://www.youtube.com/watch?v=34ItKKHNBww
- https://www.youtube.com/

Quadrant-IV

Test Items

1) The popular framework for integrating technology in the teaching – learning process is TPACK framework
   a) True b) False
2) Which among the following are the frameworks used for integrating technology in teaching and learning process?
   a) TPACK
   b) SAMR
   c) TIM
   d) All the above
3) TPACK Stands for
   a) Technological Pedagogical Content Knowledge
   b) Technological Knowledge Only
   c) Pedagogical Knowledge Only
   d) Content Knowledge Only
4) While integrating technology in instructional processes, pedagogy and content also to be considered
   a) True b) False
5) Technological Knowledge in TPACK means
   a) Knowledge about Application Software
   b) Knowledge about Hardware
   c) Knowledge about Software
   d) All the above
6) Select the true statement among the following
   a) PK is knowledge about students
   b) PK is knowledge about teachers
   c) PK is knowledge about pedagogical approaches
   d) None of the above
7) Content knowledge in TPACK refers to the knowledge of ---------- in content
   a) Students

b) Teachers

c) Both

d) None of the above

8) TPACK framework can only be applied while selecting technology for teaching at

a) Pre-primary level

b) Primary Level

c) Secondary level

d) All level

9) The purpose of TPACK includes

a) Selecting Technology suitable to Pedagogy

b) Selecting Pedagogy suitable to Content

c) Selecting Content suitable to Technology

d) All the above

10) Mishra and Koehler developed the TPACK framework

a) True b) False

Answer Key: 1.A, 2.D, 3.A, 4.A, 5.D, 6.C, 7.B, 8.D, 9.D, 10.A