

A Thematic Analysis Of Instructional Design Models

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Abstract: *This paper presents the thematic analysis of around 40 Instructional Design Models (ID Models) including learning theories, instructional events and principles which has influenced the Instructional Designing (ID) process during the time period of 1930s to 2019. The primary purpose of reviewing instructional design models is to establish that with the passage of time, many new models emerged by dwelling on the strengths and weaknesses of previous models. Reflexive thematic analysis of identified models was conducted to trace the framework and themes of their development. The theme based review analysis was organized in chronological manner. In addition to this, such continuum of analysis helps in finding the research gaps, elaboration of theoretical framework and in further designing of the practical framework of new contextual instructional models. It was found that in the process of Instructional Design development, the generic ADDIE model has influenced the development of subsequent models. The designers improved and improvised ADDIE model with the changing needs of learners and contexts. Although new theories have emerged, the socio-cultural theory, Gagne's instructional events, and Merrill's principles of instruction still hold significance in instructional designing. Instructional designing based on constructivist epistemology dominate the instructional procedures in TEIs. But, with the integration of Information and Communication Technology in constructivism, new ID Models have been developed which are effective with respect to specific subject, place and contexts. The focus also shifted towards developing integrated models to combine different pedagogical approaches and learning theories with technology. This integration resulted in the emergence of blended instructional designs having elements of both traditional face-to-face and online environments. In the end paper opined that the Indian contexts are entirely unique and different. The ID Models practiced here are originally not developed in Indian contexts but borrowed from western education systems. So, need is to develop ID models suiting to the Indian conditions keeping in view the various challenges originating at teacher education and school education.*

Key terms: *Instruction, Instruction Design Model, Technology, Information and Communication Technology, Constructivism, Blended learning.*

Introduction

The origin of instructional designing can be traced back in World War II (1939 – 1945) when training materials for the military personal were developed (Dick, 1987). At that time, psychologists and educationists solved instructional issues by working upon research and theory of instruction, instructional principles, learning and human behaviour. They viewed training as system, and number of designs and evaluation procedures (Dick, 1987) came in to existence like task analysis of Miller on the military projects (Miller, 1953, 1962). Skinner

(1954) developed programmed instructional material on the basis of his operant conditioning theory. He emphasized on small steps, active responding from learners, immediate feedback, and self-pacing in instructional designing. He focused upon formulating specific behavioral objectives, deciding and developing strategies to attain objectives along with the procedure to try out and revision, and validating the instructional programme. Bloom (1956) emphasized on measuring different types of learning outcomes and proposed taxonomy of educational objectives covering lower and higher levels of learning in a hierarchical manner. It helped in specifying objectives, task analysis and evaluations through a systematic process approach. Mager (1962) further proposed performance oriented instructional procedure also called as Criterion Referenced Instruction (CRI) framework which includes elements from Gagne's Knowles and Rogers's theory of learning. Gagne, Glaser and Silvern used the terms like systematic instruction, instructional design, system development and instructional system (Raiser, 2001) to describe such processes. Glaser (1963) applied criterion-referenced testing to assess entry-level behavior and learning outcomes. In 1965, Gagne identified five different learning types which require specific instructions and learning conditions. He opined hierarchical organization of various skills and tasks as per their level of complexity which later formed the foundations for instructional design practices.

Scriven (1967) recommended field try outs of developed instructional material before applying them in actual practice. It facilitated the evaluation of materials in their formative stages and necessary revisions as per the needs. This led to the emergence of formative evaluations. During the 1940s and the 1950s, Lumsdaine, May and Carpenter also stressed the formative evaluation of instructional materials (Cambre, 1981).

During 1960s, the Individualized Instructional Model, (The Keller Plan) was developed by Keller. It is also called as the personal system of instruction which suggested that instructions should be based upon the educational needs and skills of every learner. It also gave attention for providing effective resources to learners and continuous assessment of learning. In 1970s, many new models were developed for designing instructions systematically (like Gerlach & Ely, 1971; Kemp, 1971; Gagne & Briggs, 1974; ADDIE, 1975; Dick & Carey, 1978) and as much as 40 instructional models were identified (Andrews and Goodson, 1980). The instructional designing process was influential in business, industry and military (Morgan, 1989) but in the public education, basic instructional design processes were used in curriculum development (Spady, 1988). Although there was reference of instructional designs in some textbooks (Dick & Reiser, 1989), their impact on instructions was almost negligible (Rossett & Garbosky, 1987).

Later in 1980s, the emergence of computers greatly influenced the process of instructional designing. The development of computer-based instruction was the major change that mechanized instructional design process (Merrill, Li, & Jones, 1990, 1990). One of the most significant models developed was Cognitive Apprenticeship Model (CAM) developed by Brown, Collins, and Newman, 1989 from Situated Learning theory (Brown, Collins, and Duguid, 1989). As per situated learning theory, all knowledge is situated within the activities of social, physical and cultural environment. The CAM model successfully highlights the role of teacher/mentor/subject experts in the development of cognitive and meta-cognitive skills among learners. It gave modelling, coaching, scaffolding, articulation, reflection and exploration as important strategies in both offline and online learning environments.

In 2002, Merrill proposed five principles of instruction centred on the problem solving. He suggested that for truly effective learning experiences the online learners need to be actively engaged with online content through the process of task centred activation, demonstration, application and integration. The other factors which impact the process of instructional procedures are applications of cognitive psychology (in 1980s) and constructivist principles (in 1990s). As compared to cognitive instructional design practices, constructivist processes

has greatly impacted the process (Dick, 1987; Gustafson, 1993). The instructional principles associated with constructivism include solving complex and realistic problems; working together; considering multiple perspectives; and taking ownership of the learning process (Driscoll, 2000).

School museums (1905), visual and audio-visual instruction (1908, 1930s), use of media during World War II, instructional television (1950s & 1960s), computers (1950s to 1995), and the Internet (2000) were few significant milestones in the development of instruction delivery processes (Reiser, 2001). It was found that whenever any new medium enters the education scenario, there was a great interest and enthusiasm on its possible effects. But the empirical analysis revealed nominal effects which eventually fade away. But in present time computer, internet and digital media together have brought changes in the instructional system procedures. The emergence of virtual communities, high speed data, online Information Communicative Technologies, (ICT), e-learning, Massive Open Online Courses (MOOCs), Open Educational Resources (OERs), M-learning has revolutionized the entire educational practice. The smart phones and tablets have become indispensable component of instructional delivery leading to the emergence of mobile learning and blended learning systems.

Purpose

The primary purpose of reviewing instructional design models was to establish that with the passage of time, many new models emerged by dwelling on the strengths and weaknesses of previous models. So, thematic reviews were presented to understand the frameworks of different ID models. The other purpose was to find out the research gaps in instructional designing and to trace out the theoretical framework for designing new instructional models.

Method and Procedure

A systematic review of literature on ID models developed during the time period of 1930s to 2019 was conducted. Around 40 ID models or theories which influenced Instructional designing were identified. A reflexive thematic analysis was conducted on identified models to explore the patterns and themes of their development. The theme based review analysis was organized in chronological manner. The procedure involved following steps:

- Content, reviews on various ID Models were identified using authentic database searches like Springer, JSTOR, WebQuest, ProQuest, ResearchGate, Shodhganga etc.
- Ideas or developmental features of ID models were examined.
- Themes were generated on the basis of common features.
- The models with similar themes were grouped together in chronological manner.

Thematic Analysis

Instructional Designing in Pre Service Teacher Education Programmes

In pre service teacher education programmes, the prospective teachers are trained in preparing composite lesson plans in different teaching subjects based on various approaches like behaviorism, cognitivism and constructivism. Most of the institutions follow the Herbartian Approach/Model to instructional designing (based on behavioristic ideas of Johann Herbart, 1776-1841 which were later synthesized by his supporters in early 20th century) and it has dominated the field of instruction development till the end of 20th century. It consists of five steps; preparation, presentation, comparison & association, generalizing and application. The comparison & association stage of the model corresponds to the early form of constructivism. In contemporary world, although many researchers do not seem to be influenced with this model yet it remains the first best attempt in instructional designing. Some of the teacher education institutions also trained prospective teachers in preparing lesson on the basis of Dewey's reflective instructional model (1930s), Cognitive development model (Piaget), Inquiry training model (Suchmann), Concept attainment model (Bruner) and Advance organizer model (Ausubel). These teaching models have 6 components; focus,

syntax, social system, principle of reaction, support system and application. The syntax constitutes the main working of model and other components provide guidance and directions in its execution. The philosophical orientation and practice of instruction was based upon principles of Instructivism or sometimes called as objectivism. It states that instructional systems need to be well organized and systematic. This is also refers to as systematic view to instruction development. Instructional designers identify objectives, plan ways to achieve them in best possible conditions and evaluate the behavior described in formulated objective. The constructivists argue that this systematic process is a problem as there is nothing systematic about how we construct knowledge. So, with the emergence of constructivist epistemology in instructional designing, Bybee (1987) developed the BSCS 5E Instructional Model based on Atkins and Karplus learning cycle (1960). Atkins and Karplus learning cycle included exploration, invention and discovery which were later revised as exploration, introduction and concept application. In BSCS model, Bybee et al. added term engagement in the beginning and evaluation as the final phase. So, the five E's of the model are Engagement, Exploration, Explanation, Elaboration and Evaluation. Engagement as an activity allows learners to relate their current knowledge to prior knowledge and experiences, stimulate their thinking and create curiosity in the current concepts. In exploration, learners collect information, investigate, formulate and test hypotheses to make decisions. In explanation learners demonstrate their conceptual understanding and teachers use reflective activities to clarify their understanding. In elaboration phase, the teachers challenge the conceptual understanding of learners and create situations to apply it in real world situations. The evaluation phase allows learners to reflect on their understandings and teachers to evaluate attainment of leaning outcomes. This model specifies the role of teachers and learners in the process of knowledge construction. Most of the Teacher Education Institutions (TEI) favors 5Es approach to lesson planning over other approaches. The emergence of new ICT approaches has added another dimension of technological tools which has transformed the instructional procedures. The educators feel the need for new ID models having harmonious integration of ICT in the constructivist instructional procedures.

Socio-cultural theory (1934), Situated Cognition Theory (1989) and Cognitive Apprenticeship Model (1989)

Socio-cultural theory (Vygotsky, 1934) suggested that social environment plays an important role in learning process. The language, culture and Zone of Proximal Development (ZPD) are three central aspects of this theory. The culture is formed of tools and symbols and learners must interact with those tools and symbols to create new experiences. The teachers must create such culture in the classroom. In social setting, the learners develop social speech first, then private speech and then inner speech. It suggests that understanding or development of deep insight takes place in social contexts. ZPD ensures that the learners must be challenged and given instruction at level higher to their present level. Later Bruner (1976) added the concept of scaffolding to it. Scaffolding is the kind of assistance given to learner by any one more knowledgeable or experienced to perform at level much higher to his present level. The social nature of learning was further emphasized by Situated Cognition Theory (Brown, Collins, and Duguid in 1989). It claims that learning is a social endeavor and physical, social and cultural contexts of learning are very important in the classroom. Dwelling on the ideas of ZPD and scaffolding, Brown, Collins, and Newman (1989) developed Cognitive Apprenticeship Model (CAM) and identified modeling, coaching, scaffolding, articulation, reflection and exploration as important strategies for contextual learning. It successfully highlighted the role of teacher/mentor/subject experts in developing the cognitive and meta-cognitive skills among learners. These strategies can be successfully used in e-learning contexts. Demonstrations and tutorials on specific e-learning activities can be used in modeling. Videos of experts and screen recording demonstration showing step-by-step

procedures are helpful in orientating learners before actual performance. In coaching, use of chats, discussion forums is helpful as learners also receive feedback from e-facilitators and peers. Scaffolding is helpful in all online social interactions where learners are required to work on level much above to their present skill potential. In articulation, inquiry learning, critical thinking and thinking out loud activities are useful in synchronous learning environment but in asynchronous contexts thinking out loud is not effective. In reflection learners compare their performances with the demonstrations given by experts/facilitators to reflect on their strengths and weaknesses. In exploration, learner can apply new technologies, to solve problems.

Bloom Taxonomy (1954), Revised Bloom Taxonomy (2001) and Digital Bloom Taxonomy (2008)

Bloom model on taxonomy (1954) also known as Bloom evaluation approach considered education as an objective based process in which cognitive, affective and psychomotor learning objectives are designed for all the activities. Formulating educational objectives, creating learning experiences and evaluating the change in behavior are the three main steps of this approach. This approach of lesson planning was highly structured and mechanized; and does not provide opportunities for creativity for the teachers.

After forty years, the levels of Bloom's taxonomy were revised (Anderson and Karathwohl, 2001) in to remembering, understanding, applying, analyzing evaluating and creating. As per Revised Bloom taxonomy, the creative thinking is considered as more complex form of thinking. The original Bloom taxonomy is more appropriate at primary level but revised Bloom taxonomy is more suitable for planning instructions at elementary and secondary level. From 1954 to 2020, the teacher, learner, educational needs, learning contexts, social environments has changed. Churches (2008) devised digital Bloom taxonomy by extending the categories of revised Bloom taxonomy in to the digital learning environment. It provides opportunities for learner to use variety of digital tools. Today, the information is readily available from diverse sources and not limited to classrooms (Laufenberg, 2010) and digital changes are transforming education drastically.

Programmed Instructions (Skinner, 1954)

Programmed instruction is highly Individualized instructional procedure in which content is presented in carefully sequenced small steps called as frames. In 1954, Skinner identified five central principles of programmed instructional material which are; individualized instruction, self-paced learning, carefully sequenced small steps, making response and immediate confirmation of results.

The Individualized Instructional Model (The Keller Plan, 1960)

The Individualized Instructional Model, also called as The Keller Plan or the personal system of instruction, was developed by Keller in 1960s. It suggested that instructions need be based upon the educational needs and skills of every learner. It also gave attention for providing effective resources to learners and continuous assessment of learning.

Gagne's Nine Events (1965) of Instruction and Gagne and Briggs Model (1974)

Gagne (1965) proposed three domains of learning outcomes, five types of learning outcomes and nine events of instruction which influenced the instructional design practices greatly. Gagne-Briggs (1974) proposed a prescriptive (integrative) model to create instructions for all the domains of learning. The model comprised of three phases i.e. objectives, sequence and external events of learning. Lunzer (1976) developed rapprochement between Geneva approach (Piaget) and new behaviorists (Bloom, Carroll, Gagne & others) for developing a cognitive paradigm.

Advanced Curriculum Model of Cognitive-Learning (ACMCL, 1976)

In India Dave (1972) worked on a theoretical framework of an integrated approach towards developing a cognitive model of learning. He believed that most productive approach would

be to integrate best elements of Blooms' model, Flanders (1963-65-70) & Skinner (1954) in to one model. This model was adapted for the development of Bridge Course in Kannada which focused on bringing specific changes in language skill acquisition. Later, he modified this as Advanced Curriculum Model of Cognitive-Learning (ACMCL) in 1976. ACMCL focused on pre-planned objective based instructional & evaluation material (text book and examination oriented) especially designed for use in teaching. Later, Nagpal (2000) studied the effectiveness of Piagetian -cum - Objective Based Teaching (OBT) based on ACMCL (integrated paradigm) & Traditional model on academic achievement of primary students. The significant differences among these three groups in terms of academic attainment and creativity were found among students. The above mentioned studies highlight the importance of integration of different approaches to teaching and learning. Keeping in view these developments, Bhat & Kumar (2011) developed Activity based Lesson Planning (ABLP) model for teaching primary classes. This model was the combination of behaviorism, constructivism (5E's by Bybee, 1954) & Activity Based learning. Later, realizing the need for integrating technology in teaching learning process, Kaur & Kumar (2012) developed a micro-skill on selecting and using blends.

The ADDIE Model (1975) and Successive Approximation Model (SAM, 2012)

The ADDIE model (1975) was developed by Florida State University for training purposes. The model contains five phases i.e. Analyze, Design, Develop, Implement, and Evaluation. It is considered as generic mode and most of the subsequent instructional design models are based on it. ADDIE model is not an iterative design and follows a linear approach. In present times it is being used in designing e-learning courses but limitations remains the same. Allen (2012) developed Successive Approximation Model (SAM) as an alternative choice to ADDIE model. It is an alternative way to integrate technology in small cycles, SAM1 and SAM2. SAM1 is basic and SAM2 is extended form. The successive approximation recognizes that no instruction is going to be perfect in the beginning but perfection can be attained during the process. It encourages collaboration among the different stakeholders and avoids later confusions, called as Savvy Start. This aspect of Savvy Start is important in technology enhanced IDs.

The Dick and Carey Systems Approach Model (1978)

Dick and Carey (1978) proposed System Approach Model for instructional designing which viewed instruction as a system in which all individual components work collaboratively for desirable learning outcomes. The instructor, resources, media, activities, learning contexts, performance etc. work together and form a system. It starts with identification of goals of instructions based on instructional analysis and learners' needs, objectives formulation, assessment tools and strategies, selecting and developing materials, formative evaluation, revision of instruction and summative evaluations. All steps are interrelated and none can be skipped during the process.

Morrison, Ross, and Kemp Model (The Kemp Model, 2004)

The Kemp Model, also known as the Morrison, Ross, and Kemp Model, (Morrison, Ross & Kemp 2004) is a holistic, systemic, flexible, and non-linear (cyclic) model which emphasized the adoption of continuous implementation and evaluation throughout the instructional design process. It consists of nine key elements (phases) to instructional design which includes instructional problems, characteristics of learners, task analysis, objectives, content sequencing, instructional strategies, message, delivery, and evaluation.

In this model, designers can start from any phase and skip phase as per need. It is categorized as classroom-oriented and gives emphasis on learner over the content during instructions (Gustafson & Branch, 2002). In this the task analysis stage is similar to stages of the Dick & Carey Model & ADDIE Model, the Instructional Objectives stage is also similar to first

stages of the Dick & Carey Model. Gordon and Zemke (2000) criticized the model for slow pace, non-creativity, bad training results, and not attractive to the modern learners.

The Madeline Hunter Method (1980)

It is a model of direct instruction, which consists of 8 steps viz. anticipation, objectives, purpose, standard inputs, modeling (show) guided practice monitoring independent practice and closure. It is similar to behaviorist/cognitivist instructional design models

Pedagogical Content Knowledge (1986), Technological Pedagogical Content Knowledge (TPACK, 2006), ICT-PACK (2009)

In the past, content mastery was considered as only criteria for effective teaching and very less emphasis was given on its transaction. But, the effective teaching cannot be achieved by simply expert in the field nor solely by possessing certain skills and knowledge of pedagogical practices. Integration is required between content mastery, pedagogy and content transactions.

Shulman (1986) recognized the relationship and proposed a conceptual framework consisting of Content Knowledge, Curricular Knowledge and Pedagogical Content Knowledge (PCK).

PCK includes integration of pedagogy and content leading to the professional understanding for organizing content according to the level of learners. He also gave three forms of teacher knowledge viz. propositional, case and strategic knowledge. He further suggests that when there is a clash between propositional and case knowledge, the strategic knowledge helps the teachers in professional judgments. Although the PCK framework was given in 1986 it still hold considerable relevance today. There is a divide between content and knowledge. The Teacher Education Programmes should take lead in building connections between content and knowledge on the basis of empirical evidences gathered from all stakeholders specially, learners. Cochran et al. (1993) further extended the concept of PCK and included learner characteristics and environmental contexts in addition to content and pedagogy.

Dwelling on the ideas of Shulman, Mishra and Koehler (2006) proposed a TPACK (Technological Pedagogical Content Knowledge) model for developing and measuring the technology integration skills of teachers in teaching and learning. The technology was added to Shulman's (1986) idea of PCK (Pedagogical Content Knowledge) to emphasize the interrelation of content, pedagogy & technology. Over the time it has emerged both as a framework and as an instrument to measure TPACK. In this model technology applications directly support the constructivist strategies depending upon the type of learning environment (Roblyer and Doering, 2013). This model consists of seven components in which three circles of Content Knowledge (CK), Pedagogical Knowledge (PK) & Technological Knowledge (TK) overlaps to form three more types of interrelated knowledge i.e. Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK). The interception of these three is called as Technological Pedagogical Content Knowledge (TPCK). Although it has been used widely yet it lacks in clarity of being a unique body of knowledge (transformative view) or growth in TPACK is the growth in any of the related constituents (integrated view). Because of overlapping nature of its components, the accurate knowledge categorization is also not clear and it leads to the lack of precision and specificity in the design. It also ignored the role of tools and involvement of learners in design process.

Angeli and Valanides (2009) revised the TPACK and gave ICT-TPCK model where technology refers to ICT (Information and Communication technology). They critically reviewed the researches on TPACK model and concluded that TPACK is not integrative but transformative (unique body of knowledge). They further added knowledge content related problems of learners and knowledge of learning contexts in to it. Therefore, ICT-TPCK is a result of synthesis of tools, content, pedagogy, learning contexts and learner characteristics for making the making teaching learning process more effective with the application of

appropriate ICT. Angeli and Valanides (2007, 2008) used situative methodology called as Technology Mapping (TM) in developing ICT-TPCK ID model. The steps are given below;

1. Selection of difficult and challenging content domain
2. Identification of topics, relevant content, tentative objectives based on learners conceptions
3. Iterative ID decision process (decision about tool affordances to transform content in to powerful representations matching with the needs of learners by applying various pedagogical strategies.

The mapping refers to building connections between various tool affordances, content and pedagogy. It is important for teacher educators to explain who will use these transformations in classroom, for what purposes and why. So, the role of teacher, learner or combined role of teacher and learner needs to be defined explicitly in every context.

The ARCS Model (1987), Motivating Opportunities Model (MOM, 2006)

Keller (1987) proposed ARCS Model of Motivational Design on the bases of expectancy-value theory of Tolman's and Lewin's. It includes Attention, Relevance, Confidence, and Satisfaction as main areas. It assumes that the importance or value associated with the knowledge always motivates the people. Later, Hardre (2006) proposed an alternate model called as Motivating Opportunities Model (MOM) having 7 stages with the acronym 'SUCCESS' i.e. Situational, Utilization, Competence, Content, Emotional, Social, and Systemic.

Hybrid instructional model (1998)

Marques and Woodbury et.al (1998) proposed a hybrid instructional model for a new teaching paradigm which integrates the best elements of classroom and web based learning environment. The live lectures, classroom, textbooks, library, and offline assignments were used to generate spontaneous immediate feedback, live communication between teacher and students and among students. Some part of the courseware, assignments, communications, and information search was delivered through Internet-based tools. It ensured geographical independence, self-pace learning, and the responsibility for self-learning. By combining these balanced combination of the best was provided to students. The results show that 73.3% of the students considered themselves too much interested as compared to 46.7% before the course. 66.7% of the students considered e-mail as a useful tool in learning process.

The ASSURE Model (1999)

Heinrich and Molenda (1999) proposed ASSURE model having Analysis, Statement of the objectives, Selection of Media, Utilize technology, media & materials, Require Learners Performance, and Evaluate & revise as its main steps. This model was found to be more suitable for the blended learning approach as the step number 4, Utilize technology, media & materials, provides guidelines for technology integration. It suggested to preview and prepares the technology, media, and materials; prepare the environment and the learners; and provide the learning experiences.

FutureU ID Model (1999)

Whitmyer (1999) developed FutureU ID Model for online learning. The model is characterized by 4 phases (Discovery, Design, Development and Delivery). The model incorporates technology in design phase. The mode is similar to generic ADDIE model except that it lacks evaluation phase. As convention the evaluation of online learning is very important but model missed the evaluation dimension. Moreover, only development and delivery phases are represented in visual form indicating more importance to these two phases (Mutlu, 2016)

Merrill's Principles of Instruction (2002)

Merrill reviewed existing ID theories, models and researches and synthesized common elements to instruction called as Merrill's Principles of Instruction. These are task

centeredness (problem), activation, demonstration, application and integration. He opined that most effective learning occurs in problem centred environments and learner must be involved in activation, demonstration, application and integration of new knowledge.

ADAPT Model (2002)

Tuckman (2002) combined the best features of traditional classroom and computer mediated instruction and developed a hybrid model called as ADAPT (Active Discovery And Participation thru Technology). It was a blend of objectivist and constructivist approaches. The computer mediated instructional activities were designed to incorporate modeling, coaching and scaffolding as a way to support learning in constructivist learning environment (Jonassen, 1999). Self –pacing and assessments form its regular feature. The traditional classroom features include manual attendance, printed text books and presence of instructor. It includes performance activities like self-surveys, quick practices, assignments, applications, spot quizzes, online discussions, portfolios and paper submissions in the instructional process.

Situational Instructional Design Model (2002)

Zemke (2002) used elements from learning theories of Keller, Bloom, Gagne, Merrill, Clark and Gery as per contextual needs and proposed a situational instructional design model. It consisted of live events, online content or self-paced learning, collaboration, assessment and reference materials as key elements. In live events he used Keller's ARCS Model of motivation; in self - paced learning, he emphasised the Gagne's nine events of instruction, Merrill's component display theory called as situational design theory and modern instructional design theory by Ruth Clark (2002). He referred Bloom's (1956) model for assessment; and Gagne's retention and transfer for reference material and performance support material of Gery (2000) for generating immediate work performance.

RCET (Research Center for Educational technology) Constructivist Model (2005)

Swan (2005) developed a constructivist model, RCET (Research Center for Educational Technology), showing applications of social constructivism in online learning environment. This model emphasized on three interactive dimensions of knowledge construction, viz. representation, conceptualization and use. The model placed learning at the intersection of these three and explained the mediating effects of technology on each dimension. The representation means external representations of knowledge used in online environment. The model encourages designers and instructors not only to think for activities and tools which works and not works in online environment but also to explore their effects on learning. The conceptualizations are similar to schemas of Piaget. This refers to the ways through which knowledge is reproduced and organized in human mind and processed and manipulated internally. RCET model asks for particular technological environment that afford or constrain conceptualization of knowledge. For example online learning is supportive in conceptualization of abstract concepts but less supportive in conceptualization of procedural knowledge (Parker and Gamino, 2001) and independent learning behavior are more conducive to persistence than dependent ones (Dziuban and Dziuban, 1998). It also suggests that instruction designer should be sensitive to gender and cultural differences also. The third dimension, use, refers to the social activities and social interactions. There is tremendous effect of digital technologies on social environment of learners. The social contexts need to be created through digital environment. So, RCET model focuses on online social support for knowledge construction & learning and development of social presence among learners and creation of more online learning communities.

TPACK-COPR Model (2010)

Jang and Chen's (2010) revised the Peer Coaching Model of Joyce and Showers (1982, 95) and transformed it in to TPACK-COPR model where COPR stands for Comprehension,

Observation, Practice of instruction, and Reflection on TPACK. After the stages of practice and reflection, pre service teachers were not required to revise their lesson plans.

They conducted a study on pre service teachers enrolled in a teacher education course of 15 weeks using the four phases of transformative TPACK-COPR. The results revealed that the observation of model lessons helped prospective teachers in solving instructional problems, practice provided opportunities to select and transform tools, and they developed skills to integrate technology in the teaching.

Noon (2012) suggested a four stage model based on teacher efficiency to assimilate instructional technology in constructivist classroom. The four stages of teacher are Preliterate end users (having no experience with technology), Software technicians (can use technology for personal use), Electronic traditionalists (proficient in technology use but as extension to traditional classroom functions) and Techno-constructivists (help children create knowledge through technology). He further suggested that techno-constructivists create collaborative online projects involving students, plan real life virtual simulations, promote information literacy through online activities, use internet in lesson planning, and allow formation of digital communities, discussion forums for enhancing social interactions.

Ishman-2011 Model

Ishman (2011) developed a new instructional design model, also called as Ishman-2011, based on integration of behaviorism, cognitivism and constructivism. The behaviorism was reflected in considering the stimulus-response, reinforcement concepts, and environmental conditions; cognitivism was referred in consideration of motivation, intellectual learning process, experiences and contents and constructivism was seen in the roles of both teachers and learners in the process. The focus of the model was on effective planning, development, implementation, evaluation and organization of learning activities. It consisted of 5 steps (input, process, output, feedback and learning) which were further divided in to 12 stages. Ishman-2011 shares lots of similarities with generic ADDIE model. For examples, analysis and design of ADDIE are merged in to input of Ishman-2011 but it lacks the development phase of ADDIE (Mutlu, 2016).

TPACK-IDDIRR Model (2014)

Lee & Kim (2014) developed an instructional design model for pre service teachers' learning of technological pedagogical content knowledge (TPACK). Lee & Kim (2014) analyzed the ID models developed by Angeli, 2005; Angeli and Valanides 2005; Jang and Chen 2010 and the characteristics of a traditional ID model consisting of analysis, design, development, implementation, and evaluation elements and developed a new model called as TPACK-IDDIRR (where IDDIRR stand for Introduce, Demonstrate, Develop, Implement, Reflect, and Revise). In 1st phase, introduction, the instructor (teacher educator) introduce the TPACK and its components to the prospective teachers. The 2nd phase, demonstration, deals with the demonstration of TPACK based teaching example to the prospective teachers. The next four phases are carried out by prospective teachers in small simulated group settings and their lessons are video recorded. In these phases, prospective teachers develop TPACK based lessons, deliver them, reflect by reviewing video tape and revise lesson plans based on their collective reflection.

Micro Skill on Developing and Using Blends (2016)

With the focus on blended learning strategies at activity level, Kumar (2012) developed a micro skill on developing and using blends for teacher training institutions. The components of the skill were selection and organization of resources, handling of traditional strategies or resources, handling of online teaching and learning resources, simplicity and appropriateness of blends, sequencing of the content and involvement of learner. It was found that the prospective teachers trained in micro skill showed improvement in their technological

competencies and school students when taught through blended learning strategies showed high level of performance. It was further concluded that the technological skills of learners, size of the class, the time duration, the location and availability of technology are the challenges in developing & executing blends. The study recommended that the learners also needs to be trained in technological skills.

Synthesis of Qualitative Evidence (SQD) Model (2019)

Tondeur et al. (2019) developed Synthesis of Qualitative Evidence (SQD) model consisting of essential conditions required at institutional level and micro level strategies to develop technological pedagogical content knowledge (TPACK) among pre-service teachers. It put emphasis on planning, leadership, training, accessibility of technological resources and collaboration within and between the institutions. At strategic level, it emphasized strategies like using teacher educators as role models (ROL), reflecting on the role of technology in education (REF), learning how to use technology by design (DES), collaboration with peers (COL), scaffolding authentic technology experiences (AUT), and providing continuous feedback (FEE).

Conclusion

In the process of ID development, the generic ADDIE model (1975) has influenced the development of subsequent models (like Dick & Carey Model, 1978; FutureU ID Model & The Kemp Model, 2004). The researchers improved and improvised ADDIE model with the changing needs of learners and contexts. The technology integration to generic ADDIE leads to the development of new models (like ASSURE Model, 1999, Successive Approximation Model, 2011 & TPACK-IDDIRR). The socio-cultural theory, Gagne's instructional events, and Merrill's principles of instruction still hold significance in instructional designing. Instructional Designs based on constructivist epistemology (like 5E Model) dominate the instructional procedures in TEIs. With the emergence of ICTs, new models (TPACK, ICT-PACK, RCET, ADAPT were developed through integration of ICT in constructivism. The focus also shifted towards developing integrated models (Advanced Curriculum Model of Cognitive-Learning (ACMCL), 1976; ARCS Model, 1987; Zemke, 2002 & Ishman, 2011) to combine different pedagogical approaches and learning theories with technology. This integration further led to the emergence of blended instructional designs having elements of both traditional face-to-face and online environments (ASSURE Model, ADAPT and ICT-PACK).

With the integration of ICT in constructivism enormous new ID Models have been developed which are effective with respect to specific subject, place and contexts. The Indian contexts are entirely unique and different. The ID Models practiced here are originally not developed in Indian contexts but borrowed from western education systems. So, need is to develop ID models suiting to the Indian conditions keeping in view the various challenges originating at teacher education and school education.

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