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Comparative Reflection on Best Known Instructional Design Models: Notes from the Field

Bengi Birgili
MEF University, İstanbul, Turkey

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COMPARATİVE REFLECTİON ON BEST KNOWN INSTRUCTİONAL DESİGN MODELS: NOTES FROM THE FİELD

Bengi Birgili (*(MEF University, İstanbul, Turkey)*)

INTRODUCTİON

Instructional design is a systematic, reflective process in which instructional principles are applied into teaching and learning plans via the differentiation of materials, activities, resources and evaluation (Smith & Ragan, 2004; Morrison, Ross & Kemp, 2001). In this systematic process, instructional design tasks include analysis of knowledge and skills, of concepts, and the design of the learning environment with evaluation of learning outcomes. An instructional design model provides information regarding how to develop instructive programs in line with appropriate learning theories and prescribes how to teach content effectively (Dijkstra, 1997, 2001). Instructional design (ID), in other words, helps instructors or teachers visualize the instructional problems they will likely encounter during the education experience by breaking down learning occasions into discrete and practicable units so that instructors and teachers can analyse and adapt instruction systematically. In addition, the instructional design process requires that designers know and inquire about theories of learning, systematic analysis of learners, management techniques, and the ability to use information technology efficiently. The ability to evaluate the teaching and learning process is an integral part of systematic instructional design. Ozdemir and Uyangor (2011) define instructional design as the process of searching for how to learn better: They describe instructional design as taking into account process, discipline, science, system, performance and theory (p. 1788). The important point here is that an instructional design approach guides the expert designer to construct the instruction from the learners' perspectives rather than from the traditional educational approach of designing instruction from the perspective of content. Therefore, the main elements of an instructional design process should be consideration of the learners, objectives (or learning outcomes/attainments), method, and evaluation. Three major questions instructional designers should ask themselves are: Where are instructors going with instructional outcomes; how will instructors get there; how will instructors know that students have mastered instructional outcomes (Duchastel, 1990; Merrill, 2001; Ozdemir & Uyangor, 2011; Sims, 2006)?

I write from the perspective of a Turkish national who is both a PhD candidate and mathematics teacher and who is deeply invested in the positive impact greater knowledge of instructional design theories and the application of various models could have on the evolving educational system in my country. And I believe the history of the field bears importantly on where instructional design is heading. According to Dijkstra (1997), the first generation of instructional design models were developed in the 1970s and 1980s. However, some argue that ID dates back to the 1950s and evolved as a method to design military instruction (Instructional Design Central, 2018; Skinner, 1958). One key legacy that remains in modern day instructional design models is continued reference to the system developed for design of military training called ADDIE, an acronym for five sequential phases of the design process: Analysis, Design, Development, Implementation and Evaluation. Strictly applied, ADDIE is a linear model of instructional design. In the analysis phase, the designer undertakes formative assessment during which learners are analysed to identify their characteristics (e.g., prerequisite knowledge, previous experience, interests) and to determine instructional goals. During the design phase, the learning attainments are identified to guide in the outlining of content and selection of instructional strategies (e.g., pre-instructional activities, content arrangement). Also, instructional delivery methods, types of learning activities, task analysis, and different types of media and tech tools are selected in the design phase. In the development phase, the designer creates a prototype for instruction, and design or selects existing assessment instruments. During the implementation phase, instructional and assessment materials are delivered, supporting and reinforcing students' mastery of the learning. The evaluation phase, finally, involves summative evaluation (Allen, 2017; Khalil & Elkhider, 2016; Quan, 2018). Despite several strengths, the ADDIE design model in its purest form is rarely adhered to in modern practice, though with significant modifications aspects of the model remain influential (Bichelmeyer, 2005).

Some of the popular early design models were those advanced by Gagne and Briggs (1979), Merrill (1983), and Reigeluth and Stein (1983). Throughout history, educators have speculated about the implications involved in applying instructional design principles to educational design and have waged criticisms of emerging design practices Some have argued that early ID-models were useful for designing a single unit of content, but were of limited use for integrating multiple units of content, and when guiding learners to use units of analysis flexibly to solve problems within complex educational contexts. In addition, across the several communities of instructional design, most theorists were unaware of what colleagues had been developing and did not understood one another's academic work: Describing the theoretical landscape at the turn of the century, Dijkstra asserted "[t]here are different communities of instructional

designers that develop their own rules of good instructional design often without much knowledge of what their colleagues in other groups are doing" (2001, p. 277). Each community tried to determine the characteristics of good instructional design but worked independently. Some asserted that instructional design rules were being advocated without scientific evidence or empirical foundations, for which reason it was argued that instructional design theories and models in the field were rarely cohesive and became increasingly isolated (Perez, Johnson & Emery, 1995; Reigeluth, 1999; Tennyson et al., 1997). After the early proliferation of design models in the 70's and 80's, many new instructional design models were developed and publicised (Merrill, 2001). Many instructional design scholars concluded that the process of instructional design should not assume linearity, leading design scholars to debate the advantages and disadvantages of alternative design solutions that involved recursive processes. In response to changing constraints, different instructional design models were developed, most based on the premise that design processes that avoided a rigid linear sequence could provide both flexible learning guidelines and problem-solving methods (Verstegen, Bernard & Pilot, 2006). Once instructional designers emphasized the unity of cognition, psychology and knowledge construction, instructional design, theories became significantly more useful as educational tools (Warries, 1987). Many distinct and pioneering instructional design models became popular within the field.

According to Goksu, Ozcan, Cakir and Goktas (2014), four of the best known instructional design models are the models proposed by Morrison, Ross and Kemp's (2001) (generally abbreviated as 'Kemp's'), Smith and Ragan's (2004), Dick, Carey and Carey's (2005), and Posner and Rudnitsky's (2006) (generally abbreviated as 'Posner's'). (Each of these models has unique features intended to solve specific challenges associated with teaching and learning processes. As an illustration, Kemp's ID model, which is often depicted by a circular shape, is a flexible and adaptable model which derives its ideas from different disciplines and relies on both behavioural and cognitive approaches. Smith and Ragan, on the other hand, envision design as "an intensive planning and ideation process [that must occur] prior to development of something or execution of some plan in order to solve a problem" (p. 4). Smith and Ragan's model is not as flexible as Kemp's model in terms of the feedback provided within the instructional system, with the result that instructors must follow instructional steps in relatively linear fashion when using this design method. Similarly, Dick, Carey, and Carey use a linear structure but include many units of analysis which allow for feedback when needed. Posner and Rudnitsky coined the term *instructional learning outcomes*, developing a model that forefronted the designer's need to determine the ideals, values and educational goals of a course in which social change, social well-being, and educational equity should be emphasized.

The common message under the framework of each ID model is that different types of learning need different conditions of learning (Allen, 2017). Since instructional design models are selected in accordance with different learning needs, designers seek to match the needs of specific learning situations with theories that will respond to those needs during the design process. However, the literature tends to includes studies that examine these ID models individually within their context, with many studies relying on the ADDIE model as a general linear model to evaluate the development and impact of a course (Allen, 2017; Ozerbas & Kaya, 2017; Quan, 2018). Although there are many distinctive ID models available, and models preferred for specific circumstances from preschool to higher education, all or most models include the following essential phases ADDIE: analysis, design, development, implementation, and evaluation (Khalil & Elkhider, 2016). Thus, the influence of the ADDIE model guides designers to use behaviourist approaches in designing instruction. Within the scope of curriculum studies, there is not much attempt to relate the popular models described in this paper nor much effort to discuss their similarities and differences from an instructional design perspective. Therefore, this paper seeks to fill the gap in the literature so as to foster more frequent and efficient use of these design by *reflecting on the tendencies of each design system in the format of field notes*. My general aim is to discuss and compare the four pioneering instructional design models, distinguishing between learner-centered versus content-distribution-driven course design.
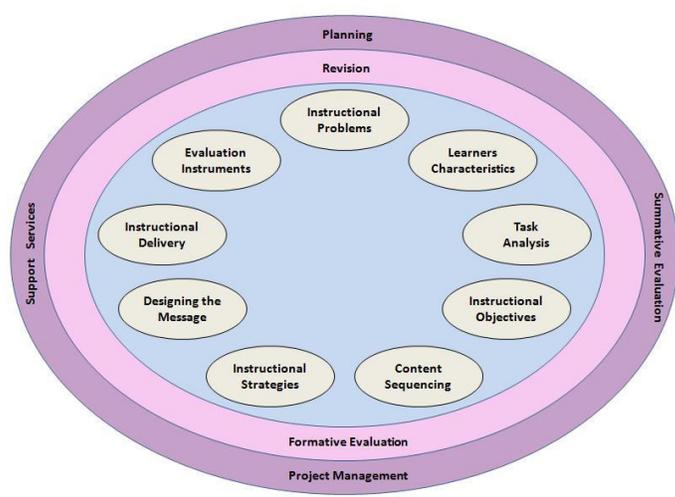
KEMP'S INSTRUCTIONAL DESIGN MODEL

FIGURE 1. Kemp's Model (Morrison, Ross & Kemp, 2004)

One model known as Kemp's model (also referred to as the Morrison, Ross and Kemp [MRK] model) is depicted as an oval pattern surrounded by two outer layer, as shown in Figure 1, above. The universe of the oval comprises the following units: an instructional problem, learner characteristics, task analysis, instructional objectives, content sequencing, instructional strategies, message design, delivery of instruction, evaluation instruments, and support services. The outer sectors represent the feedback opportunity for instructors during formative evaluation and revision. The model accommodates changes in instructional content or elements during instructional development. Kemp remarks that an instructional design does not have to originate from any specific starting point. Teachers or instructors operating as designers can start the process from any part of learning units before or during the instruction but should continue in a clockwise direction through the prescribed processes. Considering their goals and aims, instructors should focus and reflect on their instructional sequence to ensure the sequence is logical or suitable for the target instruction. The oval pattern of the Kemp model diagram suggests the high degree of flexibility derived from avoiding a sequential or linearly ordered process that one could describe using a line diagram. For some instructional or curricular design purposes, the model does not necessitate use of all the processes described. In those situations, the model is so variable that the instructor might intentionally disregard or skip steps in the process. For example, a classroom instructor operating as a designer is likely to have deep knowledge of the students before beginning to design a given unit of instruction. The instructor may not be need to analyse these learners' requirements since the instructor already has background information regarding their characteristics or learning styles. In that case, the instructor does not have to conduct an inquiry regarding learners' learning characteristics. The instructor can begin the instructional design process by selecting any part of the model. While the Kemp model is element friendly, any decisions or adaptations made in one individual unit of the model may require the designer to revise other alternative units in subsequent steps in the clockwise direction of process steps. To sum up, the Kemp model assumes continuous implementation and evaluation of the cyclic process; constant planning, design, development, or assessment are open to revision in to support the design of effective instruction within Kemp's ID model.

The Turkish researchers, Keleszade, Guneyli and Ozkul (2018) use the Kemp model in their studies of instructional design when examining the effectiveness of a history course based on social constructivist learning and developing historical thinking skills. They chose the Kemp model because they found it open to revision during the design process since the model relies on process evaluation and emphasizes the characteristics and readiness of the learners. These researchers conclude the model supports the designer by providing steps that are clear and regular. In general, the Kemp model is accepted and applied as a valid tool in current research specific to the Turkish education system.

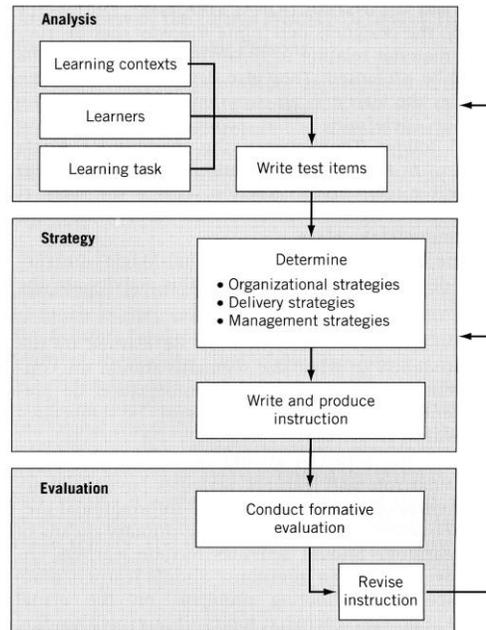# SMITH AND RAGAN'S INSTRUCTIONAL DESIGN MODEL

FIGURE 2. Smith and Ragan's ID Model.

The Smith and Ragan's ID model represented in Figure 2, above, is based on a system-oriented approach (Christopher, 2011). For this model, a system is defined as including a set of discrete elements associated with attainment of a particular learning goal; each part of the system works within a coherent and indivisible whole. The system approach represents a method for designers to work within complex instructional situations so that they can describe and analyze complications within the instructional process, identifying dysfunctions and incompatibilities within the system. Proponents of Smith and Ragan's ID model assert that the linearity of the system affords instructors the opportunity to consider instructional problems from a broad perspective, enabling instructors to solve problems identified within the instructional system. Taking an historical perspective, systems models initially were used by the military to develop large weapon systems in the 1950s (Dick, 1986). Systems model such as the Smith and Ragan's ID model was influenced by system theory, system analysis, and system engineering. The military, business, and industry were the largest consumers of this theory; however system models were adopted and discussed by school managers and academic leaders to address administrative, organizational and managerial issues (Ornstein & Hunkins, 2004). Hence, it was understood that this approach could be applied to other education-related areas such as total quality management.

On the other hand, the Smith and Ragan model also emerged in response to implication raised by Robert M. Gagne's learning theory and Gagne's work with the educational philosophies of Patricia L. Smith and Tillman J. Ragan. The Smith and Ragan model also was affected cumulatively by the theories of Mager, Merrill and Reigeluth (Christopher, 2011). While some researchers regard the model as a useful design tool for educational purposes, some researchers describe it as a prescriptive model of limited value. Critics of the Smith and Ragan model suggest that changes in one unit or section of a design require instructors or designers to make alterations to other units or sections, since analysis and assessment, instructional strategy, implementation, management, and evaluation are interlinked in each phase of this model. During or after instruction, parts of a design might require revision based on feedback from teaching and learning process. In such cases, strict adherence to the Smith and Ragan model would require the complete reapplication of all phases of the design process.

Various Turkish studies analyze the applicability and desirability of instructional design models. For example, Sezer, Karaoglan-Yilmaz and Yilmaz (2017), Goksu, Ozcan, Cakir and Goktas (2017) and Ozdemir and Uyangor (2011) performed various content analyses. They discuss the kind of instructional design models designers prefer, the types of courses for which specific models are suitable, and the strengths and weaknesses of the various models. In particular, these studies rate the Smith and Ragan ID model highly for a range of applications. In recent years, the need to educate students in 21st century skills, in general, and through computer-aided education or distance education, in particular, have driven the application of instructional design. Researchers conclude that the intertwined steps of Smith and Ragan's ID model viable option for designers who want to design a course or curriculum by developing special instructional strategies at all levels of educational institutions (Keles, Fis -Erumit, Ozkale & Aksoy, 2016; Ozdemir & Uyangor, 2011).

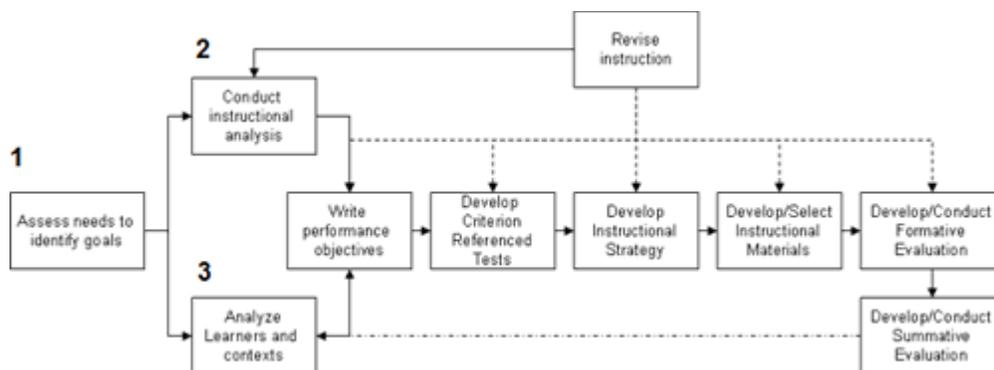## DICK AND CAREY'S INSTRUCTIONAL DESIGN MODEL

FIGURE 3. Dick and Carey's ID Model.

Some instructional design approaches reflect an eclectic set of views. For instance, the model proposed by Walter Dick and Lou Carey (commonly termed the Dick & Carey model) relies on an eclectic compromise among elements of behaviourist, cognitivist and constructivist approaches. (Figure 3, above, provides a diagram of the Dick and Carey model.) This model purports to be adaptably appropriate for learning design targeted to a variety of learners, goals, aims, learning outcomes, instructional contents and learning performances (Dick, Carey & Carey, 2005; Esmer, 2018). The pioneers of this model assume that realizing and formalizing an instruction event requires consideration of the instructional milieu as an entire system rather than the assembled sum of isolated parts. Dick and Carey see the whole of an instructional environment as greater than the sum of its parts. The uniqueness of their model stems from their attempt to support interrelationships among learning context, content, learning, and instruction. They ground their instructional approach on the idea that components of the system cover learner, instructor, any equipment or instructional tools, instructional activity, transfer systems, and learning and performance environments. They elaborate that these components should be compatible with each other to support every students' learning attainments and instructional learning outcomes. As depicted in Figure 3, goals are written from the needs or "performance" analysis. Dick and Carey suggest three types of formative evaluation strategy: a small-group, field-trial and one-to-one evaluation. Learners' entry behaviours are identified by an instructional analysis that accounts for learners' current skills and pre-requisite knowledge, learners' preferences and their attitudes. The analysis then leads to design process that attempt to control the instructional setting. In this ID Model, performance learning objectives are put forth, overtly, and assessment tools are aligned to the instructional objectives the designer develops. After determining the instructional strategy, the designer selects materials such as textual material, videotape, or hypermedia through which to deliver the instruction. Revision of instruction, if necessary, and summative evaluations are followed respectively as final steps in the Dick and Carey model (Dick, Carey & Carey, 2005).

Esmer (2018) notes the relationship between constructivist theory and the Dick and Carey model, examining the model via outlines and drawing attention to the connections among this model and other ID models. Esmer also addresses factors the designer needs to consider by way of the general linear classification of instructional design inherent in the Dick and Carey model, proposing ways to leverage the analysis, development and evaluation stages of the model in order to apply the model usefully to support classroom practice. Akgun (2002) notes the model is based on cognitive theory. Since each design stage in the model is amenable to detailed planning, the difficulties to be encountered during implementation decrease and the designer can get appropriate feedbacks from learners or specialists from time to time. According to Goksu and his colleagues

(2014), the model is among the most preferred models. Researcher have found that the model leads to high academic achievement among students, although they call for additional research as well as duplication of existing studies (Keles et al., 2016; Sezer et al., 2017).

SIMILARITIES AND DIFFERENCES AMONG THREE BASIC MODELS

There are some similarities and differences between the three basic instructional design models discussed above. One metric of sameness or difference is the degree to which a model proposes a linear versus a cyclic process. As an illustration, processes in the Smith and Ragan model progress in relatively linear fashion, as expressed in diagrams of the model featuring sequential lines (as shown in Figure 2 above.) However, one of the congruities of this model with both the Dick and Carey model and the Kemp's model stems from the fact that all three models involve analysis of learners' characteristics to determine learners' need, task analysis, context analysis and sequencing. Another similarity worth discussing here is that in Smith and Ragan's model, the instructional strategy can correspondence to organizational strategy, message design to delivery strategy and instructional delivery to the production of instruction. As a final congruity, revision and formative evaluation units are common to each model. On the other contrary, the models also differ in some ways. Whereas Kemp's ID model begins the instructional process with problem identification, Smith and Ragan's model begins with the context. It can be inferred that Kemp's focus on the instructional design process might be a problem-based approach while Smith and Ragan's approach might be more content based.   Kemp gives higher priority to determining and writing instructional objectives than Smith and Ragan: In Kemp's model, specific time is allocated to objective analysis whereas in Smith and Ragan's model analysis of objectives is reserved for the analysis step. In fact, content analysis and sequencing during instruction are forefronted in Smith and Ragan diagram (shown in Figure 2 above). Instructional strategy, message design, and production of instruction are issues addressed only during the middle of the process Smith and Ragan describe. One unique strength of the model proposed by Smith and Ragan stems from the attention they pay to management objectives and constraints, a key focus of the design stage they term "strategy," and a key attribute of system theory, in general. By contrast, Kemp, suggests focusing on planning and project management after the formative evaluation stage has concluded. However, both models specify that revision processes and formative evaluation take place after analysis of earlier steps in the processes. Even in the area of evaluation, though, differences arise: Kemp sees summative evaluation as a requirement while Smith

and Ragan do not explicitly suggest summative evaluation in their model. Also, Kemp's model addresses support services and resources whereas Smith and Ragan's model does not, a surprising omission given Smith and Ragan's general adherence to the systems approach.

Dick and Carey's model until process steps totally absent in the models of Kemp and Smith and Ragan. Though Dick and Carey base their model on a systems theory, as do Smith and Ragan, they do not similarly structure the various factors impacting the learning event as isolated parts of an instruction process. Moreover, while the Dick and Carey model can be seen as similar to the Smith and Ragan model in that both models impose sequence and assume linearity of process, in fact the Dick and Carey model accommodates recursive processing, affording designers occasions to assess the current status of the design process and enabling designers to respond to feedback from the instructional milieu. The dashed lines in the diagram of the Dick and Carey model (Figure 3 above) represent the alternative, recursive design pathways available to the designer. Dick and Carey's emphasis on the word "performance" is noteworthy, and reflect an emphasis on formative evaluation and repetition, powerful features of the model.

POSNER'S COURSE DESIGN MODEL

Posner's course design model sheds light on the well-known trio of design models discussed above. As the name suggest, Posner's model focuses on *Course Design* as a generic framework of instructional design that accentuates the conceptual distinctions between process and product. We can think of the distinction in architectural terms. In architecture, the process is all the planning that goes into the essential characteristics of a building while the product is the resulting blueprint, and ultimately the building itself. According to Posner and Rudnitsky (2006), course design involves many processes, each of which produce products in the form of curriculum planning guides. The process of instructional planning itself requires an instructional plan (Posner & Rudnitsky, 2006.) While instruction is a process referring to "what is to be done in the school" or to happen in the learning process, curriculum points out a set of intentions or intended learning outcomes, focusing on "what is to be learned."

Posner and Rudnitsky suggest some steps for course. For example, they propose creating an initial idea, selecting graphics, developing a tentative course outline, establishing instructional learning outcomes (ILO), categorizing ILO, formulating central questions, arranging initial ideas, finding out where students are, writing a course rationale, refining ILOs and categorizing ILOs. At the same time, they prescribe the appropriate number of course ILOs, and suggest how to form and organize course units, and how to develop general teaching strategies

while considering specific methods and techniques be carefully applied within the instructional planning process. Posner's model is generally credited with introducing into the instructional design field the concepts of ILOs and course rationales as newly key elements. The model defines course rationales as statements that determine the ideals, values and educational goals of a course in which social change, social well-being, and educational equity are taken into consideration. State and national standards play an important role. Also, ILOs are the controlling statements about ideas, facts, principles, skills, techniques, values or feelings. ILOs can be skills or understandings but always should be consistent with course rationales. In addition, Posner and Rudnitsky propose usage of central questions, which are fundamental to the course and identify the focus of the course. The questions should provide clues as to nature of skill we should model (Briggs, Gustafson & Tillman, 1991). Finally, careful planning of the course evaluation is a key means to maintain continuity, according to the Posner model. Course evaluation should be designed to determine main effects and side effects of the course. For Posner and Rudnitsky, main effects are about the accomplishment or failure to accomplish ILOs while side effects are about unexpected results. These design theorist propose that unexpected side effects need to be addressed before the learning objectives can be achieved.

COMPARISONS AMONG THE PIONEER MODELS

Posner and Rudnitsky are consider pioneers for having reflected on the educational process as not only developing well-educated learners but also meeting a set of intrinsic values. In other words, the educational process should include enjoyable, engaging, personally satisfying activities in addition to the accomplishment of goals. It can be inferred that Posner and Rudnitsky emphasize affective dimensions. This feature of their course design model distinguishes the model from others. While the models of Kemp, Dick and Carey, and Smith and Ragan acknowledge the importance of preparing and describing specific course objectives, Posner's course design model turns objectives into ILOs which operate non-rigid attainments. For the end product, separation of intended and unexpected ones should be the main concern. Posner generally approaches the educational process from a cognitivist perspective whereas Dick and Carey (DC) supports three eclectic behaviourist, cognitivist and constructivist approaches; Smith and Ragan follow both Gagne's objectivist and constructivist approaches. Kemp, however, takes a problem-based approach that aligns most strongly with constructivism. We would be at fault if we were to assume any course design model describes a step by step process. However, while only some design models are linear, all credible models proceed with a logical order based on conceptual relationships (Baturay, Curaoglu & Cakir, 2007).

CONCLUSION

Kemp's ID model can be summarized as one that puts learner's needs and goals into central focus. The model suggests that instructional designers use support and services. It seems especially useful for small scale tasks and individual lessons in the school climate.

Smith and Ragan's model seems to be beneficial for the design of an entire course or a curriculum when preparing a large amount of instruction. Christopher (2011) indicates that Smith and Ragan's ID model relies on condition-based theory. This theory relies on the premises that learning outcome categories are likely to change necessitating different inner cognitive development activities for different learners and instructional adaptations based on external conditions.

The Dick and Carey model features a detailed process for analysis and evaluation steps. The important aspects of Dick and Carey's model are performance analysis steps and three formative evaluation types that connect with the eclectic theoretical backgrounds that inform the model.

I wrote above that I am a learner and educator born, raised, and living and working in Turkey. Instructional design is of paramount importance in Turkey, today since our country is in period of educational transition. Given an expanding Turkish educational system, the Ministry of National Education and Board of Education are striving to develop learner-centered courses through constructivist approaches, a radical departure from the skill-centred course design advocated prior to the 2005 curriculum reform. However, in actual practice, educational content design continues to be centralized and objectivist in approach. Structured and orderly design provides standardization during the teaching and learning process. Curriculum must be manageable when it is being prepared for a huge number of students. On the other hand, curriculum designs produced at national level disregard the heterogeneity of students and do not satisfy the unique needs of local learners. Students' knowledge, skills, attitudes and dispositions are addressed as monotype though learner characteristics vary widely by region and even from individual to individual (Karaca, Yildirim & Kiraz, 2008; Lee, 2007; Sezer, Yilmaz & Yilmaz, 2013).

In Turkey, social, cultural and environmental opportunities of public and private schools have been changing, day by day, and it becomes impossible to offer credible instruction the same way in classrooms on a national level. The more familiar teachers become with diverse instructional design models, the better equipped they will be to choose a model that is appropriate to their class and courses. In-service training (professional development opportunities) is needed, since in Turkey each teacher must perform as an instructional designer well-trained with 21st century skills.

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