

# 日本の医学英語教育におけるインストラクショナル デザインモデル構築

## The Construction of an Instructional Design Model for Medical English Education in Japan

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### ABSTRACT

現在, 日本の医学英語教育における特別なインストラクショナルデザインモデルは存在しない。本稿は, その特別なインストラクショナルデザイン (ID) モデルの作成が可能であるかを考察しようとするものである。そのために一般的な6つのIDモデルの利点と弱点の分析を行った。分析に用いた $\Sigma(d+a+f)/3$ 式はIDモデルのデザイン ( $d$ ), 正確性 ( $a$ ), 応用性 ( $f$ ) を全体的に計るものである。この式により以下の点数が割り出された: the ADDIE Model (0.83), Gerlach and Ely's (1980) Model of Instructional Design (0.67), Keller's (1984) ARCS Model of Motivation (0.83), Dick and Carey's (1996) Systems Approach Model for Designing Instruction (0.67), Smith and Ragan's (1999) Instructional Design Process Model (0.67) and Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan (0.83)。その検証により2つの結果が算出された。1) 0.83と割り出した単純なデザインのモデルは基本的には経験を積んだ教師に適している。2) 0.67と割り出した単純なデザインのモデルは基本的には経験の浅い教師に適している。この結果により新しい日本の医学英語教育における特別なインストラクショナルデザインモデルを構築した。

At present, there is no specific instructional design (ID) model that can be used to describe medical English instruction encountered at Japanese medical schools during the preclinical years. Hence, the purpose of this study was to examine the viability of creating a specific ID model for describing medical English instruction by analyzing the strengths and weaknesses of 6 general ID models. Analysis was conducted using the formula  $\Sigma(d+a+f)/3$  for holistically assessing a model's functionality in terms of its design ( $d$ ), accuracy ( $a$ ), and flexibility

(f) of usage. The following scores were obtained for the 6 models reviewed: the ADDIE Model (0.83), Gerlach and Ely's (1980) Model of Instructional Design (0.67), Keller's (1984) ARCS Model of Motivation (0.83), Dick and Carey's (1996) Systems Approach Model for Designing Instruction (0.67), Smith and Ragan's (1999) Instructional Design Process Model (0.67) and Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan (0.83). The results indicated that 1) simple structural designs with a functionality score of 0.83 were more likely to offer better support to experienced practitioners, and 2) complex structural designs with a functionality score of 0.67 were more likely to offer better support to inexperienced practitioners. Based on these findings, a new ID model was developed for usage in medical English education settings in Japan.

## 1. Introduction

Japanese medical education at the undergraduate level lasts for six years and is typically divided into four years of preclinical education and two years of clinical education (Kozu, 2006). Although the number of years devoted to the study of general education (inc. English) varies from institution to institution, primary emphasis tends to be placed in the first two years (Tokuda, Hinohara & Fukui, 2008). Considering that there are exactly 80 medical schools in Japan divided into 43 national, 8 prefectural, and 29 private universities (Kozu, 2006; Tokuda, Hinohara & Fukui; 2008), there exists a large demand for the instruction of English at these institutions. Unfortunately, this demand has not translated into the transfer of effective instruction with wide discrepancies in terms of both the focus and quality of English instruction taught at Japanese medical schools including: teaching English through histological terminology (Kondo, 2010); teaching English through molecular biology (Nakayasu, Sugimura, & Endo, 2009); teaching English through language textbooks (Wood, 2009); and teaching English through literature (Chidlow, 2009). While the instruction of English in medical contexts can be collectively labeled as English for Medical Purposes (EMP), the wide variety of focus has a negative impact upon the streamlining of EMP instructional practices. This combined with the unavoidable realities of the teacher as the pri-

mary influence on the design of classroom instruction (Burkman, 1987; Olson, 1981) essentially compel instructional designers to fit theories on a school-by-school basis or even on a teacher-by-teacher basis.

In an attempt to resolve this problem, it is argued that key concepts from instructional design theory be introduced in an effort to streamline English language instruction across the various medical institutions. One way to go about this is through the adoption of a universal ID model that can be easily modified for instructional use in EMP settings. Designers use models to guide design and form visual representations of ID processes (Seels & Glasgow, 1998). This prompts the need for research to be conducted into the applicability of ID models suitable for learning systems encountered at medical schools. In this respect, Boutwell (1977) highlighted several key instructional events that were essential for medical schools. These being the requirement for: 1) an needs and goals defining event, 2) a learner characteristics identifying event, 3) a objectives defining event, 4) a task analysis event, 5) an instructional strategy event, 6) the sequencing of instructional events, 7) the selecting of appropriate media/resources, 8) the development and production of appropriate material, 9) a testing event, and 10) an evaluation event. Consequently, only a few ID models could be successfully applied to the instruction of English in medical contexts such as *Gerlach and Ely's (1980) Model of Instruc-*

*tional Design* or *Dick and Carey's (1996) Systems Approach Model for Designing Instruction*.

However, the limitations of directly transcribing these modular templates onto a medical setting are manifest in that they only provide a general framework for structuring instructional events. Therefore, a new ID model that draws on previous model design features needs to be created. For this purpose, it is proposed to examine the aforementioned ID models, and attempt to combine elements of each in order to create a workable model for basing the instruction of English in medical contexts. Hence, the purpose of this study was to examine the viability of creating a specific ID model for describing medical English instruction encountered at Japanese medical schools during the preclinical years.

## **2. Analysis of Instructional Design Models**

When establishing the validity of any ID model, it needs to be kept in mind that the model itself should be a reflection of actual practice. Most researchers tend to take the view that a model is valid “if it is a logical, coherent entity with [literary] support [derived from] practical results of its use and user satisfaction” (Richey, 2005, p. 174). Gustafson and Branch (1997) further supports this viewpoint by suggesting that “the greater the compatibility between an ID model and its contextual, theoretical, and philosophical origins, the greater the potential to generate effective instruction” (p. 76). In order to firmly establish the validation of any particular model, Richey (2005) proposes to divide model validation into two mutually inclusive processes: internal validation and external validation. The former assesses the individual components of a model and its usability, through component investigation, expert review, or usability documentation. In contrast, the latter assesses the

model’s intended purpose and instructional impact after implementation, through field evaluation and controlled testing. However, as this form of model validation has its limitations in that it can only be applied to models tested under situation-specific conditions, she further stresses the need for comprehensive model validation (i.e. systematic replication of a single model tested under different settings) to supplement the above means of validation. Consequently, six ID models were selected and reviewed based in part, upon their proven validity under various ID contexts. In addition, models were also chosen based on their adherence to the five basic ID principles of analysis, design, production, evaluation, and revision (Gustafson & Branch, 1997), theoretical focus, high literary citation, applicability to educational settings, and level of explicit detail. The six ID models reviewed were: the *ADDIE Model*, *Gerlach and Ely's (1980) Model of Instructional Design*, *Keller's (1984) ARCS Model of Motivation*, *Dick and Carey's (1996) Systems Approach Model for Designing Instruction*, *Smith and Ragan's (1999) Instructional Design Process Model* and *Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan*.

Though all of the above ID models share similar components, they tend to exhibit a high degree of variation in terms of their graphical representations and number of phases (Gagné, Walter, Golas & Keller, 2005). This makes the collective dissemination of ID models somewhat challenging, and has led to several attempts to classify models based upon their orientation, purpose or instructional contexts (Andrews & Goodson, 1980; Edmonds, Branch, & Mukherjee, 1994; Gustafson & Branch, 1997). However, there exists some degree of doubt as to whether such general classification systems could correctly encompass models with diametrically different purposes. At best, the adoption of an identification system for model types

as described by Edmonds, Branch, and Mukherjee (1994) in terms of its 1) orientation; either descriptive (general learning variables) or prescriptive (desired outcome of variables) and 2) purpose; either declarative (why a goal is reached) or procedural (how a goal is reached) would serve as a useful descriptor of ID models, though any further comparison between models as can be derived from such a classification system needs to be avoided. Moreover, Edmonds, Branch, and Mukherjee (1994) highlighted the internal flaws of such a system in that models can only be categorized after “the new model has been tested or validated in some way” (p. 71). Yet, the question also needs to be raised whether models validated under different methods could be accurately compared to one another in the first place. Ideally, it would be more accurate to only compare models that were validated using the same prescribed methodology. Until such a validation system for ID models is fully in place, it would be preferable for the researcher to avoid such classification systems in spite of its potential benefits. As a result, the current practice of analyzing models in isolation using descriptors is perhaps unavoidable. In order for the practitioner to gain an idea of the strengths and weaknesses of each model, it might be advisable to implement some form of standardized rating system based on a model’s features or functionality. Gropper (1983) proposed that this could be achieved by correlating instruction with achievement, and developed a mathematical formula demonstrating the possibility of this approach:  $\text{Instruction} = \Sigma (b_1t_1/a_1c_1) + (b_2t_2/a_2c_2) + (b_3t_3/a_3c_3) \dots + (b_nt_n/a_nc_n)$  where (*t*) is the delivery of a treatment for an identified problem, (*b*) is the degree of attention provided by treatment, (*c*) is the presence of a problem, and (*a*) is the estimate of the degree of difficulty posed by the problem (p. 45).

However as Edmonds, Branch, and Mukherjee (1994) pointed out, one of the main problems with

this type of formula is that if the denominator is set at zero (i.e. presuming that there is no problem), the equation itself becomes unsolvable. Until this is addressed, the formula’s value tends to be limited to instructional situations where a problem is encountered. As an interim solution, it is proposed that one could instead focus upon examining a model’s functionality by using a more simpler formula  $\Sigma(d+a+f)/3$ , where a minimum of half a point, and a maximum of one point was awarded each for design (*d*), accuracy (*a*), and flexibility (*f*) of usage. The main advantage of using this type of basic formula is that it negates the problems encountered with the Gropper (1983) formula by presetting the denominator with a fixed value. Additionally, the simpler formula allows for quicker usage and enables any particular model to be assessed holistically without undue emphasis on a model’s intended purposes. However, since the main weakness of this formula is its dependence on rater subjectivity, it should not be used as a means for comparing models with each other. Rather, it is to help the practitioner decide upon which model best suits his/her needs based on the strengths and weaknesses of the model itself.

## 2.1 The ADDIE Model

The **ADDIE** model is an acronym based upon five instructional events: **Analyze, Design, Develop, Implement, and Evaluate** (Rossett, 1987). Due to the model’s linearity, it can be described as being prescriptively orientated, and procedurally structured (Brown & Green, 2006). Though technically not an ID model in the truest sense, it illustrates the vital components of all ID models and has been used by designers as a base for other models (Molenda, 2003). The ADDIE model is atypical of most ID models in that it is sequentially organized, with the output of one activity providing input for the next. Maher and Ingram (1989) compared this pattern to a sequential waterfall model,

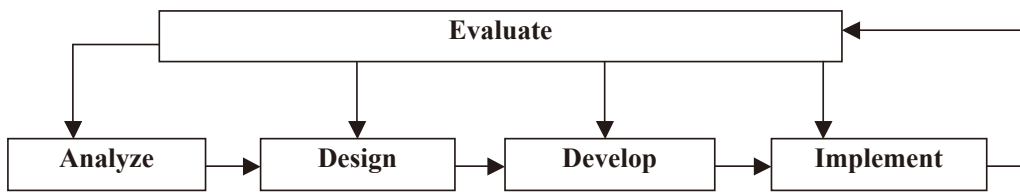


Figure 1. The ADDIE Model adapted from *Principles of Instructional Design* (5th ed., p. 21), by R. M. Gagné, W. W. Walter, K. C. Golas, and J. M. Keller, 2005, CA: Wadsworth/Cengage Learning.

with preceding events overflowing into subsequent events in the manner of a water clock. Under the ADDIE model, each of the five major phases is linked to one another, with the process generally starting from analysis and ending with evaluation. Within the process, revision can occur at any particular point, hence the additional feedback pathways stemming from the evaluation stage (see Figure 1). Despite its apparent linearity, the model is flexible enough to allow for the design process to begin at any given point (Gagné, Walter, Golas & Keller, 2005; Gustafson & Branch, 2007). This advantage allows the model to be continually modified according to the instructional situation/needs of the learning environment. However, the major drawback of this design is that it only describes a single instructional cycle that presupposes the occurrence of all five events in any given instructional event. Studies by Zemke (1985) and Wedman and Tessmer (1993) have shown that some events highlighted in ID models are rarely completed in practice. In particular, there was a tendency amongst practitioners to skip certain aspects of the analysis (i.e. assessing entry skills) or evaluation (i.e. pilot testing) phases due to external factors such as time constraints. This illustrates the primary flaw of most linear ID models, namely its dependency upon the completion of a prescribed set of sequential events.

### Functionality Score (0.83)

If we were to rate the ADDIE model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $1d+0.5a+1f=2.5daf/3$ . It scores full points for both design and flexibility, since the simple design enables for continual modifications to be made, thereby allowing for better flexibility in terms of usage. However, it is only awarded half a point for accuracy due to the inherent problems associated with linearity. Overall, the ADDIE model can be a useful ID model for both inexperienced and experienced practitioners alike, by providing an initial structural framework on which to base units, courses, modules, or lessons.

## 2.2 Gerlach & Ely's (1980) Model of Instructional Design

The Gerlach and Ely's (1980) ID model is based on six instructional events and was designed for classroom teachers on the premise that the teacher is central to the development and delivery of instruction. Due to the model's linearity, it can be described as being prescriptively orientated, and procedurally structured (Edmonds, Branch, & Mukherjee, 1994). Its design mainly revolves around the analysis of *objectives* and *content*, which forms the central core of teacher planning. As can be evinced from the model, the process then requires the teacher to assess learner characteristics

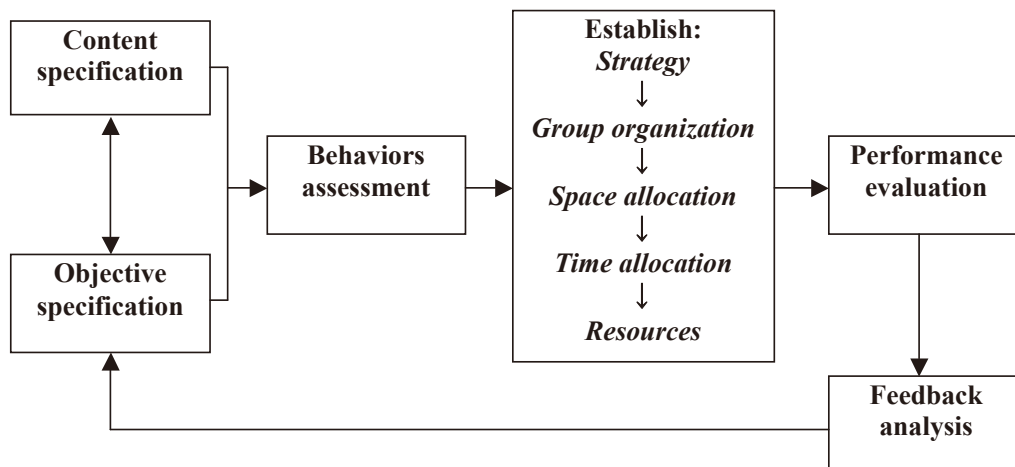


Figure 2. Gerlach & Ely's (1980) Model of Instructional Design adapted from *A Conceptual Framework for Comparing Instructional Design Models* by G. S. Edmonds, R. C. Branch, and P. Mukherjee, 1994, *ETR&D*, 42(4), p. 66.

and make simultaneous decisions with regards to strategies, groupings, time/space allocations, and resources employed. Following instruction, a thorough evaluation and analysis is performed, after which, the process is repeated again (see Figure 2). One major difference to the original model was the incorporation of arrows within the instructional decision block to serve as a sequencing guide. These were added mainly to help facilitate understanding for the inexperienced practitioner, though it should not be construed as indicating instructional flow. Rather, the practitioner can jump between steps as the needs dictate, and shift at random within the instructional decision block. Hence, the model's relatively simple design, combined with its ease of use, makes it a valuable tool for structuring lower-end classroom practices. Yet, as Gustafson and Branch (1997) mentioned, the model itself has been partly supplanted by the **ASSURE** model: **A**nalyze learners, **S**tate objectives, **S**elect media and materials, **U**timize materials, **R**epresent learner participation, and **E**valuation (Heinrich, Molenda, Russell & Smaldino, 1996). One reason for this was due to the limitations of the Gerlach and Ely's

(1980) ID model in terms of scope, as it only focuses upon instructional processes devolving around the objective and content. However, as the **ASSURE** model does not provide a schematic diagram describing the processes of instruction, it was decided to adhere to the Gerlach and Ely's (1980) ID model for the purposes of this study.

#### *Functionality Score (0.67)*

If we were to rate the Gerlach and Ely's (1980) ID model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $0.5d+0.5a+1f=2daf/3$ . It scores full points in terms of flexibility, since the relatively simple design enables for continual modifications to be made, thereby allowing for better flexibility in terms of usage. However, it is only awarded half a point for both design and accuracy, due to its limited scope and the inherent problems associated with linearity. Overall, the model can be useful for describing instructional processes at the lower scale (i.e. modules or lessons), provided that its scope limitations can be addressed.

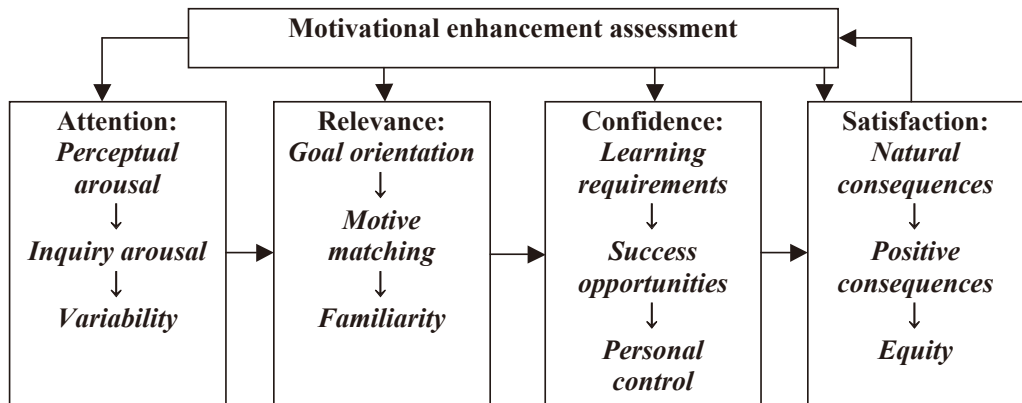


Figure 3. Keller's (1984) ARCS Model of Motivation (procedural version) adapted from *Principles of Instructional Design* (5th ed., p. 115), by R. M. Gagné, W. W. Walter, K. C. Golas, and J. M. Keller, 2005, CA: Wadsworth/Cengage Learning.

### 2.3 Keller's (1984) ARCS Model of Motivation (procedural version)

The ARCS model is an acronym based upon four motivational events: Attention, Relevance, Confidence, and Satisfaction (Keller, 1984; 1987). Under its original format, the ARCS model was basically a table of categories and subcategories, with additional questions to help the practitioner improve learner motivation. As the main purpose of the ARCS model was to highlight some of the principles governing learner motivation, and how these could be applied to improving instruction, there was little need for a graphical design of the model (Gagné, Walter, Golas & Keller, 2005). Consequently, the ARCS model differs from other ID models in that it is more descriptively orientated, and declaratively structured. While this makes it useful for experienced practitioners, the lack of any procedural structure complicates its usage by inexperienced practitioners. In this respect, it was unfortunate that the initial procedural model developed by Keller (1983) for designing motivating instruction was not carried through to the ARCS model. Therefore, it is suggested that a new procedural design constructed from the ARCS

model be developed, in order to facilitate understanding of motivational processes. This procedural ARCS model employs a similar layout as the ADDIE model, with the exception that the evaluation stage is replaced by the term 'motivational enhancement assessment' (see Figure 3). This term was selected to collectively encompass all the guiding questions found in the ARCS model, thereby maintaining the model's integrity, while preserving some design flexibility despite the addition of an extra instructional phase. It is proposed that inexperienced practitioners use this model in conjunction with the original ARCS model, when trying to improve instructional motivation. While studies undertaken by Keller (1999) and Keller & Suzuki (1988) have demonstrated the validity of the original ARCS model under different instructional situations, it would be interesting to see whether the procedural ARCS model would yield similar results. Until such studies are undertaken, it is presumed that the model's original integrity, combined with design features from the ADDIE model, would make it equally effective in various instructional settings.



*Functionality Score (0.83)*

If we were to rate the procedural ARCS model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $1d+0.5a+1f=2.5daf/3$ . Like the ADDIE model, it scores full points for both design and flexibility, since the simple design enables for continual modifications to be made, thereby allowing for better flexibility in terms of usage. However, it is only awarded half a point for accuracy due to the inherent problems associated with linearity. Overall, the procedural ARCS model can be useful for inexperienced practitioners, by supplementing the original ARCS model with a structural framework on which to improve instructional motivation within units, courses, modules, or lessons.

**2.4 The Dick and Carey (1996) Systems Approach Model for Designing Instruction (w/decision block)**

The Dick and Carey’s (1996) ID model is based on ten instructional events and was an improved

version of Dick and Carey’s (1978) ID model, designed to reflect the changes brought about by new concepts and procedures from constructivist theory. Though in essence, it still keeps the same procedural structure as in the previous model, with the exception that more emphasis has been placed on assessing learner needs and characteristics. In addition, summative evaluation (i.e. pilot testing) was now viewed as being part of the procedural flow, rather than as a final event. This allows the instructional process to be viewed as a continuous cycle with no end points, a feature that was missing in the previous models. Furthermore, the authors emphasize that though the model still adheres to a fixed, liner approach; it is assumed that the flow of information is constantly two-way with revisions taking place throughout the instructional process (Dick, 1996). However, even with these additional modifications, the model can still be described as being prescriptively orientated, and procedurally structured. One major design flaw of the model that has been remarked upon by some researchers (Tessmer & Wedman, 1990; Wedman & Tessmer,

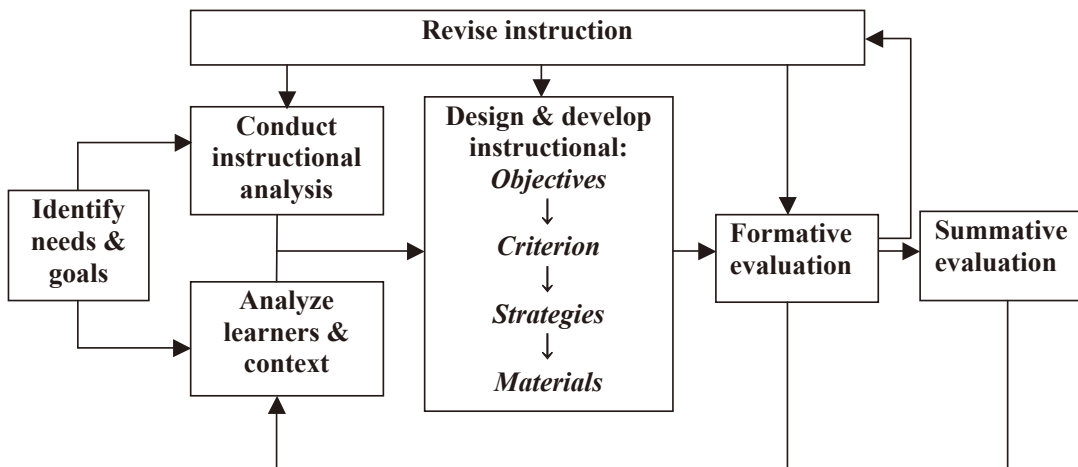


Figure 4. The Dick and Carey (1996) Systems Approach Model for Designing Instruction (w/decision block) adapted from *The Dick and Carey Model: Will it Survive the Decade?* by W. Dick, 1996, ETR&D, 44(3), p. 58.



1993) was the requirement of fulfilling a number of prescribed instructional events in order to complete the instructional process. This holds true even in the 1996 model, which contains the same number of prescribed instructional events as in the previous models. A possible solution to this would be to adopt the instructional decision block used in the Gerlach and Ely's (1980) ID model (see Figure 4). As a result, the number of instructional events can be reduced from ten to seven, helping to simplify the overall structure of the model. Although not completely rectifying the problems associated with linearity, the insertion of an instructional decision block helps practitioners shift between instructional steps in a more natural, random manner. Again, arrows within the instructional decision block serves only as a sequencing guide for the inexperienced practitioner, and do not indicate instructional flow. Whether the instructional decision block is adopted or not, the Dick and Carey (1996) ID model has proven to be popular amongst practitioners and researchers alike due to its step-by-step format and regular updating (Gustafson & Branch, 1997).

#### *Functionality Score (0.67)*

If we were to rate the Dick and Carey's (1996) ID model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $1d+0.5a+0.5f=1.5daf/3$ . It scores full points in terms of design, mainly due to the support it offers to inexperienced practitioners through its step-by-step layout of the major instructional events likely to be encountered during the design process. However, it is only awarded half a point for accuracy, due to the inherent problems associated with linearity. Furthermore, despite studies regarding the model's applicability to other instructional contexts (Tracey & Richey, 2007), it is also awarded half a point for flexibility due to its rigid structure. Even with the insertion of an instructional decision block, the model's higher

number of internal components limits both the scope and number of modifications that can be made without drastic changes to the model's overall structure. Overall, the model can be useful for inexperienced practitioners, by providing a complete structural framework on which to base the design of units, courses, modules, or lessons.

## **2.5 Smith and Ragan's (1999) Instructional Design Process Model**

The Smith and Ragan's (1999) ID model is based on eight instructional events arranged into three broad phases: analysis, strategy, and evaluation. In contrast to the Dick and Carey's (1996) ID model which makes a clear distinction between formative and summative evaluation events, the authors take a more pragmatic approach by dropping the latter phase due to studies revealing inconsistencies in terms of its usage amongst practitioners (Wedman & Tessmer, 1993; Zemke, 1985). Instead, emphasis is placed on incorporating the revision event within the formative evaluation event to closely reflect actual practices (see Figure 5). Similarly, it differs from traditional ID models by employing a more curvilinear design approach, rather than the usual rectilinear rows of boxes with individual arrows. Gustafson and Branch (1997) highlighted the merits of this type of approach by claiming that it offers a more realistic portrayal of the instructional design process by demonstrating approximate feedback as encountered in practice. Another merit of the Smith and Ragan's (1999) ID model is the usage of the Gerlach and Ely's (1980) instructional decision block to illustrate the random occurrence of instructional design processes. Nevertheless, despite these improvements, the model can still be described as being prescriptively orientated, and procedurally structured due to its overall linearity. Two possible faults that can be found with this model are the inclusion of the test item event within the analysis category, and the inclusion of the

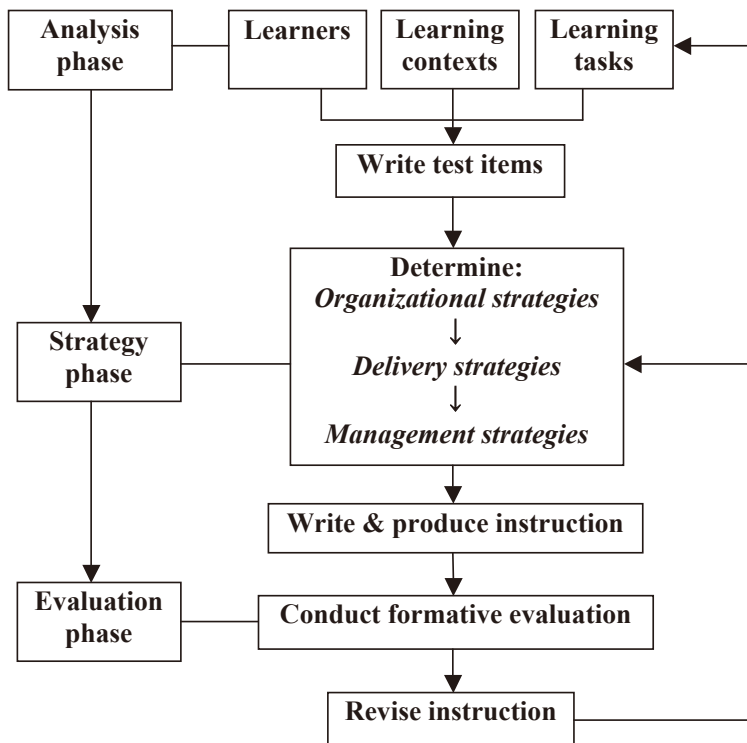


Figure 5. Smith and Ragan's (1999) Instructional Design Process Model adapted from *Instructional Design* (2nd ed., p. 7), by P. L. Smith, and T. J. Ragan, 1999, Hoboken, NJ: John Wiley & Sons.

implementation event within the strategy category. Although most practitioners employ some form of testing event during the instructional process, it would appear to be premature to assume that this always occurs prior to the design of instruction. Likewise, it is questionable whether the actual implementation of an instructional event could be defined as being part of strategy, an area more usually associated with instructional planning.

#### Functionality Score (0.67)

If we were to rate the Smith and Ragan's (1999) ID model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $0.5d+1a+0.5f=$

$1.5daf/3$ . Despite the inherent problems associated with linearity, it still scores full points for accuracy due to the number of improvements made to reflect actual practice. However, it is only awarded half a point for both design and flexibility, as a result of the limitations imposed on the type of events that can be placed within the categories. This has a negative impact in terms of the number of modifications that can be made to this model, hence limiting its usability. Overall, the model can be useful for experienced practitioners, by providing a slightly more realistic portrayal of instructional processes that might occur in units, courses, modules, or lessons.

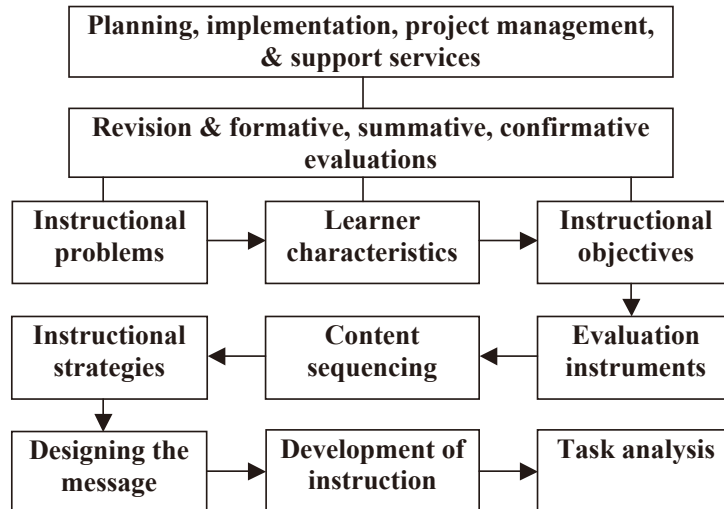


Figure 6. Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan Model (w/arrows incorporated) adapted from *Designing Effective Instruction* (6th ed., p. 12), by G. R. Morrison, S. M. Ross, H. W. Kalman and J. E. Kemp, 2011, Hoboken, NJ: John Wiley & Sons.

## 2.6 Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan Model (w/arrows incorporated)

The Morrison, Ross, Kalman and Kemp's (2011) ID model is based on nine instructional events and was basically an improved version of Kemp's (1985) *Instructional Design Process* model, with the exception of the addition of an outer oval comprised of planning, implementation, project management, and support services surrounding the original inner oval. The authors purposely designed it in the form of a double-layered oval with smaller interdependent circles transposed into it, in order to illustrate the interdependency of each instructional event (i.e. no connecting arrows indicating instructional flow), and how these in turn are affected by ongoing design processes. This was under the premise that as instruction could start at any given point during the design process, it was essential to show that each event could be addressed both independently and simultaneously by the prac-

itioner. As a result, Morrison, Ross, Kalman and Kemp's (2011) ID model differs from most other ID models in that it is predominantly descriptively orientated, and declaratively structured. The main merits of this model can be described as twofold. Firstly, the overall design layout provides an accurate reflection of real-life instructional practices, thereby allowing experienced practitioners to construct instruction based on their needs and beliefs. Secondly, the model's design simplicity allows it to be adapted to any given instructional situation, without the need for major modifications to be made. In contrast, it can be argued that the lack of any procedural structure within the original model significantly complicates its usage by inexperienced practitioners. To improve its usability, it is proposed to incorporate arrows within the original model to provide some indication of instructional flow between events (see Figure 6). As the order of events closely follows the layout described in the original model, the overall

integrity of the model is mainly preserved. Yet, even with this additional modification, it does not address how the ongoing design processes affect each instructional event. This is an aspect that needs to be clarified first, if the model is to be used by inexperienced practitioners.

#### *Functionality Score (0.83)*

If we were to rate the Morrison, Ross, Kalman and Kemp's (2011) ID model using the formula  $\Sigma(d+a+f)/3$ , it would be possible to envision the hypothetical score for this particular model as being  $0.5d+1a+1f=2.5daf/3$ . It scores full points for both accuracy and flexibility due to its close reflection of actual practice, and relative ease of adaptation without the need for major modifications to be made. However, it is only awarded half a point for design, as it does not address how the ongoing design processes affect each instructional event. Overall, the model can be useful for experienced practitioners, by providing a realistic portrayal of instructional processes that might occur in units, courses, modules, or lessons.

### **3. Results**

Based on the analysis of the six ID models described above, it can be stated that each model possesses certain strengths and weaknesses that are derived from its design characteristics. Essentially, there seems to be a trade-off between model design complexity and model flexibility, with stated accuracy being mainly dependent upon which factor is emphasized. Though a simple design offers greater potential for flexibility with improved accuracy, it only provides a 'mental template' for experienced practitioners to work from. In contrast, a more complex design offers practical guidance and support for inexperienced practitioners, at the expense of some flexibility and accuracy. While it is possible to improve a model's stated accuracy to a

certain extent by either: (1) adopting a curvilinear design approach, (2) inserting an instructional decision block, or (3) arranging instructional events interdependently, this is mainly constrained by the designs' intended purpose and the experience of the practitioner. Taking into consideration that it is likely that both experienced and inexperienced practitioners can be found at any particular educational institution, it could be argued that model design priority be given firstly to supporting inexperienced practitioners. As Dick (1996) already mentioned, even a prescriptively orientated model provides some benefit to experienced practitioners, by providing a conceptual framework from which they are able to shift between instructional events as needs dictate. With this in mind, it was decided that it would be more conducive if the ID model for medical English instruction also follows a prescriptive orientation, although with some important changes being incorporated to improve accuracy (see Figure 7). The model was based on components from all six models studied, and thus is a combination of the best features of each model design. It was procedurally structured around the following twelve instructional events: identify needs & goals, analyze contexts, analyze learner characteristics, analyze learner motivation, define objectives, select & organize content, design assessment tool, instructional decision block, conduct formative evaluation, revise instruction, implement, and performance evaluation.

#### **3.1 Identify needs & goals**

A feature adopted from Dick and Carey's (1996) ID model, this event focuses upon establishing the overall purpose of EMP instruction including: establishing the educational needs of the learners, determining desired learning outcomes, as well as facilities, administrative and budgetary factors thought to affect instruction (Boutwell, 1977). Additionally, both institutional policy and

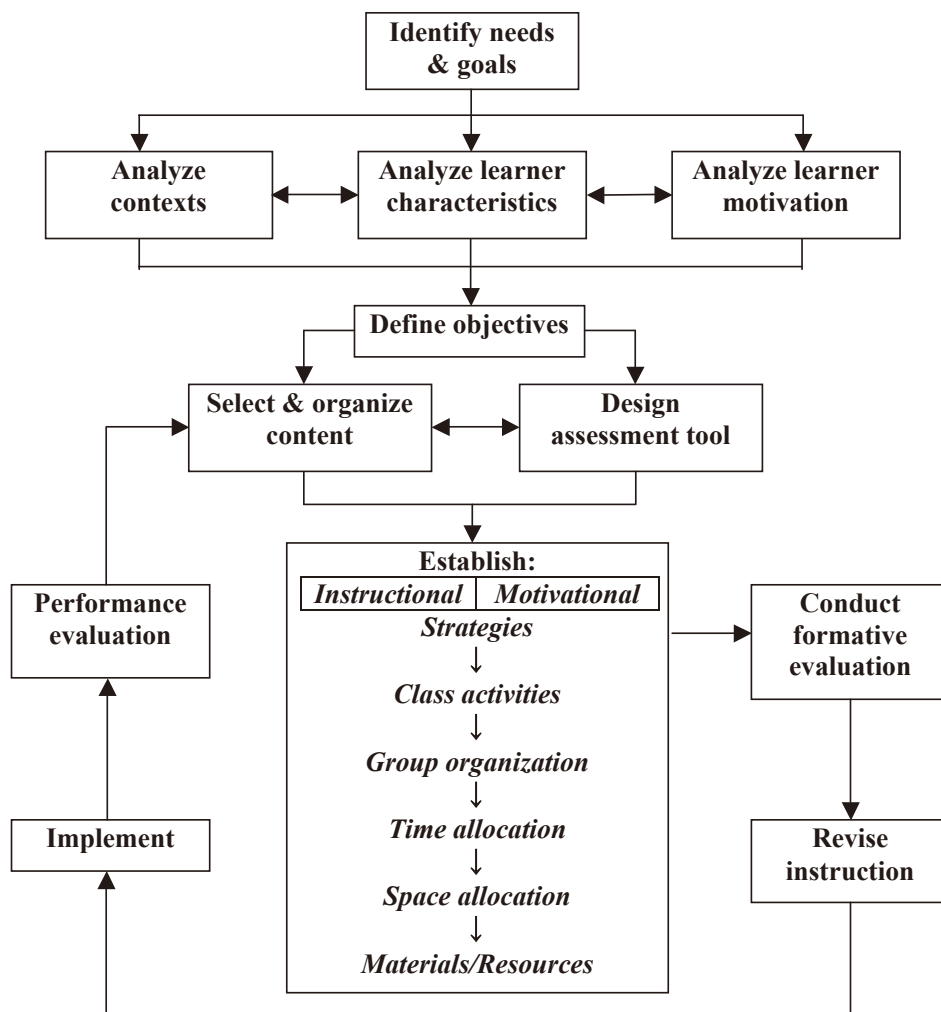


Figure 7. Instructional Design Model for Medical English Instruction in Japan.

governmental regulations with regards to medical curriculum, standards, and licensing have a substantial impact upon all decisions undertaken at this level (Locatis, 2007). While the individual practitioner may have little control over institutional and governmental regulations, it can be expected that some autonomy can be gained from defining needs and goals with regards to course development. In this respect, Antic (2007) stressed that medical English should be primarily taught

from the perspective of medicine and health care, with secondary emphasis upon linguistic aspects such as vocabulary acquisition or grammar. Thus, in the case of EMP instruction, main emphasis should be placed upon defining the learners' contextual needs (i.e. medical English) through an initial needs analysis. Once this has been performed, it is possible to determine desired learning outcomes and how best this can be achieved.

### 3.2 Analyze contexts

A feature adopted from Smith and Ragan's (1999) ID model, this event serves to delineate the parameters of EMP instruction. In this respect, the Coordinating Council on Medical and Dental Education (2001) established guidelines for an integrated organ/system-based curriculum with strong emphasis on Problem-Based Learning (PBL) to be implemented at all Japanese medical schools. This is reflected by surveys conducted during the period of 2000 to 2004, which revealed that PBL was already being implemented in 49 schools (62%), with 29 schools (37%) implementing it during the first two years of preclinical education (Kozu, 2006). Although specific guidelines concerning the instruction of English at medical schools have yet to be defined, it can be hypothesized that EMP instruction should be conducted along similar lines in order to help maximize student learning. However, due to the wide variability of EMP courses offered at medical schools, it can be postulated that instruction would equally vary. Hence, it is vital that the practitioner define the context of the course in which EMP instruction is to occur in any analysis.

### 3.3 Analyze learner characteristics

As with the Smith and Ragan's (1999) ID model or the Morrison, Ross, Kalman and Kemp's (2011) ID model, the focus of instruction is also centered on the learner. This event collectively encompasses all learner variables thought to affect the instructional decision-making process. Boutwell (1977) exemplified this by highlighting a number of learner characteristics thought to affect instruction and its presentation including: learning style, academic ability, motivational level, attention span, interest, gender, and socioeconomic background. Therefore, it is essential that the practitioner conduct some form of diagnostic pretesting prior to instruction, as a means to assess students' past

learning experiences. However, care should be given to avoiding diagnostic testing methods that bear resemblance to subject-level examinations as these have been conducted extensively prior to admittance into medical school. In this respect, student selection in Japan tends to vary according to the type of institution, with most medical schools implementing some combination of paper-based achievement test, essay writing, and interview examination system (Kozu, 2006). In order to work around this problem, it is suggested that the practitioner focus on developing diagnostic questionnaires for the purposes of collecting background information on medical students (Boutwell, 1977).

### 3.4 Analyze learner motivation

A feature derived from Keller's (1984) ARCS Model of Motivation, this event focuses upon analyzing entry-level motivational factors of students and its potential implications on course development. Although Boutwell (1977) categorizes motivational factors as part of learner characteristics, Keller's treatment of motivational factors as a separate entity through the ARCS model suggests the need to differentiate between the two. Hence, it was deemed more conducive to create an additional instructional event separate to learner characteristics. This suggests that it might be more conducive for the EMP practitioner to develop separate diagnostic questionnaires for measuring context, characteristics, and motivation levels of learners. However, even though learner motivation has been treated as a separate instructional event, it should not be misconstrued that events 2 to 4 are always independent of each other. Rather, events 2 to 4 can also be treated as interdependent events as indicated by the two-way instructional flow (see Figure 7).

### 3.5 Define objectives

A feature mainly adopted from Gerlach and Ely's

(1980) ID model and Morrison, Ross, Kalman and Kemp's (2011) ID model, this event underlines the type of knowledge or skills to be acquired by the learner within a specific instructional time frame, and how this can be brought about. Antic (2007) pointed out that these 'teaching' objectives essentially serve as the foundation of medical English instruction as it affects the development of lesson plans, activities, tests, and materials. In particular, the focus of EMP instruction needs to be defined by the practitioner during this stage of the ID process. This can take the form of the teaching of specific medical topics related to human physiology (i.e. anatomy), pathology (i.e. diseases), health promotion and patient care, or the development of skills essential for physicians such as critical thinking, problem solving, scientific writing, and patient communication (Kozu, 2006). However, when establishing EMP objectives, it is essential that these objectives can be attainable with respect to the students' current knowledge levels and language proficiency. Consequently, it is suggested that the practitioner place emphasis upon the teaching of basic anatomy as encountered during early preclinical education.

### **3.6 Selecting & organizing content**

A feature derived from Morrison, Ross, Kalman and Kemp's (2011) ID model, this event underlines the type/amount of medical content to be covered during EMP instruction and its sequencing to promote effective learning. The practitioner's choice of medical content would depend largely upon the results obtained from the initial needs analysis, balanced with the suitability/adaptability of content for EMP instruction. Once content has been selected, it needs to be structurally organized in a manner that allows knowledge to be effectively imparted. Consequently, the practitioner also needs to establish the medium of instruction most suited for EMP contexts. In this respect, Boutwell (1977)

stressed the relative importance accorded to the use of visual instruction (i.e. images, videotapes, or software) at medical schools. Additionally, there has been a gradual shift away from didactic teaching; with formal lectures giving way to experiential teaching techniques such as PBL at most Japanese medical schools (Rao & Rao, 2007). Thus, it is recommended that EMP courses also place emphasis upon the use of visual materials as a means to promote PBL instruction. One possible example of this would be an EMP lesson on the human skeletal system where students are required to identify bone structures on X-Ray or CT scans using the target language.

### **3.7 Design assessment tool**

A feature adopted from Morrison, Ross, Kalman and Kemp's (2011) ID model, this event is essential for measuring student retention or achievement and can be conducted in parallel to the selecting & organizing of content as indicated by the two-way arrangement of instructional flow (see Figure 7). Though the form of assessment may vary depending upon the focus of the lesson, it is recommended that practitioners working in medical schools place emphasis on developing formal assessment tools that employ objective, direct testing methods. The underlying reason for this is due to the evaluative structure of preclinical education at Japanese medical schools, with students required to pass a Common Achievement Test (CAT) in preclinical medicine during their fourth year, before being allowed to pursue two years of clinical study. Since 40% of the CAT is based on the analysis of anatomical structure in relation to function, pathology, diagnosis, and treatment (Kozu, 2006), it is recommended that primary emphasis be placed on anatomical content in EMP tests. Thus, an EMP test might take the form of a labeling activity of bone structures on X-Ray or CT scans using the target language.



### 3.8 Instructional decision block

A feature directly stemming from Gerlach and Ely's (1980) ID model, this event was added in order to address problems associated with design complexity and extensive linearity as evinced with the Dick and Carey's (1996) ID model. By reducing the overall number of instructional events and enhancing accuracy through the randomization of instructional decisions undertaken by the practitioner, it provides a more realistic portrayal of instruction encountered in the classroom. It encompasses a number of instructional events deemed essential by Boutwell (1977) for medical schools including: instructional & motivational strategies, instructional sequencing, media selection, and material development/production. If we were to use the same example as above, the practitioner may decide to adopt a PBL approach where students are required to use what they learned about the human skeletal system to identify/diagnose fractures using X-Rays or CT scans (Rao & Rao, 2009).

### 3.9 Conduct formative evaluation

A feature adopted from Dick and Carey's (1996) ID model, it emphasizes the importance of reviewing instruction prior to actual implementation. Although usually sequenced as a final instructional event in several general ID models (Dick & Carey, 1996; Smith & Ragan, 1999), it has been shifted before the implementation event to reflect actual practices. In this respect, Cennamo and Kalk (2005) stressed the need to conduct formative evaluations during the design/development process of materials to ensure that the material is suitable for instructional purposes, and that no errors are present. This is particularly crucial in medical education, where errors in terms of content or skills learnt can lead to life-threatening consequences for the patient (Locatis, 2007). Therefore, the practitioner needs to exercise extreme care when selecting medical

material on which to base EMP instruction upon. Unfortunately, the lack of a specific tool for the formative assessment of EMP materials complicates the evaluation process, though it is hypothesized that some form of self-evaluative tool that allows the practitioner to rate generated EMP instructional materials using medical criteria would be highly beneficial.

### 3.10 Revise instruction

A feature mainly stemming from Smith and Ragan's (1999) ID model, this event underlines the importance of continually keeping instruction updated in order to reflect changes brought about by improvements in the field of medicine and technology. In particular, medical knowledge tends to change rapidly due to advances in research and patient management, and that this information is becoming more accessible to practitioners through the Internet (Locatis, 2007). Consequently, EMP practitioners by necessity need to become adept at locating, evaluating, and adapting medical resources from the Internet to suit instructional needs and technological advances. For example, Rao and Rao (2009) proposed the use of commercially-available 3D modeling software as an adjunct to instruction on human anatomy in order to help deepen students' understanding of anatomical functions.

### 3.11 Implement

A feature derived from the ADDIE model, this event focuses on the delivery of instruction once all revisions have been completed. Although sometimes neglected as an instructional event in some of the more influential model designs such as the Dick and Carey's (1996) ID model, this event was included in order to highlight certain instructional constraints particular to EMP settings. Since instructional content under EMP settings is medically-orientated, the practitioner must be thoroughly familiar with medical terminology

covered within the lesson prior to actual delivery. This provides for better student guidance and support during instruction, allowing the practitioner to answer any questions the students may have about the subject matter (Gagné, Wager, Golas, & Keller, 2005). Additionally, the practitioner must also display professionalism on a par with physicians during instruction, through the use of value-neutral language (Cooke, Irby, Sullivan, & Ludmerer, 2006) and by exhibiting integrity, accountability, altruism, honor, and respect for others (Tokuda, Hinohara, & Fukui, 2008).

### **3.12 Performance evaluation**

A feature derived from Gerlach and Ely's (1980) ID model, this event underlines the importance attached in medical settings towards the testing of individual learner performance with regards to test scores. The need for a formal testing event is brought about by the nature of high-stakes testing conducted at Japanese medical schools, which includes: a preclinical CAT, a clinical graduation examination, a national licensing examination, and a minimum of two years residency training (i.e. internship) at a hospital (Kozu, 2006). Thus, all medical students must undergo a minimum of eight years of high-stakes testing in order to be able to practice medicine. As a result, EMP practitioners need to be able to evaluate student performance in manners that are consistent with testing standards employed at medical schools. Therefore, it is proposed that formal testing methods in the form of quizzes, tests, or exams be implemented on a regular basis by the EMP practitioner.

## **4. Discussion**

The basic merit of the model is that it provides an initial ID framework on which to base the varied instruction of medical English encountered at Japanese medical schools. Although extensively

prescriptively oriented, the model offers a more complete representation of EMP instructional processes than examined ID models, through its detailed layout and by offering examples relevant to EMP instruction. As it was mainly designed to support inexperienced practitioners in the instruction of English in medical contexts, it would be perhaps wrong to describe the model as a general ID model intended for usage by practitioners with differing levels of experience. Rather, it serves as a specialized form of ID model intended for inexperienced practitioners working within defined EMP instructional parameters as encountered in Japanese medical schools. Ultimately, it resides within the practitioner to decide if an ID model is suitable enough to base instructional practices upon (Burkman, 1987). If we were to highlight some of the major weaknesses of the model, the lack of any precedent for this type of model within the realms of medical English instruction complicates its objective analysis in terms of its design and functionality. This partly stems from the fact that the model's design was based on components derived from general ID models. The problems related to adopting components from general ID models were particularly manifested in both Keller's (1984) ARCS model and Morrison, Ross, Kalman and Kemp's (2011) ID model, as it employs a completely different structural design and orientation. Ideally, it would have been preferable to have firstly implemented a comparative analysis of the model with other ID models specifically designed for the instruction of English in medical contexts, and then to have adopted suitable design features from them. Moreover, since the model has yet to be validated under an instructional setting, it is difficult to predict how successful the model would be in actual practice. Consequently, further trials are necessary in order to establish the validity of the model under actual EMP practices encountered at Japanese medical schools.

## 5. Conclusion

Overall, the model provides an initial ID framework to base the instruction of medical English as encountered in Japanese medical schools. It offers inexperienced practitioners potential support when designing and developing instruction for EMP, through its prescriptive orientation and procedural structure. Its design was based on components derived from an analysis of six different ID models: the *ADDIE Model*, *Gerlach and Ely's (1980) Model of Instructional Design*, *Keller's (1984) ARCS Model of Motivation*, *Dick and Carey's (1996) Systems Approach Model for Designing Instruction*, *Smith and Ragan's (1999) Instructional Design Process Model* and *Morrison, Ross, Kalman and Kemp's (2011) Instructional Design Plan*. These ID models were selected based upon their proven validity and general applicability to classroom instructional practices. It was found that there was a trade-off between model design complexity and model flexibility, with stated accuracy being mainly dependent upon which factor was primarily emphasized. This was primarily due to a model's intended purpose and targeted audience, with highly complex structures offering more support to the inexperienced practitioner at the expense of some accuracy and flexibility. In contrast, more simple structures offered greater accuracy and flexibility, but required more experience for implementation.

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