

Around the Review “Around the Birth of three First Principles of Instructional Design”: Reflection on What I Learned from the Works of Reigeluth

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Abstract: I was asked to write a review paper around the birth of three first principles of instructional design, to be appeared in Vol. 28 No. 2 of *Japan Journal of Information and Systems in Education*. This presentation is my personal reflection of what I have learned from the work of Reigeluth, who was often cited when I discussed the three First Principles. From the first volume of his *Instructional Theories and Models*, important key concepts have been proposed, including the distinction of descriptive vs. prescriptive theories. It also contained the ARCS Model that aims directly at enhancing the appeal of instruction as the third goal of designing instruction. From Volume II, I learned various theories for postindustrial society, many of which was from the learning sciences background. From Volume III, I learned common knowledge base is proposed that implies the maturity of the field of instructional design.

Keywords: instructional design, First Principles, Reigeluth, Green Book

1. Introduction

I was asked to write a review paper around the birth of three first principles of instructional design, to be appeared in Vol. 28 No. 2 of *Japan Journal of Information and Systems in Education*.⁽¹⁾ The three First Principles are Merrill's First Principles of Instruction (2002), Keller's First Principles of Learning Motivation (2008), and Parrish's Aesthetic Principles of Instructional Design (2009). This presentation is my personal reflection of what I have learned from the work of Reigeluth, who was often cited when I discussed the three First Principles.

Charles M. Reigeluth is a Professor of College of Education, Indiana University, USA, majoring instructional design and technology. His contribution has been very well known by creating the research area of instructional design as a discipline within the field of educational technology. His own Elaboration Theory⁽²⁾, as known as zoom lens model, pioneered macro design of instruction, as opposed to designing shorter chunks of instruction (micro design). The trilogy of *Instructional Theories and Models* has been widely used as textbooks throughout the world in graduate programs of educational technology.^{(3) (4) (5)}

Looking back my graduate school days at Florida State University, his first volume was soon adopted as a textbook of an advanced course. Since then, I have been closely watching the works of Reigeluth. In June of 2005, I visited him at his office with a camera crew for an interview for *Human Informatics and e-Learning 2006*, a graduate course offered by Open University Japan⁽⁶⁾.

Prof. Reigeluth has never visited Japan, until May 26-31, 2011, as a transit from Korea to Taiwan for 6 days in Osaka. This presentation has been prepared in place of an invited keynote speech by Prof. Reigeluth himself, which didn't become reality due to the aftershock of the earthquake and precaution for radiation spillover.

2. The First Green Book and its effects

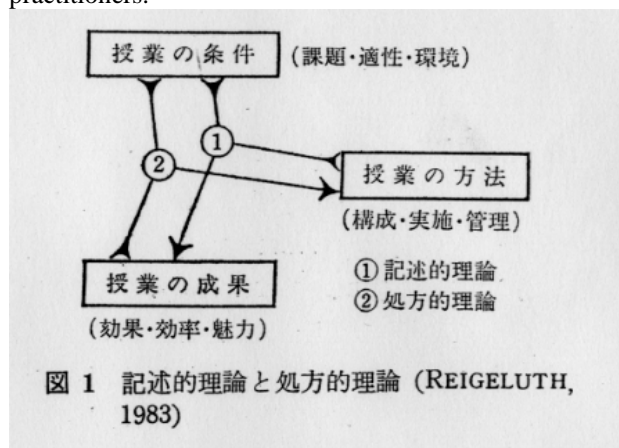
The trilogy of *Instructional Theories and Models* has been of great impact in the field of instructional design throughout the world. The first volume⁽³⁾, known as the first green book was published in 1987, introducing eight major theories of instructional design proposed in early 1980's. Reigeluth, as the editor, selected the eight theories that were promising as the foundations for the future advancement of the field, for comparison and evaluation.

Soon after its publication, it was adopted as a textbook of an advanced course at Florida State University. I still remember vividly that I was impressed by so many “other” theories existed beside Gagne's instructional theory. Gagne was the norm of Florida State at that time, who was considered to be the god father of the field of instructional design. The editor's notes were so extensive that made readers of the textbook appreciative in comparing similarities and differences among theories.

The First Green Book proposed many key concepts that had long lasting impacts in the research of instructional design. At least they had so strong impact on what I have been doing since then. They include the distinction of instructional design theories and models from models for developing instruction (as in ADDIE Model), the purposes of instruction being effectiveness, efficiency, and appeal (inclusion of the ARCS Model to represent the third purpose of instructional design), distinction of descriptive and prescriptive theory, and distinction of micro and macro theories⁽⁷⁾.

Figure 1 depicts a diagram to explain the differences of descriptive and prescriptive theories, in relation to the goals, methods, and preconditions of instruction⁽⁷⁾. Descriptive theories would try to explain what goals were met when a method was tried out with a set of preconditions. However, prescriptive theories would set the goal to be attained first, then try to create a better method, given a set of preconditions. It was claimed that theories and models should take a prescriptive approach

so that they would be of help for the decision making of practitioners.



In the interview of June 2005, Reigeluth reflected that the term “prescriptive” was used to show the opposite meaning of “descriptive,” but may not use the term any more. It is too rigid and deterministic to use the term “prescriptive” in modern time, thus the term “design theory” is more preferable. In fact the Second Green Book uses the term “Design-oriented Theory” (p. 7). No matter which term is used, it seems very important to be of benefit of educational practice when a decision is to be made. It is important to conduct experimental research in search of theory to depict how human learning takes place. It is also important to conduct a practical research in search of guiding decisions of practitioners so that they can attain predetermined goals of educational activities.

It is also significant that the First Green Book recaptured the “appeal” of instruction as one of the three goals of instructional design. It was based on the scheme proposed earlier in 1978 by Reigeluth and his mentor M. David Merrill (who proposed the First Principles of Instruction)⁽⁸⁾. The majority of effort in instructional design at that time focused on how to make the effectiveness of instruction higher, so motivation for learning often thought as a means of instruction, rather than the end goal of it. It is equally important to finish a period of instruction wanting to come back for the next opportunity (appealing instruction), if not more important than, finishing the instruction with good grade (effective instruction). It was this point of making learner motivation higher at the end, or not decreasing their motivation from what they brought into the instruction, to deliberately specify the appeal of instruction as the goal of instructional design.

Reigeluth emphasized the importance of appeal to gain more attention in the research of instructional design, thus adopted the ARCS Model, which was not yet at the final form (i.e., ARCS was not used as the acronym that represent the Model). I came to know the model and the works of John Keller by reading this chapter in the First Green Book. After that, by Keller’s coming to Florida State University as the big opportunity, I have been working very closely with Prof. Keller and his ARCS Model⁽⁹⁾. The second First Principles that I

introduced in the review paper this time, Keller’s First Principles of Learner Motivation, built on his long lasting research in this effort, which was introduced to a wider audience through the First Green Book.

3. Constructivist Psychology and the Second Volume

The Second Volume of the Green Book was published in 1999⁽⁴⁾. Reigeluth was approached to publish a revised edition of the first Green Book, but decided to publish the Second Volume of the Green Book, instead of the second version of the first Volume. It was he saw more value in publishing a book with wider varieties of newer theories from the perspectives of constructivist psychology, than revisions of old theories. The second Green Book became a large book with twenty-three chapters.

The second Green Book was edited by capturing major shifts of organization from industrialized society to postindustrial one, as shown in Table 1. Instructional design theories in industrial society mainly dealt memories and procedural skills. Although their importance would be as important as was before, stronger demands are for higher order learning. Thus, the instructional theories of the 21st century should strive for meeting such changes in demands by making learning experiences made in response to the orders, and using information technology more extensively.

I wrote a review article for Vol. 22, No. 1 of the Journal, introducing the second Green Book⁽¹⁰⁾. In that article, I described how Component Display Theory, one of the eight theories in the first Green Book was expanded to become Instructional Transaction Theory in the second Volume. It was also introduced in detail the STAR Regacy Theory, stemming from the Jasper Project⁽¹¹⁾ at Vanderbilt University. The review article was concluded using the seven elements deemed for the instructional design theories in the next generation, proposed by Reigeluth.

表 1 工業社会と情報社会の組織間の主な違い

工業社会の組織	情報社会の組織
標準化	カスタム化
官僚組織	チームを基礎とした組織
中央集権的制御	責任に裏打ちされた自律
敵対関係	協同関係
独裁的な意思決定	共有された意思決定
服従（コンプライアンス）	イニシアチブ
画一性	多様性
一方方向コミュニケーション	ネットワークづくり
区画化	全体論
部品指向の	プロセス指向の
計画的な陳腐化	トータルな品質
C E O または上司が「王様」	顧客が「王様」

注：Reigeluth, 1999, p.17 を鈴木が訳した

Many of the theories included in the second Green Book were created by the researchers in the field, known as Learning Sciences nowadays. For example, it had learning community building theory by Allan Collins, STAR Legacy Model by Daniel Schwartz and John D. Bransford, and Goal-based Scenario (GBS) Theory by Roger C. Schank. Instructional design community was not interacting very much with learning sciences community at that time, to advance without knowing one another. However, it was Reigeluth who found many important advancement in practical research that should be included in *Instructional Design Theories and Models*. It was way before the time when *Educational Technology* made a special issue on dialogue between the two communities in 2004⁽¹⁰⁾. The special issue included four articles by researchers who knew both field very well, together with a total of nine reaction papers from both communities. Reigeluth was one of the writers of reaction papers from instructional systems community.

I was most influenced by Schank's GBS theory among many theories included in the second Green Book. I encountered with the work of Schank, who was one of the leading researchers in the field of learning sciences by reading the chapter in Green Book II, and conducted a thorough investigation of his work. During the trip to USA for the interviews in June 2005, I was lucky to visit his home in Florida, to meet him for the first time, and got stimulated so much with direct conversation with him. Later at my present institution, I obtained an opportunity to design online graduate program for e-learning specialist. With the financial support by MOE for good practice in graduate education, I worked together to redesign the program⁽¹²⁾ with one of Schank's former graduate students, Kemi Jona of Northwestern University, who had build with Schank himself the Story-centered Curriculum at Carnegie Mellon's West Campus. The third cohort has been graduated from our newly re-designed program, for which we have been conducting a design-based research to accumulate generalizable concepts, as well as shaping the quality of our own program. It has been an experimental effort guided by the direction of "Not integration by technology, but transformation by technology"⁽¹⁴⁾ learned from the interview with Reigeluth in 2005.

The theories included in Green Book II varied in many ways, but all influenced by constructivist psychology. It was the Green Book II that stimulated Merrill's First Principles of Instruction that proposes that there are commonalities across the varied theories. It has been having a major impact in the field, after its first appearance in 2002. I see continuity in Merrill's First Principles from Gagne's Nine Events of Instruction, but adding constructivistic features, such as showing an authentic task when informing learners of learning objectives. With the First Principles of Instruction as a guiding scheme, the last volume of Green Book III was born.

4. Maturity of Instructional Design and the Third Volume

The third volume of the Green Book was published in 2009⁽⁵⁾, with a subtitle "Building Common Knowledge Base." As the last volume in the trilogy⁽¹⁵⁾, it was co-edited by one of Reigeluth's former students, Car-Cellman of University of Pennsylvania, published with longer preparation time than it was planned. It was positioned to serve as an important basis for educational system in information age, by reorganizing instructional design theories and its related knowledge with common terminologies, in order to form the common ground for the future. It was limited in the second volume to introduce variety of theories of the time, one by one without integrating them, without any particular guidance of when to use which theories. The third volume, on the other hand, clearly aimed at proposing a common scheme to integrate what had been proposed in the field of instructional design⁽¹⁾.

Table 2 lists the table of contents of the Green Book III, with synopses of each chapter⁽¹⁶⁾. Reigeluth adopted Merrill's First Principles of Instruction as the common rule that can be applied to any situation (Chapter 3), while calling more specific rules as the situation specific principles. This concept is to propose more powerful knowledge base with grammatical scheme with approach, instructional elements, and sequencing techniques. Unit 2 introduced situation specific principles in more advanced areas, including direct instruction, discussion, experiential approach, problem-solving approach, and simulations. In Unit 3, various learning outcomes were addressed, including skill development, understanding, affective development, and integrative instruction. The domain specific principles were not introduced as a separate chapter for memorization, as it was regarded to be unsuitable for instruction in information age. It was proposed to make a flexible learning environment by combining variety of instructional elements considerably, derived from different value system, in order to fit the needs and educational goals. To accomplish that, common principles and situation specific principles should be used, according to Reigeluth.

Unit 4, the last unit in Green Book III, deals with tools to advance common knowledge base, including layer structure, domain theory, learning objects, and so on. Last chapter concludes with important characteristics of education in information age, inviting the researchers and practitioners for continuing discussion.

5. Concluding Remarks

This paper described what I have learned from the works of Reigeluth, in relation to what I have written in my review paper. It is now apparent, from my personal reflection, how much contributions the trilogy of Reigeluth's Green Books has served for the advancement of the field of instructional design.

The third First Principle, Parrish's Aesthetic Principles of Instructional Design was not touched upon in this presentation, since I have not found Parrish's work in the writings of Reigeluth. The interested readers should make reference to my review paper itself for the information of Parrish's work. I would like to ask Prof. Reigeluth what he thinks of Parrish's work when I will have a chance to do so.

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表2 「ID 理論とモデル」 第三巻の目次と概要

章	各章の概要
ユニット1. ID 理論を理解するためのフレームワーク	
1	ID 理論を理解する : ID 理論の構造と用語/ID 分野関係用語/関連分野/新パラダイムの必要性
2	インストラクションを理解する : インストラクションの構成要素 (英語の文法のように、価値・条件・方法を記述する。方法はアプローチ・構成要素・系列で記述する。)
3	Merrill の第一原理 (First Principles) : すべてのインストラクションに共通の原理
4	インストラクションの状況依存原理 (Situational Principles) : インストラクションの状況ごとに異なる原理。アプローチと学習成果ごとに異なる原理が適用される
ユニット2. 異なるアプローチのための理論	
5	直接教授法 (Direct approach) : 教師が学習全体をしっかりと管理し、学習した内容を定着させる目的でよく検討されたレッスンをを用いて行う授業方法
6	ディスカッションアプローチ (Discussion approach) : トピックの徹底的な調査、クリティカルシンキング、問題解決力などを養うためのアプローチ
7	経験的アプローチ (Experiential approach) : Kolb によって具体化された経験学習理論から派生した現実的な課題を与え学習者主体の学びを提供するアプローチ
8	問題解決型アプローチ (Problem-based approach) : 与えられた問題に取り組み、可能性のある解決法を考える
9	シミュレーションアプローチ (Simulation approach) : 流動的なシーケンスや状況が変化していく中で複数の複雑な行動で構成される統合的なスキルを培うアプローチ
ユニット3. 異なる学習成果のための理論	
10	スキル開発 (skill development outcomes) : ある特定のタスクと時間や量的・質的な条件を与え、実行する能力を養うためのインストラクション
11	理解力 (understanding outcomes) : 実行能力を育成するためのインストラクション
12	情意的発達 (Affective development outcomes) : 学習者の感情的知性 (emotional intelligence) を養うことを支援するインストラクション
13	総合的学習 (Integrated learning outcomes across domain) : 求心力のある主題に学習目標や活動、リソースそして評価を直接結び付けて学習能力を高めること
ユニット4. 共通知識基盤を作るためのツール	
14	ID 理論のアーキテクチャ : 内容・方略・メッセージ・制御・表象・メディア論理・データ管理の各階層 (レイヤー) に分けて、それをデザインツールとして利用する提案
15	学習者中心教育を可能にするためのドメイン理論 : 理論とデータをマッピングすることで学習をカスタマイズし、異なる対象者向けの学習経験を検討するためのツール
16	ID 理論と学習オブジェクト : 古いものと新しいものをうまく組み合わせながら、その時代に合ったインストラクションを提示できるツール
17	理論構築について : デザイン理論構築のフレームワークとしてデータ駆動・価値依拠・方法依拠・実践駆動型があり、グランデッドセオリー・D B R・形成的研究が応用可能
18	情報時代の教育のための ID 理論 : まとめ/ID の社会的役割、情報社会における教育の特徴、学習者中心主義