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IMPLEMENTING MERRILL'S FIRST PRINCIPLES OF INSTRUCTION: PRACTICE AND IDENTIFICATION

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Abstract

First Principles of Instruction (FPI), a result of David Merrill's systematic review of existing instructional models in search for universal principles that can be applied to all teaching, have been reported to positively correlate with instruction quality. This study aims to develop an instrument to identify the application of FPI in use, which may assist instructors in applying the Principles in their teaching, or researchers and instructional designers in assessing the quality of existing courses. To achieve this aim, a coding scheme, consisting of indicators of each FPI in use, was therefore created and tested in a specific blended learning course. Findings confirmed the reliability of the instrument and revealed interesting relationships between how FPI are applied in course materials and in actual classes.

Keywords: First Principles of Instruction, blended learning, instructional design.

INTRODUCTION

Considering 'instruction' as one essential condition for learning process of a human being to take place, instructional design scientists have proposed numerous theories and models aiming to optimize learning (Gagné, 1970; Reigeluth, 1983, 1999; Reigeluth, & Carr-Chellman, 2009). Systematically reviewing the major existing instructional models and theories, Merrill (2002, 2007, 2009), instead of focusing on which one is the most effective and preferable, seeks the core commonalities among this diversity and synthesizes them into what he calls the First Principles of Instruction (FPI). Since the inception of FPI, research has shown that instruction which incorporates these principles is more efficient, effective and engaging than instruction that fails to do so (see for example Frick, Chadha, Wang, Watson, & Green, 2009; Collis & Margaryan, 2005; Thomson, 2002). Cropper, Bently and Schroder (2009) even hypothesized that Merrill's FPI may represent high-quality instruction and should be included in the criteria for determining course quality. This indicates the significance of applying FPI in a learning environment and also the development of an instrument that allows for identifying FPI in practice, which can then be used as one possible set of criteria for measuring instruction quality. However, no research has been done so far in offering a comprehensive framework that may assist such application and identification; and this study is an attempt to fill this gap.

In the present study, we first constructed a coding scheme which includes all possible indicators of FPI in use, which enable researchers to recognize the instances of application of FPI in both teaching

materials and classroom instruction and to code them impartially. To test the reliability of the coding scheme, we then utilized the scheme to analyse the instruction unit of a blended learning course.

Our study is believed to advance our insights into the general FPI and guide teachers of any disciplines on how these principles should be implemented in practice. For course developers and researchers, the study offers an instrument for evaluating the extent to which FPI are applied in a course; or in other words, one possible framework to assess course quality.

'Instruction' is described by Gagné (1970,28) as an action of 'arranging the conditions of learning that are external to the learner'. The external conditions are any events outside and independent of learners that may activate and support the internal process of learning, and can be as simple as an opportunity for a language learner to repeat a new word that have just been presented to them by the teacher. In terms of forms, instruction can be 'pre-designed', as in the case of the programmed instruction of an online learning course, or simply a well-designed workbook or textbook; or more flexible as in the case of immediate, unplanned communication made by a teacher to the learners during class time (Gagné, 1970).

Summarising this description, Gagné and Briggs (1979) define 'instruction' as all the intended events that can affect the learning of human beings. In this sense, the use of picture, a text, a combination of objects, or any other means that may assist and bring about learning can be considered 'instruction'.

Gage (2009) distinguishes instruction from 'teaching' by emphasizing that the former has larger connotation than the later one. According to Gage (2009), because teaching is an instructional action performed by a person (i.e. a teacher), it should be understood as only a particular form of instruction. Instruction, on the other hand, can be available to learners even in the absence of a teacher and should not be understood as being restricted to only face-to-face interaction between learners and teacher.

While these explanations emphasize what the act of instruction may look like, Reigeluth's and Carr-Chellman's (2009) focuses on what instruction does for learners, i.e. the function of instruction in the process of learning. According to them, instruction is whatever is done to learners in order to help them construct new skills and knowledge. In other words, instruction is to foster construction; and any so-called 'instruction' that fails to do so cannot be considered as such. Therefore, they define 'instruction as anything that is done purposely to facilitate learning' (Reigeluth & Carr-Chellman, 2009).

In Reigeluth (1983), principles of instruction are one basic component of the body of knowledge that the instructional science seeks to construct, exist naturally, showing the relationships between actions or changes and can be discovered. Usually by describing the causes and effects, principles show how one change or action is related to another change or action (Reigeluth, 1983).

Reigeluth (1983) also categorizes principles into two main groups. Correlation principles describe a relationship of two actions without stating which action is the cause of the other (e.g. volume is related to pressure), while causal principles take one step further: stating which action is the cause of the other (a decrease in volume causes an increase in pressure). The relationship described in a principle can be deterministic, i.e. the cause usually brings about the stated effect; or it can be probabilistic, i.e. the cause often or sometimes brings about the stated effect. Therefore, examples of principles range from a pure projection or hypothesis without empirical evidence for its validity, to a well-established scientific law (Reigeluth, 1983).

In Merrill (2009), a principle of instruction is defined as 'a relationship that is always true under appropriate conditions regardless of the methods or models which implement this principle' (p.43). The 'always true' part implies the universality, whereas the 'under appropriate conditions' part implies

situationality. Principles are not in and of themselves a model or method of instruction, but rather relationships that may underlie any model or method of instruction. A principle of instruction can be implemented in a variety of ways by different models and methods of instruction (Merrill, 2009).

Motivated by the argument that despite the diversity of existing instructional models and theories, the underlying principles of all these are in fact fundamentally the same, David Merrill had systematically reviewed various instructional design theories, models, research and in his final work in the series 'the First Principles of Instruction' published in 2002, 2007, 2009, he prescribed the following ones:

- The **demonstration** principle: Learning is promoted when learners observe a demonstration.
- The **application** principle: Learning is promoted when learners apply the new knowledge.
- The **task-centered** principle: Learning is promoted when learners engage in a task-centered instructional strategy.
- The **activation** principle: Learning is promoted when learners activate relevant prior knowledge or experience.
- The **integration** principle: Learning is promoted when learners integrate their new knowledge into their everyday world (Merrill, 2009; 44).

For a 'principle' to be considered as such, it must satisfy the following criteria:

- being included in most of the instructional design models and theories that the author had reviewed.
- promoting efficient, effective, or engaging learning from a given program.
- being supported by empirical research.
- being general and universal so that it can be applied to all learning and teaching regardless of programs or practices.
- being design oriented, i.e. the principles offer guidance on how the instruction should be designed to promote learning rather than describing what learners do on their own while learning (Merrill, 2002a, 2007, 2009).

When referred to two categories of principles described by Reigeluth (1983) in the previous section, this list belongs to the group of causal principles as it implies a better learning outcome ('learning is promoted') as a result of incorporating a certain instructional strategy (e.g. 'demonstration').

This prescription is, nevertheless, not merely a collection of separate 'blueprints' that might be used in designing effective instruction. Rather, the principles are interrelated and together form a four-phase cycle of effective instruction needed for teaching any whole tasks as can be seen in Figure 1.

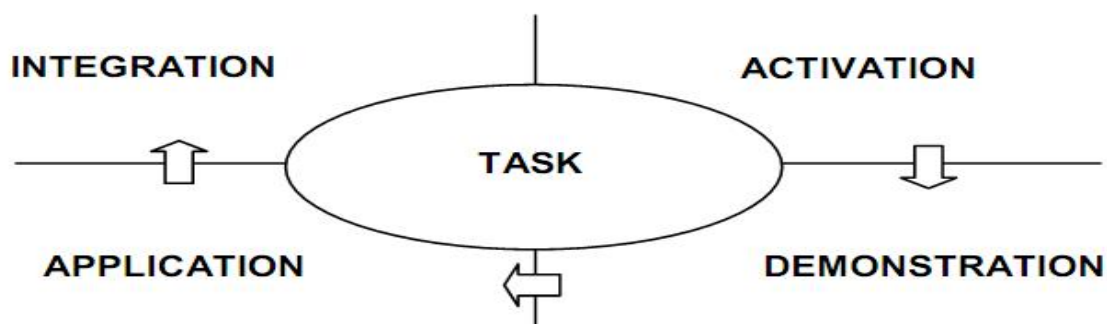


Figure 1: The four-phase cycle of instruction (Merrill, 2009: 57)

In this cycle, Activation phase comes first when learners are not only directed to recall relevant prior knowledge or experience, but also provided with an appropriate organizing structure which may then facilitate their acquisition of new information. The next phase, Demonstration, guides the learner to understand new knowledge through demonstrating new information to be learned rather than merely telling it. This phase is well done when demonstrations are consistent with the type of information



being taught (e.g. concepts should be demonstrated via examples while process is best demonstrated when being visualized) and relevant media are used (e.g. words should be placed near corresponding illustrating graphics). After Demonstration, instruction should direct learners to apply newly-acquire knowledge and skills and further enhance the learners' application by providing coaching and feedback. The cycle is finally completed when the learners are asked to either publicly demonstrate what they have just learn, to reflect, to discuss, to defend or to invent personal ways this new knowledge can be used. Effective instruction requires the incorporation of all these four activities, namely activation, demonstration, application and integration in teaching a whole learning task (Merrill, 2002a, 2007, 2009).

Because of all the above features, the FPI are supposed to form the core basis for designing all learning environments and to be a starting point on which future instructional design and models can be built (Merrill, 2002a). In fact, many authors in the field have supported the relevance and validity of those principles in the context of their research.

In a major study implemented by a large corporation, Merrill's FPI was mentioned as the 'corner stone of the current learner-centric instructional design movement and an integration of the best instructional models' (Thompson, 2002;2). Following this, a blended learning model that adheres to what Merrill recommended was constructed and implemented for a group of learners in the corporation. The comparison between pre-test and post-test results of this group of learners with those of another trained with the traditional instructional product indicated a higher efficiency and effectiveness level of the new model (Thompson, 2002).

In another research on workplace oriented learning, Collis and Margaryan (2005) used Merrill's FPI as the foundation for designing and evaluating 68 learning courses. Results show that FPI is an effective instrument in giving an overview of course quality and recommend it be utilised as an evaluation framework for quality control. It can be inferred from this conclusion that the application of Merrill's FPI is linked to a certain extent to instruction quality.

In higher education, the FPI are also used to construct scales for course evaluation (Frick, Chadha, Watson, Wang, & Green, 2008), to redesign a course (Francom, Wolfersberger, & Merrill, 2009; Francom, et. al., 2009), or to develop a curriculum design model (Huang, Ma, & Zhang, 2008). Noticeably, Cropper, Bently and Schroder (2009) implemented an empirical research on the application of the FPI in seven high-quality courses to evaluate the validity of what they called the 'five-star system' (p.1). From the results, the authors hypothesized that the use of the principles is connected to high-quality instruction, and that Merrill's FPI should be counted into existing criteria for determining course quality. The hypothesis was then partly confirmed in an empirical research implemented by Frick, Chadha, Watson, Wang and Green (2009). Analyzing responses of 156 students to a survey about (1) how FPI are implemented in their courses; (2) how they would rate their Academic learning time, (3) their satisfaction with courses and instructors (4) their learning progress and overall course quality, Frick and colleagues (2009) found strong and positive relationships between these four variables. Although such descriptive-correlational findings do not warrant a direct causal inference that FPI results in student progress or course quality, they still suggest that the implementation of these principles in their courses provides instructors one possible way to promote student learning and course quality.

The literature has, in short, supported the two main features of the FPI; that is, they correlate instruction quality, and they can be applied to all learning and teaching, regardless of it being a workplace or a formal academic classroom. The potential of FPI being one set of criteria for measuring instruction quality has therefore been firmly established. In other words, the question of 'how useful' Merrill's FPI has been positively addressed.

An equally important question that remains unanswered is, however, a practical one of 'how to'. How can course designers apply these principles in designing the learning materials? How can teachers

actually 'perform' these principles in their classroom practice? How can educational authorities and researchers can use them as course quality measurement tool? The current study, which aims to construct a framework or an instrument that allows for the identification of Merrill's FPI in use, is considered a timely and necessary response to this gap. Testing the instrument in a particular course, namely English Discoveries Online (EDO) – New Advanced 3 run at Hanoi University, Vietnam for its first year students, we sought answers to two research questions:

- (1) Which Merrill's First Principles of Instruction were incorporated in a blended learning course in Hanoi University, Vietnam?
- (2) How are the First Principles being implemented in this blended learning course?

METHOD

Constructing an instrument to identify the application of Merrill's FPI

In order to achieve the major aim of the research and answer the above questions, we first constructed a coding scheme that consists of indicators that allows us to identify the application of each and every Principle in practice. An indicator of a principle in use is agreed to be an instructional event, which can be found in teacher's communication and arrangements with students in classroom or in learning materials, and which reveals the application of that principle. All possible indicators of a principle should be specific and transparent enough to be 'seen' or observed in practice. They should, at the same time, be general enough in order not to exclude any instances in practice that may reveal the application of that principle. A coding scheme consisting of all such indicators will then be able to allow a researcher to recognize the application of Merrill's FPI and code them impartially.

The construction of the coding scheme was, however, not simple. Problems arose right at the process of studying Merrill's three major works on FPI because many general rules and guidelines instead of indicators as such were found. For example, the Activation principle in Merrill (2009) includes two general guidelines that learners should be directed to 'recall, describe or demonstrate relevant prior knowledge and experience' and 'recall or acquire a structure for organizing the new knowledge' (p.56). As there are various ways these can be done in practice, such general guidelines cannot be indicators of the Activation principle. It was decided that the researchers further review the literature Merrill (2002a, 2007, 2009) had based on to devise each Principle. For example, in search for more specific indicators of the Demonstration principle, the work of Gagné (1985), van Merriënboer (1997), Andre (1997), Merrill (1994), Clark and Blake (1997), which were referred to in Merrill (2002a,b); of Clark and Mayer (2003), which were quoted in Merrill (2007) were examined. In addition, extra sources outside Merrill's reference list but discussing Merrill's FPI such as Frick et al. (2008) were also considered.

However, what was found in such literature was no less problematic. Some works offer the very same general rules and guidelines as in Merrill's (2002a, 2007, 2009). Others give 'indicators' of the Principles at different levels of abstraction, i.e. one indicator may be included in another one. For example, Clark and Blake (1997) suggested instructors 'introduce objectives at the beginning of a lesson' for Activation, which can actually be included in what Andre (1997) referred to as 'presenting adjunct aids prior to instruction of new information'. In addition, some instructional activities are mentioned as important in one principle, but turn out to be unqualified to be an indicator for that principle. For instance, Mayer (1992, 2001, 2003) and Clark and Mayer (2003) all emphasize the significance of using appropriate multimedia in demonstration; yet the use of multimedia, although rather easily observed in practice, does not necessarily mean some information is being demonstrated, and thus cannot be an indicator for the Demonstration principle.

In light of these challenges, we finally decided to follow a bottom up approach to constructing the most appropriate indicators of each principle. That is, a list of all instructional events and features mentioned in the literature as related to the FPI was firstly compiled. An instructional event subsequently selected from that list to be an 'indicator' of a principle must ensure that principle is being applied. In other words, whenever a teacher performs an instructional activity or a piece of

teaching materials contains a text identified and coded under an indicator of the Demonstration principle for example, the teacher or the materials must be demonstrating something to students. Similarly, 'giving relevant tasks students to do' is selected as an indicator for the Application principle because it satisfies all the conditions for students' application of the newly-acquired knowledge to happen: students are provided with a relevant practice, and they have to 'do' it. By contrast, feedback alone from a teacher is not an indicator for the Application principle because according to Merrill (2009), it only enhances students' application process. Feedback alone does not mean that students will apply the knowledge or skill they have just learned. Indicators of other principles are formed on the same bases. As a result of this, all instructional events that do not carry all conditions for the implementation of a related principle (such as 'using appropriate media') were eliminated. Those with the same function were grouped together and generalized into one indicator. For example, because 'giving examples' and 'giving non-examples' both aim at demonstrating a concept, they were grouped into one indicator for the Demonstration principle. Those including one another were also grouped to make an indicator named after the most general instructional event. For example, 'presenting adjunct aids prior to the instruction of new information' and 'introducing objectives at the beginning of a lesson' were grouped into one indicator named after the former because 'objectives' is one example of 'adjunct aids'.

A comprehensive list of indicators was then put into a complete coding scheme as presented in table 1. As can be seen from the table, each indicator was given a 'code', for example, 'Giving examples and non-examples for concepts' for the Demonstration principle was given the code '1a'. Following each indicator in the coding scheme, an exemplary instructional event that can be coded under that indicator is provided. When a new concept is introduced in the indicator (e.g. 'non-example' in the Demonstration indicator 1a. 'Giving examples and non-examples for concepts'), further clarification on the new concept is found under 'Note (where necessary)' column. References of the original literature in which the indicators or examples are found are presented in the last column.

Table 1: Indicators of Merrill's First Principles of Instruction

Principles	Indicators	Note (where necessary)	Examples	Reference
Demonstration principle refers to a learning phase when the instruction demonstrates what is to be learned rather than merely telling information about what is to be learned, namely 'show me what to do' rather than 'tell me what to learn' (Merrill, 2002a).	1a. Giving examples and non-examples for concepts	Non-examples of a concept are cases where the concept does not apply or learners may mistakenly think it is applied	'Gold fish' is an example and 'whale' is a non-example of fish.	Clark & Blake, 1997; Merrill, 1994; Clark, 2003; Andre, 1997
	1b. Giving counter-examples	Using an opposite concept to explain the new concept	Using 'deforestation' to explain 'forestation' or vice versa.	Frick et al., 2008
	1c. Modeling a procedure (or giving worked examples)		showing a complete step-by-step solution to a problem	Clark & Blake, 1997; Clark, 2003; van Merriënboer, 1997; Jonassen, 1999
	1d. providing visualization for a process		Showing a picture illustrating the major events in the evolution process of human beings	Clark & Blake, 1997; Clark, 2003
	1e. describing similar cases to the new information to be learned		When teaching about immigration in Europe, teachers refer to that issue in the U.S.	Schank, Berman, & Macperson, 1999
Activation principle refers to the provision of opportunities for students to activate relevant cognitive structures (Merrill, 2009)	2a. Reviewing relevant previous learning		Teacher briefly mention the content of the old lesson that is needed to understand the new lesson.	Rosenshine, 1997
	2b. Presenting prerequisite skills and knowledge before teaching new information		Reminding students that they will need background on statistics to study 'Education measurement' course.	Rosenshine, 1997
	2c. Associate the new lesson with		In teaching how to pronounce the sound /f/ in English, teacher	Andre, 1997

	ideas studied earlier		compares it to the sound /v/ studied earlier.	
	2d. Introducing motivational themes		Before teaching a reading comprehension lesson with a text on travelling, teacher asks students to describe the place they wish to visit the most the in the world.	Andre, 1997
	2e. Using analogies	Using a familiar/known concepts/process/procedures to explain a new one.	In teaching how to pronounce the sound /b/ in English to Vietnamese students, teacher refers to the Vietnamese sound /b/ which is pronounced in the same way as the English one.	Clark & Blake, 1997, Gardner, 1999
	2f. Asking students to be engaged in an activity related to the information to be learned		Role play before introducing the new information	Andre, 1997
	2g. Presenting adjunct aids prior to instruction of new information.	Adjunct aids with the function of activation include objectives, overview, introduction, table of content, outlines, pre-questions, title, heading and sub-title, diagrams, images, pretest.	In student's textbook, a picture illustrating the theme of a unit is placed at the beginning of the unit.	Andre, 1997 Clark & Blake, 1997
Task-centered principle refers to instructional events that engage learners in a task-centered instructional strategy (Merrill, 2009)	3a. Providing authentic tasks	Authentic tasks are real-world tasks that require learners to apply knowledge from more than one subject areas.	Swimming, writing a research proposal.	van Merriënboer 1997
	3b. Giving a new task that requires students to apply some of the same knowledge and skills used in the previous one(s)		Teaching subtraction problems with two-digit numbers after the lesson on subtraction problems with single digit numbers.	Francom et al., 2009
	3c. In the context of teaching an authentic task, task components are taught in small steps with practice after each step.	Practice provided for each task component (e.g. practice writing an introduction paragraph) is not necessarily authentic.	Teaching how to write an essay is divided into smaller parts of writing introduction paragraphs, body and conclusion with practice right after each part.	Merrill, 2002b; Rosenshine, 1997.
Application principle refers to the instructional phase that provides opportunities for learners to apply the newly-acquired knowledge and skills (Merrill, 2009) Application does not merely mean remembering information but also being able to use to complete a complete a specific task. (Merrill, 2007)	4a. Giving relevant tasks for students to do	Tasks given should be consistent with the objectives of the lesson and different from the one used for demonstration	Asking learners to classify new examples in teaching 'kinds-of' knowledge; carry out the procedure in new situations in teaching 'how-to' knowledge in forms of exercises, tests, homework, assignments, etc...	Gagné, 1965, 1985; Merrill, 1994, 1997; Hilgenheger, 1993; Andre, 1997
	4b. Giving appropriate coaching and feedback during students' performance of relevant tasks	Coaching should be gradually withdrawn for each subsequent task. Feedback should be both corrective and on the quality of learners' performance.	Teachers provide models of appropriate response or procedural prompts during initial practice.	Burton & Brown, 1979, Collins, Brown & Newman, 1989; Clark, 2003; Andre, 1997; Marzano, Pickering & Pollock, 2001.
Integration principle Refers to the instructional phase in which students are encouraged to integrate (transfer) the newly acquired	5.a. Requesting students to publicly demonstrate their newly acquired knowledge or skill	Learners have the chance to reflect on, discuss, defend, or explain their thinking on their new knowledge with others.	students are asked to compare and discuss their solution to a problem with each other	Merrill, 2002a, 2002b; Schwartz, Lin, Brophy & Bransford, 1999; Gardner, 1999; Nelson, 1999

knowledge or skills into everyday life. (Merrill, 2009)	5.b. Inducing student to use the new knowledge or skills in their personal ways	Learners have the chance to create, invent and explore new ways of using the new knowledge and skills that is suitable to their own experience.	After teaching students how to type, teachers ask them to practice typing a document that they have to or tend to create most often in their daily life.	Mc Cathy, 1996
	5c. Guiding students to identify learning gains		Teachers ask students to tell how they can apply the newly acquired knowledge or skills in their own life.	Nelson, 1999

Selecting a course to analyse

EDO – New Advanced 3 is a blended learning course that Hanoi University (HANU), Vietnam has incorporated into the intensive English language training program for its first - year students at the Foundation Studies Department (FSD). The course was chosen as the context to test the coding scheme because one of us was a HANU lecturer and therefore could easily obtain permission to access the course materials and to observe running classes.

Throughout the course, students in group of 20-26 study 15 units covering a wide range of English language knowledge and skills (Listening, Reading, Writing, Speaking, Vocabulary, Grammar, and Web literacy) over 10 study weeks with one 90-minute class meeting and about two hours of online tutorial and self-study in each week. Although the syllabus outlines the content to be covered in each week, the teachers have complete freedom to choose what to teach in each lesson based on the particular group of students (FSD, 2012). Offered in blended learning format, which combines both face-to-face and computer-mediated instruction, EDO- Advanced 3 aims to create a flexible learning environment for English language learners (Edusoft, 2012) in general, and to significantly reduce class time for first-year students at FSD in particular (FSD, 2012).

The course guidelines for teachers clearly indicate that the blended format, the course materials, or course structure are supposed to effectively facilitate students' English language learning in an interactive and motivating learning environment (Edusoft, 2007a). As a result of this underlying purpose, sample lesson plans, regardless of lesson content, consistently pronounce an essence of students' prior knowledge activation, demonstration, task-centred, application (Edusoft, 2007b). It is unclear, however, whether and how these 'First Principles of Instruction' are actually incorporated in the course materials and the teaching practice of EDO instructors to promote student learning as valued in the course guidelines.

Data for the study

The first sample of data for analysis is the course materials consisting of 15 units, which can be accessed online with a username and password (at <http://edo.hanu.vn>). The author also observed five lessons taught by five different teachers during week three (from Monday, April 9 to Friday, April 13 2012) of a running course at FSD. The transcripts of these five lessons are the other sample of data to be analyzed.

These samples were chosen because they represent the instructional unit of the course. While the course materials comprise the pre-designed form of instruction, teachers' performance in the five observed lessons demonstrates the immediate or interactive type. To discover whether and how Merrill's FPI is implemented in the course, analysis done on its instructional unit is relevant.

Procedure of data analysis

A qualitative frequency analysis was performed on the data collected. Specifically, utilising the coding scheme, the indicators of FPI application in every unit and lesson observed were identified, coded and counted. Each individual instructional event that matches the description of an indicator in the coding scheme was given a single code corresponding to that indicator.

Before the official coding of the whole data sample, testing of the reliability of the scheme was first done by two researchers selecting a short chapter of a textbook to code separately. To avoid future

problems in using the coding scheme, all possible confusion and disagreements were discussed and noted during the initial coding of the sample materials. When a common guideline is settled, two researchers performed a coding separately on the whole selected chapter. Trial coding results found by two coders were then checked by a calculation of Cohen's Kappa for inter-coders reliability to verify the accuracy of the coding scheme. Since the Kappa value computed was 1.00 ($p < .0001$), which shows a full match between the results of two separate coding of the same materials (Gwet, 2008), the scheme was considered as reliable and used to code the whole sample of data collected.

Finally, a quantitative analysis of the full coding was done on SPSS program. The frequency of occurrence of each indicator was calculated and recorded on each unit in the course materials and each lesson observed. Tests of significance were done when necessary to explore the relationship and the significance of difference between the application of FPI in the course materials and observed lessons.

RESULTS

Occurrence of First Principle indicators in the course materials

The results of the data analysis performed on the course materials are presented in Table 2 in the following page.

As can be seen from the table, 144 instances of application of Principles were found and coded after a review of the 15 units of the course materials. The majority of those instances fell under the principle of Application – which appeared up to 98 times (68%) – whereas those of Activation and Demonstration only occurred 24 times (16,7%) and 22 times (15,3%) respectively. Surprisingly, no instance of the remaining principles (task-centered, integration) was observed throughout the materials. All indicators coded are distributed quite proportionately among the 15 units of the course except for those of Demonstration which were concentrated within the Reading and Grammar units with 12 and 10 out of 22 times of occurrence successively.

When comparing the frequency of occurrence of different indicators of one principle, it is noticeable that all 22 indicators for Demonstration found are coded under 1a. The same pattern occurs with Activation when all 24 instances of applying this principle are coded under only one single indicator, 2g. The implementation of Application is, however, different in that 98 instances of this principle found in the materials are shared equally between two indicators, 4a. and 4b.

Table 2 also demonstrate that although the 15 units of the course materials vary in content, the degree of applying FPI throughout these units are quite consistent. All units implement Application and Activation Principle, and none of them reveals an application of Task-Centred and Integration. Any Principle found is coded under the same indicator for a very close number of times throughout 15 units. For example, all of them show a practice of Activation principle via indicator 2g with the frequencies of 1 or 2; Application principle is coded under both indicators 4a, 4b throughout 15 units with the frequencies of 1, 3, 4, or 5. This can be partly explained by the identical format of all 15 units in the course materials, which consists of three main parts: 'Explore' normally provides new information with headings and images followed by the new information (Reading and Grammar units add examples for some new concepts and skills to be learned); 'Practice' gives practice exercises for the new information given in Explore part with an extra function of giving feedback to students' performance; and finally, 'Test' assesses students' achievement after they have 'explored' and 'practiced'.

Table 2: Frequency of occurrence as regards FPI indicators in the course materials

Principles	Code	Reading				Listening					Speaking				Grammar		Total
		Unit 1	Unit 2	Unit 3	Unit 4	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 1	Unit 2	Unit 3	Unit 4	Review 1	Review 2	
Demonstration	1a	3	3	3	3	-	-	-	-	-	-	-	-	-	7	3	22

	1b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2f	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Activation	2g	1	1	1	1	2	2	2	2	2	2	2	2	1	1	24
	3a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	3b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Tasked-centred	3c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	4a	4	3	4	4	5	4	5	5	5	1	1	1	1	3	49
Application	4b	4	3	4	4	5	4	5	5	5	1	1	1	1	3	49
	5a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Integration	5c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		12	10	12	12	12	10	12	12	12	4	4	4	4	14	144

Occurrence of First Principle indicators during class observations

The application of FPI in 5 observed lessons are presented in table 3.

Table 3: Frequency of occurrence as regards to FPI indicators in five observed lessons

Principle	Code	lesson 1	lesson 2	lesson 3	lesson 4	lesson 5	Total	
Demonstration	1a	14	32	12	-	5	63	67
	1b	-	1	-	-	-	1	
	1c	1	1	-	-	-	2	
	1d	-	-	-	-	-	-	
	1e	1	-	-	-	-	1	
Activation	2a	-	-	1	-	-	1	33
	2b	-	-	-	-	-	-	
	2c	-	-	-	-	-	-	
	2d	5	1	1	-	-	7	
	2e	8	1	1	-	-	10	
	2f	-	-	-	1	-	1	
Tasked-centred	2g	4	5	-	4	1	14	5
	3a	-	3	1	-	-	4	
	3b	-	-	-	-	-	-	
Application	3c	-	1	-	-	-	1	50
	4a	6	6	4	6	4	26	
	4b	6	5	3	6	4	24	
	5a	-	-	3	1	1	5	
	5b	-	-	-	-	-	-	
Integration	5c	-	-	-	-	-	-	5
Total		45	56	26	18	15	160	

The most noticeable pattern in the table is the application of all principles, which is in contrast to the observation made on the course materials with only three Principles found. Among 160 total indicators of all Principles recorded, those of Demonstration comprised the largest part (41,9%), then come those of Application (31,3%) and Activation (20,6%). Indicators of Integration and Task-centered appeared the least frequently with only 5 times of occurrence. As such, Demonstration and Application were the most commonly used instructional strategies in all five lessons, which is, nevertheless, similar to the findings about the course materials.

When making a quick comparison across five lessons, we can easily see that the frequency of FPI occurrences varies considerably from lesson to lesson. Lesson 2 demonstrates the highest frequency of applying FPI with 56 indicators recorded. However, although the use of Demonstration in this lesson is the most prevalent (34 out of 67 times in total of all five lessons), the number of times Integration occur there is the lowest: 0 (while 0; 1; 1; 3 is respectively observed in the other four).

Occurrence of FPI in observed classes and the course materials: A comparison

The general pattern of occurrence of FPI indicators in the observed lessons are overall quite similar to that in the course materials. 1a, for example, is the most frequently observed indicator for Demonstration in both cases. Two indicators for Application (4a, 4b) also appear nearly the same number of times in total (26 and 24 respectively out of 50) as they do in the course materials (49 and 49 respectively). In addition, while 1a, 2g, 4a, 4b are the only indicators found in the course materials, they are the most frequently observed ones in actual lessons.

Hypothesizing a relationship between the frequency of occurrence of FPI indicators in the materials and that in the actual lessons, the author calculated Pearson correlation index for these two variables. The results showed a significant, moderate positive association between them, $r=0.660$, $p<.01$ (1 tailed).

DISCUSSION

Generally speaking, the instruction unit of EDO – New Advanced 3 demonstrated a use of Merrill's FPI though with wide variations in the application degree of different Principles. While only three Principles are found in the materials with the prevalence of Application, all five Principles were incorporated in the instruction teachers gave in five actual classes.

On the one hand, this indicates the presence of some appropriate external conditions for the learning of the course content to be promoted. On the other hand, the extent to which it can facilitate the learning process should yet be questioned. If relating the results to the four-phase cycle of effective instruction (Merrill, 2009) explained in the theoretical background, it can be easily seen that the instruction given in the course materials has not yet fulfilled a complete cycle. The way teachers in the course instructed students in class might be more efficient, effective and engaging.

Two further inferences can be made from such results. First, one may doubt the possibility at which the course materials alone can effectively facilitate learning as valued by the whole EDO program, especially in the absolute absence of the Task-centered and Integration principles. Secondly, the course must have otherwise put more emphasis on the role of teachers in instructing students in the study of the materials. The later inference seems to be better supported when referring to the four sample lesson plans enclosed in teachers' online recourse kit (Edusoft, 2007b). Though the content of the sample lessons vary, the four plans all suggest teachers implement a complete cycle of Activation-Demonstration-Application-Integration in teaching authentic tasks developed from the unit in each lesson (Edusoft, 2007b). The five lessons observed and analysed in the previous part actually demonstrated quite well this guideline.



Another important implication that can be drawn from the results is that instruction given by a teacher in class seems to be affected to a certain extent by the pre-designed instruction given in the materials he/she is using. In fact, the comparative degree of application of different principles in the course is quite the similar among different units in the learning materials, among five actual lessons as well as between the learning materials and the observed lessons. The calculation of Pearson correlation as mentioned in the previous part also positively supports this point.

Concerning the wide variance in the degree of applying FPI across five observed lessons, there may be four possible reasons. First, the variance may reflect the difference in the students' levels and study majors in each class. In fact, five groups of students in five lessons observed are enrolled in five different majors: accounting, international relation, tourism, banking and finance, and were admitted to HANU with different English language proficiency requirements. As students' levels and backgrounds are different as such, teachers might have delivered their lessons in different ways accordingly. Second, as five lessons were taught by five different teachers, the variety in preferred individual teaching styles and methods may be another cause. Third, the course objectives might be another culprit for such a wide variance in five teachers' instruction. While clearly-defined instructional objectives can be considered as importantly as a means for instructors to plan and select optimum instructional methods (Rothwell & Kazanas, 1998; Reigeluth & Carr-Chellman, 2009), the objectives of EDO-New Advanced 3, being for example 'to develop self-study skills' or 'to take responsibility for their own learning' (Edusoft, 2010) are far from being well-determined. The inconsistency in five teachers' performance across five observed lessons may be partly explained by those vaguely-defined learning goals. Last but not least, as teachers have complete freedom to choose what content and skills to focus on in each class meeting, and the five observed teaches were actually teaching different units, there instruction were therefore inconsistent in the degree of applying FPI. All this suggests 'learner', 'teachers' values', 'learning goals' and 'content' be considered as the situational variables that may affect the application of the FPI in a specific learning environment.

A final point warrants discussion. The results show the reliability and usability of the coding scheme we constructed. Despite some initial confusion as described in the methodology section, most instructional events in both the materials and the transcript of the observed lessons can be easily classified as indicators of the FPI, if appropriate, thanks to clear description and examples given in the coding scheme. There is, however, one concern left with the use of indicator 4a. 'Giving relevant tasks for students to do'. At one side, to avoid overestimating the application value of the drill-and-practice instructional strategy with its typical provision of many repetitive practice exercises, we have agreed that that all tasks of the same type aiming at practicing one single skill or piece of information (e.g. five gap-filling exercises to practice using English prepositions) are not coded independently but given one single code for all. This way of coding, on the other side, completely fails to show a difference between the code given to, for instance, 10 such exercises and the same code given to only 2 of these.

CONCLUSION AND SUGGESTIONS FOR FURTHER RESEARCH

Offering a comprehensive framework with well-defined instructional events that reflect application of Merrill's First Principles of Instruction in practice, this study is immediately relevant to instructors of any subjects who are seeking practical guidelines to implement FPI in their teaching, and to researchers and course designers who are planning to assess existing courses or develop instruction under FPI perspective. Notably, the coding scheme can be applied to all forms of instruction, i.e. both pre-designed instruction as in case of a printed student book, and immediate one as in a teacher's interaction with learners. In other words, it helps to decide 'any event that can affect the learning of a human being' (Gagné & Briggs, 1979) as to reveal the application of any of the FPI or not. Including description and exemplary example for each indicator of FPI, this instrument also allows researchers to do such job without having to interpret the intention of an instructor or an instructional designer in an analysed instructional event.



It is, however, important to emphasize that much empirical research is needed to examine the correlation between the extent to which FPI are implemented and course quality. The analytical framework is intended for only identifying the application of Merrill's First Principles in a learning environment; and the results cannot directly indicate the quality of the analysed course. Furthermore, items included in the coding scheme are limited to what is found in the literature reviewed. Because of the extensiveness of the instructional science's literature, this is surely another limitation of our study, which invites larger-scale literature review as well as empirical research which may add more FPI indicators to the existing coding scheme. In addition, the problematic indicator as described in the previous section is also open to change. Finally, a separate study could be possibly done to further investigate the influence of pre-designed instruction (e.g. textbook) on teacher's performance in class or verify teacher's role in implementing a pre-designed instructional unit.

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