

# Differentiated eLearning: The Possible Approaches

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***Abstract-*** In differentiated instruction (*aka* differentiated learning), the curriculum adjusts to fit individual learners or groups of learners, whether in the classroom or online. It is an approach to teaching that acknowledges people having multiple paths for learning and for making sense of ideas. Differentiated instruction has been popular in the schools in the last decade, and picked up many dedicated advocates, and eLearning fits right in because technology can make curriculum adjustments easy to do. This paper outlines some possible strategies or approaches for differentiation in eLearning, may also be referred to as *e-diff*.

***Keywords-*** content, differentiated instruction, differentiated learning, e-diff, process, product.

## I. INTRODUCTION

Differentiated instruction (or differentiated learning) involves providing students with different avenues to acquiring content; to processing, constructing, or making sense of ideas; and to developing teaching materials so that all students within a classroom can learn effectively, regardless of differences in ability.

Research indicates that many of the emotional or social difficulties gifted students experience disappear when their educational climates are adapted to their level and pace of learning." Differentiation in education can also include how a student

shows that they have mastery of a concept. This could be through a research paper, role play, podcast, diagram, poster, etc. The key is finding how your students learn and displays their learning that meets their specific needs.

By using differentiated instruction, educators can meet all individual student needs and help every student meet and exceed established standards (Levy, 2008). According to Tomlinson (as cited by Rebor, 2008), the perceived need for differentiated instruction lies in the fact that students vary in so many ways and student populations are becoming more academically diverse.

Differentiation usually includes one or more of the following areas:

### A. Content

- Is “what” students learn
- Includes curriculum topics or concepts
- Reflects state or national standards
- Presents essential facts and skills
- Differentiates by pre-assessing student skills and understandings, then matching learners with appropriate activities
- Provides students with choices in order to add depth to learning
- Provides students with additional resources that match their levels of understanding

## B. Process

- Is “how” students learn
- Refers to how students make sense or understand the information, ideas, and skills being studied
- Reflects student learning styles and preferences
- Varies the learning process depending upon how students learn

## C. Product

- Is the end result of student learning
- Tends to be tangible: reports, tests, brochures, speeches, skits
- Reflects student understanding
- Differentiates by providing challenge, variety, and choice

## What is Differentiation Instruction?

In this context when differentiation is discussed, it is not about product differentiation by learning delivery *location*, as in hybrid eLearning content compared to fully online courses and/or cyberschools (National Leadership Institute, 2005). Nor is it about differentiation in time, as in synchronous and asynchronous learning. Rather, in e-diff, one of three types of adjustment is usually involved (Hall, 2002; Reis et al., 1988; Sizer, 2001; Tomlinson, 2001; Tomlinson & Allan, 2000; Tomlinson & McTighe, 2006; Willis & Mann, 2000):

- 1. Differentiation of content** – Offering students the chance to start at different places in the curriculum and/or proceed at different paces.
- 2. Differentiation of learning style approach** – Emphasizing many modalities of learning style or learning preference, such as visual and auditory learners.
- 3. Differentiation of product** – Giving different assignments to different students, and turn in different work products.

## II. DIFFERENTIATION IN eLEARNING

Technology to make content change on the fly is quite simple online. It can be as straightforward as html coding and back-end databases. The challenge is not in the delivery technology itself, but in establishing good logic for differentiation — if we are going to differentiate, how do we decide who gets what? Here we organize the most common e-diff strategies, based on what type of decision-making process and evidence is used to establish the adjustment choices.

Approaches can also be combined, or blended, in eLearning products. Some of the possible general approaches are:

- “Diffuse” approaches to differentiation, in which students receive the same content but have multiple opportunities for learning and are provided with different approaches for making sense of ideas planfully “diffused” throughout the content.
- Self-directed approaches, in which students receive different content by a mechanism of self-selection built in the content. This introduces differentiation through student choice.
- Naive differentiation, in which the computer is determining the course of differentiation, not the user, no specific plan or overall strategy is in place in the eLearning content for why differentiation is happening, or what it is intended to mean in the learning context.
- Boolean differentiation, in which software uses types of Boolean logic, such as rule-based frameworks or decision trees, to determine how to adjust content for different students.
- Model-based differentiation, in which expert opinion is combined with a variety of data mining techniques to generate ideas for how content might be appropriately differentiated.

- Language based differentiation, in which the students from different cultural backgrounds and different language skills can be benefitted. This is based on the differentiation in the contents of materials to be delivered by language.

## **Differences in the Approaches**

**1. In diffuse differentiation**, there is no direct intention to assess or match the needs of individual users, or to customize content or feedback, as all students receive the same content. But enough variety and different sources of stimulation are provided to interest and engage diverse audiences. This is a very common approach to differentiated instruction in a traditional classroom teaching setting. The hope is that with enough variety provided, everyone's needs can be addressed.

**2. Self differentiation**, allows students to select their personal choices as they work their way through online content. This can consist of simply selecting the order of completion among a fixed menu of learning activities or modules, or can allow much more range of choice. The courseware design determines where choice points are. Self differentiation is also very common in online content.

**3. Naive differentiation**, comes about almost inadvertently in many eLearning products. It involves changing portions of content in a more random way, not based on the specific needs of individual students, but simply rotating content and graphics so that screens have different images, representations and so forth each time viewed. This might involve a randomizing factor or a shuffle function. Though diffuse and self-directed strategies can be quite consistent with improved learning objectives of differentiated instruction, it can be harder to make the case for naïve differentiation. Gains in motivation and engagement as learning displays change, for instance, are hard to argue for if the same student only sees one of the displays.

**4. Boolean differentiation**, uses assessment evidence to change the flow of content for different students. Boolean here simply describes logic that computers use to determine if a statement is true or false. Main boolean operators include “and,” “not” and “or.” Operators get used with a series of rules to describe what happens with the content as students make their responses. There are many distinctions among different rule-based methods, including various planning agents, bug bases and chaining algorithms. But the idea is that a set of rules have been devised, often by very carefully studying many students.

These rule-based boolean methods make up some of the oldest forms of e-diff. The simplest types look like a checklist of learning objectives. Students go down the list and complete the objectives. If they successfully complete 1 AND 2, they go onto 3, for instance. But 1 and NOT 2 and maybe the student is redirected to 2A, or given some additional feedback or other learning intervention that passing students don't get. Rule based methods can take much more elaborate forms, and have been in very fine-grained ways to describe the multitude of conceptions and misconceptions students hold in certain subject matter areas, and what to do about them.

**5. Model-based differentiation**, is actually a large family of approaches that will be grouped together here for the sake of discussion. Some of the approaches are among the newer e-diff forms and others have been around for some time. Most use some form of expert opinion, including from teachers and other subject matter experts, combined with data mining to generate ideas about how content might be differentiated. Common data mining techniques include a variety of regression and Gaussian statistical models, Bayesian networks, neural networks, item response models, and mixed method approaches that combine quantitative and qualitative data to make interpretive or generative predictions.

**6. Language-based differentiation**, in which the same contents are provided to the students in different possible languages of understanding. This strategy is more related to the content repositories where we need to have the contents in different languages, or use some technology which may assist to convert from one language to another.

On the plus side, data mining approaches can be faster and easier than deriving complex rule-based forms. However, the question often is which model to use, and why. Also crucial in the case of eLearning is whether the model really is doing an appropriate job of telling you something about students.

### III. CONCLUSION

Developers are building more differentiation into eLearning products, acknowledging that people have multiple paths for learning and for making sense of ideas. But differentiation via technology is complex. There are numerous approaches that have quite different implementations and results, as can be seen by the general strategies described here. As the field matures and developers explore more ways to differentiate online, it is important that non-disclosure agreements and other intellectual property issues don't shut down the conversation about what these products are doing, and how they are doing it. So,

sure, let's all be different — but let's find some common ground to talk about these important approaches to differentiation online.

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