Examining a False Dichotomy: The Role of Direct Instruction and Problem-Solving Approaches in Today's Classrooms

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Abstract

This paper has two purposes. First, it presents an argument for concerns about recent educational research that presents teachers with a choice between using lecture style presentations or problem-solving activities as instructional methodologies, with predictably different outcomes in students' learning success levels. Second, it summarizes related research that shows value in an alternative framework for examining a teacher's instructional choices. The argument is made for the need to clarify the elements involved in direct instruction and the value of conceptual models as support in this respect. Ongoing research into the value that teacher candidates see in the use of visual models to support their developing conceptual understanding of their instructional options is presented.

Keywords: direct instruction, problem-solving approaches, student achievement

Introduction

This paper is essentially a reaction to two articles recently presented to education. One article presents first hand research and the second makes a false dichotomy argument based on the first hand research. Both articles, although well written, could present teachers with the false premise that they should teach using either direct instruction, wrongly constructed in one article to be synonymous with "lecture-style presentation", or through problem-solving activities. This paper will show how that dichotomy is false and misdirects teachers and aspiring teacher candidates to think of the act of teaching within limits that fail to represent the complex interactions that must be part of effective instruction to influence student achievement.

In the article "Sage on the Stage" (Schwerdt & Wupperman, 2011), original research is presented to examine the kinds of teaching styles that are most effective. Effectiveness is defined and measured in terms of student achievement outcomes. The study examines whether student achievement is affected by the share of teaching time that is devoted to lecture-style presentations as distinct from problem-solving activities. This study looks at the differential effects of each approach to teaching on the same student. Through surveys of teachers, researchers asked what proportion of time was used for each of the following: lecture-style presentation, working on problems with the guidance of the teacher, or working on problems without teacher guidance. The study examined student achievement scores in Math and Science and related these scores to the time proportions reported by the respective teachers.

The study found that teachers spend from 18 to 20 percent of their instructional time providing lecture-style presentations. The same study found that teachers spend between 18 and 21 percent of instructional time with their students engaged in working on problems with the teacher's guidance, and a further 17 to 18 percent of the time on having students work on problems without guidance. Homework review, testing, classroom management and other activities accounted for the remaining 43 to 45 percent of available instructional time.

The study concludes that students score higher on standardized tests in the subject in which teachers spent more time on lecture-style presentations (Science =20%) than in the subject in which teachers spent more time (Math = 18%) on problem solving activities. No distinction is made in the data related to determining the differences between student achievement in contexts where problem-solving activities are supported by teacher guidance or instances where they are pursued independently by students.

Defining the Problem

There are three critical problems with the framework that guided this study and the interpretation of its results. First, researchers do not explain what lecture-style presentations include and do not include–the sequence of instructional actions a teacher might choose. As the article is called "Sage on a Stage", the reader is led to the conclusion that lecture-style presentations are given, and the student is a relatively passive recipient of the interaction between teacher and students. This conclusion seems invalid. Teacher input sessions, often referred to as modeling, include a much more dynamic interaction and exchange of ideas than is implied by the description "lecture-style presentations". Indeed it is difficult to think of many groups of Grade 8 students, who were the target age group of this study, sitting still for much "lecture" time that did not include the interactive modalities that more properly are characteristics of effective modeling, with its "show/tell/question" reflexive variants.

A second problem is that researchers do not identify what follows the lecture-style presentation, or modeling, portion of each lesson. If this part of a lesson consumes on average 18 to 20 percent of the instructional time and an average class lasts 45 to 60 minutes, something must take place during the remaining 37 to 48 minutes of the instructional time. Theoretically this should be supported practice and increasingly independent practice with whatever was taught in the lecture-style portion of the instructional time. The data for the Schwerdt & Wupperman study shows that supported study (consolidation) and independent study (application) were also examined, and coincidentally reported, in both the Math and Science data immediately after the lecture-style presentation data in the study's data pie graphs, implying a predictable time sequence. We will argue later in this paper that this sequence is and should be quite predictable.

A third problem is that this study identifies a wide range of instructional activities that consume almost half of the total instructional time without any indication of the intent or level of student-teacher interaction within the time used. Activities such as "listening to the teacher re-teach and clarify content" would seem to be part of modeling. "Reviewing homework" would seem to be an aspect of "working on problems with teacher guidance". "Taking tests or quizzes" is related to students demonstrating increasing independence with new learning so this would seem to be part of the application of new learning or, in the study language, "working on problems without guidance". "Other activities" which range between 3 and 10 percent of the use of instructional time, is a problematic usage in the study. It is vague and misleading. Strong teachers should be well aware of exactly what interruptions or "other activities" are allowed to consume up to 10% of their classroom time.

Analysis of this study discusses potential study biases. This includes the observation that teachers with different effectiveness levels may choose to use different teaching styles: in other words, the lecture-style presentation instead of the problem-solving style. This analysis of the teachers' intent and choices provides the central flawed premise of this study.

Theoretical Framework

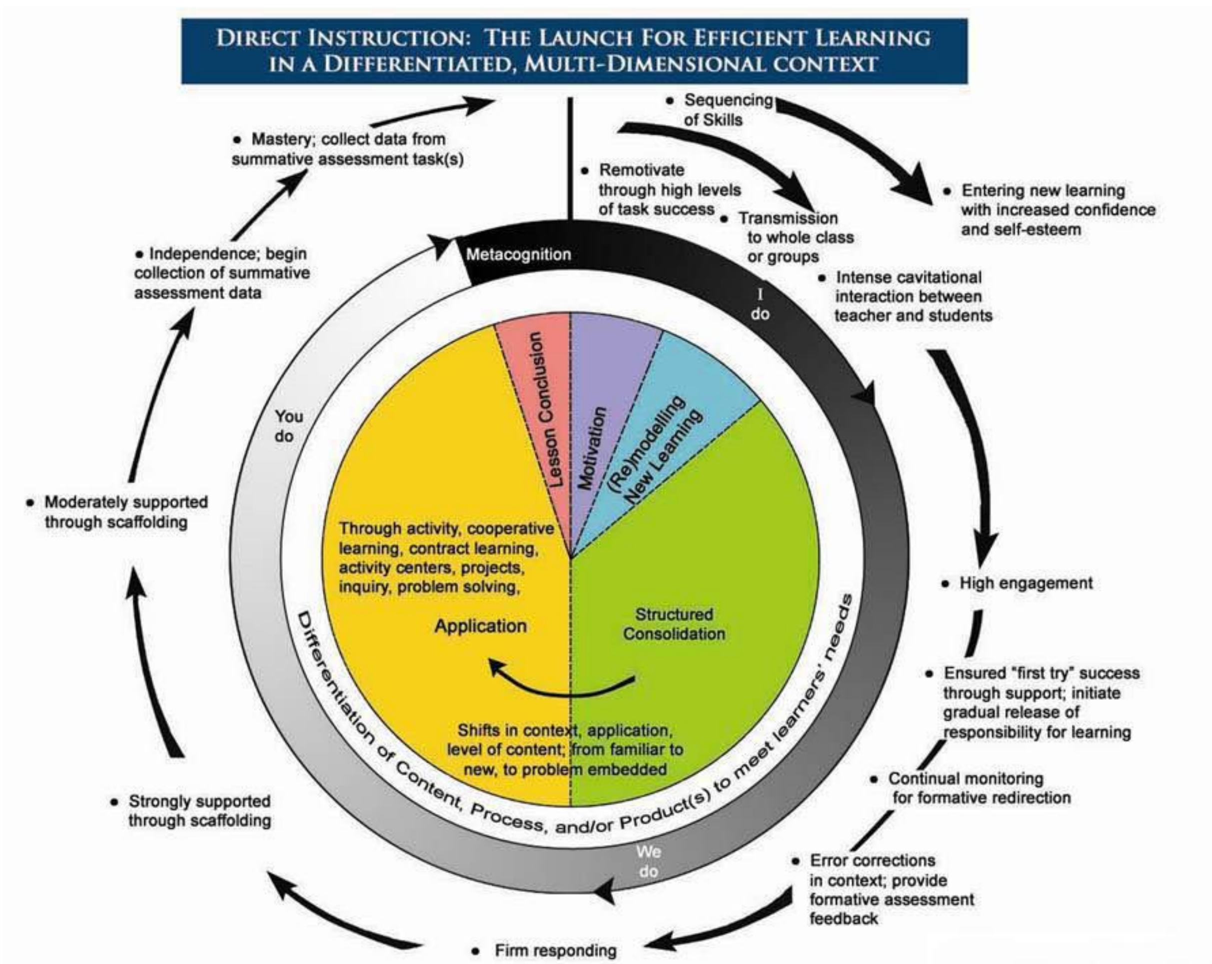
The study discussed above, and the subsequent analysis of the study results by Peterson (2011), each accept a false dichotomy as their initial premise. They establish an "either/or" argument when a "what/when" argument would be more theoretically sound. Strong teachers do not use one approach to teaching. They understand that as students learn new information, they gradually develop mastery of the information through practice with it, and gradually become increasingly independent in its use. Understanding this sequence would cause good teachers, those who arguably will have a stronger impact on student achievement, to model new learning (lecture-style presentation), followed by opportunities for guided (scaffolded) practice (consolidation punctuated with re-teaching as required), followed by opportunities for increasingly independent practice (application), as students move toward internalization of the new learning. Guided practice and independent practice both include "problem-solving" contexts that challenge students to use new learning in increasingly complex contexts. It is therefore, counterproductive to suggest "students learn more through direct instruction" (Peterson, 2011) as direct instruction does not exist on its own and is not synonymous with "lecture-style presentations" (Authors, 2010).

Schwerdt and Wuppermann (2011) state that learning by problem-solving may be "less efficient" and may lead to "incorrect or misleading information" being conveyed (p.1). The analysis is invalid if researchers understand the sequence of instructional actions that comprise the entire concept of direct instruction. Properly managed consolidation and application following effectively managed modeling of new learning would ensure that learners are on track, focused, and able to clarify misconceptions through timely re-teaching that was responsive to individual needs.

Schwerdt and Wuppermann also contextualize their study as a caution about a shift toward instruction based on problem solving and state that their study results show that "a shift to problem-solving instruction is more likely to adversely affect student learning than to improve it" (p. 2). This again is evidence of limited understanding of the elements that constitute direct instruction. This is not a dichotomy between two approaches. It is rather a misunderstanding of how modeling is a single part of the entire sequence of instructional behaviours that constitute direct instruction.

Figure 1 shows the sequence of instructional actions, in proportions roughly revealed by previous research (Authors, 2010) and interestingly, although unintentionally, also evidenced in the Schwerdt and Wupperman data. While the details of this model are the subject of a previous paper (Authors, 2010b), a simple explanation of the model follows to demonstrate the idea that the use of each strategy is a "what/when" decision, not the "either/or" choice framed in the Schwerdt and Wupperman study.

Figure 1 A Conceptual Framework for the Elements of Direct Instruction



At the outset of a lesson, the teacher motivates students' engagement by presenting a question, posing a problem, or activating prior knowledge. The teacher then models the new learning using a cavitational approach that includes dynamic interaction and exchange of ideas, including questioning for understanding, as ideas are presented. The modeling could include instruction in new knowledge (content), new skills for managing learning (process), or new ways that students can engage with new ideas to show their understanding (products). Modeling is followed immediately by opportunities for students to address the new learning through closely supported practice and re-teaching as needed. This forms a consolidation of new ideas. As students begin to demonstrate their internalization of the new content, processes, or products, the teacher adapts the application opportunities to present new contexts that are problem-embedded so that students can grapple with their new learning in ways that solidify the learning (application). Finally, teachers ensure that students are fully aware of what they already know by setting aside time for a lesson conclusion.

During the lesson conclusion teachers will assure that students know what they know as a result of having something modeled, consolidating it, and applying the new learning. This aspect of the lesson gives students metacognitive awareness.

Modeling is a component of direct instruction. The terms direct instruction and explicit instruction are essentially synonymous in current usage. Between the late 1960s and 1998, Siegfried Engelmann and colleagues (Engelmann 1992; Engelmann, 1998; Engelmann & Carnine, 1991) developed the concept of direct instruction to describe intentional instructional intervention. The original direct instruction conception was developed with two guiding principles. The first was that children can learn if they are taught. The second was that all teachers can teach effectively if they have effective programs and instructional techniques. Engelmann's (1998) approach used program designs that promoted the careful analysis of program content to ensure the following: that big ideas were taught; that ideas were built on clear communication by the careful wording of instruction and use of examples; that lessons used a scripted approach that identified what teachers should say and do and what they could expect from students' responses; that teachers planned careful sequencing of the skills being taught; and that instruction included a breakdown of the skills into activity sequences to teach over many lessons. The Engelmann (1998) approach to direct instruction promoted the organization of instruction using flexible skill groupings, the maximizing of instructional time to optimize the learner's focus, and the use of continuous assessment. While the scripted elements of the original direct instruction concept are uncommonly used and unwieldy, the other elements of the approach continue in current use.

The Concept of Gradual Release of Responsibility Evolves

In 1990, and later in 1997, Barak Rosenshine elaborated a model for direct instruction that used many of the elements of the Engelmann approach, without the limitations of scripted lessons. Rosenshine also called his model direct instruction and developed a list of characteristics to implement this approach. In both the Engelmann and Rosenshine conceptions of direct instruction, once students have had modeling from the teacher, the students need opportunities for guided practice, with support being removed gradually as students' independence in using the new learning increases. This is commonly referred to as the "gradual release of responsibility" (Wood, Bruner, & Ross, 1976; Pearson & Gallagher, 1983; Fisher & Frey, 2008).

It is clear from previous research that modeling is a major feature of direct instruction. It is equally clear that after modeling is completed, students need opportunities to work with new learning in a supportive learning environment and gradually have opportunities for increasing levels of independence. It is also clear, based on our analysis of lesson planning templates used in many pre-service teaching programs, that Faculties of Education try to teach this sequence of instructional actions to teacher candidates through lesson planning. Our experience with teaching lesson planning to teacher candidates promotes our belief that the linear nature of lesson planning templates makes it very challenging for these aspiring teachers to determine when they should model, when they should provide practice, how much practice is needed, and when they should start the "gradual release of responsibility". In response to that realization, Figure 1 is used to help teacher candidates understand the recursive nature of direct instruction and the gradual evolution of independence supported by teacher intervention that must accompany direct instruction.

A strong lesson will always have a modeling component (Fisher & Frey, 2008). What changes from lesson to lesson is whether the teacher is modeling what to do (content), how to do it (process), or how students can demonstrate that they can do it (products). Prior research (Authors, 2010) shows that the observation of teachers' use of modeling as a proportion of time spent in the classroom is roughly consistent across three studies and reflects the instances found by Schwerdt and Wupperman and earlier by Brewer and Goldhaber (1997).

So, how do false dichotomies such as that suggested by the Schwerdt and Wupperman study arise? Observers can certainly be forgiven for misinterpreting what they observe in a classroom if they start with the premise that teachers will use either direct instruction or some form of indirect instruction such as problem-solving approaches. After all, since acquiring new learning is complex, it may well consume large blocks of time that may spread over many classes in a subject area. If, for example, a Grade 8 student was learning how to identify independent variables and control dependent variables in an environmental study it is easy to image that this learning might take several classes. An observer might see (or a teacher respondent on a survey might report) that students listened for a twenty minute "lecture", then engaged in activities and problem-solving for the remaining 25 minutes of the first class and 40 minutes of the next class after a brief 5 minute reorientation to the topic.

On paper this looks like 65 minutes of problem-solving activity preceded by 25 minutes of "lecture-style presentation". However, following the model in Figure 1, such observations could be reframed to see the instructional choices as 25 minutes of modeling, followed by 20 minutes of consolidation, followed by 40 minutes of problem-embedded application and metacognitive awareness building. This alternative framing of the observations is typical of the research literature related to modeling in the apprenticeship context (Collins, Brown, & Holum, 1991; Healey, 1987: Marchand-Martella, Martella & Ausdemore, 2005).

Methodology

In a 2010 study, researchers were interested in two distinct but related questions. They asked, "How much time are teachers spending modeling?" and "What are they doing after they model new learning?" Three elementary teachers in the same school were asked to volunteer in this study that would require observation in each of their classrooms for five full school days each. The teachers needed to be unaware of the questions of the study because knowledge of the questions could influence their instructional choices. Participating teachers were recruited by the school principal on this basis. Participants represented one classroom from each elementary school division (primary, junior, and intermediate). Two researchers observed in the classrooms and recorded observations both quantitatively (timeframes) and qualitatively (nature of topics and activities) on a pre-established observation framework.

Following a total time of 4500 minutes of classroom observation, equivalent to five instructional days in each of the three classrooms, researchers met to discuss and report observations with a third researcher who interpreted the raw data. Following interpretation, all three researchers met for further discussion of the data and interpretation of the results. Figure 1 was both the theoretical framework for the observations in these classrooms and the adapted product that resulted from these observations.

Analysis of Results

In this study two major findings were evident. First, researchers found that teachers across all three divisions in this small sample were using modeling about the same amount of time in their classrooms, ranging from 18 to 24 percent of overall classroom time. This is comparable to the findings of both the previous study (Goldhaber & Brewer, 1997) and the subsequent study (Schwerdt & Wuppermann, 2011) and reflected the observation time in a much earlier study of modeling use in a language context (Durkin, 1979).

Our study also showed an unexpected result. Even very experienced and well regarded teachers seemed to be rushing the sequence of supported practice opportunities that should follow strong modeling in the classroom. Regardless of what was being modeled for students or in which school division, grade, or subject area, teachers often moved from modeling new learning (whether they modeled content, process, or products) to the immediate requirement for students to demonstrate their understanding by producing some form of product that would then be graded as evidence of their understanding of what was modeled. There was very little evidence that teachers recognized the need to provide extensive, heavily scaffolded practice, followed by problem-embedded practice in new contexts, before appropriate assessment tasks should be assigned. However, the theoretical model as presented in Figure 1 clearly reflects the wisdom of the research literature about modeling as an instructional approach (Collins, Brown, & Holum, 1991; Healey, 1987: Marchand-Martella, Martella & Ausdemore, 2005) and resonated with the practical instructional knowledge of the three researchers who designed the visual model.

Following this research study researchers met the school personnel including the teachers involved in the study, the school principal, and other interested teachers, to present the results of the study and the visual model (Figure 1). Teachers unanimously stated agreement with the ideas presented in the visual model as indicative of their understanding of how lessons should progress. They also expressed awareness of the stresses that external standardized assessments created for time constraints in their classrooms and identified this as one factor that may be causing them to overly limit the amount of practice time available for any new learning. This is an aspect of instructional practice that requires further study.

Discussion

Schwerdt and Wuppermann (2011) make the argument that "teacher quality matters enormously for student performance" (p.1). They equate teacher quality with the preponderance of decisions to use the more effective teaching strategy which their data shows to be "lecture-style presentations".

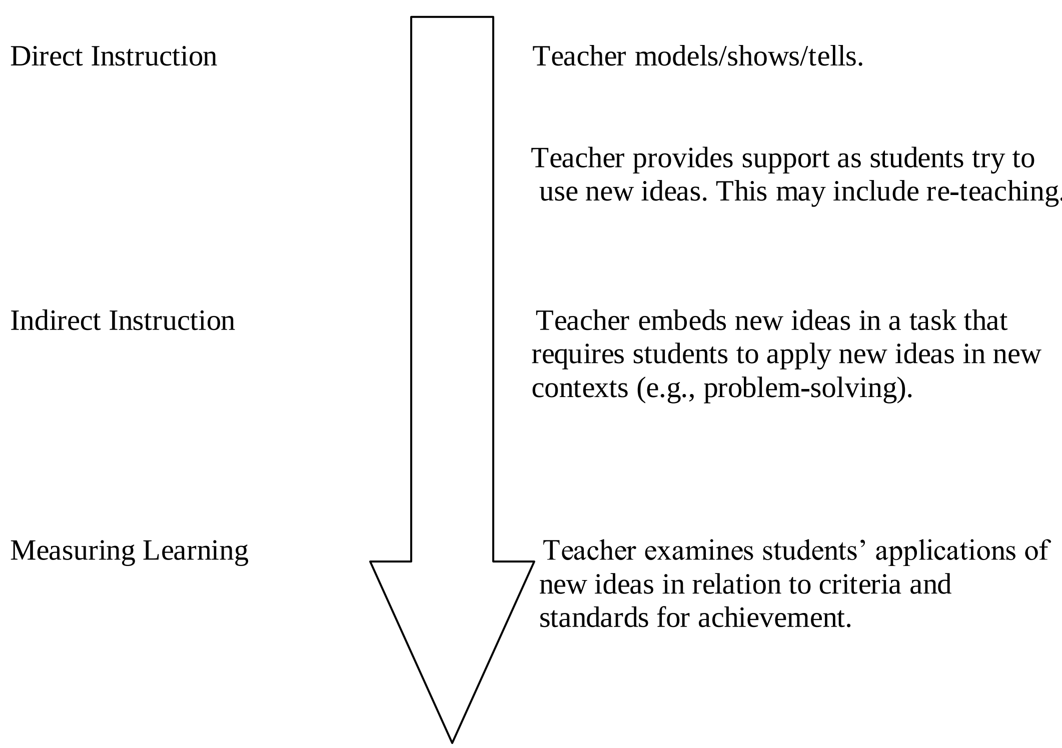
They present lecture-style presentations as the more viable instructional alternative when student performance is compared to teachers who use a larger proportion (20 % vs. 18%) of instructional time on problem-solving approaches to instruction. Their research sets up a false dichotomy between two instructional approaches that more properly belong as two elements of a complementary sequence of instructional actions.

Researchers (Authors, 2011) have found that teacher candidates see value in the visual model presented in Figure 1 to help them understand the sequence of instructional actions that should constitute their choices in both direct and indirect instruction. Teacher candidates indicate that this graphic helps them in understanding planning conceptions, understanding instructional conceptions, time management, supporting professional reflection, understanding the gradual release of responsibility, understanding variations of practice for consolidation and application, understanding relationships between successful practice and successful modeling before practice, understanding transitions within phases, using a framework to support continuous professional growth, knowing when to use various forms of assessment, helping teachers see opportunities for differentiation, developing students' metacognitive awareness, celebrating evidence of learning and readiness to apply, and understanding that students' success within any phase of instruction influences potential for success in the next phase. This research also showed much stronger inclinations of teacher candidates to reflect on their own instructional choices and their personal professional growth than on their students' learning, indicating that factors other than concern for students' learning may have a strong influence on teachers' instructional choices (e.g., immediate concern for assessment of their teaching, number of lessons they must plan).

We argue that the Schwerdt and Wuppermann research is based on a false dichotomy between two approaches to teaching. Rather than teaching new professionals that one approach to teaching is more effective than another even though it may be criticized as "old fashioned and ineffective" (p.1), we should present teachers in all trajectories of their careers with comprehensive models of instruction. Such models will help them to understand the instructional decisions they make in the context of instructional theory. Such models also help teachers respect their own instincts about what students' needs may dictate as the most viable approach for the immediate context of the learning and the phase of the instructional cycle in which learning needs are demonstrated.

Finally, we offer the following schematic (Figure 2) to help professional teachers and researchers consider their instructional and research methodologies in a "what/when" framework rather than in the false dichotomy of an "either/or" framework.

Figure 2 Examining Direct and Indirect Instructional Approaches from a "What/When" Perspective



It is our hope to continue the dialogue about instructional methodologies in ways that provide new insights into research in contexts that broaden and deepen our understanding of the complex interactions that form when teaching is engaged.

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