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Sadler, I (2009) Connection Learning: A Framework for the Development of Teaching. Journal on excellence in college teaching, 20 (1). ISSN 1052-4800

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Sadler, I. (2009). Connection learning: A framework for the development of teaching. *Journal on Excellence in College Teaching*, 20 (1), x-x.

Connection Learning: A Framework for the Development of Teaching

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The author explores how student learning can be enhanced through the appropriate development of teaching skills. In his review of elements of best practice drawn from the literature, conference material, and action research, the concept of “connectivity” emerged as a recurring, implicit term. From this evolved the concept of “connection learning,” which is based on the principle that learning is about creating links between concepts, ideas, and experiences. Connection learning creates an innovative way to think about teaching and learning based on student-centered learning and conceptual change. The author proposes a framework aligning these overarching conceptions of teaching with daily teaching and learning strategies.

Introduction

With increasing student enrollment and diversity in our colleges and universities and a growing emphasis on accountability for teaching quality, strategies to improve teaching are becoming increasingly important. This article aims to address this concern by identifying a framework for ways of thinking about, practicing, and developing teaching in higher education. The framework I propose emerged from a body of work that Biggs (1999) refers to as “student learning” research and originated from the work on approaches to learning by Marton and Säljö (1976). Whether students are engaged in deep or surface approaches to learning has been shown to influence the quality of the learning outcomes achieved (Entwistle & Ramsden, 1983).

It has been established that approaches to learning are context dependent. Because teachers are a key component in the majority of learning and teaching environments, they have the ability to influence the learning context and invoke deep approaches to learning (Prosser, Trigwell, & Waterhouse, 1999). Although a number of authors have criticized deep and surface approaches to learning as being simplistic (Richardson, 1990; Webb, 1997), these approaches have provided a valuable concept that all teachers and students can relate to. Rather than discount these labels as simplistic, then, it may be more productive to consider aspects of the concepts that require further attention and development. Ramsden (2004) has argued that two broad areas of the approaches to learning research are in need of further development: first, to identify how teachers can impact students' approaches to learning; and second, to consider how to use approaches to learning for leadership and the enhancement of teaching. The proposed framework seeks to respond to both of these needs.

Work in the development of teaching traditionally has focused either on a teaching tip approach (Gibbs, Habeshaw, & Habeshaw, 1984) or on a conceptual approach that is less specific to classroom practice (Kember, 1997). There has been no clear link made between the two, however. In order to bridge this gap it is necessary, first, to identify an overarching concept for thinking about learning and teaching that is based in evidence and aims to engage students in a deep approach to learning, and second, to match this concept with everyday teaching tasks and activities.

Student learning research has identified the mechanics and strategies that students use to achieve a deep approach to learning. Marton (1974; cited in Marton and Säljö, 1984) investigated how a group of students went about a reading task to gain insight into how the students achieved a deep approach to learning. One student commented, ". . . I was looking for the argument and whatever points were used to illustrate it. I could not avoid relating the article to other things I'd read, past experience, and associations, etc. . . ." (p. 41). If these connective strategies for learning could be captured, they could be used to support the development of teaching that encourages students to take a deep approach to learning.

The concept of connectivity in learning holds the potential to be an effective method for promoting deep learning and enhancing student understanding. This article draws on the many references to connectivity in the teaching and learning literature. The most explicit reference to the use of connection for learning, however, comes from the American Association for Higher Education (AAHE, 1998), which has stated that "Learning is fundamentally about making connections through neural networks, mentally among concepts and ideas, and experientially through

interaction between the mind and environment" (p. 3). Therefore, this article argues that the use of connections in the thinking, planning, and delivery of learning has the potential to create more effective conditions for students to adopt a deep approach to learning and achieve a greater level of understanding.

Student Understanding and Connection Learning

Knowledge, skills, and understanding are considered the three central indices of learning. Of these three, understanding is usually the most emphasized—particularly in higher education, where student understanding ideally develops and coexists with critical thinking and analysis. The definition and measurement of knowledge and skills, with knowledge being about information and skills relating to performance, come much easier than they do for understanding. Authors have defined understanding in a variety of ways. Entwistle and Entwistle (1997) identified a number of characteristics of understanding: satisfaction, in that students had finally "got it"; irreversibility, in that it could not be undone; and completeness, in that it represents a whole mindset rather than isolated, unrelated information. In contrast, Perkins (1998) suggests a more fixed definition wherein "understanding is a matter of being able to think and act flexibly with what one knows" (p. 42). This definition combines the principles of knowledge and skills, but with a greater emphasis on flexibility and performance.

Some of these conceptions of understanding are rather limited, as they suggest it occurs when a learner sees what has already been understood by others and, therefore, has a fixed or universal meaning. The definition of a deep approach to learning, the process by which understanding is achieved, suggests it is more than this, however. A deep approach to learning is based on a process of the *transformation* of knowledge in order to develop a *personal* understanding. Rather than simply trying to define understanding, then, it is important to consider it as a *process* that exists as a range or hierarchy. In trying to reach a view of understanding, Nickerson (1985) reviewed a number of experimental studies. These studies focused mainly on the process of understanding and caused him to summarize it as ". . . an active process. It requires connecting of facts, the relating of newly acquired information to what is already known, the weaving of bits of knowledge into an integral and cohesive whole" (p. 234). The idea that understanding exists as a range or on a hierarchy is well represented by Biggs's (1999) Structure of the Observed Learning Outcome (SOLO) taxonomy. Rather than viewing understanding as an

endpoint, Biggs proposes different forms or levels. Atherton (2005) described the understanding that lies at the most complete level in Biggs's taxonomy as occurring when "... the student is making connections not only within the given subject area, but also beyond it, [where he or she is] able to generalise and transfer the principles and ideas underlying the specific instance" (p. 2).

In response to these varying ways of viewing the concept of understanding, this article contests that there is a common element in the process of achieving understanding. Rather, understanding at its most complex levels is achieved through the creation of connections between concepts. Connection learning, then, may provide insight into the process that students go through in order to achieve a deep approach to learning, exhibit flexible performance capabilities (Perkins, 1998), and, ultimately, achieve understanding. In 1998 the final report by the AAHE joint task force on student learning identified 10 principles for learning and collaborative action. The first of these principles was that learning is fundamentally about making and maintaining connections between concepts, ideas and meanings as well as experientially through interaction with the environment and other contexts.

In addition to the idea of conceptual connections, the AAHE report also made brief reference to biological connections through neural networks. This introduces another dimension of learning, that connections are important for effective neurological and cognitive functioning. Literature from other related disciplines lending further support to this principle ranges from research into working memory space, whereby connections between chunks of information can reduce the information load (Baddeley, 1994), to current research in neuroscience regarding the connectivity of neurons in the prefrontal cortex (Cohen, 2004). It is possible for instructors to relate this biological research to everyday teaching, for example, situations in which a student comments that "the penny has just dropped" or "something has just clicked." Returning to the more familiar student learning literature, the AAHE report is the most direct reference to connection learning, with many more authors alluding to it in independent research (see Table 1).

What is apparent from the research above is that learning is not simply about telling students that connections exist; rather, it is about creating conditions to support students in constructing their own connections. This is the basis of the student learning epistemology summarized by Shuell (1986), who commented that "the teacher's fundamental task is to get students to engage in learning activities that are likely to result in their achieving those (desired) outcomes . . . what the student does is actually

Table 1 References to Connections in the Student Learning Literature	
Source	Reference
Nickerson (1985)	"[Understanding is] . . . the <i>connecting</i> of facts, the relating of newly acquired information to what is already known, the weaving of bits of knowledge into an integrated and cohesive whole . . ." (p. 202).
Entwistle (1997)	"They [students] soon realise that we do not store definitions in memory, but rather that the meaning resides within the <i>interconnections</i> of remembered instances, and has to be reconstituted in providing an explanation" (p. 127).
AAHE (1998)	"Learning is fundamentally about making <i>connections</i> through neural networks, mentally among concepts and ideas, and experientially through interaction between the mind and environment" (p. 3).
Palmer (1999)	"I've asked students . . . to describe their good teachers. . . [A]ll of them describe people who have some sort of <i>connective</i> capacity, who <i>connect</i> themselves to their students, their students to each other, and everyone to the subject being studied" (p. 27).
Entwistle & Walker (2000)	"A more sophisticated set of conceptions regarding learning, knowing and teaching has the potential to draw the student's attention to <i>connections</i> with other areas of knowledge and skill" (p. 355).
Hounsell & McCune (2002)	"Staff pinpointed certain forms of understanding which seemed to go beyond these fundamentals, whether through applying them, grasping <i>inter-connections</i> between them, or apprehending their derivation" (p. 16).

more important . . . than what the teacher does" (p. 429). In order for the concept of connection learning to be effective, therefore, it is important that it be based in the development of teaching. In addition, connection learning is not designed to be a stand-alone strategy, but to coexist within established conceptual frameworks that relate to effective approaches to learning and teaching.

Development of Teaching for Connection Learning

The connection learning framework bridges two parallel theories in the student learning literature: student approaches to learning (Marton & Säljö, 1976) and teachers' conceptions of teaching (Kember, 1997). The key tenets of the student learning research are that (1) a deep approach to learning is more likely to result in desirable learning outcomes; (2) *deep* and *surface* labels do not indicate attributes or abilities, because they can vary within individuals depending upon the learning context; and (3) students' perceptions of the current learning environment, their past experiences, and their conceptions of learning all influence the approach to learning in which they engage. These latter two points highlight the importance of the approaches to learning research for the development of teaching and have created a shift in the body of research toward a focus on the teacher.

A model by Prosser and Trigwell (1999) illustrates the symmetrical relations between the student and teacher. The most important aspect of this model for the development of teaching is the link between teachers' approaches to teaching and students' approaches to learning—that is, how a teacher approaches his or her teaching will impact how students approach their learning (Prosser et al., 1999). Teachers' conceptions of teaching develop not only from their classroom experiences, but also from their experiences as students (Trigwell, Prosser, & Taylor, 1994). Kember's (1998) review of over a dozen separate studies identified only a small number of similar teaching conception categories. Although several intermediate categories emerged in Kember's work, the two extreme poles are student-centered/learning-oriented and teacher-centered/content-oriented. Studies have shown that a teacher transmission model reduces the likelihood of students adopting deep approaches to learning (Gow & Kember, 1993; Prosser et al., 1999). In contrast, the initial research (Gibbs & Coffey, 2004; Ho, Watkins, & Kelly, 2001) on the conceptual change approach to the development of teaching for deep learning is promising. Therefore, the framework proposed in this article uses the student-centered/learning-oriented conception of teaching, alongside connection

learning, as the overarching ways of thinking about learning.

Based on interviews with faculty developers, Gibbs and Coffey (2000) identified two clear goals of development of teaching in higher education: the improvement of teachers' skills and the development of teachers' conceptions of teaching. The balance between these two goals has become a critical focus of the improvement of teaching. If faculty development is too skill based and simply prescribes a number of "recipes" for teaching, faculty may become either mechanical or defensive about their practices (Ho et al., 2001). Trigwell (2004) supports this in arguing that teacher training activities will be ineffective unless informed by the underlying conceptions that inform the skills. There are also problems with a solely conceptual approach to faculty development, however. If these conceptions are too detached from the classroom, it is possible for a teacher to embrace the value of the student-centered / learning-oriented conception but then approach teaching from the entirely opposing position (Prosser, Ramsden, Trigwell, & Martin, 2003). Ho et al. (2001) find that only 50% of teachers who changed their conceptions of teaching brought about positive changes in student learning. In response to this imbalance, Trigwell (2004) identified a model for the development of teaching based on an alignment between teaching conceptions, teaching activities, and student learning (see Figure 1). This model suggests that for developmental activities to be effective, they must take into account the teaching and learning context and provide support at both a conceptual and strategic level.

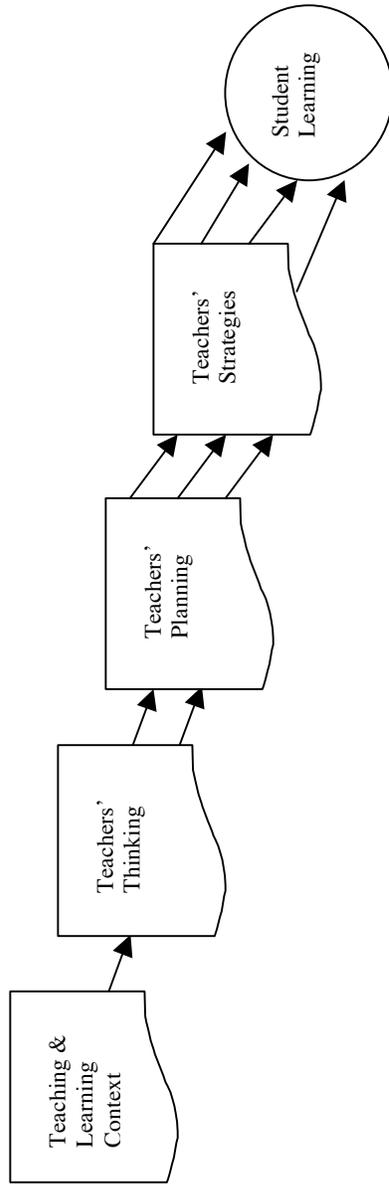
A Framework for Connection Learning

The conceptual aspects of learning and teaching outlined above have clear implications for the development of teaching. There is need for a framework that integrates the conceptual with the actual mechanical aspects of how teachers can engage students in a deep approach to learning to enhance understanding. The connection learning framework I propose (see Figure 2) combines the principles from the model of teaching development (Figure 1) and the concept of connection learning to create clear guidance for teachers. The framework aligns *Teacher Thinking* (Figure 2, column 1), *Teacher Planning* (Figure 2, column 2) and *Teacher Strategies* (Figure 2, column 3) to aid in the application of the concept of connection learning. Finally, the framework identifies how these activities may impact *Student Learning* (Figure 2, column 4).

Teacher Thinking

The connection learning framework in Figure 2 is based on the literature

Figure 1
Model of Development of Teaching
(adapted from Trigwell, 2004)



Insert Figure 2 as a 3-page Z-Foldout.



presented in the preceding sections and incorporates two key overarching concepts: (1) the concept of connection learning and (2) a conception of teaching based on student-centeredness and on learning as conceptual change. The conception of teaching that an individual holds has been shown to relate closely to the way in which he or she approaches teaching (Trigwell & Prosser, 1996). Therefore, if a teacher is aware of the concept of connection learning and a student-centered/learning-oriented conception of teaching, it is likely to result in a pedagogical approach that encourages students to take a deep approach to learning.

Teacher Planning (Meso-Level)

At the Teacher Planning (meso) level the framework provides details of the types of connections that can be made with subject content to enhance student understanding. The framework identifies the possibility of connecting subject content learning activities/materials with seven different aspects of understanding:

1. Learning Outcomes and Assessment;
2. Skills, Attitudes, and Personal Attributes;
3. Past Experiences;
4. Practice;
5. Additional Activities/Tasks;
6. The Course/Programme of Study; and
7. Future Activity.

Each of these seven connections is related to an existing broad pedagogical strategy. The aim is to provide teachers with guidance in how the connections can be achieved in practice. For example, for connection 1, *Learning Outcomes and Assessment*, the associated strategy is constructive alignment (Biggs, 1996). This strategy requires teachers to ensure that their courses make clear connections between learning outcomes, curriculum, and assessment strategies.

Connection 4, between current learning material and *Practice*, provides a concrete example of how one of these seven connections may influence a teacher's planning. In this context, connection learning means that in order to encourage a better understanding of a particular theory or concept it is important to test it in practice. While putting theory into practice is a common and well-accepted idea in teaching, I argue that the reason

it supports learning is by enabling students to see connections between abstract theories and their particular environment or area of study.

A possible approach to teacher planning that can be used to create this type of connection is based on the concept of *inquiry-based learning* (Healey, 2005). Traditionally, teachers' direct supervision based on their particular research interests has been the means to teach students about a subject specific theory, the skill of critical review, or the principles of research methods. With this information transmission model learning outcomes are considered in isolation. Inquiry-based learning, however, encourages students to connect their learning to practice. With this approach, students learn in a "research mode" that creates "in the learner's mind a connection between teaching and research" (Elton, 2005, p. 111). Inquiry-based learning, then, supports students' understanding of the purpose or role of research in their subject area. This direct involvement in research causes students' learning to become more active and questioning. In order to facilitate inquiry-based learning, Healey (2005) has specified three dimensions of curriculum redesign: that there be an emphasis on research process and problems rather than on content, that students be treated as participants rather than as audience, and that teaching be student-focused rather than teacher-focused.

It is beyond the scope of this article to expand on the examples for each of the seven connections in the connection learning model depicted in Figure 2. Most of these broad planning strategies already will be familiar to teachers, and they are by no means exhaustive. The framework's value lies in its explicit focus on the common conceptual goal of connection learning and in its application of this focus at the macro, meso, and micro levels of teaching and the resulting student learning.

Teacher Strategies (Micro-Level)

The literature about learning and teaching in higher education, particularly at the conceptual level, often either neglects strategies for daily use with students entirely or considers them only in terms of isolated tips. For each of the seven connections identified at the teacher planning or meso-level in Figure 2, in contrast, the framework provides micro-level Teacher Strategies to create conditions in which students are likely to make the appropriate connection. The dashed line dividing the rows in the micro-level column of Figure 2 is significant in suggesting that the proposed activities may not be exclusive to one connection but may facilitate several of them.

A reading and thinking strategy suggested by Hogan (1996) provides

a practical micro-level example of how the conceptual idea of connection learning can translate to the classroom. At the meso- or planning level, this learning activity aims to encourage students to create connections between the *Additional Activities/Tasks* (connection 5) they are required to complete outside of class and the learning activities or outcomes considered in class. The problem with assigning additional activities, such as reading tasks, is that students often are unmotivated to complete them. Citing Johnson (1988), Hogan (1996) attributes this lack of motivation to the fact that “the isolation . . . from the rest of the community [that reading creates] brings about a sense of irrelevance” (p. 1). It is the teacher’s responsibility, therefore, to provide more directed and specific activities to ensure the students can create the connections, see the relevance, and, therefore, evoke a deep approach to learning.

A strategy identified by Hogan (1996) encourages students to read, think, and share ideas. Half of the class is given one reading, while the other half is given a different, but related reading. Students are given a task that asks them to read the material provided and become familiar with the key themes, arguments, and ideas in order that they can:

1. Represent them in a diagram, table, or visual form.
2. Use this graphic as an aid to explain the reading to a partner from the other half so that he or she can understand its content and directions.

A seminar can be based around this approach, with pairs of students sharing the material that they have read using the relevant resources they have created. Students are encouraged to ask questions and spend time connecting the materials. Additional strategies may include increasing groups to four members in order to extend the discussion and further challenge peers’ interpretations.

Placing this strategy within the context of the connection learning framework reveals how it facilitates the associated meso-level connection between *Additional Activities/Tasks* and the material being learned. This approach aims to improve upon the traditional task of having students read an isolated chapter or journal article and making them solely responsible for making the connections with no facilitation or follow up. Learning strategies such as Hogan’s (1996) ensure that students make connections through their interaction with the material and their peers. The strategy helps students to value the learning task and see its relevance to course learning outcomes. Additional benefits for students include the promotion of metacognitive processes, the recreation of information in a different form, and the testing out of their understanding with their peers (Hogan,

1996). This strategy, therefore, utilizes connection learning and a student-centered approach to teaching, both of which are at the conceptual (teacher thinking) level of the proposed framework.

Summary

Neither the concept of connection learning nor the strategies for its facilitation presented in this article are new. I do, however, propose three innovative contributions for enhancing teaching practice:

- Making connections in learning explicit in order to guide discussions between faculty and faculty developers.
- Providing real, workable strategies for learning that have a clear rationale based on student-centered learning.
- Developing a coherent framework that can be used to guide teachers and faculty developers in their thinking and planning in order to enhance teaching and increase the number of students engaged in a deep approach to learning.

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