

Cognitive Apprenticeship Educator Resource

Students using *Carbon TIME* face the challenge of mastering practices that are new and difficult for them—practices that they can only master through sustained engagement with the help of knowledgeable mentors. Collins, Brown, and Newman (1989) studied examples of successful teaching of difficult practices and suggested that many of those examples shared a set of common features that they labeled *cognitive apprenticeship*.

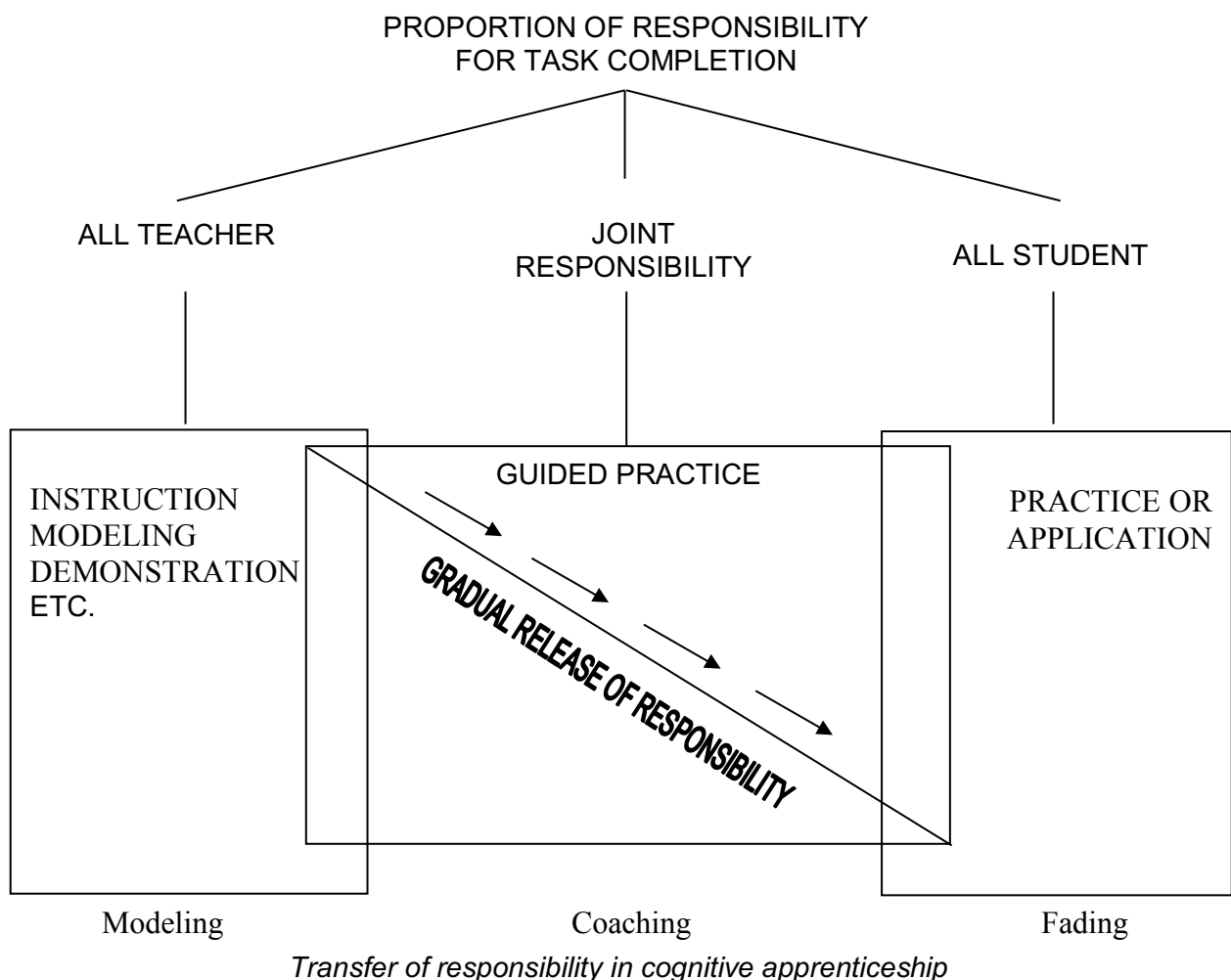
Collins, Brown, and Newman suggested that meaningful learning of difficult practices often involves creating situations where (a) learners are engaged with the problem and motivated to learn—*establishing the problem*, (b) learners are put in situations where they can observe other people engaging in the activity—*modeling*, (c) the learners engage in the practice with scaffolding or support from others—*coaching*, and (d) the support is gradually withdrawn until the learners are independently engaged in the practice—*fading*. Finally (e) learners must engage in a practice repeatedly over time in order to maintain and deepen their expertise—*maintenance*. Notice that this approach keeps the complex learning goals “whole” – in this case, three-dimensional; it does not break the engagement into smaller, separate skills.

Stages of Cognitive Apprenticeship

Stage	Goals for Students	Common Strategies
Establishing the problem	<ul style="list-style-type: none"> • discuss relevant personal experiences and ideas • understand learning goals • Become dissatisfied with their current understanding • expectancy: believe that they are capable of understanding • value: establish interest and relevance of learning goals 	<ul style="list-style-type: none"> • eliciting questions raised by students or problems that they are curious about through Expressing Ideas Tool • eliciting students' ideas about discrepant events or familiar situations • encouraging sharing and discussion (including challenges) of ideas and questions among students • discuss connections to previous units or learning sequences
Modeling	<ul style="list-style-type: none"> • see and understand how an expert accomplishes the objective • understand what they know and what they still have to learn 	<ul style="list-style-type: none"> • “think aloud” problem solving • presenting scientific ideas in the context of real world problems • Using the Three Questions to support explicit contrasts between scientific and naive thinking
Coaching	<ul style="list-style-type: none"> • practice using scientific ideas to accomplish the objective with support and feedback 	<ul style="list-style-type: none"> • scaffolding (providing support and structure that will gradually be withdrawn) • special problems that focus on student misconceptions or learning difficulties • systematic feedback and reinforcement • cooperative group work • working with multiple examples of related meaningful tasks

Stage	Goals for Students	Common Strategies
Fading	<ul style="list-style-type: none"> • learn to do the task independently 	<ul style="list-style-type: none"> • gradually reduce scaffolding and other forms of assistance • evaluation methods that maintain the integrity of the task • test questions that focus on key student difficulties
Maintenance	<ul style="list-style-type: none"> • apply knowledge in other contexts 	<ul style="list-style-type: none"> • providing opportunities to use the knowledge in other units or courses • connecting key ideas and practices for this objective with other important ideas and practices

These stages involve a transfer of responsibility from teacher to learners:



Reference

Collins, A., Brown, J. S., Newman, S. E. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.) *Knowing, learning, and instruction: Essays in honor of Robert Glaser*. Hillsdale, N.J.: Lawrence Erlbaum Associates, pp. 453-494.