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What is transfer?

Transfer as the goal of education

When I was a soccer coach, I learned about transfer the hard way.The work we did in the drills everyday in practice did not seem totransfer into fluid, flexible, and fluent performance in games. I slowly began to see that, indeed, the real game situations were "messier" and "swifter to change" than we were preparing for. I thought I had made my drills realistic and helpful, but the results were still disturbingly poor. It often appeared, in fact, as if all the work in practice was for naught as players either wandered around purposelessly or only reacted to the most obvious, immediate needs.

An epiphany came in a game, from the mouth of my co-captain. In my increasing frustration, I started yelling loudly, "Give-and-go, 3-on-2, use it, use it, all the drills we just worked on!" My co- captain stopped dribbling the ball in the middle of the field, and yelled back at me, "I can't SEE it now; they won't line up like the way we did the drill!"

That's both a clear picture of the problem and the road to the solution. Too many "clean" sideline drills; not enough practice inlearning to play the "messy" game, intelligently. Too great a gap between what the (simplified) drill was "teaching" and what the complex performance demanded that they learn. The theoretical links between our drill and game situation were certainly obviousto me – but not obvious to players, given the messiness and speedof the game; there was insufficient realistic rehearsal way.

My soccer problem is not unique. It is like the second-grade teacher's challenge in trying to get students to learn to read for meaning on their own or the college professor's challenge of tryingto help students understand physics in context. You can provide students with training in a dozen reading strategies or physics problems (drills), provide helpful verbal cues, etc. and yet, when asked to read on their own, they may neither activate the strategiesby themselves nor make meaning of unfamiliar material:

> Both the meaning and the challenge of `"transfer of learning" are well-expressed in a story told to one of us by a disappointed professor of physics at a nearby college. Among the stock problems explored in the physics course was one like this: "A ball weighing three kilograms is dropped from the top of a hundred-meter tower. How many seconds does it take to reach the ground?" (Aficionados of physics will recognize that the weight of the ball has nothing to do with the problem; it is a distraction. The answer depends only on the acceleration of gravity.)
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> On the final exam, the professor included a problem like this: "There is a one-hundred meter hole in the ground. A ball weighing three kilograms is rolled off the side into the hole. How long does it take to reach the bottom?"
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> Some students did not recognize the connection between the "tower" problem and the "hole" problem. One student even came up after the exam and accosted the professor with a complaint. "I think that this exam was unfair," the student wailed. "We neverhad

> any hole problems!"[2]

What the research on transfer reveals is that this failure of intelligent use and adaptation of what we 'know' is depressingly common: students will typically not cue themselves to use all their prior learning or recognize how the "new" situation reflects prior learning unless they have been given lots of training and practice in thus cueing themselves and in being weaned from simplified exercises and teacher scaffolds: "Unfortunately, achieving significant transfer of learning has proven to be a difficult chore. Dating back to the beginning of this century, the research literature on transfer is replete with reports of failure."3

Transfer doesn't just happen as a result of a typical regimen of teaching and testing, no matter how rigorous the course of study. Transfer happens only when we aggressively teach and test for understandings that are applied in situations. As the authors of *How People Learn* put it:

> A key finding in the learning and transfer literature is that organizing information into a conceptual framework allows for greater "transfer"; that is, it allows the student to apply what was learned in new situations and to learn related information more quickly…. Transfer is affected by the degree to which people learn with understanding rather than merely memorize sets of facts or follow a fixed set of procedures; the research also shows clearly that "usable knowledge" is not the same as a mere list of disconnected facts.4

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Teaching for transfer

Below are a set of tips for planning, teaching, and assessing to make transfer more to be realized by design than by luck:

- Establish and keep highlighting clear transfer goals: Explicitly and regularlyalert learners to the goal of transfer. Why? Because most students do not realize that this is the goal of learning in school. They are quite convinced – from prior experience and, especially typical tests – that the aim is to recall and plug in what was previously taught. Make clear that the "transfer" gameis very different from the "recall" and "plug in" game.

  Initially, make this clear through think-alouds and explicit reminders of what we are now doing and what its purpose is. Spend time going over thekinds of transfer performance they will need to be able to do well by the endof the unit/course.

Examples: “By the end of the unit, you’ll have to do this product on your own, with no prompts or cues from me. Here are a few model student papers from past years, and a rubric describing the end-goal.”Or: “Initially, you will just mimic some approaches I teach you. But later, you will have to invent your own approach or adapt one you have learned toa new task,” etc.

- Always work on a Gradual Release of Responsibility sequence – in units, and in the course as a whole. The Gradual Release of Responsibility (GRR)model was first articulated for reading instruction by Pearson (1983): I do, you watch; I do, you help; you do, I help; you do, I watch. More formally:

  Model, Guided Practice, Independent Practice, Independent use of all Strategies. But GRR can also be thought of as the common flow used in athletic training: simple drill, game situation, game-like conditions, the game. Note that in both cases – reading and athletics – the movement to thefinal stage of self-regulated complex performance is done in each unit of study. Independent and self-regulated behavior is practiced all the time, notpostponed until many discrete “sideline” activities are done over many lessons. You have to practice transfer to master it!

- Highlight Essential Questions to suggest the kinds of connections students will have to make all year: Knowing that essential questions will be used toexplore connections between units will make students more likely to makeconnections on their own – particularly if the assessments regularly involve the questions. Examples: “How should this data be modeled?” when problem solving in math and science. “Who is an American? Says who?” when considering each major topic in US history. “What should we eat?” inhealth. “What is the author saying without stating?” in English/language arts, etc.

- Have learners practice judgment, not just skill. Transfer is about judging which skill and knowledge to use when. Transfer is thus not about pluggingin a “skill” but “judgment” - smart strategy - in the use of a repertoire of skills. (Psychologists refer to this as “conditional” knowledge as opposed to“declarative” and “procedural” knowledge). Make sure learners have opportunity to hear think-alouds of your problem-solving or text- interpreting. Give students practice and get feedback on their attempts to judge which skill or knowledge might be best here. Have learners do think-alouds and provide reports of why they did what they did when they did it.Learning to self-monitor in this way improves both self-assessment and self-adjustment.

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- Assess (without grading) student self-cueing, knowledge retrieval, self- assessment, and self-adjustment on their own, i. e. minus teacher cues. As insports and independent reading, there have to be countless opportunities for the student to self-prompt, self-assess, and self-adjust – with teacher feedback on the attempts. What does the student do when teachers don't supply the graphic organizers or a big hint that they should use the writing process we studied yesterday? The research is clear, alas: many students do not self-prompt, in the absence of explicit direction. "You didn't say touse it!" is a common comment.

  The irony here is that this is precisely where students often fall down on standardized tests! Now, there are no teacher or textbook cues as to wherethe item comes from in the course content, and no overt cues about what content applies are typically given. So, constantly "test" (without necessarily grading them and/or entering the grade in the grade-book) student ability to self-cue. Examples: Give them unfamiliar looking items,writing prompts, problems, etc. – with no mention of which knowledge is being tapped and which strategies and tools they should use. See what theydo on their own, then go over the assessment carefully in class soon after –debrief like a coach: What kind of task did they think it was? Why didn't they think to use Graphic Organizer X or Strategy Y since it should haveseemed so clearly related to the task? etc.

- Change the set-up so that students realize that a possible use of prior learning comes in many guises: The research on transfer stresses that students need to be given tasks in which the setting/format/context/ mode/language is sufficiently varied over time that students learn they haveto think more flexibly in tapping their knowledge. The student too often thinks that – and wishes that! – a recipe or plug-in formula will solve all future needs. Make clear that the initial recipe/structure/scaffold is just that – a scaffold or crutch to be eventually replaced by fluid decision-making. Examples: After learning about gravitational force using balls dropped fromtowers, give a problem about a ball of a different size and material dropped down a big tunnel in the earth. (See Perkins and Salomon 1989). Teach 2-3 ways to solve every major kind of problem. Give students increasingly odd 'looks' at a task or problem that requires the same knowledge (e.g., increasingly non-routine and unobvious problems involving the Pythagorean theorem).

- Practice the whole/part/whole development of transfer early and often. Think of what coaches do to break the complex game down into easier butgame-like games, e.g. 3 v 3 and 6 v 6 in soccer, to practice the full 11 v 11game in a more manageable way. In the arts the play or musical piece is broken down into its elements and practiced in chunks, then put back into the whole. Reading instruction proceeds similarly, as does the best problem-solving instruction in mathematics.

- Have students constantly generalize from (increasingly challenging) specific instances and cases: Transfer is about using helpful 'big ideas' to find familiarities and connections where others see only newness and difference. Ask students to generalize from their experience and immediate past lessons to more widely applicable principles, rules, and ideas. Example: After studying westward expansion, ask, "What big generalizations about human migration does this movement west suggest? Can you support your generalizations by other evidence you know of?" Then, ask the same

question after studying early 20th-century immigration,and help them understand that this kind of transfer will be more and more requested of them – i.e. using ideas to see connections and transfer.

- Make sure that any tool or technique is seen as one of many: Too often students work too rigidly or mechanically in applying their learning, rather than seeing application as use of an idea. Example: Teach the 5-paragraph essay, the 3-paragraph essay and the no-paragraph argument (i.e. a powerfuladvertisement). Make clear that the transfer goal is "rational persuasion," not "plug in the 1 tool called 5 paragraphs."

- Provide many examples of 'think-alouds' in transfer situations: Talk out, demonstrate, model the kind of pro-active thinking that needs to take placein one's head if transfer goals are to be achieved. Example: A math teacherdemonstrates how a problem might be solved by "thinking aloud" to revealstrategic thinking and efficient reframing of the problem based on prior knowledge.

- Shift perspective: After any lesson in teaching a particular skill or approach,shift gears. Challenge the prior assumptions, look at the problem or situation from a new point of view, read a different opinion – anything to help students see that the goal is active learning and understanding, not merely taking in the "official" single (glib) answer.

- Require self-assessment and self-adjustment as part of all major assessments. Learning to transfer is greatly facilitated by learning to self-monitor, self-assess, and self-adjust. Initially, make the accuracy of the self-assessment and the self-adjustment more central to scoring than the answer.Example: 5 points for doing the task on your own; 3 points for getting it based on 1 teacher hint; 2 points for getting it after 2 hints, etc.

- Require students to constantly re-word/re-phrase/re-present what they learn:Whether in just taking notes or creatively placing a complete text in a new genre, time, and place: making learners re-cast what they have learned in their own terms is a significant aid to long-term memory and flexible use of knowledge, according to the research on learning and transfer.

Resources on Transfer

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[2] *D.N. Perkins and Gavriel Salomon, "The Science and Art of Transfer," Harvard University Web site, http://learnweb.harvard.edu/alps/thinking/docs/trancost.htm (accessed September 21, 2005).*

[3] *Anne McKeough, Judy Lupart, and Anthony Marini, eds., Teaching for Transfer: Fostering Generalization in Learning, (Mahwah, NJ: Lawrence Erlbaum Associates, 1995), 1. (Also cited at http://www.questia.com/PM.qst?a=o&d=59527464)*

[4] *John D. Bransford, Ann L. Brown, and Rodney R. Cocking, eds., How People Learn: Brain, Mind, Experience, and School (Washington, D.C.: National Academy Press, 1999), 17. (Available free online from the publisher at http://www.nap.edu/openbook/0309065577/html/index.html)*