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Do We Need to Change How We Assess Learning?

by Gary L. Whitt, Ph.D.

Johnny sits in a classroom for many hours a day engaged in a host of activities designed to help him learn. One moment he is busily helping his group assemble gathered materials into something resembling a puzzle map of North America, the next he is calling out spelling words to a classmate, and later he is listening to the teacher explain the various parts of a letter. Indeed, during the course of his day in school, because his teachers are creative and good at what they do, he will operate in many different modalities: visual, aural, and kinesthetic. He will take in new information rich in sensory cues and that information will have associated with it sounds, shapes, smells, touches, and spatial orientations, a veritable cornucopia of sensory input surrounding Johnny, linked together in his memory (Anderson, 1995; Cann & Ross, 1989).

However, when it comes time to ascertain exactly what Johnny has learned, he receives only one kind of clue, one kind of cue. All the important assessments of Johnny's learning, the tests which determine if he is ready to advance, to take advanced courses, and to go to college, are text-based tests. His learning environment is brimming with sensory input, his testing environment is not. All the cues so prevalent during learning have been stripped out and reduced to the text on the page before him. And looking at the words on the test in front of him, he just can't remember exactly what it was he was supposed to remember. He remembers quite a lot about the environment surrounding him when he was learning the information, he just doesn't remember that exact bit, and is forced to leave that part of the test blank. So, does Johnny do poorly on the test because he didn't learn what he should have or does he do poorly because he wasn't given the retrieval cues he needed to remember? The test was textual, but when Johnny was learning the material, the teacher had students in groups and was talking to them intermittently. If the test modality had been changed to more accurately reflect Johnny's learning environment, would his score have increased?

Obviously, the answers to these questions are very important. After all, parents and students trust educational institutions to accurately assess learning and to use these assessments to guide decisions regarding the future. And really, in years past, there were precious few options to text-based

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testing. However, with the advent of increasing numbers of computers in the classroom, assessments incorporating multiple modalities are quite possible. These multimodal computer-delivered tests might contain pictures and sounds as well as text. But, are these types of tests necessary? Would they more accurately reflect what students know? Would test scores change appreciably if test modality changed? Common experience, information processing theory, and experimentation regarding the effects of testing modality on test performance are very suggestive and indicate that educational testing practice may need to change.

If you've ever seen old re-runs of "This is Your Life" on television you know how powerfully additional environmental cues can aid memory. It often happens like this: the man whose life is in review is standing center-stage and trying to recall just exactly who it is who "always believed in you, from the very beginning, and bought a pair of shoes from you when you were selling them in the neighborhood just to prove it". The man is clueless, has no idea who it could be, and awkward silence follows. The lady speaks from off stage and the audience hears her quavering alto intone, "You weren't a very good shoe salesman, but you were a good friend." The man's face brightens with recognition and a smile, "Mrs. Freeman!" He remembers her but it was touch-and-go for a minute. If not for the voice of the woman he would have been searching his neurons still. We've all had similar experiences. We can almost remember but we just need one more cue. We don't need help with the answer; we just want one more clue relating to the time when we encoded the answer. Just give us one smell, one taste, one sound, one directional hint and we'll give you the answer.

The theory surrounding the encoding and retrieval of information, information processing theory, also strongly suggests that our ability to remember information is closely linked to the retrieval cues that are provided on the test.

Alan Paivio, father of Dual-Coding theory, held that there are two representations of every event in memory, visual and verbal. Both representations are accompanied by their corresponding environmental cues, environmental traits that accompanied the target memory at the time of encoding. The more closely the retrieval cues represent these environmental cues the greater the likelihood of recalling the information (Paivio, 1986).

Craik and Lockhart, developers of the Depth of Processing theory, posit that memory places real emphasis on the appropriateness of the retrieval environment and suggest that test type has as much to do with recall as the strength of the memory trace (Morris, Bransford, & Franks, 1977).

Endel Tulving, father to the theory of Episodic Memory, agrees and goes so far as to say that:

> what a person remembers about an event, and how well, depends not only on the nature of the event and its encoding, but also on the conditions prevailing at

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> the time of its attempted recollection, particularly that component of the conditions that we refer to as retrieval information...what a person recollects about an experience is not determined by the memory trace of that experience. The memory trace is only one important co-determinate of recollection; the other equally important one is the retrieval information that is used in the process of actualizing the trace (Tulving, 1983, p. 4-5).

Indeed, it is very common to find in education literature today the supposition that retrieval accuracy increases as the retrieval environment more closely approximates that of the encoding environment. The statement is so common that it appears often without support or reference to literature, as though it were agreed upon by all. There are some experiments which bear out this supposition.

In the 1970's Godden and Baddeley (1975) did some fairly light-weight research with memory tasks performed underwater (one suspects a coupling of business with pleasure). They concluded that the memory retrieval environment did significantly affect a person's ability to remember. Cann and Ross (1989), as well as Schab (1990), found that memory retrieval was significantly improved by having the smells at time of encoding present in the retrieval environment as well. Seemingly, if you study with the smell of chocolate in the air, you should try to remember the information with the smell of chocolate in the air. Smith (1985) found that music had much the same effect; those with similar musical backgrounds at time of encoding and retrieval remembered more than those who did not have such cues to access. Over the years, state-dependent and context-dependent researchers have shown that music, smells, and traits of the physical environment all provide cues that help people remember, if those cues are produced at the time of retrieval.

So, what is the point of all this? The point is that Johnny may not do well on tests because his brain is operating exactly as educational theorists and experimenters propose. His performance on tests might improve if the tests he was asked to take more closely referenced his encoding environments. Every sound, smell, touch, spatial orientation, and image Johnny relied on to remember has been stripped out, with one exception. The text representation of the knowledge has been retained. Is the text representation of his rich learning environment sufficient for him to remember? (And here is the real point.) We aren't sure. After all the theories and all the experimentation has been examined, the fact remains that this question has very little pertinent experimentation one can reference. Designing the experiments necessary to answer this question would have been all but impossible until just a few years ago. Now, however, it is possible to design and implement experiments which would provide real answers to this question instead of relying upon unsubstantiated theoretical frameworks. An accurate assessment of student learning is too important to rest upon guesswork. Practitioners and researchers in the field need to investigate and find real answers. If student achievement changes with test modality then the surety with which we treat standardized test results is a sham and a disservice to the students and parents we are attempting to help.

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