DR K-12 Reflections – STEM, Language, Experience, Learning, and Life in the Modern World[1]
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Hearing Jim Gee talk is always a treat. As one colleague said: "I always come away feeling both inspired and doomed." Jim thinks, or at least speaks, differently than most people I know. He is willing to look our world's problems right in their face, outline all the ugly and fear-inducing truths in our lives…and then provide a totally different way of looking at these issues.

In his session at the 2016 DR K-12 PI Meeting, Jim painted a pretty dire picture of the state of our world and the state of science education in the US. He linked these two, noting that the type of thinking needed to provide solutions for our world's biggest problems requires scientific thinking – something that is scarily on the decline (and even objected to) in the US today. And something at which, he argued, our schools are failing to promote.

He also explained that well designed experiences for learning must engage the learners' affect. In other words, the learner must care about the experience. They should focus on an action or problem from which the learner can build an expectation or hypothesis, there should be a feedback system that helps the learner assess the outcomes of the action in terms of their hypothesis, and they must provide some way of managing the learner's attention.

Jim seeks well designed learning environments and has found them in many digital games. Well, not always in the games themselves, more in the affinity spaces that surround them. He argues that digital games provide many elements of good design for learning environments and also provide rich opportunity for negotiation of language to make meaning. By studying the interactions in the user groups and social media sites surrounding multi-player games like World of Warcraft (WoW), game-based learning researchers have observed knowledge building behaviors that rival formal education programs, and many times these programs are reaching kids who are disengaged with school (e.g. Steinkeuhler & Duncan, 2008).

In this session, Jim emphasized the contextual underpinnings of any learning experience, giving examples to illustrate how much language and situation can impact meaning for different individuals. He explained how when we use a complex term, such as "democracy," we bring our own preconceptions of that term, along with our skills and biases, to how we choose to parse its meaning in a sentence. The nuance of any term or phrase may be implicit in the context of a

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[1] The plenary session *STEM, Language, Experience, Learning, and Life in the Modern World* took place on June 2 at the 2016 DR K-12 PI Meeting and was led by James Paul Gee.

particular situation, and teasing out that nuance is a skill that requires expertise and even still can be subjective.

For DR K-12 educators, I think the most relevant take-away from Jim's talk is to look for learning where you least expect it. Find the environments that are engaging youth and leverage those environments to support and measure STEM learning. Don't use the limitations of contextualization as a reason to avoid reaching learners where they are most engaged.

Our work at [EdGE at TERC](#) builds directly from this message. We use digital game environments where learners *choose* to dwell, and underlay those environments with rich opportunities to build implicit understanding of STEM phenomena. By keeping the games free of any formalisms or "teaching" language, we let players' behaviors with the phenomena guide their learning. The games provide feedback realistic to the scientific problem, and the player learns by grappling with the game.

Clearly, in order for game-based learning to be productive, it should transfer to something useful in the learners' life outside the game. Much of what happens during gameplay (be it within the game or within the affinity space) could remain implicit learning, learning that is not expressed formally by the learner. Methods are needed to recognize the skills and knowledge that is built in games as well as to build game-based learning assessments that teachers can use to help bridge to useful, "real-world" skills and knowledge. Teachers could be a key vehicle in bridging from implicit, game-based learning to explicit learning, if armed with information about what their students are learning in games.

Over a decade ago, Jim set the stage for the game-based learning assessment field by famously saying "No one gives someone who has finished Halo on the hard difficulty level a Halo test after they have won the game." Val Shute coined the term "stealth assessment" to describe assessments of knowledge and skills that were so embedded in the activity that the learner didn't even know they were being assessed (Shute, 2011; Shute & Ventura, 2013; Shute, Ventura, Bauer, & Zapata-Rivera, 2009). Putting these ideas together, a growing community of educational data mining researchers are building sophisticated and innovative analytics to use the vast logs of digital "clickstream" data generated by games—logs of every player action and associated game state, tagged with a timestamp and PlayerID.

Now, game-based analytics are allowing researchers to see the patterns of behaviors learners exhibit in game spaces much like Amazon or Facebook analyzes consumer behaviors. This provides a powerful formative assessment tool that shows promise for measuring learning at a more implicit level and from a broader range of learners than ever before. With tools like this, Jim's suggestion of distributed teaching systems —where learning and interactions that take place in game can be leveraged for other learning experiences—are becoming a reality.

References

Shute, V. (2011). Stealth assessment in computer-based games to support learning. In S. Tobias & J.D. Fletcher (Eds.), *Computer games and instruction* (pp. 503-524). Charlotte, NC: Information Age Publishers.

Shute, V., & Ventura, M. (2013). *Stealth assessment: Measuring and supporting learning in video games*. Cambridge, MA: The MIT Press.

Shute, V., Ventura, M., Bauer, M., & Zapata-Rivera, D. (2009). Melding the power of serious games and embedded assessment to monitor and foster learning: Flow and grow. In U. Ritterfeld, M. Cody, & P. Vorderer (Eds.), *Serious games: Mechanisms and effect* (pp. 295-321). Mahwah, NJ: Routledge, Taylor and Francis.

Steinkuehler, C., & Duncan, S. (2008). Scientific habits of mind in virtual worlds. *Journal of Science Education and Technology, 17*(6), 530-543.