Team Up 4 Anything: Case Study 1

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Summary

Michael Bishop was a university researcher that created educational science computer games for K-12 students to increase engagement through scientific inquiry. After an unexpected collaborator withdrew from this project, Michael experienced difficulty in finding a replacement classroom to pilot the game *Rigglefish*. The case study *Implementing Gaming Technologies in Traditional K-12 Contexts* narrates Michael's interactions with various educators in an effort to continue his project and advice he sought out to appeal to school system administrators. Below is a preliminary analysis of Michael's struggles to implement *Rigglefish* in regular middle school classes, followed by insights to inform future educational game design decisions.

Preliminary Analysis Questions

1. Identify the different *barriers* Michael encountered when he tried to convince school district personnel to implement the games in middle school classes. What *questions* do you think educational game designers must consider when designing a game for K-12 contexts?

Michael had no luck while trying to convince the school district personnel to implement *Rigglefish* in middle school classes. One of the biggest concerns that the administrators, teachers, and colleagues had was that the game takes too long to play, considering the importance of preparing students for standardized tests. Administrators expressed that "we can't afford to have our kids spend time playing games, even ones that are supposed to be educational" (Ertmer et al., p.12) and they have to dive into deep lessons in a short amount of time. The assistant superintendent, Jim Harrington, brought up a point that potential bugs in the game could slow down the learning process and bring the game play to a "screeching halt"

(Ertmer et al., p.15). The administrators also questioned whether Michael's game would improve student's standardized test scores.

School district personnel were concerned that it would take too long to train the teachers as well; if half of the students get confused and their teacher isn't trained properly to help a student when they get stuck, then it defeats the purpose of the game. Michael's goal was to get students to navigate the game independently and engage in problem solving, reasoning, and information processing. The assistant superintendent, colleagues, and administrators also had suggested that Michael should add checkpoints and small tests to the game to make sure the kids are interpreting and understanding what they are learning in the game. While adding questions to the game may appease administrators, Michael was advised by game designer Bob Blanchard that it would break up gameplay and likely kill student motivation.

Questions educational game designers must consider when designing a game are as follows:

1. How much time can be dedicated to games in the classroom?
2. Can the games be played at home? Do students have devices for this?
3. What else / how else are students learning?
4. Do students already play games? If so, what type?- you could research educational games already in use
5. How can I make this easy for teachers to implement?- how can you train the teachers? Admins?
6. Is Michael's design in line with cognitive and/or constructivist learning theories?

2. What *arguments* could Michael make to convince school administrators and teachers about the potential *benefits of education games*?

Michael made a concerted effort to engage stakeholders in the vision of instruction early in the process, an essential element of instructional design (Reigeluth, 1996). While he did cite

National Assessment of Education Progress (NAEP) evidence that games have a positive impact on both higher-order thinking and test scores, he could bolster this argument with a greater breadth of research (Ertmer et al., 2019). He might also benefit from reframing his proposed solution for his intended audience.

Learning Theory and Instructional Design Theory Support. Michael's game aligns with both the tenets of cognitivist learning theory: (1) meaningful instruction that builds on existing knowledge to facilitate acquisition of complex problem-solving skills, and (2) constructivist learning theory principles that allow students to create meaning from a realistic challenge in a collaborative environment (Ertmer & Newby, 2008).

Michael could reference many instructional design (ID) theories that build on cognitive and constructivist learning theories to demonstrate the ways that his game aligns with these evidence-based methods of instruction.

Jonassen's ID theory emphasizes that "learners assume ownership only if problems are interesting, relevant, and engaging." Michael can readily demonstrate that his game meets these criteria (Merrill, p. 46).

Problem Based Learning (PBL) elements are also demonstrably present. Michael's game requires an extended time commitment to an authentic, engaging, and complex question (Buck Institute for Education). The key elements of group work, self-directed learning, critical thinking, and self-reflection are all present in the design. Michael should make it clear that his game aims to promote deep understanding of the material and foster higher-order critical thinking skills, which is the goal of PBL (Reiser & Dempsey, 2018).

As his colleague Antonia stated, engagement ought to be the objective. Students should come out of school with the well-established practice of demanding evidence for claims others make and should be able to critically evaluate if that evidence is biased or unbiased (Ertmer et al., 2019). All theories of learning support active participation and interaction, practice, and cooperative groups to facilitate engagement (Merrill, 2002). Michael's game meets these criteria, and he might benefit from pointing this out specifically.

Reframing. While the advisory board members were averse to a "game," perhaps reframing the proposed tool as an "interactive activity" might garner greater support.- Perception is key to acceptance of an idea.

It is essential to assess the application environment of any proposed instructional design project. This includes the level of management support and any predetermined notions they might hold (Rothwell et al., 2016). Perhaps using terminology more familiar to a K-12 environment would foster stakeholder buy-in.

3. *Why* does Michael feel so strongly about *not* putting the game in an after-school program? Discuss the *pros and cons* of Michael's decision.

The case made very clear that Michael's intention for building the game was to assist general science classroom audiences. He does not feel that putting it in any other situation would prove his use case and provide him the data he needs to continue to push the project forward. As Reiser and Dempsey (2018) assert, constructivist teaching methods are historically tied to privileged groups that have the resources and time to devote to innovative practices.

Pro: everyone should have access to the innovative tools

- He will get a feel of how the students respond to the game and see if teachers have a real understanding.
- He can see if the games have any bugs and take note any off-task behavior.

Con:

- Less likely to get game adopted by schools as-is
- Michael could benefit from working out the bugs in a smaller group and making that distinction early on means that he is missing out on valuable feedback. This does not need to be from students in special programs and it may be possible to put out a general call for volunteers interested in piloting the game.
- The research project demands time not only for gameplay, but also for student pre-tests, surveys, and interviews. That component alone may make it unrealistic for the average classroom setting and Michael may need to be more flexible.

Implications for ID Practice

1. What *characteristics of middle school learners* must designers consider when planning educational games? Provide specific *examples*.

As the Stanford d-School process guide dictates, design thinking should begin with empathy. The instructional designer should ask what learners will consider important, how they want to engage with content, and how they might choose to demonstrate learning (Holland, 2016).

As the experienced instructional designers Stolovitch and Keeps (2011) state, the mantra of any instructional designer should be to ensure their product remains learner-centered and performance-based. We must assess the characteristics of our learners to accomplish this goal.

Learner-Related Characteristics. As Rothwell et al. (2016) states, it is important to ascertain the baseline knowledge, skills, and attitudes of our learners.

What previous experience with technology and computer games do these middle-schoolers possess?

What support systems are in place - within the school, the home, and broader community?

What cultural attitudes might affect their receptivity to the game? – this is very important, it would be included in research process of learning about the target audience

What level of math and science comprehension have they currently attained?

As it may be impossible to fully establish instructional prerequisites, trial and error will test assumptions about our middle-schooler target audience, allowing game modifications to follow (Rothwell et al., 2016). This may involve more thorough student-facing instructions within the game itself to make it more inclusive and effective.

Erikson's Stages of Development. Depending on the grade-level, a typical middle-schooler might fall into Erikson's fifth stage of Psychosocial Development: "Identity vs. Role/Identity confusion." In this stage, the child seeks to establish who they are within the context of their past experiences and societal expectations (Orenstein, 2021). As the implementation of this game involves a great deal of collaboration, the "guide on the side" instructor should be conscious of the vulnerability a middle schooler might experience when tackling new challenges in a public environment. The instructor should model empathetic behavior, as well as provide encouragement and correction of social behaviors when appropriate.

2. Identify the *different contexts* in which an educational game might be played and how those *contexts affect design decisions.*

As expressed by Ertmer and Newby (2008), context matters, and learners must be placed in the real context in order to learn (p.63). Transfer is facilitated through authentic tasks anchored in meaningful contexts, (p.64, Ertmer & Newby), as demonstrated in Rigglefish, an interactive game where students play the role of the scientist. In the case study, the game appears to be targeted primarily to students playing in a group classroom environment. The designers might consider consciously integrating individual play, though this may already be the case. This would allow for independent acquisition of knowledge that could subsequently be defended in a collaborative, social context.

Is the game single user, go at your own pace? In this case, the designer could focus on the characteristics of individuals in that environment. Implementing difficulty levels would reach more learners and provide more data for the study. One could customize this game to include the user's information to make it more relational. This type of game would also need to provide individual reporting to staff and administrators.

Is this game intended for group use? Problem based? If this is the case, one would tailor the game toward collaboration and outcomes. Are there supplemental materials? Should we build breaks in the game? These are both possibilities with this time of use case. Measuring success would be through qualitative analysis and evaluation of activity due to the game.

Is this a timed, in-person activity in class? Mini games could be created and played in an appropriate amount of time, depending on length of classes and other lesson plans. The case study gave the impression that students played the game, and only the game, in their science classes. When Tara says it takes "over a week to play" a game, it is unclear how often students are in the class to play.

Tara decided with the superintendent that they "need to double down on essential skills and knowledge and that we can't afford to have our kids spend time playing games, even ones that are supposed to be educational" (p.11). Tara is worried about wasting time to prepare her soon-to-be eighth graders for their science proficiency test.

Is this game used in conjunction with another material? This would make designers have to think about flexibility when material changes. We would need to think through the capacity of staying in lock step with materials. Is the game being used to measure competency? If so, what's the best way to do that? Do we need to have the educators trained on the game? Does that require us to build an alternative profile?- all of this would require an extensive development stage, it would have to include teachers, admin and the standards- this alone indicates that successful implementation of this game would require far more access and collaboration

3. How can teachers *assess* student learning through educational games?

As Reiser and Dempsey (2018) admit, it is hard to measure the benefits of constructivist teaching methods. However, they lead to “broader outcomes - a competent, confident problem-solver who loves the subject matter” (Reiser & Dempsey, p. 64). It is the role of instructional designers to strive to develop these measures. There may be fun, clever ways to integrate these questions that don’t entail an abrupt halt in gameplay, addressing the advisory committee’s concerns that such questions would “kill motivation” (Ertmer et al., p.18),

Options:

- Check student statistics: Incorporate game mini-goals or checkpoints (stars) that are tracked by the software and auto-sent to an instructor portal.
- Watch them play or screen record to see what they do and learn from them.
- A simple pop-up with a choose your own adventure prompt, where their choices serve as assessment markers.
- Discussion: ask students what they did to solve specific problem(s) and why. Use FlipGrid or video forum rather than written response or sharing live verbally.

4. How are the factors affecting the adoption of a game in this case similar to or different from efforts to introduce other innovations (e.g., problem-based learning, mobile devices) in schools?

Though standardized tests aim to identify failing schools and students in need of support, they also lead skepticism in the face of educational innovation and any changes tend to be slow, much like Michael’s experience. It is ironic that Michael needs the very data he is trying to collect in order to gain support for a broader adoption of the game, much like a recent college graduate not getting a job due to lack of experience. Our current paradigm of education and training focuses on ‘standardization’ rather than ‘customization.’ (Reigeluth, p.18). Standardization “allows for valid comparison of student abilities,” but this is a model for efficiency rather than effectiveness (Reigeluth, p.18). Preparing students to be independent problem solvers demands a shift in thinking regarding our evaluation strategies.

Cohesiveness of curricula and fairness to faculty affect decisions to embrace change. Science coordinator Laura Kenner expressed that if they were to “allow a few teachers to do something different… everyone would be asking to bring in their pet projects” (Ertmer et al., p. 12). Her colleague Daniel followed with the need to “limit how much time our science classes use computers” otherwise “the other teachers and students would complain” (Ertmer et al., p. 12).

Budgetary and resource constraints can heavily limit educational innovation. Students cannot play the game if there are not enough classroom computers for the whole school to share. Even if the resources are available, instructors need intrinsic motivation to effectively facilitate new methods, especially given the considerable time and investment in making a change to their curriculum or lesson plans (Reiser & Dempsey, p. 289). Jim Harrington, an assistant superintendent that Michael consulted with, stated “We’ve had university folks come into our schools before [to] try out new materials and approaches. But not all of them are ready for prime time. [Bugs in the game] could bring a class to a screeching halt… We just can’t spend that sort of time on research.” (Ertmer et al., p. 15)

Conclusion

Time seems to be the common, underlying factor in the above elements that affect the introduction of new tools in the classroom. Learner-based instruction takes considerably more work at the beginning, especially if the change is systematic. However, if executed well, the results of learner-empowerment and self-directed learning can justify the means. Implementing innovative educational practices is a high-risk, high-reward proposition. These undertakings require significant preparation *before* implementation. Skeptical administrators have full schedules and limited budgets, making them more likely to stick to the systems in place. Until they are convinced that innovations will improve standardized test scores, or until the paradigm of standardized testing itself is challenged, even evidence-based educational practices will be slow to implement, if adopted at all.

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