Virtual Cognitive Apprenticeships to Fill High School to College Knowledge Gap

Introduction

Expecting 17 and 18 year olds fresh out of high school to know what they want to do with the rest of their lives is a tall task. Most high school courses, in the U.S. at least, are a “mile wide and an inch deep,” to borrow a phrase, making it difficult for students to know with much certainty what a career in a given field might actually look like.

Once they start college, students meander through general education courses with the supposed goal of exploring their options and different career paths, but most still have no clue what they want. According to the National Center for Education Statistics, in the 2007-2008 academic year, less than half (44 percent) of first-time bachelor's degree recipients completed their degree within the standard 48 months of their initial postsecondary enrollment.

Part of this delayed path to graduation stems from difficulty choosing a major. According to Gordon & Steele (1995), an estimated 20 to 50 percent of students enter college as “undecided” with respect to their major, and an estimated 75 percent of students change their major at least once before graduation.

As Freedman (2013) writes, “choosing a major is a choice that should be intentional and based on knowledge of one’s self… when the wrong choice is made, the implications can be harsh” (Introduction section). Harsh, indeed. The results of this “5th year senior” (or longer) effect have been well-documented: Americans now owe well over $1.2 trillion in student loan debt, spread out among nearly 44 million borrowers.

Making informed decisions with respect to one's major would set students up for a much more successful life; avoiding suffocating student loan debt is only one example. Freedman (2013) notes that even "'decided' students are not necessarily basing their decision of major on factual research and self-reflection" (Facts and figures section). Citing a College Student Journal survey of more than 800 students who were asked to elaborate on their career decision-making process, Freedman (2013) writes, "the study ultimately implied that students are choosing a major based on influence and assumption rather than through an understanding of their own personal goals and values." Anecdotally, according to a 2006 Canadian study, having a major close to one's personality more accurately predicted overall grade-point average (GPA) after five years than ACT scores (Jones, 2014).

The crux of the problem is thus: "the common four-year curriculum path colleges and universities use assumes that students enter college prepared to make a decision regarding major and, ultimately, career path. Unfortunately, the reality is that students are most likely not developmentally prepared to do so," explains Freedman (2013, The development of traditional first-year students section). This paper argues that to solve this problem, the development of virtual cognitive apprenticeships accessible to every graduating high school senior would go a long way towards reducing the number of postsecondary students who switch majors, the amount of time it takes students to graduate, and subsequently the amount the amount of debt students are racking up, while simultaneously increasing overall academic and professional success.

Current Literature

“Although research in virtual multimedia environments using components of cognitive apprenticeship is limited, the results from a few existing studies are promising,” writes Ramdass (2012, Learning in a virtual environment section, para. 2).

One such study was detailed in *Science games and the development of possible selves* where Beier et. al (2012) concluded: “the opportunity to explore a virtual scientific environment helped [players] develop a sense of agency and self-efficacy that might manifest in the development of their possible selves. In sum, virtual experiences with games may shape players’ ideas about what they hope for, expect, and fear about their future, and their ideas about the strategies that they need to follow to achieve their goals” (Implications and potential use of a scientific possible selves measure section, para. 1).

Bouck et. al (2008) used a web-based instructional environment called Virtual History Museum (VHM) to apprentice students with high-incidence of disabilities into the discipline of history. VHM’s constructivist concept enabled the teaching and learning of this domain to be closely linked to the authentic nature of what actual historians do – i.e “to engage in authentic activities of historians, to analyze primary sources, and to share their written work in a public space with peers” (Bouck et. al, 2008, p. 33). “Students’ written responses, interviews, and classroom discussions indicated an emergence of multiple perspectives and apprenticeship into the role of historians,” writes Ramdass (2012). Whether or not these students choose to further pursue a career as a historian in the future, they would at the very least be prepared to make an intelligent decision rooted in self-interest on the matter, and not one "based on influence and assumption."

There have also been a small handful of other subject-specific studies such as the one done by Saadati et. al (2015) that utilized an internet-based Cognitive Apprenticeship Model, which they called "i-CAM." They sought to evaluate i-CAM's effectiveness at improving statistics problem-solving among postgraduate students. Compared to conventional mathematics learning models, their results showed that i-CAM could significantly promote students' problem-solving performance, further evidence of the power of virtual cognitive apprenticeships.

Across the board, virtual cognitive apprenticeships have been shown to produce great results in learning, engagement, and future self exploration. The question now is: how can we apply these findings in great scale for all graduating high school seniors to improve academic and professional success?

Application

To dig into the application of our proposed post-high school/pre-university virtual cognitive apprenticeships, let's break down the importance of each component: cognitive apprenticeships and eLearning.

Why Cognitive Apprenticeships?

Cognitive apprenticeships come from the situated cognition learning theory. To understand the core of situated cognition, it helps to contrast the theory to the objectivist tradition. "Objectivism is the view that… knowledge is thought to exist independently of learners, and learning consists of transferring that knowledge from outside to within the learner” explains Driscoll (2005, p. 387).

Situated cognition, then, is the view that knowledge does *not* exist independently from the learner and is completely formed from an individual's personal life experiences. Or as Driscoll (2005) phrases it, “knowledge is constructed by learners as they attempt to make sense of their experiences” (p. 387).

Educational psychologists like Brown et. al (1989), Driscoll (2005), and Vygotsky (1978) described cognitive appreticeships as “communities of practice.” “To talk about academic disciplines, professions, or even manual trades as communities or cultures will perhaps seem strange,” writes Brown et. al (1989, p. 33). “Yet communities of practitioners are connected by more than their ostensible tasks. They are bound by intricate, socially constructed webs of belief, which are essential to understanding what they do. The activities of many communities are unfathomable, unless they are viewed from within the culture.”

Indeed, one of the primary implications of the situated cognition learning theory for instruction is that learning goes far beyond the boundaries of brick-and-mortar school walls (Driscoll, 2005).

Brown et. al (1989) continue: “Activity and situations are integral to cognition and learning,” and “by ignoring the situated nature of cognition, education defeats its own goal of providing useable, robust knowledge” (p. 32).

General education college courses are an example of education ignoring the situated nature of cognition, and thereby defeating its own goal. Students are not gaining relevant and applicable knowledge and experience when they take Psychology 101 or Introduction to Macroeconomics; they are not prepared to make an informed decision if this is a field they can spend the rest of their lives in.

Cognitive apprenticeships, on the other hand, embed “learning in activity and make deliberate use of the social and physical context [that] are more in line with the understanding of learning and cognition,” (Brown et. al, 1989, p. 32). Students in these communities of practices acquire precisely the knowledge and skills they need to become professional historians, economists, or scientists.

In short, cognitive apprenticeships help develop vital experiences of a discipline. Without such opportunity, disciple-specific knowledge communicated out of situation, in a classroom, for example, will prove fruitless (Oriol et. al, 2010).

While cognitive apprenticeships have certainly been around for a long time, most notably in the form of internships, these typically occur in a student's third or fourth year of undergraduate studies. A change of course at this stage of one's education, should their internship prove to be unfulfilling and not at all the career they want to pursue, would result in serious delays in graduation, only further adding to the problem of student loan debt.

I argue, then, that cognitive apprenticeships and internships would better serve students before they even start college, so that from the moment they arrive on campus they have a much clearer path to a future career.

Why eLearning?

So how would an online delivery system of cognitive apprenticeships work?

Ramdass (2012) provides some insight: “Computer-based simulations can be designed to capture some key elements of cognitive apprenticeship, such as modeling authentic tasks to students, providing expert guidance, giving feedback in real time, fading support, and assessing comprehension immediately on posttests and transfer tasks” (Learning in a virtual environment section, para. 1). Quoting Roger Schank, Ramdass continues, “advances in computer technology such as computer simulations have enhanced the potential for ‘learning-by-doing.’”

Modeling authentic tasks to students, providing expert guidance, giving feedback in real time, fading support, and assessing comprehension immediately on posttests and transfer tasks -- these are the core elements of our virtual cognitive apprenticeship program.

1. Modeling authentic tasks to students: Our eLearning platform will bring on subject matter experts from every major field of work or industry. These experts will help us craft their “typical day” or a variety of scenarios they find themselves in. They will also provide more general, but still important, details such as:
    - Do you work in a dark lab, bright office, or outdoors?
    - How often do you interact with people during work hours?

    - What cities are jobs in your field located in?
2. Providing expert guidance: Our platform will facilitate chats with real professionals in the field -- both by text and by video. Regardless of where you are in the world, we can find a 15-minutes time frame for a professional and a student to be on a Skype or Google Hangout call together.
3. Giving feedback in real time: While feedback on job performance is certainly the main idea here, we can also provide instant feedback on the quality of life one would have with a given professional. Financial considerations are an important part of career choice and given readily available statistics, we can show users what kind of housing they can and can't afford, what kind of car they can buy, if they can afford to go on vacation, etc. Financial responsibility can also be incorporated into gameplay in this way.
4. Fading support: Collins et. al (1987) proposed six steps within cognitive apprenticeships: modelling, coaching, scaffolding, articulation, reflection, and exploration. After showing the user the tasks that need to be accomplished in a given day, they will be given more responsibility and be expected to perform in line with job expectations.
5. Assessing comprehension immediately: Certainly one of the biggest advantages of online learning environments is the ability for instant grading and feedback. Tests will include job-specific knowledge as well as questions on the importance of choosing a major inline with one's interests.

All of this can live in a *SimCity*-like environment where players create an avatar and live their life as a post-college professional. You wake up, go to work, earn money, spend money, start a family, make career advancement decisions, raise kids, move cities, go on vacation, buy a home, etc. Like the online game *SimCity*, time is accelerated so that a 24-hour day may only take 2 or 3 hours, but there is enough detail in the game, and especially at the office, for users to understand exactly what is involved in their chosen career path.

This delivery mechanism would achieve Saadati et. al's (2015) call for innovation in content delivery: "Many different LMSs (such as Moodle) are used in the teaching and learning process, but there is a lack of innovation to adopt effective instructional approaches on these learning platforms. Hence, the need exists to begin using these technological platforms or LMSs in new ways in order to advance beyond what is currently possible in the classroom" (Introduction section, para. 3).

Conclusion

"Present day schooling is a far cry from this apprenticeship model," writes Honebein et. al (1993). General education in high schools and universities is falling short because, in reality, concepts "are much more like perceptions than they are like rule-defined categories" (Bereiter, 1991, p. 13). Classroom education is far too rote and rule-defined to provide students a genuine understanding of the the situated perceptions they will develop as professionals in a given field. To gain this missing component, students need to learn directly from in-the-field professionals. To achieve this on a massive scale, innovative eLearning can be deployed.

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