To Be or Not to Be an Online Math Instructor?

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"Would you be willing to teach an online course of Algebra 1 next term?"

Have you been asked this question yet? If not, it is just a matter of time before you are queried. A growing need exists for teachers of online courses. The numbers of individuals enrolling in online courses is steadily increasing. For example, the "2008 Sloan Survey of Online Learning," supported by the Alfred P. Sloan Foundation, found that about 3.7 million learners enrolled in accredited, degree-granting institutions in the United States took at least one online course (as cited in Alfred P. Sloan Foundation, 2015). In a ten-year study, Allen and Seaman (2013) found that online enrollment as a percent of total enrollment rose from 9.6% in 2002 to 32.0% in 2011.

As enrollment grows, so too does the number of teachers being asked to teach online. As Palloff and Pratt (2013) note, "online learning has become ubiquitous" (p. 4). Moreover, your chances of being asked to teach an online course (on any subject) greatly increase if you are an adjunct or part-time instructor. Many tenured and other full-time faculty have not joined the growing number of online instructors, for a variety of reasons from workload to resistance (Bedford, 2009). Institutions have turned to adjuncts to meet the need, and most online faculty are adjunct faculty (Shattuck, Dubins, & Zilberman, 2011).

Data Quiz 1: How many students?

In 2011, how many students in degree-granting post-secondary institutions took at least one online course?

(a) 6,714,792

(b) 3,749,298

(c) 1,945,218

So what will your answer be—regardless of whether you are tenured or adjunct, full-time, or part-time? Is it "Sure, sign me up," "Not on your life," or "Let me get back to you on that"? The best answer is one in which the relevant factors have been thoughtfully considered. But do you know what all the relevant factors are? The purpose of this article is to discuss factors to keep in mind when preparing to respond to the question. In what follows, we offer some background and then give seven self-assessment tasks. You can rate yourself on each of the seven criteria to get a sense of your readiness for success each time you find yourself facing the question "Will you teach math course *X* online?" Throughout, *online course* is a generic term that applies to any course in which the majority of interaction with students is digitally mediated. This can range from an entirely synchronous course where the class gathers at the same time (live) in the same virtual room, to an entirely asynchronous course where no real-time interaction happens between instructor and students or among students.

Data Quiz 2: Institutional role of online education.

What percentage of institutions view online education as a critical component of their long-term strategy?

(a) 93% (b) 69% (c) 43%

Let us start with the major assumption underlying this article: online teaching is different from face–to–face teaching. Although the two have much in common, they are not the same. Necessary skill sets, roles of technology, intellectual property concerns, structure, and management present different issues and challenges for online teaching. The relevant factors discussed in this article are based on the foundational

The data in the boxes in this article were taken from *Changing Course: Ten Years of Tracking Online Education in the United States* (Allen & Seaman, 2013). This report tracks the opinions of chief academic officers regarding fundamental questions about the nature and extent of online education. Answers are at the end of the article.

tenet that while competent online teaching has outcomes similar to competent face–to–face instruction (students learn), the mechanisms and skills sets for instruction differ in several ways.

Although research about online teaching is still in its infancy, some data and much expert advice support the idea that a substantially different approach to teaching is needed. At the core is a shift from traditional teacher-centered transmission of knowledge through lecture to a set of learner-centered strategies. Weimer (2002) summarizes the difference: "Being learner-centered focuses attention squarely on learning: what the student is learning, how the student is learning, the conditions under which the student is learning, whether the student is retaining and applying learning, and how current learning positions the student for future learning" (p. xvi). What is more, Yang and Cornelious (2005) have highlighted that effective online teaching is more than "uploading teaching materials, receiving and sending e-mail messages, and posting discussion topics onto the Internet" (p. 7).

Data Quiz 3: What makes it an *online* course?

According to the standard in the field, what percentage of a course has to be online before it can be called an online course?

(a) 95% (b) 80% (c) 51%

While it is beyond the scope of this article to delve deeply into the differences between teacher-centered and learner-centered education, there are some distinctions worth noting in the particular context of online instruction. In online instruction, the role of the mathematics instructor, for example, shifts from presenter of mathematical facts, procedures, and strategies to facilitator of learning. In other words, instead of being the primary voice and a nexus through which discussion happens or questions are answered, the teacher facilitates student engagement in a variety of activities that scaffold students to explore the content both independently and with others, to build skill at clear communication by working with at least one other student, and to deepen knowledge and understanding of what mathematics to use and when to use it. In teacher-centered instruction, the role of faculty is to monitor coverage, to make sure students have seen topics. In learner-centered online instruction, the focus is on students completing tasks that are carefully aligned to mathematics learning objectives. Assessment in teacher-centered contexts is used to document student achievement while in good online instruction, assessment serves the additional purposes of diagnosing students' challenges and using the information to inform instructional planning. The point is that online mathematics instruction requires a different approach. It is one that is more in line with a learner-centered view.

Data Quiz 4: Views of online education's value.

What percentage of chief academic officers believe their faculty see the value of online education?

(a) 76% (b) 44% (c) 30%

If online instruction is substantially different, then it follows that not every face–to–face teacher is necessarily a good candidate for becoming an online instructor—at least not without developing new skills. Current research suggests that skills required for effective online teaching are different enough from face–to–face instruction to warrant separate study and guidelines (Smith, 2005; Southern Regional Education Board, 2006).

In response to the pleas of instructors and administrators, the Southern Regional Education Board developed *Guidelines for Quality Online Teaching* (2006). The guidelines cover three major areas of instructor development: (a) academic preparation in the subject, (b) skills and temperament for instructional technology, and (c) online teaching and learning methodology, management skills, and delivery. Similarly, the International Association for K–12 Online Learning (iNACOL) published *National Standards for Quality Online Teaching* (2011). Though developed for K–12 teachers, these standards are worthwhile for the postsecondary instructional environment. In particular, the online standards provide a self-assessment for instructors on the professional knowledge and understanding called for in online teaching.

Those who work extensively in preparing effective online instructors have taken on the task of identifying associated roles and competencies. According to one research group, online teachers have seven roles: process facilitator, consultant/counselor, assessor, researcher, content expert, technician, designer, and manager/administrator. Building on that work, Smith (2005) identified 51 different competencies. Of these, 18 are needed prior to teaching a course, 25 during the course, and eight after the course is complete. The collection of 51 competencies embody a mix of knowledge, skills, attitudes, and values. In related work, Bigatel (2012) had teachers experienced in online instruction rate 64 items as to relative importance. Data indicated that the participants thought all of the competencies were important, with the three highest being active learning, administration/leadership, and active teaching/

responsiveness. Palloff and Pratt (2011) have authored an entire book, *The Excellent Online Instructor*, in which they explore the characteristics of effective online instruction in detail.

A recurring theme in the literature is that not everyone should be an online teacher—either because of internal factors (such as teaching style or readiness for change) or external ones (such as absence of appropriate professional development or insufficient preparation time). So, when the question comes to you, what do you say? Here are seven factors to consider. Read each one and rate yourself according to the guide following each factor.

Factor 1. Have you taken an online course yourself?

Experience helps a great deal. Before deciding to teach an online course, make sure you have taken one; it may be the most critical qualification. Being an online student gives you insight into being the recipient of online instruction. As an online learner, you will encounter a number of issues. What is your relationship with your instructor? How are you at scheduling your time for study and online discussion? How much interaction are you able to have with your fellow students? What do you do if (when) your software fails to function properly? Seeing what works and does not work for you as a student helps you envision the kind of learning environment you want for your own students. As one instructor–in–training said, "Being in the student role made me look at both sides of a situation. Did I, as a student, learn something from the exercise? Would I, as an instructor, get valuable feedback from this exercise? If it does not meet both criteria, it must be changed" (Shattuck & Anderson, 2013, p. 6).

Factor 1 Self-Assessment.

This one is relatively easy to assess. Have you taken an online course?

□ Yes □ No

If No and you are still interested, find a useful online course for yourself (e.g., how to teach online) and sign up.

Factor 2. Are you ready to make a big change?

Shattuck and Anderson, (2013) point out that "moving from a campus-based to an online learning environment can be a discombobulating experience that can make instructors question what they feel they know as truths about teaching and learning" (pp. 7–8). This can be a major shift for instructors, one that some may not be prepared for or interested in negotiating.

We know that there are two aspects of this change: the rational and the emotional. The major thrust of this article is the rational: here are the factors, analyze the pros and cons, and decide. However, we do not want to leave out the emotional. What will it feel like to change your teaching? What is the impact of being a beginner as you learn new skills? How will online teaching change the impact you have on students?

Changes that affect self-confidence, sense of control, comfort, or perceptions of competence are more difficult and almost always generate some measure of reluctance—even when the change is something we really desire. Are you ready to embrace being "discombobulated" for a while?

Factor 2 Self-Assessment.

This factor is much more difficult to assess because of its subjective nature. Try asking yourself this one question as a proxy: Do you handle professional change well?

□ Yes □ No

If yes, press on. If no, and you are still interested, look for a supportive community for those new to online instruction, such as might exist on campus in a Center for Teaching and Learning or Educational Technology program.

Factor 3. Is your teaching style compatible with online instruction?

You are a great lecturer: superb content, humor, engaging style, glowing evaluations; your students adore you. Unfortunately, these characteristics do not translate well to an online environment. Decisions "about who should teach online are often based on faulty criteria: it is usually either someone who is considered a content expert or is deemed entertaining in the face–to–face classroom" (Palloff & Pratt, 2013, p. 23). If you see teaching and performance (e.g., presenting ideas to students) as one and the same, online instruction may be a real stretch for you.

Palloff and Pratt go on to say that a good candidate for online instructor sees the value in loosening the reins on control of the learning process, uses collaborative-learning strategies, values personal interaction among students, contributes real-life experiences and examples, and has a habit of reflective

practice. Online instruction builds student learning and, by its very nature, does not accommodate or support the classic *sage on the stage* approach to learning. Not to denigrate an instructional strategy that has been around since Socrates, but it just does not fit modern day technology.

A theme related to style that emerged from six interviews with online instructors conducted by the authors was the loss of relationship that normally builds as an instructor interacts with each student in a face–to–face setting. The instructor can read students' reactions, spot problematic conceptions, and prompt for and answer students' questions immediately, all of which can be lost online, particularly in an online instructional setting that does not include shared video feeds. Palloff and Pratt (2013) suggest that instructors "need to assess the tricks of the trade that have served them well in motivating students…in order to find those that might work online as well" (p. 149). Additionally, they stress that when an instructor cannot see a student, nothing should be left to chance or assumption: "instructors need to stay actively involved, diagnose problems as they occur, and seek solutions to keep the course moving and students motivated" (p. 149).

Factor 3 Self-Assessment.

This is a double whammy.

(a) Can you adapt?

□ Yes □ No

(b) Are you willing to adapt?

□ Yes □ No

This is where a little advice from your friends may help. How do they view your ability and willingness to make the transition? Ask those who will give you a candid answer.

Factor 4. Can you take on a new major responsibility?

Teaching three classes, chairing the curriculum committee, managing a challenging development project, and having a new baby at home—how much more can you take on? The literature suggests that preparation for teaching online is far more time consuming than for traditional face–to–face instruction. Two time requirements figure in: the amount of time necessary to develop an online course and the time required to teach it. One estimate of time required to develop a one-semester online course is about 100 hours. In a higher estimate, Northern Arizona University (2012) suggests 120 to 180 hours for a new, fully online course and 60 to 90 hours for a hybrid of about half online, half face–to–face. Also, just like face–to–face courses, online courses need to be tweaked with each new class.

A second recommendation is that the development be spaced over six months. In terms of time required for teaching, researchers have found that instructors spend about 46 hours *per credit hour* teaching online. Often, this extra time is done without additional compensation or released time.

Thus, if you tally your current time commitments and add in additional hours for developing and teaching an online course, have you exceeded the hours in your workweek, or can you accommodate an increased workload? Take into account any released time you might have.

Factor 4 Self-Assessment.

What was your tally? Are there enough hours available for you to take on online teaching?

□ Yes □ No

If the answer is no, and you are still interested, what might you drop, postpone, or restructure to give yourself more time?

Factor 5. Are you prepared to teach students how to learn online?

As a face–to–face instructor, you assume that your students know how to learn in context-appropriate ways. They know to come to class, read a textbook, take notes, and seek out help (from the instructor or someone else) if they need it. Online learning is different. In online learning, students will notice that learning through technology changes the learning process itself and may challenge their tried and true strategies and learning habits (Palloff & Pratt, 2013). In an online class, the most powerful learning comes through interaction with other students (Dixson, 2010). Instead of being the purveyor of knowledge, the instructor serves as a facilitator, structuring collaborative learning experiences for students. This is a major shift in learning, and students may need to learn how to work collaboratively with their classmates.

Just as online teaching is not for all instructors, online learning is not for all students—at least not without some instruction.

Factor 5 Self-Assessment.

You can learn to teach your students how to learn in an online environment, but are you willing to do so?

□ Yes □ No

If you sense some reluctance or hesitation on your part, but are still interested, check out what campus resources are available (e.g., a tutoring or counseling center) for your students and pass this information on to them. If you are willing to teach students who may need some guidance in learning online, check out your campus Center for Teaching and Learning (or similar service) to get some assistance for yourself.

Factor 6. Does your institution offer a reasonable range of support?

Assume for a moment that you would like to try online teaching. You have taken two online courses and had a positive experience. You have already incorporated a number of online assignments into your face–to–face course. You have even been talking to your colleagues about asynchronous versus synchronous instruction. Maybe your youngest offspring just left for college, so you have some time, and you feel excited about the challenge. What you need to consider next is what support your institution offers to successfully launch you in your transition.

While trial and error can be a way to do it, just like attempting to learn new mathematics without the guidance of a course or text, it can be frustrating. Learning to work in the new environment without guidance or structured professional development is a recipe for stress. Learning how to maneuver through the institution's course-management system alone is not sufficient. Your learning needs to go beyond that to focus on skill development specifically for online teaching. In a study of instructor roles for moderating online discussions, researchers Morris and Finnegan (2009) found that novice online instructors did some course management *to a limited degree* and rarely offered an instructional move that might be called pedagogical. On the other hand, experienced online instructors "enacted multiple roles—social, managerial, and pedagogical—to engage students and increase student persistence and success" (p. 61). Various studies have documented that professional development can help instructors in acquiring the skills they need for online teaching (Shattuck & Anderson, 2013).

However, support is more than finding professional development. It includes institutional policies addressing course and student issues. Online instructors need to have access to resources if problems develop, such as a student cheating. Instructors also need to feel part of the institution, not just outsiders providing a service. That can happen only if online instructors and their administrators are involved in establishing policies and procedures that guide the online offerings. Unless the online program is an integral part of the institution, it will suffer from a lack of resources and support.

A key way that instructors can be supported is through receiving compensation of either time and/or money. An early study (Dickinson, Agnew, & Gorman, 1999) found that 88% of 60 faculty members at Arkansas State University did not receive either additional compensation or a reduced workload for developing or teaching an online course. However, as online education has grown, so have compensation policies. Colleges and universities are now likely to have guidelines on instructor compensation for online courses (Ball State University, 2013). Other types of incentives for instructors to teach online can be credit for tenure, reduced teaching loads, availability of mentors, and recognition for one's work. The presence of such incentives sends the message that online teaching and learning is valued and an important component of the institution's mission.

Factor 6 Self-Assessment.

Does your institution offer the support that you will need?

□ Yes □ No

If no, you may need to be prepared to go it alone. That said, do not give up! Continue to make your needs known. You might also pursue outside resources such as Leading Edge Certification (an alliance of nonprofits, universities, and other educational institutions that offers international certification in areas related to online instruction).

7. Does your content area adapt reasonably well to a technological environment?

One critical aspect of online instruction about which you need to be knowledgeable in making your decision is the interface of your content area and technology. What works well? What does not? As a mathematics instructor, what adjustments will you need to make in your instruction?

Mathematical symbols are not readily available on a keyboard. Alternate representations have to be used when typing (e.g., `x^2` for the thing that is said "*x* squared" or `root[4]{x-3}` for the thing that is said "fourth root of the quantity *x* minus three.") Some online tools do exist that are point and click, but typography for mathematical symbols can be cumbersome online. Among the most common *work arounds* are to: (a) write longhand and then scan to make it electronic, (b) use mouse or e-pen to handwrite on an online white board, (c) use a glossary of standard alternate typology like that used in computer algebra systems or mathematical typesetting like TeX or LaTeX (e.g., ^ as "raise to the power").

The absence of mathematical symbols can present some interesting challenges. In the preceding example, if a student says or writes the words "subtract 8 by five," or says "three *x*" but writes "`3^x`," what do they mean? Teaching mathematics online may provide an opportunity that does not exist on–land: to clarify communication and what constitutes standard form.

Similarly, mathematics is full of diagrams and figures, and communicating about them in the traditional face-to-face ways may not work well online. In the classroom, you can see a sheet of paper on each desktop and can see whether the student is peering at it. Not so, online. More online tools are being developed to allow the instructor to know if something is visible on a student's screen or if a student has accessed a particular file, but real-time checking to see what students are doing with/to a diagram is not yet universally available. Adaptation to teaching online in visually rich ways means using new strategies. Rather than relying on reading student engagement from facial expressions, online math instructors need tasks and prompts where students make sense of images and then do something more with that sense-making (e.g., talk with another student, generate a related figure, or quickly respond to a poll).

Some online teaching allows students to revisit content (e.g., WeBWorK, MathXL, ALEKS, Khan Academy, and other asynchronous or unfacilitated sessions that make up some part or all of an online course), and this has the benefit of differentiated instruction. Each student can be supported to learn current material and fill in gaps in understandings. At the same time, as noted, students need to learn to learn online—in mathematics, it has not been shown to be especially useful to do large quantities of procedural problems. So, being able to do more or different procedural problems online may be a benefit, but one that has limited power. Providing mathematical situations that have multiple access points and offering scaffolds, when needed, is essential for more than procedural learning. The "multiple access points" part means that different students with differing mathematics (and English) backgrounds have an opportunity to understand and begin to engage with mathematics.

Factor 7 Self-Assessment.

Are you excited about the challenges of adapting your content to an online environment?

□ Yes □ No

If you are *not* excited, you might want to figure out why. Go back and reread the preceding six questions to help you find an answer. There is something hanging you up.

Conclusion

So how did you do number-wise? The total number of Yes/No responses is 8 (remember the double whammy?). Does a score of 6 Yes/2 No indicate you should call your dean to say you are on board? Does 5 No/3 Yes mean you should abandon the idea? The assessment is much too subjective, and the factors are not weighted. Impending surgery, transfer to a new institution, or an upcoming move can throw the outcome one way or the other very quickly.

Also, how are your numbers distributed? Remember what it will take for you to be successful. Having taken an online course yourself is critical. Certain psychological and personal factors need to be favorable. Finally, your institution needs to support you.

Data Quiz 5: Views of online education time–cost.

What percentage of academic leaders believes that teaching online requires more faculty time and effort than face-to-face teaching?

(a) 32% (b) 65% (c) 45%

The value of such an informal assessment is two-fold. It encourages you to think carefully about making a career decision that will have a major impact on your work life, perhaps considering factors you had not thought about before. Also, the bulk of yes or no answers, and their distribution, give you an indication of the strength of the critical mass working to support or impede you.

Finally, remember that a yes or no response is for now, not necessarily forever. Circumstances do change.

Consider the observations of David Gray, former CEO of UMassOnline (2004):

> *It would not surprise me at all to see the term "distance education" fade or morph into "distributed education" or perhaps simply "education." ...Our fascination with the web as an exciting new medium for learning and collaboration will most likely give way to seeing it as a common utility that people make use of routinely…. It will be a rare course indeed that does not take advantage of the tools of technology and high speed networks to aid and abet the learning process (response 5).*
>
> We are well on our way.

Acknowledgment.

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Answers to Data Quiz Questions

1. (a) 6,714,792
2. (b) 69%
3. (b) 80%
4. (c) 30%
5. (c) 45%

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rather than the exact computations given here. One can also tie this material into a linear algebra course in the context of change of basis and transition matrices. All in all, it provides a nice connection between real world applications and the TNB coordinates commonly found in a course in the calculus of vector-valued functions.

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Using the Feds for an Exploration of Graphing Concepts

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Results and Feedback

This assignment was introduced in Summer 2014 for a blended pilot algebra course, and it has been regularly used since then. Students have performed the assignments enthusiastically because of its relevance to their individual career goals. On end-of-course surveys, this assignment is always mentioned among the students' favorites. The only negative comments arise from students with a weak knowledge of spreadsheets. However, those same students are the ones that will benefit the most from this assignment. In fact, software skills and especially the use of spreadsheets for data analysis and presentation are highly desirable in the current workplace.

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The *Math*AMATYC *Educator* is Looking for "Lucky Larry"

Who is Lucky Larry (or Lucky Lucy)? These are examples of student work where the student arrived at the correct answer, while making one or more mistakes, or by using a flawed process. Readers are invited to send Lucky Larry submissions to the Production Manager, Johanna Debrecht, at jdebrecht@nvcc.edu.