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The Relationship between Successful Completion and Sequential Movement in Self-Paced Distance Courses

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Abstract

A course design question for self-paced courses includes whether or not technological measures should be used in course design to force students to follow the sequence intended by the course author. This study examined learner behavior to understand whether the sequence of student assignment submissions in a self-paced distance course is related to successful completion of the course. The study included 543 students in 89 different general education courses at a private university in the United States during a two year period. Results indicate that students who completed at least one assignment or exam out of the intended sequence of instruction were more likely to complete the course. Results were consistent when replicating the analysis with subsets of the data by course characteristics such delivery type, content, course format, and course level; and student demographics such as ethnicity, gender, GPA, and class standing. Learner control and self-direction within online self-paced courses should be included in course design to increase the likelihood of learner successful completion. Additional research could benefit course design and student support to promote higher rates of completion in self-paced courses.

Keywords: learner behavior, online learning performance, self-paced, student completion, assignment sequence, distance education, online learning, learner control, user-driven sequence, sequential movement

Introduction

Self-paced classes have been a staple of distance education since the early days of print based correspondence courses . Self-paced learning is defined as “an interactive mode of learning over the Internet that each learner does on his or her own, at his or her pace and in his or her time” . Self-paced classes typically are designed so that students may start any time and can complete the class at their own pace. Students choose self-paced classes because of relevance to employment, ability to adjust scheduling, and the flexible learning environment . While some may be concerned about the quality of learning in self-paced classes , other research argues that different formats of learning can each produce positive outcomes in terms of impact on learning .

A course design question for self-paced courses includes whether or not technological measures should be used in course design to force students to follow the assignment sequence intended by the course author, defined as “sequential movement” . Some faculty express concern that students may not complete the learning activities in the sequence designed and prefer to use measures to force students to follow a specific sequenced learning path. Research into adaptive learning and course systems explores different technological measures to sequence the activities presented to the learner . Do instructional and learning theories suggest an answer to the question of choice vs. sequencing? In this section, perspectives on sequencing, learner control, self-directed learning, and andragogy are reviewed.

Sequencing Instruction

The concept of organizing instruction into specific sequences has been studied for many years. Much of the literature on sequencing learning comes from a cognitivist or behaviorist perspective, often focusing on programmed learning. Studies of sequencing strategies may be organized into macro sequencing which concerns sequence at the course or curriculum level, and micro sequencing which addresses sequencing of teaching components . Either the content or the learner responses could be ordered in a specific sequence.

Macro sequencing recommends methods of organizing instruction at the unit, course, or curriculum level. Bruner theorized a spiral curriculum over the course of a child’s education that still influences scope and sequence in K12 education. White and Gagné emphasized the importance of gaining prerequisite knowledge which highlights the importance of prerequisite courses . Ausubel’s work on learners’ cognitive structures offered an order of general and known to detailed and new, providing a lesser to greater differentiation of the ideas with an advance organizer. Other theories focus on elaboration of concepts or the shortest path for teaching procedures .

Micro sequencing studies emphasize ordering the instructional presentation of principles and ideas. Concepts may be organized by the known to unknown, simple to complex, concrete to abstract, observations to reasoning or whole to detailed . Micro sequencing studies include scramble studies, which examine the effectiveness of presenting information in a specific order vs scrambling the order. Roe contended that college students may be more alert to material presented out of sequence. Others found that low ability students performed better with a logical sequence of math instruction; whereas high ability students were not affected .

Learner Control and Self-Direction

Most of the literature on sequencing focuses on the teacher creating a sequence for students, and the courses in this research study were written from that perspective. However, other research supports the value of learner control and the need for self-directed learning for adult learners.

Learner control has been defined as instruction designed so that learners control the content, display, or conscious-cognitive processing. Others contend that learner control includes varied concepts such as selecting goals, time to spend on the learning task, sequencing and pacing, aids for navigation, and self-evaluation . Learner control may also be defined within the construct of locus of control, where the learner may follow the instructor's path as external locus of instructional control, or the learner may control the path and pace of the instruction with internal locus of control . The very nature of the Internet, with links and hypertext, creates a level of learner control as the learner selects which link to access, can follow links at their own pace, and can choose their own sequence. In web-based teaching, the learner can follow their own path, backtrack, review, jump ahead, or follow side-trails . Learner control may be most effective when the learners are older, more experienced and the content is familiar. Mager and Clark also found that the learning time may be reduced for adult students when the student can choose their own path through the materials. However, in a careful meta-analysis of learner control studies, Niemiec, Sikorski, and Walberg (1996) argued that learner control does not provide specific benefits to any subsets of learners. Further research on learner control may be needed, with an understanding of the best environments for implementing learner control still yet to emerge.

Another body of literature examines andragogy and the importance of self-direction for adult learners. Knowles proposed four assumptions of andragogy, the study of adult learners. Adult learners tend to prefer self-directedness: allowing the adult learner to participate in the planning of the learning, making choices on the sequence of instruction, or learning activities. Adult learners bring a rich resource of experience valuable to the learning process; they are more ready to learn when benefits to a real-world problem are obvious. Adult learners are performance oriented and want to apply learning to life situations. . While adult learning literature does not specifically focus on the sequence of learning, the emphasis on self-directedness implies the importance of the learner's choice in the learning process. In fact, Rachal (1983) argued that the terms andragogy and pedagogy should be replaced with the terms self-directed and teacher-directed to clarify the discussion.

Since Knowles seminal work on andragogy, the concept of self-directed learning expanded to examine the learning context . With the advent of the Internet, additional studies have applied the concept of self-direction to a variety of online learning situations. Alonso et al. (2008) proposed an effective learning approach that blended self-paced learning with live e-learning and traditional classroom training. His approach also mixes objective-driven instruction with the constructivist concepts of learning choice. Vasilescu and Codreanu (2013) argued that for adult e-learners to be successful, faculty may need to teach principles of learning from pedagogy to assist the learners in making decisions about learning. The content must also be structured so that the learner can choose, self-pace their work, and to skip content they already know. Thus the teacher's role is facilitator of dialogue and explanation in a conversation network within the course. Glancy and Isenberg (2013) created an e-learning framework where the learner designs their own course space within the instructor's course in the learning management system, and sequences resources and activities according to their own choices, interests, and learning needs. The

younger learners were engaged and confident in their interaction; whereas the older learners were more hesitant and frustrated with the new strategy. However, the resulting courses created by the participants exceeded the expectations of the course facilitator. McLoughlin and Lee (2007) argued that social networking tools provide affordances for social rapport, collaborative information sharing, content creation, information aggregation, and content modification. Social networking affordances can be packaged into a personal learning environment, where the learner chooses how to organize and navigate through their learning space. The learner exercises significant control and responsibility for their own learning, which can improve learning effectiveness. These studies of e-learning contribute examples of how the Internet provides a new dimension for self-directed learning. Learner control, choice, and self-direction play a significant role in inquiry-based and problem-based learning models. Learners are accustomed to choice in exploration of the Internet, and expect at least some self-direction in their navigation of online course materials.

Completion and Retention

Some concerns with self-paced learning include the completion and retention rates. Attrition and dropout rates generated concern throughout many years of distance education, both print-based correspondence forms of self-paced learning and instructor-paced online education . Student completion of online courses continues to be challenging for all types of online courses, especially as completion is often used to measure the quality of distance learning. However, Diaz argued that drop rates are not a fair measure of academic non-success; instead online students have more life experiences and tend to have higher GPAs than their on-campus counterparts. He maintained that online students actually outperform traditional students; and may drop classes making a mature decision to take the class at a later time when they have time to complete the course successfully. While Diaz's findings may explain non-traditional students, completion and retention rates continue to be an area of research and public comment, most recently with massive open online courses .

Need for the Study

While the literature shared here examines concepts of sequencing in instruction, as well as self-paced learning and completion, there is a lack of understanding of the relationship between the learner's sequence choices and course completion in self-paced courses. Billings found that students were more likely to finish their degree if they accomplished a program of courses in sequence; however, literature is limited in examining links between successful completion of the course and completing lessons within the courses in the sequence designed by the course author.

Student activity patterns can provide insights on whether students are completing assignments in the desired sequence. Advances in learning management system technologies have enabled the collection of data on student activity patterns, including the navigation and usage paths of learners with higher scores . Learning management system data has made it easier to research student activity, but recent research tends to examine interaction and online discussion activity metrics such as participation, quantity, threading in large data sets and what materials students access . While recent research focuses on

important factors of student completion, additional research is needed on how the student's activity patterns such as sequential movement in the course may be related to course completion.

This study examines the record of the student's behavior to explore the relationships between the sequence of the assignments and exams completed and successful course completion. In the courses researched, students were encouraged but not forced to complete assignments in sequence, however, some students completed one or more learning activities in a user-driven sequence. The purpose of this study was to examine the relationship between successful student completion and student sequential movement through the course.

Research Objective

The research questions are:

What is the relationship between students' sequential movement and students' successful completion in distance self-paced courses?

What is the relationship between students' sequential movement and students' successful completion when replicated with subsets of self-paced distance course characteristics?

What is the relationship between students' sequential movement and students' successful completion when replicated with subsets of student demographic characteristics?

What is the interaction between students' successful completion, sequential movement, and student demographic characteristics?

Research Methodology

The research design was an ex post facto design with hypotheses . The study included the whole population of 543 students in 89 different general education and elective courses in a small American private religious university during a two year period. The courses offered came from a range of disciplines, including astronomy, english, geography, government, health, history, math, psychology, religion, and sociology. Half of the courses were offered online self-paced; and the other half were offered print-based self-paced.

Data collected included the student's registration date, completion grade, final grade, the date each assignment was submitted. Each student course experience was coded by the "sequential movement" of the student: if the student completed the assignments and exams in the sequence prepared by the course author . The number of assignments or exams out of sequence was also counted.

Statistical procedures used were correlational. Pearson's r was used to analyze the relationship between students' completion and student activity indicators . A non-directional t-test of significance was run on the r to determine if it was significant at the alpha = .05 level. A non-directional t-test was used because

no empirical data advised a direction for the test . Analysis was conducted to determine the power to detect a medium effect size (f2=.15) as determined by Cohen and McNeil, Newman, and Kelly (1996) for an alpha level of .05 and with an n of 543. The power analysis indicated a result of approximately .80.

Some limitations are that the length and difficulty of assignments varied across courses. It is possible that the large sample minimized the impact of these variations.

Results

Student Descriptive Statistics

This study analyzed student completion and sequential movement through the course for 543 undergraduate students registered for self-paced courses. The demographic descriptive data of the students is shown in Table 1. The students ranged in age from 18 to 78 with a mean of 30. Of the 253 students where data was available,[i] the highest percentage of students was Black, followed by White and Hispanic. Fifty-three percent of the students were female and 45.9% were male. Most of the students were seniors; and students' GPA at the time of the course ranged from 1.72 to 4.00 with a mean of 3.156.

Table 1

Student Demographic Descriptives

Demographic	***n***	**Percent**
Ethnicity		
Black	91	16.8%
American Indian/Alaska Native	6	1.1%
Asian/Pacific Islander	35	6.4%
Hispanic	53	9.8%
White	62	11.4%
Nonspecified	4	0.7%
Incomplete Data[i]	292	53.8%
Gender		
Female	292	53.8%
Male	249	45.9%

Class Standing		
Freshman	25	4.6%
Sophomore	10	1.8%
Junior	20	3.7%
Senior	198	36.5%
Incomplete Data[i]	290	53.4%

	N	Min.	Max.	Mean	Std. Dev.
Age	540	18	78	30.367	10.992
Undergraduate GPA	253	1.72	4.00	3.156	.451
Number of undergraduate credits completed	253	3	225	113.635	46.427

Course Characteristics

The characteristics of the courses researched are described next and shown in Table 2. All of the courses were delivered in a self-paced format. Students who registered for the first year and a half had up to a year to complete the course. Students who registered in the last half year had 180 days to complete the course. Sixty percent (60.6%) of the students registered for print-based courses with an online gradebook; and the rest attended fully online self-paced courses (39.4%). Most of the courses followed a course design of several assignments followed by a midterm, more assignments, and then a semester exam (90.0%). Most of the courses were 100 and 200 level courses. Many of the 543 students registered for religion courses (41.3%), with many other content areas making up the difference.

Table 2

Course Descriptives

Course Characteristics	***n***	**Percent**
Course Delivery		
Print-based with online gradebook	329	60.6
Fully online	214	39.4

Course Format		
Assignments, midterm, final exam	488	90.0
Assignments, semester exam	45	8.3
Assignments, final project or paper	9	1.7
Course Level		
100 level course	242	44.6
200 level course	137	25.2
300 level course	138	25.4
400 level course	26	4.8
Course Discipline		
Religion	224	41.3
History and political science	87	16.0
Math	61	11.2
Behavioral sciences	49	9.0
English	30	5.5
Health	20	3.7
Science	20	3.7
Fine arts	16	2.9
Languages	12	2.2
Communication	9	1.7
Business	6	1.1
Computer science	5	.09
Education	4	.07

Student Completion Descriptives

Of the 543 students, 76.6% successfully completed their courses. Successful completion was defined as a C grade or higher as proposed by Diaz . A withdrawal, dropping out, or receiving a D or an F were considered unsuccessful completion.

The students' patterns of submitting assignments were analyzed to determine if each student completed the learning activities in the sequence determined by the course author as shown in Table 3. If even one assignment was completed out of sequence, it was coded as not in sequence. No technological measures required students to complete the assignments in sequence. Policy dictated that students must complete the previous assignments before taking the exam; however, sometimes exceptions were made. Sixty percent (60.6%) of the students completed the course with sequential movement; while the rest followed a user-driven sequence (39.4%). To understand the sequential movement of the students, the students' sequence patterns were also analyzed to determine if they completed the exams in sequence (65.7%) and if they completed the assignments in sequence (62.4%). Finally, the number of assignments or exams out of sequence was counted. The average number of learning activities completed out of sequence was less than 2.

Table 3

Sequential Movement Descriptive Statistics

	n	**Percent**
Students who completed the course in sequence	213	39.4%
Students who completed exams in sequence	264	65.7%
Students who completed the assignments in sequence	305	62.4%

	n	Min.	Max.	Mean	Std. Dev.
Number of assignments or exams out of sequence	508	0	14	1.596	22.477

Relationship Analysis

Statistical procedures used were correlational. Pearson r point biserial correlations were used to analyze the relationship between students' completion and student sequential movement. A non-directional t-test of significance determined if the correlation was significant at the alpha = .05 level. Course in Sequence was binary coded 1 if the student completed the course in the sequence designed by the course author and 0 otherwise. Successful completion was binary coded 1 for successful completion and 0 for unsuccessful

completion. Successful completion was defined as receiving a grade between A and C. In Table 4, the relationship between sequential movement and successful completion are shown. For all of the courses, completing the course in sequential movement was significantly negatively correlated to successful course completion (r=-.374, p<.000).

When examining the data, one may consider the Pearson r (r=-.374, p<.000) as a low r result. However, the courses researched cover a wide range of content and a variety of students participated in the courses; hence it is not surprising that low r results were found. A low Pearson r is common in education where many other variables such as student aptitude and effort can contribute to the variation in the relationship .

Table 4

Relationship between Sequential Movement and Successful Completion

	n	**Pearson *r***	**Sig. (2-tailed)**
Students in each course	540	**-.374****	.000

*p < .05. ** p < .01.

To answer the second research question, correlation analysis was replicated with subsets of self-paced distance course characteristics. Some consider replication more useful and powerful than statistical significance .

The negative correlation between sequential movement and successful completion was true for online courses (r=-.365, p<.000), print-based courses (r=-.396, p<.000), humanities (r=-.359, p<.000), non-humanities (r=-.414, p<.000), math courses (r=-.328, p<.010), traditional courses with a midterm and semester exam (r=-.418, p<.000), lower division courses (r=-.408, p<.000), upper division courses (r=-.311, p<.000), religion courses (r=-.354, p<.000), and non-religion courses (r=-.395, p<.000).

With so many correlations, it is useful to determine the probability of finding these results by chance. Using the binomial index of goodness of fit to check the ten results in Table 5 for the relationship between the Course in Sequence and Successful Completion, the probability of getting the significant relationship for all ten by chance is low (p=.001) . The binomial index of goodness of fit is not based on sample size, but based on the number of hypotheses and was selected due to the small sample size of some of the variables.

Table 5

Replication of Relationship Analysis between Sequential Movement and Successful Completion in Subsets of Course Characteristics

Course characteristics	***n***	**Pearson *r***	**Sig. (2-tailed)**
Online	212	**-.365****	.000
Print	328	**-.396****	.000
Humanities	379	**-.359****	.000
Non-humanities	161	**-.414****	.000
Math only	61	**-.328****+	.010
Two-exam courses	486	**-.418****	.000
Lower division	376	**-.408****	.000
Upper division	164	**.311****	.000
Religion	222	**-.354****	.000
Non-religion	318	**-.395****	.000

*$p < .05$. ** $p < .01$.
+Non-significant using the Bonferroni correction

The third research question was examined by replicating the analysis of sequential movement and successful completion with subsets of student demographic characteristics as shown in Table 6. The negative relationship between sequential movement through the course and successful course completion varied based on ethnicity. Black, Hispanic, and White students were less likely to complete the course if they followed sequential movement, but not for the Asian students. Both males and females were less likely to successfully complete the course if they followed sequential movement. While all ages were less likely to successfully complete if they followed sequential movement, the result was more evident for students in age categories older than 40. Students with a GPA of 2.5 to 2.99 and 3.0-3.49 were less likely to successfully complete when they completed the courses in sequence.

Table 6

Replication of Relationship Analysis between Sequential Movement and Successful Completion in Subsets of Student Demographics

Student Demographics	***n***	**Pearson *r***	**Sig. (2-tailed)**
Ethnicity			
Black	91	**-.376****	.000
Asian	35	.028	.871
Hispanic	52	**-.329***+	.017
White	62	**-.515****	.000
Gender			
Female	290	**-.394****	.000
Male	250	**-.357****	.000
Age Bracket			
18-24	224	**-.193****+	.004
25-39	201	**-.433****	.000
40-49	70	**-.478****	.000
50+	39	**-.636****	.000
GPA			
1.5-2.49	19	-.382	.106
2.5-2.99	80	**-.549****	.000
3.0-3.49	92	**-.422****	.000
3.5-4.0	62	-.153	.236
Class Standing			
Freshman	25	**-.449***	.025
Sophomore	10	-.583	.077
Junior	20	**-.596****+	.006

Senior	197	**-.298****	.000

*$p < .05$. ** $p < .01$.
+Non-significant using the Bonferroni correction

Tests for interaction were conducted on the student demographic variables . No significant interaction was found between ethnicity and gender. No significant interaction was found between gender and sequential movement. No significant interaction was found between age and sequential movement.

A significant interaction was found between ethnicity and sequential movement. The difference in successful completion for each of the ten ethnicity groups were as follows: (a) 50% of Blacks who followed the sequential movement successfully completed the course; (b) 100% of American Indians who followed the sequential movement successfully completed the course; (c) 90% of Asians who followed the sequential movement successfully completed the course; (d) 50% of Hispanics who followed the sequential movement successfully completed the course; (e) 45.8% of Whites who followed the sequential movement successfully completed the course; (f) 85% of Blacks who followed a user-driven sequence successfully completed the course; (g) 100% of American Indians who followed a user-driven sequence successfully completed the course; (h) 88% of Asians who followed a user-driven sequence successfully completed the course; (i) 81% of Hispanics who followed a user-driven sequence successfully completed the course; and (j) 92% of Whites who followed a user-driven sequence successfully completed the course. The interaction effect contained in the sample was statistically significant (F (1, 528) = 51.103, p / 2 = . 000). Blacks, Hispanics, and Whites were more likely to successfully complete the course if they followed a user-driven sequence in completing the course.

A significant interaction was found between GPA and sequential movement. The statistical test of the difference between the R^2 values of the Full Model (R_F^2= .258) and the Restricted Model (R_R^2= .228), which tested the interaction effect between student GPA and student sequential movement, was statistically significant at the two-tailed .05 alpha level ($F(1, 248) = 10.037$, p / 2 <.002). The interaction effect was horizontal for students who completed the course in the instructor's designed sequence, with no difference in completion. However, for students who completed the course in a user-driven sequence, the interaction was negative. Students with higher GPAs had a lower completion score if they followed a sequential movement; or to rephrase, students with higher GPAs had a higher completion score if they followed a user-driven sequence.

In summary, this study found a significant negative correlation between students' sequential movement through the course and successful completion. The result was stable when replicated with subsets of course demographics; and fairly stable when replicated with student demographics. Interaction was found between ethnicity and sequential movement; and between GPA and sequential movement.

Discussion

Understanding learner behavior and sequential movement through courses has several implications for online course design and support of a variety of online learners. The first is the importance of learner control. While it seems counterintuitive that a student would be more likely to complete the course if they followed a user-driven sequence, previous research hints at the possibility. Recent research on MOOCs found that students who accessed a massive online course in a user-driven approach had a higher retention rate than those who followed the sequential movement designed by the instructor . Much earlier, Roe argued that college students may be more alert to material presented out of sequence; although he did not consider the learner's choice in the sequence of accessing material or finishing assignments. Others found that adult learners may indeed come to the learning task with prior knowledge that affects their sequencing choices and it may not be effective to force them to follow a specific path . Indeed, given the non-linear nature of the Internet and the changing nature of today's learners; all students may prefer to take advantage of the Internet's unique features of choice to follow links of interest and select their own sequence of learning . While learner control is important, it seems logical that some content areas such as science and math would require specific sequencing. The courses researched were predominantly humanities, and it could be argued that the low number of students in math courses (61) was insufficient for a trustworthy result. However, Mager and Clark's research reviewed studies of engineering, electrical meter reading and other industrial skills where a logical sequence may be expected to be necessary; and found that the learning was most efficient when the learner could select their learning path. In cases where assignments build on each other, the sequence should be displayed as designed; but students should be allowed to navigate throughout the sequence to plan for the learning assignments. Including explanation of required sequences will help the learner understand the intent of the course. Additional ways to provide learning path choice within lessons would likely also be beneficial.

Nevertheless, it should not be argued that designing a sequence is unnecessary. All of the courses researched had an intended sequence, and students followed it for a large percentage of the course. The average number of learning tasks completed in a user-driven sequence was only 1.596. When a sequence is designed, the instructor should explain it to the students. Create advance organizers to assist students in understanding the sequence of course concepts and the relationships among the concepts, particularly for math and science. Course design should provide opportunities for students to explore the content with choice and to teach students appropriate strategies for self-study so that they can make effective decisions about their learning .

Another implication of this study's results is found in examining the data for varying ability and for adult students. Students with a higher GPA were more likely to successfully complete if they followed a user-driven sequence. The interaction found between GPA and sequential movement aligns with previous research which found that learner control may be most effective when the learners are more experienced and the content is familiar . Others found that low ability students performed better with a logical sequence of math instruction; whereas high ability students were not affected . In addition, older students were even more likely to successfully complete if they followed a user-driven sequence. The stronger negative relationship between sequence activity and successful completion for adult students combined with the fact that most of the courses researched were general education confirms that adult students

have more prior knowledge about the content and may even be considered an expert. Experts learn differently than novices, building on a deeper understanding . The more sophisticated student is more efficiently served when learner control is encouraged. Experts in a course may be older with more experience, or they may have a higher ability level. Experts within a course can be detected by encouraging learners to share their prior experience with the content, within discussion forums or in interactions with the instructor. The instructor may notice how the learners behave in the course, understanding that experts or adult learners may come with a higher level of ability. Learner control for older and more sophisticated students should be allowed and even encouraged.

Ethnicity or cultural background also played a role in the results of this study. Significant interaction was found between ethnicity and sequential movement; where Blacks, Hispanics, and Whites were more likely to successfully complete if they followed a user-driven sequence. For the Asian students, no significant relationship was found between their sequential movement and course completion. On the other hand, White students were even more likely to successfully complete if they followed a user-driven sequence. Considering the ethnicity interaction may be enlightened by Vasilescu and Codreanu's (2013) work on the principles of andragogy moderated by culture. In high power distance cultures, the learning process is more teacher-centered, and students may be more likely to follow the teacher's intended sequence.

Conclusions

In conclusion, this study examined the record of the student's behavior to explore the relationships between the sequence of the assignments and exams completed and successful course completion. The results suggest a significant negative correlation between students' sequential movement through the course and successful completion. The result was fairly stable when replicated with subsets of course and student demographics.

It is clear that the concept of learner control is important to course design, especially when in deciding whether or not to use technological measures to force students' sequential movement through courses. A constant focus on teacher directed instruction may restrict motivation and creativity; whereas a focus on self-directed methods and student internal locus of control may provide more access for expert and adult learners. Most undergraduate online courses currently serve both non-traditional adult learners and traditional 18-22 year-old students. Courses should be designed in a manner to provide opportunities for choice in how students complete most assignments. For example, it would be unnecessary and possibly even ineffective to hide portions of the course until a learner completed previous components. The learner should be able to see the full course, to explore what is included in the course, and to make plans to accommodate the learning activities required in the course. Some course components, such as major projects or papers, do not require a specific sequence of submission. A course overview and navigation map could provide the opportunity for the learner to review the big picture of the course and to access content as desired.

Further research could explore a variety of other definitions of out of sequence. This study required only one item to be out of sequence. More robust research is needed to understand the results from this study. Future research could examine if certain types of courses are more flexible on learning activity sequence

than others and if there is a difference between general education and major courses. Other research questions include examining the effect of promoting self-direction in learning outcomes and whether self-directed behaviors such as following links and using social media may also advance learning outcomes. Additional replication in different populations, at the graduate level would provide a broader picture of students' sequential movement to determine if the results of this study are generalizable beyond one institution. Understanding the sequence in which students' access and complete assignments in face-to-face courses, even though they may turn assignments in at the specific deadline, would also provide a broader understanding of learner control and self-direction. A qualitative study, examining the detail of what types of assignments were involved in the user-driven sequence, in the context of the content of the course, may illuminate the reasons the effectiveness of a user-driven sequence. Additional factors contributing to successful completion, such as study strategies, levels of persistence and procrastination, and demographics in various situations would provide further insight into student completion in self-paced courses. Finally, additional research on learner behavior could benefit course design and student support to increase the likelihood of higher rates of completion in self-paced courses.

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[i] The students participated in courses that were part of a consortium of four universities. The lead consortium institution which facilitated the registration process and provided the courses collected gender and age demographics on students. One of the other institutions provided additional demographic data on the students. Demographic data was not available for the other two institutions.