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Analysis of the Tuition Assistance Program: does the method of instruction matter in TA classes?

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

Analysis of the Tuition Assistance Program: Does the Method of Instruction Matter in TA Classes?

15 April 2010

by

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14. ABSTRACT
The Navy's Tuition Assistance (TA) program subsidizes the tuition costs of off-duty college classes for Navy personnel. Although prior studies have investigated the effect of completing college courses via TA on enlisted retention and promotion (Mehay and Pema, 2009), no prior study has examined the effect of the instructional methods in the courses taken via TA. Interest in course delivery methods has been stimulated by the rapid growth in online TA classes. This study analyzes the effects of completing TA-supported college courses on promotion and retention, and whether the mode of instruction in the courses is important. We also analyze how student learning and course completion varies by mode of instruction. Our analyses recognize the potential biases that arise from self-selection of students into courses, and we statistically adjust for individual heterogeneity in estimates of the impact of online and traditional classes. We find that completion rates and student grades are lower in online classes than in traditional classes. Overall, reenlistment rates are higher for those who complete their TA classes, versus those who fail or withdraw from their classes. However, reenlistment effects are greater for TA students who pass online courses than for those who pass traditional classes. Similarly, we find that the probability of promotion to E5 is higher for those who pass online classes, compared to those who do not complete their TA classes. On balance, the shift to online classes in the TA program appears to generate net benefits for the Navy.

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Tuition Assistance, Enlisted Personnel, Promotion, Retention.

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Executive Summary

This study analyzes the Navy's Tuition Assistance (TA) program, which is the largest component of the Voluntary Education (VOLED) program. Mehay and Pema (2009) analyzed the impact of participation in the TA program on retention and promotion outcomes for first term Sailors and find that TA users have a higher retention and promotion probabilities than non-users. This study extends their analysis in several ways. First, while the prior study analyzed all TA courses, this study focuses on differences in the effects of TA classes delivered via distance learning (DL) versus via traditional classrooms. Second, we examine student learning outcomes as well as career outcomes. Finally, we apply accepted statistical techniques to control for self-selection into DL classes in the multivariate models.

Interest in course instructional methods has been stimulated by the rapid growth in DL courses in the TA program and establishment of the Navy College Distance Learning Partnership (NCDLP). Between 2000 and 2007 the number of DL classes grew ten-fold and became the dominant mode of instruction in TA classes. The shift to primarily online instruction poses several concerns for policymakers. The major is that the literature indicates that course completion rates and student learning are frequently lower in DL classes. Thus, the shift to DL classes may reduce the return to the Navy on the resources invested in the TA program.

Research on differences in academic performance between online and traditional courses has been inconclusive. Russell (2002) lists hundreds of studies that find no significant differences in student performance across modes of instruction, whereas a more recent review (Department of Education, 2009) finds that online students perform better. However, critics contend that casual implications cannot be drawn due to weaknesses in research methodology. One meta-analysis of DL studies concludes that, "overall, the 232 studies reviewed were judged to be of poor methodological quality" (Bernard et al., 2004). A major problem in these studies is the failure to control for self-selection of students who voluntarily choose a class based on the instructional method. Studies that have statistically adjusted for sample selectivity, find that student

performance is lower in online classes (Coates et al., 2004). In all of the multivariate models in this study we apply accepted statistical techniques to adjust for sample selectivity.

Our analysis of retention estimates separate models for long-term reenlistments, short-term extensions, and an overall retention measure which combines reenlistment and extensions. To mitigate bias from unobservable individual characteristics driving TA participation, we focus on samples of TA participants. These individuals signal a shared interest in additional education; however, not all students who enroll in TA courses complete them. 'Non-completers' constitute a natural control group who reveal their propensity for education, but whose educational attainment does not change as a result of their participation in TA. Using non-completers for the control group minimizes selection problems because non-completers and completers should be similar in terms of motivation, initiative, and circumstances at the time of enrollment.

We analyze promotion to E-5 because achieving this rank reflects superior job performance. Sample selectivity bias is also a concern in estimating promotion outcomes. Also, retention decisions differ from promotion outcomes in that promotions can occur multiple times during the first term, and they do not occur at fixed points in time. To deal with these problems we create a panel data set composed of annual snapshots of each new recruit from entry until expiration of their four-year contracts. Panel data allow us to analyze the effect of taking a TA class over time on subsequent promotion outcomes. In addition, we can difference out individual fixed effects, which include unobservables such as ability and motivation.

Data for the retention and promotion models is drawn from DMDC enlisted files on new recruits who accessed between 1994 and 2007. Data on TA courses and enrollees is drawn from the Navy College Management Information System (NCMIS) database.

As measures of student academic performance we use course completion rates and course grades (GPA). A 'noncompletion' occurs if the course grade is 'F,''I,' or 'W.'. Bias would be eliminated if students were randomly assigned to classes. However, in

the TA program students choose the classes and instructional method and this choice is based in part on their comparative advantage in one instructional method over another. To control for sample selectivity, we analyze learning outcomes using course-level data on the 1.6 million TA-funded college courses between 1995 and 2008, taken by 233,459 different Sailors. The models are estimated using fixed effects techniques.

The key results from the estimated course completion model are based on the preferred fixed effects models estimated on a sample of TA users only. The fixed effects estimates indicate that taking a DL class is associated with a 6.5 percentage point (or 8%) lower completion rate (compared to a traditional class. In the grade point (GPA) models the preferred fixed effects estimates suggest that taking a DL class is associated with a letter grade that is .26 points (on a 1.0-4.0 scale) lower. Since the average grade in the sample is 3.18 (slightly above a B), taking an online class reduces this to a 2.92 (slightly below a B).

In the probit reenlistment model, when the sample includes all enlistees, the estimates suggest that those who take at least one TA class are more likely to reenlist by 28 points (a 70% difference). When the sample is restricted to only TA users, the estimated reenlistment effect is only 11 points. This difference highlights the size of the selection bias in the estimates in unadjusted estimates. In the preferred models, we find that both DL and non-DL completers are more likely to reenlist, but that the marginal effect is much larger for DL completers than for non-DL completers (24 points versus 1.7 points, respectively).

The probit models of extensions find that those who ever use TA are 6 points less likely to extend than non-users, but after adjusting for sample selectivity the difference falls to 3 points. In the preferred estimates, the effect of passing a DL class has a much larger effect on reducing extensions (a 10 point difference) than passing a traditional class. In the aggregate retention model, the results find that passing at least one TA course yields a 6.6 point increase in the overall retention probability. The effect of passing a DL class increases retention by 11 points.

The promotion models are estimated with panel data and fixed effects techniques. We find that promotion is positively affected by TA use, but the effect is largely due to self-selection by students. TA effects drop substantially when we restrict attention to the sample of TA enrollees, and become insignificant when we net out individual fixed effects. When separating the effect of online versus traditional courses, we find that DL has a large positive effect on promotions, even net of unobserved individual ability, whereas taking traditional courses has no effect.

We find that TA participation increases long-term reenlistments and reduces extensions, much like selective reenlistment bonuses. TA use also appears to increase the probability of promotion to E5, but this effect is only observed for those who pass DL courses. This suggests that the availability of online courses helps Sailors balance work demands and course taking. The analysis also finds that DL classes are associated with lower course completion rates and with lower grades.

Our results could be explained by a combination of factors. It could be that DL courses allow sailors to manage time such that, while course performance suffers, job performance does not, or at least not as much as when taking traditional courses. This could be because DL courses allow more choice in time allocation between education and work. Another reason could be that the availability of online courses attracts individuals who are more attached to the military and who otherwise would not have taken college courses if it would have impaired their job performance.

On balance, the answer to the question of whether the shift to online classes has generated net positive benefits to the Navy appears to be a qualified 'Yes.' Those who take online classes have lower completion rates and lower course grades but these costs must be balanced against the enhanced job performance of those who complete the courses. A second benefit of the expansion of DL courses is the improved access to college classes for Sailors in environments where traditional classrooms may not be feasible. These latter benefits likely exceed the cost of the reduced educational value from DL classes. Finally, if online classes offered under NCDLP are linked more closely

to Navy ratings than traditional classes were before NCDLP, the increase in specific human capital also will help offset any reductions in course quality or student learning.

To improve completion rates, we recommend that Navy College counselors attempt to screen applicants for DL classes, especially for those who have not previously taken a DL class and those who are in their first term of service. Tighter screening should improve completion rates, student learning and, ultimately, job performance, which would increase the return to the Navy from the TA program.

In addition, it would be useful to analyze why students are failing to complete their classes, and whether non-completion is due to withdrawals or incompletes, or due to failing grades. An analysis of non-completers could identify whether non-completion is due to difficulty of the course subject and material in an online setting, or whether it is due to time-management problems for the student.

While this study has analyzed key outcomes of the TA program and it appears that net benefits of the TA program are positive, we recommend further study of the benefits and costs of the TA program. In addition, the net benefits of the NCDLP program should be evaluated separately. Further studies should expand the analyses to include the effects of TA and NCDLP on second-term as well as first-term Sailors.

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Table of Contents

List of Figures (cont.)

List of Tables

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I. Introduction

The Navy's Voluntary Education Program (VOLED) supports off-duty college and other classes for enlisted sailors and officers. In FY 2007, the Navy spent approximately $103 million on the VOLED program, which supported classes taken by approximately 64,000 active duty personnel. The primary goal of the VOLED program is to cultivate the career potential of its Sailors. The focus of this study is the Tuition Assistance (TA) program, which is by far the largest component of the VOLED program. Between FY 2000 and FY 2007, enrollment in undergraduate courses via TA grew by 50%. By FY 2008, 52,481 Navy enlisted personnel enrolled in 152,698 classes with assistance from the TA program.[1]

Sailors who complete undergraduate college courses via the TA program increase their general human capital. Numerous studies have found that increased educational attainment increases individuals' job performance, productivity, and earnings (Ehrenberg and Smith, 2010). Hence, we expect that completing college classes via the Navy's TA program will have similar effects on service members' military job performance. However, college classes also improve employment opportunities in the civilian labor market, which may reduce retention.

Mehay and Pema (2009) analyze the impact of participation in the TA program on retention and promotion outcomes for first-term sailors. They find that TA courses increase sailors' probability of promotion to E4 and E5. They conclude that this

[1]Based on data from the NCMIS database.

promotion effect tends to improve internal career prospects, which offsets the increase in external labor market opportunities. As a result, the program boosts first term retention rates of sailors.

This study extends Mehay and Pema (2009) in several ways: First, whereas the prior study looked at all TA courses, we focus on the effects of classes delivered via distance learning (DL) and compare these effects to those of classes delivered in traditional classrooms. Second, this study compares course completion rates and grades of students in DL and traditional classes, generating implications for current policies that are emphasizing distance education.

Interest in the mode of instruction has been stimulated by the rapid growth in the number of distance learning (DL) courses being taken via the Navy's TA program. As Table 1 shows, between FY 2000 and FY 2007 the number of DL classes taken by Sailors via the Tuition Assistance Program grew ten-fold whereas the number of traditional classes fell by 29%. By FY 2006, for the first time, enrollment in undergraduate college classes taught via distance learning exceeded enrollment in courses taught in traditional classroom settings.

The shift to DL appears to have been fueled by policies to expand the number of online classes. In 1999, the Navy formally established formal partnerships with postsecondary institutions to provide degrees online. These partnerships eventually evolved into the Navy College Program Distance Learning Partnership (NCDLP)

program.[2] This program created formal relationships with a few postsecondary institutions to provide degree programs, with all courses delivered via distance education. In addition, each postsecondary institution agreed to offer either an associate or bachelor degree and to link each degree with specific enlisted ratings. In 2004, the program expanded to include 17 institutions and 96 degree programs, and in 2007 it doubled to include 34 institutions offering 264 degree programs.[3] For example, Central Texas College, a two-year college, offers 15 online A.A. degree programs for 15 ratings (CS, FC, IT, JU, MA, MU, NC, NC/Duty Counselor, OS, QM, SB, SH, SK, SO, YN).[4]

The stimulus behind offering more online courses was due, at least in part, to the Global War on Terror (GWOT), which increased the deployment of Sailors to locations with limited access to traditional college classrooms. However, the new policy also linked college classes and degrees to Navy ratings. In principle, this change made the classes more job-related and thus made the education less general in nature and more job-specific. Prior to the establishment of NCPDL, the program did not formally link college courses with Navy ratings nor did it require that college courses or degrees be job-related. Rather, counselors required students to develop an 'education plan' to

[2] Personal correspondence with Ronald C. Smith, Navy Voluntary Distance Education Program Manager, Center for Personal and Professional Development, 19 October 2009.

[3] For a list of the 34 institutions currently in the NCPDLP and the ratings supported by each institution, see http://www.navycollege.navy.mil/storefront.cfm (accessed January 12, 2010).

[4] For details see http://ww.ctcd.edu/NP_ctc1.htm (accessed January 12, 2010).

guide their college course choices, but the plan was not binding on student course decisions.[5]

While the postsecondary institutions in the NCPDL partnership have identified degree programs for individual ratings, in many cases the degrees and the 'related' courses are still in very general subjects. For example, the degree offered by Central Texas University for the OS (Operations Specialist) rating is in "General Studies," and the degree offered for the SB (Special Warfare Boat Operator) rating is in "Business Management." The relationship between the degree program and the skills needed in these ratings is often weak. The actual specificity of the degrees appears to vary widely across ratings and schools, and the effect of this policy change remains to be determined.

Table 1. College Courses Taken via TA Program, by Instructional Method

FY	Overall	Traditional	DL
1995	102,712	102,668	44
1996	90,129	90,060	69
1997	93,578	92,397	1,181
1998	100,363	96,838	3,525
1999	101,241	95,509	5,732
2000	105,571	97,355	8,216
2001	106,888	94,550	12,338
2002	112,002	91,980	20,022
2003	112,971	82,756	30,215
2004	131,483	84,161	47,322
2005	143,021	82,767	60,254
2006	153,731	78,569	75,162
2007	151,334	68,953	82,381

Source: NCMIS database

[5] Beginning in 2010, the Navy intends to make educational plans 'binding' in that TA will only fund courses that are covered by the plan.

The shift to primarily online instruction raises several issues for policymakers. One issue is whether the shift to distance education has been accompanied by a reduction in course completion rates, an outcome that has been widely observed in the education literature. If online courses have lower completion rates, then valuable resources may be wasted, including the sailors' time and Navy funding. If course grades and completion rates are lower in online classes, the quality and quantity of the additional human capital acquired by the individual may be reduced. If so, the overall return to the Navy on resources invested in the VOLED program will be reduced. Of course, any potential difference in returns due to lower quality must be balanced against the improved access to online classes for Sailors in environments where traditional classrooms may not be feasible. If Sailors are able to enroll in classes that otherwise would not be available, this benefit may exceed the cost of the reduced educational value of the class. In addition, if the online classes now being offered under the NCDLP program are linked more closely to Navy ratings than traditional classes were before NCDLP, the increase in specific human capital may to some extent offset any reduction in course quality.

This study addresses several questions. First we investigate whether course completion rates vary by mode of instruction. Second, we investigate whether course subject and other observable characteristics of recruits affect the completion rates of DL and traditional classes. Third, we analyze whether, among those who complete their courses, the instructional method affects student learning, measured in terms of course grades. Next we look at the effect of participation in the TA program on job performance and retention and examine whether these effects depend on the course delivery

method. If DL courses are more job-specific, this may increase the productivity of enlisted personnel. However, any positive effect of DL courses being more job-specific may be offset by their lower quality or by lower completion rates.

The study is organized as follows. Section II reviews prior studies on the effects of military Voluntary Education programs on the retention and performance of service members. Section III provides descriptive statistics of the Navy's TA program based on data files provided by the Naval Education and Training Command (NETC) and the Defense Manpower Data Center (DMDC). Section IV describes the multivariate statistical models used to estimate the effect of TA participation and instruction method on retention and promotion. In addition, this section estimates the effects of DL courses and course subject on course completion rates. The results of the multivariate models are discussed in Section V, and Section VI summarizes the statistical results and presents the conclusions and policy recommendations derived from the results.

II. Background and Literature Review

A. Growth of Distance Education

Previous studies have focused on the effect of participation in the Navy's TA program on Sailors' subsequent job performance, but have not discussed the possibility that career outcomes could vary depending on the method of instruction in the courses. Distance education classes have grown rapidly in postsecondary institutions since the mid-1990s. During the 2006-07 academic year, 66% of 2-year and 4-year postsecondary institutions offered distance education courses, encompassing over 12 million enrollments (U.S. Department of Education, 2008). About 32% of all institutions offered degree or certificate programs designed to be completed via distance education. About 3.5 million postsecondary students took at least one online course, representing a 9.7% increase over the previous year. This growth rate of online enrollments greatly exceeds the 1.5% growth in overall postsecondary enrollments (Allen and Seaman, 2007; Beffa-Negrini et al, 2002).

Reasons for the growth in distance education include the following: (1) to meet student demand for flexible schedules; (2) to provide access to college for students who otherwise would not be able to attend; (3) to make more courses available; and (4) to increase overall student enrollment (U.S. Department of Education, 2008). Key barriers to implementation of effective DL programs include: low faculty acceptance; perceived lack of discipline of DL students; and the high development costs of DL courses. Low faculty acceptance appears to be based on the view that DL is a less

effective mode of instruction, primarily due to the lack of face-to-face interaction between professor and student.

Both civilian and military studies find that completion rates for online courses are lower than they are for classes taught in a traditional face-to-face setting. Although most civilian studies find that DL students are older than traditional students, age does not appear to causally affect completion rates. Rather, DL students are more likely to work full-time and often choose DL classes due to work schedules (Allen and Seaman, 2007; Dutton, et al., 2002). Although some studies blame poor completion rates on student discipline, the priority of work over study appears to offer a better explanation for the low completion rates in DL classes.

Work schedule was the single most important factor in predicting both persistence and performance of DL students and its effect was generally negative (Kemp, 2002). Dutton, et al. (2002) found that 84% of DL students expected to work during the upcoming academic quarter as compared to only 54% of traditional students. In addition, for students who work, DL students expected to work almost twice as many hours as traditional students. The demands of life commitments, such as children and work, appear to be important factors accounting for some of the difference in completion rates between DL and traditional students (Borstorff and Lowe, 2007). The U.S. Department of Education (1999) found that children and work demands were among the seven situational factors which play a significant role in whether students will persist in college. Dutton, et al. (2002, 2005) also found that work commitments are statistically significant predictors of final test scores.

B. Academic Performance in DL Courses

Differences in academic performance, measured mostly by class test scores, have been observed between DL and traditional students. While some studies find that DL students do as well or better than other students in similar courses (Phipps and Merisotis, 1999; Dutton, et al., 2002), Russell (2002a) lists hundreds of studies that find no significant differences in class performance between DL and traditional students. Critics of this literature, however, counter that casual implications cannot be drawn due to the inherent weaknesses in research methodology. After reviewing the statistical methodology of over 232 studies on distance education, Bernard et al. (2004) concluded that, "overall, the 232 studies reviewed were judged to be of poor methodological quality." (p. 175). Problems cited included: lack of random assignment, unreliable and invalid outcome measures, and failure to control for external factors. Missing exogenous variables and selection bias created by systematic differences between students who voluntarily choose online over traditional courses, in particular, make it difficult to draw reliable inferences from prior studies

Prior studies that have adjusted for selection bias using standard statistical techniques have been conducted by economists in the economics of education field. For example, Coates et al. (2004) compared student test scores on a standardized test (Test of Understanding of College Economics, TUCE) for students in online and face-to-face versions of a standard economics principles class. The study found that students in instructor-led classes scored significantly better. The authors also found that failure to account for self-selection into courses biases estimate effects toward zero (i.e., toward finding no significant differences). In this study, we focus on applying accepted

statistical techniques to adjust for selection bias in our analyses of the effects of the TA program.

C. Course Completion Rates

Research on differences in completion rates across instructional methods generally finds lower completion rates for DL classes than for traditional classes. Howell et al. (2004) review several studies and find that DL completion rates range widely between 40% and 80%. Brigham (2003) finds that 66% of distance learning institutions had better than 80% completion rates and 87% of institutions had better than 70% completion rates.

Differences in completion rates may be due to how the rates are calculated. Kemp (2002) defines non-completers as those who signed up for a course and either did not complete the course or received a failing grade, including those who dropped the course within the official 'no penalty' drop period. This definition resulted in an overall course completion rate of 36%. However, if students who dropped the course later and those who never submitted a single assignment ('non-starters') are removed from the sample, the completion rate jumps to 97%.

D. Student Satisfaction

Student satisfaction is important in course evaluation because it can affect student commitment, learning, and perseverance. Several studies find that students show a slight preference for a traditional education setting, while others find student satisfaction is similar in DL and face-to-face classrooms (Beffa-Negrini et al. 2002;

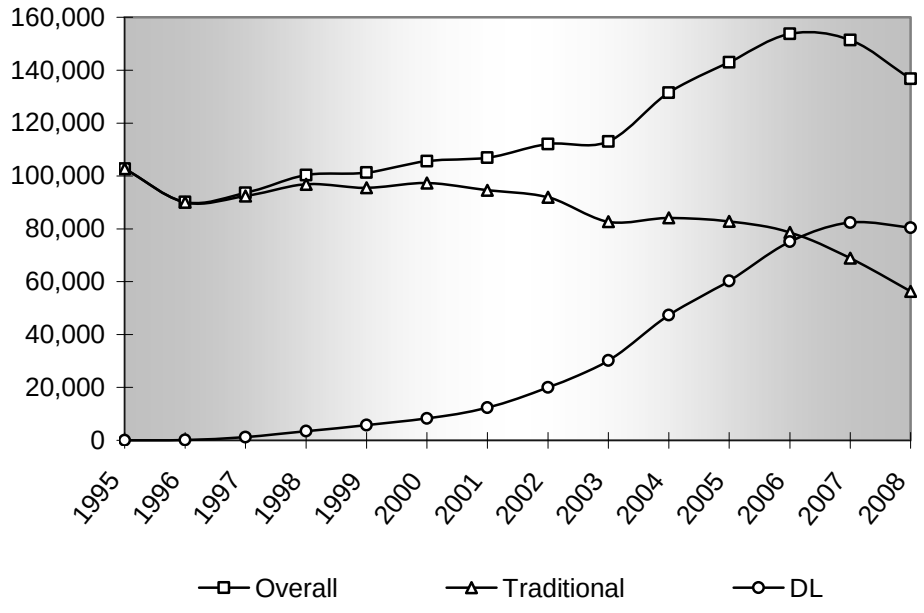
Borstorff and Lowe, 2007). The literature does suggest that, in general, student satisfaction and success is greater the richer the delivery media. However, a meta-analysis found that in DL classes may not lead to more effective instruction (Allen et al., 2002). Although the amount and ease of communication affects student satisfaction, the richness of the media, such as video teleconferencing versus e-mail, did not significantly affect satisfaction. The study further implies that a switch from face-to-face to online instruction should not reduce student satisfaction and should not interfere with completion rates (Allen et al., 2002).

III. DISTANCE EDUCATION IN THE TUITION ASSISTANCE PROGRAM

The data on TA use were provided by NETC and were drawn from the Navy College Management Information System (NCMIS) database. The database included information on 1,960,592 course enrollments funded by TA for active duty Navy personnel between FY 1995 and FY 2008. The sample is restricted to undergraduate courses, leaving 1,641,740 valid course enrollment records.

Figure 1 shows that annual TA enrollments grew steadily between FY 1996 and FY 2003, increased sharply after FY 2003, then dropped slightly after 2006. The sharp increase in TA participation after 2003 is mostly due to the rapid growth of DL courses and the increase in the tuition reimbursement rate from 75% to 100% of tuition costs.

Figure 1. Undergraduate TA Courses by Fiscal Year



Source: NCMIS database.

In FY 1995, only 44 classes were taught via DL; by FY 2007, 82,381 classes were taught online. In the same period, the number of traditional courses dropped commensurately from 102,668 (FY 1995) to 68,953 (FY 2007). Figure 1 shows that the number of students in DL classes first surpassed those in traditional courses in FY 2006.

Between FY 2000 and FY 2007, DL classes increased ten-fold while traditional classes fell by 29%. By FY 2008, DL classes accounted for nearly 60% of classes taken by active duty enlisted sailors. During this period, among students who took any TA-funded classes, the average number of classes taken per person was about three per year.

Enrollment in TA grew steadily between FY 1995 and FY 2007, despite the fact that the Navy reduced the active duty enlisted force by approximately 100,100. As Figure 2 shows, participation in the TA program grew slowly between 1995 and 2002, and then rose rapidly after 2002, climbing from 10% in 2003 to 18% in 2007. Enrollment rates in DL classes grew from 4.6% to 11.7% between 2003 and 2007, while enrollment rates in traditional classes remained flat.

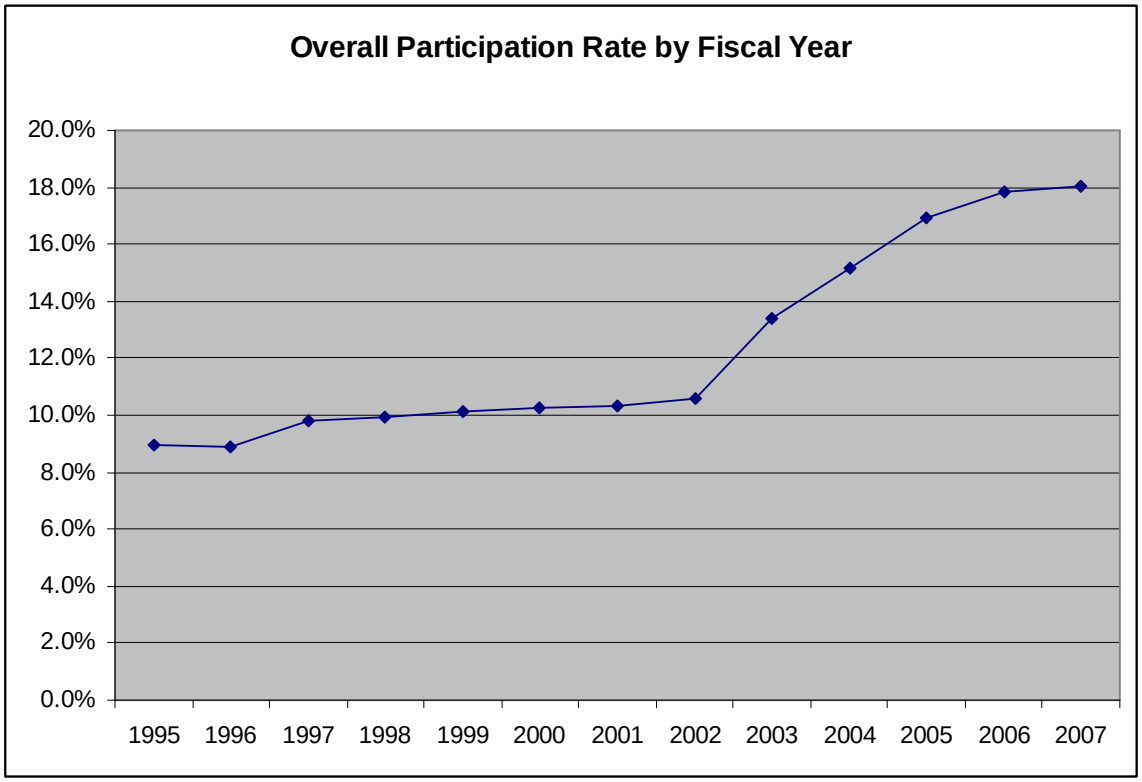


Figure 2. Overall TA Participation Rate by Fiscal Year

Source: NCMIS

A. TA Participation by Rank

Although the Navy reduced the active duty enlisted inventory after 1995, Figure 3 shows that reductions were not evenly distributed across pay grades. The entry grades of E-1 and E-2 experienced the largest decreases in inventory (averaging 43%), while E-3's experienced the smallest cuts (10%). This may have resulted from Navy policies that targeted retention of experienced sailors during the various reductions-in-force. The fact that the mid grades were not cut as severely as the entry grades may be one factor fueling the growth of the TA program, since, as shown below, sailors in the middle grades tend to use the TA program at higher rates than those in other grades.

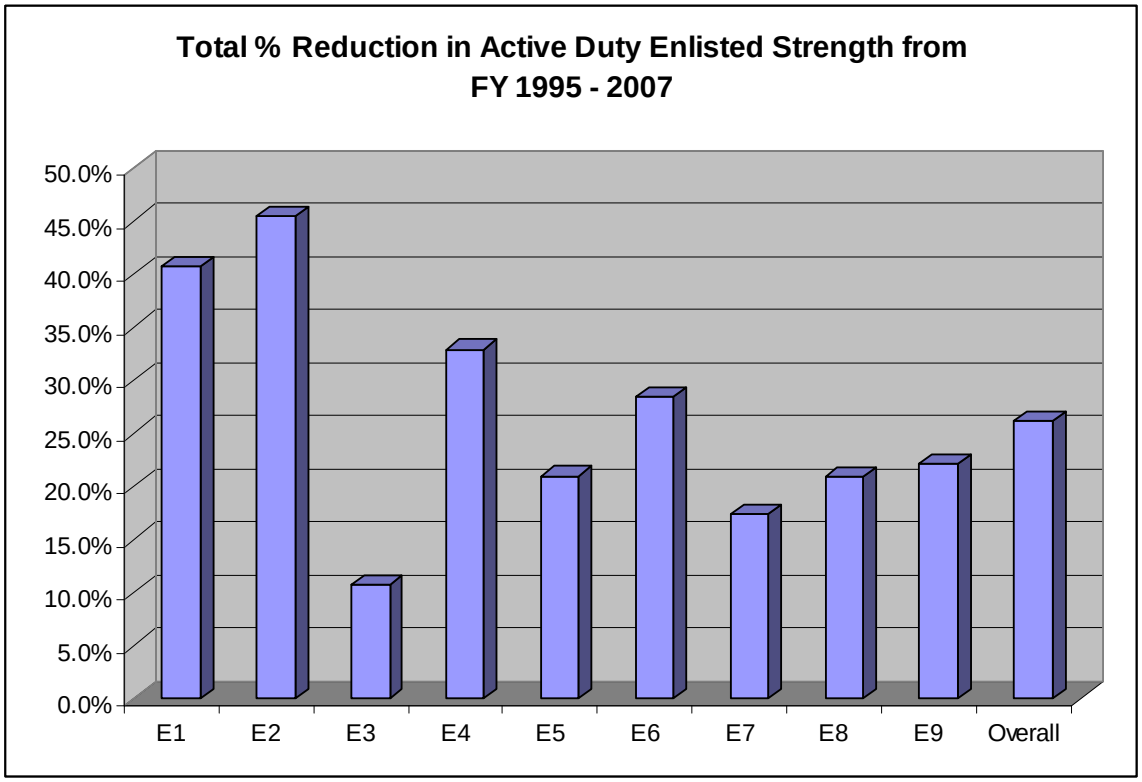


Figure 3. Percent Reduction in Active Duty Enlisted Strength, FY 1995-2007: *Source DMDC data.*

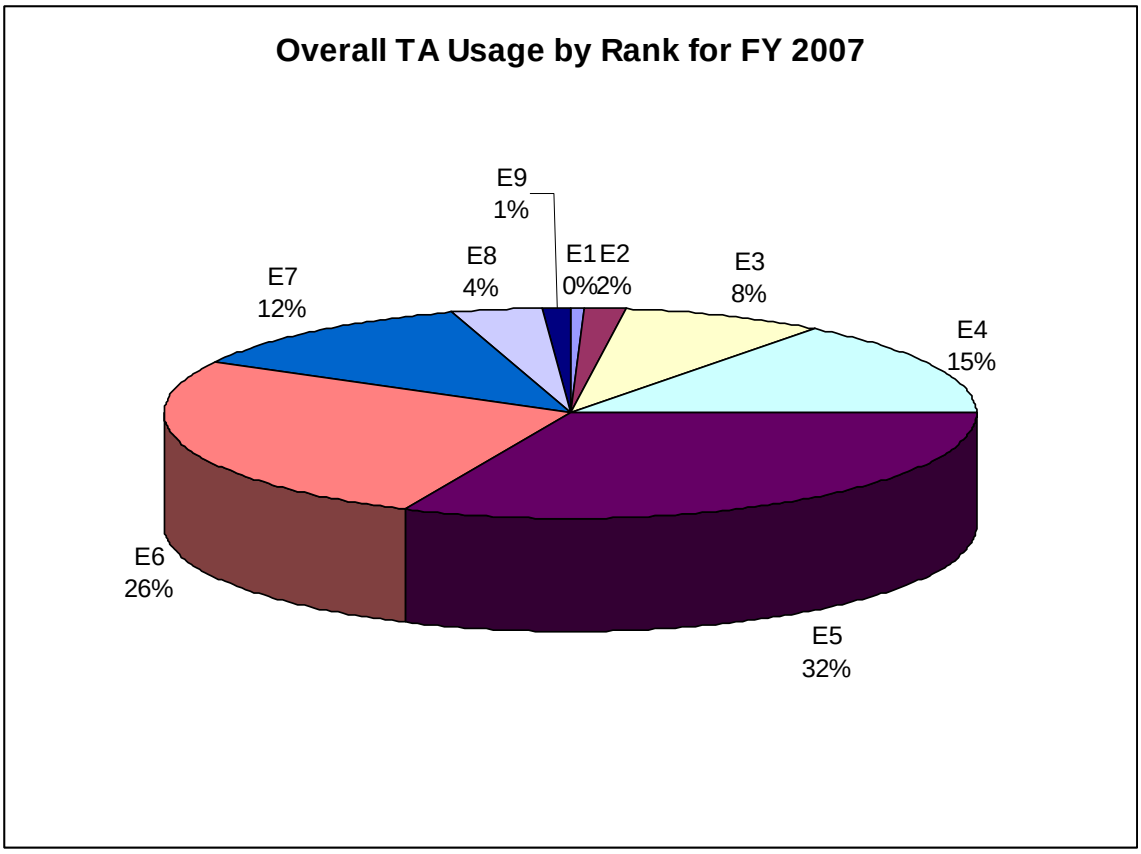


Figure 4. Percent Distribution of TA Participants by Rank for FY 2007.

Source NCMIS

Figure 4 displays the percentage distribution of TA users by pay grade for 2007. Raw data for the calculations in Figure 4 can be found in Appendix Tables 7 and 10. It appears that TA users are concentrated in grades E-4 through E-6, which account for about three-fourths of all participants. By contrast, first term enlistees in grades E-1 through E-4 account for between 25% of all participants.

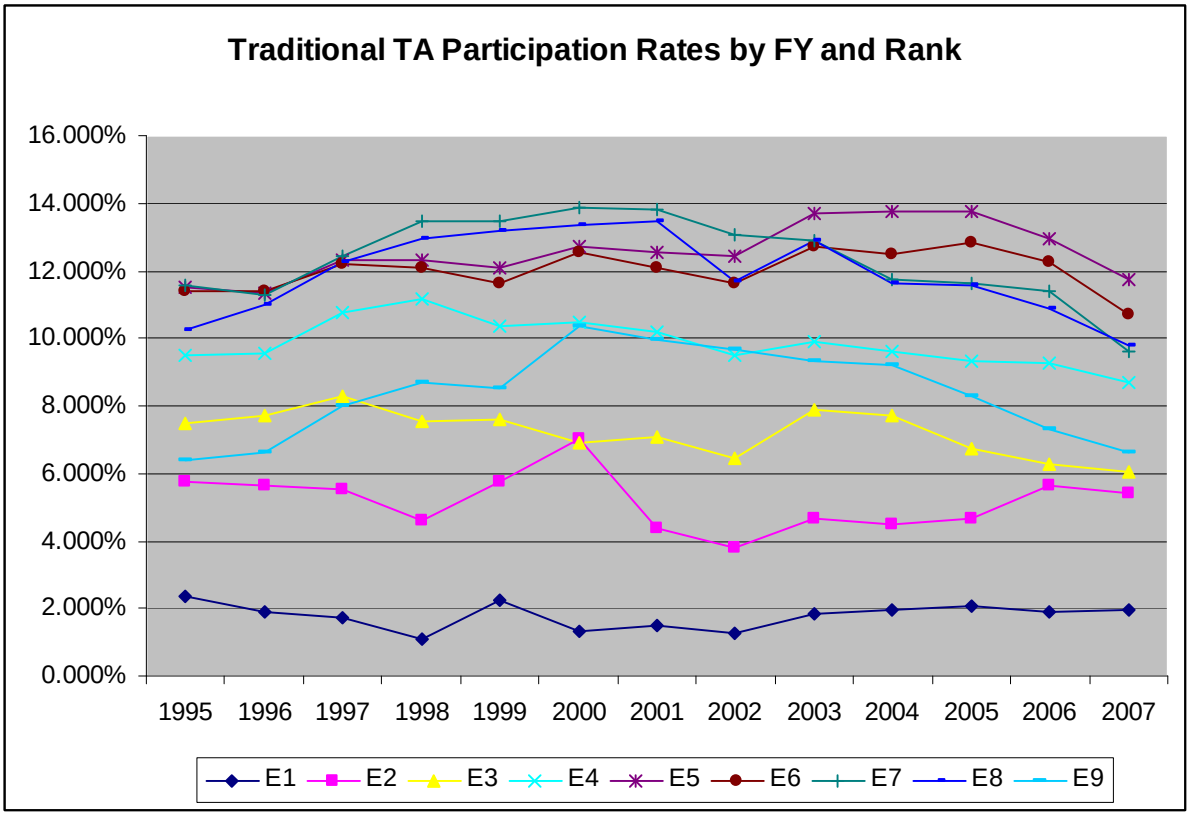


Figure 5. Participation Rates in Traditional Classes by FY and Rank.
Source: NCMIS

Figure 5 describes trends in participation rates in TA-funded traditional classes by rank and year. Raw data for the calculations in Figure 5 can be found in Appendix Table 8. Petty Officer Second Class (E-5) through Senior Chief Petty Officer (E-6) have consistently participated at the highest rates in traditional classes, maintaining at least a 5 point gap with E-3s during the FY1995-FY2007 period. The entry pay grade of E-1 consistently has the lowest participation rate (averaging less than 2%).

Figure 6 shows trends in participation rates in TA-funded DL classes by grade and year. Participation rates in DL classes are higher for E-7s and E-8s (averaging 20.5%) and lower in the junior grades. Figures 5 and 6 show that the gaps in

participation rates in traditional classes between ranks E-3 and E-8 (1.4% gap) are smaller than are the gaps in DL classes between ranks (3% gap). The larger gaps in DL classes may be due to differences in maturity and career status in the higher ranks.

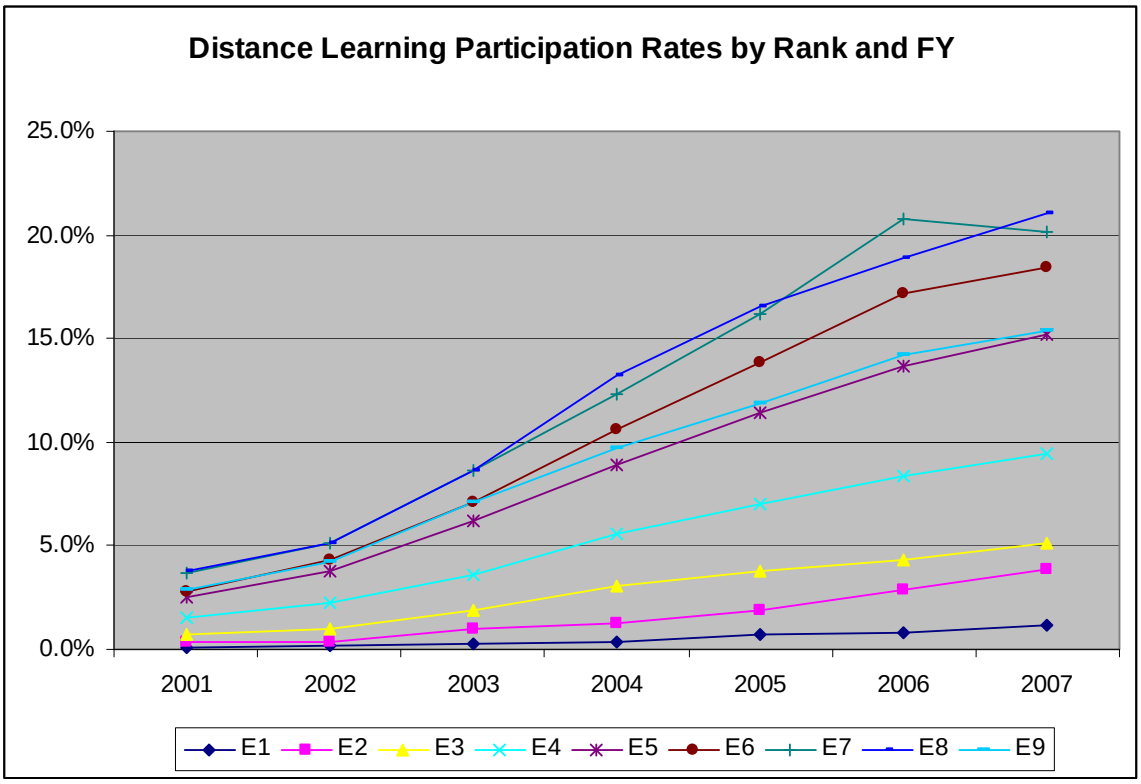


Figure 6. Distance Learning Participation Rates by Rank and FY.
Source: NCMIS

B. TA Participation by Gender

The diversity of the Navy active duty enlisted force has grown in recent years. During the 13-year period covered by this study, the representation of women in the Navy grew from 11.6% to 14.3%. During the military drawdown, overall the active duty

enlisted force fell by 26%; however, the number of women fell by only 8% while the number of men dropped by 28%.

Figure 7 displays overall TA participation rates by gender, while Table 2 summarizes gender-based differences in participation rates by fiscal year and instruction method. Raw data for the calculations in Figure 7 and Table 2 are displayed in Appendix Table 12. The data shows that women consistently participate in TA at nearly double the rate of men. This may be due in part to women attempting to increase their net value to the Navy, perhaps to compensate for being restricted from participating in combat-related occupations. These occupational restrictions may hinder their promotion opportunities. Alternatively, women may participate at higher rates because they are assigned primarily to shore-based occupations that offer more opportunities to use TA. Participation rates by men grew by 8% whereas rates for women surged by 17% during the DL expansion period (Figure 12). Figure 2 shows that participation in DL classes grew by 8% for men but by 17% for women. Although men accounted for nearly 86% of the force in FY 2007, they participated in only 75% of the TA courses taken by active duty enlisted sailors.

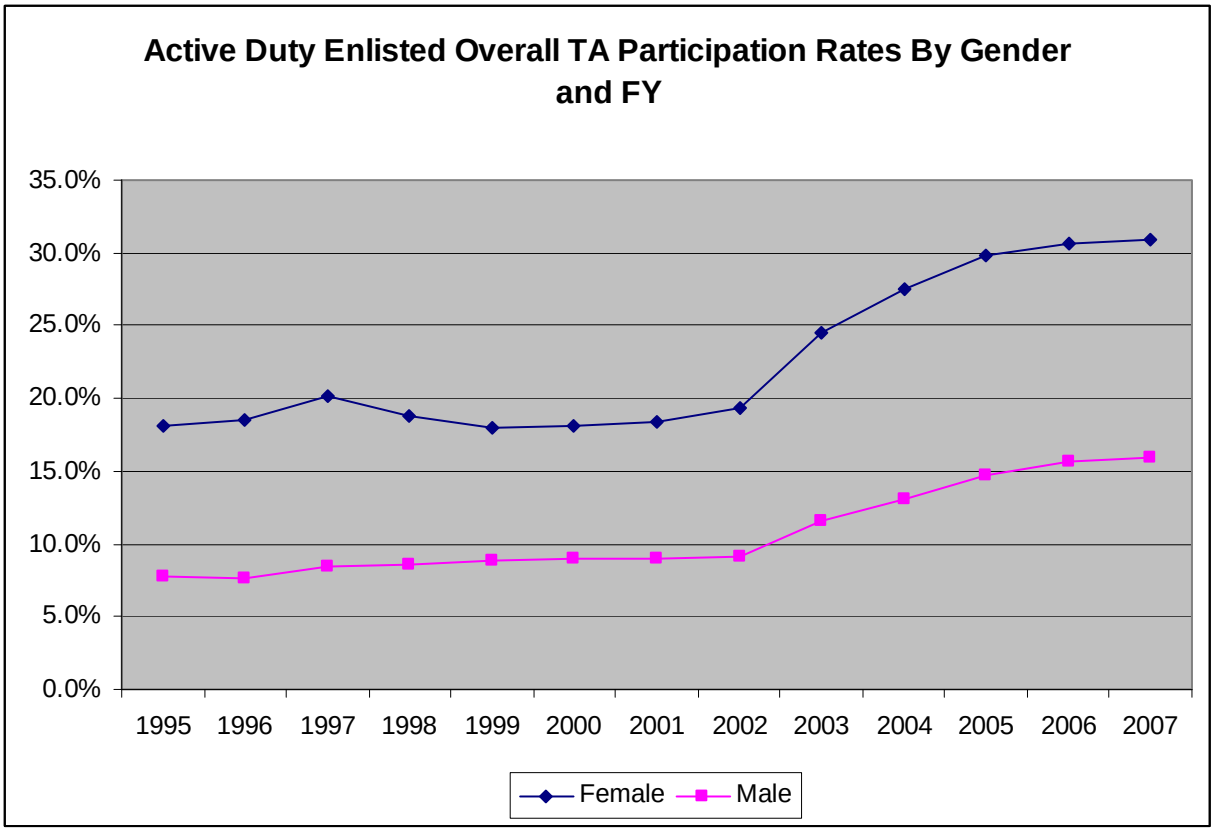


Figure 7. Active Duty Enlisted Overall TA Participation Rates By Gender and FY
Source: NCMIS

Table 2. Participation Rates in DL and Traditional Classes, by Gender

	DL Participation Rates by Gender						
	2001	2002	2003	2004	2005	2006	2007
Female	3.41%	4.99%	8.66%	12.59%	16.00%	18.43%	20.44%
Male	1.57%	2.28%	3.89%	5.90%	7.71%	9.40%	10.28%
	Traditional Participation Rates by Gender						
	2001	2002	2003	2004	2005	2006	2007
Female	14.28%	16.47%	18.72%	18.58%	17.88%	16.77%	15.15%
Male	8.15%	7.69%	8.65%	8.49%	8.55%	8.14%	7.45%

C. TA Participation by Race/Ethnicity

Between FY 1995 and 2007 the Navy increased its racial and ethnic diversity. In FY 1995, Caucasians accounted for 68.2% of the enlisted force, but by 2007, they accounted for only 53% of all enlistees. During this same period the representation of Hispanics in the Navy grew dramatically from 7% to 15% of the enlisted force. The data also indicate that TA participation rates vary by race and ethnicity. Minorities, with the exception of Native Americans, participate in the TA program at higher rates than whites. Also, as Figure 8 shows, minorities participate in traditional classes at higher rates than whites. Raw data for Fig. 8 are available in Appendix Table 13. For example, in recent years African Americans and Hispanics have participated in traditional TA classes at rates 3% to 4% points higher than whites.[6]

[6] Significant changes in coding of races and ethnicity occurred after FY 2003. The number of service members coded with "Unknown" or "Other" was 5,496 in FY 2004 dropping to 3,364 by FY 2007 using the same coding standard. This may have had subtle inflationary effects on minority participation rates in FY 2004 and FY 2005 when coding practices were adjusted.

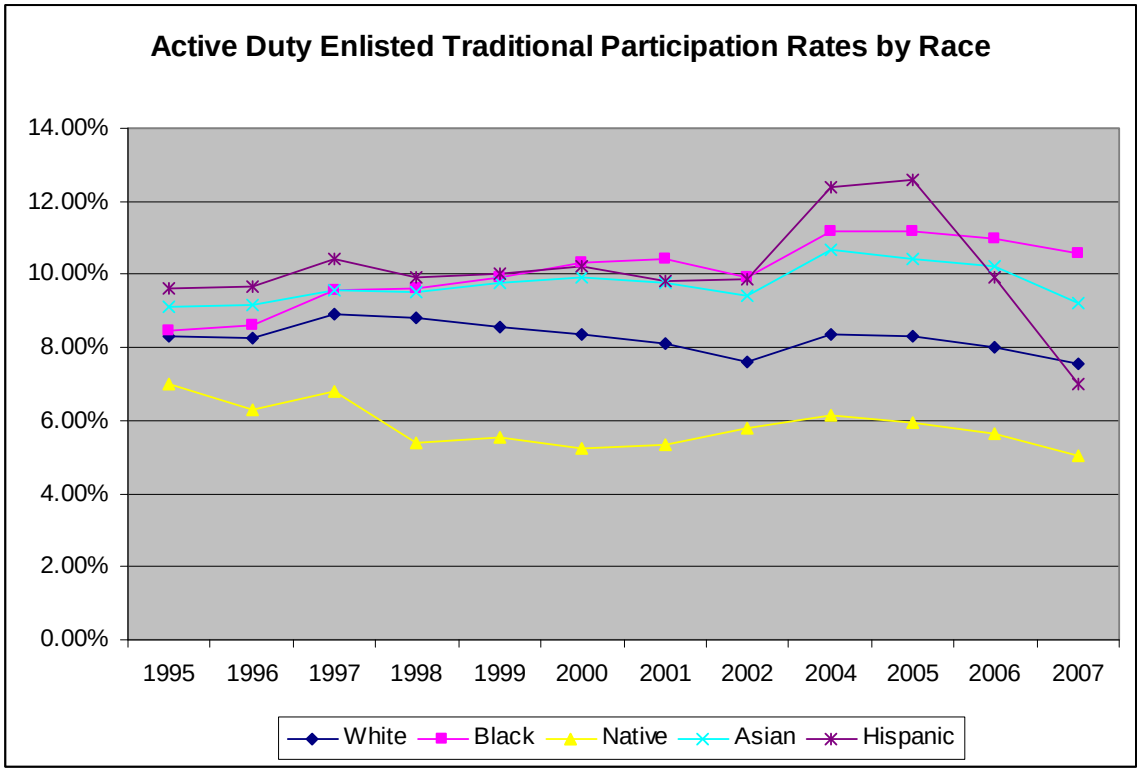


Figure 8. Participation Rates in Traditional Classes by Race.

Source: NCMIS

Figure 9 shows that minority participation in DL classes has grown substantially since FY 1995. In particular, African Americans increased their participation in DL from 1.4% in 1995 to 13.7% in FY 2007. In FY 2006 and FY 2007, Hispanic overall participation rates in TA dropped. This may be due to Hispanic representation in the Navy being at an all time high in FY 2007, while Hispanic participation in TA remained stable.

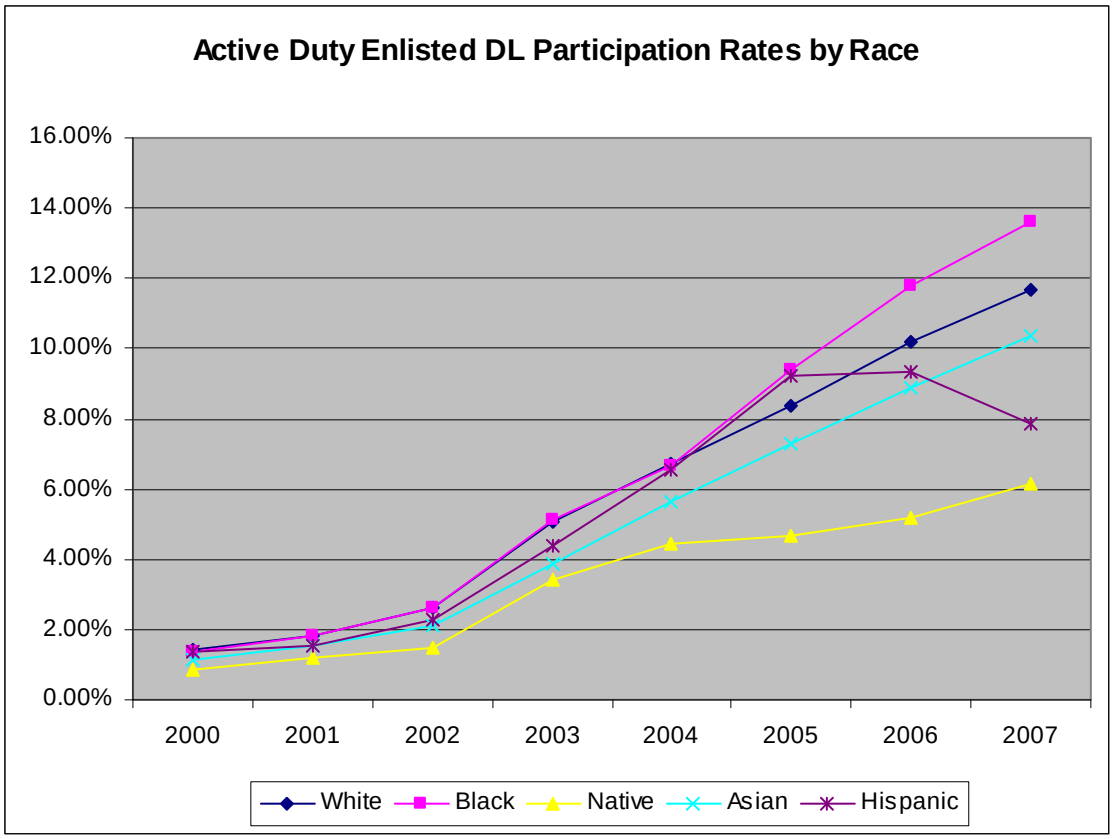


Figure 9. Participation Rates in DL Classes by Race.

Source: NCMIS.

D. TA Participation Rates by Course Subject

The NCMIS data file contains the names nearly 2 million courses taken by TA-funded students between FY 1995 and FY 2008. We aggregated course names into 11 broad categories to provide an overview of the course subjects taken by Sailors. The 11 categories of subjects we identified are: Business, History, Math, Natural Sciences, Physical Sciences, Information Technology, Humanities, English, Medical, Technical (undergraduate) and Law. Using the most recent fiscal year in the NCMIS data (2008), several significant differences in the methods of instruction for each subject were noted.

Figures 10 and 11 display the distribution of course subjects taught via traditional and via DL methods, respectively, in 2007. Raw data for Figures 10-11 are displayed in Appendix Table 14.

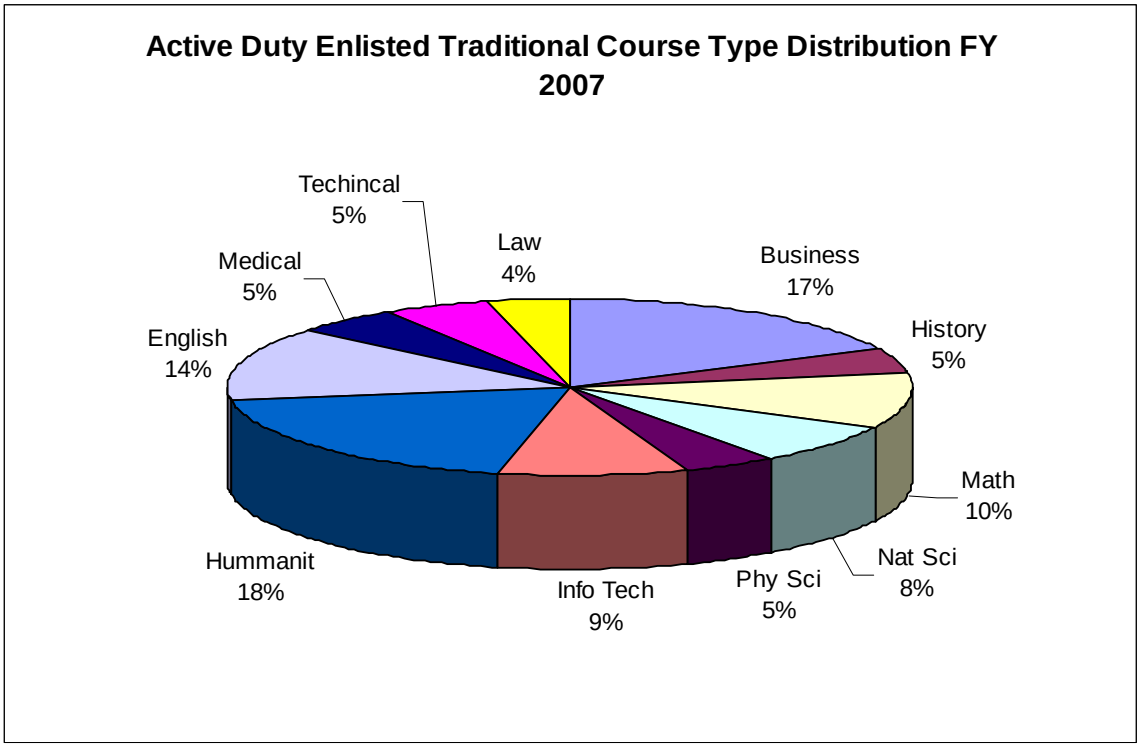


Figure 10. Distribution of Course Subject in Traditional Classes, FY 2007.
Source: NCMIS

Figures 10 and 11 indicate that students are more likely to enroll in traditional classes for English, Physical Sciences, Math, and Technical courses. The largest difference is observed for English courses, which are three times as likely to be taught face-to-face as online. Humanities and Information Technology courses are more likely to be delivered via DL.

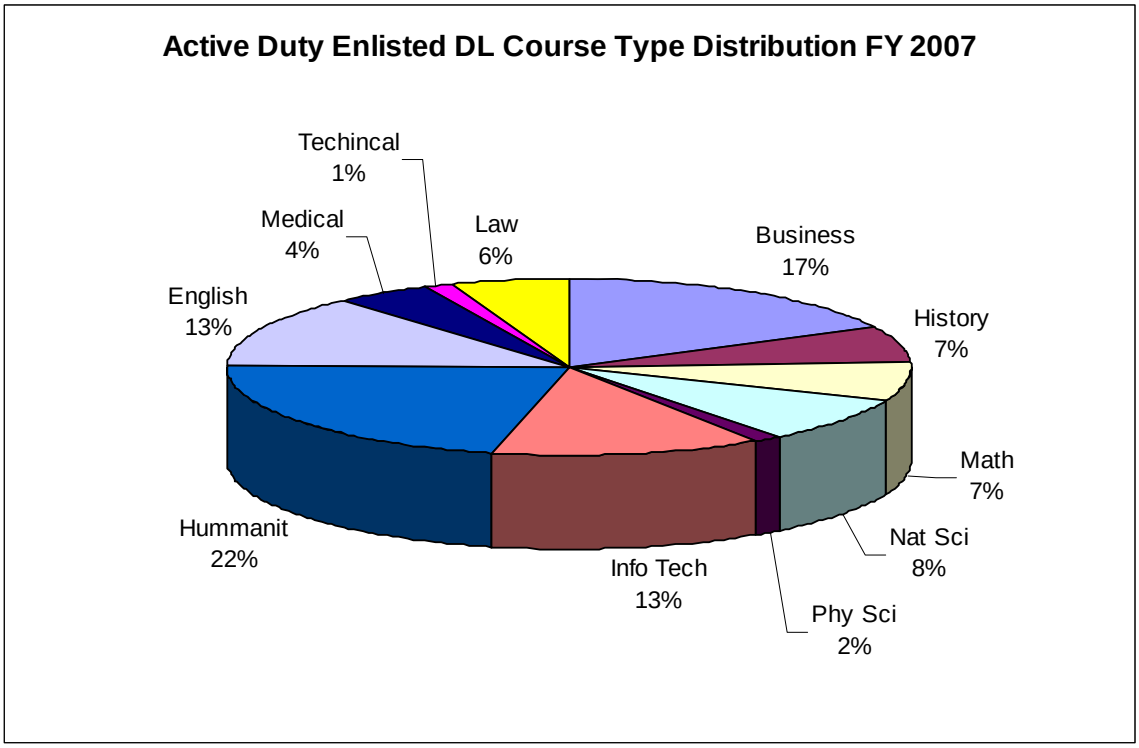


Figure 11. Distribution of Course Subject in DL Classes, 2007. *Source: NCMIS*

These differences may be due in part to a lack of course offerings by educational institutions for classes that require extensive lab work or a 'hands-on' approach. Figure 12 shows that the growth of DL courses has been most rapid in the Humanities, Business, and Information Technology subjects. Appendix Table 15 contains the raw data for Figure 12.

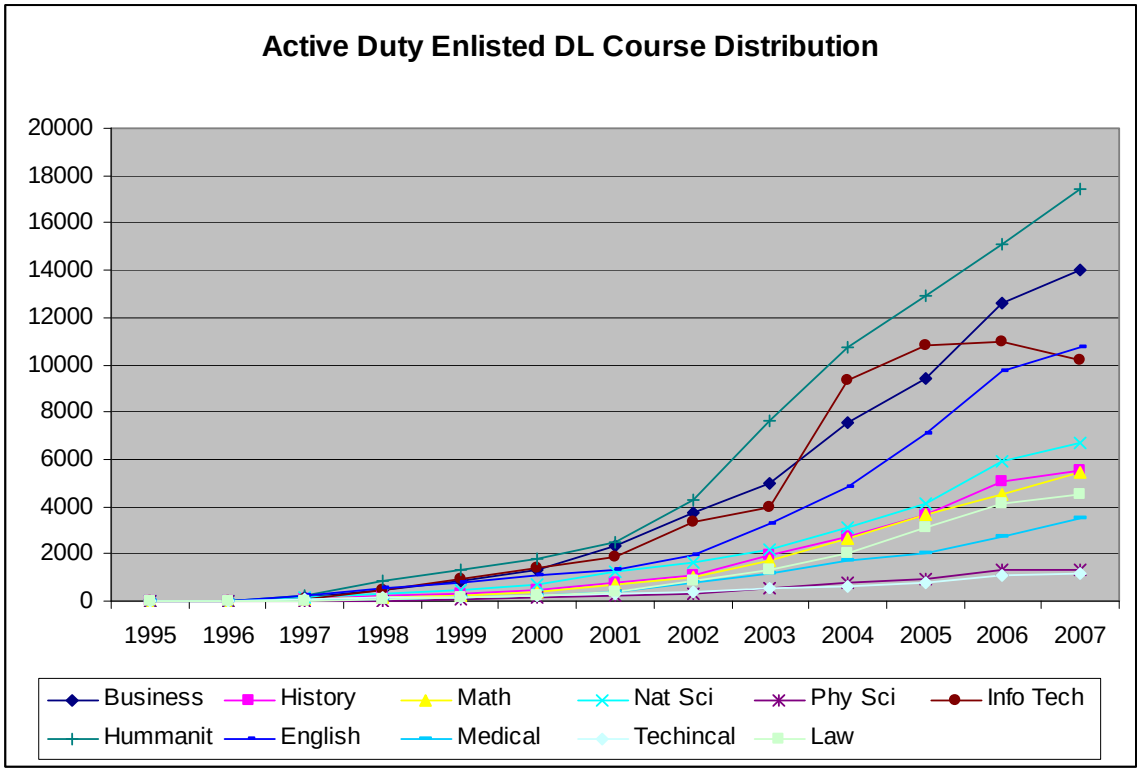


Figure 12. Distribution of DL Courses by Subject and Year. *Source: NCMIS*

E. TA Course Completion Rates

Figure 13 shows completion rates in DL and traditional classes by Fiscal Year. Completion rates are consistently higher in traditional classes than in DL classes.

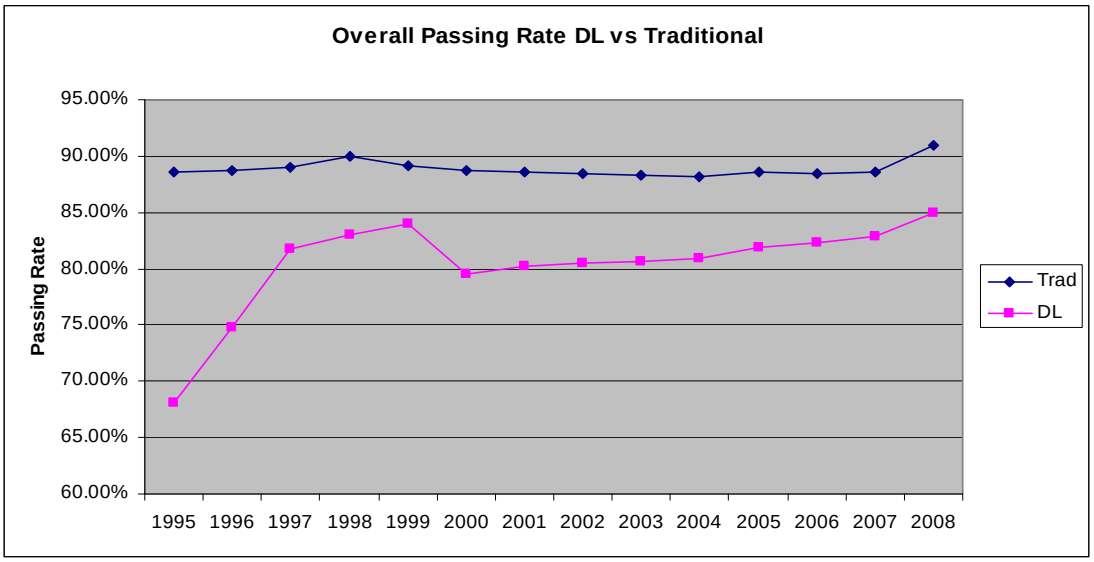


Figure 13. Completion Rates for DL and Traditional Courses.

Source: NCMIS.

The sizeable difference in completion rates between the two instruction methods in 1995-1996 is influenced by the small number of DL classes in those years. In 1997, the first year when a sizeable number of TA students enrolled in DL courses, the gap in completion rates was only 7 points. In FY 2000 the gap was 9 points and by 2007 it was about 6 points. The slight decrease in the gap between the two types of courses may reflect improvements in the delivery of DL classes by educational institutions and improvements in access to computers and the internet for Sailors.

Differences in completion rates by subject area also have diminished. For example, in physical science classes, Figure 20 shows that the gap in completion rates was nearly 15 percentage points in 2002 but only 7 points in 2006.

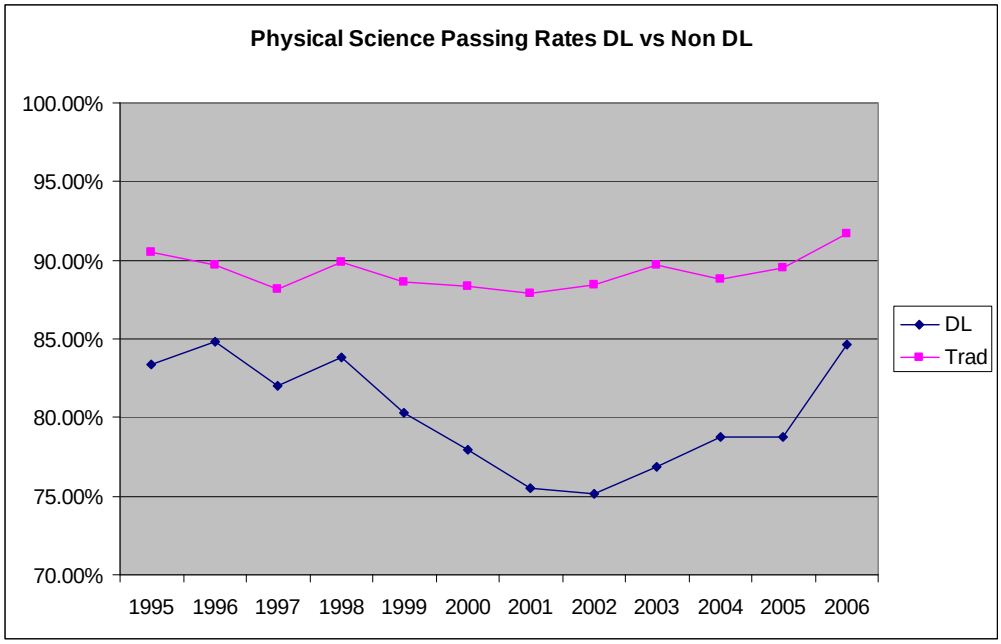


Figure 14. Completion Rates in Physical Science Classes in DL and Other Classes by Year.

Figure 15, which depicts completion rates by the pay grade of the student, shows that junior sailors (E1-E3) consistently have lower course pass rates than more senior sailors.

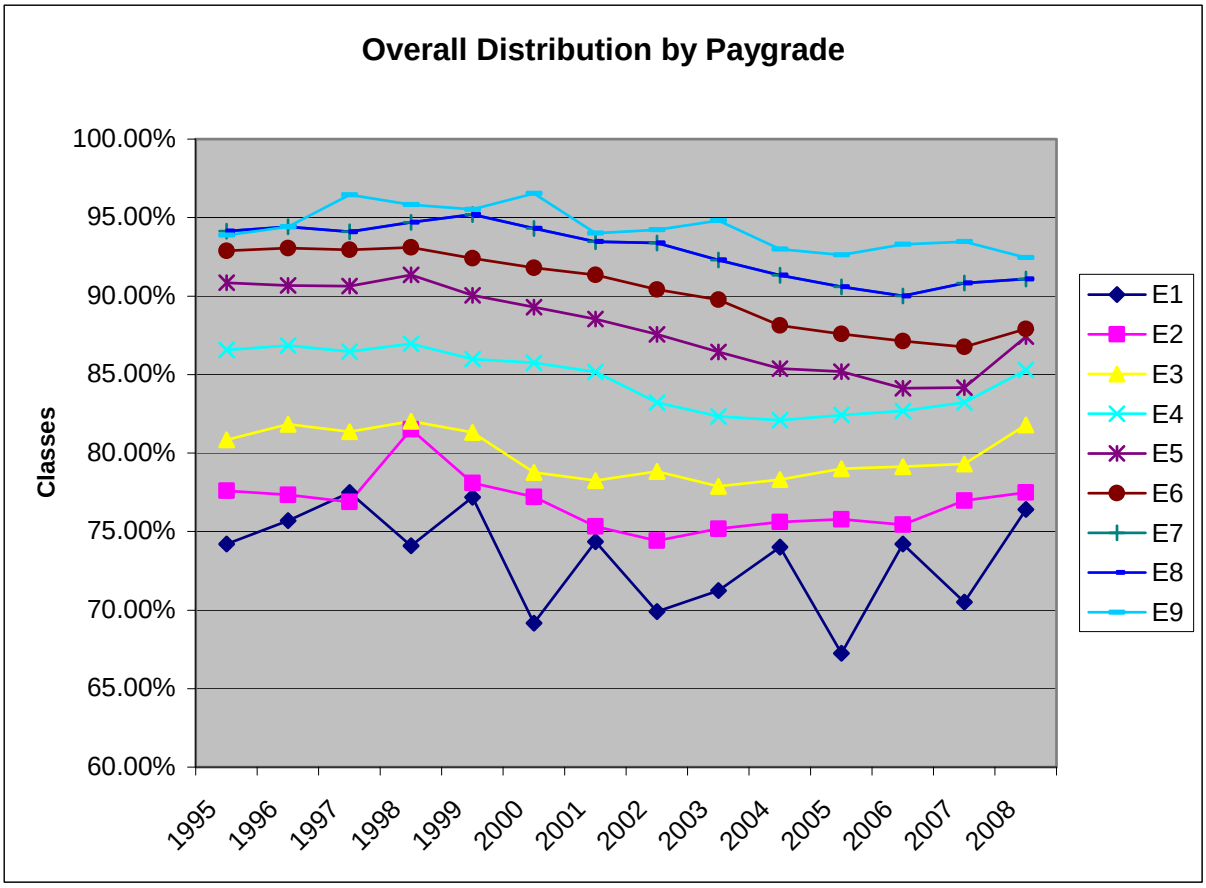


Figure 15. Course Completion Rates by Pay Grade and Year.

Finally, Figure 16 shows that course pass rates for women are slightly lower than for men.

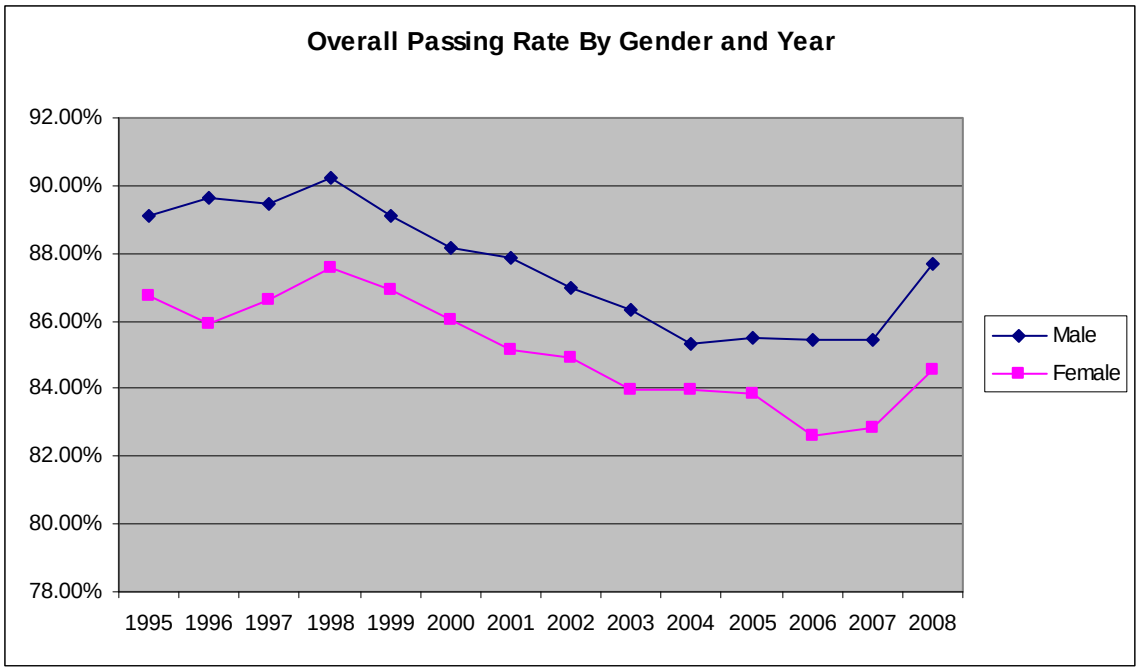


Figure 16. Course Completion Rates by Gender by Year.

In summary, participation in the TA program grew steadily between fiscal years 1995 and 2007 even though the active duty enlisted force fell by over 100,000 sailors. The number of courses offered via DL grew by ten-fold after 2000. E-5s and E-6s have the highest TA participation rates in the enlisted ranks. Overall, females and minorities participate in TA at higher rates than white males. Finally, completion rates for DL courses are lower than for traditional courses; but the gap has declined substantially since 2000.

IV. Data and Multivariate Models

This section discusses the multivariate statistical models used to estimate the effect of TA participation on the selected outcomes. The section discusses the final data set used for the statistical analyses, explains the estimation methodology, and identifies the relevant treatment and control groups used to obtain program effects for each of the selected outcome measures.

A. Retention Models

We create three variables to identify sailors who stay in the Navy beyond their initial 4-year contract. The first variable captures short-term extensions (less than 3 years in length). This variable allows us to test whether those who participate in the TA program complete additional years of service beyond their initial 4-year contracts, even though they do not sign long-term reenlistment contracts. The sample for this model includes all new recruits who entered during the period 1994-2004. From the point of view of the organization, sailors who extend, although they do not sign a reenlistment contract, are contributing their human capital (including any additions due to TA participation) to the organization.

The second retention variable captures those who sign long-term reenlistment contracts. This allows us to capture those who commit to more years of service since long-term contracts can vary from 3 to 6 years of additional service. This variable was created utilizing the Interservice Separation Code (ISC) code for the first listed date of separation. The third retention variable captures both long-term

reenlistments and short-term extensions. This allows us to analyze if TA usage is linked to any increase in years of effective military service beyond the expiration of the initial contract. It also allows us to capture the overall effect of TA on length of service in case the program has differential effects on extensions and reenlistments.

Dealing with Selection Bias. The focus of this study is on the effect of completion of TA classes on selected outcome indicators, including retention and promotion, and potential differences in these effects across modes of instruction. A critical issue in obtaining unbiased statistical estimates of program effects is the confounding effect of self selection by TA students. To model retention, ideally we want to estimate the effect of TA as:

$$ATT_1 = E\left(y_1 \mid X, M, A, TA = 1\right) - E\left(y_1 \mid X, M, A, TA = 0\right) \quad (1)$$

where y_1 denotes a specific outcome. However, since we cannot observe the outcomes of TA participants in the absence of treatment, we can obtain program effects by approximating the counterfactual with the outcomes of non-participants:

$$ATT_2 = E\left(y_1 \mid X, M, A, TA = 1\right) - E\left(y_0 \mid X, M, A, TA = 0\right) \quad (2)$$

where y_0 denotes outcomes for non-TA users, X includes demographics (race, ethnicity, gender, marital status, dependents, and an interaction of the last two variables), M represents military-specific variables, and A represents ability and motivation, which is proxied by AFQT scores. TA is an indicator of program participation.

Bias in estimates of ATT_2 can stem from both observable and unobservable factors. Prior studies have focused on potential differences in unobservable factors between TA participants and non-participants (Buddin and Kapur, 2002). The concern is that higher-ability sailors will pursue more education and also will have better job performance. Hence, estimates of the effect of additional education (via TA) will tend to be biased. Although we include AFQT scores in the model to proxy for ability, other unobservable characteristics of individuals, such as motivation, perseverance, learning style, or other dimensions of cognitive ability, may remain in u_i.

To deal with selection bias and to focus on average treatment effects for the typical participant (ATTs) we exploit a unique feature of the data to create the comparison group. First, to mitigate the bias from unobservable factors driving program participation, we focus solely on those enroll in the TA program. These individuals signal a similar propensity for additional education. However, not all of those who enroll in TA-supported courses complete those courses. We exploit the information on course completers and noncompleters to construct control and treatment groups based on whether educational attainment actually changes due to their enrollment in TA. Thus, we propose ATT_3 below as an approximation for ATT1:

$$ATT_3 = E\left(y_{11} \mid X, M, A, TA = 1, P = 1\right) - E\left(y_{10} \mid X, M, A, TA = 1, P = 0\right) \quad (3)$$

where P indicates whether the recruit passes at least one TA course, which reveals the potential and opportunity to complete courses, conditional on work schedules and other contingencies unobservable to us. In (3), y_{11} represents outcomes

for TA users who complete at least one course, while y_{10} represents outcomes for TA users who complete none of their courses.

'Non-completers' constitute a natural control group who reveal their propensity for education, but whose educational attainment does not change as a result of their participation in the TA program. Using non-completers to construct the control group minimizes selection problems because non-completers and completers are similar in terms of motivation, initiative, and circumstances at the time of enrollment. In our definition, 'completers' include those who fail to complete some, but not all, of their courses. We interpret this to mean that they have the opportunity to complete courses, despite work demands or other unforeseen circumstances. In our data, 48,876 individuals enroll in TA, but 20% of enrollees are 'non-completers.'

The justification for this research design is based in part on the observation that many of the events that disrupt course completion – deployments, transfers, changes in work schedules, and medical problems, for example – are exogenous. With respect to deployments, Lyle (2005) demonstrates that deployment decisions in the Army are exogenous to individual decision-making because they are made at the unit (battalion) level. This argument applies equally to the Navy because sailors also deploy according to unit (ship) schedules. In addition, even when sailors can anticipate deployment schedules, return dates are far less predictable, which can interfere with education plans.

Another reason non-completion may be randomly distributed among TA users is that 18- to 20-year olds in general may simply be bad planners. For example,

evidence finds that civilian community college students frequently drop or fail classes, often due to unforeseen events.[7] If sailors behave the same as their civilian counterparts, their course drop rates may be due less to ability than to their lack of foresight in anticipating changes.[8]

In summary, restricting the sample to TA users helps to control for unmeasured skills and preferences. It is assumed that individuals linked by enrollment in the TA program share more similar abilities and preferences than randomly selected individuals, in which case our design controls for many unobservables affecting participation. The design also controls for qualification for college-level classes because all TA users meet enrollment criteria. These data allow us to exploit what may be largely exogenous variation in TA completion to obtain unbiased measures of the effect of additional education on career outcomes.

Although our approach has several advantages in controlling for important unobservables, there may still be pre-treatment differences between TA users and non-users. Even though all TA users have a similar interest in further education and face similar hardships of long and varying work schedules and deployments, completers somehow managed to successfully finish their classes. They may succeed either because they have better career prospects in the military and wish to use education to

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[7] Brock et al. (2007) analyze the records of 66,129 entering community college students in 2002 and find that the mean completion rate over three years for individual courses was 70%. Matus-Grossman and Gooden (2002) discuss the reasons cited by community college students for dropping courses.

[8] Note, too, that many college classes are now offered to TA enrollees via distance learning. Since sailors often take these classes while on lengthy and demanding deployments, they may miscalculate the time and effort necessary to complete the DL classes within the allotted time.

advance in their careers, or because they are accumulating human capital in preparation for leaving the military, or because they have higher ability. Hence, outcomes for noncompleters may still overstate or understate outcomes that would have accrued to participants had they foregone program participation. However, with forces working in opposite directions within a relatively homogeneous population, our contention is that the net bias will be small.

Explanatory Variables. Our main indicator of TA participation indicates captures whether a sailor ever passed a TA-funded college course (pass_some). Two other binary variables were created to indicate the type of class successfully completed by the Sailor—DL or traditional. *A priori* it is unclear whether the mode of instruction would affect retention and promotion outcomes. Some studies suggest that online courses will have positive effects on the job performance measures (retention and promotion). However, this effect may stem not so much from the direct causal effect of instruction mode as from differences in DL and traditional students, with DL students tending to be more career-oriented and more mature than traditional students. The Navy places greater demands on sailors as they increase in rank making decisions between work, family, and education increasingly difficult. The ability to choose the time and location of the online course benefits the Navy by not detracting from the sailor's main work responsibilities. On the other hand, prior research also shows that DL students are less likely to complete their courses than other students.

We attempt to control for life and work demands using data on sailor demographics at the time of the retention decision. The DMDC data contains information on student demographics, ability (AFQT scores), as well as proxies for work

and life demands, such as rating and marital status from entry into the Navy until the date of separation. We include an indicator for gender because some studies indicate that females have lower retention and promotion rates than males. Similarly, we include dummy variables for race and ethnicity (white, Black, Native American, Asian, Hispanic and other) to measure the effect of minority status on the outcome measures. Based on prior research, we expect that marriage and children will have positive effects on the career outcomes as sailors will prefer a steady job and an increasing salary to maintain their families' living standards. We also include the number of dependents at the time of the retention decision. We include a continuous variable for age at the time of entry into the Navy.

We use AFQT scores as a measure of observed ability. We also account for the educational attainment of sailors at the time of entry. Sailors who had taken college courses prior to entering the Navy may have a higher interest in the TA program and higher aptitude for further education. Educational attainment prior to entry into the military is classified in the following categories: high school diploma, no high school diploma, general equivalency diploma (GED), and one or more completed college courses. Prior studies have shown that failing to obtain a high school diploma is often a signal of lower motivation and persistence.

Finally, the models include dummies for 10 broad military occupational specialties. We control for specialty (rating) to isolate the effect of additional general education from the effect of advanced skill training. Cohort dummies (FY) are also included to proxy for civilian labor market conditions and other unmeasured differences across cohorts (due, for example, to fluctuations in recruiting policies).

B. Promotion Models

The promotion model captures whether the sailor is promoted to at least E-5 in the first term of service. Promotions to lower pay grades are not investigated because these promotions are not as competitive as promotion to E-5. In contrast, promotions to E-5 depend on performance tests and periodic evaluations by superiors, among other factors (Schmitz and Moskowitz, 2008). Furthermore, promotions to lower levels tend to be contemporaneous with TA participation, thus making it difficult to establish causality. We do not analyze promotions to pay grades above E-5 because they seldom occur during the first four years of service. Self-selection into TA courses is also a concern in estimation of the promotion models. Reenlistment and extension decisions differ from promotion outcomes in that promotions do not occur at fixed points in time. In addition, sailors need to be in the sample during the entire first term to observe pay-grades during this period.

Unlike the retention model, for the promotion model we create a panel data set composed of observations of each new recruit from time of entry until the end of the four-year contract. The panel data set tracks the year-to-year pattern of TA usage and of promotion. This setup allows us to control for unobserved individual heterogeneity by using panel data methods. More specifically, if we assume that self-selection into the program is driven by ability, and that ability stays relatively fixed over the period of observation, we can eliminate the bias in the estimates by differencing out the fixed effects over different time periods. Hence, our approach for dealing with sample selectivity bias differs in the promotion models from that adopted in the reenlistment models.

C. Data Set for Retention and Promotion Models

The analysis sample for the retention and promotion models is drawn from two separate data files. The Defense Manpower Data Center provided information on all new recruits who entered the Navy between FY 1994 and 2007. Each new recruit is followed until separation from the Navy or September 30, 2007, which is the latest date of observation in our data. Quarterly snapshots of every new recruit were available during this entire period. The data include information on demographics, contract length, rating, promotions, AFQT scores, and dates of separation and reasons for separation (based on the Interservice Separation Codes (ISC)).

The analysis data file was restricted in several ways. First, we included only sailors with 4-year contracts in the sample. Sailors with longer contracts have longer training pipelines, which may affect their career paths, and their educational and retention decisions. Second, we included only sailors who survived 36 months of service to ensure that sailors in the treatment and control groups had a comparable period of time to participate in the TA program.

The second set of data was provided by the Navy Education and Training Center (NETC) and includes every TA-funded class taken by sailors between 1995 and 2008. The data includes course name and type, method of delivery, course status (completed, in progress, etc.), final grades, student demographics, and dates when the course commenced and when it was completed. This data set was also restricted in several ways. First, we focus only on college courses taken by enlisted service members. To avoid combining remedial high school courses with college courses and graduate-level

courses, we also restricted the course sample to undergraduate college courses that were taken during the sailors' first enlistment term. Individuals taking remedial classes will have different motivations and goals than those taking undergraduate courses, and the focus of our study is on the effects of general education on worker mobility and performance.

D. Models of Learning Outcomes: Course Completions and Grades (GPA)

To analyze the determinants of student academic performance as a function of course delivery method we analyze two different outcomes: (a) course completion rates, and (b) course grades (GPA). To estimate causal effects of course delivery methods, we need to address the inherently different characteristics of students typically enrolling in DL courses from students enrolling in traditional classroom courses. It is likely that students choose classes based in part on their learning style or on their comparative advantage in one instructional method. Hence, the learning models must account for unobserved differences among TA users that may be correlated with course choice. These unobservable, and omitted factors, may also be correlated with the learning outcomes, which creates biases estimates of the effect the instructional mode.

To control for self-selection into online courses, the learning models use course-level data, rather than individual-level, cross-sectional data. More specifically, we estimate the effect of DL instruction on learning outcomes by comparing the GPA and course completion rates for DL and traditional classes taken by the same student. This way we can hold fixed all individual characteristics correlated with delivery method and

also unobserved ability and motivation that would influence achievement. The data for this model comes from the 1,960,592 TA-funded courses that Navy personnel enrolled in between FY 1995 and FY 2008. The sample is restricted to enlisted personnel taking undergraduate college courses leaving 1,641,740 person-course-level observations.

The model is estimated using fixed effects techniques, which control for the invariant and unobservable attributes of individual enrollees, such as motivation, perseverance, and learning style. The fixed effects approach essentially assesses outcomes, such as completion rates, for each individual when the person switches between delivery modes over time. That is, the effect of taking a DL class is identified when, in the course-person panel data, individuals take both face-to-face and DL courses over time. The fixed effects method requires that both dependent and explanatory variables in the model vary over time. As a result, individual demographic characteristics, which are time-invariant, such as AFQT scores, gender, race, etc., drop out of the estimations.

Binary (dummy) variables for each fiscal year also are included in the models to control for changes over time in military policies and other factors. For example, the policy change in 2002 that increased tuition reimbursement rates from 75% to 100% may have affected completion rates. For example, this policy may have reduced completion rates if marginal sailors are enticed to enroll in classes due to the lower tuition costs to them. At the same time, more sailors will be on the margin during this period due to the increases operational tempo from the Global War on Terror. On the other hand, sailors may have become more cautious about enrolling because if they enroll in a class but fail it, the amount they must reimburse the Navy has increased.

Dummy variables for course subject also are included as predictors in the learning models. It could be that some courses are harder when delivered via DL or that some subjects are more likely to be offered in the classroom rather than via DL. The course subject categories are based on the following established secondary education categories: business, history, math, natural sciences, physical sciences, information technology, humanities, English, medical, technical, and miscellaneous. To capture the interaction of DL with course subject in predicting course success, we also add interaction terms between the DL indicator variable and the course subject dummies.

Dummy variables for rank (at the time the course was taken) also are included in the models. These variables serve as proxies for work schedules and time constraints. Grades E-1 to E-3 were aggregated into a single category due to the small number of observations and due to the fact that promotions to these grades are not based on performance factors such as rating examinations, periodic evaluations, and board selection. As E-5s constitute the largest group of TA participants, they were chosen as the reference category. The literature review suggests that completion rates will increase with rank. Finally, since it is likely that student maturity will be a predictor of course completion, and that the effect of maturity will differ by subject, we also add interactions of DL with the pay grade dummies.

Formally, for the course completion model, we assume that the probability of passing a course is determined via the following model:

$$P(pass_{ij} = 1 | X_{ij}, a_j) = a + b\,DL_{ij} + g_i Subject_i + d_t FY_t + f\,Rank_{ijt} + a_j + u_{ijt} \qquad (1)$$

Where *i* denotes course, *t* indicates year when course was taken, *j* indicates individual, and a_j represents all unobserved individual attributes that remain fixed over the time period observed. The unobserved individual characteristics captured by a_j would include ability, motivation, maturity, time management skills, etc., that would potentially be correlated with both the likelihood of passing a course and with the decision to take the course online or in a traditional classroom. The fixed effects transformation eliminates this term (and, consequently, the source of bias). The estimated model also eliminates all other observable individual attributes that are fixed over time, such as gender, race, and AFQT scores.

E. Descriptive Statistics

The sample was first restricted to non-prior service recruits with 4-year contracts who entered the Navy between 1994 and 2003, which includes 381,455 observations. To ensure that sailors in both the treatment and control groups had a comparable time period to utilize TA, the sample was restricted to sailors who completed at least 36 months of service. This restriction reduced the number of observations to 278,474. High school graduates comprised the largest education accession group (87.2%); females comprised 17% of new recruits, African Americans 19%, Hispanics 11.7%, and Asians 5.3%. The overall TA participation rate in the first 4-years of service was 16%. Table 3 provides descriptive statistics for the full sample of individual sailors, and separately for TA-users and non-users.

Table 3. Descriptive Statistics for Samples of All Recruits and Recruits Who Enrolled in TA

Variable	Full Sample	TA Users	Non-TA Users
TA Usage rate	.159	—	—
TA Completers	.130	.820	—
DL Completers	.029	.750	—
Non-DL Completers	.114	.856	—
Reenlistments & Extensions[a]	.681	.747	.668
Reenlistment Rate	.379	.351	.383
Promotion Rate E4	.856	.899	.842
Promotion Rate E5	.239	.258	.235
Age	.199	.201	.199
AFQT Score (percentile)	.612	.633	.608
Female	.171	.348	.137
Married	.398	.432	.391
White	.599	.556	.608
African-American	.187	.199	.185
Hispanic	.117	.136	.113
Asian	.053	.065	.050
H.S. Diploma	.872	.888	.869
No H.S. Diploma	.054	.040	.057
GED	.030	.025	.031
Some College	.044	.047	.043
Sample Size	278,474	44,251	234,223

[a] Variable includes all sailors who reenlisted or extended past their initial enlistment.

Of the 44,251 individuals who enrolled in TA during this period, 82% successfully completed at least one course. Completion rates were lower for those taking DL classes than for those taking traditional classes (.75 vs. .85). TA participation rates of women are more than double those of men (32% vs. 12.4%)

To adjust for selection bias, the retention and promotion models are estimated for the sample of TA users only. Table 4 provides descriptive statistics for the TA users sample and, among all TA users, separately for DL and traditional class-takers. DL users are only 1.1 points less likely to reenlist than those taking traditional classes, but are 2.4% more likely to stay beyond 4 years of service. Women are more likely to enroll in DL than men. DL class takers have higher average AFQT scores and are more likely

to be married than traditional students. Minorities participate in traditional TA classes at higher rates than DL classes, whereas whites are the only group to prefer DL classes. Sailors with some college are more likely to utilize DL than traditional TA.

Table 4. Descriptive Statistics for the Sample of TA Users Only

Variable	All TA Users	DL Users	Traditional Users
TA Completers	.820	.750	.856
Reenlist & Extensions[a]	.747	.763	.745
Reenlist Rate[b]	.351	.315	.353
Promotion Rate E4	.899	.931	.895
Promotion Rate E5	.258	.359	.239
Age	.201	.204	.200
AFQT Score (%)	.633	.656	.627
Female	.348	.365	.356
Married	.432	.502	.417
White	.556	.592	.542
African-American	.199	.186	.205
Hispanic	.136	.114	.142
Asian	.065	.051	.068
H.S. Diploma	.888	.882	.889
No H.S. Diploma	.040	.035	.041
GED	.025	.027	.024
Some College	.047	.057	.046
Sample Size	44,251	10,854	36,928

[a] Variable includes all sailors who reenlisted or extended past their initial enlistment
[b] To calculate reenlistment rates, the sample was restricted to recruits who entered 1994-2001 and had valid ISC codes.

F. DL Participation Models

The summary statistics above indicate that TA participation varies by demographic characteristics and that TA users are different from non-participants. To establish a baseline for participation in the Navy's TA program, probit models were estimated for the determinants of overall TA participation, and separately for the

determinants of taking a DL course and for taking a traditional course. Model (2) was used to estimate the TA participation models:

$$P(TA = 1 | X_i) = a + b_1 Female_i + b_2 Race_i + b_3 Married_i + b_4 Dependents_i + b_5 Age_i + b_6 AFQT_i + b_7 Education_i + b_8 FY_t + u_i \quad (2)$$

These models are intended to be descriptive and to reveal whether the observed demographic differences between TA participants and non-participants are statistically significant.

V. Statistical Results

A. Student Learning Outcomes

As discussed earlier, the course completion models use course-level data. The NETC data on TA-funded courses taken by Sailors between FY 1994 and 2008 provides a sample size of 1,641,740 person-course observations for undergraduate college classes. These courses were taken by 233,459 different Sailors. Thus, over this period, the average Sailor enrolled in about seven college classes. We use fixed effects to estimate the course completion model to eliminate heterogeneity due to fixed individual characteristics such as aptitude, motivation, ability, and initiative.[9] The key results from the model are summarized in Table 5. The full results for the course completion model are displayed in Appendix Table 1.

Table 5. Course Completion Models

	LPM Regression Model	Fixed Effects Model
DL Course	-0.007	-0.065
	(0.001)***	(0.002)***
Constant	0.835	0.880
	(0.004)***	(0.005)***
Observations	1,336,878	1,336,878
R-squared	0.03	0.01
Individuals	N.A.	217,052

Robust standard errors in parentheses;
* significant at .10; **significant at.05; ***significant at .01

[9] One problem the data cannot address is that of 'non-starters,' students who enroll in a class, but never start the class. Howell et al. (2004) argue that a large portion of non-completers are students who never attend a class, submit any assignments, or take any tests (non-starters). Unfortunately, the NETC data does not contain any information that would identify non-starters. In this model a non-completer is a sailor who did not withdraw from a course before the official withdrawal date and consequently received either a failing or an incomplete grade or a 'w' for the withdrawal.

In the linear probability model estimated via OLS in column 1, the estimated effect of taking a DL class is negative but small in magnitude. However, we argued above that this estimate is likely to be biased due to self-selection into DL classes. When the model is estimated via fixed effects in column 2, which nets out individual fixed characteristics, we find that the negative effect of taking a DL class is much larger. The fixed effect coefficient suggests that if the same sailor switches from a traditional to a DL class he is 6.5 percentage points less likely to complete the course. At the mean completion rate of .82, this represents about an 8 percent lower pass rate in DL courses. The key point here is that these estimates are not dependent on any unobserved individual characteristics and have a causal interpretation.

As the full results in Appendix Table 1 show, among the other determinants, the coefficients of the year dummies suggest that TA completion rates have deteriorated over time. The gap in completion rates was 2-3 points in the earliest years covered by this data, 1995-1996, but rose to a difference of 8-9 points in the last two years, 2006-2007. There are several hypotheses explaining this trend. First, it could be that the availability of DL courses has increased the participation rates of marginal sailors who would otherwise not enroll in college courses. These sailors could have lower ability than the typical TA participant in earlier years, or they could have more demanding work schedules. In fact, the decline in completion rates could be a direct effect of increased operational tempo associated with GWOT. Since those taking DL courses are more likely to be deployed, it could be that the increased work demands are more visible in DL pass rates rather than in traditional TA pass rates. Finally, the increase in the amount of reimbursement from the Navy may have reduced the initial individual risk of

enrolling in a course, thus resulting in higher participation rates from individuals who are simply exploring the possibility of further education rather than committing to it. In fact, DL courses may carry less risk for the individual since they allow for a more flexible schedule, thus attracting individuals who otherwise may be too busy to invest in further education. Since all the course performance models control for individual attributes, the most likely explanation for the declining completion rates would have to be one that depends on policy changes or changes in the time allocation decisions due to changing work schedules.

Of interest is also the observation that there is some variation in the pass rate in DL courses across subjects. The coefficients of the interactions terms in Appendix Table 1 indicate that pass rates are lower in distance education classes in History and English.

Table 8 displays the key results of estimating the grade point (GPA) models. The full model results are displayed in Appendix Table 2.

Table 6. Model of Course Grades (GPA)

	LPM Regression Model	Fixed Effects Model
	Coefficient (standard error)	Coefficient (standard error)
DL Course	-0.207	-0.260
	(0.003)***	(0.005)***
Constant	3.008	2.902
	(0.013)***	(0.015)***
Observations	1,173,093	1,173,093
R-squared	0.03	0.02
Number of Individuals	N.A.	200,740

Robust standard errors in parentheses;* significant at .10; ** significant at .05; *** significant at .01

The estimates in Table 8 suggest that switching to a DL class is associated with a lower course grade. The effect is somewhat larger in the fixed effects estimates, which suggest that taking a DL class reduces an individual's grade by .26 points. Since the average grade in the sample is 3.18, or slightly above a B, taking an online class reduces this to a 2.92, or slightly below a B. Once again, the fiscal year dummies suggest that the negative effect of online classes on grades worsens significantly over the period covered by this data. This is consistent with the course completion results above, in part because the course completion or pass rate is based partly on the grade recorded in the class.

B. Results of TA Program Participation Models

The TA participation models analyze the determinants of TA participation for a sample restricted to first-term Sailors with 4-year contracts who survived at least the first 36 months of service (N=255,749). This model is estimated on individual-level data for first-term Sailors during this period. The multivariate models attempt to isolate the effects of the demographic characteristics of Sailors on their decisions to take at least one TA-subsidized class. Table 8 displays the estimated probit coefficients along with their standard errors and the calculated marginal effect associated with each coefficient.

In column 1 of Table 7 we find that TA participation rates are much higher (15.5 percentage points higher) for women than for men. The 15.5 percentage point difference means that women are nearly twice as likely to take a TA class as men are. Most minority groups, excluding Native Americans, are more likely to participate in TA than whites. Hispanics and Asian-Americans are about 4 percentage points (25%)

more likely to participate than whites, while Blacks are about 2 points (12%) more likely to participate than whites. Sailors who were married during their first enlistment were 2 points more likely to participate, while those with dependents were less likely to participate. Not surprisingly, those with higher AFQT scores are more likely to participate, while those with no high school diploma or a GED were less likely to take college courses. The effect of AFQT scores indicates that a 10-point increase in AFQT score increases TA usage by about 2 points. Surprisingly, recruits with some college were less likely to participate in TA, as compared to high school diploma graduates. However, it should be pointed out that often recruits with 'some college' have not necessarily received a traditional high school diploma. Being classified as having 'some college' increases the educational status of military applicants and increases their chances of being accepted into the military.

In terms of differences in participation by mode of instruction, the results show that, consistent with previous studies, sailors with dependents were no less likely to participate in DL classes, but were 1.5 points less likely to participate in traditional classes. Otherwise, few differences emerge in the likelihood to take DL versus non-DL classes. Finally, as expected, the year dummies reflect the increased annual growth of DL classes after FY 2000. As discussed above, the increase appears to be traced to the Navy's program that signed partnership agreements with postsecondary institutions to supply DL classes. Another reason is that the Navy has increased the availability of computers and internet access to Sailors during the past decade. Finally, the increase to 100% tuition reimbursement also played a role.

Table 7. Probit Model of TA Participation by Course Type

	Overall TA		DL TA		Traditional TA	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
female	0.588	0.155	0.461	0.032	0.560	0.131
	(0.008)***		(0.012)***		(0.008)***	
black	0.083	0.019	0.038	0.002	0.100	0.020
	(0.009)***		(0.014)***		(0.009)***	
native	-0.077	-0.016	-0.084	-0.004	-0.064	-0.012
	(0.019)***		(0.028)***		(0.020)***	
Asian	0.177	0.042	0.038	0.002	0.199	0.042
	(0.014)***		(0.023)		(0.014)***	
Hispanic	0.188	0.044	0.082	0.004	0.202	0.042
	(0.010)***		(0.017)***		(0.010)***	
race unknown	0.148	0.035	0.113	0.006	0.184	0.039
	(0.038)***		(0.048)**		(0.040)***	
race other	0.224	0.055	0.135	0.008	0.229	0.050
	(0.036)***		(0.052)***		(0.037)***	
married	0.090	0.020	0.103	0.005	0.076	0.015
	(0.009)***		(0.014)***		(0.009)***	
dependents	-0.064	-0.014	-0.010	-0.000	-0.077	-0.015
	(0.005)***		(0.007)		(0.005)***	
age	0.009	0.002	0.018	0.001	0.006	0.001
	(0.001)***		(0.002)***		(0.001)***	
AFQT	0.008	0.002	0.010	0.000	0.007	0.001
	(0.000)***		(0.000)***		(0.000)***	
non high school	-0.119	-0.024	-0.153	-0.007	-0.107	-0.019
diploma	(0.016)***		(0.026)***		(0.016)***	
GED	-0.072	-0.015	-0.100	-0.004	-0.064	-0.012
	(0.020)***		(0.031)***		(0.021)***	
some college	-0.106	-0.022	-0.091	-0.004	-0.085	-0.015
	(0.016)***		(0.024)***		(0.017)***	
fy95	0.020	0.004	0.408	0.029	0.008	0.001
	(0.016)		(0.059)***		(0.017)	

fy96	-0.002	-0.000	0.669	0.058	-0.022	-0.004
	(0.016)		(0.056)***		(0.017)	
fy97	-0.040	-0.008	0.774	0.072	-0.062	-0.011
	(0.016)**		(0.055)***		(0.016)***	
fy98	0.047	0.010	0.942	0.099	0.007	0.001
	(0.016)***		(0.054)***		(0.016)	
fy99	0.024	0.005	1.019	0.112	-0.030	-0.006
	(0.016)		(0.054)***		(0.016)*	
fy00	0.064	0.014	1.212	0.151	-0.033	-0.006
	(0.016)***		(0.053)***		(0.016)**	
fy01	0.145	0.034	1.407	0.204	-0.002	-0.000
	(0.016)***		(0.053)***		(0.016)	
fy02	0.227	0.054	1.587	0.251	0.028	0.005
	(0.015)***		(0.053)***		(0.016)*	
fy03	0.250	0.060	1.665	0.276	0.020	0.004
	(0.015)***		(0.053)***		(0.016)	
Constant	-2.105		-4.251		-1.962	
	(0.030)***		(0.067)***		(0.032)***	
Observations	255,749	255,749	255749	255,749	255,749	255,749

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

C. Retention Models

The retention models estimate the effects of TA on the retention probability while controlling for race, gender, education, AFQT scores, marital status, number of dependents, and dummies for year and occupational categories. Without occupational controls, differences in external job opportunities and occupational work demands coupled with higher selective reenlistment bonuses (SRB) for ratings with historically lower retention rates could bias model parameter estimates.

Three different retention outcomes are examined – long-term reenlistment, short-term extensions, and reenlistments plus extensions. The results of the probit retention models are listed in Tables 8-10. Again, the full model results are displayed in Appendix Tables 3-5.

Table 8. Probit Reenlistment Models

	Effect of TA on reenlistment		Effect of passing TA class on Reenlistment		Effect of passing DL class on Reenlistment	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
Ever take TA course	0.729 (0.007)***	0.281 (0.003)***				
Pass at least one TA course			0.280 (0.016)***	0.110 (0.006)***		
Pass at least one DL course					0.664 (0.012)***	0.246 (0.004)***
Pass at least one non-DL course					0.045 (0.013)***	0.017 (0.005)***
Observations	208,488	208,488	63,169	63,169	63,169	63,169

Standard errors in parentheses;* significant at .010; ** significant at .05; *** significant at .01

In columns 1-2 of Table 8, when retention is measured as long-term reenlistments, the estimates suggest that sailors who take TA classes are more likely to reenlist at the end of their enlistment term. Moreover, the marginal effect is quite large, suggesting that those who take at least one TA class are more likely to reenlist by 28 percentage points (a 70 percent difference). However, when the sample is restricted to only those who take TA classes in columns 3-4, the effect of TA indicates a difference of only 11 percentage points. This difference between the two samples is an indicator of the size of the selection bias in the estimates in columns 1-2, which are not adjusted for sample selectivity. In columns 5-6 we separate the TA courses into those taken and passed via DL and those taken and passed via traditional methods. Both groups are more likely to reenlist, but the marginal effect is much higher for those who pass DL classes than those who pass traditional classes (25 points versus 2 points, respectively).

Table 9 presents the results of probit models of extending beyond the EAOS date. Columns 1-2 show that those who ever take a TA class are 6 points less likely to extend than those who do not use TA. In columns 3-4 when we adjust for sample selectivity bias, this effect remains negative, but indicates only a 3 point difference in the extension probability. Finally, in columns 5-6, the effect of passing a DL class has a much larger effect in terms of reducing extensions than passing a traditional class.

Table 9. Probit Extension Models

	Effect of TA on extension		Effect of passing TA class on extension		Effect of passing DL class on extension	
	Coefficient (std. error)	Marginal Effect	Coefficient (std. error)	Marginal Effect	Coefficient (std. error)	Marginal Effect
Sample:	*All*		*TA participants*		*TA participants*	
Ever take TA course	-0.216 (0.007)***	-0.067 (0.002)***				
Pass at least one TA course			-0.108 (0.017)***	-0.034 (0.005)***		
Pass at least one DL course					-0.346 (0.013)***	-0.103 (0.004)***
Pass at least one non-DL					-0.001 (0.013)	-0.000 (0.004)
Observations	208,463	208,463	63,169	63,169	63,169	63,169

Standard errors in parentheses; significant at .01; ** significant at .05; *** significant at .01

Finally, in Table 10, when the model captures both extensions and reenlistments the results simply provide the average effects from both the separate reenlistment and extension models. Specifically, passing at least one TA course yields a 6.6 points increase in the probability of a sailor serving beyond the contract expiration date via either an extension or a reenlistment.

The results show no differences in retention rates for women, but both models find that African-Americans have higher retention rates. Sailors who are married or have dependents are more likely to reenlist or extend their service beyond the first four years. In both models sailors entering with some college have the lowest probability of staying.

Table 10. Probit Retention Models (Reenlistments and Extensions).

	Effect of taking TA on Retention		Effect of passing TA class on Retention		Effect of passing DL class on Retention	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Sample:	*All*		*TA participants*		*TA participants*	
Ever take TA course	0.735	0.221				
	(0.008)***	(0.002)***				
Pass at least one TA course			0.316	0.066		
			(0.019)***	(0.004)***		
Pass at least one DL course					0.733	0.112
					(0.017)***	(0.002)***
Pass at least one non-DL course					0.095	0.016
					(0.016)***	(0.003)***
Observations	208,488	208,488	63,169	63,169	63,169	63,169

Standard errors in parentheses; * significant at .01; ** significant at .05; *** significant at .01

D. Promotion Models

Next, we evaluate the effect of TA participation on promotion to E-5. If additional general education increases the productivity of new recruits, we would expect service members who participate in TA to be more likely to be promoted, all else equal. The multivariate linear probability promotion models use the same specification as the retention models above. The sample is again restricted to 4-year enlistees who completed at least 36 months of service to ensure that all sailors in the sample had adequate, and comparable, time to utilize TA. In contrast to the retention models, the promotion models are estimated via fixed effects on the panel dataset including observations for sailors in all four years of service. Key parameter estimates of the linear probability models and fixed effects models using the panel data set are presented in Table 11. Full model results are presented in Appendix Table 6.

Table 11. Promotion to E-5

	LPM	FE	LPM	FE	LPM	FE
Sample:	*4-year stayers*		*TA enrollees*		*TA enrollees*	
Ever take TA course	0.018	0.006				
	(0.001)***	(0.002)***				
Pass at least one TA course			0.009	0.001		
			(0.002)***	(0.002)		
Pass at least one DL course					0.043	0.035
					(0.005)***	(0.006)***
Pass at least one non-DL course					0.004	-0.003
					(0.002)*	(0.002)
Observations	800,844	800,844	107,260	107,260	107,260	107,260
R-squared	0.12	0.11	0.13	0.12	0.13	0.12
Number of individuals	N.A.	200,211	N.A.	26,815	N.A.	26,815

Standard errors in parentheses;* significant at .01; ** significant at .05; *** significant at .01

To provide benchmark estimates, the results in columns 1-2 are estimated using the full sample of 4-year stayers. These results indicate that TA use is associated with about a 1 point higher promotion rate to E-5. The results in cols. 3-4 are based on the restricted sample of TA users. In this setup, the effect of passing at least one TA class is also about 1 point in the LPM estimates, but is not significant in the fixed effects estimates. Thus, there appears to be some upward bias in the unadjusted estimates, although the overall promotion effect, even when significant appears to be small in magnitude. Interestingly, in columns 5-6 the positive promotion effect appears to be confined to those who successfully complete DL classes. The promotion rate of DL completers is 3.5 percentage points higher than non-completers. Note that the comparison group for columns 5-6 is all non-completers.

VI. Conclusions and Recommendations

A. Summary and Conclusions

This study provides new evidence on the effects of the Navy's TA program on the first-term retention and performance of new recruits. Relevant to current policy decisions, we investigate whether there are any differences in both course performance and performance on the job between sailors who take traditional and those who take DL classes. To overcome selection bias our estimates are based on samples of TA users only and on estimation via fixed effects methods.

Overall, we find that passing a TA course improves reenlistment rates. The reenlistment effect is larger for those who take and pass DL courses than for those who pass traditional courses. On the other hand, those who pass DL courses are less likely to extend beyond their EAOS date. Thus, the TA program acts much like the selective reenlistment bonus (SRB) program – it stimulates long-term reenlistment contracts and reduces short-term extensions. The overall effect is to increase the years of effective service from TA participants, which allows a longer time for the Navy to recoup firm-specific training investments. A monetary benefit of the TA program is the potential cost saving from the reduced SRB spending necessary to generate a given reenlistment rate. Of course, it is unknown whether these cost savings would exceed the TA program costs that produced the retention effect.

We also find that TA users are more likely to be promoted to E-5 before the end of the first term of service than are non-users. However, the effect appears to be

confined to those who take and pass DL classes. In our preferred estimates, the promotion effect of taking and passing a traditional class is statistically insignificant.

Because we find that the retention and promotion effects of TA usage are much larger for those who successfully complete their courses, our analysis of success rates is especially important. We find that those who enroll in online classes are less likely to complete their TA classes (a difference of about 8%). This effect is larger for those in lower pay grades and in certain subjects, especially English, Math, and Sciences. The negative effect is partially reduced when more senior enlistees take DL courses. It is likely that the lower completion rates for DL courses are due to the heavier work demands of DL students compared to sailors who take traditional classes. We control for this factor in part by including occupation dummies in the models, but this adjustment does not account for classes that may have been chosen due to deployments or other situations where service members have higher workloads and where traditional courses are unavailable.

The models clearly indicate positive returns to the TA program in terms of job performance, especially for DL students who pass their courses. These positive outcomes should be added to other benefits of the program, such as its effect as a recruiting incentive. Additionally, because females and minorities are more frequent users of TA, the program serves as a diversity tool.

B. Recommendations

DL use is rapidly growing in both Navy and civilian institutions. Although this study found negative effects of taking for DL classes on course completion rates, the

effect is much smaller for more senior enlistees. This is consistent with civilian studies that more successful DL students are more mature and career oriented. Finally, the study finds that retention and promotion effects are much larger for those who successfully complete their classes.

Future policies should focus on combating course failures, drops, and withdrawals. An obvious policy shift would be to screen students who are applying for DL classes, especially junior sailors and those who are taking a DL class for the first time. Adjusting to the military environment, to the demands of required training, and to the demands of their first jobs consumes too much time for junior sailors to devote sufficient time to do well in online classes. In addition, there is a need for increased command awareness of service members who take off-duty courses along with counseling programs in Navy College Centers that build strong study habits and that stress course completion. One possibility is to institute a policy of disallowing future course enrollments for one semester for students who fail to complete a class and require that they receive educational counseling or assessment as to their suitability for college classes, especially online classes. With the unique challenges and opportunities provided by service in the Navy, flexible educational opportunities will continue to be needed in order to fulfill both training and educational requirements for tomorrow's sailors.

The following are recommendations for further research. We recommend a follow-on study which focuses on the differential costs of providing online and traditional classes, which include the costs of the lower completion rates in DL classes. Subsequent studies should also incorporate more recent cohorts to encompass the

rapid growth of DL after about 2003 and after expansion of the NCDLP program. Next, it is important to obtain data to augment TA information with data on deployments and deployment durations, which will help isolate the effect of DL on passing rates. Finally, we recommend further analyses on patterns of course taking to find out whether course completion and reenlistment rates vary between sailors who take courses occasionally for personal enrichment versus those whose goal is to complete degrees.

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Appendix Table 1. Course Completion Models

	LPM Regression Model	Fixed Effects Model	Fixed Effects Model (with interactions)
DL Course	-0.007	-0.065	-0.066
	(0.001)***	(0.002)***	(0.006)***
FY1995	-0.012	-0.023	-0.023
	(0.003)***	(0.004)***	(0.004)***
FY1996	-0.012	-0.038	-0.038
	(0.003)***	(0.004)***	(0.004)***
FY1997	-0.012	-0.036	-0.036
	(0.003)***	(0.004)***	(0.004)***
FY1998	-0.020	-0.043	-0.042
	(0.003)***	(0.004)***	(0.004)***
FY1999	-0.038	-0.060	-0.059
	(0.003)***	(0.004)***	(0.004)***
FY2000	-0.027	-0.055	-0.054
	(0.003)***	(0.004)***	(0.004)***
FY2001	-0.035	-0.063	-0.063
	(0.003)***	(0.005)***	(0.005)***
FY2002	-0.045	-0.059	-0.059
	(0.003)***	(0.005)***	(0.005)***
FY2003	-0.101	-0.066	-0.065
	(0.003)***	(0.005)***	(0.005)***
FY2004	-0.123	-0.077	-0.077
	(0.003)***	(0.005)***	(0.005)***
FY2005	-0.113	-0.079	-0.078
	(0.003)***	(0.005)***	(0.005)***
FY2006	-0.089	-0.076	-0.075
	(0.003)***	(0.005)***	(0.005)***
FY2007	-0.091	-0.093	-0.092
	(0.003)***	(0.005)***	(0.005)***
Business	0.079	0.041	0.035
	(0.002)***	(0.002)***	(0.003)***
History	0.056	0.037	0.043
	(0.002)***	(0.002)***	(0.003)***
Math	0.021	0.001	0.001
	(0.002)***	(0.002)	(0.002)
Natural Sciences	0.047	0.032	0.032
	(0.002)***	(0.002)***	(0.003)***
Physical Sciences	-0.042	0.000	0.000
	(0.003)***	(0.000)	(0.000)
IT	0.083	0.053	0.050
	(0.002)***	(0.002)***	(0.002)***
Humanities	0.075	0.053	0.051
	(0.002)***	(0.002)***	(0.002)***
English	0.069	0.047	0.049
	(0.002)***	(0.002)***	(0.002)***
Misc	0.000	0.040	0.035
	(0.000)	(0.003)***	(0.003)***
Medical	0.091	0.059	0.056
	(0.002)***	(0.003)***	(0.003)***
Vocational	0.113	0.060	0.058
	(0.002)***	(0.003)***	(0.003)***

Law/Crim.Justice	0.117	0.073	0.075
	(0.002)***	(0.003)***	(0.003)***
Paygrade E4	-0.011	0.004	0.004
	(0.001)***	(0.002)*	(0.002)*
Paygrade E5	0.016	0.010	0.010
	(0.001)***	(0.002)***	(0.002)***
Paygrade E7	0.082	0.031	0.031
	(0.001)***	(0.003)***	(0.003)***
Paygrade E8	0.097	0.049	0.048
	(0.001)***	(0.004)***	(0.004)***
Paygrade E9	0.099	0.070	0.069
	(0.002)***	(0.008)***	(0.008)***
DL x Business			0.020
			(0.006)***
DL x History			-0.030
			(0.006)***
DL x Math			-0.007
			(0.006)
DL x Nat Sci			-0.003
			(0.006)
DL x Phy Sci			-0.011
			(0.008)
DL x IT			0.008
			(0.006)
DL x Human			0.006
			(0.006)
DL x English			-0.016
			(0.006)***
DL x Misc			0.018
			(0.007)***
DL x Medical			0.010
			(0.007)
DL x Voc			0.000
			(0.000)
DL x Law			-0.011
Constant	0.835	0.880	0.881
	(0.004)***	(0.005)***	(0.005)***
Observations	1336878	1,336,878	1,336,879
R-squared	0.03	0.01	0.01
Individuals	N.A.	217,052	217,052

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

N.A.=not applicable

Appendix Table 2. GPA Models

	LPM Regression Model	Fixed Effects Model
DL Course	-0.207	-0.260
	(0.003)***	(0.005)***
FY 1995	0.072	-0.039
	(0.012)***	(0.013)***
FY 1996	0.068	-0.046
	(0.012)***	(0.014)***
FY 1997	0.087	-0.010
	(0.012)***	(0.014)
FY 1998	0.105	0.020
	(0.012)***	(0.014)
FY 1999	0.103	0.039
	(0.012)***	(0.014)***
FY 2000	0.109	0.100
	(0.012)***	(0.015)***
FY 2001	0.111	0.134
	(0.012)***	(0.015)***
FY 2002	0.096	0.157
	(0.012)***	(0.015)***
FY 2003	0.047	0.202
	(0.012)***	(0.015)***
FY 2004	0.082	0.235
	(0.012)***	(0.015)***
FY 2005	0.093	0.243
	(0.012)***	(0.016)***
FY 2006	0.100	0.293
	(0.012)***	(0.016)***
FY 2007	0.078	0.272
	(0.012)***	(0.016)***
Business	0.132	0.193
	(0.006)***	(0.007)***
History	-0.030	0.125
	(0.007)***	(0.008)***
Math	-0.144	-0.054
	(0.007)***	(0.007)***
Natural Sciences	-0.053	0.081
	(0.007)***	(0.007)***
Physical Sciences	0.000	0.000
	(0.000)	(0.000)
IT	0.199	0.274
	(0.006)***	(0.007)***
Humanities	0.071	0.222
	(0.006)***	(0.007)***
English	0.030	0.182
	(0.007)***	(0.007)***
Misc	0.233	0.260
	(0.008)***	(0.009)***
Medical	0.153	0.256
	(0.008)***	(0.008)***
Vocational	0.227	0.275
	(0.007)***	(0.008)***
Law/Criminal Justice	0.177	0.308
	(0.007)***	(0.008)***

Paygrade E4	-0.100	0.039
	(0.003)***	(0.006)***
Paygrade E5	0.048	0.062
	(0.002)***	(0.005)***
Paygrade E7	0.298	-0.028
	(0.003)***	(0.008)***
Paygrade E8	0.388	-0.060
	(0.004)***	(0.013)***
Paygrade E9	0.438	-0.102
	(0.007)***	(0.026)***
Constant	3.008	2.902
	(0.013)***	(0.015)***
Observations	1,173,093	1,173,093
R-squared	0.03	0.02
Number of Individuals	N.A.	200,740

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

N.A.=not applicable.

Appendix Table 3. Reenlistment Model

	Effect of taking TA on extension		Effect of passing TA class on Extension		Effect of passing DL class on	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal
Sample:	*All*		*TA participants*		*TA participants*	
Ever take TA course	0.729	0.281				
	(0.007)***	(0.003)***				
Pass at least one TA course			0.280	0.110		
			(0.016)***	(0.006)***		
Pass at least one DL course					0.664	0.246
					(0.012)***	(0.004)***
Pass at least one non-DL course					0.045	0.017
					(0.013)***	(0.005)***
Female	-0.239	-0.089	-0.255	-0.100	-0.278	-0.108
	(0.008)***	(0.003)***	(0.013)***	(0.005)***	(0.013)***	(0.005)***
Black	0.246	0.096	0.214	0.081	0.225	0.085
	(0.008)***	(0.003)***	(0.015)***	(0.006)***	(0.015)***	(0.006)***
Native American	0.049	0.019	0.115	0.044	0.116	0.044
	(0.018)***	(0.007)***	(0.034)***	(0.013)***	(0.035)***	(0.013)***
Asian	0.255	0.100	0.213	0.080	0.231	0.086
	(0.013)***	(0.005)***	(0.022)***	(0.008)***	(0.023)***	(0.008)***
Hispanic	0.032	0.012	0.016	0.006	0.042	0.016
	(0.009)***	(0.004)***	(0.016)	(0.006)	(0.017)**	(0.006)**
Unknown	-0.050	-0.019	-0.107	-0.042	-0.079	-0.031
	(0.054)	(0.020)	(0.097)	(0.038)	(0.097)	(0.038)
Other	0.067	0.026	-0.086	-0.033	-0.052	-0.020
	(0.041)	(0.016)	(0.067)	(0.026)	(0.068)	(0.027)
Married	0.028	0.011	0.010	0.004	-0.002	-0.001
	(0.008)***	(0.003)***	(0.014)	(0.005)	(0.014)	(0.005)
Number of	0.150	0.057	0.154	0.059	0.136	0.052
	(0.004)***	(0.002)***	(0.008)***	(0.003)***	(0.008)***	(0.003)***
age	0.018	0.007	0.004	0.002	0.006	0.002
	(0.001)***	(0.000)***	(0.002)**	(0.001)**	(0.002)**	(0.001)**
AFQT score	-0.003	-0.001	-0.005	-0.002	-0.006	-0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Non-Grad	0.052	0.020	0.011	0.004	0.026	0.010

	(0.013)***	(0.005)***	(0.026)	(0.010)	(0.027)	(0.010)
G.E.D.	-0.004	-0.002	0.040	0.015	0.054	0.021
	(0.018)	(0.007)	(0.036)	(0.014)	(0.036)	(0.014)
Some college	-0.053	-0.020	-0.082	-0.032	-0.079	-0.031
	(0.022)**	(0.008)**	(0.040)**	(0.016)**	(0.041)*	(0.016)*
A.A.degree	-0.078	-0.029	-0.121	-0.048	-0.114	-0.045
	(0.022)***	(0.008)***	(0.043)***	(0.017)***	(0.044)***	(0.017)***
Undesignated	-0.828	-0.254	-0.661	-0.258	-0.663	-0.259
	(0.060)***	(0.013)***	(0.148)***	(0.054)***	(0.151)***	(0.055)***
Special Operations	0.467	0.184	0.153	0.058	0.133	0.050
	(0.059)***	(0.023)***	(0.104)	(0.038)	(0.106)	(0.039)
Instructor	-0.043	-0.016	0.174	0.066	0.202	0.075
	(0.078)	(0.029)	(0.145)	(0.053)	(0.147)	(0.053)
Combat Systems	-0.045	-0.017	-0.169	-0.067	-0.167	-0.066
	(0.029)	(0.011)	(0.064)***	(0.025)***	(0.065)**	(0.026)**
Aviation	-0.009	-0.003	-0.157	-0.062	-0.124	-0.048
	(0.013)	(0.005)	(0.029)***	(0.011)***	(0.029)***	(0.012)***
Seaman	0.023	0.009	0.007	0.003	0.019	0.007
	(0.017)	(0.006)	(0.038)	(0.015)	(0.038)	(0.015)
Security	-0.432	-0.150	-0.907	-0.343	-0.906	-0.344
	(0.059)***	(0.018)***	(0.087)***	(0.028)***	(0.089)***	(0.029)***
Communications	0.151	0.059	-0.027	-0.011	-0.035	-0.013
	(0.017)***	(0.007)***	(0.033)	(0.013)	(0.034)	(0.013)
Damage Control	0.376	0.148	0.222	0.083	0.181	0.068
	(0.026)***	(0.010)***	(0.051)***	(0.018)***	(0.052)***	(0.019)***
Missile Tech	0.190	0.074	0.071	0.027	0.051	0.020
	(0.022)***	(0.009)***	(0.043)*	(0.016)*	(0.044)	(0.017)
Sonar Tech	0.325	0.128	0.194	0.073	0.151	0.057
	(0.020)***	(0.008)***	(0.042)***	(0.015)***	(0.043)***	(0.016)***
Information Tech	-0.033	-0.013	-0.192	-0.075	-0.222	-0.087
	(0.017)*	(0.007)*	(0.034)***	(0.013)***	(0.034)***	(0.014)***
Radar Tech	0.112	0.043	-0.026	-0.010	-0.058	-0.023
	(0.015)***	(0.006)***	(0.031)	(0.012)	(0.032)*	(0.012)*
Intelligence	0.038	0.015	-0.074	-0.029	-0.112	-0.044
	(0.035)	(0.013)	(0.056)	(0.022)	(0.057)**	(0.022)*
Ops Specialist	0.003	0.001	-0.166	-0.065	-0.195	-0.077
	(0.040)	(0.015)	(0.061)***	(0.024)***	(0.063)***	(0.025)***
Medical	-0.195	-0.072	-0.510	-0.201	-0.473	-0.186
	(0.015)***	(0.005)***	(0.029)***	(0.011)***	(0.029)***	(0.011)***
Photography	-0.002	-0.001	-0.042	-0.016	0.023	0.009

	(0.096)	(0.037)	(0.164)	(0.064)	(0.168)	(0.065)
Meteorology	-0.095	-0.036	-0.334	-0.132	-0.393	-0.155
	(0.041)**	(0.015)**	(0.061)***	(0.024)***	(0.063)***	(0.025)***
Musician	0.356	0.140	-0.342	-0.135	-0.283	-0.112
	(0.073)***	(0.029)***	(0.139)**	(0.055)**	(0.141)**	(0.056)**
Admin Clerk	0.171	0.067	-0.019	-0.007	-0.023	-0.009
	(0.017)***	(0.007)***	(0.032)	(0.013)	(0.033)	(0.013)
Supply Clerk	0.134	0.052	0.054	0.021	0.070	0.027
	(0.018)***	(0.007)***	(0.036)	(0.014)	(0.037)*	(0.014)*
Postal Clerk	-0.064	-0.024	-0.139	-0.055	-0.166	-0.065
	(0.052)	(0.020)	(0.089)	(0.035)	(0.092)*	(0.036)*
Rel Specialist	-0.043	-0.016	-0.320	-0.127	-0.316	-0.125
	(0.058)	(0.022)	(0.078)***	(0.031)***	(0.079)***	(0.032)***
Engineer	0.156	0.061	-0.188	-0.074	-0.168	-0.066
	(0.021)***	(0.008)***	(0.043)***	(0.017)***	(0.044)***	(0.017)***
Int. Comms.	-0.205	-0.075	-0.128	-0.050	-0.162	-0.063
	(0.034)***	(0.012)***	(0.074)*	(0.029)*	(0.075)**	(0.030)**
Ordinance	0.087	0.033	-0.068	-0.027	-0.025	-0.010
	(0.023)***	(0.009)***	(0.052)	(0.020)	(0.053)	(0.020)
Machinist Mate	-0.178	-0.066	-0.129	-0.051	-0.139	-0.054
	(0.022)***	(0.008)***	(0.048)***	(0.019)***	(0.049)***	(0.019)***
Nuclear	0.788	0.306	0.552	0.194	0.538	0.188
	(0.017)***	(0.006)***	(0.036)***	(0.011)***	(0.036)***	(0.011)***
Machinery Repair	0.001	0.001	0.051	0.020	0.090	0.034
	(0.036)	(0.014)	(0.080)	(0.030)	(0.081)	(0.030)
Parachute Rig.	-0.144	-0.054	-0.084	-0.033	-0.081	-0.032
	(0.023)***	(0.008)***	(0.056)	(0.022)	(0.057)	(0.022)
Electricn Mate	0.001	0.000	-0.253	-0.100	-0.235	-0.093
	(0.051)	(0.020)	(0.083)***	(0.033)***	(0.085)***	(0.034)***
Culinary Spec.	0.184	0.072	0.082	0.031	0.110	0.042
	(0.021)***	(0.008)***	(0.047)*	(0.018)*	(0.048)**	(0.018)**
Ship Servicemen	0.024	0.009	0.162	0.061	0.189	0.071
	(0.047)	(0.018)	(0.108)	(0.040)	(0.111)*	(0.040)*
Master at Arms	-0.064	-0.024	-0.194	-0.076	-0.245	-0.097
	(0.038)*	(0.014)*	(0.060)***	(0.024)***	(0.061)***	(0.024)***
1995 Cohort	0.035	0.013	0.030	0.012	0.009	0.004
	(0.013)***	(0.005)***	(0.024)	(0.009)	(0.024)	(0.009)
1996 Cohort	0.200	0.078	0.139	0.053	0.105	0.040
	(0.013)***	(0.005)***	(0.023)***	(0.009)***	(0.023)***	(0.009)***
1997 Cohort	0.321	0.126	0.293	0.109	0.246	0.092

	(0.013)***	(0.005)***	(0.023)***	(0.008)***	(0.024)***	(0.009)***
1998 Cohort	0.338	0.132	0.190	0.072	0.117	0.045
	(0.013)***	(0.005)***	(0.022)***	(0.008)***	(0.023)***	(0.009)***
1999 Cohort	0.225	0.088	0.051	0.020	-0.036	-0.014
	(0.013)***	(0.005)***	(0.022)**	(0.008)**	(0.022)	(0.009)
2000 Cohort	0.019	0.007	-0.184	-0.072	-0.289	-0.113
	(0.013)	(0.005)	(0.022)***	(0.009)***	(0.023)***	(0.009)***
2001 Cohort	-0.207	-0.077	-0.554	-0.218	-0.660	-0.259
	(0.013)***	(0.005)***	(0.024)***	(0.009)***	(0.025)***	(0.009)***
2002 Cohort	-1.164	-0.329	-1.617	-0.527	-1.743	-0.551
	(0.020)***	(0.003)***	(0.039)***	(0.007)***	(0.039)***	(0.006)***
2003 Cohort	-1.321	-0.341	-1.776	-0.541	-1.932	-0.564
	(0.062)***	(0.008)***	(0.118)***	(0.016)***	(0.119)***	(0.013)***
2004 Cohort	0.892	0.341				
	(0.272)***	(0.091)***				
Constant	-0.941		0.336		0.418	
	(0.032)***		(0.062)***		(0.063)***	
Observations	208,488	208,488	63,169	63,169	63,169	63,169

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 4. Probit Model of Extension Probability

	Effect of TA on extension		Effect of passing TA class on Extension		Effect of passing DL class on extension	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Ever take TA course	-0.216	-0.067				
	(0.007)***	(0.002)***				
Pass at least one TA course			-0.108	-0.034		
			(0.017)***	(0.005)***		
Pass at least one DL course					-0.346	-0.103
					(0.013)***	(0.004)***
Pass at least one non-DL course					-0.001	-0.000
					(0.013)	(0.004)
Female	0.167	0.055	0.176	0.056	0.185	0.059
	(0.008)***	(0.003)***	(0.013)***	(0.004)***	(0.013)***	(0.004)***
Black	-0.062	-0.020	-0.089	-0.027	-0.093	-0.028
	(0.009)***	(0.003)***	(0.016)***	(0.005)***	(0.016)***	(0.005)***
Native American	-0.018	-0.006	-0.084	-0.026	-0.083	-0.025
	(0.018)	(0.006)	(0.035)**	(0.010)**	(0.036)**	(0.010)**
Asian	-0.105	-0.033	-0.139	-0.041	-0.145	-0.043
	(0.014)***	(0.004)***	(0.024)***	(0.007)***	(0.024)***	(0.007)***
Hispanic	-0.023	-0.007	-0.006	-0.002	-0.019	-0.006
	(0.010)**	(0.003)**	(0.017)	(0.005)	(0.017)	(0.005)
Race Unknown	-0.011	-0.003	0.034	0.011	0.020	0.006
	(0.052)	(0.017)	(0.097)	(0.031)	(0.097)	(0.030)
Race Other	-0.012	-0.004	-0.019	-0.006	-0.039	-0.012
	(0.045)	(0.014)	(0.074)	(0.023)	(0.074)	(0.022)
Marriage status at end	0.014	0.005	0.000	0.000	0.007	0.002
	(0.008)*	(0.003)*	(0.014)	(0.004)	(0.015)	(0.004)
Number of dependents	-0.084	-0.027	-0.124	-0.038	-0.113	-0.035
	(0.005)***	(0.001)***	(0.008)***	(0.003)***	(0.008)***	(0.003)***
age	0.006	0.002	0.004	0.001	0.004	0.001
	(0.001)***	(0.000)***	(0.002)*	(0.001)*	(0.002)	(0.001)
AFQT score	0.008	0.003	0.007	0.002	0.008	0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Non Grad	-0.004	-0.001	0.036	0.011	0.026	0.008
	(0.014)	(0.004)	(0.028)	(0.009)	(0.028)	(0.009)
G.E.D.	0.076	0.025	0.014	0.004	0.007	0.002
	(0.019)***	(0.006)***	(0.038)	(0.012)	(0.038)	(0.012)
Some college	0.045	0.015	0.051	0.016	0.049	0.015

	(0.023)**	(0.008)*	(0.042)	(0.014)	(0.042)	(0.014)
A.A.	0.023	0.007	0.076	0.024	0.072	0.023
	(0.022)	(0.007)	(0.044)*	(0.015)*	(0.045)	(0.014)
Undesignated	-0.097	-0.030	-0.093	-0.028	-0.101	-0.030
	(0.050)*	(0.015)**	(0.145)	(0.042)	(0.145)	(0.041)
Special Operations	0.136	0.045	-0.039	-0.012	-0.023	-0.007
	(0.062)**	(0.022)**	(0.112)	(0.034)	(0.113)	(0.034)
Instructor	0.574	0.211	0.154	0.050	0.144	0.047
	(0.074)***	(0.029)***	(0.147)	(0.050)	(0.147)	(0.050)
Combat Systems	-0.098	-0.030	-0.010	-0.003	-0.014	-0.004
	(0.031)***	(0.009)***	(0.071)	(0.022)	(0.071)	(0.022)
Aviation	0.042	0.014	0.003	0.001	-0.016	-0.005
	(0.013)***	(0.004)***	(0.032)	(0.010)	(0.032)	(0.010)
Seaman	-0.059	-0.019	-0.100	-0.030	-0.105	-0.031
	(0.018)***	(0.006)***	(0.042)**	(0.012)**	(0.042)**	(0.012)***
Security	0.553	0.203	0.534	0.192	0.521	0.186
	(0.056)***	(0.022)***	(0.085)***	(0.033)***	(0.086)***	(0.033)***
Communications	0.301	0.104	0.138	0.045	0.144	0.046
	(0.017)***	(0.006)***	(0.036)***	(0.012)***	(0.036)***	(0.012)***
Damage Control	0.486	0.176	0.121	0.039	0.150	0.049
	(0.025)***	(0.010)***	(0.053)**	(0.018)**	(0.053)***	(0.018)***
Missile Tech	0.385	0.136	0.148	0.048	0.163	0.053
	(0.022)***	(0.008)***	(0.046)***	(0.016)***	(0.046)***	(0.016)***
Sonar Tech	0.193	0.065	0.021	0.006	0.050	0.016
	(0.021)***	(0.007)***	(0.045)	(0.014)	(0.045)	(0.014)
Info. Tech	0.126	0.042	0.080	0.026	0.095	0.030
	(0.018)***	(0.006)***	(0.037)**	(0.012)**	(0.037)***	(0.012)**
Radar Tech	0.099	0.033	0.036	0.011	0.055	0.017
	(0.016)***	(0.005)***	(0.034)	(0.011)	(0.034)	(0.011)
Intelligence	-0.125	-0.039	-0.130	-0.039	-0.108	-0.032
	(0.038)***	(0.011)***	(0.062)**	(0.018)**	(0.062)*	(0.018)*
Ops. Spec	-0.008	-0.002	-0.076	-0.023	-0.067	-0.020
	(0.044)	(0.014)	(0.069)	(0.020)	(0.070)	(0.021)
Medical	1.014	0.378	0.889	0.319	0.870	0.311
	(0.015)***	(0.006)***	(0.031)***	(0.012)***	(0.031)***	(0.012)***
Photography	-0.296	-0.085	-0.352	-0.095	-0.387	-0.102
	(0.110)***	(0.028)***	(0.205)*	(0.047)**	(0.206)*	(0.045)**
Meteorology	0.084	0.028	0.135	0.044	0.159	0.052
	(0.043)**	(0.015)*	(0.066)**	(0.022)**	(0.066)**	(0.023)**
Musician	-0.018	-0.006	0.313	0.107	0.277	0.093

	(0.078)	(0.025)	(0.141)**	(0.052)**	(0.142)*	(0.051)*
Admin. clerk	0.011	0.003	-0.047	-0.015	-0.046	-0.014
	(0.019)	(0.006)	(0.035)	(0.011)	(0.036)	(0.011)
Supply Clerk	-0.081	-0.025	-0.160	-0.047	-0.168	-0.049
	(0.020)***	(0.006)***	(0.041)***	(0.011)***	(0.041)***	(0.011)***
Postal Clerk	0.006	0.002	-0.153	-0.045	-0.148	-0.043
	(0.057)	(0.018)	(0.104)	(0.029)	(0.104)	(0.029)
Rel. Specialist	0.159	0.053	0.177	0.058	0.172	0.056
	(0.062)**	(0.022)**	(0.083)**	(0.029)**	(0.083)**	(0.029)*
Engineer	0.762	0.284	0.517	0.184	0.507	0.180
	(0.021)***	(0.008)***	(0.044)***	(0.017)***	(0.044)***	(0.017)***
Int. Comms	0.044	0.014	0.052	0.016	0.070	0.022
	(0.034)	(0.011)	(0.079)	(0.026)	(0.080)	(0.026)
Ordinance	-0.145	-0.044	-0.169	-0.049	-0.197	-0.056
	(0.025)***	(0.007)***	(0.059)***	(0.016)***	(0.060)***	(0.016)***
Machinist Mate	0.061	0.020	-0.059	-0.018	-0.056	-0.017
	(0.023)***	(0.008)***	(0.054)	(0.016)	(0.054)	(0.016)
Nuclear	0.235	0.080	-0.083	-0.025	-0.067	-0.020
	(0.017)***	(0.006)***	(0.037)**	(0.011)**	(0.038)*	(0.011)*
Machinery Repair	0.126	0.042	-0.067	-0.020	-0.086	-0.026
	(0.037)***	(0.013)***	(0.088)	(0.026)	(0.089)	(0.026)
Parachute Rig.	-0.042	-0.013	-0.094	-0.028	-0.093	-0.028
	(0.024)*	(0.008)*	(0.064)	(0.018)	(0.064)	(0.018)
Electric. Mate	0.867	0.327	0.614	0.223	0.607	0.220
	(0.050)***	(0.019)***	(0.083)***	(0.033)***	(0.084)***	(0.033)***
Culinary Spec.	0.100	0.033	-0.104	-0.031	-0.121	-0.036
	(0.022)***	(0.008)***	(0.052)**	(0.015)**	(0.053)**	(0.015)**
Ship Servicemen	0.053	0.017	-0.157	-0.046	-0.168	-0.049
	(0.051)	(0.017)	(0.122)	(0.034)	(0.123)	(0.033)
Master at Arms	0.434	0.156	0.188	0.062	0.210	0.069
	(0.033)***	(0.013)***	(0.056)***	(0.020)***	(0.056)***	(0.020)***
1995 Cohort	-0.077	-0.024	-0.085	-0.026	-0.073	-0.022
	(0.014)***	(0.004)***	(0.025)***	(0.007)***	(0.026)***	(0.008)***
1996 Cohort	-0.156	-0.048	-0.150	-0.045	-0.129	-0.038
	(0.014)***	(0.004)***	(0.025)***	(0.007)***	(0.025)***	(0.007)***
1997 Cohort	-0.238	-0.072	-0.251	-0.073	-0.223	-0.065
	(0.014)***	(0.004)***	(0.025)***	(0.007)***	(0.025)***	(0.007)***
1998 Cohort	-0.116	-0.036	-0.120	-0.036	-0.078	-0.024
	(0.013)***	(0.004)***	(0.024)***	(0.007)***	(0.024)***	(0.007)***
1999 Cohort	-0.032	-0.010	0.026	0.008	0.074	0.023

	(0.013)**	(0.004)**	(0.023)	(0.007)	(0.024)***	(0.008)***
2000 Cohort	0.068	0.022	0.155	0.050	0.211	0.069
	(0.013)***	(0.004)***	(0.024)***	(0.008)***	(0.024)***	(0.008)***
2001 Cohort	0.189	0.063	0.362	0.123	0.414	0.142
	(0.013)***	(0.005)***	(0.025)***	(0.009)***	(0.026)***	(0.009)***
2002 Cohort	0.322	0.112	0.633	0.229	0.686	0.248
	(0.015)***	(0.006)***	(0.031)***	(0.012)***	(0.031)***	(0.012)***
2003 Cohort	-1.258	-0.237	-1.125	-0.211	-1.067	-0.204
	(0.062)***	(0.005)***	(0.126)***	(0.010)***	(0.126)***	(0.011)***
Constant	-1.325		-1.248		-1.283	
	(0.034)***		(0.066)***		(0.066)***	
Observations	208463	208463	63169	63169	63169	63169

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 5. MODEL OF RETENTION (REENLISTMENT PLUS EXTENSION).

	Effect of taking TA on extension		Effect of passing TA class on Extension		Effect of passing DL class on extension	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Ever take TA course	0.735	0.221				
	(0.008)***	(0.002)***				
Pass at least one TA course			0.316	0.066		
			(0.019)***	(0.004)***		
Pass at least one DL course					0.733	0.112
					(0.017)***	(0.002)***
Pass at least one non-DL course					0.095	0.016
					(0.016)***	(0.003)***
Female	-0.126	-0.043	-0.185	-0.035	-0.211	-0.038
	(0.009)***	(0.003)***	(0.015)***	(0.003)***	(0.016)***	(0.003)***
Black	0.216	0.069	0.240	0.040	0.249	0.038
	(0.009)***	(0.003)***	(0.020)***	(0.003)***	(0.020)***	(0.003)***
Native American	0.041	0.013	0.075	0.013	0.080	0.013
	(0.019)**	(0.006)**	(0.043)*	(0.007)*	(0.044)*	(0.007)*
Asian	0.213	0.067	0.192	0.031	0.208	0.031
	(0.015)***	(0.004)***	(0.030)***	(0.004)***	(0.031)***	(0.004)***
Hispanic	0.011	0.004	0.021	0.004	0.046	0.008
	(0.010)	(0.003)	(0.020)	(0.004)	(0.021)**	(0.003)**
Race Unknown	-0.063	-0.021	-0.105	-0.020	-0.094	-0.017
	(0.053)	(0.018)	(0.106)	(0.022)	(0.108)	(0.020)
Race Other	0.051	0.017	-0.189	-0.038	-0.161	-0.030
	(0.047)	(0.015)	(0.083)**	(0.019)**	(0.085)*	(0.017)*
Married	0.031	0.010	0.000	0.000	-0.015	-0.003
	(0.009)***	(0.003)***	(0.018)	(0.003)	(0.018)	(0.003)
# of dependents	0.102	0.034	0.096	0.017	0.078	0.013
	(0.005)***	(0.002)***	(0.010)***	(0.002)***	(0.011)***	(0.002)***
age	0.028	0.009	0.014	0.002	0.015	0.002
	(0.001)***	(0.000)***	(0.003)***	(0.001)***	(0.003)***	(0.000)***
AFQT	0.005	0.002	0.001	0.000	0.000	0.000
	(0.000)***	(0.000)***	(0.000)**	(0.000)**	(0.000)	(0.000)
Non Grad	0.040	0.013	0.058	0.010	0.073	0.012
	(0.014)***	(0.005)***	(0.033)*	(0.006)*	(0.034)**	(0.005)**

G.E.D.	0.049	0.016	0.075	0.013	0.094	0.015
	(0.019)**	(0.006)***	(0.045)*	(0.007)*	(0.046)**	(0.007)**
Some college	-0.028	-0.009	-0.089	-0.017	-0.090	-0.016
	(0.023)	(0.008)	(0.049)*	(0.010)*	(0.050)*	(0.009)*
A.A.	-0.069	-0.023	-0.102	-0.020	-0.102	-0.018
	(0.024)***	(0.008)***	(0.056)*	(0.011)*	(0.057)*	(0.011)*
undesignated	-0.635	-0.240	-0.725	-0.193	-0.726	-0.183
	(0.046)***	(0.018)***	(0.136)***	(0.047)***	(0.140)***	(0.047)***
Special Operations	0.652	0.170	0.182	0.029	0.168	0.025
	(0.071)***	(0.013)***	(0.136)	(0.019)	(0.140)	(0.019)
Instructor	0.545	0.149	0.610	0.074	0.679	0.071
	(0.084)***	(0.018)***	(0.225)***	(0.016)***	(0.233)***	(0.013)***
Combat Systems	-0.124	-0.043	-0.260	-0.055	-0.251	-0.049
	(0.027)***	(0.010)***	(0.071)***	(0.017)***	(0.073)***	(0.016)***
Aviation	0.015	0.005	-0.221	-0.044	-0.191	-0.035
	(0.012)	(0.004)	(0.034)***	(0.007)***	(0.034)***	(0.007)***
Seaman	-0.025	-0.008	-0.102	-0.020	-0.091	-0.016
	(0.016)	(0.005)	(0.044)**	(0.009)**	(0.045)**	(0.008)*
Security	-0.011	-0.004	-0.597	-0.150	-0.590	-0.139
	(0.057)	(0.019)	(0.087)***	(0.028)***	(0.089)***	(0.027)***
Communications	0.443	0.129	0.144	0.024	0.145	0.022
	(0.018)***	(0.004)***	(0.041)***	(0.006)***	(0.042)***	(0.006)***
Damage Control	1.208	0.245	0.899	0.091	0.887	0.082
	(0.037)***	(0.003)***	(0.096)***	(0.004)***	(0.099)***	(0.004)***
Missile Tech	0.604	0.163	0.385	0.055	0.381	0.050
	(0.024)***	(0.005)***	(0.059)***	(0.006)***	(0.061)***	(0.006)***
Sonar Tech	0.515	0.144	0.374	0.054	0.337	0.045
	(0.022)***	(0.005)***	(0.056)***	(0.006)***	(0.057)***	(0.006)***
Info. Tech	0.031	0.010	-0.206	-0.042	-0.233	-0.045
	(0.017)*	(0.006)*	(0.039)***	(0.009)***	(0.040)***	(0.009)***
Radar Tech	0.171	0.055	-0.006	-0.001	-0.037	-0.006
	(0.015)***	(0.005)***	(0.037)	(0.007)	(0.038)	(0.007)
Intelligence	-0.122	-0.042	-0.267	-0.057	-0.308	-0.062
	(0.034)***	(0.012)***	(0.062)***	(0.015)***	(0.064)***	(0.015)***
Ops. Specialist	-0.063	-0.022	-0.328	-0.072	-0.369	-0.077
	(0.040)	(0.014)	(0.068)***	(0.018)***	(0.070)***	(0.018)***
Medical	1.242	0.270	0.908	0.110	0.978	0.105
	(0.019)***	(0.002)***	(0.041)***	(0.003)***	(0.041)***	(0.003)***
Photography	-0.237	-0.084	-0.419	-0.097	-0.361	-0.075
	(0.092)**	(0.035)**	(0.175)**	(0.049)**	(0.180)**	(0.045)*

Meteorology	-0.092	-0.032	-0.333	-0.073	-0.391	-0.083
	(0.041)**	(0.014)**	(0.068)***	(0.018)***	(0.070)***	(0.018)***
Musician	0.315	0.094	-0.133	-0.026	-0.072	-0.013
	(0.080)***	(0.021)***	(0.158)	(0.034)	(0.161)	(0.030)
Admin. Clerk	0.140	0.045	-0.097	-0.019	-0.105	-0.019
	(0.018)***	(0.005)***	(0.038)***	(0.008)**	(0.039)***	(0.007)**
Supply Clerk	0.049	0.016	-0.103	-0.020	-0.088	-0.016
	(0.018)***	(0.006)***	(0.042)**	(0.009)**	(0.043)**	(0.008)*
Postal Clerk	-0.082	-0.028	-0.346	-0.077	-0.368	-0.077
	(0.051)	(0.018)	(0.096)***	(0.025)***	(0.099)***	(0.025)***
Rel. Spec.	0.015	0.005	-0.258	-0.055	-0.247	-0.048
	(0.060)	(0.020)	(0.087)***	(0.021)***	(0.089)***	(0.020)**
SeaBee Engineer	1.110	0.239	0.600	0.074	0.646	0.071
	(0.026)***	(0.003)***	(0.063)***	(0.005)***	(0.064)***	(0.004)***
Int.Comms.	-0.159	-0.055	-0.137	-0.027	-0.171	-0.032
	(0.032)***	(0.012)***	(0.084)	(0.018)	(0.086)**	(0.018)*
Ordinance	-0.019	-0.006	-0.261	-0.055	-0.224	-0.043
	(0.022)	(0.007)	(0.057)***	(0.014)***	(0.058)***	(0.013)***
Machinist Mate	-0.124	-0.043	-0.258	-0.054	-0.271	-0.054
	(0.021)***	(0.007)***	(0.054)***	(0.013)***	(0.056)***	(0.013)***
Nuclear	1.591	0.292	1.388	0.116	1.425	0.105
	(0.025)***	(0.002)***	(0.069)***	(0.002)***	(0.070)***	(0.002)***
Machinery Repair	0.100	0.032	-0.025	-0.005	0.014	0.002
	(0.035)***	(0.011)***	(0.093)	(0.017)	(0.095)	(0.016)
Parachute Rig.	-0.151	-0.053	-0.224	-0.046	-0.221	-0.043
	(0.022)***	(0.008)***	(0.063)***	(0.015)***	(0.064)***	(0.014)***
Electrician's Mate	1.180	0.239	0.862	0.088	0.904	0.081
	(0.075)***	(0.006)***	(0.169)***	(0.007)***	(0.172)***	(0.006)***
Culinary Spec.	0.260	0.080	-0.002	-0.000	0.027	0.004
	(0.021)***	(0.006)***	(0.055)	(0.010)	(0.056)	(0.009)
Ship Servicemen	0.057	0.019	0.069	0.012	0.108	0.017
	(0.047)	(0.015)	(0.128)	(0.021)	(0.132)	(0.019)
Master at Arms	0.371	0.109	0.063	0.011	0.021	0.003
	(0.034)***	(0.008)***	(0.060)	(0.010)	(0.062)	(0.010)
1995 Cohort	-0.035	-0.012	-0.075	-0.014	-0.095	-0.017
	(0.015)**	(0.005)**	(0.031)**	(0.006)**	(0.032)***	(0.006)***
1996 Cohort	0.080	0.026	0.032	0.006	-0.002	-0.000
	(0.014)***	(0.005)***	(0.031)	(0.005)	(0.032)	(0.005)
1997 Cohort	0.167	0.053	0.198	0.033	0.150	0.023
	(0.015)***	(0.005)***	(0.033)***	(0.005)***	(0.034)***	(0.005)***

1998 Cohort	0.305	0.094	0.191	0.032	0.122	0.019
	(0.014)***	(0.004)***	(0.031)***	(0.005)***	(0.031)***	(0.005)***
1999 Cohort	0.244	0.077	0.148	0.025	0.066	0.011
	(0.014)***	(0.004)***	(0.030)***	(0.005)***	(0.031)**	(0.005)**
2000 Cohort	0.090	0.029	-0.096	-0.018	-0.193	-0.035
	(0.014)***	(0.004)***	(0.029)***	(0.006)***	(0.030)***	(0.006)***
2001 Cohort	-0.038	-0.013	-0.389	-0.085	-0.492	-0.106
	(0.014)***	(0.005)***	(0.030)***	(0.008)***	(0.031)***	(0.008)***
2002 Cohort	-0.534	-0.198	-0.990	-0.282	-1.112	-0.314
	(0.016)***	(0.006)***	(0.035)***	(0.013)***	(0.036)***	(0.013)***
2003 Cohort	-1.889	-0.635	-2.402	-0.768	-2.590	-0.804
	(0.060)***	(0.011)***	(0.125)***	(0.027)***	(0.127)***	(0.024)***
2004 Cohort	0.035	0.012				
	(0.279)	(0.091)				
Constant	-1.001		0.398		0.480	
	(0.035)***		(0.079)***		(0.081)***	
Observations	208488	208488	63169	63169	63169	63169

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 6. E5 Promotion Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	LPM	FE	LPM	FE	LPM	FE	LPM	FE
Black	-0.009	0.000	-0.008	0.000	-0.008	0.000	-0.007	0.000
	(0.001)***	(0.000)	(0.002)***	(0.000)	(0.002)***	(0.000)	(0.002)***	(0.000)
Native American	-0.002	0.000	-0.005	0.000	-0.005	0.000	-0.005	0.000
	(0.001)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)
Asian	-0.000	0.000	-0.005	0.000	-0.004	0.000	-0.004	0.000
	(0.001)	(0.000)	(0.002)**	(0.000)	(0.002)*	(0.000)	(0.002)*	(0.000)
Other	-0.006	0.000	-0.013	0.000	-0.013	0.000	-0.013	0.000
	(0.003)**	(0.000)	(0.007)*	(0.000)	(0.007)*	(0.000)	(0.007)*	(0.000)
Unknown	-0.007	0.000	-0.012	0.000	-0.012	0.000	-0.011	0.000
	(0.004)*	(0.000)	(0.011)	(0.000)	(0.011)	(0.000)	(0.011)	(0.000)
Hispanic	-0.004	0.000	-0.005	0.000	-0.005	0.000	-0.005	0.000
	(0.001)***	(0.000)	(0.002)***	(0.000)	(0.002)***	(0.000)	(0.002)***	(0.000)
female	-0.004	0.000	-0.005	0.000	-0.005	0.000	-0.005	0.000
	(0.001)***	(0.000)	(0.001)***	(0.000)	(0.001)***	(0.000)	(0.001)***	(0.000)
Married	-0.009	-0.011	-0.011	-0.013	-0.010	-0.013	-0.011	-0.013
	(0.001)***	(0.001)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Number of dependents	0.004	-0.008	0.003	-0.005	0.003	-0.005	0.003	-0.005
	(0.001)***	(0.001)***	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)
Married x dependents	0.005	0.006	0.007	0.008	0.007	0.008	0.007	0.008
	(0.001)***	(0.001)***	(0.003)***	(0.003)**	(0.003)**	(0.003)**	(0.003)**	(0.003)**
fy2	-0.000	0.021	0.000	0.026	0.003	0.028	0.001	0.026
	(0.000)	(0.000)***	(0.001)	(0.001)***	(0.001)***	(0.001)***	(0.001)	(0.001)***
fy3	0.041	0.071	0.046	0.078	0.050	0.080	0.045	0.077
	(0.001)***	(0.001)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
fy4	0.137	0.169	0.149	0.183	0.153	0.185	0.147	0.181
	(0.001)***	(0.001)***	(0.002)***	(0.003)***	(0.002)***	(0.003)***	(0.002)***	(0.003)***
Special Ops	0.019	-0.088	0.020	-0.108	0.020	-0.108	0.020	-0.107
	(0.005)***	(0.008)***	(0.017)	(0.025)***	(0.017)	(0.025)***	(0.017)	(0.025)***
Instructor	0.074	0.049	0.096	0.045	0.097	0.045	0.096	0.046
	(0.013)***	(0.019)***	(0.038)**	(0.060)	(0.038)**	(0.060)	(0.038)**	(0.060)
Combat Systems	0.026	-0.048	0.036	-0.030	0.036	-0.029	0.037	-0.028
	(0.003)***	(0.004)***	(0.013)***	(0.018)	(0.013)***	(0.018)	(0.013)***	(0.018)
Aviation	-0.016	-0.066	-0.004	-0.056	-0.004	-0.056	-0.004	-0.055

	(0.001)***	(0.001)***	(0.002)**	(0.003)***	(0.002)*	(0.003)***	(0.002)*	(0.003)***
Seaman	-0.010	-0.047	-0.007	-0.043	-0.007	-0.042	-0.006	-0.042
	(0.001)***	(0.001)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Security	-0.005	-0.050	-0.011	-0.058	-0.011	-0.058	-0.012	-0.058
	(0.005)	(0.008)***	(0.009)	(0.012)***	(0.009)	(0.012)***	(0.009)	(0.012)***
Communications	-0.015	-0.055	-0.012	-0.054	-0.012	-0.053	-0.012	-0.053
	(0.001)***	(0.001)***	(0.003)***	(0.004)***	(0.003)***	(0.004)***	(0.003)***	(0.004)***
Damage Control	0.001	-0.034	-0.008	-0.045	-0.009	-0.044	-0.009	-0.045
	(0.003)	(0.003)***	(0.015)	(0.016)***	(0.015)	(0.016)***	(0.015)	(0.016)***
Missile Tech	-0.005	-0.030	-0.005	-0.043	-0.005	-0.042	-0.005	-0.042
	(0.002)***	(0.002)***	(0.007)	(0.007)***	(0.007)	(0.007)***	(0.007)	(0.007)***
Sonar Tech	0.021	-0.009	0.025	-0.004	0.025	-0.003	0.024	-0.004
	(0.002)***	(0.003)***	(0.008)***	(0.012)	(0.008)***	(0.012)	(0.008)***	(0.012)
Info Tech	0.017	-0.072	0.029	-0.068	0.030	-0.068	0.029	-0.068
	(0.002)***	(0.002)***	(0.004)***	(0.006)***	(0.004)***	(0.006)***	(0.004)***	(0.006)***
Radar Tech	0.049	-0.020	0.052	-0.007	0.052	-0.007	0.052	-0.007
	(0.001)***	(0.002)***	(0.004)***	(0.005)	(0.004)***	(0.005)	(0.004)***	(0.005)
Intelligence	0.041	-0.014	0.051	-0.008	0.051	-0.008	0.050	-0.008
	(0.004)***	(0.006)**	(0.009)***	(0.013)	(0.009)***	(0.013)	(0.009)***	(0.013)
Ops specialist	-0.008	-0.064	-0.005	-0.061	-0.005	-0.060	-0.005	-0.060
	(0.003)**	(0.006)***	(0.006)	(0.012)***	(0.006)	(0.012)***	(0.006)	(0.012)***
Medical	-0.049	-0.095	-0.054	-0.104	-0.053	-0.103	-0.053	-0.103
	(0.001)***	(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.002)***	(0.001)***	(0.002)***
Photography	0.004	-0.045	-0.009	-0.063	-0.008	-0.064	-0.007	-0.063
	(0.010)	(0.012)***	(0.024)	(0.046)	(0.024)	(0.046)	(0.024)	(0.047)
Meteorology	0.020	-0.047	0.027	-0.033	0.028	-0.032	0.027	-0.033
	(0.005)***	(0.005)***	(0.009)***	(0.010)***	(0.009)***	(0.010)***	(0.009)***	(0.010)***
Musician	0.025	-0.048	-0.044	-0.092	-0.043	-0.092	-0.044	-0.094
	(0.009)***	(0.008)***	(0.015)***	(0.013)***	(0.015)***	(0.013)***	(0.015)***	(0.013)***
Admin clerk	0.009	-0.027	0.012	-0.023	0.013	-0.022	0.013	-0.022
	(0.002)***	(0.003)***	(0.003)***	(0.006)***	(0.003)***	(0.006)***	(0.003)***	(0.006)***
Supply Clerk	0.001	-0.084	0.015	-0.075	0.016	-0.075	0.016	-0.074
	(0.001)	(0.002)***	(0.004)***	(0.006)***	(0.004)***	(0.006)***	(0.004)***	(0.006)***
Postal Clerk	-0.036	-0.108	-0.027	-0.097	-0.026	-0.096	-0.027	-0.096
	(0.004)***	(0.005)***	(0.010)***	(0.015)***	(0.010)**	(0.015)***	(0.010)***	(0.015)***
Rel Specialist	-0.020	-0.102	-0.011	-0.098	-0.010	-0.097	-0.011	-0.097
	(0.005)***	(0.007)***	(0.008)	(0.014)***	(0.008)	(0.014)***	(0.008)	(0.014)***
SeaBee Engineer	-0.014	-0.066	-0.004	-0.050	-0.003	-0.049	-0.003	-0.049
	(0.001)***	(0.002)***	(0.005)	(0.008)***	(0.005)	(0.008)***	(0.005)	(0.008)***
Int comms	-0.014	-0.048	-0.016	-0.076	-0.016	-0.076	-0.017	-0.077

	(0.003)***	(0.004)***	(0.010)	(0.016)***	(0.010)	(0.016)***	(0.011)	(0.016)***
Ordinance	-0.018	-0.080	-0.006	-0.062	-0.005	-0.061	-0.005	-0.061
	(0.001)***	(0.002)***	(0.005)	(0.009)***	(0.005)	(0.009)***	(0.005)	(0.009)***
Machinist Mate	-0.023	-0.063	-0.015	-0.061	-0.014	-0.060	-0.014	-0.060
	(0.001)***	(0.002)***	(0.005)***	(0.007)***	(0.005)***	(0.007)***	(0.005)***	(0.007)***
Nuclear	0.117	0.129	0.123	0.142	0.123	0.143	0.124	0.143
	(0.002)***	(0.003)***	(0.008)***	(0.011)***	(0.008)***	(0.011)***	(0.008)***	(0.011)***
Mach Repair	0.023	-0.028	0.026	-0.030	0.026	-0.029	0.027	-0.029
	(0.004)***	(0.007)***	(0.015)*	(0.030)	(0.015)*	(0.030)	(0.015)*	(0.030)
Elects Mate	-0.034	-0.095	-0.037	-0.099	-0.036	-0.097	-0.036	-0.097
	(0.003)***	(0.005)***	(0.008)***	(0.010)***	(0.008)***	(0.010)***	(0.008)***	(0.010)***
Parachute Rigger	0.022	-0.044	0.016	-0.037	0.016	-0.036	0.016	-0.036
	(0.002)***	(0.003)***	(0.009)*	(0.015)**	(0.009)*	(0.015)**	(0.009)*	(0.015)**
Culin Specialist	-0.024	-0.089	-0.015	-0.073	-0.015	-0.072	-0.014	-0.071
	(0.001)***	(0.002)***	(0.005)***	(0.008)***	(0.005)***	(0.008)***	(0.005)***	(0.008)***
Ship Servicemen	-0.038	-0.143	-0.022	-0.140	-0.021	-0.139	-0.021	-0.139
	(0.003)***	(0.005)***	(0.014)	(0.016)***	(0.014)	(0.016)***	(0.014)	(0.015)***
Master at Arms	0.045	0.008	0.059	0.031	0.059	0.030	0.058	0.028
	(0.004)***	(0.007)	(0.007)***	(0.015)**	(0.007)***	(0.015)**	(0.007)***	(0.015)*
Midshipmen	-0.112	-0.182	0.000	0.000	0.000	0.000	0.000	0.000
	(0.004)***	(0.001)***	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
1995 Cohort	0.006	0.000	0.001	0.000	0.001	0.000	0.001	0.000
	(0.001)***	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)
1996 Cohort	0.011	0.000	0.008	0.000	0.008	0.000	0.008	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
1997 Cohort	0.021	0.000	0.023	0.000	0.022	0.000	0.022	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
1998 Cohort	0.032	0.000	0.034	0.000	0.033	0.000	0.032	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
1999 Cohort	0.040	0.000	0.040	0.000	0.039	0.000	0.039	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
2000 Cohort	0.034	0.000	0.035	0.000	0.033	0.000	0.033	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
2001 Cohort	0.032	0.000	0.035	0.000	0.033	0.000	0.032	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
2002 Cohort	0.023	0.000	0.016	0.000	0.014	0.000	0.012	0.000
	(0.001)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)	(0.003)***	(0.000)
2003 Cohort	0.020	0.000	0.018	0.000	0.017	0.000	0.013	0.000
	(0.004)***	(0.000)	(0.011)	(0.000)	(0.011)	(0.000)	(0.011)	(0.000)
2004 Cohort	0.027	0.000	-0.067	0.000	-0.066	0.000	-0.070	0.000

	(0.020)	(0.000)	(0.021)***	(0.000)	(0.021)***	(0.000)	(0.020)***	(0.000)
NHSDG	-0.006	0.000	-0.007	0.000	-0.007	0.000	-0.007	0.000
	(0.001)***	(0.000)	(0.003)**	(0.000)	(0.003)**	(0.000)	(0.003)**	(0.000)
GED	-0.007	0.000	-0.007	0.000	-0.007	0.000	-0.006	0.000
	(0.001)***	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)
Some college	0.005	0.000	0.006	0.000	0.006	0.000	0.006	0.000
	(0.002)***	(0.000)	(0.005)	(0.000)	(0.005)	(0.000)	(0.005)	(0.000)
2 year degree	0.036	0.000	0.022	0.000	0.022	0.000	0.022	0.000
	(0.002)***	(0.000)	(0.006)***	(0.000)	(0.006)***	(0.000)	(0.006)***	(0.000)
4 year degree	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AFQT score	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
	(0.000)***	(0.000)	(0.000)***	(0.000)	(0.000)***	(0.000)	(0.000)***	(0.000)
Ever take TA	0.018	0.006						
	(0.001)***	(0.002)***						
Pass at least one class			0.009	0.001				
			(0.002)***	(0.002)				
Pass DL class							0.043	0.035
							(0.005)***	(0.006)***
Pass Traditional class							0.004	-0.003
							(0.002)*	(0.002)
Only non DL					-0.004	-0.007		
					(0.002)**	(0.002)***		
Took DL and non DL					0.047	0.042		
					(0.008)***	(0.009)***		
Constant	-0.081	0.018	-0.085	0.026	-0.083	0.026	-0.082	0.026
	(0.001)***	(0.000)***	(0.003)***	(0.001)***	(0.003)***	(0.001)***	(0.003)***	(0.001)***
Observations	800844	800844	107260	107260	107260	107260	107260	107260
R-squared	0.12	0.11	0.13	0.11	0.13	0.12	0.13	0.12
Number of SSN		200211		26815		26815		26815

Appendix Table 7. Active Duty Personnel by Fiscal Year and Rank

Rank	1995	1996	1997	1998	1999	2000	2001
E1	23,769	22,426	19,944	21,416	19,186	22,164	20,141
E2	31,175	29,159	26,307	24,302	22,911	19,434	24,320
E3	57,210	58,300	54,494	50,437	46,043	52,564	50,604
E4	78,521	73,935	68,157	63,071	63,049	63,183	63,910
E5	85,771	79,941	75,905	72,063	68,380	67,448	68,591
E6	69,097	64,776	61,970	58,256	55,100	54,113	52,945
E7	28,667	26,662	26,534	25,081	23,480	22,494	22,560
E8	8,350	7,940	7,283	7,135	6,121	5,954	6,128
E9	3,596	3,115	3,121	3,067	2,909	2,918	2,887
Total	386,156	366,254	343,715	324,828	307,179	310,272	312,086

Rank	2002	2003	2004	2005	2006	2007
E1	18,915	13,190	11,817	11,682	15,841	14,090
E2	24,898	22,407	20,024	17,808	15,358	17,009
E3	53,024	56,299	57,264	58,210	53,788	51,128
E4	66,949	67,742	65,495	59,022	57,328	52,683
E5	71,843	75,026	74,910	73,261	70,697	67,780
E6	53,084	54,028	53,767	54,318	52,773	49,456
E7	23,610	23,969	24,184	23,465	22,731	23,697
E8	6,670	6,897	6,896	6,738	7,092	6,607
E9	3,176	3,191	3,125	3,035	2,855	2,801
Total	322,169	322,749	317,482	307,539	298,463	285,251

Source: Defense Manpower Data Center enlisted master file. Annual numbers derived from first quarter of respective fiscal year.

Appendix Table 8. TA Participation Rates by Fiscal Year and Instruction Method

	Overall	Traditional	DL
1995	9.0%	8.9%	0.0%
1996	8.9%	8.9%	0.0%
1997	9.8%	9.7%	0.3%
1998	9.9%	9.6%	0.7%
1999	10.1%	9.6%	1.1%
2000	10.3%	9.5%	1.4%
2001	10.3%	9.0%	1.8%
2002	10.6%	8.9%	2.7%
2003	13.4%	10.1%	4.6%
2004	15.2%	9.9%	6.9%
2005	16.9%	9.9%	8.9%
2006	17.8%	9.4%	10.7%
2007	18.0%	8.6%	11.7%

Source:NETC TA data from NCMIS database files for active duty enlisted sailors participating by method of instruction divided by active duty enlisted strengths per year. DL + Traditional rates can be greater than Overall as some sailors participate in both DL and traditional courses in the same year.

Appendix Table 9. TA Courses by Fiscal Year and Rank

Rank	1995	1996	1997	1998	1999	2000	2001
E1	840	677	477	372	745	501	509
E2	3118	2874	2562	2031	2500	2805	2066
E3	9238	9721	9769	8654	8608	9064	8928
E4	20024	17649	18271	19641	20057	20047	20569
E5	30438	25837	26609	29672	30133	31358	32411
E6	24781	21071	22010	23661	22896	24732	24758
E7	10877	9294	10401	12084	12229	12629	13224
E8	2725	2460	2759	3415	3154	3293	3276
E9	671	546	720	833	919	1142	1147
Total	102712	90129	93578	100363	101241	105571	106888

Rank	2002	2003	2004	2005	2006	2007
E1	420	403	410	519	675	714
E2	1841	2087	1862	1917	2240	2838
E3	8941	10742	11936	11679	11382	11832
E4	21230	20035	22272	21382	22497	22528
E5	35386	36347	42746	46467	48558	47921
E6	25515	26369	33083	39606	42581	39861
E7	13702	12258	13841	15674	18581	18658
E8	3683	3505	4002	4401	5582	5308
E9	1284	1225	1331	1377	1535	1674
Total	112002	112971	131483	143022	153631	151334

Source: NETC TA data from NCMIS database files for active duty enlisted sailors taking undergraduate level courses

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