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Time to Train in Self-Paced Courses and the Return on Investment From Course Conversion

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Preface

The authors thank Krissy Kritselis, Virgil Hart, and John Phillips for their excellent advice and assistance in this study. Krissy and Virgil are program analysts for the Naval Personnel Development Command (NPDC) Code N9, the Integrated Learning Environment (ILE) Inplementation Team. John is an ILE program analyst working with NPDC Code N92, the Training Modernization Division. Our lively discussions with Krissy, Virgil, and John helped us to focus our analyses on the right questions and to seek additional datasets that are available. In addition, Krissy, Virgil, and John made it possible to visit and ask questions at the training sites where course conversions took place. They are not responsible, however, for any errors that might remain in this document.

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Executive summary

The Individuals Account (IA) costs the Navy millions of dollars each year because it represents days for which the Navy pays Sailors but gets no work in return. Students in training represent one component of the IA, so decreasing time to train will reduce the size of the IA and save the Navy money.

The Navy has converted many A-School courses to computerized self-paced format in recent years. The Human Performance and Acquisition Assessment Branch (N-173) asked the Center for Naval Analyses (CNA) to determine whether such conversions have decreased time to train and, if so, whether these savings were achieved at the expense of students' subsequent Navy success in C-School or later. N-173 further asked (a) how much reduction in time to train should be expected from converting courses to computerized self-paced format, (b) whether these decreases in time to train result in significant savings to the Navy, and, if so, (c) which types of courses or course content should be given priority for future conversion.

To answer N-173's questions, we analyzed the results of three A-School course conversions: Electronics Technicians (ETs), Fire Controllmen (FCs), and Yeomen (YNs). In each course conversion, sufficient time had elapsed that we could assess the impact of course conversion on time to train and on students' later success in C-School. We statistically controlled for any changes in student characteristics that might have occurred after converting to the new format. Therefore, changes that we report are due to course conversion rather than to changes in student characteristics. We found the following:

1. Converting courses to computerized self-paced format resulted in significant decreases in time to train.

2. These savings were achieved with no apparent ill effects on students' success in C-School or later Navy career progression.

3. Based on the three conversions that we studied, the Navy should expect that converting courses to computerized self-paced format will result in reductions in time to train of 10 to 30 percent.

4. Decreases in time to train result in significant savings, both in man-years and monetary terms; the monetary savings were achieved without cutting instructor billets.

5. Navy Education and Training should give priority to converting courses and content that have long course lengths and high student throughput. Priority should also be given to course content and skills that involve small risk of personal injury, of equipment breakage, or of causing mission failures in the fleet.

The findings of savings in time to train are significant. In the three courses, we observed these improvements in total time to train:[1]

- 26-percent reduction for ETs (44.7 days, about 83 man-years saved per year)
- 10-percent reduction for FCs (9.1 days, about 18 man-years saved per year)
- 31-percent reduction for YNs (19.4 days, about 42 man-years saved per year).

Figures 1 and 2 illustrate these reductions in time to train **for ETs and YNs**, focusing on under-instruction (UI) time, which constitutes the largest portion of total time to train. Other components, not shown in the**se** figures but included in the analysis, include time awaiting instruction (AI) before instruction, and time awaiting transfer (AT) after instruction.

These decreases in time to train translate into large monetary savings for the Navy. By using the IA programming rate of $148 per day, the annual savings from these three courses alone add up to millions of dollars. These savings are due to decreases in time to train only, not to decreases in instructor billets.

1. These reductions occurred despite an increase in awaiting transfer (AT) time at some training sites. AT time is not under the control of the A-School.

Figure 1. Example of savings in under-instruction (UI) time due to course conversion (for YN course graduates)

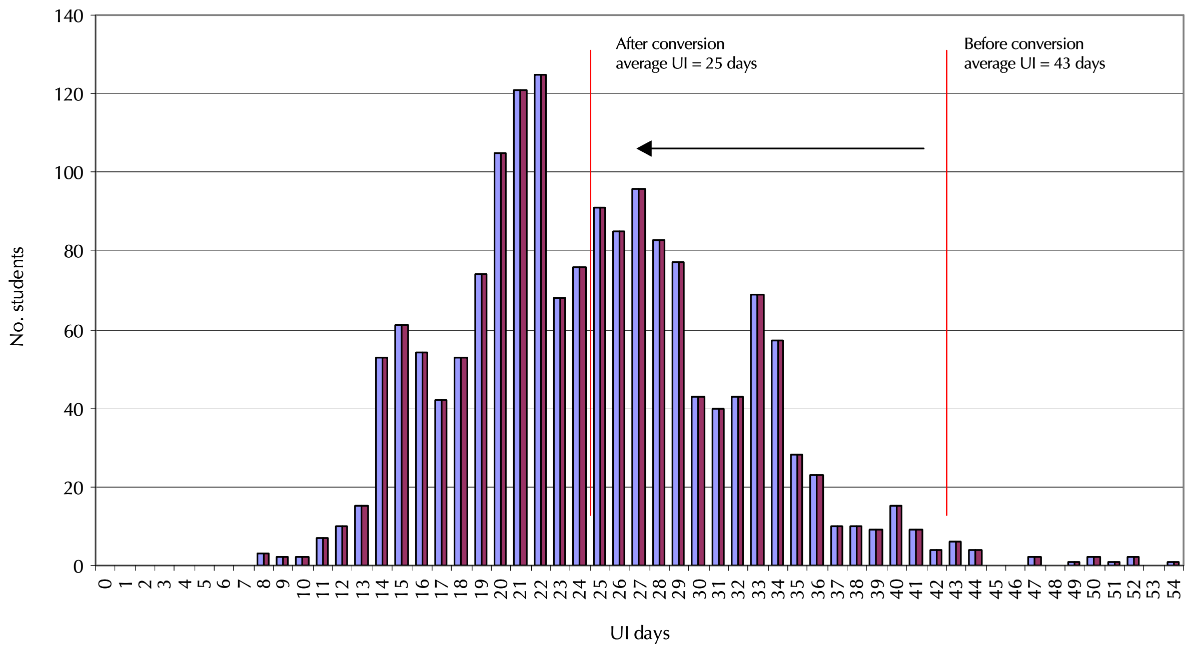
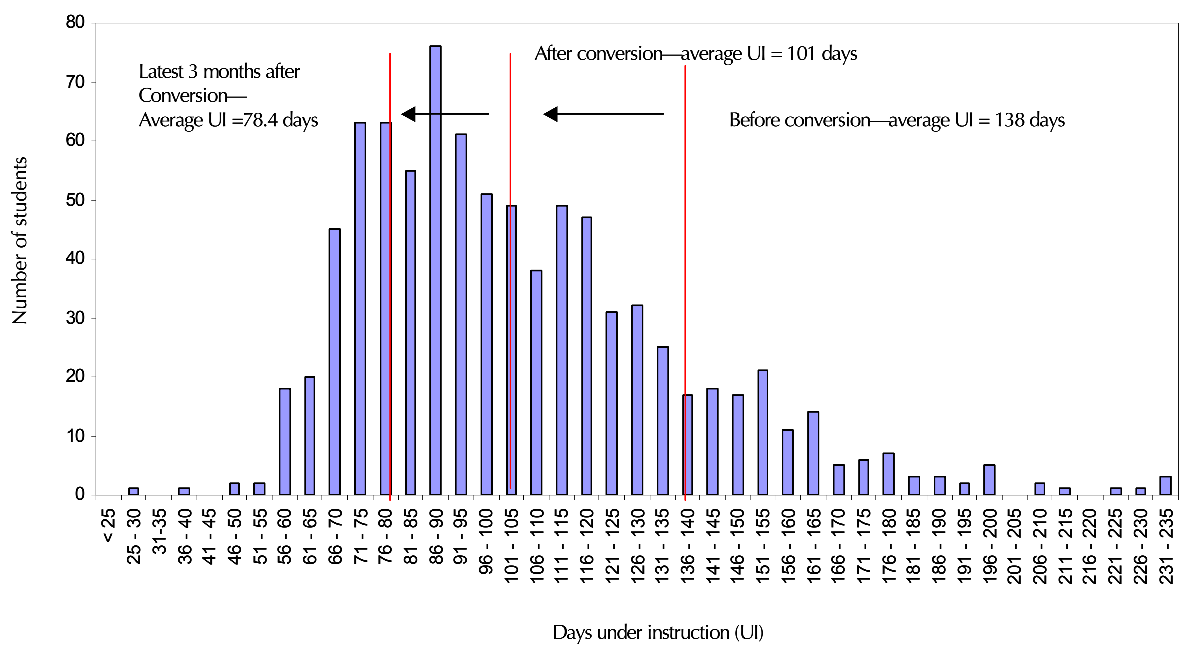


Figure 2. Example of savings in UI time due to course conversion (for ET graduates)



In addition to these findings, our study team made several observations that could benefit from followup. First, AT time after completing A-School courses had increased for those courses with the largest gains in student throughput. To make further savings to the IA, we recommend that the Navy conduct prefleet screenings and cut orders at boot camp instead of at A-School, at a minimum for administrative ratings with relatively short A-School lengths, such as YNs, Personnel Specialists (PSs), Religious Program Specialists (RPs), Ship's Servicemen (SHs), and Storekeepers (SKs). Staff members at the training site at Meridian, MS, have conducted a "proof of concept" analysis; their results show that students who graduate from Meridian A-School with their prefleet screenings and orders completed spend much less time awaiting transfer. Students who have to complete screenings or obtain orders after graduation from Meridian A-School spend more time awaiting transfer.

Second, converting courses to computerized self-paced format complicates the jobs of class and course management. Instructors find it more difficult to manage the classes and class content because, at any time, students could be at the beginning, middle, or end of the course. It would be worthwhile to invest in course management software that decreases the strain of keeping track of students at different parts of the course.

Third, we note that conversion to self-paced format can sometimes increase student course drops. We recommend that mechanisms be put in place to increase students' feelings of commitment to finishing their courses, such as community-of-practice websites. Instructors at Great Lakes have already made great strides in developing such websites.

Overall, we find that savings in time to train are sufficiently large to warrant further investment in course conversions. The savings in time to train that we found were achieved for straight conversions of course content that did not involve any deletion or shortening of course content. It is possible that further decreases could be achieved if redundancies in course content across the training pipeline were identified and addressed.

Introduction

Purpose of the study

The Navy's revolution in training (RIT) has resulted in a number of changes designed to make the training system more efficient and more responsive to fleet needs [1]. Among the innovations that have been initiated, the Navy has made changes to its training pipelines, many of which now use a greater number of self-paced, online, and computer-mediated modules and courses.

The Individuals Account (IA) costs the Navy millions of dollars each year because it represents days for which the Navy is paying a Sailor but not getting work in return. Students in training represent one component of the IA, so decreasing time to train will reduce the size of the IA and save the Navy money.

N-173 posed this question to CNA: Has converting A-School courses to computerized self-paced format decreased time to train? If so:

- Were these savings achieved at the expense of students' later success in the Navy (in C-School or beyond)?
- How much reduction in time to train should be expected from converting courses to computerized self-paced format?
- Do these decreases in time to train result in significant savings to the Navy, and, if so, which types of courses or course content should be given priority for future conversion?

Previous research

Effects of new technologies on learning and time to train

To answer N-173's questions, this study began with a review of previous research on the effects of converting classrooms using several different instructional technologies and of computerizing course content. This review of the literature included many significant previous studies (e.g., [2, 3, 4, 5, and 6]), including some on video teletraining and distance learning.

We began by looking at the education literature. In one study, Cavalluzzo and Lopez [7] examined the influence of distance-based, computerized education as a means of professional development training for teachers. The literature has identified several concerns about what makes up online professional development, the infrastructure it requires, and its costs and benefits, especially when compared with face-to-face delivery [8, 9, 10, and 11]. Most of the literature evaluates the impact of distance education courses on students who take them for academic credit—graduate, undergraduate, and even high school courses. Relatively few studies examine the impact of distance education courses for other educational and/or training needs, such as professional development, certification, or basic training.

In terms of professional development, several studies suggest that there is no significant difference between the outcomes of online and face-to-face instruction. Ryan [12], in the study of one undergraduate mathematics course, found no significant difference—as measured by final grade—between classroom, telecourse, and web-based delivery systems. Expanding the scope of the study to the college's entire catalog of distance education offerings, the investigator again found no significant statistical difference in either the attrition rates or the grade point averages of the participants in online courses compared with those in face-to-face settings. Karr et al. [13] compared student performance in a graduate engineering mathematics course that was offered online, traditionally, and as a hybrid online/in-class experiment. Assessing student performance on three tests, one final examination, and homework assignments, the researchers concluded that mode of delivery had little impact on student outcomes.

In a recent meta-analysis, Bernard et al. [14] provided a comprehensive survey of the empirical literature that compares distance learning and classroom instruction. Achievement, attitude, and retention outcomes from 232 studies were reviewed. The investigators rated the methodological quality of the literature as "weak," noting that field experiments are "often conducted in circumstances in which opportunities to control for rival explanations of research hypotheses are minimal" (p. 407). In general, however, this meta-analysis does support the claim that effective distance education depends on the provision of pedagogical excellence. That is, effective learning, regardless of context, depends on effective teaching.

We also reviewed the military literature on the effects of technology on training. We found considerable evidence that computerized self-paced courses can be just as effective as traditional face-to-face instruction. For example, Winkler and Polich [15] found that Army electronics technicians learned just as well with interactive videodisc instruction as they did with face-to-face technical instruction. Similar findings that support the usefulness of technology in military training are cited in a book by Moore [16], a review by Belcher and Neisler [4], reports by Rupinski and Stoloff [6], a study by Simpson and Parchman [17], and a series of studies by Wetzel and colleagues at the Navy Personnel Research Development Command [18 through 22].

A review by Fletcher [23] concludes that not only do students learn just as well with training technologies but the time needed to learn can be reduced by 20 to 50 percent. Fletcher includes the caveat that "what is done with the technology is what counts….The presence of technology is no guarantee that effective instructional content, effective ways to present it, or even that the unique strengths of the technology will be used" (p. 93). Fletcher concludes, however, that:

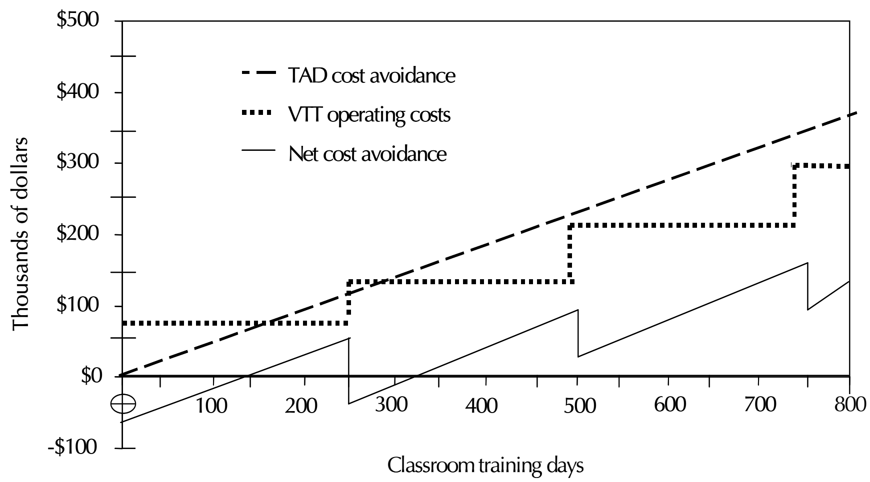
> This review of technology-based instruction suggests that it will most probably lower costs and increase effectiveness for many applications. It is likely to emerge as the most cost-effective alternative in many settings and applications when considered among all other possibilities in a full systems context….It does not seem unreasonable, then, to argue that the resources needed to realize its potential are well spent. [23, p. 97]

Computing return on investment of new training technologies

Previous research had also looked at the return on investment from spending on new instructional technologies. One study [2] made the important observation that return on investment is a step function:

New investments initially decrease the return on investment (or add costs rather than save costs) but become more cost-effective as there is greater use of the new technology. Figure 3 (from [2]) illustrates how this step function of investment and return on investment usually proceeds.

Figure 3. Illustration of the stepwise nature of return on investment from instructional technology



With these two findings as background (the equivalence of the learning outcomes of new technologies and face-to-face learning, and the stepwise nature of return on investment from instructional technology), we began our research on the effects of computerized self-paced courses on time to train and later career success.

Method

In selecting test cases to assess the effects of converting to self-paced computerized format, we looked for courses with certain characteristics that would allow us to conduct analyses:

1. There must be adequate sample size and sufficient time since conversion to detect reasonably small differences in performance.

2. We must statistically control for factors that are not the focus of the study but might affect results (e.g., differences in personal characteristics, such as students' ability as measured by the Armed Forces Qualification Test (AFQT)).

3. There must be understanding of how the courses were implemented.

After consulting with Naval Personnel Development Center (NPDC) and investigating Corporate Enterprise Training Activity Resource Systems (CeTARS) data, we chose to analyze the data for the A-School strand conversions of the courses for the following ratings: Yeomen (YNs), Electronics Technicians (ETs), and Fire Controllmen (FCs). ETs and FCs are more technical ratings and have higher costs of accession and training. In contrast, the duties of a YN are less technical. YNs cost less to recruit and less to train. All three of these ratings' A-Schools had at least 300 students who had gone through before and after computerization of the courses. Our study focuses on the ET and FC strand courses and the YN A-School course. Statistics on these students' abilities and other scores allowed us to statistically control for differences.

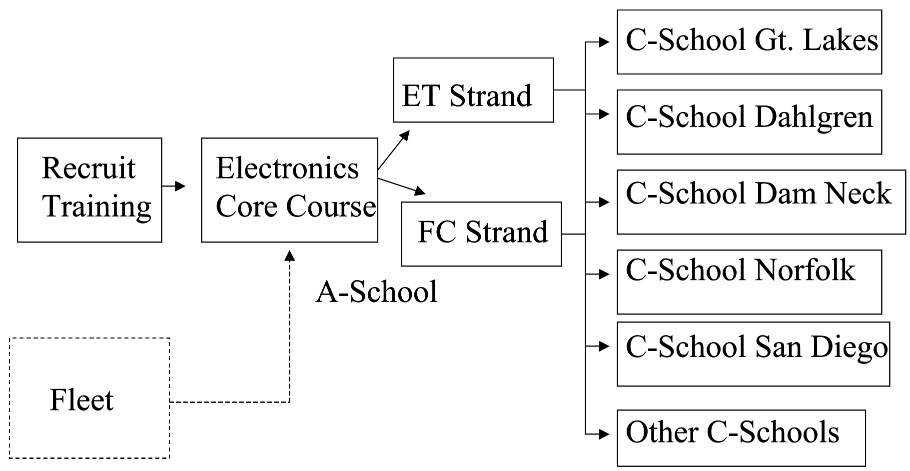
The computerization of courses happened in the following sequence:

- Initial computerization of YN A-School course pilot took place from 27 October to 12 December 2003

- Initial computerization of FC and ET A-School strand courses was accomplished in June 2004, with the first fully computerized students beginning in July 2004.

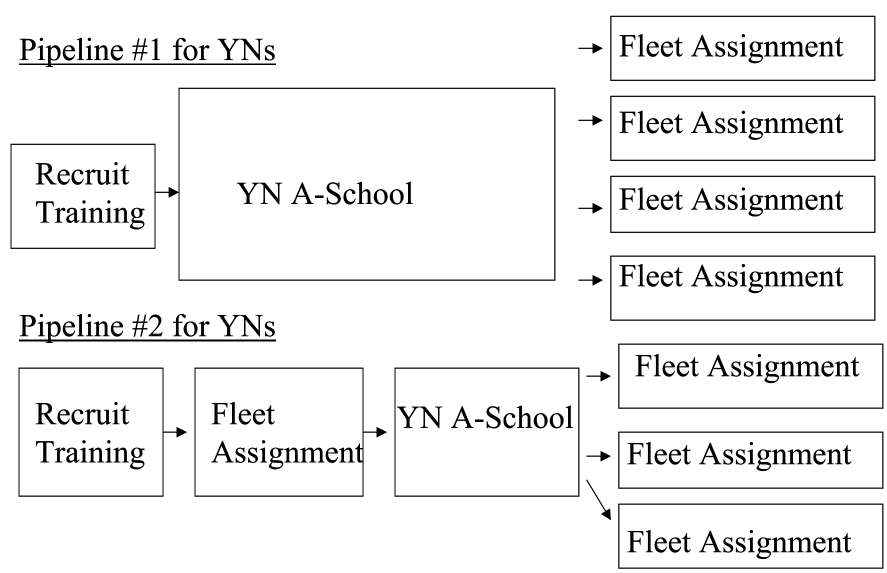
Figures 4 and 5 illustrate the training pipelines that develop students into ETs, FCs, and YNs.

Figure 4. Training pipelines for ETs and FCs[a]



a. The dotted line indicates that a very small number of ET and FC students have fleet experience. Most do not.

Figure 5. Major training pipelines for YNs[a]



a. Students can enter YN A-School from two major pipelines. This is different from the ETs and FCs, where very few students enter from the fleet

For this study, we used CNA's Street-to-Fleet database. It uses data from the Navy Integrated Training Resources Administration System (NITRAS), which is supported under the umbrella CeTARS architecture. We also used Navy accession records and data on career progression from the Enlisted Master File (EMF). With the resulting Street-to-Fleet database, we were able to conduct analyses concerning A-School time to train, C-School success, and success in later Navy career. The accessions data allowed us to statistically control for mental ability, as measured by the AFQT, and for length of service.

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Results

We will report the results in five subsections: (1) Comparability of samples before and after course conversion, (2) A-School time to train, (3) A-School graduation and drop rates, (4) Success in C-School, and (5) Career progression after training.

Comparability of samples before and after course conversion

As table 1 shows, characteristics of the students entering the courses before and after course conversion are similar in average AFQT, average Electronics Information (EI), percentage who had no waivers, and percentage Tier 1. The largest difference is that the average length of service (LOS) at the start of the course decreased for ETs and FCs (on average, from about 7.4 to about 5.2 months); for YNs, the average LOS at the start of the course increased (on average, from 7.4 to 12.6 months). These and other changes will be accounted for when we interpret any observed changes in student time to train or graduation rates before and after course conversion.

Table 1. Comparison of student samples for 18 months before and after course conversions

	ETs		FCs		YNs	
	Before	After	Before	After	Before	After
Number in sample (18 months)	867	790	572	840	397	951
Average AFQT	80.6	80.7	80.1	78.2	54.9	58.5
Standard deviation	12.4	13.7	11.5	14.9	14	16.3
Average EI	56.1	57.3	55.8	56.8	46.1	47.5
Standard deviation	6.6	7.2	5.8	7.3	6.9	7.2
Percentage Tier 1	94.8	95.9	98.4	96.1	93.1	94.4
Average LOS at start of course (months)	7.4	5.1	7.4	5.2	7.4	12.6
Percentage female	10.4	8.7	10.7	12.2	33.5	26.8
Percentage TAR Enlistment Program	11.5	2.2	0.0	0.0	14.4	9.3
Percentage advanced electronic field	81.0	89.6	94.2	87.9	0.0	0.4
Percentage no waiver	85.5	86.0	86.0	86.1	85.1	85.2

A-School time to train

The first question we addressed was whether time to train (TTT) changed as a result of course conversion. Table 2 shows the results of TTT for ET A-School, before and after course conversion. Awaiting-instruction (AI) time decreased dramatically—from an average of 8.5 days in the 18 months before course conversion to an average of just 0.3 day after course conversion. This indicates that students were usually put into instruction as soon as they arrived, rather than waiting for other students to arrive and a new class to convene. Furthermore, under-instruction (UI) days decreased, on average, from 137.6 to 100.7 days—a 26.8-percent drop. The standard deviation increased after course conversion, indicating a greater spread in the time to train as a result of self-paced learning.

Table 2. Time to train ETs before and after conversion (includes January through June 2006)

	Traditional classroom	Self-paced
Number of students	867	1,000
Average UI days	137.6	100.7
SD	27.2	35.3
Average AI days	8.5	0.3
SD	6.7	1.8
Average AT days	19.6	18.2
SD	25.2	20.2
Average total days	171.2	126.5
SD	37.4	46.9

For the ET A-School, the average time awaiting transfer after instruction (AT) decreased slightly but not significantly—from 19.6 to 18.2 days. This difference in AT time is not statistically significant. The total days include all of the categories shown in table 1, plus days of interrupted instruction. Overall, the total days spent in A-School ET training decreased from an average of 171.2 days to an average of 126.5 days—for a statistically significant savings of 26 percent.

Could this improvement in TTT for the ETs have been a result of differences in student characteristics before and after course conversion? Table 3 shows that this is very unlikely. In the table, "Post" is the coefficient for the indicator of whether the student took the course before or after course conversion. The coefficient of -28.63 and the t-statistic of -17.66 indicate that, controlling for such student characteristics as AFQT and accession status, by far the largest determinant of UI time was course conversion. Other significant coefficients showed that both students with higher AFQT scores and female students finished the course faster. Students who started the course with longer LOS, TAR Entry Program (TEP) students, and Advanced Electronics Field (AEF) students tended to take longer in the course. Waiver status was not a significant predictor of how fast a student finished the course. Therefore, we conclude that the improvement in UI time was primarily due to course conversion, rather than any differences in student characteristics after conversion.

Table 3. Regressions predicting ET UI time before and after course conversion

Variable	Coefficient	Standard error	t-statistic	Chance probability
Post conversion	-28.63	1.62	-17.66	0.000
Female	-8.68	2.65	-3.27	0.001
E_LOS	0.30	0.15	2.02	0.044
AFQT	-0.18	0.07	-2.57	0.010
TEP	17.08	4.63	3.69	0.000
AEF	8.68	3.66	2.37	0.018
No waiver	-1.62	2.23	-0.72	NS
Constant	143.19	5.73	25.01	0.000

Table 4 shows the TTT results for the FC A-School. The average AI time decreased from 5.6 days to 0.3 day, on average, indicating that students are being put to work almost immediately under the self-paced FC instruction. Furthermore, the standard deviation for the AI time decreased from 6.1 to 2.0 days. This makes sense because, before course conversion, students had to wait for the next time the course would start, and the wait times would vary. The average UI time decreased from 78.9 to 65.2 days after conversion, with the standard deviation increasing from 9.2 to 28.2 days.

Table 4. Time to train for FCs before and after conversion (includes January through June 2006)

	Traditional classroom	Self-paced
Number of students	572	1,237
Average UI days	78.9	65.2
SD	9.2	28.2
Average AI days	5.6	0.3
SD	6.1	2.0
Average AT days	4.7	13.9
SD	16.2	15.4
Average total days	92.8	83.7
SD	21.9	32.8

The improvements in FC student UI time resulted from course conversion—not any change in student characteristics. Table 5 shows the results of regressions to predict UI time, both before and after course conversion.

Table 5. Regressions predicting FC UI time before and after course conversion

Variable	Coefficient	Standard error	t-statistic	Chance probability
Post conversion	-8.29	1.38	-5.94	0.000
Female	-2.40	2.05	-1.17	NS
E-LOS	0.01	0.13	0.10	NS
AFQT	-0.20	0.06	-3.24	0.001
TEP	19.97	17.59	1.14	NS
AEF	-2.87	2.96	-0.97	NS
No waiver	-0.22	1.90	-0.12	NS
Constant	97.76	4.76	20.53	0.000

Table 5 shows that it is the course conversion that decreased student under-instruction time. Conversion status has the largest absolute value t-statistic (-5.94) and lowest probability of occurring by chance of any substantive factor in the regression equation. The other significant factor associated with faster UI times was having higher AFQT scores, but this factor was not as highly associated with UI times as was course conversion. Such student characteristics as being female, length of service on entry into the course, TEP status, and AEF status had no significant effects on UI times. Therefore, we conclude that course conversion was the primary reason for the decrease in UI time for FCs, rather than any change in student characteristics.

The pattern for the FC awaiting transfer time, however, moved in the other direction—increasing from an average of 4.7 days to an average of 13.9 days. (Refer to table 4.) This statistically significant increase suggests that not all of the potential savings in student time under instruction are being used effectively. The average increase in AT time of over 9 days nullifies much of the 13-day decrease in UI time. Despite the increase in AT time for FCs, the total days under instruction decreased almost 10 percent—a savings of about 9 days, on average. The savings in overall time to train would have been much larger if AT time had not increased.

We performed some analyses to try to understand better why AT time increased for the FCs (table 6 shows the results). Most FCs go on to C-School immediately after they finish A-School. Our first look was at the location of the next course. It looks as if most large course locations (>=10 students) decreased their time awaiting instruction plus their AT time at A-School, with the exception of Virginia Beach, which had larger AI + AT times for both the ETs and the FCs. The increase in time is especially significant for the FCs (from 5.9 up to 11.0, on average). We do not know why AT time increased for students who received follow-on training at Virginia Beach, but it appears that there is a pattern of longer waiting times for courses at Virginia Beach than at other followup locations. It is possible that there are fewer class convenings, or a longer time for convenings, for the"C" schools whose AT time increased.

Table 6. Patterns of AT and follow-on AI time for ETs and FCs before and after conversion (for locations with >=10 students both before and after conversion)

	Before conversion			After conversion		
	Count	(AI + AT) average	SD	Count	(AI + AT) average	SD
ETs						
Ft. Gordon	36	9.9	11.3	24	12.0	8.2
Great Lakes	26	23.0	14.5	18	19.3	16.4
Norfolk	253	18.9	18.7	197	18.1	21.5
Pensacola	54	23.4	28.7	41	22.5	13.7
San Diego	258	19.3	21.4	286	17.9	16.3
Virginia Beach	63	17.0	17.7	57	25.1	22.3
FCs						
Dahlgren	233	17.3	23.1	240	10.9	12.8
San Diego	95	8.4	19.9	120	7.5	6.4
Virginia Beach	162	5.9	14.4	224	11.0	10.3

We next looked at time to train for the YNs. As table 7 shows, average time awaiting instruction has decreased from an average 7.8 days to 1.9 days—a savings of almost 6 days.[2] UI time decreased dramatically

2. We were asked why the after-conversion average AI time for ETs and FCs (0.3 day) was less than the average for the YNs (1.9 days). Three factors account for this difference: (1) travel time, (2) weekend arrivals, and (3) lack of staff at Meridian. **Travel time:** At Great Lakes, the A-School is on the same base as the engineering common core, so students are essentially "moving across the street" to enter ET or FC A-School. In contrast, Meridian's students come from RTC or the fleet, which are at sites other than Meridian. Travel time counts as AI time, and it takes at least a day of travel to get to Meridian, MS; there are only two commercial flights into Meridian each day. In contrast, there is no travel time at Great Lakes. **Weekend arrivals:** It takes a long time to fly into Meridian, so students often come on a Friday or a Thursday and do not start their course until Monday. **Lack of staff at Meridian:** Currently, Meridian does not have NMT on Wednesday or Friday, so students arriving on Thursday do not get their NMT until the following week. This factor will be rectified in the next few months, however, when Meridian obtains another primary instructor, allowing them to have NMT instruction on all days of the week.

as well—from an average of 43.3 days to an average of 24.6 days under self-paced. It is interesting that the standard deviation of time to train decreased under the self-paced training, which suggests that the course might have hit a limit; further decreases in UI time for YNs might not be possible.

Table 7. Time to train for YNs before and after course conversion

	Traditional classroom	Self-paced
Number of students	397	1,706
Average UI days	43.3	24.6
SD	11	7.1
Average AI days	7.8	1.9
SD	26.1	2.0
Average AT days	9.9	15.1
SD	27.4	15.8
Average total days	62.4	43.0
SD	40.7	18.2

These decreases in time to train were not an artifact of changes in student characteristics before and after conversion. The decreases are the result of course conversion. Table 8 shows that the single largest predictor of decreased UI times at Meridian was after-conversion status, with a coefficient of -17.66 and t-statistic of -34.77. Other factors were significantly associated with going through the course more quickly—higher AFQT scores and post fleet students—but these factors were not as strongly associated as was conversion status.

The AT time for the YNs increased by over 5 days, essentially nullifying the savings made in AI days; however, the standard deviation in AT days decreased. Overall, the total days for the YNs decreased from an average of 62.4 days to an average of 43.0 days—for an overall savings in time to train of over 30 percent.

The reason for the increase in AT time for the YNs is different from the reason for the FCs. FCs go to C-School immediately after

A-School, whereas YNs are moving from A-School to the fleet. According to personnel at Meridian, part of the problem is that there are sometimes no requisitions for a portion of the A-School graduates. We will discuss the reasons for the increase in YN awaiting transfer time further in the discussion section of this report.

Table 8. Regression predicting UI time for YNs

Variable	Coefficient	Standard error	t-statistic	Probability
Post conversion	-17.67	0.51	-34.77	0.000
Female	-.21	0.52	-0.4	NS
E-LOS	-0.01	0.01	-1.00	NS
AFQT	-0.89	0.02	-5.53	0.000
TEP	0.96	1.03	0.93	NS
SG	0.16	0.82	0.20	NS
SF	0.60	0.96	0.62	NS
Post fleet	-3.27	1.00	-3.25	0.001
No waiver	-0.42	0.63	-0.66	NS
Constant	49.13	1.50	32.85	0.000

The results for all three ratings show significant decreases in UI time after course conversion. In the next subsection, we address whether course conversions affected the graduation rates of the courses.

Graduation and drop results

Table 9 shows the graduation and drop results for the 18 months before and after the ET course conversion. It shows that the number (and percentage) of graduates decreased slightly—from 94.6 to 89.2 percent—which is statistically significant. The increase in drops was significant for both academic drops (from 0.8 to 2.8 percent) and nonacademic drops (from 4.6 to 8.0 percent). These results suggest a small but statistically significant tendency for students to leave the ET course at a higher rate since course conversion.

Table 9. Graduation and drops for ETs-18 months before and after course conversion

	Traditional classroom	Self-paced
Number of students	866	821
Number of graduates	819	732
Percentage of graduates	94.6	89.2
Number of academic drops	7	23
Percentage of academic drops	0.8	2.8
Number of nonacademic drops	40	66
Percentage of nonacademic drops	4.6	8.0

To find out if there were a reason for the increase in the percentage of drops for ETs that was unrelated to course conversion, we first looked at whether the characteristics of the students before and after conversion were different. None of the following characteristics were different before and after course conversion: percentage of waivers, average AFQT score, average EI score, and percentage male. We found only two differences: (1) There were more TAR Enlistment Program students before conversion than after conversion, and (2) students entered the ET course with less LOS, on average, after course conversion. Neither of these differences, however, appears to be a sufficient explanation for the increase in drop rates. The TEPs' drop rates increased after course conversion, as did those of the other groups (males, females, waivers, and nonwaivers). And LOS on entering A-School was not a significant predictor of whether a student dropped the ET course (see table 10). Altogether, it appears that the increases in drops in ET A-School were due to course conversion, rather than any change in student characteristics, although the AFQT is a moderate predictor of graduating from ET A-School (probability of 0.056).

We also compared whether drop rates were different by month before and after conversion. The results are shown in appendixes A and B. It appears that seasonality is not a reason why drop rates were higher after conversion for the ET course.

Table 10. Logits to predict whether students graduate from ET A-School

Variable	Coefficient	Standard error	t-statistic	Probability
Post conversion	-0.80	0.20	-4.05	0.000
Female	0.14	0.33	0.42	NS
E_LOS	-0.01	0.01	-0.66	NS
AFQT	0.01	0.01	1.91	0.056
TEP	0.08	0.52	0.16	NS
AEF	0.24	0.37	0.66	NS
WV_None	-0.35	0.30	-1.2	NS
Constant	1.83	0.61	3.02	0.003

We next looked at the graduation and drop rates for FCs. As table 11 shows, there was a significant increase in the number of students (from 572 to 826), but the graduation rate remained essentially unchanged—from 93.9 percent before course conversion to 94.9 percent after course conversion (a statistically insignificant difference). Both the academic and nonacademic drops were about the same percentage before and after conversion.

Table 11. FC graduation and drops-18 months before and after course conversion

	Traditional classroom	Self-paced
Number of students	572	826
Number of graduates	537	784
Percentage of graduates	93.9	94.9
Number of academic drops	10	8
Percentage of academic drops	1.7	1.0
Number of nonacademic drops	25	34
Percentage of nonacademic drops	4.4	4.1

The results for the YN graduation rates are shown in table 12. The results were very similar to those for the FCs—no changes to the percentage of graduation and drops, but a large increase in the total student throughput. In fact, the increase in throughput for the YNs is particularly large—well over 2.5 times the number of graduates (from

305 to 847) in similar 18-month periods. We have shown that the graduation percentage was unchanged by course conversion for the FCs and YNs but that graduation percentage decreased for the ETs. In the next subsection, we present the results for whether C-School success was different after course conversion.

Table 12. YN graduation and drops—18 months before and after course conversion

	Traditional classroom	Self-paced
Number of students	310	862
Number of graduates	305	847
Percentage of graduates	98.4	98.3
Number of academic drops	1	2
Percentage of academic drops	0.3	0.2
Number of nonacademic drops	4	13
Percentage of nonacademic drops	1.3	1.5

Success in C-School after graduation from A-School

The next question is whether the graduates of the converted A-School courses performed as well in C-School as did graduates before course conversion. We requested the C-School grades of graduates, but the numbers of grades available were too small for meaningful analysis. Consequently, the following results are based on graduation rates from C-School, not course grades. We will present results for ETs and FCs because they usually go on to C-School after completing their A-School courses. We will not present results for the YNs because they do not usually go to C-School.

Table 13 shows the graduation rates for ETs before and after course conversion for the nine ET courses that had the largest numbers of A-School graduates. (Appendix C includes the results for all courses with 8 or more students.) The numbers of graduates going to any particular C-School are fairly small—ranging from a high of 118 students for Comsec Maintenance in self-paced to a low of 37 students for AN/SYQ-7(V). The graduation rates for all of the C-School courses shown in table 13 (both before and after conversion) were very high; all were

94 percent or higher. In all cases, any small differences in C-School graduation rates are not statistically significant, showing that the graduates of the converted A-School courses are not having trouble in C-School courses afterward (as measured by graduation success). In many cases, the graduation rates after course conversion are slightly higher, but those differences are not statistically significant.

Table 13. Success in C-School of ETs (courses with largest throughputs)

Course	Traditional classroom		Self-paced classroom	
	No. students	Grad. rate (%)	No. students	Grad. rate (%)
Comsec Maintenance	90	97.8	118	98.3
UHF Systems	103	96.1	96	97.9
HF Systems	95	100.0	98	99.0
Info. Systems	52	94.2	105	98.1
Single Audio System	57	98.2	64	100.0
Miniature Electronics	41	100.0	74	94.6
Air Traffic Control Maint.	54	100.0	52	100.0
AN/SYQ-7(V)	59	100.0	37	100.0
AN/SRQ-4 LAMPS	41	100.0	52	100.0

We next looked at the graduation rates of the FCs in C-School. Table 14 shows the graduation rates before and after conversion for the seven courses that had the largest numbers of students. (Appendix D includes the results for all courses.) As with the ETs, the number of A-School graduates going into any particular C-School is fairly small—ranging from a high of 90 students for MK-15 Close-In Weapon (CIWS) to a low of 26 for Aegis Radar System. The graduation rates for the C-Schools for the FC are usually very high—ranging from a low of 80.6 percent for the Aegis Display System for students who passed A-School before course conversion to a high of 100 percent for Advanced Tomahawk Weapons Control.

In all cases, any differences in the graduation rates for the FC C-School are statistically not significant. Taken together, the results from table 14 show that the students who graduated from FC A-School after course conversion did just as well in C-School as those who completed A-School before course conversion, as measured by graduation rates.

Table 14. Success in C-School of FCs (courses with largest throughputs)

	Traditional classroom		Self-paced classroom	
	No. students	Grad. rate (%)	No. students	Grad. rate (%)
MK-15 Close-in Weapon (CIWS)	89	95.5	90	93.3
Advanced Tomahawk Weapons Control	64	100.0	49	98.0
Aegis FCS/ORETS Ops and Maintenance	46	91.3	66	90.9
Aegis Radar System	43	90.7	26	96.2
Aegis Computer Ops & Maint.	31	87.1	30	90.0
Aegis Display System	36	80.6	25	92.0
Aegis Computer Network	31	83.9	29	86.2

In summary, the results in tables 13 and 14 show that the conversion of the A-School course for ETs and FCs did not seem to affect later success in C-School. Using graduation rates as the measure of success, graduates of A-School performed well in C-School, both before and after the A-School conversions. The next subsection will address whether this initial success continues into students' Navy careers.

Career progression after finishing A-School and C-School

Table 15 presents the summary statistics for career progression after A-School. The second column shows that the average length of service on entering A-School was significantly different before and after course conversion for all three courses. After course conversion, ETs and FCs had significantly less service on entering A-School, whereas YNs had significantly more. The third column shows that average total class days were significantly lower after course conversion for all three courses.

The first step in career progression after completing the A-School course is to be promoted to E3 (shown in the fourth column). As table 15 shows, the ETs were promoted to E3 with the same average LOS before and after course conversion; the difference of 0.2 month is not statistically significant. The differences in average LOS to E3 were statistically significant for the FCs and YNs, whose average LOS to E3 was 0.8 month less (for FCs) and more than 1 month less (for YNs) after course conversion. These findings suggest that there is no detrimental effect of the course conversion on the speed of promotion to E3.

Table 15. Career progression of A-School graduates—before and after course conversion

Course and format	Average LOS at start of course (months)	Average total class days	Average LOS (months)			
			At E3	At E4	Reaching fleet	Reaching sea duty
ET						
Traditional	7.5	171.2	7.8	15.3	17.3	18.6
Self-paced	5.0[a]	126.5[a]	7.6[b]	13.4[a]	14.1[a]	14.1[a]
FC						
Traditional	7.5	92.8	8.3	15.5	18.8	19.1
Self-paced	5.1[a]	83.7[a]	7.5[a]	12.4[a]	14.5[a]	14.9[a]
YN						
Traditional	7.3	62.4	11.5	27.1	9.7	13.8
Self-paced	12.7[a]	43.0[a]	10.2[a]	26.3[b]	14.3[a]	12.9[b]

a. The difference between traditional and self-paced classrooms is statistically significant.
b. The difference between traditional and self-paced classroom is not significant.

The next step in career progression is to make E4. The fifth column of table 15 shows that, for ETs and FCs, the average LOS to make E4 is less than it was before course conversion: The differences for ETs and FCs are statistically significant. For YNs, the difference in LOS to make E4 is not statistically significant. These results for LOS to E4 suggest that, again, the course conversion did not seem to produce graduates who were having difficulty in their later Navy careers.

The sixth column of table 15 shows that ET and FC course graduates were reaching the fleet faster after course conversion than they did before course conversion.[3] (This column refers to reaching the fleet after A-School.) The YNs, in contrast, reached the fleet later, on aver-

3. Reaching fleet was determined by Accounting Category Codes 100, 106, 108, and 352. Reaching sea duty was defined as having a Sea Shore Code of 2 (sea duty) or 4 (nonrotated sea duty).

age, after course conversion. This difference is explained by the fact that, on average, YNs started the course later in their careers during the self-paced than they did before. (The average student began YN A-School with 12.6 months of service after conversion, which is higher LOS than students who reached the fleet before the conversion—average LOS starting the course of 9.7 (see tables 1 and 15).) Before conversion, 13 percent of those in YN A-School had prior fleet experience; after conversion, 26 percent did. This explains why reaching the fleet occurred later after course conversion. It is not a cause for concern, however. In fact, YNs reached the fleet 2.5 months after A-School before conversion, on average, but 1.5 months after A-School in the self-paced course.

The final column of table 15 shows that, in general, the LOS to reaching sea duty was less after course conversion, for all three ratings. The differences were statistically significant for the ETs and FCs, but not for the YNs.

Table 16 explains an apparent anomaly in table 15 and shows that time to the fleet was faster in all three ratings. The apparent anomaly in table 15 was that, on average, the YNs reached sea duty after conversion at LOS 12.9, whereas they reached the fleet at LOS 14.3. This is an anomaly because any given Sailor must reach the fleet no sooner than reaching sea duty. In fact, the anomaly occurs because a large number (337) of post-conversion YNs' data is missing (i.e., not available because not enough time has passed since graduation). Of those YNs who reached the fleet after conversion, they made it to the fleet an average of 3.7 months after finishing the course, compared with an average of 7.4 months before conversion. Table 16 also shows that, measured by months since the course, students made it to the fleet faster after course conversion, on average.

In summary, tables 15 and 16 show that, after course conversion, the career progression of students after graduation was just as fast as, or faster than, it was before course conversion. In the case of ETs and FCs, they actually made it to the fleet and to sea duty with less LOS after the course conversion. The combination of starting A-School earlier and completing A-School faster seems to have contributed to getting to the fleet faster. In the case of YNs, it took less time between finishing A-School and starting the next fleet and sea duty assignment.

Table 16. Speed of reaching fleet and sea duty after A-School course

Course	Milestone reached after A-School	Average number of months since A-school course that milestone reached	
		Pre-conversion	Post-conversion
ET	Reached fleet	9.9	9.1
	Reached sea duty	11.4	9.1
FC	Reached fleet	11.4	9.5
	Reached sea duty	11.8	9.9
YN	Reached fleet	3.0	2.5
	Reached sea duty	7.4	3.7

Findings from the classroom sites: Great Lakes (ET and FC courses)

We traveled to Great Lakes to visit the ET and FC A-School courses to better understand how the course conversion occurred and to find out about any factors that should be considered in our data analyses.[4] Our discussions with the A-School administrators and instructors showed that they were conscientiously trying to move students through the courses, consistent with maintaining adequate learning. They raised several issues that need to be considered concerning course conversion.

Classroom management

The typical classroom setup for the ETs and FCs was to have students working individually at computer stations around the room, with an

4. For example, course managers at Great Lakes told us that a group of students were shifted from the ET course to the FC course after the course conversion. This knowledge allowed us to correctly identify these students as FCs, rather than as ET students who did not graduate.

instructor watching and answering questions from a position in the back or center of the room. Instructors' jobs of managing the classes and class content become more difficult as a result of course conversion because, at any time, students could be at the beginning, middle, or end of the course. The instructor must stay aware of whether particular students are going too slowly (perhaps daydreaming, not trying, or not understanding the material) and whether their scores on quizzes and tests are high enough to move on to the next course module. Is the student understanding the material? Is he or she going fast enough? Does the student need remediation?

To assist instructors in these class content management tasks, Great Lakes invested in a computerized management system that allows the instructor to see on a computer screen what the students are doing as they work at their computers around the room. For example, the instructor can see how long a student is spending on a particular block of material, how long it has been since the student last entered any answers, and how many questions he or she got correct on the last quiz. This system makes much of the course management challenges easier, but it does not substitute for the in-depth knowledge that an instructor must possess. The ability to address students' questions from any part of the course on any day is certainly more difficult than having to prepare for students' understanding of the course in one particular module, which was the case in the "lock step" course before course conversion.

Course management

The job of managing the course is also made more complicated by self-paced mode of instruction. To keep students moving to a new position and to know how many new positions will open up to new students without creating a queue, course managers need to predict when students will finish particular modules. Course management needs to know whether they will soon need to go into double shifts or add equipment to address a course bottleneck. The important course management issue of predicting when a student will finish the course is also made more difficult. A student might do well on earlier modules, only to slow down or to have difficulty with the need for remediation and retests at later parts of the course.

To address these course management issues, Great Lakes devised its own spreadsheet program for tracking the progression of students through the course modules, their grades, and dates of promotion, and for noting any special circumstances that affected the students' progress, such as illness or death in the family.

Improving time to train

Great Lakes started an "open learning" initiative in January 2006, in which instructors encourage students to work on course material on nights and weekends, as well as the typical weekday course hours. The purpose of the open learning initiative is to speed students' progress and to address any remediation issues without having them unduly slow the students' time to train. Our analyses suggested that, indeed, average time to train had decreased since January 2006. Average UI time decreased from 138 days to 101 days overall, but those were 18-month averages. More recent data show that UI time for the ET strand has decreased since January 2006—down to an average of just 78.4 days.

Community of practice

Great Lakes devised other computerized enhancements to deal with the challenges of self-paced instruction, such as a community-of-practice website for each of the ratings. The websites allowed students to e-mail questions to instructors, provided course material that could be taken online, and provided a "question of the day" about a topic related to the rating. The intent of the community-of-practice websites was (a) to develop a place where students could get in the habit of looking online for assistance with technical challenges of their ratings and (b) to help foster a sense of commitment to one's rating.

Encouraging active learning

Great Lakes also tried to encourage students to take charge of their own learning by displaying posters suggesting that students should actively address any questions they have by searching different references or by asking questions of instructors or other students. The point of the posters was to make sure that students do not assume a passive attitude that allows them to “fall between the cracks” in the self-paced environment.

We asked the staff at Great Lakes about why the percentage of ET graduates dropped after course conversion. (This was not the case for FCs.) They said that, before course conversion, the ET instructors were told that they (the instructors) were responsible if a student failed to graduate from the course. After course conversion, the student was held more responsible for his or her own progress through the course.

Findings from classroom sites: Meridian (YN courses)

The A-School at Meridian trains administrative ratings, and it is a much smaller training location than Great Lakes. We met with the CO, XO, and primary course administrators, as well as instructors at Meridian. Our discussions there showed that the administrators were trying very hard to increase the throughput of the students, maintain high-quality graduates, and decrease or eliminate time awaiting training or awaiting transfer. Instructors at Meridian were typically contractors, unlike at Great Lakes. These discussions with instructors, administrators, CO, and XO showed that, for the YNs, there were challenges to be addressed with the conversion of the course to self-paced mode.

Increased AT time

The biggest issue for Meridian was that the awaiting-transfer time had increased after course conversion, which negated to some extent the advances that had been made in decreased time awaiting instruction and under instruction. It was frustrating for the instructors and course managers because they were not in control of getting the requisitions from the fleet. There was also a perceived negative effect on student morale because students were finishing the course but not able to go to the fleet immediately. Since Meridian's courses take less time to complete than the ET or FC course, it is more difficult to get students ready for transfer during instruction time. Completion of prefleet physicals and getting orders are more difficult to fit in, especially because YNs are going to the fleet, whereas ETs and FCs go to C-school (where some of the prefleet preparation can be completed).

The staff at Meridian had several ideas about ways to decrease AT time. One was to have the A-School be considered an "intermediate stop," with screenings and orders filled while the student is still in boot camp, prior to A-School. Another was to have blank requisitions available at Meridian so that they can quickly get students orders once they finish the course.

The CO at Meridian has been performing a "retrospective experiment" to determine whether having screenings and orders completed while students are in Recruit Training Camp (boot camp) would decrease AT time at Meridian. The CO had his staff look up which students had their screenings and orders by the time they finished their curricula at Meridian, and which ones did not. They then compared the average AT time for those two groups of students. They have been finding much lower AT time for those students whose screenings and orders were completed. Of the 130 who had orders in hand and were screened, the average AT time was 4.1 days. Of the 141 who were missing either orders or screening, the average AT time was 10.0 days.

Difficulties getting fleet feedback on A-School YN training

The instructors at Meridian were interested in finding out whether the fleet had feedback on the A-School training provided to YNs. Two instructors took it upon themselves to write letters to the work supervisors on board ships where the YNs were stationed after A-School. They listed a variety of subjects that the YNs learned in A-School and requested feedback from the supervisor on how well their graduates were performing. Unfortunately, the instructors said that they received only a small number of replies to their requests for information; they would still like to have a better way to obtain fleet feedback.

Summary and discussion

To summarize the results of this research, we found that time to train decreased substantially in all three courses that were converted to computerized self-paced format. The decreases in under-instruction (UI) time ranged from about 10 percent (for the FC course) to 30 percent (in the case of the YNs). There were substantial decreases in awaiting-instruction (AI) time as well—ranging from 8.5 days to 0.3 day for ETs, to 7.8 to 1.9 days for the YNs.[5] These highly significant decreases in UI and AI time were enough to overcome any increases in awaiting-transfer (AT) time or interrupted-instruction (II) time that occurred. Unlike UI time, AT time and II time are not under the control of the A-Schools.

There is no question that these decreases in time to train saved man-years. The ETs had 732 graduates in the 18-month period after course conversion, which corresponds to 483 graduates in a 12-month period. The 12-month totals would be 517 for FCs and 559 for YNs. Multiplying this number of graduates by the average savings in total time to train (44.7 for ETs, 9.1 for FCs, and 19.4 for YNs), and dividing by 260 (number of productive days per year), we find that the savings in man-years per year are as follows:

- 26-percent reduction for ETs (44.7 days, about 83 man-years saved per year)
- 10-percent reduction for FCs (9.1 days, about 18 man-years saved per year)
- 31-percent reduction for YNs (19.4 days, about 42 man-years saved per year).

5. Data presented to us by the staff at Meridian indicate that UI and AI time have also decreased for other administrative ratings where conversions to self-paced format were made, such as PSs, RPs, SHs, and SKs. Those ratings, however, were not the focus of the current CNA study.

How much do these decreases in man-years save? To compute the savings, we will use the IA programming rate, which is the rate that resource sponsors use to program dollars during the PPBES cycles. CNO N-10 develops the rate on a yearly basis and disseminates the number to CNO N-8 and FMB. The rate is not rank or paygrade specific; it is the same for an E1 as for an E9. The IA programming rate is the same rate as the MPN for all enlisted. It is developed by gathering all the MPN cost the Navy has for a given endstrength and dividing it by the number of personnel.

In the 18 months after the ET course converted, there were 732 graduates, and average total time to train decreased 44.7 days. If we accept the estimate of $148 per graduate per day, the following calculations can be made. Note that these calculations do not depend on cutting instructor billets, and they are for straight conversion of material to computerized self-paced (not reducing or eliminating any topics). For ETs, the average total TTT decreased from 171.2 to 126.5 days—a decrease of 44.7 days per graduate. Multiplying 44.7 by $148 provides a savings of $6,616 per graduate. Multiplying by 732 graduates during the 18-month period following course conversion gives us a total savings of $4.8 million over an 18-month period. Over a 12-month period, the savings would be $3.2 million.

For FCs and YNs, the savings are smaller but still significant. FCs required 9.1 fewer total training days, on average, in A-School after course conversion. Multiplying this by $148 per graduate per day yields a savings of $1,347 per FC graduate. Multiplying this by the 784 graduates over the 18-month period provides a total savings of over $1.0 million for the 18 months after course conversion, or a 12-month rate of about $670,000. For YNs, TTT decreased from 62.4 to 43.0 days—a total savings of 19.4 days per graduate. Multiplied through by $148 per graduate per day and 847 graduates (during the 18-month period), total YN conversion saved over $2.4 million over 18 months. This corresponds to a 12-month rate of about $1.6 million in savings.

Potential additional savings from decreasing AT time

If we follow the foregoing logic, we can calculate the potential additional savings by decreasing AT time. For the ETs, average AT time after conversion was 18.2 days per graduate. If this could be cut in half, to 9.1 days, it would save $1,347 (i.e., 9.1*$148) per graduate. Potential savings could be $1,347*488 graduates per year, or about $660,000 per year.

For FCs, average AT time after conversion was 13.9 days per graduate. If this could be cut in half, to 6.9 days, it would save $148* 7 = $1,036 per graduate. Multiplying by 522 graduates per year, we would get $541,000 per year. For YNs, the average AT time after course conversion was 15.1 days. If we cut that AT time in half, to 7.5 days, we could save $1,110 per student ($148*7.5), or annual savings with 564 graduates per year of $1110*564—about $626,000 per year.

These savings would be larger or smaller, depending on how much AT days were decreased and how large student throughput was. So savings could be increased about another 33 percent by policy measures and investments to decrease AT time (total annual savings for the three courses was about $5.5 million; if we cut AT time by half, the total additional savings would be about $1.8 million annually).

Implications for future investments

We were asked to discuss our results in terms of how to choose courses to computerize first. As our calculations show, the longest courses with the largest throughputs provided the largest savings:

- ETs were 171 days on average, decreased to 126 days, and had throughput of 488 per year.
- FCs were 93 days on average, decreased to 84 days, and had throughput of 533 per year.
- YNs were 62 days on average, decreased to 43 days, and had throughput of 564 per year.

The Navy's C-School courses would similarly be looked at for high student throughput and long course lengths to prioritize which ones provide the largest potential savings. Other potential factors in choosing courses to convert to computerized self-paced courses would be to select courses that pose low risk of harm to personnel, equipment, or mission accomplishment.

Graduation rates

Our findings that graduation rates were the same after conversion for FCs and YNs are encouraging. The finding that ETs' graduation rates decreased suggests that investments might need to be made to assist with management of student course commitment during the longest (and most difficult) course that we studied in this research. Two investments that might be helpful would be course management software and community-of-learning websites.

Career progression

We found that later Navy careers are not adversely affected by converting to self-paced A-School. This is encouraging; gains in speed of training translated to slightly faster career progression later on. However, this is not the main reason for computerizing courses. Many factors affect career progression, and school learning is only a minor factor.

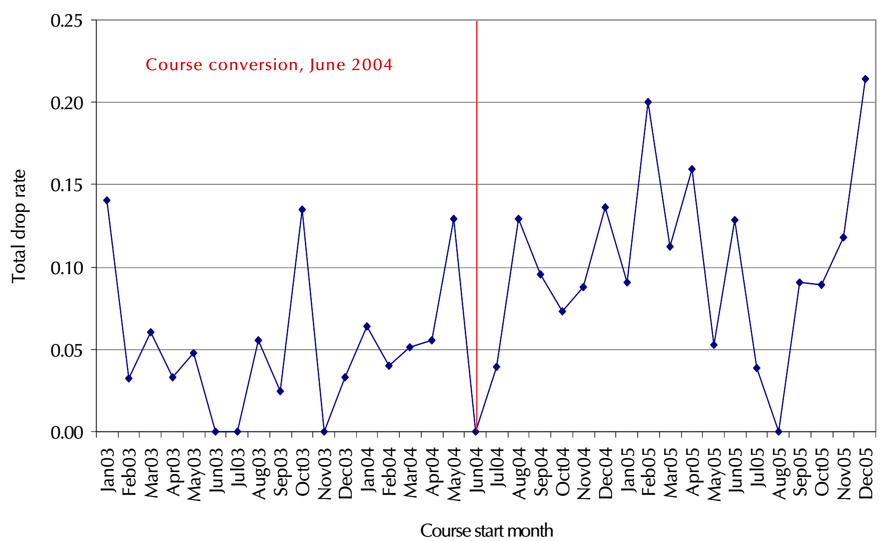
AT time

Awaiting-transfer time presents a potential target of opportunity for further decreases in time to train. Given the success of the proof-of-concept experiment at Meridian (comparing those with and without orders upon graduation), it seems to be time to conduct a formal experiment of having boot camp orders and screenings for YNs and other administrative ratings. Since a very small number of administrative ratings fail to graduate A-School, the risk of this experiment is low.

Appendix A: Monthly drop rates before and after ET course conversion

Figure 6 shows that the total A-school drop rate for ETs increased slightly after course conversion--and that the highest drop rates occurred after course conversion.

Figure 6. ET total drop rates from January 2003 through December 2005



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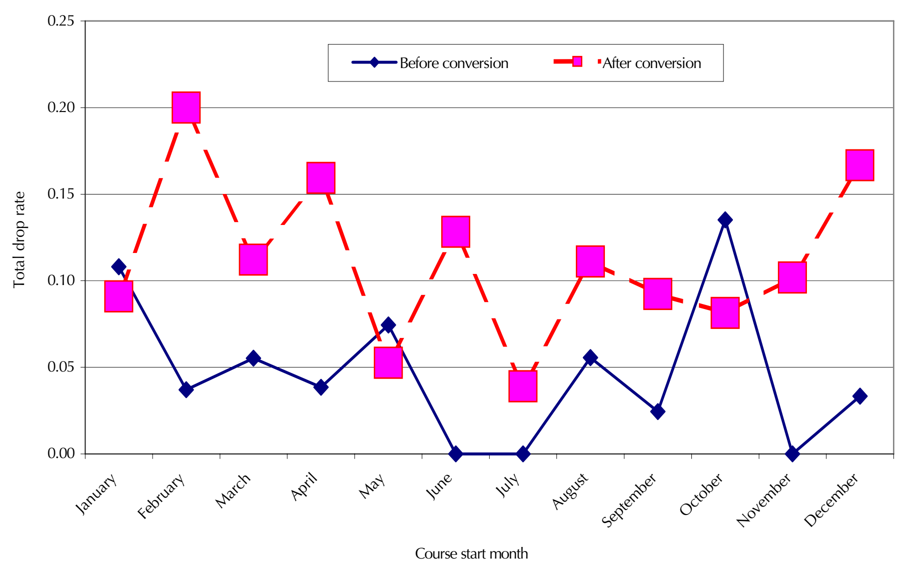
Appendix B: Comparison of same-month drop rates for ETs before and after course conversion

Figure 7 shows that the total A-school drop rate for ETs increased after course conversion for all 12 months except January, May, and October.

Figure 7. Same month total drop rates for ETs from January 2003 through December 2005



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Appendix C: Course graduations and drops for ETs in follow-on courses—before and after conversion

Table 17 shows that the ET graduation rates from C-School courses are very similar before and after A-School course conversion.

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G)

	Traditional classroom					Self-paced classroom				
Course Name	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
COMSEC MAINTENANCE TECHNICIAN	90	88	0	1	1	118	116	0	2	0
UHF SYSTEMS TECHNICIAN	103	99	1	3	0	96	94	0	2	0
HIGH FREQUENCY SYSTEMS MAINTENANCE TECHNICIAN	95	95	0	0	0	98	97	1	0	0
INFORMATION SYSTEMS MAINTENANCE TECHNICIAN	52	49	1	2	0	105	103	0	2	0
SINGLE AUDIO SYSTEM MAINTENANCE	57	56	1	0	0	64	64	0	0	0
MINIATURE ELECTRONICS REPAIR	41	41	0	0	0	74	70	3	1	0
AIR TRAFFIC CONTROL MAINTENANCE PREPARATORY	54	54	0	0	0	52	52	0	0	0
AN/SYQ-7(V)2 NAVAL MODULAR AUTOMATED COMMUNICATIONS SYSTEM (NAVMACS) MAINTENANCE	59	59	0	0	0	37	37	0	0	0
AN/SRQ-4 LAMPS MK-3 DATA LINK TRANSCEIVER MAINTENANCE	41	41	0	0	0	52	52	0	0	0
AN/USM-674 OPERATOR/MAINTAINER	30	30	0	0	0	54	54	0	0	0
AIMS MK-12 IFF SYSTEM MAINTENANCE	51	48	3	0	0	30	28	2	0	0
MICROMINIATURE ELECTRONICS REPAIR	23	22	1	0	0	58	57	1	0	0
AN/URN-25 TACAN MAINTENANCE	37	37	0	0	0	37	37	0	0	0
NAVAL MODULAR AUTOMATED COMMUNICATIONS SYSTEM 2	29	28	0	1	0	44	44	0	0	0
AN/WSN-7(V)1 SURFACE OPERATOR MAINTENANCE	39	38	0	0	1	32	32	0	0	0
STRATEGIC SHF SATCOM SYSTEMS MAINT (USN)	36	35	0	1	0	25	25	0	0	0
AN/SPS-55 RADAR SET MAINTENANCE	27	27	0	0	0	27	27	0	0	0
AN/WSC-6 (V) 7 COMBATANT SHF SATELLITE COMMUNICATIONS MAINTENANCE	29	28	0	1	0	23	23	0	0	0
AN/SPN-41 MAINTENANCE	23	23	0	0	0	18	18	0	0	0
AN/SPN-43C RADAR MAINTENANCE	23	23	0	0	0	18	18	0	0	0
AN/SPS-49 (V) 5, 7, 8 + AN/SPS-49 A (V) 1 RADAR SET MAINTENANCE TECHNICIAN	18	18	0	0	0	17	17	0	0	0
AN/SPA-25G SERIES RADAR REPEATER,SB-4229/SP RADDS SWITCHBOARD, AND RADDS CONVERTER CV-3989/SP.	23	23	0	0	0	9	9	0	0	0

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G) (continued)

Course Name	Traditional classroom					Self-paced classroom				
	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
EHF SATCOM AN/USC-38(V) NAVY SATELLITE TERMINAL MAINTENANCE	9	9	0	0	0	23	23	0	0	0
INTERROGATOR SYSTEM AN/UPX-29(V) MAINTENANCE	21	21	0	0	0	11	11	0	0	0
HIERARCHICAL YET DYNAMIC REPROGRAMMABLE ARCHITECTURE (HYDRA) AN/SRC-55(V) MAINTENANCE	2	2	0	0	0	28	28	0	0	0
SHF SATCOM SYSTEMS MAINTENANCE	18	17	0	1	0	8	8	0	0	0
DATA LINK COMMUNICATION SYSTEM MAINTENANCE TECHNICIAN	12	12	0	0	0	13	13	0	0	0
GENERAL PURPOSE ELECTRONIC TEST EQUIPMENT REPAIR AND CALIBRATION	19	18	0	0	1	5	5	0	0	0
AN/SPN-46 PALS MAINTENANCE	8	7	0	1	0	15	15	0	0	0
SHORE COMMUNICATIONS SYSTEMS MAINTE-NANCE TECHNICIAN	18	18	0	0	0	5	5	0	0	0
AN/SPS-49(V)8 RADAR SET MAINTENANCE	11	11	0	0	0	10	10	0	0	0
AN/TPX42A(V)14 SHIPBOARD DAIR MAINTENANCE TECHNICIAN	6	6	0	0	0	14	14	0	0	0
FLIGHT DECK COMMUNICATIONS SYSTEM (FDCS) MAINTENANCE	14	14	0	0	0	5	5	0	0	0
AN/WSC-6 (V) 9 COMBATANT SHF SATELLITE COM-MUNICATIONS MAINTENANCE	7	7	0	0	0	9	9	0	0	0
AN/SPS-67(V)3 RADAR SET MAINTENANCE	7	7	0	0	0	8	7	1	0	0
METEOROLOGICAL EQUIPMENT MAINTENANCE CLASS C1 USN	11	11	0	0	0	4	4	0	0	0
AN/SPS-67(V) RADAR SET MAINTENANCE	4	4	0	0	0	9	9	0	0	0
AN/SPS-40E SOLID STATE RADAR SET MAINTENANCE	8	8	0	0	0	3	3	0	0	0
RADIAC INSTRUMENT CALIBRATION	6	6	0	0	0	5	5	0	0	0
AN/SPN-35B MAINTENANCE	5	5	0	0	0	5	5	0	0	0
CARRIER BASED TACTICAL SUPPORT CENTER (CV-TSC) COMBAT SYSTEMS MAINTENANCE TECHNICIAN	7	6	0	1	0	3	3	0	0	0
AN/URC-131 HIGH FREQUENCY RADIO GROUP MAINTENANCE TECHNICIAN	1	1	0	0	0	8	8	0	0	0

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G) (continued)

	Traditional classroom					Self-paced classroom				
Course Name	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
INTERMEDIATE LEVEL CALIBRATION OF PHYSICAL/ DIMENSIONAL TEST AND MEASURING SYSTEMS (PHASES B/D)	9	9	0	0	0	0	0	0	0	0
AN/SPS-49(V) RADAR SET MAINTENANCE	6	6	0	0	0	2	2	0	0	0
AN/SYQ-13 NAVIGATION AND CONTROL STATION MAINTENANCE	6	5	0	1	0	2	2	0	0	0
LASER SAFETY FUNDAMENTALS	8	8	0	0	0	0	0	0	0	0
AN/SYQ-13 NAVIGATION AND CONTROL STATION OPERATOR	5	5	0	0	0	2	2	0	0	0
COMMAND CENTER MAINTENANCE TECHNICIAN	2	2	0	0	0	5	5	0	0	0
INTEGRATED SUBMARINE AUTOMATED BROAD-CAST PROCESSING SUBSYSTEM (ISABPS) MAINTENANCE	3	3	0	0	0	4	4	0	0	0
AN/URC-109 HF COMMUNICATIONS	4	4	0	0	0	2	2	0	0	0
AN/UYX-1(V) BRANDS MAINTENANCE	5	5	0	0	0	1	1	0	0	0
INTELLIGENCE CENTER MAINTENANCE	1	1	0	0	0	5	5	0	0	0
AN/GPN-27 MAINTENANCE	5	5	0	0	0	0	0	0	0	0
AN/TPX-42A(V)13 SHIPBOARD DAIR	2	2	0	0	0	3	3	0	0	0
F/A-18 AVIONICS SYSTEMS (INITIAL) ORGANIZA-TIONAL MAINTENANCE	5	5	0	0	0	0	0	0	0	0
F/A-18 TARGET/LASER FORWARD LOOKING INFRA-RED SYSTEMS ORGANIZATIONAL MAINTENANCE	5	5	0	0	0	0	0	0	0	0
F/A-18 WIRE BUNDLE AND CONNECTOR REPAIR ORGANIZATIONAL MAINTENANCE	5	5	0	0	0	0	0	0	0	0
AN/FPN-63(V) MAINTENANCE	4	4	0	0	0	0	0	0	0	0
AN/SSN-2(V4) PRECISE INTEGRATED NAVIGATION SYSTEM (PINS) OPERATOR	1	1	0	0	0	3	3	0	0	0
AN/TPX-42A(V)10 RATCF DAIR MAINTENANCE	4	4	0	0	0	0	0	0	0	0
F/A-18 CONVENTIONAL RELEASE SYSTEM TEST	4	4	0	0	0	0	0	0	0	0
KC-130 COMMUNICATION, NAVIGATION, AND IDENTIFICATION ORGANIZATIONAL MAINTENANCE	4	4	0	0	0	0	0	0	0	0
KC-130 ELECTRICAL CONNECTOR REPAIR ORGANI-ZATIONAL MAINTENANCE	4	4	0	0	0	0	0	0	0	0

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G) (continued)

	Traditional classroom					Self-paced classroom				
Course Name	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
TACTICAL SUPPORT CENTER SYSTEM MAINTENANCE	4	4	0	0	0	0	0	0	0	0
AN/ASM-686 INTERMEDIATE AVIONICS TEST SET (IATS) OPERATOR/MAINTAINER	3	3	0	0	0	0	0	0	0	0
AN/FSC-104(V) STANDARD EMERGENCY COMMUNICATIONS SYSTEM	3	3	0	0	0	0	0	0	0	0
AN/FSC-127 ENHANCED TERMINAL VOICE SWITCH (ETVS) HARDWARE MAINTENANCE	3	3	0	0	0	0	0	0	0	0
AN/FSQ-204 STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS) MAINTENANCE COURSE	--	--	0	0	0	3	3	0	0	0
AN/GPN-30 DIGITAL AIRPORT SURVEILLANCE RADAR (DASR) MAINTENANCE COURSE	--	--	0	0	0	3	3	0	0	0
ELECTRONIC SECURITY SYSTEMS MAINTENANCE	1	1	0	0	0	2	2	0	0	0
FLIGHT DATA INPUT/OUTPUT MAINTENANCE	3	3	0	0	0	0	0	0	0	0
P-3C INTEGRATED BASIC CORE ORGANIZATIONAL MAINTENANCE	3	3	0	0	0	0	0	0	0	0
TACTICAL SUPPORT CENTER (TSC) COMMUNICATIONS MAINTENANCE TECHNICIAN	1	1	0	0	0	2	2	0	0	0
AIRBORNE MINE COUNTERMEASURES SYSTEMS AN/AQS-14A ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE	2	2	0	0	0	0	0	0	0	0
AN/AAM-60(V)2 ELECTRO-OPTICAL SYSTEMS TEST SET INTERMEDIATE MAINTENANCE	2	2	0	0	0	0	0	0	0	0
AN/AAS-36 INFRARED DETECTION SYSTEM INTERMEDIATE MAINTENANCE	2	2	0	0	0	0	0	0	0	0
AN/SSN-2(V4) PRECISE INTEGRATED NAVIGATION SYSTEM (PINS) MAINTENANCE	0	0	0	0	0	2	2	0	0	0
AN/TPX-42A(V)5 DAIR MAINTENANCE	1	1	0	0	0	1	1	0	0	0
AN/USM-636(V) CONSOLIDATED AUTOMATED SUPPORT SYSTEM (CASS) COMMON CORE INTERMEDIATE MAINTENANCE	2	2	0	0	0	0	0	0	0	0
AN/USM-636(V) HIGH POWER DEVICE TEST SUBSYSTEM/RADAR INTERMEDIATE MAINTENANCE	2	2	0	0	0	0	0	0	0	0

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G) (continued)

	Traditional classroom					Self-paced classroom				
Course Name	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
AQS14A/141 SY I-	2	2	0	0	0	0	0	0	0	0
COMMON USER DIGITAL INFORMATION EXCHANGE SUBSYSTEM II (CUDIXS II) AN/USQ-124(V)2	0	0	0	0	0	2	2	0	0	0
ELECTROMAGNETIC COMPATIBILITY TECHNICIAN (SURFACE)	0	0	0	0	0	2	2	0	0	0
H-60 WIRE SYSTEM REPAIR ORGANIZATIONAL MAINTENANCE	2	2	0	0	0	0	0	0	0	0
MH-53E COMMUNICATION, NAVIGATION AND IDENTIFICATION SYSTEMS ORGANIZATIONAL MAINTENANCE	2	2	0	0	0	0	0	0	0	0
P-3 CONNECTOR AND WIRING REPAIR ORGANIZATIONAL MAINTENANCE	2	2	0	0	0	0	0	0	0	0
P-3C AVIONICS (INITIAL) ORGANIZATIONAL LEVEL MAINTENANCE	2	2	0	0	0	0	0	0	0	0
SH-60F/HH-60H ELECTRONIC SYSTEMS (INITIAL) ORGANIZATIONAL MAINTENANCE	2	2	0	0	0	0	0	0	0	0
51V-4 GLIDESLOPE INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AFLOAT PLANNING MAINTENANCE SYSTEM	0	0	0	0	0	1	0	0	0	1
AN/APS-115B SEARCH RADAR SYSTEM INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/ARC-101 VHF VOR SYSTEM INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/ARC-159(V) TRANSCEIVERS AND ASSOCIATED EQUIPMENT INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/ARC-182 (V) COMMUNICATION EQUIPMENT INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/ASA-66 TACTICAL DATA DISPLAY INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/UQN-4/4A SONAR SOUNDING SET OPERATOR/ MAINTENANCE	1	1	0	0	0	0	0	0	0	0
AN/USM-429(V)1 COMPUTERIZED AUTOMATIC TEST STATION IIID OPERATOR/MAINTAINER INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0

Table 17. Counts of graduations and drops from courses taken since ET A-school and before reaching fleet (course types starting with C, D, or G) (continued)

Course Name	Traditional classroom					Self-paced classroom				
	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
AN/USM-629 ELECTRO-OPTICAL TEST SET (EOTS) OPERATOR/MAINTAINER INTERMEDIATE MAINTE-NANCE	1	1	0	0	0	0	0	0	0	0
APN-182 RDR INT-	1	1	0	0	0	0	0	0	0	0
BEARINGS	0	0	0	0	0	1	1	0	0	0
CLOSE IN WEAPON SYSTEM MK 15 MODS 11-14 TO MODS 21, 22, 25 DIFFERENCE COURSE	0	0	0	0	0	1	1	0	0	0
COMBINED DIGITAL DATA LINK/CARRIER LANDING SYSTEM INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
COMBINED RADAR ALTIMETER INTERMEDIATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
CV-2059/ARN-87 NAVIGATION SYSTEM INTERMEDI-ATE MAINTENANCE	1	1	0	0	0	0	0	0	0	0
DD-963 COM MAINT	1	1	0	0	0	0	0	0	0	0
EXPLOSIVE ORDNANCE DISPOSAL DIVER	0	0	0	0	0	1	1	0	0	0
FLLDP MTT-MTT	0	0	0	0	0	1	1	0	0	0
MK-15 CLOSE-IN WEAPON SYSTEM (CIWS) MODS 11-14 OPERATION AND MAINTENANCE	0	0	0	0	0	1	1	0	0	0
NAVAL SPECIAL WARFARE COMMUNICATIONS	1	1	0	0	0	0	0	0	0	0
P-3 STRUCTURES HYDRAULIC POWER AND FLIGHT CONTROLS (INITIAL) ORGANIZATIONAL MAINTENANCE	1	1	0	0	0	0	0	0	0	0
S-3 CONNECTOR AND WIRE REPAIR ORGANIZATIONAL MAINTENANCE	1	1	0	0	0	0	0	0	0	0
S-3B AVIONICS SYSTEMS (INITIAL) ORGANIZATIONAL MAINTENANCE	1	1	0	0	0	0	0	0	0	0
SH-3H C/N INT OR	1	1	0	0	0	0	0	0	0	0
SINGLE CHANNEL GROUND AND AIRBORNE RADIO SYSTEM AN/SRC-54 (V) COMBINED MAINTENANCE	0	0	0	0	0	1	1	0	0	0

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Appendix D: Course graduations and drops for FCs in follow-on courses—before and after conversion

Table 18 shows that the FC graduation rates from C-School courses are very similar before and after A-School course conversion.

Table 18. Counts of graduations and drops from courses taken since FC A-school and before reaching fleet (course types starting with C, D, or G)

Course Name	Traditional classroom					Self-paced classroom				
	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
MK-15 CLOSE-IN WEAPON SYSTEM (CIWS) MODS 11-14 OPERATION AND MAINTENANCE	89	85	0	0	4	90	84	2	3	1
ADVANCED TOMAHAWK WEAPONS CONTROL SYSTEM , LAUNCHER CONTROL GROUP-REPLACEMENT, OPERATION AND MAINTENANCE	64	64	0	0	0	49	48	0	1	0
AEGIS FCS/ORTS OPERATION AND MAINTENANCE TRK 2	46	42	0	2	2	66	60	1	5	0
AEGIS RADAR SYSTEM AN/SPY-1B/D OPERATION AND MAINTENANCE TRK 2	43	39	0	3	1	26	25	0	1	0
AEGIS COMPUTER OPERATION AND MAINTENANCE	31	27	1	3	0	30	27	0	3	0
AEGIS DISPLAY SYSTEM OPERATION AND MAINTENANCE TRK 3	36	29	5	2	0	25	23	0	2	0
AEGIS COMPUTER NETWORK TECHNICIAN TRK 2	31	26	4	1	0	29	25	1	3	0
MK-86 GUN FIRE CONTROL SYSTEM MOD-9 MAINTENANCE	21	20	1	0	0	28	24	2	1	1
NATO SEASPARROW 7M MAINTENANCE	11	9	2	0	0	38	36	1	1	0
RADAR SYSTEM AN/SPY-1D(V) RADAR OPERATION AND MAINTENANCE TRK 3	17	17	0	0	0	30	28	0	2	0
AEGIS COMPUTER NETWORK TECHNICIAN	38	34	2	2	0	8	8	0	0	0
AN/UYQ-21 DISPLAY COMMON CORE OPERATION AND MAINTENANCE	1	1	0	0	0	45	43	0	1	1
AN/SPS-48E OPERATION AND MAINTENANCE	21	19	0	0	2	19	18	0	0	1
COOPERATIVE ENGAGEMENT TRANSMISSION PROCESSING SET (CETPS) AN/USG-2 MAINTENANCE	24	24	0	0	0	13	13	0	0	0
AEGIS SPECIALIZED OPERATIONAL BRIEF	18	18	0	0	0	16	16	0	0	0
CLOSE IN WEAPON SYSTEM MK 15 MODS 11-14 TO MODS 21, 22, 25 DIFFERENCE COURSE	15	15	0	0	0	10	10	0	0	0
FFG-7/36/61 CLASS SHIPS DATA DISPLAY GROUP SUBSYSTEM MAINTENANCE	6	6	0	0	0	19	18	0	1	0
GUN COMPUTER SYSTEM (GCS) MK 160 MOD 4/6 AND OPTICAL SIGHT SYSTEM (OSS) MK 46 MOD 0 OPERATION AND MAIN	2	2	0	0	0	23	23	0	0	0
CV/CVN COMBAT DIRECTION SYSTEM (CDS) COMPUTER/PERIPHERAL SUBSYSTEM MAINTENANCE	9	7	0	1	1	11	11	0	0	0

Table 18. Counts of graduations and drops from courses taken since FC A-school and before reaching fleet (course types starting with C, D, or G) (continued)

Course Name	Traditional classroom Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Self-paced classroom Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
FCS MK-92 MAINTENANCE	3	3	0	0	0	17	16	1	0	0
FFG-7/36/61 CLASS SHIPS COMPUTER/PERIPHERAL SUBSYSTEM MAINTENANCE	3	3	0	0	0	17	17	0	0	0
TACTICAL TOMAHAWK WEAPONS CONTROL SYSTEM (TTWCS) OPERATIONS AND MAINTENANCE	0	0	0	0	0	19	19	0	0	0
CV / CVN / LHD COMBAT DIRECTION SYSTEM AN / UYQ-21 DISPLAY MAINTENANCE TECHNICIAN	2	2	0	0	0	16	16	0	0	0
MK-23 TARGET ACQUISITION SYSTEM	11	11	0	0	0	6	6	0	0	0
LHD COMPUTER AND PERIPHERAL EQUIPMENT MAINTENANCE	11	11	0	0	0	2	2	0	0	0
GUN COMPUTER SYSTEM(GCS) MK 160 MOD8/ OPTICAL SIGHT SYSTEM (OSS) MK46 MOD1 DIFFERENCES	1	1	0	0	0	11	11	0	0	0
AEGIS DISPLAY SYSTEM OPERATION AND MAINTENANCE TRK 1	6	4	1	1	0	5	0	4	1	0
AEGIS RADAR SYSTEM AN/SPY-1A OPERATION AND MAINTENANCE TRK 1	8	8	0	0	0	3	2	0	1	0
AN/SYQ-27 NFCS(NAVY FIRES CONTROL SYSTEM) PHASE I OPERATOR AND MAINTENANCE TRAINING	2	2	0	0	0	8	8	0	0	0
SHIP SELF DEFENSE SYSTEM (SSDS) MK 1 MOD 0 MAINTENANCE TECHNICIAN	3	3	0	0	0	6	6	0	0	0
AN/SYQ-24(V) LHA ADVANCED COMBAT DIRECTION SYSTEM MAINTENANCE	1	1	0	0	0	7	7	0	0	0
MK-31 MOD 0/1 ROLLING AIRFRAME MISSILE WEAP-ONS SYSTEM OPERATION AND MAINTENANCE COURSE-AEC	5	5	0	0	0	3	3	0	0	0
NATO SEASPARROW SURFACE MISSILE SYSTEM MK 57 MODS 4-9 OPERATION + MAINTENANCE DIFFERENCES	4	4	0	0	0	4	4	0	0	0
SHIP SELF DEFENSE SYSTEM (SSDS) MK 1 OPERATOR	2	2	0	0	0	6	6	0	0	0
AEGIS SPECIALIZED MAINTENANCE BRIEF	7	7	0	0	0	0	0	0	0	0
AEGIS FCS/ORTS OPERATION AND MAINTENANCE TRK 1	6	6	0	0	0	0	0	0	0	0

Table 18. Counts of graduations and drops from courses taken since FC A-school and before reaching fleet (course types starting with C, D, or G) (continued)

	Traditional classroom					Self-paced classroom				
Course Name	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees	Subtotal	Grads	Academic non-grads	Non-academic non-grads	Dis-enrollees
MINIATURE ELECTRONICS REPAIR	3	3	0	0	0	3	3	0	0	0
AEGIS COMPUTER OPERATION AND MAINTENANCE UYK-7 DIFFERENCE	3	3	0	0	0	2	2	0	0	0
GUN FIRE CONTROL SYSTEM MK-86 SYSTEM MAIN-TENANCE FOR FOREIGN NATIONALS	4	3	1	0	0	0	0	0	0	0
HARPOON WEAPON SYSTEM AN/SWG-1A(V) MAINTENANCE	3	3	0	0	0	1	1	0	0	0
SHIP SELF DEFENSE SYSTEM MARK 2 MAINTENANCE	0	0	0	0	0	4	3	0	0	1
MK-92 MOD-6 FCS DIFFERENCE	0	0	0	0	0	3	3	0	0	0
AN/SPQ-9B RADAR MAINTENANCE	2	2	0	0	0	0	0	0	0	0
GUN COMPUTER SYSTEM (GCS) MK 160 MOD 9 DIFFERENCE	0	0	0	0	0	2	2	0	0	0
HARPOON WEAPON SYSTEM (HWS) AN/SWG-1A(V) ENGAGEMENT PLANNER (SURFACE APPLICATION)	2	2	0	0	0	0	0	0	0	0
AN/USM-674 OPERATOR/MAINTAINER	0	0	0	0	0	1	1	0	0	0
EA-6B ARMAMENT SYSTEMS ORGANIZATIONAL MAINTENANCE	0	0	0	0	0	1	1	0	0	0
EA-6B ELECTRICAL CONNECTOR /WIRE BUNDLE REPAIR COURSE	0	0	0	0	0	1	1	0	0	0
FLLDP-TCT	0	0	0	0	0	1	1	0	0	0
GLOBAL COMMAND AND CONTROL SYSTEMS - COMMON OPERATING PICTURE/MARITIME OPERATOR	0	0	0	0	0	1	1	0	0	0
MICROMINIATURE ELECTRONICS REPAIR	0	0	0	0	0	1	1	0	0	0
VLS TOMAHAWK WCS	1	1	0	0	0	0	0	0	0	0

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