



Relationship of the EMS-020 Reading Prerequisite to EMS-020 Course Success

Spring 2011 to Spring 2013

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Introduction

The Crafton Hills College (CHC) Office Emergency Medical Services (EMS) Faculty worked with the CHC Office of Institutional Effectiveness in 2010 to research the possibility of implementing a prerequisite for entrance into the Emergency Medical Technician-I/EMT-Basic Certificate program; specifically the first course, Emergency Medical Technician-I/EMT-Basic EMS-020. Successfully completing READ-956 (Intermediate Reading) or placement into READ-078 (Advanced Reading) or higher and successfully completing READ-078 (Advanced Reading) or placement into "NO READ" (i.e. Student Placed into College Level Reading) were both individually related to successfully completing EMS-020.

Prior to 2011 California Title 5 Education Code required that prerequisites be established with statistical validation. Accordingly, a prerequisite validation study was conducted in 2010 to examine whether establishing a prerequisite might be related to EMS-020 course success. Title 5 Education Code requires that prerequisites are reviewed every six years and that career technical education courses and programs are reviewed every two years [§ 55003(b)(4)]. The prerequisite for EMS-020 was first implemented in Spring 2011. In addition to examining the impact of the prerequisite, the college is also required to examine disproportionate impact [§ 55003 (g)(2)]. Title 5 [§ 55502 (e)] defines disproportionate impact as occurring "...when the percentage of persons from a particular racial, ethnic, gender, age or disability group who are directed to a particular service or placement based on an assessment instrument, method, or procedure is significantly different from the representation of that group in the population of persons being assessed, and that discrepancy is not justified by empirical evidence demonstrating that the assessment instrument, method or procedure is a valid and reliable predictor of performance in the relevant educational setting."

The purpose of this brief is to examine the relationship between EMS-020 course success and the reading prerequisite as well as to identify disproportionate impact if it occurred.

Summary of Results

1. Did the EMS-020 course success rate increase after the READ-078 prerequisite was implemented?
 - a. Yes, students who met the reading prerequisite were statistically significantly ($p < .001$) and substantially ($ES = .21$) more likely to successfully complete EMS-020 (62%) than students who had not completed the prerequisite (51%).
2. What is the racial/age/gender/disability makeup of the course post implementation compared to pre implementation?
 - a. Gender, ethnicity, age, and disability status were not substantially different prior to or after the implementation of the READ-078 prerequisite.
3. Does the increased success of students in each protected category support the implementation if indeed the percentages of students in each group have changed?
 - a. Yes, male students, Hispanic Students, and students 24 years old or younger were substantially ($ES \geq .20$) and statistically significantly ($p < .01$) more likely to

successfully complete EMS-020 if they had met the reading prerequisite than students who had not met the prerequisite.

- b. In addition, female, African American, and Native American students were slightly more likely to successfully complete EMS-020 post-implementation.
4. Was there disproportionate impact?
 - a. No, there was not any disproportionate impact.
5. What effect did the implementation have on overall course enrollment?
 - a. The overall course enrollment in EMS-020 did not decrease as a result of the implementation of the prerequisite
 - b. The decline in enrollments and section offerings was due to the statewide budget cuts and comparable to the cuts that occurred college wide.

Possible Implications

At the time of the initial implementation of the reading prerequisite for EMS-020, READ-078 was the course that students were required to meet prior to taking EMS-020. However, since that time the faculty in the Reading Department changed READ-078 to READ-980. Both reading courses have similar curriculum and both were one level below transfer level reading. Based on this information and the data that strongly indicates that READ-078 was related to increasing the likelihood of successfully completing EMS-020 by 10%, the Office of Institutional Effectiveness, Research, and Planning strongly recommends that the READ-980 be instituted as the prerequisite to EMS-020 and that the effectiveness of the prerequisite be re-examined after two years.

Methodology

The following questions were examined to determine the impact of implementing READ-078 as a prerequisite for EMS-020:

1. Did the EMS-020 course success rate increase after the READ-078 prerequisite was implemented?
2. What is the racial/age/gender/disability makeup of the course post implementation compared to pre implementation?
3. Does the increased success of students in each protected category support the implementation if indeed the percentages of students in each group have changed?
4. Was there disproportionate impact?
5. What effect did the implementation have on overall course enrollment?

The effect size statistic was used to indicate the size of the difference on enrollments, success, and retention between Left Lane and non-Left Lane students. One method of interpreting effect size was developed by Jacob Cohen. Jacob Cohen defined "small," "medium," and "large" effect sizes. He explained that an effect size of .20 can be considered small, an effect size of .50 can be considered medium, and an effect size of .80 can be considered large. An effect size is considered to be meaningful if it is .20 or higher. It is important to mention that the number of students in each group does not influence Effect Size; whereas, when statistical significance is calculated, the number of students in each group does influence the significance level (i.e. "p" value being lower than .05).

Findings

Question 1: Did the EMS-020 course success rate increase after the READ-078 prerequisite was implemented?

One of the main concerns after implementing a prerequisite for a target course is whether the students who were required to meet the prerequisite had an increased likelihood of successfully completing the target course (i.e. EMS-020). The EMS-020 prerequisite has been in place from Spring 2011 to Spring 2013. The performance of these students was compared to students who earned a GOR in EMS-020 for the same number of primary (i.e. fall and spring only) terms from Fall 2008 to Fall 2010. Referring to Table 1, students who were required to complete the reading prerequisite were statistically significantly ($p < .001$) and substantially ($ES = .21$) more likely to successfully complete EMS-020 (62%) than students who were not required to complete the prerequisite (51%).

Table 1: EMS-020 Success Rates Prior to and After the Implementation of READ-078 as the Prerequisite to EMS-020.

Course	Success Rate						ES	P Value
	Pre-Implementation			Post-Implementation				
	#	N	%	#	N	%		
EMS-020	440	857	51.3	349	565	61.8	.21	< .001

Question 2: What is the racial/age/gender/disability makeup of the course post implementation compared to pre implementation?

Proportionally, the gender, ethnicity, age, and disability were not substantially or statistically significantly different from the pre-implementation to the post-implementation of the prerequisite (see Table 2). Students were only slightly more likely to be 20 – 24 years old post implementation (44%) than pre-implementation (40%) of the prerequisite. Only 31 students who were identified as disabled pre-implementation and 10 post-implementation and therefore were not examined.

Table 1: Gender, Ethnicity, Age, and Disability Status Prior to and After the Implementation of READ-078 as the Prerequisite to EMS-020.

Demographic Characteristics	Pre-Implementation		Post-Implementation		Total	
	#	N	%	#	N	%
Gender						
Female	142	16.6	103	18.2	245	17.2
Male	710	82.8	462	81.8	1,172	82.4
Unknown	5	0.6	0	0.0	5	0.4
Total	857	100.0	565	100.0	1,422	100.0
Ethnicity						
Asian	22	2.6	24	4.2	46	3.2
African American	57	6.7	26	4.6	83	5.8
Hispanic	304	35.5	211	37.3	515	36.2
Native American	24	2.8	14	2.5	38	2.7
Caucasian	429	50.1	286	50.6	715	50.3
Unknown	21	2.5	4	0.7	25	1.8
Total	857	100.0	565	100.0	1,422	100.0
Age						
19 or younger	306	35.7	180	31.9	486	34.2
20-24	342	39.9	247	43.7	589	41.4
25-29	135	15.8	81	14.3	216	15.2
30-34	48	5.6	35	6.2	83	5.8
35-39	13	1.5	10	1.8	23	1.6
40-49	11	1.3	10	1.8	21	1.5
50 or older	2	0.2	2	0.4	4	0.3
Total	857	100.0	565	100.0	1,422	100.0
Disability Status						
Not a DSPS Student	826	96.4	555	98.2	1,381	97.1
DSPS Student	31	3.6	10	1.8	41	2.9
Total	857	100.0	565	100.0	1,422	100.0

Question 3: Does the increased success of students in each protected category support the implementation, if indeed the percentages of students in each group have changed?

Yes, the increased success of students in each protected category supports the implementation of the prerequisite. Male students, Hispanic Students, and students 24 years old or younger were substantially ($ES \geq .20$) and statistically significantly ($p < .01$) more likely to successfully complete EMS-020 post-implementation than pre-implementation (see Table 3). In addition, female, African American, and Native American students were slightly more likely to successfully complete EMS-020 post-implementation.

Table 3: EMS-020 Success Rates Prior to and After the Implementation of READ-078 as the Prerequisite to EMS-020 by Gender, Ethnicity, Age, and Disability Status.

Demographic Characteristic	Success Rate						ES	P Value
	Pre-Implementation			Post-Implementation				
	#	N	%	#	N	%		
Gender								
Female	86	142	60.6	63	103	61.2	.01	.925
Male	352	710	49.6	286	462	61.9	.25	< .001
Unknown	2	5	40.0					
Total	440	857	51.3	349	565	61.8	.21	< .001
Ethnicity								
Asian	11	22	50.0	11	24	45.8	-.08	.783
African American	30	57	52.6	14	26	53.8	.02	.919
Hispanic	116	304	38.2	121	211	57.3	.39	< .001
Native American	14	24	58.3	9	14	64.3	.12	.726
Caucasian	258	429	60.1	191	286	66.8	.14	.070
Unknown	11	21	52.4	3	4	75.0	.44	.425
Total	440	857	51.3	349	565	61.8	.21	< .001
Age								
19 or younger	143	306	46.7	107	180	59.4	.26	.007
20-24	166	342	48.5	154	247	62.3	.28	.001
25-29	83	135	61.5	52	81	64.2	.06	.691
30-34	27	48	56.3	22	35	62.9	.13	.551
35-39	9	13	69.2	6	10	60.0	-.19	.663
40-49	10	11	90.9	6	10	60.0	-.74	.120
50 or older	2	2	100.0	2	2	100.0	.00	1.00
Total	440	857	51.3	349	565	61.8	.21	< .001
Disability Status								
Not a DSPS Student	428	826	51.8	343	555	61.8	.20	< .001
DSPS Student	12	31	38.7	6	10	60.0	.43	.249
Total	440	857	51.3	349	565	61.8	.21	< .001

Question 4: Was there disproportionate impact?

In addition to providing evidence that the proposed prerequisite is “such that a student who has not met the prerequisite is highly unlikely to receive a satisfactory grade in the course” [Title 5, §5503(d)(2)], Title 5 regulations also state that the district should conduct, “...an evaluation to determine whether the prerequisite or corequisite has a disproportionate impact on particular groups of students described in terms of race, ethnicity, gender, age or disability, as defined by the Chancellor. When there is a disproportionate impact on any such group of students, the district shall, in consultation with the Chancellor, develop and implement a plan setting forth the steps the district will take to correct the disproportionate impact.” [Title 5, §55003(g)(2)]. To clarify, the Chancellor’s Office has operationally defined disproportionate impact, stating that it occurs when, “...the percentage of persons from a particular racial, ethnic, gender, age or disability group who are directed to a particular service or placement based on an assessment instrument, method or procedure is significantly different than the representation of that group in the population of persons being assessed and that discrepancy is not justified by empirical evidence demonstrating that the assessment instrument, method or procedure is a valid and reliable predictor of performance in the relevant educational setting [Title 5, §55502(d)].” Phillips, Spurling, and Armstrong go on to state, “while the issue of access is important, the real question is access for what purpose. Access needs to lead to goal attainment. Without goal attainment, access becomes a meaningless exercise.”

A useful statistical model in analyzing disproportionate impact is classification and regression tree (CART) modeling, a statistical application that is useful in situations in which the overall goal is to divide a population into segments that differ with respect to a designated criterion. In short, CART modeling affords researchers the opportunity to examine the interaction and impact of a number of distinct categorical predictor variables (e.g., gender, ethnicity, and age) on a categorical dependent variable (e.g., met prerequisite/did not meet prerequisite). CART modeling initially identifies the best predictor variable, conducting a splitting algorithm that further identifies additional statistically significant predictor variables and splits these variables into smaller subgroups. CART modeling merges categories of a predictor variable that are not significantly different. This merging, combined with the splitting algorithm, ensures that cases in the same segment are homogeneous with respect to the segmentation criterion, while cases in different segments tend to be heterogeneous with respect to the segmentation criterion. As it applies to disproportionate impact, CART modeling has a number of distinct advantages over traditional statistical applications used to examine categorical data (e.g., chi-square, cluster analysis, etc.). Utilizing CART modeling, researchers can easily determine whether specific aspects of numerous categorical predictor variables merge to provide a more accurate identification of populations

experiencing disproportionate impact (e.g., male Latino students under twenty-one years of age, female Asian students 30 to 34 years of age, etc.).

As it pertains to this study, CART modeling was conducted to determine whether specific student populations disproportionately meet/do not meet the EMS-020 prerequisite. The following predictor variables were entered into each CART model:

Gender:

- Group 1) Male
- Group 2) Female
- Group 3) Unknown/No Response

Ethnicity:

- Group 1) African American
- Group 2) Asian
- Group 3) Caucasian
- Group 4) Hispanic
- Group 5) Native American
- Group 6) Pacific Islander
- Group 7) Other
- Group 8) Unknown/No Response

Age:

- Group 1) 19 or Younger
- Group 2) 20 to 24 Years of Age
- Group 3) 25 to 29 Years of Age
- Group 4) 30 to 34 Years of Age
- Group 5) 35 to 39 Years of Age
- Group 6) 40 to 49 Years of Age
- Group 7) 50 Years of Age or Older
- Group 8) Unknown/No Response

Disability:

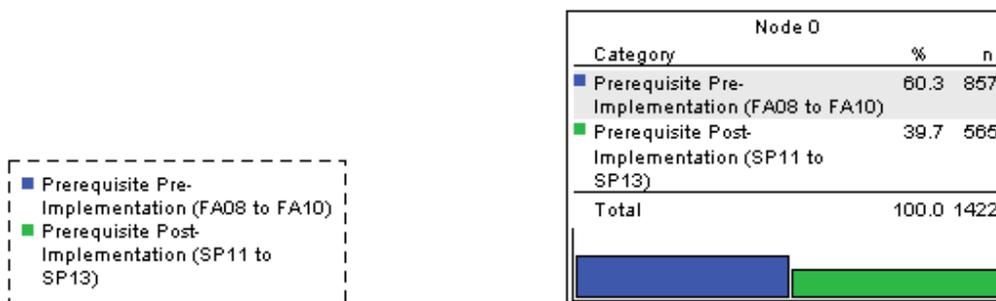
- Group 1) Students With Disabilities
- Group 2) Students Who Do Not Have Disabilities

To examine whether disproportionate impact existed, one CART models was generated for READ-925 as the prerequisite to EMS-020.

Figure 1 uses segmentation modeling to identify disproportionate impact when READ-925 is the prerequisite for EMS-020. **The segmentation model indicates that disproportionate impact does not exist by gender, ethnicity, age, and/or disability status.**

Figure 1: CART Segmentation Model Showing Disproportionate Impact When Prerequisite for EMS-020 is READ-925 (Age, Gender, Ethnicity, and Disability Status examined).

EMS-020 Comparison of Read Prereq pre and post implementation



Note: Disproportionate Impact was not identified. Risk Estimate = .397, SE of Risk Estimate = .013, Improvement set to .01, Child Node set to 5% of Total N, Parent Node is twice the Child Node.

Question 5: What effect did the implementation have on overall course enrollment?

The results indicate that overall course enrollment in EMS-020 did not decrease from the implementation of the prerequisite, but because of the Statewide budget cuts that were occurring at the same time. Referring to Table X, the number of EMS-020 sections being offered was reduced from 6 in Fall 2008 to 3 in Fall 2010, all of which occurred prior to the implementation of the reading prerequisite. Three sections of EMS-020 were offered in the five terms after the prerequisite was implemented. One hundred and twenty-one students earned a GOR in EMS-020 in Fall 2010, the last term prior to the implementation of the prerequisite. After the implementation of the prerequisite the number of students who earned a GOR ranged from 105 to 121. Even at the lowest point, the decline in GOR earned was only 16 (13%), and might be accounted for in the decrease of overall enrollments for the college, which was also 15% from Fall 2010 to Spring 2013, higher than the decrease in GOR earned in EMS-020.

Table 4: EMS-020 GOR Earned from Fall 2008 to Spring 2011 by Semester, Section, and Prerequisite Status Implementation.

Section	Pre-Implementation					Post-Implementation				
	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2010	Fall 2012	Spring 2013
1	40	40	40	40	42	39	39	43	39	42
2	40	39	42	30	43	38	37	39	37	42
3	39	45	37	41	36	43	40	35	29	23
4	40	36	41	41	0	0	0	0	0	0
5	37	35	0	0	0	0	0	0	0	0
6	33	0	0	0	0	0	0	0	0	0
Total	229	195	160	152	121	120	116	117	105	107

Any questions regarding this report can be directed to the Office of Institutional Effectiveness, Research, and Planning at (909) 389-3206 or you may send an email to kwurtz@craftonhills.edu: 2013_July_EMS20_PrereqEal_Post.docx, Grades_CHC_GOR_20130625_FiveYears_0809to1213.sav, SD_DSPS_SU06toSP13.sav.