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A Study on American Tuition Education Reform to Promote Educational Equity

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Abstract

In the past few years, follow-up research has been conducted on the reform of remedial education in Florida. The phased results were announced in early 2019 and attracted attention. Based on the results of this phase, this paper will raise research questions, and then briefly introduce various factors that may affect the success of college students in the remedial education model and Florida reforms, describe the research data in detail, and define research samples to answer the research questions. Explain the concept of Interrupted Time Series and the model used to analyze the comparison of the results of college students before and after the remedial education reform. Finally, this article provides an overall descriptive analysis of learning outcomes before and after the remedial education reform and analysis of ethnic differences. At the same time, a regression adjustment model that can make a stronger potential causal analysis is used to summarize student learning outcomes.

Keywords: *Remedial education, SB1720 policy, Education equity, Analysis of racial differences, Regression adjustment model*

1. Introduction

With the popularization of higher education today, post-secondary education in the United States is facing an increasingly severe challenge. A large number of students are not academically prepared when entering the higher education system, which is far from the requirements of universities. This situation is very prominent in all states, especially some community colleges [1]. This article calls it the phenomenon of "students with learning difficulties". The phenomenon of "students with learning difficulties" has a long history. The traditional response is that after middle school, the education system provides these students with remedial education, which is to provide them with some courses to make up for the knowledge they should have after high school. "Students with academic difficulties" need to study and pass these remedial courses before they can formally register for university introductory courses. This kind of remedial education method has attracted much attention in recent years. One reason is that this method is not effective. Many students have dropped out before completing the remedial education courses; even the students who have completed the remedial education courses rarely can complete their studies on schedule to obtain a degree [2]. Another reason is that governments at all levels are financially tight, and the scarce higher education resources invested in remedial courses that students should master in high schools have been criticized. In such a general environment, many state governments have

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begun to actively seek reforms in remedial education. Florida (hereinafter referred to as Florida) has taken drastic measures in this new round of reforms and has attracted much attention from all walks of life [3].

Before the remedial education reform, about 70% of freshmen in the Florida College System (FCS) had at least one subject below the university admission standard, and about half of these students had not completed all their remedial education course requirements [4]. Among the students with academic difficulties who have partially completed the remedial education requirements, only 15% of the students have obtained a college diploma within three years. In other words, the traditional methods of remedial education have little effect.

In 2014, Florida's SB1720 policy triggered a statewide remedial education reform in the community college system. Most schools in the community college system can no longer require students to receive remedial education. Students can decide whether to register for remedial education courses or university-level courses. Community colleges need to use different education methods to provide remedial education courses and need to improve the school's curriculum consultation and curriculum assistance services. Under the SB1720 policy, most students are free to choose university-level courses, but opponents of the reform worry that many students who do not have university admission qualifications choose university-level courses. For this reason, both students with university admission qualifications and those without admission qualifications will be able to choose university level courses. For example, students who do not have university entrance qualifications may not be able to pass this university-level course, and qualified students may affect their learning progress because teachers need to take care of students with weaker learning levels [5].

The Florida community college system includes 28 community colleges scattered across the state, with a total of more than 800,000 students. Many students in the state, especially minority students and students from low-income families, have entered the higher education system. The remedial education reform in Florida has attracted much attention because of its large pace and wide coverage. Generally speaking, the university's remedial education courses involve Reading, Writing, and Math. The university's introductory courses are mainly English and mathematics. This article mainly explores the impact of the Florida tutoring education reform on the registration rate and pass rate of students' college introductory courses, and the credits earned in the first year of college courses. The two research questions of this paper are as follows:

1. Since the reform of remedial education, in the university introductory courses, what changes have been made to the registration rate, Course-based passing rates, and Cohort-based passing rates? How this change is reflected in students of different race/ethnic backgrounds?

2. Since the reform of remedial education, what changes have been made in the credits earned by students in the introductory courses of the first academic year? How is this change reflected in students of different racial/ethnic backgrounds?

2. American remedial education and Florida's reform plan

Remedial education has a long history in the United States, which can be traced back to higher education in the colonial period, but large-scale remedial education has developed along with higher education from elite education to mass education to popularization [6]. Accompanied by the controversy between university entrance opportunities and the concept

of higher education excellence, supporters believe that remedial education has a suitable role in higher education, and its existence helps some students, especially disadvantaged groups in the traditional sense, have access to higher education. Opportunities; opponents believe that remedial education lowers the standards of higher education and does not conform to the pursuit of excellence in higher education [6].

Although there are controversies in remedial education, it is an undeniable fact that remedial education has long existed in American higher education, and it is one of the important functions of some four-year universities and almost all two-year colleges. About two-thirds of community college freshmen and more than one-third of open-entry four-year college students need to receive remedial education in mathematics or English reading and writing [7][8].

Traditional remedial education requires freshmen who have not yet reached the academic standard to take a graded examination of English reading, English writing, and mathematics. The school decides whether students need to receive remedial education and what kind of remedial education according to the test scores. Students receiving remedial education must first complete remedial mathematics, English reading, or English writing courses that cannot be applied to college credits before applying for courses that can be applied to college credits.

The traditional remedial education model has been criticized in recent years. More and more studies have shown that this model not only failed to help students complete their university studies, but many students failed to complete the remedial education courses, and many students even failed to formally enter university degree courses due to lengthy remedial courses, leading to dropouts. Even some students who have completed remedial education courses are rarely able to complete their studies on time to obtain a degree [2]. At the same time, under the policy environment where higher education funds are increasingly scarce, spending a lot of higher education funds on remedial education is also under greater pressure. Regarding the cost of remedial education, there is a large statistical difference. A study from Columbia University estimates that the average annual expenditure on remedial education in the United States in recent years has reached 7 billion US dollars [9].

Some researchers and university administrators pointed out that there are many reasons why traditional remedial education is expensive and ineffective. One is that standardized graded examinations cannot truthfully reflect students' academic preparation. The second is that students will have different professional choices and employment directions in the future. It is not necessary to adopt a unified curriculum to make some students enter remedial education. At the same time, because there is no clear grading standard for remedial education, some school teachers and counselors tend to allow students to accept remedial education courses. In addition, the lengthy course series and teaching methods of remedial education have gradually become obstacles to student success [8].

Recent studies have shown that remedial education courses harm the success of college students. For example, it takes more time and money to receive remedial education, which may reduce the motivation of students to study and delay their time to complete university courses [9]. The impact of this delay is also reflected in the student's credit acquisition. The research of P. Martorell and I. McFarlin Jr. [10] found that after the end of the first academic year, remedial education led to a decrease of 2.4 credits for student participants in two-year colleges and student participants in four-year colleges. After the end of the third academic year, compared with students who did not require remedial education in the same class, those whose scores were slightly lower than those required by university courses, and those who took mathematics tuition courses received 8.3 fewer credits. This situation mainly occurs in two-year community colleges [1].

Given the various problems of remedial education, some state governments and schools have carried out major reforms for remedial education. On the one hand, the evaluation and grading of remedial education gradually abandon the single graded examination model and consider the multiple measures of students. These indicators include standardized test scores, transcripts before enrollment, student self-assessment, and other related information. On the other hand, a significant change in the teaching mode of remedial education is aimed at reducing the time of remedial education and speeding up the pace of students entering university-level courses. There are four common methods: one is targeted Modularized, that is, according to the student's test scores, only the lack of course content is required to supplement the course content instead of the entire course. This method is mostly realized through computer modular teaching. The second is compressed; the single course of remedial education is compressed from one semester to six to eight weeks. The third is Co-requisite, which combines remedial education courses and university introductory courses. The fourth is contextualized. The curriculum requirements and teaching methods of remedial education are linked to the students' professional choice intentions. Students with different professional intentions have different curriculum requirements, and the methods and examples selected in teaching are also different. The most recent extension of this method is the reform direction of Math Pathways, which is to formulate different mathematics curriculum requirements according to students' academic interests and professional inclination.

Florida's remedial education reform bill was passed during the 2013 spring legislative session of the state legislature. The bill requires that starting from the fall of 2014, eligible students in the community college system no longer need to take the remedial education grading test, and schools cannot require students to take remedial education courses. These students include ninth-grade students enrolled in 2003-2004 and later, as long as they graduated from any Florida public high school. Military students on active duty are also exempted from the remedial education requirements. Therefore, most students can decide for themselves whether to register for remedial education courses or university-level courses. The plan stipulates that remedial education courses must adopt certain teaching methods, including modular tuition, compressed teaching methods, parallel tuition, and situational tuition education. Schools are also required to provide intensive academic counseling and support to enrolled students.

The research team previously found that the remedial education reform in Florida has a positive effect on the completion rate of college mathematics and college English by comparing the completion rate of each student's college course [12]. This article will continue to track the changes in the completion rate of courses in different periods and analyze whether these positive effects will continue to increase so that credit accumulation becomes another indicator of the success of college students.

Under the influence of Florida's remedial education policy, the most important change is that a large number of students can be exempted from the university grade examination and remedial education courses. Remedial education has become an option for most community college students, not a required option. The analysis of remedial education found that if students who are slightly below the university's standard score are assigned to remedial education courses, their probability of completing a degree is 1.5% lower than that of students who are slightly above the university's standard score [13]. These researchers did not explain why students receiving remedial education performed worse. They proposed a possible reason that these students face more "blocking stones" due to the additional course requirements and make it difficult to complete the degree.

The second major change brought about by the Florida remedial education reform is that the remedial education courses reserved by community colleges need to be taught in one of the four forms mentioned above. The long-term impact of these accelerated courses on educational outcomes is not yet known. More research results indicate that they may help students who do not have university admissions qualifications to acquire credits faster and slightly increase the probability of completing a degree [14].

The third major change brought about by the Florida tutoring education reform is to require community colleges to provide students with better curriculum consultation and curriculum assistance services. When remedial education became an option, a large number of students who did not have university entrance qualifications enrolled in university courses [14]. To help these students succeed, the community college will provide additional course guidance services and implement an early warning system to prevent students from falling too far behind in the course of study. Relevant studies have shown that these curriculum support facilities can promote student success, for example, in terms of avoiding dropouts and degree completion, and other educational achievements [15].

Existing studies have involved exploring the impact of various changes in remedial education on the educational outcomes of college students. Florida's current remedial education policy combines spontaneous remedial education, a new curriculum teaching model, and improved curriculum support measures. We expect that this comprehensive reform model will produce better results for students' education than a single measure.

3. Research methods

3.1. Data sources and measurement methods

The Florida K-20 education database tracks the basic situation of all students in public schools in the state from kindergarten to university. Based on the K-20 database, this article uses data such as university course registration, degree completion, student background data, and student high school learning records for analysis. The research sample covers all 28 community colleges in the Florida community college system. This article uses the six-year freshman data in the database for analysis-fresh students in the three years before the implementation of the SB1720 policy (2011-2013) and three years after the implementation of the SB1720 policy (2014-2016).

For the passing rate of introductory courses in universities, this article uses two measurement methods to calculate. The first is the ratio of the number of courses passed to the number of course registrations. This calculation method mainly focuses on the impact of SB1720 on students' classroom performance, which is called the classroom pass rate in this article. The second is the ratio of the number of students who passed the course to the number of freshmen enrolled in the fall of the school that year. This calculation method mainly focuses on the overall impact of the SB1720 policy and the changing trend of the selection and passing of the college courses of each class of students. This article refers to the passing rate of the year. The credits obtained by students in the first academic year of college-level courses are continuous variable credits.

All models in this article have added covariates of student background and student high school learning records. These variables include students' characteristics (race, gender, free lunch status) and high school learning status (whether they have taken honors mathematics, double registration mathematics, advanced mathematics, honors English, double registration English and advanced English courses).

3.2. Research steps

Aiming at the first research question, this paper models English and math courses separately, and uses interrupted time series design to detect the changes in the registration rate and pass rate of student tuition courses and university courses before and after the implementation of the SB1720 policy.

To test the overall impact of the reform on the registration and passing of introductory courses of universities, the author constructs the following model for the analysis of the registration/pass rate of i students in the j University of t Class:

$$logit\ (y_{ijt}) = \beta_0 + \beta_1(2014)_t + \beta_2(S)_{ijt} + \beta_3(HS)_{iji} + \xi_j + \lambda_t \quad (1)$$

In this model, $\beta 1$ measures the change in course registration/pass rate after the policy reform, $\beta 2$ is the coefficient of student background, $\beta 3$ is the coefficient of high school learning background, and ξj represents the fixed effect of unobservable university heterogeneity. λt is the continuous year (Number of sessions) indicator, used to measure potential time trends.

To explore whether the changes in registration rate and pass rate are different for different races, the author added variables for African and Hispanic descent into the model (European descent students are a comparative group, and students of other races are not included in this model). At the same time, the interaction of race and variables after the implementation of the policy is added. This paper uses the following model to measure the enrollment/pass rate of i, students, in the t - j University:

$$\begin{aligned} logit\ (y_{ijt}) = {} & \beta_0 + \beta_1\ (2014) + \beta_2(\text{ Black })_{ijt} + \beta_3(\text{ Hispanic })_{ij} \\ & + \beta_4\ (2014 * \text{Black})\, i_{jt} + \beta_5\ (2014 * \text{Hispanic})\, i_{jt} \\ & + \beta_6\ (S)_{jt} + \beta_7(HS)_{iji} + \xi_j + \lambda_t \end{aligned} \quad (2)$$

In this model, $\beta 1$ represents the change of course registration/pass rate after the implementation of the SB 1720 policy, $\beta 2$ and $\beta 3$ represent the difference between the overall registration rate/pass rate of African students and Hispanic students and European students, respectively, $\beta 4$ and $\beta 5$ refer to After the implementation of the policy, the differences between African and Hispanic students and European students in terms of course results are compared. $\beta 6$ is the coefficient of student background, $\beta 7$ is the coefficient of high school learning background, ξj is the university fixed effect, and $\lambda \iota$ is the index of consecutive years (number of sessions).This model measures the changes in overall student learning outcomes before and after the policy is implemented, as well as the differences in changes in the learning outcomes of African and Hispanic students. The y of the above two models represents the registration and passing of the university introductory course.

Aiming at the second research question, this article measures the students' first-year college course registration credits and passing credits. Because of the option of directly enrolling in university courses and the support of more school resources, this article predicts that students will pass more credits after the implementation of the policy than before the implementation of the policy. This paper uses the interrupted time series design to detect the changes in the university course credits passed by the students before and after the policy is implemented. The following model is used to measure the university course registration and passing credits of the students of $t - j$ University i:

$$y_{iji} = \beta_0 + \beta_1(2014)_\iota + \beta_2(S)_{ij} + \beta_3(HS)_{iji} + \xi_j + \lambda_t + \varepsilon_{iji} \quad (3)$$

In this model, $\beta 1$ detects the changes in the registration and passing of college course credits before and after the policy, $\beta 2$ is the coefficient of student background, $\beta 3$ is the coefficient of high school learning background, ξj represents the fixed effect of unobservable university heterogeneity, and λt is a Consecutive year (number of sessions) indicators, used to measure potential time trends.

To detect the differences in the changes in credit registration and passing in different student groups, the author added variables for African and Hispanic in the model (European students are the contrast group, and students of other races are not included in this model). At the same time, the interaction of race and variables after the implementation of the policy is added. This paper uses the following model to measure the registration and passing credits of i students in the $t-j$ university:

$$y_{ijt} = \beta_0 + \beta_1(2014) + \beta_2(\text{Black})_{ijt} + \beta_3(\text{Hispanic})_{ijl} + \beta_4(2014 * \text{Black})_{ij} + \beta_5(2014 * \text{Hispanic})_{ijk} + \beta_6(S)_{ijl} + \beta_7(\text{HS})_{ijl} + \xi_j + \lambda_\iota + \varepsilon_{ijl} \quad (4)$$

In this model, $\beta 1$ represents the change in registration/passed credits after the implementation of the SB1720 policy, $\beta 2$ and $\beta 3$ represent the difference between the overall registration/passed credits of African students and Hispanic students and Europeans, and $\beta 4$ and $\beta 5$ respectively After the implementation of the policy, the difference between African and Hispanic students in the number of course credit registration/passes and European students is compared. $\beta 6$ is the coefficient of student background, $\beta 7$ is the coefficient of high school learning background, ξj is the university fixed effect, and $\lambda \iota$ is the Index of consecutive years (number of sessions). This model measures the changes in overall student credit registration/passes before and after the implementation of the policy, as well as the differences in the changes in the learning outcomes of African and Hispanic students. This article uses all students registered in the fall to analyze the college course registration/pass credits of the students in the first year of college.

4. Research results

4.1. Enrollment rate of university introductory courses

After the implementation of the SB1720 policy, the registration rate of university introductory courses has shown an overall upward trend. In the first year after the policy was implemented (2014), the registration rates of compulsory courses in English and mathematics increased by 6.49 and 3.20 percentage points respectively. The registration rate of these courses continued to increase in 2015 and was relatively stable in 2016 see [Table 1].

Table 1. The overall situation of students' college course registration

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
English writing						
Registration rate (%)	56.14	60.78	63.64	70.13	73.04	72.4
Number of registered people	40718	39411	43552	47910	49105	48772
Freshman	72527	64838	68440	68315	67232	67364
Mathematics compulsory course						
Registration rate (%)	21.75	22.93	24.84	28.04	33.48	33.66
Number of registered people	15772	14866	17000	19153	22508	22672
Freshman	72527	64838	68440	68315	67232	67364

The enrolment rate of all students' college introductory courses has increased. Hispanic and African American students have increased the most in the enrolment rate of compulsory courses in English writing and mathematics, see [Table 2] and [Table 3]. However, in 2016, the registration rate of English writing by European, African, and Hispanic students declined slightly, and the decline was less than 2 percentage points. The enrolment rate of all students' mathematics compulsory courses increased in the second year after the implementation of the policy and stabilized in the third year. Among them, the registration rate of compulsory mathematics courses of Hispanic students continued to increase slightly in the third year after the implementation of the policy.

Table 2. English writing registration of students of various ethnicities

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
European students						
Registration rate (%)	63.07	65.83	67.58	71.76	72.98	72.41
Number of registered people	18768	17820	18330	18845	18736	17033
Freshman	29757	27069	27124	26261	25673	23522
African American students						
Registration rate (%)	44.22	49.14	54.59	66.41	72.63	71.07
Number of registered people	7155	6600	8084	9341	9726	9238
Freshman	16180	13432	14809	14065	13391	12998
Hispanic students						
Registration rate (%)	55.15	61.56	64.72	70.73	73.37	72.96
Number of registered people	12265	12518	14367	16631	17254	17915
Freshman	22241	20333	22197	23514	23516	24556

Table 3. Registration status of compulsory mathematics courses for students of various ethnicities

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
European students						
Registration rate (%)	25.73	26.05	27.85	30.63	35.68	35.1
Number of registered people	7655	7052	7554	8044	9160	8257
Freshman	29757	27069	27124	26261	25673	23522
African American students						
Registration rate (%)	11.88	13.64	15.36	19.86	25.92	25.86
Number of registered people	1922	1832	2274	2793	3471	3361
Freshman	16180	13432	14809	14065	13391	12998
Hispanic students						
Registration rate (%)	22	23.72	26.08	28.86	34.41	36.28
Number of registered people	4893	4823	5788	6786	8093	8910
Freshman	22241	20333	22197	23514	23516	24556

4.2. Regression adjustment results of university course registration rate

After the policy reform, the increase in the registration rate of all university introductory courses has been statistically significant. The registration rate of English writing increased by 4.79%, and the required mathematics course increased by 4.89% see [Table 4].

Table 4. Regression prediction results of college course registration rate before and after the implementation of the policy

	Forecast rate before policy implementation	Forecast rate after policy implementation	Policy changes
English writing	65.44	70.23	4.79***
Mathematics compulsory course	22.78	27.67	4.89**

*Note: ***p<0.001,**p<0.01,*p<0.05*

After the implementation of the policy, the registration rate of introductory courses for all students has increased, and the registration growth rate of Hispanic and African students is faster than that of European students. This effectively narrowed the gap between the registration rates of African/Hispanic and European students. For example, in the course of English writing, the registration rate of European students increased by 7.47 percentage points, while Hispanic and African students increased by 12.75 and 22.64 percentage points, respectively. A similar situation also appears in the registration rate of mathematics compulsory courses.

4.3. Class pass rate of university introductory courses

The class pass rate of English writing remained stable before and after the implementation of the policy, but the enrolment of this course increased sharply after the implementation of the SB1720 policy. After the implementation of the policy, the pass rate of compulsory mathematics courses dropped slightly.

After the implementation of the policy, the enrollment of all European, African, and Hispanic students in English writing courses has increased significantly see [Table 5]. Although the pass rate of African-American students is still lower than that of European and Hispanic students, the overall class-pass rate of the three has remained stable.

Table 5. The passing of English writing class by students of various ethnic groups

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
European students						
Passing rate (%)	75.89	75.79	75.67	75.95	76.8	76.32
Number of passers	14259	13506	13871	14312	14390	13000
Number of registered people	18768	17820	18330	18845	18736	17033
African American students						
Passing rate (%)	67.49	68.64	70.24	67.02	67.03	66.61
Number of passers	4829	4530	5678	6260	6519	6153
Number of registered people	7155	6600	8084	9341	9.726	9238
Hispanic students						
Passing rate (%)	76.46	77.51	77	76.81	77.11	76.49
Number of passers	9378	9703	11062	12775	13305	13704
Number of registered people	12265	12518	14367	16631	17254	17915

The pass rate of compulsory mathematics for European and Hispanic students remained relatively stable before and after the implementation of the policy. However, the pass rate of the compulsory mathematics courses of African students has declined after the implementation of the policy, which is still lower than that of European and Hispanic students, see [Table 6]. For all students, the number of registrations for required courses in universities has increased after the implementation of the policy.

Table 6. Classroom passing of compulsory mathematics courses for students of various ethnic groups

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
European students						
Passing rate (%)	69.44	69.13	68.18	68.86	67.67	68.64
Number of passers	5316	4875	5150	5378	6199	5668
Number of registered people	7655	7052	7554	8044	9160	8257
African American students						
Passing rate (%)	58.9	61.35	62.27	58.36	53.96	54.33
Number of passers	1132	1124	1416	1630	1873	1826
Number of registered people	1922	1832	2274	2793	3471	3361
Hispanic students						
Passing rate (%)	69.12	69.79	67.16	66.8	67.71	68.32
Number of passers	3382	3366	3887	4533	5480	6087
Number of registered people	4893	4823	5788	6786	8093	8910

4.4. Regression adjustment results of the classroom pass rate of university introductory courses

The regression analysis results of the predictive model for the classroom pass rate of university introductory courses show that the classroom pass rates of English writing and maths compulsory courses are consistent before and after the policy see [Table 7].

Table 7. Regression prediction results of the classroom pass rate of college courses before and after the implementation of the policy

	Forecast rate before policy implementation	Forecast rate after policy implementation	Policy changes
English writing	75.92	76.09	0.17***
Mathematics compulsory course	67.87	68.32	0.45**

*Note: ***p<0.001, **p<0.01, *p<0.05*

The class pass rate of European and Hispanic students in English writing showed a slight increase (up by 1.25 and 0.54 percentage points respectively), while the class pass rate of African students in English writing decreased slightly (down by 0.67 percentage points). The pass rate of compulsory mathematics courses for European and Hispanic students fell by 1 percentage point, and for African-American students fell by 4.3 percentage points.

4.5. Pass rate of college introductory courses

The measurement of the pass rate for the corresponding term provides information on the overall impact of the SB1720 policy and how many students registered and passed the

university introductory course in the first academic year. The primary purpose of the SB1720 policy is to allow more students to register and pass university courses because the policy itself allows students to directly register for university introductory courses.

In terms of the number of students, the number of registered and passed college English and math courses has increased after the implementation of the policy (see Table 8). In the first year of policy implementation, the passing rate of English writing immediately increased by 4.36 percentage points; the passing rate of compulsory mathematics courses rose slightly by 1.77 percentage points in the first year and increased by 5.37 points in the second year compared to 2013. The passing rates of all courses have stabilized after the third year of implementation of the policy.

Table 8. The overall situation of the passing rate of students' college courses

	Before policy implementation			After the policy is implemented		
	2011	2012	2013	2014	2015	2016
English writing						
Passing rate (%)	42	45.75	47.9	52.26	54.84	53.87
Number of passers	30460	29662	32786	35699	36873	36289
Freshman	72527	64838	68440	68315	67232	67364
Compulsory course						
Passing rate (%)	14.9	15.77	16.7	18.47	22.07	22.35
Number of passers	10804	10228	11431	12615	14839	15055
Freshman	72527	64838	68440	68315	67232	67364

Compared with European students, the passing rate of African and Hispanic students increased more, which narrowed the learning gap between races. From the year before the policy (2013) to the year after the policy (2014), the pass rate of African students increased by 6.17 percentage points. Before the implementation of the policy, the passing rate of English writing by Hispanic students was slightly behind that of European students; after the implementation of the policy, they caught up with or even surpassed European students.

As for the passing rate of required math courses, Hispanic students have caught up with European students after three years of implementation of the policy. The performance gap between African-American students and European-American students also narrowed slightly. From 2015 to 2016, the passing rate of African-American students remained unchanged.

4.6. Regression adjustment results of the passing rate of college courses

In general, the passing rates of compulsory courses in English writing and mathematics increased by 3.38 and 2.94 percentage points respectively see [Table 9]. It is worth noting that after the implementation of the policy, more than half of the fresh students successfully registered and passed English writing within one year, and about one-fifth of the students registered and passed the required mathematics course.

Table 9. Regression prediction results of the passing rate of college courses before and after the implementation of the policy

	Forecast rate before policy implementation	Forecast rate after policy implementation	Policy changes
English writing	47.85	51.23	3.38***
Mathematics compulsory course	14.53	17.47	2.94**

*Note: ***p<0.001, **p<0.01, *p<0.05*

Students of all ethnicities have shown an increase in the passing rate of college courses in English and mathematics. Among them, the passing rate of African and Hispanic students has increased more than that of European students see [Table 10]. For example, the passing rate of African American students in English writing increased by 14.18%, which is 7.89% higher than that of European students.

Table 10. Prediction of the passing rate of college courses before and after the implementation of the student policy of each ethnic group

	English writing			Mathematics compulsory course		
	2011-2013	2014-2016	Before and after policy changes	2011-2013	2014-2016	Before and after policy changes
Predict the passing rate of the new year						
African American	33.36	47.54	14.18***	6.97	11.76	4.79***
Hispanic	46.44	56.56	10.12***	14.45	20.76	6.31***
European	49.76	56.05	6.29***	16.2	21.17	4.97***
Ethnic differences						
African American vs. European			7.89***			-0.18
Hispanic vs. European			3.83***			1.34***

4.7. Accumulation of university course credits and regression adjustment results within one year of enrollment

After the implementation of the policy (2014-2016), the registered credits and passing credits of all students continued to increase. Before the implementation of the policy, there was a slight gap between European and Hispanic students in obtaining credits; after the implementation of the policy, the credits of the two were the same in 2016. Before the implementation of the policy, there was a large gap in credit acquisition between European and African students; but after the implementation of the policy, this gap gradually narrowed.

In general, the study found that regardless of the ethnic background of students, they registered an average of 0.422 more credits in their first year of enrollment, and gained 0.397 more credits. Although the accumulative credits of African American and Hispanic students are less than that of European students, the former two showed higher accumulative credits after the implementation of the policy (0.525 and 0.348 respectively). In the first year after the policy was implemented, all students showed an increase in cumulative credits, and the cumulative credits of African and Hispanic students increased faster than that of white students.

5. Conclusion

After Florida's remedial education policy was implemented in the fall of 2014, the enrolment rate of university introductory courses has risen sharply. One of the most important changes in the policy reform is to allow students to skip remedial courses. Therefore, it is necessary to distinguish the pass rates of the two college admission courses. The classroom pass rate is very important for teaching suggestions, learning support, curriculum design, and teaching mode. The passing rate of the current year is more accurate in measuring the overall impact of SB1720 policy reform.

By comparing the passing rate of college introductory courses before and after the implementation of the policy in 2014 and the accumulation of credits in one year of admission, this article finds that students have made great progress in both aspects. The SB1720 policy seems to narrow the learning gap between European and minority students and is conducive to achieving fairness in higher education outcomes. For example, the passing rate of the introductory courses of Hispanic students has caught up with and surpassed that of European students, and in the first year of enrollment, they have almost obtained the same credit accumulation as European students. African-American students have also greatly reduced the gap in the passing rate of introductory college courses with European-American students. Interrupted time-series design regression analysis research results provide further evidence that these changes in students after the implementation of the policy are not accidental. The SB1720 policy has brought a lasting, substantial, and positive impact on student learning outcomes and educational equity in the Florida community college system.

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