# No Cost and Low Cost Schedule Designation and Student Enrollment Behavior at Oregon Community Colleges and Public Universities

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Abstract

The purpose of this study is to determine whether the no- and low-cost schedule designation used statewide at Oregon's public community colleges and universities had an effect on student enrollment behavior, and whether it had a more pronounced effect for historically underserved student populations. Research questions included (1) whether there was a difference in the percentage that designated and undesignated sections filled, (2) whether there was a difference in the make-up of the student population in designated and undesignated sections, and (3) whether there was a difference in the number of credits per term students were enrolled in between students in designated and undesignated sections. Data from six public institutions of higher education were analyzed using a Factorial ANOVA for Research Questions 1 and 3 and One-Way ANOVAs for Research Question 2. The data analysis showed that designated sections filled at a significantly higher percentage; students in undesignated sections took more credits per term, but that this statistical significance did not translate into a real-world difference that would affect students' lives; and that the proportion of historically underserved students is significantly higher in designated sections. Due to this study's limitations, the results may not be generalizable, but the authors hope that this method may be replicable in other settings. These findings have implications for stakeholders including faculty, staff who support these schedule designations, and the Oregon Higher Education Coordinating Commission and legislature in terms of future directions for improving the processes surrounding these designations to better support students.

***Keywords:*** open educational resources, oer, textbook affordability, schedule designations, course marking

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# Designación de horarios gratuitos y de bajo costo y comportamiento de inscripción de estudiantes en los colegios comunitarios y universidades públicas de Oregón


## Resumen

El propósito de este estudio es determinar si la designación de horario gratuito o de bajo costo utilizada en todo el estado en los colegios y universidades públicos de Oregón tuvo un efecto en el comportamiento de inscripción de los estudiantes y si tuvo un efecto más pronunciado en las poblaciones de estudiantes históricamente desatendidas. Las preguntas de la investigación incluyeron (1) si había una diferencia en el porcentaje que llenaban las secciones designadas y no designadas, (2) si había una diferencia en la composición de la población estudiantil en las secciones designadas y no designadas, y (3) si había Hubo una diferencia en el número de créditos por semestre en los que estaban matriculados los estudiantes entre los estudiantes de las secciones designadas y no designadas. Los datos de seis instituciones públicas de educación superior se analizaron utilizando un ANOVA factorial para las preguntas de investigación 1 y 3 y un ANOVA unidireccional para la pregunta de investigación 2. El análisis de datos mostró que las secciones designadas se llenaron en un porcentaje significativamente mayor; los estudiantes de secciones no designadas obtuvieron más créditos por trimestre, pero que esta significación estadística no se tradujo en una diferencia en el mundo real que afectaría la vida de los estudiantes; y que la proporción de estudiantes históricamente desatendidos es significativamente mayor en secciones designadas. Debido a las limitaciones de este estudio, es posible que los resultados no sean generalizables, pero los autores esperan que este método pueda replicarse en otros entornos. Estos hallazgos tienen implicaciones para las partes interesadas, incluidos los profesores, el personal que apoya estas designaciones de horarios y la Comisión Coordinadora de Educación Superior de Oregón y la legislatura en términos de direcciones futuras para mejorar los procesos que rodean estas designaciones para apoyar mejor a los estudiantes.


***Palabras clave:*** recursos educativos abiertos, oferta, asequibilidad de libros de texto, designaciones de horarios, calificación de cursos

# 俄勒冈社区学院和公立大学的免费及低成本课程表指定与学生注册行为


## 摘要

本研究旨在确定俄勒冈全州范围内的公立社区学院和大学所使用的免费及低成本课程表指定(schedule designation)是否对学生的课程注册行为产生影响，以及它是否对历史上教育资源不足的学生群体产生更明显的影响。研究问题包括(1)指定课程和非指定课程的百分比是否存在差异，(2)指定课程和非指定课程的学生人口构成是否存在差异，以及(3)指定课程和非指定课程的学生每学期注册的学分数量是否存在差异。对来自六所公立高等教育机构的数据进行了分析，即对研究问题1和3使用因子方差分析，对研究问题2使用单向方差分析。数据分析表明，指定课程的百分比显著高于非指定课程；非指定课程的学生每学期获得更多学分，但这种统计显著性并没有转化为能影响学生生活的现实世界差异；注册指定课程的学生中，历史上教育资源不足的学生比例显著更高。鉴于本研究的局限性，研究结果可能不具有普适性，但作者希望这种方法能在其他情境中加以复制。这些研究发现对利益攸关方（包括支持这些课程表指定的教师、工作人员、以及俄勒冈州高等教育协调委员会和立法机构）具有启示，即在未来方向上改进围绕这些指定课程的过程，以期更好地支持学生。


关键词：开放教育资源，oer，课本可负担性，课程表指定，课程评分

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Oregon's H.B. 2871, passed in 2015, requires Oregon's public community colleges and universities to add no- and low-cost designations to their course schedules (H.B. 2871, 2015). H.B. 2871 did not define the parameters for no- and low-cost course materials, leaving each institution to determine their own definitions of no-cost and low-cost. Generally, institutions applied no-cost designations to courses where the cost of materials is $0, whether or not openly licensed materials were adopted. They applied the low-cost designation to course materials at dollar amounts ranging from $25 to $60. The purpose of the schedule designation is to enable students to have textbook cost information available when they are choosing their courses. The bill makes the assumption that, all other factors being equal, students may choose a section with no- or low-cost course materials when given the option.

This study uses enrollment data to determine whether that assumption is correct. Understanding the impact of the schedule designation on enrollment behavior is important to different stakeholder groups for different reasons. In the authors' opinion, there are three main audiences for this research.

First, faculty want to know whether their course material choice may have an impact on enrollment. If their course does not make or is under-enrolled, they see a financial impact.

Second, bookstore managers, registrars, schedulers, and others invest considerable effort to implement the no- and low-cost schedule designation. People in these back-end roles want to know that their work has an impact that benefits students.

Third, the Oregon Higher Education Coordinating Commission (HECC) and legislature want to know the impact of H.B. 2871. The results of the present study may result in additional policies or recommendations to increase the effectiveness of H.B. 2871 or to increase benefits to students.

## Literature Review

### *Enrollment Behavior*

In Oregon, the number of no- and low-cost designated sections offered at public community colleges and universities increased from 2017–2021. While there was a slight decrease in the total number of sections offered during this time, there was an increase of over 50% in sections with the no- and low-cost schedule designations; at reporting institutions, almost 20% of sections offered were designated no- and low-cost during the 2019–21 biennium (Open Oregon Educational Resources, 2021). It is important to collect and share this data because it shows the impact that faculty choices have on students, and also suggests that the no- and low-cost schedule designation can be a tool to communicate with students. However, Oregon has not previously tested the assumption that the no- and low-cost schedule designation has an effect on student behavior, or considered whether that effect closes equity gaps for historically underserved students.

In fact, as of this writing, there is no airtight answer to the question of whether no- and low-cost schedule designations have an effect on student enrollment behavior. Common sense would suggest that students will opt for the lowest-cost alternative available, but there are many confounding factors to take into account. The most obvious is that students juggle multiple priorities that affect their scheduling decisions, including work, family, graduation requirements, and so on. A study by Nusbaum and Cuttler (2020) establishes that, absent these considerations, students will choose a section with no- and low-cost materials when given the option for a hypothetical semester. Other factors that students consider include the course delivery method, the faculty teaching the section, and many more.

While Nusbaum and Cuttler (2020) presented students with a hypothetical decision, student behavior

associated with Kwantlen Polytechnic University's Zed Cred program (i.e., zero-textbook-cost degree program) suggests a real-world correlation between schedule designation and higher section enrollment, based on section wait-lists (Jhangiani, 2020). Other open education program managers express interest in conducting this type of analysis but as of this writing had not published results (e.g. Domaika, 2020; Ainsworth et al., 2020a).

It is also relevant that the literature generally finds lower drop and withdrawal rates when zero-cost textbooks are used compared to when commercial textbooks are used, because it is possible to correlate lower drop and withdrawal rates with enrollment behaviors such as faster time to degree completion. For example, Hilton et al. (2016) found that students who took courses designated in the schedule as "Z Courses" (zero cost courses) at Tidewater Community College received higher grades and lower drop, withdrawal, and fail rates than students in non-zero cost sections. They suggested that this could result in increased retention and graduation rates since students could continue on with their studies after passing at a high rate (Hilton et al., 2016). Wiley et al. (2016) also found that students enrolled in "Z Courses" at Tidewater Community College had significantly lower drop rates than non-zero cost sections.

Other studies produced similar findings when looking at courses that use OER compared with commercial textbooks. While the key attribute of OER is the open license, and materials labeled with a no- and low-cost designation may have any copyright or license status, OER are available for free online or in print at low cost and therefore address student cost needs (and so may be used as a proxy for no-cost course materials for the purpose of this literature review). Clinton & Khan (2019) performed a meta-analysis comparing courses with open textbooks and courses with commercial textbooks and found that students in courses with open textbooks had significantly lower withdrawal rates than students in courses with commercial textbooks. Delgado et al. (2019) also found that students had significantly lower withdrawal rates in courses that used OER compared to commercial textbooks. Conversely, several studies found similar withdrawal rates between courses that used OER and commercial textbooks (Fialkowski et al., 2020; Vander Waal Mills et al., 2019).

Other studies more directly consider whether the use of OER may impact student enrollment behavior in future terms. Notably, a report from Achieving the Dream (Griffiths et. al., 2020) found that in 6 of the 11 community colleges included in the study, students in courses using OER (although not necessarily designated in the schedule) took significantly more credits and therefore progressed more quickly in their degree pathways. By way of explanation, students reported that they would use their textbook savings to take additional courses.

As the studies mentioned above suggest, the relationship between student enrollment behavior and student

outcomes is complex, with multiple possibilities for both correlation and causation. Perhaps for this reason, the literature does not provide strong evidence that use of OER results in improved student learning outcomes that would result in changed enrollment behavior. Student learning outcomes are generally similar when OER and commercial textbooks are used (Beile et al., 2020; Clinton et al., 2019; Clinton & Khan, 2019; Cummings-Clay, 2020; Engler & Shedlosky-Shoemaker, 2019; Fialkowski et al., 2020; Fowler et al., 2020; Grinias & Smith, 2020; Hilton, 2020; Jones & Nyland, 2020; Kalaf-Hughes, 2021; Stoval et al., 2019; Vander Waal Mills et al., 2019). Some exceptions are Hardin et al. (2019), who found that student learning was significantly increased with the use of OER, and Delgado et al. (2019), who found that students performed significantly worse when OER were used.

### *Equity and Open Education*

Lambert (2018) proposes that open education should be defined with a focus on social justice. Lambert argues that open resources do not necessarily benefit non-privileged learners by the nature of being open or via technical features, but must result in allocation of resources to non-privileged learners enabling them to succeed (redistributive justice), incorporate the views and experiences of non-privileged learners as legitimate (recognitive justice), and include non-privileged individuals in their creation, direction, and discourse (representational justice). Using Lambert's terms, the present study investigates the no- and low-cost schedule designations in terms of redistributive justice (the scope of this study does not include recognitive or representational justice) because textbook costs do not affect all students in the same way.

This approach aligns with equity goals stated in the State of Oregon Diversity, Equity, and Inclusion Action Plan, which asserts that "As Oregon's demographics shift over time, governmental policies and practices have both a historic and current role in alleviating racial and other inequities" (Stoudamire-Wesley et al., 2021, p. 4). The Oregon HECC produced an Equity Lens aligned with statewide goals, declaring that, "We believe that our community colleges, university, and workforce training systems have a critical role in serving our communities of color, learners experiencing poverty, and other underserved populations" (Oregon Higher Education Coordinating Commission [HECC], 2021a, p. 4). Oregon's HECC has identified historically underserved students in Oregon as the following groups:

> Native Americans, members of Oregon's nine federally recognized tribes, American Indians, Alaska Natives; Black, Africans, African Americans; Latino/a/x, Hispanic; Asian, Pacific Islanders; Arab/Middle Eastern/North Africans; immigrants, refugees, asylum seekers; undocumented persons, DACA, "Dreamers"; linguistically diverse; people with disabilities; LGBTQ+; aging/

> older adults; economically disadvantaged; farmworkers, migrant workers. (Oregon HECC, 2021a)

There is research demonstrating that historically underserved students are disproportionately harmed by textbook costs. For example, Jenkins et al. (2020) found that textbook costs are a greater barrier to higher education for historically underserved students than for other student populations. Appedu et al. (2021) found that Pell Grant recipients were more likely not to purchase the required textbook for a course, and to report struggling academically due to textbook costs. Part-time students, with increased time to completion (U.S. Department of Education, 2020), see higher costs of attendance overall (Bound et al., 2012; Darolia, 2014; Oregon HECC, 2021c).

Similarly, Nusbaum et al. (2020) found that first-generation students reported enrolling in fewer classes, not registering for a specific class, or dropping a class as a result of high textbooks costs. The same study found that the problem compounded for students with intersecting underserved identities, such as first-generation students who also identified as a nonwhite race or ethnicity (Nusbaum et al., 2020). Hardin et al. (2019) found that historically underserved students were more likely to enroll in a course that used an open textbook, and more likely to stay enrolled in the course, than their non-minoritized counterparts. These studies suggest that textbook costs do disproportionately affect historically underserved students and that these students may make enrollment decisions, in part, based upon these costs.

There is research in the open education field that disaggregates student learning outcomes (though not student enrollment behavior) by demographic group. In an influential study, Colvard et al. (2018) looked at student performance in OER and non-OER sections of courses. When they disaggregated the data, students who were Pell Grant recipients had a greater improvement in student outcomes than non-Pell Grant recipients when OER was used. They also found that there was a greater improvement in student outcomes for students who did not identify as white in OER sections than for white students when OER was used. Finally, they found that there was a greater improvement in student outcomes for part-time students in OER sections than for full-time students when OER was used. Colvard et al. (2018) suggest that use of OER could possibly narrow equity gaps between these groups by providing all students with free access to materials from the first day of class while also offering greater benefits to historically underserved groups. However, followup studies have had mixed success in replicating these findings (Smith et al., 2020; Delgado et al., 2019; and Dempsey, 2021).

These mixed results may demonstrate the difficulty in establishing causality between student outcomes and the copyright or license status of materials, or may demonstrate that the openly licensed materials need improvement if they are to foster a sense of inclusion

or belonging among historically underserved students. More to the point for the present study, the literature shows *some* differential impact between demographic groups in studies about student outcomes, which is likely applicable to the present study on enrollment behavior.

### *Messaging for Faculty and Students*

Finally, the authors wish to consider how to operationalize findings on student enrollment behavior through messaging to both faculty and students. Because there is not yet a definitive answer to the question of whether no- and low-cost schedule designations have an effect on student enrollment behavior, most arguments in favor of schedule designations rely on the benefits of transparency instead. For example, the most comprehensive work on the topic, the collaboratively authored 2020 guide, *Marking Open and Affordable Courses: Best Practices and Case Studies,* asserts:

> Student agency, or students' ability and autonomy to use information to make informed decisions, is foundational to student success. Marking the schedule of classes with details about required course materials provides a mechanism for students to learn more about the course and weigh the course material costs with their financial circumstances. (Ainsworth et al., 2020b)

Notably, an argument for greater transparency successfully advanced a 2021 Oregon policy for on-time course materials adoption reporting (H.B. 2919, 2021).

A further consideration, though, is whether students know how to find and use the no- and low-cost designations in course schedules. One report found that very few students were aware of their college or university's efforts to designate no- and low-cost sections in the schedule (Open Oregon Educational Resources, 2018). The researchers' recommendations for best practices based upon their findings led to the inclusion of a plan to market the no- and low-cost schedule designation in Oregon's H.B. 2213, passed in 2019 (H.B. 2213, 2019).

Most mentions of schedule designations consider the potential impact on faculty alongside the presumed benefits for students. In particular, part-time faculty are not compensated for course design and are sometimes required to teach with a preselected textbook, raising justifiable concern that their enrollment numbers would be harmed by the designation (Nusbaum and Cuttler, 2020). Ainsworth et al. (2020c) point out that full-time and tenure-track faculty may have similarly valid concerns relating to promotion and tenure evaluation.

The open education community generally offers three possible responses to faculty concerns about schedule designations. The first is to reassure faculty with a reminder that students consider a variety of factors when selecting courses, such as word of mouth, day/time, cost of fees, etc. (Ainsworth

et al., 2020d). A similar, if less reassuring, take is to remind faculty that students take textbook cost into account when selecting courses, whether or not the information is available via the schedule (Lieberman, 2017). The third type of response to faculty concerns is more along the lines of "*Yes, and?*" as expressed for example by Reed (2017): "Yes, signaling to students which sections have OER might lead them to vote with their feet (or clicks). But I think that's a feature, not a bug."

A better understanding of whether student enrollment behavior is affected by the no- and low-cost schedule designation can help make the case for designations at institutions that do not already use them. It can suggest more effective messaging to students so that they are able to act on information available to them through the course schedule. And it can be used to mitigate impacts on faculty whose courses are not designated.

## Research Questions

This study seeks to determine whether the no- and low-cost schedule designation used statewide at Oregon's public community colleges and universities had an effect on student enrollment behavior and whether it had a more pronounced effect for historically underserved student populations. We have the following three research questions:

1. Is there a statistically significant difference in the percentage that sections fill (percentage of students enrolled in a section on the last day to add or drop a course compared to its enrollment cap) between no- and low-cost designated sections and undesignated sections? Is the difference in section fill percentage significantly attributable to the designation status, or is it also attributable to the time the section was offered, day of the week the section was offered, or the course delivery method?

2. Is there a statistically significant difference in the make-up of the student population (i.e., the percentage of students in each category in each class) in sections with the no- and low-cost designation and undesignated sections, when the data is disaggregated as follows?

    a. Part-time status (<12 credits); Full-time status (≥12 credits)

    b. Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/ Native Hawaiian/Pacific Islander, Asian/Asian American; White; Not reported

    c. Eligible for the Pell Grant; Not eligible for the Pell Grant

3. Did students in no- and low-cost designated sections have a statistically significant difference in the number of credits enrolled per term (enrollment intensity) than students in undesignated sections?

    a. Is the difference in the num-

ber of credits enrolled per term significantly attributable to the designation status, or is it also attributable to the time the section was offered, day of the week the section was offered, or the course delivery method?

b. Does the presence of a designated course in a student's schedule have a significant effect on enrollment intensity when disaggregated as follows?
    i. Part-time status (<12 credits); Full-time status (≥12 credits)
    ii. Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American; White; Not reported
    iii. Eligible for the Pell Grant; Not eligible for the Pell Grant

## Methods

Prior to gathering data, the research proposal was submitted to the Linn-Benton Community College Office of Institutional Research for review and approval in lieu of an institutional review board process at each participating institution. After approval, data requests were sent to the offices of institutional research at Oregon's public community colleges and universities that had implemented no- and low-cost schedule designations prior to Fall 2019, using the letter template shared in Appendix A. This included 15 out of Oregon's 17 community colleges and six out of Oregon's seven universities.

The data points shown in Appendix B were requested for all terms when the no- and low-cost schedule designation was present in the schedule, up to and including Fall 2019. This meant that each institution might send data for a different number of terms depending on when they implemented the schedule designation. The time frame was chosen to ensure that the time period of the data request does not include any term affected by the COVID-19 pandemic.

To keep the data secure, offices of institutional research deposited it in a secure dropbox. All files containing identifiable information were sent as password-protected Excel files. Passwords were then shared by phone. These files will be stored for the length of the study. After that time all identifiable data will be deleted.

To ensure privacy, the data was de-identified before analysis so that it no longer included student names or identification numbers, faculty names or identification numbers, or CRNs. The final report was aggregated at a level that ensures student anonymity. Where cell sizes were smaller than 10, per federal guidance, samples were combined for analysis (U.S. Department of Education, 2013). The final data set also masks institution names by replacing

names with identifiers and removing identifying attributes.

To answer the research questions, enrollment data was gathered for the top ten highest enrolled transfer courses in Oregon's community colleges and universities. The list of courses shown in Table 1 is based on 2017-18 HECC data, the most recent year available at the time that this project began. The scope of this analysis was narrowed to the top ten highest enrolled transfer courses in Oregon's community colleges and universities for four reasons. First, this choice made it possible to work with large enough data sets to likely find statistically significant patterns while protecting student privacy. Second, these high-enrollment courses were more likely to have multiple sections taught each term, even at very small participating institutions. Third, these courses have relevant high-quality OER available and have known OER adoptions in Oregon, which means that it would likely be possible to compare sections with no- and low-cost adoptions against undesignated sections. Fourth, these ten courses are likely to be similar across institutions; for example, writing instructors have an affinity group that meets regularly and ensures that learning objectives are aligned to common course numbers.

**Table 1.** *Highest Enrolled Transfer Courses in Oregon's Community Colleges and State Universities in 2017–18*

| Course Number | Total 2017-18 Enrollment |
|---|---|
| WR 121 | 36,197 |
| MTH 111 | 23,625 |
| WR 122 | 20,109 |
| COM 111 | 16,809 |
| MTH 112 | 14,119 |
| EC 201 | 13,632 |
| MTH 243 | 13,361 |
| BA 101 | 12,752 |
| MTH 251 | 11,779 |
| PSY 201 | 10,994 |

*Note*. (A. Hofer, personal communication, August 15, 2020)

The second and third research questions require disaggregating the data based upon race/ethnicity, part-time/full-time status, and Pell Grant eligibility. The goal was to determine whether there was a difference in enrollment behavior based upon these categories, as Colvard et al. (2018) did with course outcomes. However, the data received from participating institutions in the individual categories for Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Island-

er, and Asian/Asian American were too small in comparison to the number of students who identified as white (see Table 2) to draw statistically meaningful conclusions from the data.

One goal of this study was to determine whether there was a difference in enrollment behavior between the designated and undesignated sections for historically underserved students. Oregon's student population in its community colleges and public universities for the 2019–20 academic year included 27.1% students of color and 55.7% white students, as shown in Table 2 (Oregon HECC, n.d.; Oregon HECC, 2021c). Since the numbers from most of the race/ethnicity categories were low enough to skew the results, the statistical analyses for Research Questions 1 and 3 were run with the race/ethnicity categories separated and also with the race/ethnicity categories that the Oregon HECC had defined as historically underserved combined as follows: (1.) Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American; (2.) White; and (3.) Not reported. The authors found that the results were similar, but that when they were combined into the three categories listed above, it reduced the skew between the categories in the data set. Based upon this analysis, these three race/ethnicity categories were used for the statistical analyses. Note that while Asian students in the U.S. complete bachelor degrees at higher rates than students of other races/ethnicities, including white students (National Center for Education Statistics, 2020), the current study does not analyze student *performance*, but rather *enrollment behavior*. For this reason Asian/Asian American students are included with the other race/ethnicity categories defined as historically underserved.

The authors also decided to combine data from the no- and low-cost designated courses into a "designated courses" category for two reasons. First, some institutions only had a no-cost designation and not a low-cost designation for the time that the data was requested; and second, because of sample size skew: there were far fewer no- and low-cost designated courses than there were undesignated courses. The authors ran the preliminary statistics for Research Questions 1 and 3 for the data separated into the no- and low-cost categories and found that the results were similar to the results in which the categories were combined.

Table 2 shows that the data received in response to our request was representative in some ways, and unrepresentative in others. The authors received data from 6 out of Oregon's 24 public community colleges and universities. The participating institutions tracked more closely to the statewide averages than the students in the sections represented by the current study.

**Table 2.** *Student Data Received By Race/Ethnicity for This Study Compared to Statewide Data and Data from Participating Institutions*

| Categories | Statewide (2018-19)[abc] | Participating Institutions (2018-19)[abc] | Current Study (Variable Years)[d] |
|---|---|---|---|
| Student Headcount | 331,760 | 166,670 | 176,159 |
| Course Sections Designated | 13.66% | 14.61% | 22.97% |
| Part-Time | Unknown | Unknown | 41.43% |
| Pell Grant Eligible | 17.85% | 15.43% | 34.36% |
| Asian American/ Asian | 4.64% | 5.74% | 6.80% |
| Black/African American | 2.00% | 2.80% | 3.50% |
| Latino/a/x/Hisanic | 13.21% | 14.84% | 18.20% |
| Native American/ Alaska Native | 1.00% | 0.82% | 0.70% |
| Native Hawaiian/ Pacific Islander | 0.40% | 0.47% | 0.70% |
| Multi-racial | 4.42% | 5.13% | 6.80% |
| White | 55.12% | 54.48% | 51.20% |
| Unknown | 19.40% | 15.87% | 9.60% |

*Note*. [a]Student headcount and race/ethnicity data (Oregon HECC, 2021c). [b]Course sections designated data (Open Oregon Educational Resources, 2019). [c]Data for part-time percentage were unavailable. [d]Research sample based upon variable number of years per institution. Data received from Offices of Institutional Research from six Oregon community colleges and public universities for this study. Percentages do not total 100% because of missing data at the source.

### *Data Analysis*

Six institutions shared data from a total of 176,159 students and 7,026 sections spanning years from 2016 to 2019.

For Research Question 1, a Factorial ANOVA was used to understand if there is an effect on enrollment behavior when several variables including designation status are considered. This is most appropriate, because a Factorial ANOVA allows for a single dependent variable and multiple independent variables in the analysis. The means of each variable are compared within the analysis. A Factorial ANOVA allows for an analysis of each independent variable, as well as an analysis of the interactions between all independent variables (Zach, 2021). The Factorial ANOVA was chosen as it addresses the questions provided above, and as there is no nonparametric option among other tests.

For Research Question 1, the fill rate is the dependent variable and there are four independent variables: designation status (undesignated; designated: no-cost or low-cost designation), time of day the section was delivered (Morning: <12 pm; Afternoon: 12-5; Evening: >5 pm), day of the week the section was delivered (MWF: Monday, Wednesday, Friday; TR: Tuesday, Thursday; Weekend: Saturday and/or Sunday; Variable: Any other combination of days), and the delivery method (Online: courses taught completely online, asynchronously; In-Person: Courses taught synchronously at specific meeting dates/times; Hybrid: Courses that are taught partially online and asynchronously but that have some synchronous class meeting times[4]). Therefore, comparing the mean fill percentage across the four independent variables assesses whether there are any statistically significant differences that help to explain how designated sections and undesignated sections might differ. If an interaction effect was found that did not include designation status, then it was excluded from this paper as the effect of the designation status is at the heart of this study's research questions. A robust test for the ANOVA was also used due to skew in the data counts represented by a significant Levene's Test. The Brown-Forsythe Equality of Means Test was chosen in those cases where there was skew in the data. The Eta Squared was also analyzed to see if there was a small, moderate, or large effect size. This is a measure of the proportion of the variance that is attributable to that variable and determines whether a statistically significant p value is picking up on a variable that is driving a large or small proportion of the variation (Zach, 2020b).

Additionally, all single variable analyses were supported with a Chi-Square Goodness of Fit test. This was chosen to support the Factorial ANOVA, because there is skew between variable counts and the Chi-Square is a non-parametric test that handles skew in the data well. This test checks for statistically significant differences in the distribution of the data by comparing expected counts with observed counts. Expected counts are derived from a hy-

4 The hybrid course modality was not defined consistently across institutions.

pothesized distribution (e.g., all class times should have an equal number of students) that is tested for statistical significance at the 0.05 alpha level (Zach, 2020a).

Research Question 2 employs a series of three One-Way ANOVAs to determine whether there were statistically significant differences in the student makeup of the designated and undesignated sections based on the three demographic categories introduced above. A One-Way ANOVA is most appropriate because it analyzes a dependent variable against an independent variable (Zach, 2020a). The designation status is the independent variable with several dependent variables in the demographic categories. Each dependent variable was broken down into the percentage of students that make up a level of the variable. For example, Pell Grant eligibility had two levels: one level that included the percentage of students that were Pell Grant eligible, and another that included the percentage of students who were not Pell Grant eligible for each section. The independent variable was designation status along all three analyses.[5] The Brown-Forsythe test, Chi Square, and Eta Squared were also used as noted above for question 1.

For Research Question 3a, a Factorial ANOVA was also used, as discussed for Research Question 1, and looks at the effect of the four independent variables mentioned above on the mean number of credits a student attempted per term. The mean credits per term was the dependent variable and the four independent variables remain designation status, time of day the section was delivered, day of the week the section was delivered, and the delivery method. This will show whether there are any statistically significant differences between students in undesignated and designated sections with respect to mean credits per term, as well as interaction effects between designation status and the other independent variables. The Chi Square and Brown-Forsythe tests were also used as indicated in research question 1 for all portions of this question.

Research Question 3b also used a Factorial ANOVA, but the independent variables are the demographic categories from the disaggregated data. The three independent variables are part-time/full-time status, race/ethnicity, and Pell Grant eligibility. This analysis shows whether there were statistically significant differences in mean credits per term across designation status and the other independent variables. It also shows whether there were any interaction effects among the independent variables.

Research Questions 1 and 2 did analyses of course-level data. Research Question 3 does analyses of student-level data. Results of Research Question 3 are exploratory because while courses are either designated or undesignated, students may enroll in both designated

5 The effect sizes, covariance matrices, and nonparametric Mann Whitney U test results were also examined, but they revealed no additional information so these analyses are not reported in the results section below.

and undesignated courses in the same term. We were not able to avoid duplicate counts of students and were unable to track individual students across course enrollments.

## Results

### *Research Question 1*

The results of the Factorial ANOVA show that there were significant differences in the mean percent fill in independent tests for each of the four variables: designation status, day the section was offered, time of day the section was offered, and course delivery method. Further, there were four two-variable interactions that were also significant (see Table 3). The sample size of all variables is noted below (see Table 4).

**Table 3.** *Significant Results of the Factorial ANOVA for Research Question 1*

| Variables | Between Group df | F | Sig. | Within Group df |
|---|---|---|---|---|
| Single Variables | | | | |
| Designation Status | 1 | 4.121 | .042* | 6,967 |
| Day Section Offered | 4 | 8.644 | <.001* | 6,967 |
| Delivery Method | 3 | 67.644 | <.001* | 6,967 |
| Time of Day Section Offered | 3 | 37.825 | <.001* | 6,967 |
| Two-Variable Interactions | | | | |
| Day Section Offered by Designation Status | 4 | 8.055 | <.001* | 6,967 |
| Delivery Method by Designation Status | 3 | 6.624 | <.001* | 6,967 |
| Delivery Method by Time of Day Section Offered | 5 | 3.181 | .007* | 6,967 |
| Time of Day Section Offered by Day Section Offered | 8 | 10.475 | <.001* | 6,967 |

*Note*. *Statistically significant with alpha=0.05.

**Table 4.** *Sample Size by Variable for Factorial ANOVA for Research Question 1*

| Variable | Levels | Section n |
|---|---|---|
| Designation Status | No- or Low-Cost Designation | 1614 |
| | Undesignated | 5412 |
| Day Section Offered | TR[a] | 1935 |
| | MWF[b] | 2101 |
| | Weekend[c] | 118 |
| | Variable[d] | 249 |
| Delivery Method | Hybrid[e] | 411 |
| | In-person | 4921 |
| | Online | 1283 |
| Time of Day Section Offered | Morning[f] | 2107 |
| | Afternoon[g] | 1604 |
| | Evening[h] | 587 |

*Note.* [a]Sections with classes on Tuesday and Thursdays. [b]Sections with classes on Monday, Wednesday, and Fridays. [c]Sections with classes only on the weekends. [d]Sections with classes in any other schedule not described above. [e]The definition of "hybrid" delivery differs among institutions. [f]Section start time before noon. [g]Section start time between noon and 4 pm. [h]Section starts at 5 pm or later.

**Analysis by Variable.** The independent ANOVA of each variable shows where the following differences are between groups.

***Designation Status***. Sections in our sample with the no- or low-cost designation had a mean course fill of 66.75%, whereas undesignated sections had a mean course fill of 60.15%. As discussed below, the central finding of this study is that sections with the no- or low-cost designation had a significantly higher percentage of students in the class compared to the course cap than undesignated sections. The Brown-Forsythe Test of Equality of Means supported these results $F(1, 7025)=88.34$, $p<.001$. In addition, a Chi-square Goodness of Fit test was run and there was a significant relationship between the variables, $\chi^2$ (1,

524,802)=133,499.48, p<.001. The Eta-Squared test had a value of .006, which indicates a small effect size.

**Two-Factor Analysis Between Variables.** Interactions between each variable were also analyzed. The following interactions were significant, which means that there was a significant difference when membership in both variable categories was considered.

***Designation Status and Day Section Offered.*** There was a significant two-factor interaction between designation status and day of the week the section was offered. Designated sections had the highest fill on MWF (87.34%) and TR (85.72%). Undesignated sections, similarly, had the highest fill on MWF (83.69%) and TR (82.77%). This analysis shows that the designated sections still had a significantly higher fill than undesignated sections, even when accounting for the day of the week. These results were supported by a Chi-Square Test of Independence to assess the relationship between designation status and section day. There was a significant relationship between the variables, $\chi^2$ (4, 524,795)=1076.20, p<.001. The Partial Eta-Squared showed a small effect size (.008).

***Designation Status and Delivery Method.*** There was also a significant two-factor interaction between the designation status and the delivery method. Designated sections offered online had the highest fill at 88.66%, followed by hybrid at 80.91% and in-person at 78.45%. Undesignated sections also had the highest fill when offered online at 77.65%, followed by in-person at 70.95% and hybrid at 62.89%. This analysis shows that the designated sections still had a significantly higher fill than undesignated sections, even when accounting for the course delivery method. These results were supported by a Chi-Square Test of Independence to assess the relationship between designation status and delivery method. There was a significant relationship between the variables, $\chi^2$ (3, 524,789)=7260.11, p<.001. The Partial Eta-Squared showed a small effect size (<.001).

## *Research Question 2*

The results of the One-Way ANOVAs show statistically significant differences in the makeup of designated and undesignated sections, as refers to full-time and part-time status, race/ethnicity, and Pell grant status. The makeup is determined as the percentage of each student that falls into each category.

**Part-Time/Full-Time Status.** There was a significant difference in the mean percentage of full-time (F(1, 6816)= 27.73, p<0.001) and part-time students (F(1, 6816)= 216.83, p<0.001) in designated and undesignated sections. Both designated and undesignated sections had more full-time students than part-time students. However, within that finding, the proportion of part-time students in designated sections was higher relative to undesignated courses. The Brown-Forsythe Test of Equality of Means supported these results F(1, 6818)=206.81, p<.001. The Eta Squared for part-time status (.031) shows a small-medium effect size, while full-time status (.004) has a comparatively small effect size.

**Table 5.** *Descriptive Statistics for Designation Status and Part-Time or Full-Time Student Percentages per Section for Research Question 2*

| Student Makeup | Designation | Section n | Mean % | SD | Std. Error |
|---|---|---|---|---|---|
| Part-Time | No or Low-Cost | 1551 | 43.7134 | 25.45349 | .64631 |
| | Undesignated | 5267 | 33.2390 | 24.37248 | .33583 |
| | Total | 6818 | 35.6218 | 25.00921 | .30288 |
| Full-Time | No or Low-Cost | 1551 | 50.3525 | 26.15923 | .66423 |
| | Undesignated | 5267 | 46.0079 | 29.22738 | .40272 |
| | Total | 6818 | 46.9963 | 28.61457 | .34654 |

**Race/Ethnicity.** There was also a significant difference in the mean percentage of Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, and Asian/Asian American students ($F(1, 6816) = 126.25$, $p<0.001$), white students ($F(1, 6816) = 107.59$, $p<0.001$), and unknown/unreported students ($F(1, 6816) = 84.03$, $p<0.001$). It should be noted that all variables had a significant ($p<0.001$) Levene's Test of Equality of Error Variances, so robust tests were run. The Brown-Forsythe Test of Equality of Means supported these results for white students ($F(1, 6818)=143.79$, $p<.001$); and Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, and Asian/Asian American students ($F(1, 6816)= 153.92$, $p<.001$). The Eta Squared for both categories had a small effect size (.012 and .018, respectively).

There were more white students than any other race/ethnicity category in all sections, regardless of the designation status of the section. However, within that finding, the proportion of Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American students in designated sections was higher compared to undesignated sections (see Table 6).

**Table 6.** *Descriptive Statistics for Designation Status and Student Race/Ethnicity Percentages per Section for Research Question 2*

| Student Makeup | Designation | Section n | Mean % | SD | Std. Error |
|---|---|---|---|---|---|
| Black/African American, Latino/a/x/ Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/ Asian American | No or Low-Cost | 1551 | 38.1353 | 17.00647 | .43183 |
| | Undesignated | 5267 | 31.7405 | 20.42513 | .28144 |
| | Total | 6818 | 33.1952 | 19.88005 | .24076 |
| White | No or Low-Cost | 1551 | 47.8487 | 19.03828 | .48342 |
| | Undesignated | 5267 | 40.7351 | 24.95457 | .34385 |
| | Total | 6818 | 42.3534 | 23.92392 | .28974 |
| Unknown/ Not Reported | No or Low-Cost | 1551 | 11.8884 | 19.64847 | .49891 |
| | Undesignated | 5267 | 19.7393 | 31.99909 | .44092 |
| | Total | 6818 | 17.9533 | 29.82598 | .36122 |

**Pell Grant Eligibility.** Lastly, there was also a significant difference in mean percentage student makeup for designation status and Pell Grant eligible ($p<0.001$, Between groups df=1, Within Groups df= 6816,df=1, F=156.72) and ineligible students ($p=0.03$, Between groups df=1, Within Groups df= 6816,df=1, F=4.72). The proportion of Pell Grant eligible students was greater in the designated sections compared to the undesignated sections (see Table 7). Undesignated sections had a higher proportion of students who were not Pell Grant eligible. The Brown-Forsythe Test of Equality of Means supported these results for students that were not Pell legible ($F(1, 6818)=6.02$, $p= .014$) and those that were ($F(1, 6816)=163.49$, $p<.001$). The Eta Squared for Pell eligible students (.022) shows a small effect size, as well as e Pell ineligible students (.001).

**Table 7.** *Descriptive Statistics for Designation Status and Pell Grant Eligibility Percentages per Section for Research Question 2*

| Student Makeup | Designation | Section n | Mean % | SD | Std. Error |
|---|---|---|---|---|---|
| % Pell Grant Eligible | No or Low-Cost | 1551 | 35.9917 | 19.36684 | .49176 |
| | Undesignated | 5267 | 28.7724 | 20.13272 | .27741 |
| | Total | 6818 | 30.4147 | 20.18784 | .24449 |
| % Not Pell Grant Eligible | No or Low-Cost | 1551 | 61.8807 | 20.74109 | .52665 |
| | Undesignated | 5267 | 63.4432 | 25.98588 | .35806 |
| | Total | 6818 | 63.0878 | 24.89725 | .30152 |

### *Research Question 3a*

To address Research Question 3a, a Factorial ANOVA was performed to compare the effect of designation status on enrollment intensity, measured as the number of credits enrolled per quarter per student. The results of the Factorial ANOVA for Research Question 3a show that all four independent variables are significant for mean credits per student (see Table 8). There were also significant two-variable interactions between designation status and both day the section was offered and time of day the section was offered. The sample sizes for each variable are noted below (see Table 9). It should be noted that this analysis also had a significant ($p<0.001$) Levene's Test of Equality of Error Variances. Therefore, robust tests were used to support the results.

**Table 8.** *Significant Results of Factorial ANOVA for Research Question 3a*

| Variables | Between Groups df | F | Sig. | Within Groups df |
|---|---|---|---|---|
| Designation Status | 1 | 294.512 | <.001* | 176,112 |
| Designation by Day Section Offered | 4 | 124.685 | <.001* | 176,112 |
| Designation by Time Section Offered | 3 | 12.089 | <.001* | 176,112 |

*Note*. *Statistically significant with alpha=0.05.

**Table 9.** *Sample Size By Variable for Factorial ANOVA for Research Question 3a*

| Variable | Level | Student n |
|---|---|---|
| Designation | No or Low-Cost Designation | 40831 |
| | Undesignated | 135330 |
| Day Section Offered | TR[a] | 58569 |
| | MWF[b] | 61826 |
| | Weekend[c] | 2394 |
| | Variable[d] | 7437 |
| | Unknown | 45935 |
| Time Section Offered | Morning[e] | 63078 |
| | Afternoon[f] | 50873 |
| | Unknown | 48345 |
| | Evening[g] | 13865 |

*Note*: [a]Sections with classes on Tuesday and Thursdays. [b]Sections with classes on Monday, Wednesday, and Fridays. [c]Sections with classes only on the weekends. [d]Sections with classes in any other schedule not described above. [e]Section start time before noon. [f]Section start time between noon and 4 pm. [g]Section start time at 5 pm or later.

**Factorial ANOVA by Variable.** The independent ANOVA of each variable shows the differences between groups as described below:

***Designation Status.*** For the designation status, the students in designated sections took a mean of 9.35 credits per term, compared with students in undesignated sections, who took 11.12 credits per term. Therefore, students in undesignated sections had a significantly higher course load each term. The Brown-Forsythe Test supported these results ($F(1, 66065)= 2139.741$, $p<.001$). The Partial Eta-Squared shows a small effect size (.012).

**Two-Factor Analysis Between Variables.** There were two analyses with significant results: designation by day section offered, and designation by time section offered.

***Designation Status and Day Section Offered.*** Students in undesignated sections took a significantly higher mean number of credits per student per term when they enrolled in MWF sections (11.50 credits) and TR sections (11.18 credits). Students in designated sections took a significantly higher mean number of credits, per student per term, when they enrolled in TR sections (10.86 credits) and MWF sections (10.85 credits). Overall, the students in undesignated sections tended to take more credits per term regardless of the day, compared to students taking designated sections; and students enrolled in either MWF or TR sections tended to take more credits per term regardless of the designation status of the sections they enrolled in. There was a small effect size with the Partial Eta-Squared at .010; day on its own had a medium effect size at .067 and is therefore a stronger driver of the variance found.

***Designation Status and Time of Day Section Offered.*** The same pattern that was outlined for designation status by day is also seen with the analysis of designation status by the section time of day. The mean number of credits that students took was significantly higher for all three time of day categories (morning, afternoon, and evening) in undesignated sections compared to students in designated sections. Students in undesignated sections took the highest number of credits in the afternoon sections (11.23 credits), followed by morning sections (11.12 credits). Students in designated sections took the highest mean credits for afternoon sections (9.90 credits), followed by evening sections (9.71 credits), and morning sections (9.63 credits). Overall, students in undesignated sections tended to take more of their credits in the afternoon and morning, while it appears that students who enrolled in designated sections tended to take more of their credits later in the day, from the afternoon on. There was a small effect size with a Partial Eta-Squared of .003; time on its own had a medium effect size at .061 and is therefore a stronger driver of the variance found.

## *Research Question 3b*

To address research question 3b, a Factorial ANOVA was performed to compare the effect of course designation status on enrollment intensity, measured

as the number of credits enrolled per quarter per student. The data was disaggregated by part-time/full-time status, race/ethnicity, and Pell Grant eligibility. The results of the Factorial ANOVA for Research Question 3b show that only one independent variable (part-time/full-time status) is significant for mean credits per student (see Table 10). There were also two-factor interactions for designation status by part-time/full-time status and a three-factor interaction for designation status by Pell Grant eligibility by race/ethnicity. The sample sizes for each variable are noted in Table 11.

**Table 10.** *Significant Results of Factorial ANOVA for Research Question 3b*

| Variables | Between Group df | F | Sig. | Within Group df |
|---|---|---|---|---|
| Designation by Part-Time/Full-Time Status | 2 | 43.263 | <.001* | 176, 124 |
| Designation by Part-Time/Full-Time Status by Race/Ethnicity | 4 | 3.699 | .005* | 176, 124 |
| Designation by Pell Grant Eligibility by Race/Ethnicity | 2 | 6.575 | .001* | 176, 124 |
| Part-Time/Full-Time Status by Pell Grant Eligibility | 2 | 762.503 | .000* | 176, 124 |
| Part-Time/Full-Time Status by Race/Ethnicity | 4 | 6.369 | <.001* | 176, 124 |
| Designation by Part-Time/Full-Time Status by Pell Grant Eligibility by Race/Ethnicity | 3 | 3.338 | .018* | 176, 124 |

*Note*. It should be noted that this analysis also had a significant ($p<0.001$) Levene's Test of Equality of Error Variances.

*Statistically significant with alpha=0.05.

**Table 11.** *Sample Size By Factor for Research Question 3b*

| Variable | Levels | Student n |
|---|---|---|
| Designation | No or Low-Cost Designation | 40831 |
| | Undesignated | 135328 |
| Part-Time/Full-Time Status | Full-Time | 102468 |
| | Part-Time | 72991 |
| | Not Enrolled | 700 |
| Pell Grant Eligibility | Not Pell Grant Eligible | 115634 |
| | Pell Grant Eligible | 60525 |
| Race/Ethnicity | Unknown/ NotReported | 15208 |
| | Black/African American, Latino/a/x/ Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 70685 |
| | White | 90266 |

**Factorial ANOVA by variable**. There were no significant single variable interactions pertinent to this study.

**Two-Factor Analysis Between Variables**. There were significant differences in the analysis of designation status by part-time/full-time status. Full-time students in undesignated sections took slightly more credits (13.92 credits) than full-time students in designated sections (13.61 credits). Similarly, part-time students in undesignated sections also took higher mean credits (7.93 credits) than part-time students in designated sections (7.23 credits). The effect size was small with a Partial Eta-Squared of .002.

**Three-Factor Analysis Between Variables.** There were two significant three-factor analyses: designation status by part-time/full-time status by race/ethnicity, and designation status by Pell Grant eligibility by race/ethnicity (see Appendix C). Both interactions had a small effect size with a Partial Eta-Squared at <.001.

***Designation Status by Part-Time/Full-Time Status by Race/Ethnicity.*** The first analysis shows a higher number of credits taken by Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, and Asian/Asian American students than

students who identified as white or left their race/ethnicity unreported, regardless of part-time/full-time status and designation status. In other words, students who identified as Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, or Asian/Asian American enrolled in a significantly higher number of credits regardless of the presence of the other two variables.

***Designation Status by Pell Grant Eligibility by Race/Ethnicity.*** The second analysis shows that all students in undesignated sections took more credits per term across all categories (part-time/full-time status, race/ethnicity, Pell Grant eligibility) compared to their counterparts in designated sections. It also shows this pattern with Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, and Asian/Asian American students taking higher mean credits, regardless of Pell Grant eligibility or designation status, than students who identified as white or left their race/ethnicity unreported.

## Discussion

The purpose of this study was to determine whether enrollment data showed a connection between student enrollment behavior and the no- or low-cost schedule designation. Data from this study did show that sections with a no- or low-cost designation had a significantly higher percentage of students in the class, compared to the course cap, than undesignated sections (Research Question 1). Sections with the designation had an average fill of 67%, compared to an average fill of 60% for undesignated sections. The difference is not only statistically significant but also has real-world implications; depending on the course cap, this could be the difference between a course running or not, or an instructor being paid at a reduced rate or not.

As outlined at the beginning of this paper, there are three primary stakeholder groups for whom this information is relevant, and there are actions that campus administrators, agency staff, and legislators may take as a result.

First, faculty want to know whether their course material choice may have an impact on enrollment, and it appears that the answer is yes. As Nusbaum and Cuttler (2020) discuss, this finding may not be welcome news for part-time and non-permanent instructors who lack time, resources, or permission to change their course materials adoption. The findings of this study can be used by department chairs and administrators to mitigate this impact for instructors whose employment is precarious. Actionable suggestions based on this finding include:

- Adopt department-wide commitments to use no- and low-cost course materials;
- Encourage part-time instructors to participate in funding opportunities for course redesign when offered; and
- Assign part-time instructors to sec-

tions that are likely to fill for other reasons based on student information system enrollment data (e.g., weekday sections, morning sections, and/or online sections).

Second, bookstore managers, registrars, schedulers, and others invest considerable effort to implement the no- and low-cost schedule designation. People in these back-end roles want to know that their work has an impact that benefits students. This study suggests that these efforts may result in a change in student behavior as students use the information provided in the course schedule to enroll in courses with the no- or low-cost designation. This study adds evidence to the hypothesis that the no- and low-cost schedule designation can be a tool to communicate with students and improve transparency about the total cost of attendance in higher education. Actionable suggestions based on this evidence include:

- Improve the timeliness and accuracy of adoption reporting;
- Improve the usability of the no- and low-cost designation in course scheduling software;
- Market the no- and low-cost designation so that more students know how to use it; and
- Publicly recognize the work of the people who implement it.

Third, the Oregon HECC and legislature want to know the impact of H.B. 2871. The results of the present study suggest that students are potentially using the no- and low-cost schedule designation to lower the total cost of attendance of higher education in Oregon. Agency staff and legislators can use this information along with other initiatives to lower the cost of attendance and ensure that students' basic needs are met. Actionable suggestions based on this finding include:

- Align course marking efforts with other HECC initiatives;
- Earmark funding for course marking implementation and affordability efforts;
- Conduct analysis of which course marking implementations are working well and make recommendations on best practices; and
- Celebrate success through widespread public recognition of implementation and student savings.

The authors also find a significant difference in the percentage of students in designated sections who identified as Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, or Asian/Asian American; had part-time status; or were Pell Grant eligible (Research Question 2). This finding suggests that these historically underserved groups are finding the no- and low-cost designated courses, and that the designation is potentially helping students in these groups get through college with an overall lower cost of at-

tendance. The state and the HECC will be able to use this evidence to show that statewide equity goals are being furthered by H.B. 2871.

The available evidence from the present study does not support the conclusion that historically underserved students had significantly higher enrollment intensity correlated with taking designated courses (Research Question 3). By contrast, Hilton et al. (2016), Wiley et al. (2016), and Griffiths et. al. (2020) do find longer-term impacts in student behavior, as described in the literature review above. Their research suggests that no- and low-cost course materials are associated with lower drop rates, faster credit accumulation, increased retention and graduation rates, and resulting financial benefits for institutions. In the present study, course load differences in the results were statistically significant, but not *educationally* significant—a fraction of a course does not represent a real-world effect that would speed a student towards graduation. Therefore, the findings of the present study do not suggest that students plow textbook savings back into tuition by enrolling in more courses per term.

In fact, the present study finds that students in designated sections had a lower credit load per term than students in undesignated sections by about two credits per term, which can also be understood as one or two courses per year (and this was the case for both full-time and part-time students). The students enrolling in sections with the no- or low-cost schedule designation, then, may take longer to get through college. The authors suggest that these students may be full-time workers, have families, or juggle other demands on their time. However, they may also benefit from lower cost of attendance because they spend less on course materials over that longer time. In this analysis, the lower credit load may be a proxy for financial need in the data. Therefore, from a scheduling standpoint, if the goal is to offer no- or low-cost sections to students who need it most, these sections should be scheduled for days and times outside of business hours, offered online, and so on.

As discussed in the literature review above, students often make course selection based on a wide variety of factors that the present study does not account for. The results of the present study may provide the basis for the design of a qualitative student study to better understand how and why students make decisions, and how much weight the schedule designation or textbook cost carries. A very ambitious future study would cross-reference quantitative enrollment data with qualitative student response data to get a fuller picture.

## Limitations

This study has limitations which may mean that the results are not generalizable beyond the population studied.

To begin with the limitation that is top of mind, the authors requested enrollment data from Fall 2019 and earlier in order to avoid the disruption

of the COVID-19 pandemic showing up in the data set. However, solving for this problem introduces new questions about whether pre-COVID-19 behaviors are applicable to the uncertain future of higher education. Future studies will be able to capture post-COVID-19 enrollment data over multiple terms.

The data set may not be representative. The authors received data from 6 out of Oregon's 24 public community colleges and universities. The participating institutions represented a fraction of the state's student headcount, and the sections of courses analyzed had major demographic differences from the state overall. Future studies with bigger sample sizes will see less effect from missing data or categories with too-small data sets. For example, with a bigger sample size, future research may be able to disaggregate beyond the three race/ethnicity categories that the present study used.

Further, there were several ways in which the data in the present study was unbalanced. First, the number of undesignated courses is much bigger than the designated courses in the sample (designated sections made up 23% of the sample). Second, the number of white students is larger than the number of students who identified as Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, or Asian/Asian American (51% of students identified as white, and 37% of students identified as Black/African American, Latino/a/x/Hispanic, Native American/Alaska & Native/Native Hawaiian/Pacific Islander, or Asian/Asian American; the remainder did not report their race/ethnicity). Likewise, the numbers of full-time students and students who were not eligible for the Pell Grant were larger than the number of part-time and Pell Grant eligible students (Part-Time students made up 42% of the sample; Pell Grant eligible students made up 34% of the sample).

As with any educational research, there were many confounding variables that the authors could not control. For example, the present study does not consider whether the number of courses offered was different depending upon time of day and day of week, and whether this influences the results. The present study does also not consider the effectiveness of the schedule designation from a student communication standpoint or any of the other course selection considerations raised in the literature review above.

Other limitations are baked into the methodological choices that the authors made. For example, the scope of this analysis was narrowed to the top ten highest enrolled transfer courses in Oregon's community colleges and universities and does not consider any other course offerings. The race/ethnicity categories used by the HECC are not neutral terms and are unlikely to accurately represent the racial or ethnic identities of many students. Student-level data had duplication issues that made the findings of Research Question 3 exploratory only.

## Conclusion

The present study is, to the authors' knowledge, the first to make a connection between student enrollment data and the presence of the no- or low-cost schedule designation. The implications of this finding are significant for multiple stakeholder groups who can take action to promote the designation to students, mitigate its impact on precarious faculty, and celebrate the success of an effective statewide policy.

While the authors did not find that historically underserved students had significantly higher enrollment intensity correlated with taking designated courses, it is encouraging to see evidence that historically underserved groups are finding the no- and low-cost designated courses, and that the designation is potentially helping students in these groups get through college with an overall lower cost of attendance.

The limitations of the study mean that these results may not be generalizable. The replicability of the method used is also a significant outcome to share, in the hopes that others will conduct similar studies in other settings and with larger data sets.

## References

Ainsworth, B., Allen, A., Dai, J., Elder, E., Finkbeiner, N., Freeman, A., Hare, S., Helge, K., Helregel, N., Hoover, J., Kirschner, J., Perrin, J., Ray, J., Raye, J., Reed, M., Schoppert, J., & Thompson, L. (2020a). Assessment. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/chapter/assessment/

Ainsworth, B., Allen, A., Dai, J., Elder, E., Finkbeiner, N., Freeman, A., Hare, S., Helge, K., Helregel, N., Hoover, J., Kirschner, J., Perrin, J., Ray, J., Raye, J., Reed, M., Schoppert, J., & Thompson, L. (2020b). Introduction. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/front-matter/introduction/

Ainsworth, B., Allen, A., Dai, J., Elder, E., Finkbeiner, N., Freeman, A., Hare, S., Helge, K., Helregel, N., Hoover, J., Kirschner, J., Perrin, J., Ray, J., Raye, J., Reed, M., Schoppert, J., & Thompson, L. (2020c). Other stakeholders. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/chapter/other-stakeholders/

Ainsworth, B., Allen, A., Dai, J., Elder, E., Finkbeiner, N., Freeman, A., Hare, S., Helge, K., Helregel, N., Hoover, J., Kirschner, J., Perrin, J., Ray, J., Raye, J., Reed, M., Schoppert, J., & Thompson, L. (2020d). Talking points. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/chapter/talking-points/

Appedu, S., Elmquist, M., Wertzberger, J., & Birch, S. (2021). Inequitable impacts of textbook costs at a small, private college: Results from a textbook survey at Gettysburg College. *Open Praxis, 13*(1), 69-87. https://eric.ed.gov/?id=EJ1295590

Beile, P., deNoyelles, A., & Raible, J. (2020). Analysis of an open textbook adoption in an American history course: Impact on student academic outcomes and behaviors. *College & Research Libraries, 81*(4), 721-736. https://doi.org/10.5860/crl.81.4.721

Bound, J., Lovenheim, M. F., & Turner, S. (2012). Increasing time to baccalaureate degree in the United States. *Education Finance and Policy, 7*(4), 375-424. https://doi.org/10.1162/EDFP_a_00074

Clinton, V., & Khan, S. (2019). Efficacy of open textbook adoption on learning performance and course withdrawal rates: A meta-analysis. *AREA Open 5*(3), 1-20. https://doi.org/10.1177/2332858419872212

Clinton, V., Legerski, E., & Rhodes, B. (2019). Comparing student learning from and perceptions of open and commercial textbook excerpts: A randomized experiment. *Frontiers in Education, 4*(110), 1-12. https://doi.org/10.3389/feduc.2019.00110

Colvard, N. B., Watson, C. E., & Park, H. (2018). The impact of open educational resources on various student success metrics. *International Journal of Teaching and Learning in Higher Education, 30*(2), 262-276. http://www.isetl.org/ijtlhe/pdf/IJTLHE3386.pdf

Cummings-Clay, D. (2020). Impact of OER in teacher education. *Open Praxis, 12*(4), 541-554. https://doi.org/10.5944/openpraxis.12.4.1112

Darolia, R. (2014). Working (and studying) day and night: Heterogeneous effects of working on the academic performance of full-time and part-time students. *Economics of Education Review, 38*, 38-50. https://doi.org/10.1016/j.econedurev.2013.10.004

Dempsey, M. (2021). The impact of free and open educational resource adoption on community college student achievement and course withdrawal rates. *The International Journal of Open Educational Resources, 4*(1). DOI: 10.18278/ijoer.4.1.

Delgado, H., Delgado, M., & Hilton III, J. (2019). On the efficacy of open educational resources: Parametric and nonparametric analyses of a university calculus class. *International Review of Research in Open and Distributed Learning, 20*(1), 183-203. https://doi.org/10.19173/irrodl.v20i1.3892

Domaika, C. (2020). Nicolet College. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/chapter/nicolet-college/

Engler, J. N., & Shedlosky-Shoemaker, R. (2019). Facilitating student success: The role of open educational resources in introductory psychology courses. *Psychology Learning & Teaching, 18*(1), 36-47. https://doi.org/10.1177/1475725718810241

Fialkowski, M. K., Calabrese, A., Tilinghast, B., Titchenal, C. A., Meinke, W., Banna, J. C., & Draper, J. (2020). Open educational resource textbook impact on students in an introductory nutrition course. *Journal of Nutrition Education and Behavior, 52*(4), 359-368. https://doi.org/10.1016/j.jneb.2019.08.006

Fowler, J., Snapp, B., Johns, C., Andrews, D., Boros, D., Clemens, H., Ferdinand, V., Findell, B., Husen, B., Johnson, J. H., Lakos, N., Miller, E., Ramsey, B., Sheldon, J., Talamo, J., & Carlson, T. (2021). An open-source calculus textbook on the Ximera platform. *PRIMUS, 31*(9), 925-939. https://doi.org/10.1080/10511970.2020.1781720

Ginder, S.A., Kelly-Reid, J.E., Mann, F.B. (2018, December). *Graduation rates for selected cohorts, 2009-14; outcome measures for cohort year 2009-10; student financial aid, academic year 2016-17; and admissions in postsecondary institutions, Fall 2017: First look (provisional data)*. NCES 2018-151. National Center for Education Statistics: Institute of Education Sciences. https://nces.ed.gov/pubs2018/2018151.pdf

Griffiths, R., Mislevy, J., Wang, S., Ball, A., Shear, L., Desrochers, D. (2020). *OER at Scale: The Academic and Economic Outcomes of Achieving the Dream's OER Degree Initiative.* Menlo Park, CA: SRI International. https://www.achievingthedream.org/resource/17993/oer-at-scale-the-academic-and-economic-outcomes-of-achieving-the-dream-s-oer-degree-initiative

Grinias, J.P., & Smith, T.I. (2020). Preliminary evidence on the effect of an open-source textbook in second-year undergraduate analytical chemistry courses. *Journal of Chemical Education, 97*(8), 2347-2350. https://doi.org/10.1021/acs.jchemed.0c00293

Hardin, E. E., Eschman, B., Spengler, E. S., Grizzell, J. A., Moody, A. T., Ross-Sheehy, S., & Fry, K. M. (2019). What happens when trained graduate student instructors switch to an open textbook? A controlled study of the impact on student learning outcomes. *Psychology Learning & Teaching, 18*(1), 48-64. https://doi.org/10.1177/1475725718810909

Hare, S., Kirschner, J., & Reed, M. (Eds.) (2020). *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/

H.B. 2213, 80th Or. Legis. Assemb., 2019 Reg. Sess. (Or. 2019). https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB2213/Enrolled

H.B. 2871, 78th Or. Legis. Assemb., 2015 Reg. Sess. (Or. 2015). https://olis.oregonlegislature.gov/liz/2015R1/Measures/Overview/HB2871

H.B. 2919, 81st Or. Legis. Assemb., 2021 Reg. Sess. (Or. 2021). https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2919

Hilton, J. (2020). Open educational resources, student efficacy, and user perceptions: A synthesis of research published between 2015 and 2018. *Education Tech Research Dev, 68*, 853-876. https://doi.org/10.1007/s11423-019-09700-4

Hilton, J., Fischer, L., Wiley, D., & Williams, L. (2016). Maintaining momentum toward graduation: OER and the course throughput rate. *International Review of Research in Open and Distributed Learning, 17*(6), 18-27. https://doi.org/10.19173/irrodl.v17i6.2686

Jenkins, J.J., Sánchez, L.A., Schraedley, M.A.K., Hannans, J., Navick, N., & Young, J. (2020). Textbook broke: Textbook affordability as a social justice issue. *Journal of Interactive Media in Education, 2020*(1), p.3. http://doi.org/10.5334/jime.549

Jhangiani, R. (2020). Kwantlen Polytechnic University. In S. Hare, J. Kirschner, & M. Reed (Eds.), *Marking open and affordable courses: Best practices and case studies.* Mavs Open Press. Retrieved from https://uta.pressbooks.pub/markingopenandaffordablecourses/chapter/kwantlen-polytechnic-university/

Jhangiani, R. S., Pitt, R., Hendricks, C., Key, J., Lalonde, C. (2016, January 18).

BCcampus research report: Exploring faculty use of open educational resources at British Columbia post-secondary institutions. BCcampus. https://bccampus.ca/2016/01/27/exploring-faculty-use-of-open-educational-resources-in-b-c-post-secondary-institutions/

Johnson, J., & Bozeman, B. (2012). Perspective: Adopting an asset bundles model to support and advance minority students' careers in academic medicine and the scientific pipeline. *Academic Medicine, 87*(11), 1488-1495. https://doi.org/10.1097/ACM.0b013e31826d5a8d

Jones, M., & Nyland, R. (2020). A case study in outcomes on open-source textbook adoption in an introduction to art class. *Frontiers in Education, 5*(92), 1-6. https://doi.org/10.3389/feduc.2020.00092

Kalaf-Hughes, N. (2021). Reaching students with low interest: Subject matter interest and perceptions of open educational resources in an introductory American government course. *Journal of Political Science Education, 17*(1), 459-485. https://doi.org/10.1080/15512169.2019.1694530

Lambert, S. (2018). Changing our (dis)course: A distinctive social justice aligned definition of open education. *Journal of Learning for Development, 5*(3), 225-244. https://jl4d.org/index.php/ejl4d/article/view/290

Lieberman, M. (2017, December 6). OER and affordable-textbook labeling gains ground. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/digital-learning/article/2017/12/06/states-mandate-oer-and-affordable-textbook-labeling-challenges

National Center for Education Statistics. (2020). *Digest of education statistics: 2020*. U.S. Department of Education. https://nces.ed.gov/programs/digest/d20/

National Student Clearinghouse Research Center. (2021, February 9). *Yearly success and progress rates*. https://nscresearchcenter.org/yearly-success-and-progress-rates/

Nusbaum, A.T., & Cuttler, C. (2020). Hidden impacts of OER: Effects of OER on instructor ratings and course selection. *Frontiers in Education*, *5*, Article 72, 1-7. https://doi.org/10.3389/feduc.2020.00072

Nusbaum, A.T., Cuttler, C. and Swindell, S. (2020). Open educational resources as a tool for educational equity: Evidence from an introductory psychology class. *Frontiers in Education, 4*(152), 1-8. https://doi.org/10.3389/feduc.2019.00152

Oregon Higher Education Coordinating Commission. (n.d.). *Oregon community colleges data mart, state level student head count, 2019-20, ethnicity/race.* https://datamart.hecc.oregon.gov/Screens/Student/StudentHeadCountStateLevel.aspx

Oregon Higher Education Coordinating Commission. (2021a). *Oregon HECC Equity Lens*. https://www.oregon.gov/highered/about/Documents/State-Goals/Equity-Lens.pdf

Oregon Higher Education Coordinating Commission. (2021b). *Oregon public university student head count by race/ethnicity (2019–20).* https://www.oregon.gov/highered/research/Documents/Student/Uni-Headcount-by-race.pdf

Oregon Higher Education Coordinating Commission. (2021c). *Statewide higher education snapshots 2019–20.* https://www.oregon.gov/highered/research/Pages/snapshots.aspx

Open Oregon Educational Resources. (2018, July 17). *Evaluating Oregon's Open Educational Resources designation requirement*. https://openoregon.org/evaluating-oregons-open-educational-resources-designation-requirement/

Open Oregon Educational Resources. (2019, July 10). *Estimated 2017–19 student savings in no-cost/low-cost courses.* https://openoregon.org/estimated-2017-19-student-savings/

Open Oregon Educational Resources. (2021, August 27). *Estimated 2019–21 student savings in no-cost/low-cost courses*. https://openoregon.org/estimated-2019-21-student-savings/

Spilovoy, T., Seaman, J., & Ralph, N. (2020). The impact of OER initiatives on faculty selection of classroom materials. Bay View Analytics. http://onlinelearningsurvey.com/reports/impactofoerinitiatives.pdf

Reed, M. (2017, November 8). Ask the administrator: Labeling OER sections. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/blogs/confessions-community-college-dean/ask-administrator-labeling-oer-sections

Smith, N. D., Grimaldi, P. J., & Basu Mallick, D. (2020). Impact of zero cost books adoptions on student success at a large, urban community college. *Frontiers in Education, 5*, 179-189. https://doi.org/10.3389/feduc.2020.579580

Stoudamire-Wesley, S., Cheang, S., Hsiao, C.A., Kotting, J., & Callen, A. (2021). *State of Oregon Diversity, Equity, and Inclusion Action Plan*. https://www.oregon.gov/lcd/Commission/Documents/2021-09_Item-2_Directors-Report_Attach

ment-A_DEI-Action-Plan.pdf

Stovall, J. P., Laird, S. G., Welford, L., & Williams, A. (2019). Student and instructor generated open educational resources compare favorably to a traditional textbook. *Journal of Forestry, 117*(4), 370-378. https://doi.org/10.1093/jofore/fvz035

U.S. Department of Education. (2013, May). Frequently Asked Questions—Disclosure Avoidance. https://studentprivacy.ed.gov/sites/default/files/resource_document/file/FAQs_disclosure_avoidance_0.pdf

U.S. Department of Education. (2020). National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), fall enrollment component final data (2006 - 2019) and provisional data (2020). https://nces.ed.gov/ipeds/TrendGenerator/app/answer/7/33?f=6%3D41

Vander Waal Mills, K.E., Gucinski, M., & Vander Waal, K. (2019). Implementation of open textbooks in community and technical college biology courses: The good, the bad, and the data. *CBE–Life Sciences Education, 18*(44), 1-10. https://doi.org/10.1187/cbe.19-01-0022

Wiley, D., Williams, L., DeMarte, D., & Hilton, J. (2016). The Tidewater Z-Degree and the INTRO model for sustaining OER adoption. *EducationPolicy Analysis Archives, 23*(41). https://doi.org/10.14507/epaa.24.1828

Zach. (2020a). *How to perform a One-Way ANOVA in SPSS*. Statology. https://www.statology.org/one-way-anova-spss/

Zach. (2020b). *What is Eta Squared?*. Statology. https://www.statology.org/eta-squared/#:~:text=Eta%20squared%20is%20a%20measure,effect%20in%20an%20ANOVA%20model

Zach. (2021, March 9). *What is a Factorial ANOVA? (Definition & example)*. Statology. https://www.statology.org/factorial-anova/

# Appendix A

## *Letter to Institutional Research Offcies*

November 18, 2020

Dear {{First Name}},

Open Oregon Educational Resources is conducting research to determine whether the no-cost/low-cost schedule designation required at Oregon's community colleges and universities by HB 2871 has an effect on student enrollment behavior. Additionally, we'll determine whether the no-cost/low-cost schedule designation has an effect on course completion and enrollment intensity, and whether there is a different effect for traditionally underserved student populations.

Read more about the project and the data requested: https://tinyurl.com/designationdata

The Institutional Review Board at Linn-Benton Community College has reviewed the protocols and instruments associated with this study and has approved the study going forward.

It would greatly help this research project to have {{Institution}}'s participation. To participate in this study, please submit your data to our secure drop-box form at Umpqua Community College at this link by December 18, 2020: https://www.umpqua.edu/ooer-dropbox

If you have any questions or would like to arrange a different date for submission, please contact hofera@linnbenton.edu.

Thank you!

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## Appendix B

### *Research Question and Data Request*

## Purpose

Determine whether the no-cost/low-cost schedule designation required at Oregon's community colleges and universities by HB 2871 has an effect on student enrollment behavior. Additionally, determine whether the no-cost/low-cost schedule designation has an effect on course completion and enrollment intensity, and whether there is a different effect for traditionally underserved student populations.

## Audience

- Faculty want to know whether their course material choice may have an impact on enrollment. If their course doesn't make or is under-enrolled, they see a financial impact.
- Bookstore managers and other stakeholders who implement the no-cost/low-cost schedule designation want to know that their efforts have an impact that benefits students.
- The HECC and Oregon legislature want to know the impact of HB 2871 (passed in 2015) which required the no-cost/low-cost schedule designation on the assumption that students benefit when cost information is available upfront.

## Research Questions

1. Does the presence of no-cost/low-cost schedule designation affect student enrollment behavior?
    a. Is there an effect on course enrollment (defined as the final number on the last day to add/drop)?
    b. Is there an effect on course fill rate (how quickly course filled)?
2. Is there a significant difference in enrollment intensity (number of credits enrolled per quarter per student) in courses with the no-cost/low-cost schedule designation compared to courses without the designation?
    a. Is there an additive effect (number of additional credits increases with enrollment in more designated courses)?
3. Is there a significant difference in course enrollment, course fill rate, or

enrollment intensity if the data is disaggregated as follows?

a. Part-time vs full-time status
b. Race/ethnicity
c. Pell grant eligibility
d. Age
e. Sex/gender

## Methodology

Data requests will be made to the offices of institutional research at 15 out of Oregon's 17 community colleges and 6 out of Oregon's 7 universities in Oregon for the top 10 transfer courses statewide by enrollment in all terms since the no-cost/low-cost schedule designation was implemented. The institutions below are eligible because they implemented the designation prior to Fall 2019:

- Blue Mountain Community College
- Central Oregon Community College
- Chemeketa Community College
- Clackamas Community College
- Columbia Gorge Community College
- Klamath Community College
- Lane Community College
- Linn-Benton Community College
- Mt. Hood Community College
- Portland Community College
- Rogue Community College
- Southwestern Oregon Community College
- Tillamook Bay Community College
- Treasure Valley Community College
- Umpqua Community College
- Oregon Institute of Technology
- Oregon State University

- Portland State University
- Southern Oregon University
- University of Oregon
- Western Oregon University

### *Data Requested*

We request data for all sections of the following courses, which are the top 10 transfer courses statewide by enrollment (based on 2017–18 HECC data):

| Course # | Total 2017–18 Enrollment |
|---|---|
| WR 121 | 36197 |
| MTH 111 | 23625 |
| WR 122 | 20109 |
| COM 111 | 16809 |
| MTH 112 | 14119 |
| EC 201 | 13632 |
| MTH 243 | 13361 |
| BA 101 | 12752 |
| MTH 251 | 11779 |
| PSY 201 | 10994 |

Table B1. Top 10 transfer courses in Oregon statewide by enrollment.

Please include data for all terms when the no-cost/low-cost schedule designation was present in the course schedule, up to and including Fall 2019. Each institution may send data for a different number of terms depending on when they implemented the schedule designation.

| **Data requested** | **Definition/notes** |
|---|---|
| Term offered | Fall, Winter, Spring, Summer |
| Year offered | Calendar year, e.g. 2019 |
| Registration start date for term | mm/dd/yyyy |
| Date term started | mm/dd/yyyy |
| Last date to add/drop | mm/dd/yyyy. Internally consistent per institution even though may differ between institutions. |

| | |
|---|---|
| Designation Status | Valid responses:<br>1=No Cost<br>2=Low Cost<br>3=Combined no/low designation<br>4=None |
| Course prefix | E.g. WR |
| Course Number | E.g. 121 |
| CRN | String or number? |
| Instructor Name | Last, First |
| Delivery Method | Online: courses taught completely online, asynchronously<br>In-Person: Courses taught synchronously at specific meeting dates/times<br>Hybrid: Courses that are taught partially online and asynchronously but that have some synchronous class meeting times |
| Campus location | For institutions with multiple locations |
| Section day | M, T, W, Th, F, Sa, Su |
| Section time | 00:00-00:00 |
| Course ran or was cancelled | Valid responses:<br>1=Course ran<br>2=Course cancelled |
| Date that course filled, for courses that hit enrollment cap | mm/dd/yyyy |
| Date that each student first enrolled in course | mm/dd/yyyy |
| Date that each student dropped the course | mm/dd/yyyy |
| Course cap | Number |
| Enrollment count on last day to add/drop | Number |

| | |
|---|---|
| Total credits enrolled in at census date for each student in section | Number |
| Pell eligibility for each student in section | Yes/No |
| Race of each student in section | American Indian Or Alaskan Native<br>Asian<br>Black<br>Hispanic Or Latino<br>International<br>Multi-Racial/Ethnic<br>Not Reported<br>Pacific Islander<br>White |
| Full-time/part-time status of each student in section | Full-time<br>Part-time |
| Sex/gender of each student in section | Not Reported<br>Female<br>Male<br>Other Gender |
| Age of each student in section | Not Reported<br>If reported, number |

Table B2. Data requested from offices of institutional research at Oregon's community colleges and public institutions.

### *Schedule Designation Evaluation*

In order to quantify the visibility and ease of use of the institution's schedule designation, we created an instrument for the research group to score the visibility and ease per the recommendations of the report created for the HECC (Open Oregon Educational Resources, 2018). We then used an average of the scores to determine the visibility and ease of use of the schedule designation using the following criteria:

- Located next to the course name and CRN when registering online (Y/N).
- The meaning of the designation is clear (on a scale of 1-5).
- It is noticeable (on a scale of 1-5).
- Can easily search and find a list of all no cost courses (on a scale of 1-5).
- Can easily search and find a list of all low cost courses (on a scale of 1-5).

## *Data Analysis*

### Research Question One

This question addresses whether course materials cost designation (i.e., low cost, no cost, or none) affects course enrollment levels and fill rates. Enrollment level is defined as final student count on the last day to add/drop the course. Course fill rate addresses how quickly a course fills and is defined by the date that the course filled after the start of registration or % enrollment compared to course cap over the defined registration period for those courses that did not fill. In order to analyze course designation effects on course enrollment, we will use an analysis of variance (ANOVA) to compare the mean student counts on the last add/drop date for courses based on the three designations. This will allow us to determine if there is a statistically significant difference between the class counts among our three designations. ***The effects of course designation on fill rate can be done one of two ways: either with linear regression or ANOVA. If we can get a scatterplot of enrollment by day, like I showed in our last meeting, then we can use linear regression to predict fil rates for our different course designations. If that doesn't happen for all schools, then we can just do a count of how many days it took to fill the course and run an ANOVA on the mean.***

### Research Question Two

This question addresses whether there is a significant difference in enrollment intensity (i.e., number of credits enrolled per quarter per student) in courses with the no-cost/low-cost schedule designation compared to courses without the designation. An ANOVA will be run to analyze the means between our course designation levels/statuses as relates to the quarter credits for our students over the number of terms for which data is available at each institution, depending on when the no-cost/low-cost schedule designation was implemented. We can then determine if there is a statistically significant difference in credit loads among students who enrolled in designated courses.

**Research Question Three**

We hope to disaggregate the data based on: institution, part-time vs full-time status, race/ethnicity, Pell grant eligibility, age, and sex/gender in order to see if there are statistically significant differences among these groups in relation to course enrollment, course fill rate, student outcomes, or enrollment intensity. If final data cell counts allow for statistical validity, we will use Chi-Squared analyses of observed versus expected counts to determine if the low or no cost options differ from the courses without the designation in relation to our outcomes.

## Privacy Considerations

### *Confidentiality Statement*

The data will be deidentified before analysis so that it does not include student names or identification numbers, faculty names or identification numbers, or CRNs.

Final report will be aggregated at a level to assure student anonymity. Where cell sizes are less than 10, per federal guidance, samples will be combined for analysis (U.S. Department of Education, 2013). For example, demographic data on race may be combined into white and non-white populations if groups within the non-white category are too small.

Final report will mask institution names by replacing names with identifiers such as College A, College B, etc., and removing identifying attributes (e.g., use percentages rather than proportions in order to avoid stating FTEs).

### *Data Security*

We will take care to protect the data we collect; however, a very determined person or a data breach presents a risk of loss of confidentiality. These are the steps we will take to mitigate risk and keep all data secure.

Umpqua Community College (UCC) has a secure drop-box on its website where data can be sent. The file is swept away immediately, so even if the website is penetrated, the file will be secure. All files containing identifiable information should be sent as password-protected Excel files. Passwords will be shared by phone.

UCC will securely store the files for the length of the study (anticipated through July 1, 2022). After that time all data will be deleted.

## Anticipated questions for discussion section

1. How does the presence of institutional support for OER correlate with research findings regarding the no-cost/low-cost schedule designation (Jhangiani et al., 2016, p. 32-34; Spilovoy et al., 2020)? Institutional supports include:
    i. OER librarian FTE
    ii. Availability of print copies of OER in bookstore
    iii. Availability of instructional design support
    iv. OER adoption or creation grants
    v. Faculty participation in Open Textbook Network workshops or other professional development
    vi. Institutional policy or collective bargaining agreement allowing faculty to add Creative Commons licenses to course material they create for the college
    vii. Institutional policy supporting OER adoption or textbook affordability
2. Does the visibility, ease of use, or reliability of data for the institution's schedule designation correlate with higher enrollment levels and faster course fill rates for no cost/low cost designated courses?
    a. Has the designation implementation changed during the time studied?
    b. Account for nonstandard implementation across the state?
    c. Data provided for this study may also have caveats, eg enrollment caps may not reflect classroom space, faculty may not report adoptions on time
3. Does a greater difference in cost savings, before and after the no cost/low cost designation was added, correlate with higher enrollment levels and faster course fill rates for no cost/low cost designated courses? (e.g., courses with historically high textbook prices like STEM vs WR)
    a. Information may be available where OER initiatives have collected it (e.g., PCC, LBCC) and for courses that have received statewide grants
    b. Connect with Colvard, Watson & Park (2018) method, topic for future research
4. Confounding variables limit our confidence in the correlations we find. This is a typical problem with educational research but also puts caveats on any claims we can make. Are there other factors that have a bigger impact on enrollment behavior than presence/absence of the designation? Examples:

a. Major or program that the student is enrolled in

b. Prior academic achievement

## References

Colvard, N. B., Watson, C. E., & Park, H. (2018). The impact of open educational resources on various student success metrics. *International Journal of Teaching and Learning in Higher Education, 30*(2), 262-276. http://www.isetl.org/ijtlhe/pdf/IJTLHE3386.pdf

Jhangiani, R. S., Pitt, R., Hendricks, C., Key, J., Lalonde, C. (2016, January 18). BCcampus research report: Exploring faculty use of open educational resources at British Columbia post-secondary institutions. BCcampus. https://bccampus.ca/2016/01/27/exploring-faculty-use-of-open-educational-resources-in-b-c-post-secondary-institutions/

Open Oregon Educational Resources. (2018, July 17). Evaluating Oregon's Open Educational Resources Designation Requirement. https://openoregon.org/evaluating-oregons-open-educational-resources-designation-requirement/

Spilovoy, T., Seaman, J., & Ralph, N. (2020). The impact of OER initiatives on faculty selection of classroom materials. Bay View Analytics. http://onlinelearningsurvey.com/reports/impactofoerinitiatives.pdf

U.S. Department of Education. (2013, May). Frequently Asked Questions—Disclosure Avoidance. https://studentprivacy.ed.gov/sites/default/files/resource_document/file/FAQs_disclosure_avoidance_0.pdf

## Appendix C

### *Three Variable Descriptive Statistics for Research Question 3b*

| Variable 1 | Variable 2 | Variable 3 | Mean Credits | Std. Error |
|---|---|---|---|---|
| Designation Status | Part-Time/ Full-Time Status | Race/Ethnicity | | |
| No or Low-Cost Designation | Full-Time | Unknown/NotReported | 13.583 | .062 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 13.674 | .026 |
| | | White | 13.582 | .025 |
| | Part-Time | Unknown/NotReported | 7.156 | .073 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 7.321 | .032 |
| | | White | 7.219 | .030 |
| Undesignated | Full-Time | Unknown/NotReported | 13.634 | .032 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 14.112 | .014 |
| | | White | 14.010 | .013 |
| | Part-Time | Unknown/NotReported | 7.311 | .042 |

| | | | | |
|---|---|---|---|---|
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 8.280 | .018 |
| | | White | 8.197 | .018 |
| Designation Status | Pell Grant Eligibility | Race/Ethnicity | | |
| No or Low-Cost Designation | Not Pell Grant Eligible | Unknown/NotReported | 6.680 | .484 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 6.884 | .233 |
| | | White | 6.853 | .165 |
| | Pell Grant Eligible | Unknown/NotReported | 10.718[a] | .081 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 7.113 | .280 |
| | | White | 7.014 | .419 |
| Undesignated | Not Pell Grant Eligible | Unknown/NotReported | 6.947 | .242 |
| | | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 7.419 | .062 |
| | | White | 7.374 | .048 |

| | | | |
|---|---|---|---|
| Pell Grant Eligible | Unknown/NotReported | 7.016 | .484 |
| | Black/African American, Latino/a/x/Hispanic, Native American/ Alaska & Native/Native Hawaiian/Pacific Islander, Asian/Asian American | 7.509 | .099 |
| | White | 7.430 | .103 |