UC Berkeley Students' Perceptions and Consumption of Green Cosmetics

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ABSTRACT

The cosmetics industry faces many environmental challenges and is transitioning to green cosmetic products that are made to be more sustainable. The switch to green cosmetics for the industry and students especially may be attributed to exposure to environmental education (EE), which is what my thesis aims to explore. I interview industry professionals to determine the extent of EE's influence on the production of green products and I survey UC Berkeley students to determine their propensity to buy green products given their EE exposure (completion of the American Cultures requirement and sustainability courses) and existing consumer perceptions (value, ethicality, and green product knowledge). The interviews revealed the importance of consumer demand. Additionally, the responses demonstrated the necessity to integrate EE within the cosmetics industry and expose people to consumer-focused EE. The survey results showed that priority for green products varies, such as facial versus body products. Consumption of cosmetics also largely depends on socioeconomic factors (56.4% of students ranked price the most important factor) and individualized needs such as acne. There was also an insignificant difference in green product knowledge between students who are more exposed to EE and those who are less exposed. These results suggest the lack of consumer-focused EE at UC Berkeley, despite the large range of topics that the institution offers. This thesis can be applied to other academic institutions that are looking to improve their EE programs and even the general public's exposure to consumer-focused EE.

KEYWORDS

INTRODUCTION

The cosmetics industry has strong associations with overproduction and overconsumption (Correa 2023). Cosmetic products include makeup, skincare, haircare, fragrances, and toiletries. It is a fast-growing global industry that makes over $500 billion in revenue each year (Danziger 2019). A significant downside to the cosmetics industry is the environmental damage. Many products are made with harmful ingredients like UV filters, parabens, triclosan, and plastic microbeads (Juliano and Magrini 2017). There are also organizational issues such as unethical sourcing, non-recyclable product packaging, natural resource depletion, and more (Delmas and Burbano 2011). These are serious threats to the environment and there is little to no regulation in preventing them. Many stakeholders in the cosmetics industry are focusing on shifting their company values as consumers are becoming more concerned about the consequences of their purchasing habits (Delmas and Burbano 2011, Suphasomboon and Vassanadumrongdee 2022). Consumers are influenced to buy eco-friendly alternatives, which are also known as green cosmetics.

Green cosmetics are products that are intentionally made to be sustainable or manufactured using eco-friendly practices (Safdie 2023). They are commonly made without the harmful ingredients and instead formulated with ones that are ethically-sourced and renewable, such as plant-based oils and extracts (Meza 2023). They are also typically sold in glass, biodegradable plastic, and/or refillable packaging to alleviate the accumulation of plastic pollution within the industry (Dillon 2023). The sustainability issues that green cosmetics aim to address are important topics in environmental education (EE). EE is a collection of processes to teach people about the environment and its challenges. It also revolves around the ways that humans utilize nature based on social, economical, political, and cultural aspects of their lives (Tilbury 1995). This is relevant to the value of cosmetics among users. The purpose of EE is to encourage the development of initiatives that help solve these challenges and sustain the ways that humans live today (Tilbury 1995). The transition to green cosmetics is a solution to overconsumption and other environmental damages and it may be attributed to EE.

The extent to which EE shapes consumers' attitudes and behaviors towards green cosmetics is understudied. The cosmetics industry emphasizes its commitment to sustainability in many ways, but there is also limited comprehension in how EE is integrated in business practices

(Simões and Sebastiani 2017). However, EE continues to be an effective tool to encourage socially and environmentally sustainable habits, especially when the topics are issues that are culturally relevant and ones that consumers tackle personally (Chawla and Cushing 2007, Clusserath 2015). Since cosmetics is widely used among people, EE is important in understanding the consumption of green products. Many universities and other academic institutions integrate EE into their curriculum and it has been shown to improve students' environmental literacy (Fletcher 2023). The expansion of their environmental literacy in turn impacts their decision-making with respect to what they learn (Bruyere 2008). Therefore, the knowledge that students have about green goods like cosmetics products may influence what they purchase.

I researched patterns of green cosmetics consumption among UC Berkeley students and how they are attributed by environmental courses that they have taken. I answered this through three subquestions: what is the role of EE within the cosmetics industry, how do students choose cosmetic products, and are students exposed to EE. I expected to find that many lessons in EE are relevant to the cosmetics industry and consumerism. I also expected to find a positive correlation between the proportion of students that purchase green products and their exposure to EE. The findings of my research are important because they address the knowledge gap between how education can reduce the effects of cosmetics overproduction and overconsumption.

EXTENDED INTRODUCTION

Consumer Perceptions

Aside from EE exposure, consumer perceptions heavily influence purchasing behavior. The extent to which these perceptions outweigh the impact of EE was also observed in this research. The three consumer perceptions I focused on were perceived value, perceived ethicality, and perceived green product knowledge. Perceived value is a consumer's individualized assessment regarding the worth of a product or service based on the costs and benefits (Suphasomboon and Vassanadumrongdee 2022). Perceived value covers a large range of specific concerns like functional, social, and emotional values (Sheth et al. 1991) Consumers want to purchase products that not only perform well and are reasonably priced, but also enhance their social wealth and emotional experiences (Sweeney and Soutar 2001). The intent to purchase a

specific product also increases as the perceived functional benefits increase (Suphasomboon and Vassanadumrongdee 2022). For example, these benefits for cosmetic products include targeting multiple cosmetic concerns at once, application methods, and/or environmental consciousness. Green cosmetic products can impact perceived value positively because consumers trust that there is the added benefit of environmental consciousness that conventional products generally do not provide (Roh et al. 2022). This specific characteristic that consumers value is also known as perceived ethicality.

The importance of perceived ethicality increases as environmental concerns among consumers increase. As a consequence, the intent to buy green products will become more prevalent (Suphasomboon and Vassanadumrongdee 2022). Consumers are more willing to pay for a product if they believe it will produce positive results on human and environmental health (Nie et al. 2021). Consumers want to believe that they are engaging in sustainable practices through the functional, social, and emotional values of the goods and services that they interact with (Roh et al. 2022). This directly applies to green cosmetics because these products are normally made with chemicals that are harmful to humans and the environment. For example, oxybenzone in sunscreens can disrupt the human endocrine system and bleach coral reefs in the ocean (Downs et al. 2022). Products like these have a low perceived ethicality because conscious consumers are actively trying to avoid them. Perceived ethicality also goes hand-in-hand with perceived green product knowledge because there must be some level of understanding to develop a baseline concern for ethicality.

Green product knowledge is defined as consumer understanding of the environmental attributes and impacts of green products (Wang et al. 2019). There are different types of product knowledge such as subjective, objective, and experience-based knowledge (Park et al. 1992). EE affects a consumers' objective knowledge because more exposure adds to the product information that is stored in their memory. Each type of green product knowledge may interfere with the others in how they shape consumption patterns, which is observed in this research. Nonetheless, having a higher level of green product knowledge can boost consumers' certainty about the positive benefits of these products and their confidence in making environmentally conscious purchasing decisions (Wang et al. 2019, Wu et al. 2010, Roh et al. 2022). In the context of green cosmetic products, ingredient lists and green labels are large knowledge barriers for many consumers. Learning relevant topics in EE that address these knowledge gaps can increase the percentage of

consumers that purchase green cosmetic products. Overall, these consumer perceptions have various effects on consumption and EE influence.

UC Berkeley Students for the Foundation of the Study

Cosmetics is a prevalent consumer packaged goods industry because everyone uses cosmetics in one form or another. Almost all adults use common cosmetic products such as shampoo and deodorant. However, skincare, makeup, and hair styling products are more popular among female-identifying adults (Wu et al. 2010). Young adults are also more likely to try different cosmetic brands, and this may be attributed to the growing importance of social status among these age groups (Park et al. 2018). Certain socioeconomic factors affect cosmetic use, such as monthly income. Cosmetic products vary in price because of differently valued ingredients, functions, and ethicality. Cosmetics use increases as monthly income increases (Park et al. 2018). More expensive products may be inaccessible to younger consumers who do not have a steady source of income. These trends help explain inconsistencies in cosmetics usage between different groups of people. It is useful to consider these patterns when making conclusions about what factors shape college students' consumption aside from EE.

UC Berkeley is often regarded as having one of the top environmental programs among universities (Wu 2022). It is a unique study site because of its reportedly high levels of environmentalism integrated into their curriculum. Students are generally driven by their education and this may affect their purchasing habits. UC Berkeley participates in the Sustainability Tracking, Assessment, and Rating System (STARS), a self-reporting framework for schools to measure their sustainability performance (Tran 2021a). According to the report, 50% of all courses available at UC Berkeley are sustainability-focused and they are spread out across 90% of all academic departments (Tran 2021b). The university has also issued an American Cultures requirement for all undergraduate students in which they develop understanding on social responsibility, social systems, and global consequences in the context of American experiences (Tran 2021c). My research in the context of UC Berkeley can be used to compare how EE at other institutions affects consumer behavior, even when combined with the effects of consumer perceptions.

METHODS

Study System

To answer my central research question of how EE affects people's propensity to purchase green cosmetic products, I interviewed professionals currently working in the cosmetics industry and surveyed attending students or recent graduates from UC Berkeley. I interviewed cosmetic professionals to gather information about how sustainability and EE is integrated into their industry. These professionals come from chemist backgrounds and have direct experience with cosmetic ingredients and green label verification. I surveyed students to understand their perspectives on green cosmetics and how these are shaped by their education, specifically UC Berkeley students that are exposed to EE in their curriculum. The interviews that I conducted aimed to reveal the extent to which EE is incorporated within companies and how consumer perceptions are factored into the creation of green cosmetic products. This complements the student survey that I distributed in which I aimed to research what students look for when purchasing cosmetics and if their knowledge of the environment has an influence on this.

Industry Professional Interviews

I conducted interviews with two cosmetic industry professionals: Aubri Thompson, the CEO of a refillable, sustainable cosmetics startup, Rebrand Skincare, and Francesca Cao, a cosmetic chemist from L'Oréal USA. These two interviewees represent two types of cosmetic companies, small startups and large corporations. The purpose of the interviews was to determine the extent of EE and sustainability emphasis by the industry. I asked each interviewee what their views are on green labeling, green cosmetics consumption, and EE. I also asked them what ways they integrate them into their work formulating cosmetic products. At the end of the interview, I asked each professional for advice that they would give to young consumers to make better informed purchasing decisions, especially with respect to cosmetic products. The interview with Thompson was conducted through Zoom and I transcribed the answers for data analysis using Otter.ai. I collected interview responses from Cao through email due to distance and scheduling conflicts.

Student Survey

To document UC Berkeley students' perceptions of green cosmetics and their exposure to EE, I surveyed students through a link using the survey software program, Qualtrics. I distributed the survey by online methods, such as direct messaging, social media, various Slack groups, and the ESPM 175 Ed Discussion. My aim was to target avid users of cosmetics, therefore I also distributed the survey through the only cosmetics-focused organization on campus, Cal Aurum Cosmetics. I advertised my survey through a post on their Instagram page and shared it among its members on Slack. Additionally, I offered students the incentive of being entered into a raffle for a sustainable skincare set from Rebrand Skincare, which was valued at over $100.

The survey consisted of three sections: a choice experiment, a vocabulary test, and a self-report of EE exposure. To determine the perceived ethicality among students, I conducted a product choice experiment (Ding 2022). In this section, I featured seven categories of cosmetics and displayed products that do and do not have green labeling for each of these categories. The categories were body wash, shampoo, facial wash, face cream, sunscreen, lip balm, and deodorant. I chose these specific categories among other types of cosmetics because these are commonly used among all consumers. For each product, I concealed brand name and package appearance to avoid bias. I only included information about volume/mass, the first five ingredients listed on the back of the product packaging, green labels, and price. I asked students to rank one product above the other. I also asked them to rank the purchasing factors (ingredients, green label, and price) from least to most considered and to list any other factors that they consider when they purchase cosmetics that were not included in the choice experiment. This determined perceived value as well as perceived ethicality.

Secondly, I conducted a vocabulary test to determine green product knowledge. For this, I included seven green terms that are regularly used to characterize green cosmetic products on packaging and I asked students to choose the best and correct definition for each term. The terms were vegan, plant-based, paraben-free, sulfate-free, natural, clean, and organic.

For questions about one's environmental education level, I surveyed students on whether or not they have completed the university-wide AC requirement and if they have taken any

sustainable-related or sustainability-focused courses aside from their AC class. If they answered yes, I asked them to list what topics were taught.

Data Analysis

Industry Professional Interviews

I analyzed the interview responses by comparing the answers between the two professionals. I examined the similarities and differences in how both professionals view and integrate sustainability and EE in their industry. Additionally, I analyzed both of their advice for purchasing eco-friendly cosmetics in order to determine the ways that students can digest green product knowledge. Overall, I determined key themes and phrases that help validate the value of green cosmetic products and the importance of implementing lessons about consumption in EE.

Student Survey

I analyzed the responses in each section of the survey to answer the central question of how EE affect UC Berkeley students' propensities to purchase green cosmetic products. For the choice experiment, I found the percentage of students who ranked the green cosmetic product above the non-green cosmetic product for each of the seven product categories. I then found and compared the percentages of each purchasing factor when ranked as students' first choice consideration. Lastly for this section, I aggregated the answers to the open-ended question to see what other purchasing factors students consider aside from the given factors.

For the vocabulary test, I analyzed the distribution of the students' test scores. I documented the mean and standard deviation of their scores to determine their green product knowledge. I then examined if there was a difference in average test scores between students who have completed the AC requirement and those who have not. I repeated this for students who have taken a sustainability-related and/or sustainability-focused course. I also compared the EE topics that students have learned in their courses and what EE topics Thompson and Cao referenced in their interviews.

At the end of the survey, I added an optional demographics section in which I asked survey takers to identify their gender, age, race and/or ethnicity. I used the reported information to characterize my study population.

RESULTS

Industry Interviews

Both of the professionals interviewed have experience in cosmetic chemistry and business management from various cosmetic companies. Across both Aubri Thompson and Francesca Cao, they have experience with formulation, customer service, project management, accounting, marketing, and product validation for quality and regulation.

When asked about what factors impact the products that they create, they both cited the importance of catering to consumer targets and sustainability goals. Both companies make products that consumers have a demand for while searching for ways to improve their corporate social responsibility. Sustainability translates into their work in many ways. Thompson explains:

> *...we want to have sustainability be a part of the design process all the way like from product consumption or conception...I'm making sure I'm not just creating something for a trend, I'm really creating a product that there is demand for.*

They both use renewable and consciously sourced materials. Rebrand uses refillable packaging to reduce plastic pollution. L'Oréal is focused on creating unique cosmetic technology and analyzing sustainability afterwards. One difference for Cao is that her commitment to green cosmetics as a corporate scientist is defined by the resources that the company provides her.

Both professionals make sure that their own environmental claims about the products that they create are honest and factual. They warn consumers to be wary of green labels and sustainability claims from companies that may just be marketing ploys to attract consumers that have environmental concerns. Thompson claims that despite this, green labels may be helpful in finding brands that align with certain consumer values. Cao adds that it is also important to consider that actual green products may have a trade-off in sensory or performance.

In regards to EE, they both believe that it plays an integral role in the cosmetics industry and consumers' purchasing decisions. Cao states:

> *Even if the cosmetic industry is not the biggest contributor to the carbon footprints on the earth, we can still do our part as best as we can and continue to emphasize the importance of the green initiative.*

EE topics that they believe are important include product lifecycle management and carbon footprint. They also encourage consumers to research ingredients in their products on their own to gain an understanding of where they are sourced from and what they do. They can also learn about products and ingredients that may damage environmental and human health. Thompson references the Environmental Working Group Skin Deep Database to conduct this research. Thompson also advises young consumers to slow down their consumption of products and to consider the influence of unrealistic beauty standards on their purchasing habits.

Student Surveys

The 66 students that responded to the survey are all currently undergraduates or recent graduates of UC Berkeley. They are all assumed to use cosmetics of any form. All survey findings below refer to this sub-population. Most survey takers self-reported as Asian/Asian American or Hispanic/Latino and are between the ages of 18 and 30 (Appendix A).

For the choice experiment, there was a mix of responses. Students' preferences for conventional versus non-green products varied in different categories (Table 1). Students were more likely to prioritize green products for their choice of facial wash, face cream, sunscreen, and lip balm/treatment. They were more likely to choose the conventional product for their choice of body wash, shampoo, and deodorant. When asked to rank the purchasing factors used in the choice experiment, 62 students responded and most reportedly prioritized price the most. Green labels were the least important factor to students (Table 2). At the end of this section, students voluntarily listed different factors not included in the experiment that they also consider when buying cosmetics (Table 3). These factors include brand reputation, convenience purchasing, type of cosmetics, concerns about greenwashing, and product performance.

Table 1. Student choices between products with and without green labels.

Cosmetic Category	Green Product	Conventional Product
Body Wash	43.9%	56.1%
Shampoo	42.4%	57.6%
Facial Wash	77.3%	22.7%
Face Cream	57.6%	42.4%
Sunscreen	57.6%	42.4%
Lip Balm/Treatment	71.2%	28.8%
Deodorant	30.3%	69.7%

Table 2. Student ranking of purchasing factors.

	Price	Ingredients	Green Label
First choice	56.5%	32.3%	11.3%

Table 3. Students reported additional purchasing considerations.

Topic	Frequency	Quotes
Brand	8	"brand, how big it is, reputation…" "Trusted brand name is important to me…" "I also consider if [it's a] well known, established brand…"
Convenience	1	"I usually purchase cosmetics when I already have run out…"
Cosmetic type	7	"I really care about the ingredients of any products I use for my face and body…" "There are some products I prioritize better ingredients for…"
Greenwashing	5	"I'm wary of green labels because they are often blanket statements with no legal/regulatory standards." "Green labels sometimes are not verified…"

Performance	6	"Effectiveness in what it's meant to do." "...how effective it is (sunscreen), how it works on my face, how it makes me feel…"
Recommendation	5	"Personal recommendations are [the] most influential for me over anything." "...many people can vouch for [its] functionality…" "...customer reviews."

For the vocabulary test of the green terms labeled on cosmetic products, the sample size was 60, the mean score was 4.6 out of 7, and the standard deviation was 1.6.

Out of 59 students who responded, the majority (83.1%) have completed the AC requirement, which the university uses to measure EE. However, the majority (57.6%) of students reported to have never taken at least one sustainability-focused/related course before. Students that have taken these classes scored better on the test on the order of 0.10 points. However, there was no significant difference between the vocabulary test scores of students that have completed the AC requirement and those who have not (Table 4), Similarly, there was no statistically significant difference in scores between students who have taken a sustainability course and those who have not (Table 5).

Table 4. Average score versus completion of AC requirement.

Completed AC requirement?	Percent	Average score
Yes	83.1%	4.69
No	16.9%	4.30

Table 5. Average score versus completion of sustainability course.

Has taken a sustainability course?	Percent	Average score
Yes	42.4%	4.84
No	57.6%	4.47

Additionally, even though the AC requirement is used to measure EE exposure at UC Berkeley, 51% of students who have completed the requirement also report to have never taken a course that teaches themes of sustainability.

Many students that have taken explicitly sustainability-related/focused courses reported to have been exposed to a variety of topics and 43.5% of these respondents have learned relevant lessons that Thompson and Cao say are valuable. These lessons include circular economy, life cycle analysis, carbon footprint, chemicals, plastics, resource management, and corporate social responsibility. These students had an average score of 5.33.

DISCUSSION

Both industry professional and student perspectives on green cosmetics reveal the role that EE and green knowledge have on consumption habits. The interviews with the industry professionals revealed that integrating EE and sustainability into their business practices is important because consumers' ethical concerns are growing. In the student survey, respondents reported an overall conscious effort to choose more sustainable products for specific cosmetic concerns. There was also low green product knowledge despite reportedly high levels of EE exposure among students. Among students who highly value green products, the disconnect between student consumption behavior and student environmental knowledge may suggest that UC Berkeley lacks consumer-focused EE and the AC requirement may not be a valid measurement of EE. These observations address the gap in knowledge of how consumption patterns are formed, especially among young consumers. Environmental education can have a significant impact on students when relevant sustainability topics a.re integrated into their social behavior (Clusserath 2015).

Industry Perspectives on Green Cosmetics and EE

The interview responses from Thompson and Cao represent the perspectives of professionals across the cosmetics industry. Their work with cosmetic products is largely driven by consumer demand, which includes people's desires to be more environmentally conscious. Consumption trends of different cosmetic products provide them insight as to what they should

manufacture and distribute. Both Thompson and Cao recognized how growth in the market for sustainable products has had a significant influence on their business values and they actively search for ways to meet these needs given the resources they have. They both personally value environmental sustainability and recognize the concerns for greenwashing, or the act of misleading consumers about a product's environmental footprint (Delmas and Burbano 2011). Due to this, they emphasize the importance of transparency and factual environmental characterization of the products that they produce. Thompson's and Cao's attention to the bridge between consumer perceptions and their business roles are consistent with theories regarding the effects of CSR. It was learned that CSR values that businesses exert through their products and services influence consumer views (Bocquet et al. 2013). The target audience of a product or service was found to search for brands that align with their consumption principles (Kim and Lee 2020). Their interview responses magnify the importance of consumer perceptions and the role that corporate sustainability plays in green cosmetics. There is an existing partnership between how the consumers shape the values of industries and vice versa. The interviews also situate ways that EE can be applied within the cosmetics industry.

Thompson and Cao determine the extent of how EE can influence consumer perceptions based on their industry perspectives. They advocate mainly for relevant topics that address consumerism and social responsibility, such as the awareness of lifecycle product management and carbon footprint. Thompson and Cao also heavily encourage people to engage in personal research about ingredients and the environmental effects of their consumption habits in order to make the most informed purchasing decisions. This follows many past studies that explore the relationship between consumption behavior and education. Students behave according to their beliefs and values, which are impacted by information they digest (Chawla and Cushing 2007, Zsóka et al. 2013). This can be identified in consumption patterns, which was observed when students with greater environmental awareness were more likely to engage in pro-environmental behavior (Zsóka et al. 2013). Thompson's and Cao's perspectives of EE on cosmetics use and existing literature suggest ways that EE at UC Berkeley can be improved to better address consumerism. Certain topics are more advantageous over others in this sense and this information helps better categorize students' exposure to EE.

Berkeley Students' Consumption of Green Cosmetics

Green cosmetics consumption is dependent on a variety of factors, which can be suggested by the results of the choice experiment in the survey. I observed that UC Berkeley students prioritize green cosmetics to an extent relative to other purchasing factors. Preferences for green products over conventional products varied across many categories. Specifically, students preferred the green product for facial areas. This supports existing literature that describes how perceived value influences consumers' propensity to purchase green cosmetics. Many studies cite the association between perceived functional value of green products and purchase intention (Suphasomboon and Vassanadumrongdee 2022). Consumers often believe that green products are of higher quality than conventional products (Gomes et al. 2023). This stems from the concerns for certain harmful ingredients in products that can be detrimental to human and environmental health (Juliano and Magrini 2017). These patterns are observed in the choice experiment results because students perceive green cosmetics products as gentler and better for sensitive areas of the skin like the face. While these choices may be attributed to perceived ethicality, functional value and performance are central factors to choosing green products.

Student perceptions of green cosmetics are primarily dictated by price because many college students generally cannot afford these products. Cosmetics use generally increases with income and green cosmetic products are typically more expensive because they offer more benefits than conventional products do (Park et al. 2018, Gomes et al. 2023). After choosing between green and conventional products in the choice experiment, the majority of respondents ranked price as the most important factor that they consider when buying cosmetics products and green categorization as the least. Ingredients may not be as important as price and green labels because chemical names are not easily recognizable or understood by the general public. This is understood through consumers' perceived green product knowledge (Suphasomboon and Vassanadumrongdee 2022). Aside from price, green label, and ingredients, students reported to consider brand reputation, convenience, product type, greenwashing risk, and product performance. The data from the choice experiment demonstrates how UC Berkeley students perceive green cosmetics and how they interact given the choices between products.

EE in Action at UC Berkeley

UC Berkeley students' understanding of green cosmetics is not attributed to their education at UC Berkeley. The AC requirement and many sustainability-related/focused courses do not aid students in making informed and sustainable purchases, specifically in cosmetics. The results of the green term vocabulary test in the survey suggest that the topics that students learn are a strong indicator of their consumption habits. The overall mean score of the vocabulary test was 4.6 out of 7. The majority of survey respondents (83.1%) reported to have completed the AC requirement and about half have taken a sustainability-focused/related course. Despite these varying EE exposure levels, the difference in mean vocabulary test scores between these groups was insignificant. On the other hand, the students that have learned relevant consumer-focused topics that Thompson and Cao referenced scored significantly higher on the vocabulary test (5.33). The scores reflect similar ideas from other literature exploring the effects of EE and consumption. Many written works stress the importance of teaching topics that are connected to students' circumstances, such as frequent cosmetics use (Roczen et al. 2014). Perceived green product knowledge is proven to improve consumers' trust in products and this can be applied to services and goods that they regularly use (Roh et al. 2022). It also allowed consumers to believe that their purchasing decisions actually have a positive impact on the environment (Wang et al. 2019). There is a limitation to the effects of EE at UC Berkeley, specifically the AC requirement.

Additionally, the vocabulary test and the EE student self-report imply that the AC requirement is not as accurate of an EE measurement at UC Berkeley as the university reports it to be (Tran 2021a). This is because many students do not recognize the class that fulfilled the requirement as a sustainability-focused/related course. A little more than half of survey respondents did not consider their AC requirement fulfillment to address themes of the environment or sustainability. This is inconsistent with the claim that about 50% of courses at UC Berkeley are focused on sustainability (Tran 2021b). This also counters the perception that UC Berkeley is one of the most environmentally conscious universities in the world (Wu 2022). The AC requirement represents only a portion of the EE topics that should be integrated and taught to students.

Limitations and Future Directions

   There are a number of elements in my study design that limit the interpretation of what I observed in the survey and interviews, specifically the interviewee selection and the survey population. The arguments that I made based on the interview responses may not portray the cosmetics industry as a whole. I chose to interview Thompson and Cao because they represent both ends of the business type range, startup and large corporation. This is limiting to my research because there are many other types of companies in between that may have different views towards sustainability and consumers. Other companies and professionals may have the intentions to greenwash and/or prioritize economic growth over sustainability, which differs from that of Thompson and Cao. As for the student survey, I distributed the survey to students of all levels of cosmetics use. This limits my research because students who do not engage with a lot of cosmetic products on an everyday basis may have insignificant perceptions towards green cosmetics. Additionally, some of the data may be unreliable because my survey population is limited to undergraduate and recently graduated students from UC Berkeley. The data may not accurately reflect the consumption habits and EE exposure of those attending other universities, or other consumers in general.

   Given these initial limitations, my research can be improved through many future directions. Firstly, I would conduct more interviews with different professionals within the cosmetics industry to collect a wider range of perspectives regarding EE and consumer perceptions. This may include people in other sectors of the industry, such as marketing, sales, operations, finance, and more. This would expand the extent to which EE affects consumption habits because other professionals may find other EE topics important to know. Next, I would be more intentional with my survey data collection by sorting through students that meet a baseline level of cosmetics use. By doing this, I can analyze better data about green cosmetics use because I would focus on those who have established views on products based on recurrent and varying experiences with cosmetics. Lastly, I would distribute a similar survey to different groups outside of UC Berkeley. This would allow me to compare different institutional EE programs and other students' consumption habits of green cosmetics. Furthering my project through these steps would gather more information that can further answer the central question of how EE affects the perceptions and consumption of green cosmetics.

Broader Implications and Conclusions

The applications of EE extend beyond the classroom and are reflected in everyday lives. Consumerism is a growing issue in society and people are becoming more conscious of their own roles in regards to pollution and the climate crisis (Delmas and Burbano 2011, O'Rourke and Lollo 2015). Cosmetics use especially is evolving because of the increased social value and negative environmental consequences it has on today's society (Juliano and Magrini 2017, Park et al. 2018). Based on the interviews, transitioning to green cosmetics production and consumption is difficult and there are many trade-offs such as product performance and price. The surveys also demonstrate that consumer choice is complex because of the many socioeconomic factors and perceptions of value that shape it. These conclusions can be applied to other consumer goods industries that are also largely driven by consumer perceptions and the need for sustainable practices.

My study also recognizes the value in EE, which universities and academic institutions are prevalent sources of. The interview results exhibit the influence that EE can have on green cosmetics. The survey data also display the result of green product knowledge and how young consumers interact with EE lessons that are integrated into their curriculum and everyday lives. Schools like UC Berkeley have the potential to improve their EE programs to include more applicable lessons, such as product analysis and consumerism. Cao even stated that it is important for consumers to be well-informed about environmental issues that affect them because every action has an impact on the environment. Student knowledge can combat the effects of greenwashing and lead to more efficient sustainable transitions within business and consumer practices (O'Rourke and Lollo 2015, Álvarez-García and Sureda-Negre 2023).

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APPENDIX A: SURVEY DEMOGRAPHICS

Table A1. Demographic information of student survey respondents

	Total (%)
Ethnicity (self-reported)	
Asian	56.1%
Hispanic/Latino	12.1%
Mixed	7.6%
White	4.5%
Middle Eastern	3.0%
None	16.7%
Gender (self-reported)	
Female	69.7%
Male	9.1%
Non-binary	7.6%
None	13.6%
Current year at UC Berkeley	
First-year	9.1%
Second-year	22.7%

Third-year	18.2%
Fourth-year	36.4%
Fifth-year and above	3.0%
None	10.6%

Area of Study

College of Letters and Science	43.9%
College of Natural Resources	21.2%
College of Chemistry	12.1%
Haas School of Business	4.5%
College of Computing, Data Science, and Society	4.5%
College of Engineering	1.5%
College of Environmental Design	1.5%
None	10.6%