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Circular economy awareness of students in higher education: the assessment of knowledge, attitudes, and behavior

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ABSTRACT

The implications of the circular economy system are important in creating a balance of sustainable economic activities. This study aims to analyze student awareness as agents of change towards circular economy principles and practices in terms of knowledge, attitude, and behavior (KAB) variables based on a gender perspective and the correlation between variables. The study used a descriptive quantitative approach with a survey method via a Google form questionnaire. Research data was collected from June to August 2023. The study population composed of active students of economics/cooperative education programs, office administration education, and accounting education batches of 2020 and 2021 at Universitas Negeri Semarang (UNNES) and Universitas Sebelas Maret (UNS) with a research sample of 245 students. Result showed that average circular economy awareness score did not differ significantly between men and women, and an analysis revealed a positive correlation between the variables of knowledge and behavior, knowledge and attitudes, and attitudes and behavior. The study's result demonstrates that knowledgeable students will develop a favorable attitude about the effects of the circular economy and pro-environmental behavior.

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1. INTRODUCTION

Economic activities can be classified into three categories: production, distribution, and consumption [1]. All countries worldwide, including Indonesia, are dependent on rapid economic activities accompanied by environmental sustainability. However, it is undeniable that all economic activities, particularly production and consumption, produce waste. Waste interferes with environmental sustainability, has an impact on health, and has the potential for natural disasters. Based on data from The Economics Intelligence Unit in 2021, Indonesia ranks second as a food loss- and waste-producing country after Saudi Arabia. If examined further, in 2021, food waste in Indonesia will reach 46.35 million tons and plastic waste will reach 26.27 million tons on a national scale [2]. Indonesia experienced economic losses of 4-5% of the national gross domestic product (GDP), equivalent to Rp. 213-551 trillion [3]. This creates a dilemma between maximizing production and consumption to achieve welfare and preserve the environment. Sollow economists suggest that economic actors should preserve their general capacity to promote economic wellbeing [4]. That is, the problem is not only environmental but also economic.

Circular economy is a solution to challenges related to the dilemma of increasing productivity while considering the externalities of the production process, product consumption, and the final impact on the sustainability of nature and the environment [5]. Assuming that natural resources are limited, producers

continuously use these resources to produce new products under the take-make-disposal principle. Thus, the circular economic model is intended to replace the linear economic model. The United Nations Environment Assembly defined circular economy in 2019 as an economic model that incorporates all goods and resources intended to be recovered, recycled, remanufactured, or reused, and kept in use for a maximum amount of time. Because it greatly minimizes the negative effects that production and consumption activities have on the environment and society, while also benefiting businesses in the short and long term, circular economy is completely integrated into the larger sustainability paradigm [6], [7].

Currently, Indonesia is putting efforts into implementing circular economy in various sectors, both in the business, industrial, and non-industrial sectors. Circular economy is in line with sustainable development and is driven by the sustainable development goals (SDGs) 2030 agenda [8]. The relevance of the SDGs to circular economy is more specific to Agenda No. 12, that is, responsible consumption and production. Indonesia has prepared a framework for Agenda No. 12 of the SDGs, that is, the implementation of sustainable consumption and production (SCP), which is currently at the acceleration stage. SCP encourages resource efficiency, low-carbon development strategies, and green and circular economies.

Practically, efforts to implement a circular economy require synergy from various parties such as, the government, industry, society, and universities. As a regulator, the government needs support from industry and the public in the implementation of existing regulations [9]. Higher education holds a strategic position as a circular agent of the economy and plays a role in socializing and educating students to understand and implement a circular economy [10]. The role of universities is to promote new ideas about circular economy and their reputation has allowed them to reach students and the general public more easily [11]. This is in line with a research that argues that higher education is key to driving the circular economy approach into reality and has the potential to improve sustainable performance [12]. Universities can do this through teaching circular economy subjects [9] and preparing future teachers to include sustainability issues in the curriculum [13].

Universitas Sebelas Maret (UNS) and Universitas Negeri Semarang (UNNES) are state universities in Central Java that were included in the top 10 UI Greenmatrices in 2023. These two universities have accounting education, office administration, and economics education programs that produce output as prospective teachers in accounting, office administration, and economics. The strategic position of this program has the potential to become an agent for internalizing circular economic values in learning on campus. If successful, graduates of an economic education program can provide education and integrate circular economy with students when they become teachers [14]. If they learn to reduce the impact of their daily activities on campus, circular economic practices can be extended to all aspects of life [14].

This study employs the theory of planned behavior (TPB) because it is considered pertinent for gauging circular economic awareness through knowledge, attitudes, and behavior [15]. According to the knowledge, attitude, and behavior (KAB) model, consumers seek knowledge before forming an attitude toward a particular behavior [16]. Knowledge is a critical factor in shaping behavioral intentions and attitudes [17]. Understanding sustainable economics can help students become more conscious and sympathetic toward the subject [1]. Conversely, attitudes can influence subjective norms, which then influence behavioral patterns [18]. According to previous research, attitudes have the power to fundamentally alter how students behave, as they determine how they will react to issues in their everyday lives, which in turn affects how environmentally conscious they will be [19].

A lot of scientific research on circular economies remains unexplored [20], including the importance of sustainability competencies in teacher education [18], [21]. In Indonesia, there is still a dearth of studies on the circular economy, and the higher education sector has not seen any particular initiatives [22]. The study of circular economic practices is closely related to student awareness. Awareness is important because it fosters concern and commitment to the quality of the surrounding environment in everyday life. Prior studies on South African students' awareness of the circular economy have revealed that their knowledge and awareness of waste management techniques to reduce waste are still poor and insufficient [23]. The results highlight obstacles, such as lack of knowledge and awareness, as the main challenges in implementing a circular economy. Other research results show that in the first phase, which focuses on student awareness of the circular economy, only one-third of students had an understanding or knowledge of the concept of circular economy [10]. This finding is supported by [24], who suggested that approximately 70% of university students in India do not have knowledge on the circular economy, which has implications on implementation. Furthermore, other research has found that the use of old products (reuse) among students is only 21.1% and the level of awareness of the circular economy is 55.7% [25].

This study examines the extent to which college students possess knowledge of the concepts and applications of a circular economy. The circular awareness of student economics was investigated by identifying aspects of knowledge, attitudes, and behavior. Furthermore, this study examined the gender perspective and analyzed the correlation with KAB. The problem statements put out in this research were: i) how are students aware of the circular economy? ii) to what extent are the students aware of circular economics with a consideration of gender differences? and iii) what is the correlation between students' knowledge, attitude, and circular economic behavior?

2. METHOD

This study employed a descriptive-quantitative methodology. The survey used a Google Forms questionnaire and research data were collected from June to August 2023. The research population comprised of active students of economic/cooperative education study programs, office administration education, and accounting education for the 2020 and 2021 classes at UNNES and UNS, totaling 630. Proportional random sampling was used and 245 students were selected based on the slovin formula, with a 5% margin of error.

The study adapted and changed the Cifuentes-Faura SDG survey questionnaire [26]. To assess KAB about the circular economy (CE), the reuse, reduce, refuge, repair, and recycle (5R's) of the CE concept were modified. This SDG survey was selected because the environment, economy, and society are all closely related to the aims of the SDGs and some writers view CE as a new paradigm that aligns with these objectives [27], [28]. Furthermore, in this study, instruments were adopted and modified from the research by [29] with relation to student behavior towards waste management, energy saving, and water.

Students were asked to rate their agreement or disagreement with each descriptor on the following Likert scale: strongly disagree, disagree, neutral, agree, and highly agree. Instrument items were tested for validity through pilot tests with 34 respondents. The results show that on the variable level of circular economic awareness, for knowledge indicators, there are six question items and all are valid; for attitude indicators, there are 10 valid items and two invalid items; and for behavior indicators, there is only one invalid item and nine valid items. Next, in the circular economic behavior variables related to waste management behavior, there was one invalid question from 16 items, energy management practices one invalid item from six items, and water saving one invalid item from four items. Decisions made against invalid items are excluded from the list of questions in the questionnaire. Additionally, reliability tests were conducted to assess the consistency of the research tools. This study variable had a Cronbach's alpha value >0.70, indicating reliability, as shown in Table 1. Table 2 presents descriptive intervals for the percentage of Norman criteria [30], based on the degree of awareness, mindset, and conduct (very high, high, sufficient, low, and extremely low).

Table 1. Reliable results of research instruments

Variable	Cronbach's alpha	Criteria	Results
Circular economy awareness	0.832	0.70	Reliable
Circular economy behavior	0.871	0.70	Reliable

Table 2. Interval/percentage

Interval/percentage (%)	Interpretation
84 until 100	Very high
68 until 83	High
52 until 67	Sufficient
36 until 52	Low
20 until 36	Extremely low

The SPSS 23.0 software was used to analyze and report the data on students' awareness of the circular economy in terms of knowledge, attitudes, and behavior. The results were displayed as a percentage. Furthermore, the t-test was employed to ascertain the disparity in mean scores between males and females. There was a difference in the average value by gender on the questionnaire item or variable if the overall p-value is less than 0.05. Furthermore, inferential analysis employed the Pearson correlation test to determine the association between the variables (knowledge and behavior, knowledge and attitude, and attitude and behavior). There was a correlation or association between the two variables if the computed r value was bigger than the tablet or significant value was less than 0.05.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Level of student awareness of circular economy principles and practices at university

The results for students' awareness levels in the knowledge category were as follows: 55.1% for very high criteria, 37.6% for high criteria, and 6.7% for intermediate criteria. Then, the results of the level of student awareness in the attitude category were 25.8% on the very high criteria, 49.4% on the high criteria, 24.2% on the middle criteria, and 0.6% on the low criteria, Furthermore, the level of student awareness in the behavior category was 46.6% on the very high criteria, 44.4% on the high criteria, and 8.4% on the intermediate criteria. Based on these findings, it can be concluded that the level of circular awareness of the student economy (KAB) is generally high. Table 3 presents the level of circular awareness in the student economy.

Table 3. Student economy circular awareness level

Knowledge		Attitude		Behavior	
Criteria	Percentage (%)	Criteria	Percentage (%)	Criteria	Percentage (%)
Very high	55.1	Very high	25.8	Very high	46.6
High	37.6	High	49.4	High	44.9
Sufficient	6.7	Sufficient	24.2	Sufficient	8.4
Low	0.6	Low	0.6	Low	0.0
Extremely low	0	Extremely low	0.0	Extremely low	0.0
Total	100	Total	100	Total	100

The results of the sustainable behavior of students in the waste management behavior category were 15.7% for very high criteria, 54.5% for high criteria, and 29.8% for medium criteria. The sustainable behavior of students in the energy-saving practice category was 24.7% for very high criteria, 49.4% for high criteria, 23.0% for medium criteria, and 2.8% for low criteria. Furthermore, students' sustainable behavior in the category of water-saving practices was 59% for very high criteria, 27.5% for high criteria, 12.9% for medium criteria, and 0.6% for low criteria. Based on these findings, it can be concluded that student sustainable behavior was generally in the high category but waste management behavior and energy-saving practices showed a tendency for the question items to be in the medium category. Table 4 presents the results for student sustainability behavior.

Table 4. Student sustainability behavior

Waste management behavior		Energy-saving practices		Water-saving practices	
Criteria	Percentage (%)	Criteria	Percentage (%)	Criteria	Percentage (%)
Very high	15.7	Very high	24.7	Very high	59
High	54.5	High	49.4	High	27.5
Sufficient	29.8	Sufficient	23	Sufficient	12.9
Low	0.0	Low	2.8	Low	0.6
Extremely low	0.0	Extremely low	0.0	Extremely low	0.0
Total	100	Total	100	Total	100

The descriptive results of the percentage of sustainable behavior of students showed that the lowest results with intermediate criteria were found in the variable of waste management behavior in question item 6, with an average percentage of 55% in the medium criteria, 36.7% in the medium criterion, 32.8% in the low criterion, 9.4% in the very low criterion, and the remaining 21.1% for high criterion. This means that students have a tendency to recycle batteries, lights, or electrical and electronic devices (old technology phones), though this is still low. The second lowest result with intermediate criteria was found in the variable of waste management behavior in question item 5, with an average percentage of 64% in the medium criterion, 39.2% in the medium criterion, 22.1% in the low criterion, 2.8% in the very low criterion, and the remaining 35.9% in the high criterion. This indicates that students tend to separate caps from plastic bottles and recycle them separately, which remains low. Furthermore, the third lowest result with intermediate criteria was found in the variable of waste management behavior in question item 7, with an average percentage of 66.9% in the medium criterion, 41.4% in the medium criterion, 17.1% in the low criterion, 2.2% in the very low criterion, and the remaining 39.2% for high criterion. This means that students tend to often use single-use products such as plastic cups, plastic or Styrofoam plates, and plastic straws.

The fourth lowest result in the variable of waste management behavior with intermediate criteria was found in item 9, with an average percentage of 65.7% in the medium criterion, 37.2% in the medium criterion, 17.2% in the low criterion, 3.9% in the very low criterion, and the remaining 41.7% in the high criterion. This means that college students tend to buy soft drinks and drinks in returnable glass containers, which remains low. The lowest result in the energy-saving practice variable with medium criteria was in question 4, with an average percentage of 60.2% for medium criteria, 35.9% for medium criteria, 24.3% for low criteria, 9.4% for very low criteria, and the remaining 30.4% for high criteria. This means that students tend to use motorbikes to get around campuses; therefore, this statement has implications in that the use bicycles still needs to be increased.

3.1.2. Level of circular awareness of student economy from a gender perspective

Data analysis from a gender perspective answers the second research question, which relates to the level of circular awareness in student economics from a gender perspective. Data analysis showed that most respondents were women, with a percentage of 80% with men having the remaining percentage. Based on the findings of the study, it can be concluded that students' circular economic awareness (KAB) viewed from an overall gender perspective has a p-value of >0.05; therefore, in general, there is no difference in the average

value of circular economic awareness between men and women. However, testing each question item for each variable revealed a unique finding: there were question items that showed an average difference between men and women. Table 5 presents circular awareness from a gender perspective and Table 6 presents the t-test results for the knowledge variable.

Table 5. Level of circular awareness of student economy from a gender perspective

Variable	Male		Female		p-value	Finding
	Mean	St. Dev	Mean	St. Dev		
Knowledge	25.74	3.128	25.78	3.283	0.957	There is no difference on mean score
Attitude	39.00	5.856	37.25	5.353	0.091	There is no difference on mean score
Behavior	29.63	4.124	29.00	3.749	0.385	There is no difference on mean score

Table 6. T-test results of each knowledge variable

Measurement		Male		Female		p-value		Finding
		Mean	St. Dev	Mean	St. Dev			
I have the knowledge that saving water and electricity every day is part of circular economy efforts.	K1	4.37	0.690	4.36		0.708	0.953	No difference
I understand that reuse in a circular economy is not only to reduce waste but also to reduce the exploitation of natural resources.	K2	4.49	0.612	4.50		0.615	0.878	No difference
I am aware that a fundamental tenet of a circular economy is the 5R habit.	K3	4.34	0.802	4.42		0.696	0.572	No difference
I have a circular economic view (5R) that opposes the conventional economic view, there are production-use-waste in order to reduce natural exploitation.	K4	4.03	0.954	3.90		0.883	0.456	No difference
I am aware that minimizing different forms of trash and practicing efficient waste management promote a circular economy.	K5	4.31	0.676	4.31		0.706	0.998	No difference
I know that the circular economy emphasizes business owners being responsible for the welfare of society.	K6	4.20	0.933	4.27		0.724	0.616	No difference

Table 6 presents t-test results of the knowledge variable. The t-test result of each knowledge variable item shows testing of each question item (from K1 to K6) and showed that there is no average difference between male and female students. This is in line with the findings, which show that the circular economic awareness of students in the knowledge category does not show any average difference from a gender perspective. Table 7 presents t-test results of attitude variable. The results particularly in item A3 indicate that there is an average difference between male and female students, even if there is often no average difference between male and female students in the attitude variable. Male students had a comparatively higher average than female students, according to item A3 analysis. Then, we discovered that there was no average difference in any of the other question items on the attitude variable between male and female students. Tables 6 and 7 present t-test results of attitude variable and t-test results of the knowledge variable.

Table 8 presents t-test results on each behavior variable item. The findings specifically show through testing on each question item, namely as many as 7 items from B1 to B7. It demonstrates that there is no typical difference in behavioral factors between pupils who are male and female. This is in line with the findings in general, which show that the circular economic awareness of students in the behavior category does not show any average difference from a gender perspective. Table 9 presents student sustainability behavior. The findings in the analysis of sustainable behavior of students in the circular economy show that waste management behavior in students from a gender perspective has a p-value of <0.05, so it can be concluded that there is a difference in the average waste management behavior in male and female students, where based on the analysis, male students show a relatively higher average than female students. Then, the next variable in students' sustainable behavior is energy and water-saving practices, which show that there is no difference in the average energy and water-saving practices between male and female students. Tables 8 and 9 present t-test results on each behavior variable item and student sustainability behavior.

Table 7. T-test results on each item of attitude variable

Measurement		Male		Female		p-value	Finding
		Mean	St. Dev	Mean	St. Dev		
I believe that thrifting-buying secondhand goods rather than new-is preferable.	A1	3.00	1.000	2.76	0.924	0.240	No difference
Even though recycling or reusing products is more expensive to make, if I owned a business, I would think about whether the product or packaging might be repurposed.	A2	3.94	0.802	3.86	0.826	0.645	No difference
If I had a business, I would use an online-based system.	A3	4.34	0.684	3.93	0.896	0.022	There are differences
The ability to be an environmentally conscious economics instructor or entrepreneur promotes the renewal of natural systems should be taught in university curricula.	A4	4.34	1.027	4.38	0.855	0.854	No difference
I think it's preferable to fix a broken thing rather than get a new one.	A5	3.86	0.944	3.67	0.886	0.344	No difference
I limit air, land and water pollution, and overcome climate change (for example choosing to use a bicycle/ride a shuttle) in the campus area.	A6	3.74	0.950	3.52	0.941	0.267	No difference
I utilize renewable resources, plant and animal waste (for example: for the production of organic fertilizer).	A7	3.69	0.867	3.84	0.834	0.382	No difference
I am willing to share services with other people (e.g. car, motorbike to travel to the same destination) to avoid excessive pollution and protect the environment.	A8	4.40	0.651	4.14	0.782	0.100	No difference
I utilize waste production processes for energy production (example: biogas production from livestock manure).	A9	3.66	1.027	3.50	0.903	0.442	No difference
I choose to rent a service rather than own it (for example, using public transportation instead of owning a motorbike/private car).	A10	3.17	1.200	3.05	0.944	0.595	No difference

Table 8. T-test results on each behavior variable

Measurement		Male		Female		p-value	Finding
		Mean	St. Dev	Mean	St. Dev		
I'm used to carrying my shopping bag when shopping.	B1	3.71	1.319	3.64	0.989	0.767	No difference
I only buy new things when I need them.	B2	4.54	0.657	4.37	0.719	0.198	No difference
I'm used to keeping things in good condition for a long time with the help of good maintenance.	B3	4.43	0.815	4.34	0.750	0.519	No difference
I still own and wear clothes I bought more than five years ago.	B4	4.34	0.765	4.29	0.918	0.770	No difference
I'm used to giving used items to others instead of throwing them away.	B5	4.29	0.789	4.13	0.948	0.358	No difference
I'm used to bringing a water bottle when I travel instead of buying bottled water.	B6	4.00	1.111	4.13	0.929	0.467	No difference
I try not to throw away consumable items but I try to reuse them.	B7	4.31	0.796	4.10	0.816	0.160	No difference

Table 9. Student sustainability behavior

Variable	Male		Female		p-value	Finding
	Mean	St. Dev	Mean	St. Dev		
Waste recycles	58.54	9.166	54.22	7.425	0.004	There is a difference on mean score
Energy saving	23.34	4.014	22.92	3.670	0.552	There is no difference on mean score
Water saving	13.03	1.871	12.85	1.957	0.632	There is no difference on mean score

3.1.3. Correlation between knowledge, attitude and behavior on circular principles and practices

Data were analyzed using Pearson's correlation test. The test results showed that knowledge and conduct had an r-count value of 0.436>0.147 and a significance of 0.000<0.05, indicating a positive correlation between the two variables. The results indicated a positive correlation between the knowledge and attitude variables, with the knowledge and attitude variables having an r-count value of 0.495>0.147 and a significance of 0.000<0.05. Additional results on the variables related to attitude and behavior revealed r-count values of 0.654>0.147 and a significance of 0.000<0.05, indicating a positive correlation between the two. Thus, it can be concluded that the overall variables are positively correlated. Table 10 presents the correlation data.

Table 10. Correlation between variables of KAB

Variable	r-count	Sig	r-table	Finding
Knowledge and behavior	0.436	0.000	0.147	There is a correlation
Knowledge and attitude	0.495	0.000	0.147	There is a correlation
Attitude and behavior	0.654	0.000	0.147	There is a correlation

3.2. Discussion

Based on these findings, it can be concluded that the recycling of electronic equipment and plastic bottles is included in the circular economy 5R concept, especially in the category of recycling, which is still low. Then, avoiding the use of single-use products is included in the 5Rs, especially in the 'reuse' category, which is still low. Furthermore, the tendency to use bicycles is still low and there is a higher likelihood to use motorcycles when it comes to the category of 'reduce' or reduction in the use of fuel oil (BBM), which is still low. Therefore, students' waste management behaviors and energy-saving practices need to be improved.

The results of this study confirmed the theory of planned behavior (TPB) by Ajzen [15] and argued that individuals make judgments based on the information or knowledge obtained, and that knowledge is used to consider the implicit behavior of an action before engaging in it. According to behavioral research and the SDG theory, beliefs, values, knowledge, and attitudes are examples of intrinsic factors that might impact environmental activities and behavioral change. However, as student replies show, the latter is a lengthy process that requires many external factors and is time-consuming [15]. The findings of this study support the results of several studies [22], [31], which suggest that most students have knowledge and positive attitudes towards sustainable consumption, but the results of the study highlight barriers in practice regarding sustainable consumption as the main challenge in implementing a circular economy. Gherheş *et al.* [25] has argued that the behavior of using old products (reusing) among students is still low, supports the findings of this study, which suggest that the reuse among students is still low, which is reflected in the purchase of goods used (thrifting) and avoiding the use of disposable products. The findings of the research by Owojori *et al.* [23], which suggested that students' awareness of waste management to minimize waste is still low, support the findings of this study, which suggests that the practice of recycling among students is still low.

Based on these findings, to obtain a high level of circular economy awareness of the student, which consists of knowledge, attitudes, and behaviors, a lot of knowledge and change in attitudes are needed to shape student behavior toward a sustainable environment. However, the results showed that in the attitude category, there were still some students who were in the middle and low categories, thus affecting the sustainable behavior of students, especially in terms of waste management, which was still in the middle category and tended to be low in terms of recycling plastic bottle waste. Thus, high individual knowledge does not positively influence attitudes towards the concept. However, student reuse is still low, which is reflected in the high number of students who tend to use disposable products rather than products that can be reused. Regarding sustainability practices in energy saving, students tend to use motorcycles as a mode of transportation rather than environmentally friendly bicycles, and students are more likely to buy goods than rent.

Based on the findings regarding the level of circular economy awareness among students from a gender perspective, the outcomes of this study validate TPB of Ajzen [15], which argues that knowledge and attitudes can influence actions in the environment and behavioral change. This is consistent with perceived behavioral control, which measures how easy or difficult it is to carry out actions depending on the opportunities and resources available [15], so that reviews based on gender perspectives can provide a more comprehensive analysis. The findings suggest that, in general, there is no difference in the average circular economy awareness of the students (KAB) between men and women. These findings confirm the results of Musova *et al.* [32], who argued that there is no average difference in the results of gender analysis on circular economic behavior and are supported by the results of research by Hao *et al.* [33] which suggests that both men and women are generally willing to participate in the circularity practices. The findings of this study, specifically on Item A3 statement on the attitude variable, there is an average difference in terms of gender perspective, where male students show a relatively higher average than female students confirm the results of research by Kamble [34], which suggests that awareness of circular economics in women is lower than in men. Furthermore, research findings specifically regarding student sustainable behavior in waste management behavior variables show that there is an average difference in terms of sex, with male students showing a relatively higher average than female students. These findings confirm the results of a previous study on better waste management by [35].

Based on the findings of this study, it can be concluded that, in general, there is no difference in the average value of circular economy awareness between men and women, so it can be interpreted that both men and women have relatively the same level of circular economy awareness. However, the findings

specifically in statement item A3 in the attitude variable show an average difference between male and female students in the attitude variable, where it is stated that male students tend to have a higher average in business management, specifically, the use of online-based systems, than female students. Based on the researcher's limited analysis, this is because men tend to adopt a strategic and easier attitude, where the use of online systems is an easier way to manage and promote business in the digital era than offline systems that need to rent places and take care of business licenses. This is because, in the digital era, there have been mushrooming marketplaces for shopping for various needs. Findings specifically on the sustainable behavior of students in waste management behavior variables showed that there was an average difference in terms of gender, where male students showed a relatively higher average than female students. Based on the researchers' limited analysis, this is because men behave on the basis of rational or reasonable considerations, while female do so on the basis of emotional considerations; therefore, so male tend to be better at waste management.

Based on the findings regarding the correlation between students' knowledge, attitudes and circular economic behavior, the results of this investigation support The TPB by Ajzen [15], has argued that knowledge and attitudes can influence actions in the environment and behavior change, thus forming a positive relationship between variables. The SDGs have been utilized to investigate and comprehend environmental challenges and knowledge as predictors of intent to adopt to environmentally-friendly items in behavior and have frequently been used as a fundamental theoretical framework for forecasting and analyzing widespread pro-environmental behavior [29]. The results of this study demonstrate a favorable link between behavior and attitude, knowledge and behavior, and behavior and attitude. These findings support the findings of the study carried out by Nikolić *et al.* [36], which has found that sustainable attitudes and behaviors are significantly positively correlated. Dewi *et al.* [22], confirmed the existence of a relationship between the variables of knowledge, attitudes, and behavior in circular economic awareness.

The study's conclusions support the notion that there is a positive correlation between the variables of behavior and attitude, knowledge and behavior, and behavior and attitude. Thus, the researchers' limited analysis concluded that students' positive attitudes toward the circular economy and their pro-environmental behavior were shaped by their knowledge of the concept, which, in turn, influenced their positive behavior in the circular economy. However, certain question items in the explanation of percentage descriptive results confirm a slightly different phenomenon, where students have sufficient knowledge but do not have positive sustainable attitudes and behaviors. This is reflected in some items falling into the medium category, and there are still quite high percentages in the criteria of medium and low in some items of sustainable attitudes and behaviors. It can be concluded that positive sustainable attitudes and behaviors will not necessarily be formed with sufficient knowledge. According to the researcher's limited analysis, this is because the formation of sustainable attitudes and behaviors takes time and is a long-term process, and it is necessary for individuals to have behavioral intentions to exhibit changes.

4. CONCLUSION

The conclusion shows that the level of circular awareness of student economics (KAB) is generally in the high category. This is based on high knowledge and attitudes in the formation of sustainable and environmentally-conscious behavior. When examining the average value of circular economy awareness (KAB) from a gender perspective, men and women generally scored similarly, indicating that both sexes had relatively similar levels of awareness in these areas. The variables knowledge and behavior, knowledge and attitude, and attitude and behavior are positively correlated. These variable connections explain the relationship between the factors that influence the other variables. Therefore, a circular economy within academic institutions must be established comprehensively. The idea of a circular economy can be made known through education hence fostering the development of an environmentally sensitive mindset that leads to deliberate acts of applying circular economic principles to the environment. This action must be carried out continuously to achieve sustainable, environmentally-conscious behavior. The authors recommend that researchers increase the number of respondents and include additional variables such as education level, social media use, and the socioeconomic status of students. Further research is needed to develop circular economic practices in microeconomics courses, for example, on consumer behavior. Universities can also add new courses on the circular economy to their curriculum.

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