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Student Engagement in a Brazilian Research University

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ABSTRACT
Research universities enable students to have a unique learning environment and other experiences. This article aims to analyze student engagement in one research university in Brazil, the effects of student socioeconomic and academic characteristics and their associations with university structures (curriculum), and student trajectories. The data comes from the Student Experience in the Research University, an international survey administered in 2012 at the University of Campinas and longitudinal academic registers. The study used both Principal Component Analysis and also Multiple Linear Regression Models. Five modes of engagement were found: two related to curricular engagement (engagement with faculty and engagement outside the classroom), social and leisure engagement, curricular disengagement and co-curricular engagement. The main effects are associated with the disciplines. Regarding student trajectories, there was a negative association between academic engagement and dropout students and those still enrolled seven years after the survey application. The results align with other studies that associate disciplines with student engagement and student engagement with student success.

Keywords: Student Engagement; Higher Education; Research University; Quantitative Analysis; Student Experience; Undergraduate Education.

This article analyzes the association of students' socioeconomic and academic characteristics on student engagement, academic performance and students' trajectories in a research university[1]. Student engagement is understood, as per Astin (1999), as the quantity and quality of physical and psychological energy that the student dedicates to the academic experience. Student engagement is an important success factor in higher education (Fior & Mercuri, 2018; McCormick et al., 2013; Pike et al., 2012; Kahu, 2013).

Astin's (1999) engagement theory was an attempt to "open the student's black box." Previous to Astin, the analysis only considered the inputs, e.g., the university policies and program, and outputs, e.g., the learning outcomes. However, the mediation mechanisms, which explain how these educational programs

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[1] A version of this article was published in Portuguese (Carneiro & Pedreira, 2021).

and policies are translated into student performance and development, were not explained. For Astin, engagement is a dynamic variable that changes during the academic trajectory and is influenced by the student's personal characteristics and study background (Fior & Mercuri, 2018).

The data came from the application of the Student Experience in the Research University (SERU) survey among undergraduate students from the University of Campinas (Unicamp) in 2012. Unicamp is one of Brazil's main research-intensive universities. Unicamp is highly selective: in 2012, only 6% of the undergraduate candidates were selected (AEPLAN/Unicamp, 2013).

This study aims to enhance the existing literature on student engagement through two primary contributions. Firstly, it presents a comprehensive case study conducted within a single institution. Such an approach is particularly relevant because intra-institutional variations can often be more pronounced than inter-institutional differences, especially within comprehensive research universities (Chatman, 2007; Kahu, 2013). Secondly, student engagement is a new study area in Brazil's higher education field, especially in research universities.

The country has a tradition of studies about university students since the 1960's (Paul, 2015), that grew and started to include more dimensions as the higher education system expanded, including students who accessed via affirmative action (De Oliveira *et al.*, 2018; Figueiredo, 2018), student life quality (Andrade *et al*., 2016; Arronqui et al., 2012; Solis & Lotufo-Neto, 2019), and student engagement effects on integration, retention and graduation (Granado *et al.*, 2005; Guerreiro-Casanova & Polydoro, 2011; Polydoro *et al.*, 2001; Vendramini *et al.*, 2004). Guzmán-Valenzuela et al. (2020) literature review on the studies in Latin America found that there is an epistemic polyphony of research on the student experience in the region. Besides, there are many empirical studies about students, but few about student experience.

A. RESEARCH UNIVERSITIES AND STUDENT ENGAGEMENT

The research universities offer a unique environment for learning and other student experiences during the transition from high school to the world of work. The rich environment comes from the concentration of high-level researchers and the emphasis on discovery (Brint, 2015). According to Douglass (2016, p. 100), the student experience is more diverse in these institutions because it goes beyond the classroom to the "key role of the disciplines in building learning communities, the socioeconomic background and the interaction of students, and their opportunities to engage in research, service learning, and co-curricular activities". The research universities offer a variety of resources and educational opportunities (Bae; Han, 2019; Brint, 2015; Brint et al., 2008b; Brint et al., 2012; Thomson, Chirikov & Douglass, 2015). These interactions and the intra-institution variation were not completely understood in the literature nor in the public discourse about the role of research universities in the public sphere (Douglass, 2016).

Student engagement is influenced by, on the one hand, structural and institutional factors, such as university policies, institutional culture, and curricula and by, on the other, student characteristics, such as sociodemographic background, skills and motivation (Kahu, 2013; Kahu & Nelson, 2018). Alignment between institutional characteristics and student personal factors positively influences their self-efficacy beliefs, emotions, sense of belonging, and well-being, making them more receptive towards engagement (Kahu & Nelson, 2018).

Regarding individual characteristics, studies point out a series of variables that influence engagement, such as gender (Pike et al., 2012), nationality (Lu et al., 2020), parents' education (Bae & Han, 2019), being the first generation in higher education (Soria & Stebleton, 2012) and economic class (Soria, 2012).

According to Pike, Smart & Ethington (2012), female students tend to have higher levels of engagement than male students. However, this engagement is lower when female students are interacting with faculty. There are also difference among areas. Some studies indicate that women are more likely to contend with external pressures that limit their engagement in higher education, as well as being affected by gender stereotypes prevalent in certain fields of knowledge, which influence the advancement of their careers (González & Arismendi, 2018).

Lu et al. (2020), in a study with international students in China's higher education institutions, report that the nature of interactions established among students and faculty during classes affects academic engagement. Regarding interaction among students, the occurrence of cooperation practices within the classroom, as well as the occurrence of competition, had a positive correlation (albeit weak) with extracurricular engagement. Regarding the relationships between faculty and students, educational practices in which faculty support students in their daily activities also had a positive correlation (albeit weaker) with extracurricular engagement (Lu et al., 2020).

Parents' education level positively influences academic engagement with faculty, including outside the classroom, because the higher the education level, the higher the engagement level (Bae & Han, 2019). The correlation intensity is low but statistically significant (Bae & Han, 2019). Regarding family income, higher income levels are associated with lower academic engagement, although the association is weak (Bae, 2019). Higher income levels, in turn, are associated with higher academic engagement in practices involving peer learning (Bae & Han, 2019). First-generation students tend to have lower academic engagement, including interaction with faculties and participation in classroom discussions (Soria & Stebleton, 2012).

Social class is also related to student engagement, especially among first-year students who are transitioning to higher education. First-year working-class students experience a less welcoming campus climate, lower academic engagement, higher academic disengagement, and fewer classmate interactions than their middle/upper-class peers (Soria, 2012). Additionally, these students have lower academic engagement, which included the frequency with which students contributed to class discussion and interaction with faculty inside and outside of class. Working-class students also reported higher academic disengagement, which included turning in assignments late, attending class unprepared, and skipping classes (Soria, 2012). Finally, working-class students stated fewer interactions with classmates in academic activities, including working on group projects outside of class (Soria, 2012).

The individual characteristics' effect on academic engagement does not occur unidimensional, but in an interrelated way. Working-class students also tend to be black and first-generation.

As per Brint, Cantwell & Hanneman (2008b), the difference between cultures came from the difference in recruitment and socialization of faculty and peers. The levels of paradigmatic development (e.g., the level of consensus among theories and methods) influence the teaching styles.

Faculty in fields with low paradigmatic development (most of the arts, humanities, and social sciences) tend to behave more frequently in ways that encourage student participation than do faculty in high paradigmatic development fields (most of the natural sciences and engineering), which have far more structured and organized subject matter (Brint et al., 2008b).

Other studies also pointed out the influence of the discipline in measuring student engagement. According to Chatman (2007), the results of the 2006 University of California's census survey of undergraduates

(UCUES), a predecessor of SERU, showed a greater variance among the programs within an institution than among the same programs in different institutions, pinpointing differences between "hard" and "soft" sciences. Brint, Cantwell & Saxena (2012) point in the same direction. Fior & Mercuri (2018) found that the programs and the time of the student in the program are important factors that explain the involvement of students in obligatory and non-obligatory activities.

Measuring student engagement is a challenge because it is a latent variable. The analysis model used herein follows the same one formulated by Thomson, Chirikov & Douglass (2015) which applied the engagement index in several dimensions. The main objective was to develop a holistic understanding of student engagement, including the role of higher education in preparing students for professional careers and citizenship. Drawing upon Kerr's (1963) multiversity metaphor, which conceptualizes a university as a bustling city composed of diverse subcultures and responsibilities mirroring its expanding societal role, Thomson, Chirikov & Douglass (2015) investigated the role of research universities in facilitating students' navigation and utilization of various modes of engagement and learning.

Thomson et al. (2015) developed an exploratory analysis of SERU-2014 data from 11 institutions and more than 63,000 student responses. Using Categorical Principal Component Analysis (CatPCA), they found four main "pillars" or modes of undergraduate engagement - curricular, research, co-curricular and civic engagement (see Figure 1). The four modes of engagement are not independent however they are not highly correlated. Each mode offers a series of unique experiences which complement the others. Thus, students benefit from the multiple modes of engagement.

Figure 1
Modes of engagement and variables used by Thomson, Chirikov & Douglass (2015)
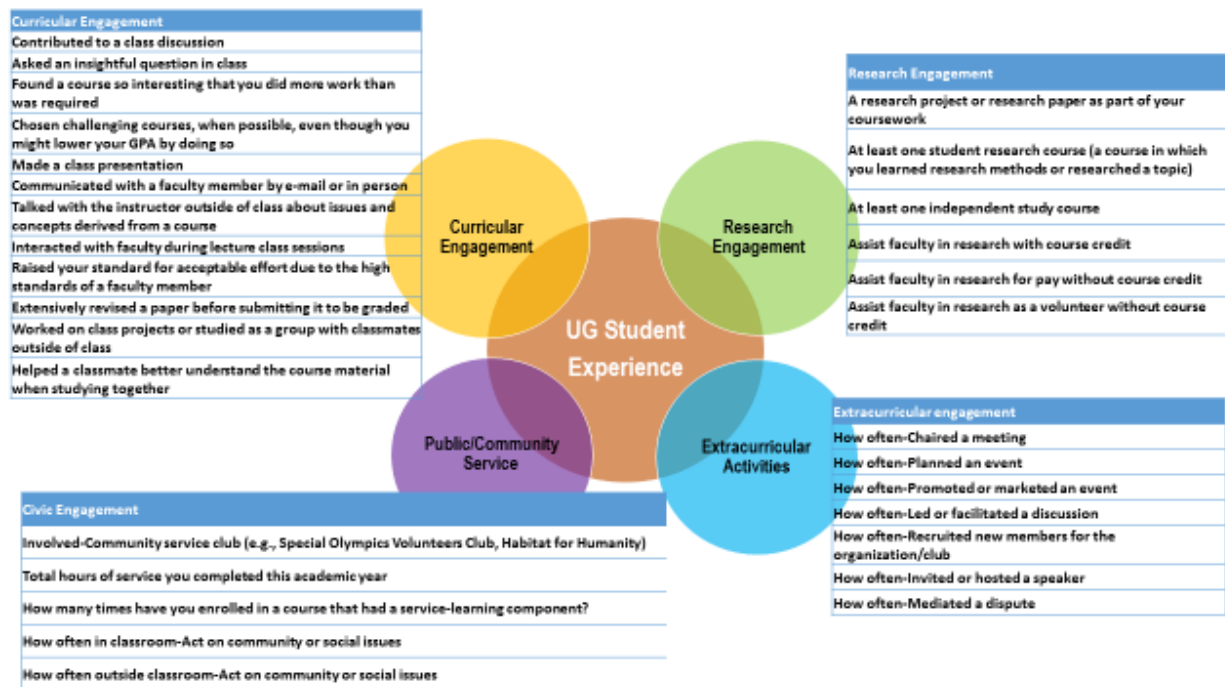
Source: Adapted from Thomson, Chirikov & Douglass (2015).

The study showed that students in American intensive research universities are engaged not only in the traditional mode (curricular) but also in other modes. Thereby, research universities offer substantially more than the classroom experience, and curricular engagement is only the tip of the iceberg (Thomson, Chirikov & Douglass, 2015).

B. METHODS

All Unicamp enrolled undergraduate students (16,856) were invited in 2012 to participate in the SERU survey. The invitation was sent to their academic email provided by Unicamp, and 518 emails bounced back. The total number of answers was 4,206, which means a 26% response rate, not considering bounced-back emails. The database was cleaned to eliminate inconsistent records, including all blank answers, same responses throughout and overly brief survey response time. The database was also submitted to a series of tests in order to eliminate records that were almost all blank (more than 70% missing questions). The data analyzed in this study consist of 2970 valid answers in the case of PCA analysis and 2.477 answers for Multiple Linear Regression[2].

The questionnaire consisted of 4 main parts:
- Part 1 - Academic engagement, time allocation, student development, campus climate and educational experience
- Part 2 - Community and civic engagement
- Part 3 - Background and personal characteristics
- Part 4 - Assessing undergraduate education at Unicamp

The answers to the survey were linked to the academic records (enrollment in 2019 and sociodemographic data at the moment of application to ingress at Unicamp) of these students. Therefore, the academic trajectories were set up based on the onset of each student's record from the moment they entered the university until 2019[3]. For example, at the time of the application of the SERU survey in 2012, some students had been at the university for nine years.

Regarding the academic trajectories in 2019:

- 82,2% of the participants of the 2012 survey had graduated from the program they were enrolled in 2012;
- 9,9% had dropped out from the 2012 program but had reenrolled and graduated from the original or another program;
- 7,9% were still enrolled.

The study sample is similar to the Unicamp population in terms of gender, study shift and number of programs (Table 1). The SERU sample, however, has a bigger concentration of bachelor students, older students, freshman students, and students from Human Sciences and Engineering programs.

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[2] The survey was also sent to students of the ProFIS program (Interdisciplinary Higher Education Program), which is a two-year undergraduate program that was established in 2011 at Unicamp for the purpose of increasing the access of low-income and minority students in an innovative general education program. However, their answers are not used in the MLR analysis.
[3] The research was approved by the Unicamp Research Ethics Committee (CAAE: 71276117.0.0000.5404).

Table 1

SERU sample (2.477 answers) and the total number of Unicamp undergraduate students according to sociodemographic characteristics in 2012

		SERU Sample	Unicamp Total number
Gender	Male	54.7%	53.0%
	Female	45.3%	47.0%
Age	Expected age range (18 to 24 years old)[a]	79.3%	90.0%
Work	Do not work	73.4%	-
	Up to 20 hours/week	12.6%	-
	More than 20 hours/week	9.1%	-
	Unknown	4.9%	
Year of enrollment	Freshman	28.9%	23.4%
	Sophomore	6.4%	-
	Junior	19.6%	-
	Senior	45.1%	-
Study shift	Day	65.1%	65.0%
	Night	34.9%	35.0%
Type of degree	Bachelor degree	83.3%	76.0%
	Teacher training	11.2%	8.0%
	Vocational	5.5%	15.0%
Field of study	Arts	4.4%	5.3%
	Health and Life Sciences	11.8%	20.1%
	Exact Sciences and Technological areas	19.6%	21.4%
	Human Sciences	28.3%	23.0%
	Engineering	35.9%	29.0%
Trajectory	Graduated	82,2%	-
	Enrolled	7,9%	-
	Drop out	9,9%	-
Number of courses		62	71

Note. Data from SERU Survey, AEPLAN (2013) and COMVEST Unicamp (2020).

[a] The data from Unicamp refers only to freshman under 23 years of age.

C. DATA ANALYSIS

Three types of analysis were carried out: a descriptive analysis of the sample profile; Principal Component Analysis (PCA) to explore the engagement modes and Multiple Linear Regression (MLR) to measure the association of student socioeconomic and academic characteristics on the modes of engagement and student trajectories. The descriptive analysis and PCA were carried out on SPSS software. The MLR was carried out on Jeffrey´s Amazing Statistic Program (JASP), a free multi-platform open-source statistics package (Goos-Sampson, 2018).

The version of the SERU survey administered at Unicamp did not have most of the items included in the Thomson, Chirikov & Douglass (2015) analysis. All items related to curricular engagement were present, but there was only one item related to the other modes of engagement. To deal with these absences, the question about time use was used in the analysis in a similar way to that used by Bae & Han (2019).

PCA was initially carried out with 40 variables using all items from the first four questions of the 2012 SERU survey. The three first questions had 19 items about some activities carried out during the academic year, and the students should answer using the scale "1=Never, 2=Rarely, 3=Occasionally, 4=Somewhat often, 5=Often, 6=Very often". In the fourth question, students should indicate how many hours they spent in a regular week on each of the 21 activities, using the "0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, more than 30" scale. During PCA, 6 items were removed because they presented eigenvalues under 0.5[4], four because they did not score in any component[5] and two were not included because they were sub-items of items removed.

PCA was carried out on the 28 items with orthogonal rotation (varimax). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = 0.82, and all KMO values for individual items were higher than 0.67, which is well above the acceptable limit of 0.5. Barlett's test of sphericity indicated that correlations between items were sufficiently large for PCA ($X2$ (378) = 26016.102, p.<0.001). An initial analysis was run to obtain eigenvalues for each component in the data. Five components were retained in the final analysis.

Three MLR were carried out to analyze the effects of socioeconomic and academic variables on selected modes of engagement: curricular engagement with faculty; curricular disengagement and curricular engagement outside the classroom. In the case of the categorical variables, reference groups were selected. The continuous variables were standardized. After the model parameter estimation, the goodness of fit of the models was made with the R^2, Anova test, Durbin-Watson test and collinearity statistics. The models were also checked in relation to heteroskedasticity using the residue quantile-quantile plot (Q-Q plot) (GOOS-SAMPSON, 2018).

D. MODES OF ENGAGEMENT

PCA allowed the extraction of 5 components, which explains 48.9% total variance. Table 2 presents PC loadings after rotation. The modes of engagement are not correlated, appearing to be independent constructs.

Mode 1 of engagement - curricular engagement with faculty – is formed by seven variables and is responsible for 15% of the total variance. The students engaged in this mode more frequently contributed to class discussions, interacted with faculty members in class, asked questions and made class presentations. They work less frequently with faculty in activities aside the course. Mode 2 refers to social and leisure engagement and is also made up of 7 variables, including using the computer for leisure and the reading of news; socializing with friends and family; watching leisure events and TV; and hobbies. This mode is outside of the university environment. Mode 3 - curricular disengagement - goes in a different

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[4] The items were as follows: Taken a small research-oriented seminar with a faculty member; Communicated with a faculty member by email or in person; Raised your standard for acceptable effort due to the high standards of a faculty member; Attend classes, discussion sections, or labs; Reading newspapers or news magazines; Commute to school and to work.

[5] The items were as follows: study and other academic activities outside of class; paid employment (include paid internships); developing a formal undergraduate research program; Participating in religious or spiritual activities.

direction from the other curricular engagement modes and includes items such as "gone to class without completing assigned reading", "skipping class" and "turning in a course assignment late." Mode 4 - curricular engagement outside the classroom - includes activities such as group study, helping a colleague and carefully reviewing work before handing it in.

Table 2

Rotate Factorial loads

	Engagement modes				
	1 - Curricular engagement with faculty	2 – Social and leisure engagement	3 - curricular disengagement	4 – Curricular engagement outside the classroom	5 – Co-curricular engagement
Contributed to a class discussion	0.807				
Interacted with a faculty member during lecture or class sessions	0.784				
Asked an insightful question in class	0.777				
Brought up ideas or concepts from different courses during class discussion	0.774				
Talked with the instructor outside of class about issues and concepts derived from a course	0.65				
Found a course so interesting that you did more work than was required	0.622				
Made a class presentation	0.604				
Worked with a faculty member on a research or creative activity other than course work	0.491				
Using your computer or phone for leisure activities (games. email. text messages. social networks. etc.)		0.728			
Reading news and information on your computer or mobile		0.689			
Socializing with friends		0.638			
Watching movies, concerts, shows, sports or other leisure events		0.625			
Watching TV		0.618			
Spending time with family		0.53			
Developing creative interests and leisure activities (crafts. reading / writing. music. photography. other hobbies)		0.438			
Came to class unprepared			0.858		
Came to class without completing assigned reading			0.853		
Skipped class			0.641		
Turned in a course assignment late			0.562		
Worked on class project or studied as a group with other classmates outside class				0.796	
Helped a classmate better understand the course materials when studying together				0.776	
Sought academic help from instructor or tutor when needed				0.635	
Extensively revised a paper at least once before submitting it to be graded				0.452	
Participating in clubs and student organizations					0.693
Developing activities of voluntary community work					0.557
Involved with student company activities					0.513
Going to parties					0.507
Doing physical activities, playing sports, hobbies with lots of action					0.433
Total variance explained	15%	10.60%	8.70%	7.70%	6.90%

Note. Only the factors with a factorial load above 0.4 were selected. N = 3103.

Lastly, mode 5 – co-curricular engagement - includes activities such as participating in group and student organizations, volunteering, going to parties, doing sports and taking part in student company activities.

Given that the activities of "going to parties" and "doing sports" have been classified alongside other extracurricular engagements, it can be postulated that these activities pertain to events taking place within the campus or are directly associated with Unicamp-specific initiatives.

The following step was the construction of the five engagement Indices using the PCA Factor loadings transformed into 0-100 scale. Table 3 presents the descriptive statistics of the components transformed into indices.

Table 3
Descriptive statistics of the components transformed in indices

		Modes of engagement				
		1 - Curricular engagement with faculty	2 – Social and leisure engagement	3 - Curricular disengagement	4 – Curricular engagement outside the classroom	5 - Extracurricular engagement
N	Valid	2477	2476	2477	2476	2476
	Missing	0	1	0	1	1
Mean		50.52	32.12	42.90	58.66	31.51
Median		49.00	29.62	41.17	59.21	29.75
Standard Deviation		19.40	11.38	15.55	14.38	9.58
Minimum		0.18	9.54	6.14	14.25	6.60
Maximum		100.00	100.00	100.00	100.00	100.00

E.   CURRICULAR ENGAGEMENT AND STUDENT CHARACTERISTICS

According to Fior and Mercuri (2018, p. 87), "student involvement varies according to institutional characteristics, as well as student background and personal attributes, among other variables which create a complex network of influence that should be taken into account".

In this sense, this study aimed to analyze the effects of student characteristics in the curricular engagement modes. The variables were selected based on literature (Brint et al., 2008b; Brint et al., 2012; Chatman, 2007; Fior & Mercuri, 2018; Kahu, 2013; Pike et al., 2012).

The variables presented in Table 4 were used to develop three regression models to explain the two curricular engagement modes (1 – with faculty, 4 – outside the classroom) and the mode 3 - Curricular disengagement. This analysis was carried out based on 2,477 answers. The models are presented here after the elimination of the non-significant variables.

Table 4
Variables used in the Multiple Linear Regression Model

	Reference category	Categories	n	%
Gender	Male	Female	1123	45,3%
		Male	1354	54,7%
Race/color	White	White	1859	75,1%
		Black/Brown	381	15,4%
		Asian	127	5,1%
Age	Up to 22 years	Up to 22 years	1434	57.9%
		Between 23 and 28 years	862	34.8%
		Bigger or equal to 29 years	181	7.3%
Mother level of education	Incomplete primary school	Incomplete primary school	247	10%
		Complete primary school	149	6%
		Complete high school	740	29.9%
		Complete higher education	905	36.5%
		Complete post-graduate	293	11.8%
Income per capita in mininum wage[b]	Up to 1.5	Up to 1.5	796	32.1%
		Between 1.5 and 3	817	33%

		More than 3	679	27.4%
Paid employment	No	No	1818	73.4%
		Yes, sporadic	124	5%
		Yes, part-time	189	7.6%
		Yes, full time	225	9.1%
Campus	Central	Central	2171	87.6%
		Other	306	12.4%
Program shift	Full day	Full day	1612	65.1%
		Evening	865	34.9%
Knowledge area of program according to International Standard Classification of Education – Fields of Education and Training (ISCED-F 2013)	Engineering, Manufacturing and Construction	Engineering, Manufacturing and Construction	889	35.9%
		Social Sciences, Journalism and Information+ Business, Administration and Law	335	13.5%
		Information and Communication Technologies+ Natural Sciences, Mathematics and Statistics	486	19.6%
		Health and Welfare	292	11.8%
		Education	259	10.5%
		Arts and Humanities	216	8.7%
Level of Satisfaction with Unicamp[a]	__	Continuous variable		
Study trajectories at Unicamp in relation to the program enrolled in 2012	Graduation	Graduation (after a single entrance; after multiple reentrances)	2042	82.4%
		Still enrolled (after a single entrance; after multiple reentrances)	195	7.9%
		Dropout (Dropout but with at least a graduation before 2012; Dropout after a single entrance; Dropout after multiple reentrances)	240	9.7%
Curricular engagement with faculty	__	Continuous variable		
Social and leisure engagement	—	Continuous variable		
Curricular disengagement	—	Continuous variable		
Curricular engagement outside the classroom	__	Continuous variable		
Co-curricular engagement	—	Continuous variable		

Note:
[a] The index of satisfaction with Unicamp was calculated by adding the individual scores of 12 items (subject variety and quality; class quality; elective subject availability; the size of classes; research experience; educational enrichment programs, libraries etc.). Each item could have a score from 1 (highly dissatisfied) to 6 (highly satisfied). Thus, the values could range from 12 to 72 points. Then, the variable was normalized.
[b] The total family income variable was a scale in minimum wages. The income per capita was calculated by dividing the average point of the total family income scale by the number of people who lived on this income.
[c] Common area of ingress for Mathematics, Physics, Applied and Computational Mathematics and Physical Engineering.

F.   EFFECTS ON THE CURRICULAR ENGAGEMENT WITH FACULTY

Table 5 presents the associated coefficients of the MLR model, their standard errors, the values of T-Student test, and p-values. The multiple linear regression model is well adjusted and explains 19.1% of the variance ($F_{(24)} = 17.66$, $p < 0.001$; $R^2_{adjusted} = 0.191$). Apart from this, the model is homoscedastic.

The coefficient of four variables had the biggest effect (program area, age, paid employment and level of satisfaction with Unicamp). The biggest effects are related to program grouped in knowledge areas. Compared with engineering students, the model estimates a mean positive effect of 14.93 points in this engagement mode for the Health and Welfare students, 13.34 points for the Humanities and Arts students and 12.43 for the "Social Sciences, Journalism and Information, Business, Administration and Law" students.

Table 5

Effects of mode of curricular engagement with faculty

Variable	Coefficients	Standard error	T Student test	p.value
(Interception)	21.454	2.869	7.477	< 0.001
Gender				
Female	-2.147	0.903	-2.378	0.017
Race/color				
Black/Brown (African-Brazilian)	-0.009	1.193	-0.008	0.994
Yellow (Asian)	-5.316	1.871	-2.841	0.005
Age				
Between 23 and 28 years	5.127	0.947	5.414	< 0.001
Bigger or equal to 29 years	7.432	1.995	3.725	< 0.001
Mother's level of education				
Complete primary school	4.174	2.129	1.961	0.050
Complete high school	4.258	1.570	2.712	0.007
Complete higher education	3.579	1.643	2.179	0.030
Complete post-graduate	4.227	1.959	2.158	0.031
Income				
Between 1.5 and 3	-1.718	1.067	-1.610	0.108
More than 3	-1.857	1.157	-1.606	0.109
Paid employment				
Yes, sporadic	6.972	1.886	3.696	< 0.001
Yes, part- time	2.540	1.705	1.490	0.137
Yes, full time	-1.300	1.632	-0.796	0.426
Campus				
Other campi	2.384	1.437	1.659	0.097
Program shift				
Evening	-1.603	1.124	-1.427	0.154
Knowledge area				
Social Sciences, Journalism and Information + Business, Administration and Law	12.436	1.401	8.879	< 0.001
Information and Communication Technologies + Natural Sciences, Mathematics and Statistics	0.246	1.212	0.203	0.839
Health and Welfare	14.932	1.538	9.708	< 0.001
Education	9.047	1.702	5.316	< 0.001
Arts and Humanities	13.346	1.712	7.795	< 0.001
Level of Satisfaction with Unicamp	5.094	0.530	9.620	< 0.001
Studies trajectories at Unicamp in relation to the program enrolled in 2012				
Dropout	-5.274	1.504	-3.506	< 0.001
Still enrolled	-4.309	1.644	-2.621	0.009

Compared with students up to 22 years old, the model estimates a 7.43 mean positive effect in curricular engagement with faculty for the oldest students and a 5.127 mean positive effect for the students between 23 and 28 years old. Compared with students that did not work, there is a mean positive effect of 6.972 for those who work sporadically.

Regarding the enrollment status, compared with graduated students, there is a negative effect in this mode of engagement for those who drop out (-5.274) and for those still enrolled (-4.309).

Finally, there is a positive relationship between the level of satisfaction with Unicamp and engagement (a one-unit increase in satisfaction leads to a 5.1 increase in engagement). And there is a slightly smaller negative effect among women.

G. CURRICULAR DISENGAGEMENT

Table 6 presents the associated coefficients of the MLR model, their standard-errors, the values of T-Student test, and p-values. The multiple linear regression model is well-adjusted and explains 13.8% of the variance (F (24) = 12.32, p < 0.001; $R^2_{adjusted}$ = 0.138). Apart from this, the model is homoscedastic.

Table 6

Effects of mode of curricular disengagement

Variable	Coefficients	Standard error	T Student test	p.value
(Interception)	56.948	2.417	23.559	< 0.001
Gender				
Female	-3.876	0.760	-5.097	<0.001
Race/color				
Black/Brown (African-Brazilian)	0.915	1.005	0.910	0.363
Asian	-0.246	1.576	-0.156	0.876
Age				
Between 23 and 28 years	4.187	0.798	5.248	< 0.001
Bigger or equal to 29 years	0.960	1.681	0.571	0.568
Mother's level of education				
Complete primary school	-0.110	1.793	-0.062	0.951
Complete high school	2.466	1.323	1.864	0.062
Complete higher education	3.493	1.384	2.524	0.012
Complete post-graduate	3.687	1.650	2.234	0.026
Income				
Between 1.5 and 3	1.711	0.899	1.904	0.057
More than 3	0.840	0.974	0.862	0.389
Paid employment				
Yes, sporadic	-0.007	1.589	-0.004	0.997
Yes, part-time	1.862	1.437	1.317	0.188
Yes, full time	2.302	1.375	1.674	0.094
Campus				
Other campi	-3.420	1.211	-2.825	0.005
Program shift				
Evening	0.729	0.947	0.770	0.441
Knowledge area				
Social Sciences, Journalism and Information + Business, Administration and Law	-0.356	1.180	-0.301	0.763
Information and Communication Technologies + Natural Sciences, Mathematics and Statistics	-4.669	1.021	-4.574	< 0.001
Health and Wellbeing	-4.530	1.296	-3.496	< 0.001
Education	-6.498	1.434	-4.532	< 0.001
Arts and Humanities	-7.519	1.442	-4.963	< 0.001
Level of Satisfaction with Unicamp	-3.586	0.446	-8.038	< 0.001
Studies trajectories at Unicamp in relation to the programs enrolled in 2012				
Dropout	1.632	1.267	1.287	0.198
Still enrolled	-4.207	1.385	-3.037	0.002

The biggest effects are related to program areas, campus location, age and gender. Compared with engineering students, a mean negative effect is expected in the disengagement among students from Humanities and Arts (-7.51), Education (-6,49), ICT, Natural Sciences, Mathematics and Statistics (-4.66), and Health and wellbeing (-4.53). Compared with students up to 22 years old, a mean positive effect of 4.18 is expected for students between 23 and 28 years. Compared to students from the central campus, a mean negative effect of -3.42 is expected for students from other campi. And the higher the curricular disengagement, the lower the level of satisfaction with Unicamp (a mean negative effect of -3.58).

Compared with male students, a mean negative effect of -3,87 is expected for female students. Therefore, students from engineering, older, male and from other campi are expected to be more curricular disengaged.

H.   EFFECTS ON CURRICULAR ENGAGEMENT OUTSIDE THE CLASSROOM

Table 7 presents the associated coefficients of the model, their standard errors, the values of the T-Student test, p-values and adjusted p-values (BH). The multiple linear regression model is well-adjusted and explains 17.1% of the variance (F (24) = 15.527, p < 0.001; $R^2_{adjusted}$ = 0.171). Apart from this, the model is homoscedastic.

Table 7
Effects of mode of curricular engagement outside the classroom

Variable	Coefficients	Standard error	T Student test	p.value
(Interception)	51.503	2.154	23.916	< 0.001
Gender				
Female	5.145	0.677	7.601	< 0.001
Race/color				
Black/Brown (African-Brazilian)	0.923	0.894	1.032	0.302
Asian	2.218	1.402	1.581	0.114
Age				
Between 23 and 28 years	-2.355	0.711	-3.315	< 0.001
Bigger or equal to 29 years	-6.116	1.495	-4.090	< 0.001
Mother's level of education				
Complete primary school	2.372	1.595	1.487	0.137
Complete high school	1.147	1.177	0.975	0.330
Complete higher education	1.373	1.232	1.115	0.265
Complete post-graduate	1.538	1.468	1.047	0.295
Income				
Between 1.5 and 3	-0.263	0.800	-0.329	0.742
More than 3	-0.682	0.868	-0.786	0.432
Paid employment				
Yes, sporadic	-1.847	1.414	-1.306	0.192
Yes, part-time	-1.432	1.278	-1.113	0.266
Yes, full time	-1.878	1.223	-1.535	0.125
Campus				
Other campi	1.612	1.077	1.497	0.135
Program shift				
Evening	-1.437	0.842	-1.707	0.088
Knowledge area				
Social Sciences, Journalism and Information + Business, Administration and Law	-8.749	1.050	-8.334	< 0.001
Information and Communication Technologies + Natural Sciences, Mathematics and Statistics	-2.510	0.909	-2.761	0.006
Health and Wellbeing	-5.359	1.153	-4.648	< 0.001
Education	-5.365	1.276	-4.206	< 0.001
Arts and Humanities	-15.066	1.283	-11.739	< 0.001
Level of Satisfaction with Unicamp	2.535	0.398	6.376	< 0.001
Studies trajectories at Unicamp in relation to the program enrolled in 2012				
Dropout	-4.200	1.127	-3.726	< 0.001
Still enrolled	-1.220	1.232	-0.990	0.322

The effects that are highlighted refer to program area, age and gender. Compared with engineering students, a mean negative effect is expected in the engagement among students from Humanities and

Arts (-15.06), "Social Sciences, Journalism and Information, Business, Administration and Law" (-8.74), Education (-5.36), Health and Wellbeing (-5.35) and ICT, Natural Sciences, Mathematics and Statistics (-2.51).

Compared with the youngest students, age has a mean negative effect on this mode of engagement among the older.
There is an expected 5.14 mean positive effect among female students. In terms of trajectory, there is a mean negative effect among those who drop out.

I.   CONCLUSION

The SERU survey administration at Unicamp in 2012 provided an excellent opportunity to better know who the undergraduate students are and what they think, their experience at the university, their engagement modes, level of satisfaction, and how they use their time among other factors.

It was the only administration of this instrument in Brazil and South America. Besides, this research contributes to studies that explore the academic engagement dimensions in detail using SERU data, which are rare, according to Bae & Han (2019).

Compared to the Kahu (2013) framework, this study initially explored the behavioral aspects of engagement, called engagement mode here. Following this, the antecedent effects were analyzed, taking into consideration the structural influence of the university, mainly the influence of disciplines, and student characteristics.

Compared to the SERU-2014 study mentioned above, the engagement modes at Unicamp are different. Thomson, Chirikov & Douglass (2015) reported four academic engagement modes: curricular, research, co-curricular and civic. The exploratory analysis brought forth three curricular engagement modes (with faculty, outside the classroom and curricular disengagement), a co-curricular engagement mode and one engagement mode regarding social and leisure activities.

The differences can be explained based on two main reasons. As previously presented, most of the variables used by Thomson, Chirikov & Douglass (2015) were not available in the 2012 questionnaire applied at Unicamp and the addition of the time question could not have been enough to incorporate all academic engagement modes, apart from setting up a leisure engagement mode unrelated with university activities, despite two items (parties and sports) having been grouped with more well-known co-curricular activities (participation in student associations and student companies). However, this engagement mode not related to activities developed around the university is an interesting result. According to Brint et al. (20212), the number of hours dedicated to studying, both inside and outside the classroom, has decreased since the 1960s. Students tend to spend more time on social and recreational activities.

The second reason is the Unicamp context differences compared with American universities in terms of curriculum and teaching organization. According to Guzmán-Valenzuela (2020), the student engagement definition is context-dependent.

However, it is important to take a closer look at the curricular components. On the one hand, a disengagement mode emerged, which includes items such as "came to class unprepared", "gone to class without completing assigned reading", "Skipped class" and "Turned in a course assignment late". In order to better understand this engagement mode, we run an MLR. The results showed that students less disengaged are female, from other campi and from TIC and natural sciences, health, education and art

and humanities programs (when compared with engineering students). Students more disengaged are older, and those still enrolled. Finally, disengagement decreases with a decrease in satisfaction with the university.

These results appear to point out that these items could not necessarily mean disengagement but curricular issues and strategies used by students facing challenges present in their academic life. Such difficulties can be due to rigid curricular structures centralized in the classroom. Most Unicamp undergraduate programs, especially engineering programs, have lengthy curriculums regarding obligatory and elective course loads, with long hours in the classroom, a common practice among Brazilian universities (Fior; Mercuri, 2018). Curricular disengagement can be also associated with difficulties in the self-regulation learning process (Casanova et al.,2020), which impacts student engagement with faculty (Kahu, 2013).

Another important effect of the university structure, the discipline culture, can help explain the segmentation between the two modes of curricular activities – one in the classroom with faculty and another with peers outside the classroom (Brint et al., 2008b; Brint et al., 2012; Chatman, 2007; Fior & Mercuri, 2018; Kahu, 2013; Pike et al., 2012). The knowledge area of programs was the variable that stood out most. Compared to engineering students, there was a positive effect in the mode of curricular engagement with faculty in Human Sciences and Arts students (social sciences, business, arts, humanities and education) and also in Health and Welfare students. The opposite effect was observed in the mode of curricular engagement with peers and in the disengagement curricular mode. Compared to engineering students, the effect was negative in these disciplines.

A parallel between the two culture effects can be carried out here as per Brint et al. (2008b). The teaching and learning strategies vary per discipline and bring forth different engagement cultures. According to Brint et al. (2008b), in Arts, Humanities and Social Sciences, the focus would be on the interaction, participation and interest in ideas, similar to the mode of curricular engagement with faculty. However, in the natural sciences and engineering programs, the focus is on the enhancement of quantitative skills using a collaborative study in a perspective of work market gains, which could draw on the items of the mode of curricular engagement outside the classroom[6].

Brint et. al (2012) noticed that the differences among disciplines and programs remain significant even after controlling student participation when analyzing the academic experiences in terms of study time, academic conscientiousness and analytical and critical thinking based on the UCUES 2008 results. The study also showed that the performance and sociodemographic student characteristics in different disciplines do not represent much of the variance of the measures studied. The study by Bae and Han (2019), using 2012 SERU data, also pointed out the small effect of socioeconomic characteristics on students in academic engagement.

Another explanation based on the study by Lu et al. (2020) is that the existence of a competitive environment in the classroom and a lack of closeness between teachers and students helps to explain why

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[6] Differently from Brint et al. (2008b) study, the effect on curricular engagement in the classroom with faculty was positive but small and not significant among students from TIC and natural sciences. And on the curricular engagement outside the classroom, the effect was negative and small than in the other areas. Perhaps this occurred due to the combination of two different sets of areas of programs from the ISCED-F 2013, namely TICs and Natural Sciences, Mathematics and Statistics.

engineering students describe lower engagement with professors and higher engagement with activities outside the classroom.

Programs in the Humanities, Arts, Social Sciences, and Health fields have proposed curricula that value and create conditions for greater interaction between students and teachers. On the other hand, compared to other fields, the curricula of engineering courses offer fewer opportunities for interaction with professors, greater disengagement, and a higher level of interaction with peers. These data point to the importance of discussing Engineering curricula, which underwent a revision in 2019 through new curriculum guidelines. Even in 2012, the data collection period, curricula seem to reflect a training proposal that distances teachers and students. Without teacher support, students seek their peers to confront the challenges achieved through engagement with peers.

Silva & Cecílio (2007) raise the need for reflection on the training proposal for engineering courses, whether it has a character of knowledge construction centered on the student or reproduces itself as strictly technical professional training. In this sense, Bazo & Pereira (2019) highlight the lack of reflective and critical practice, and analysis of broader factors in the curricula, which, according to the authors, are indispensable in current times. This resulted in the proposition of new curriculum guidelines for Engineering courses.

Most of the socioeconomic variables had little or no effect on characterizing the academic engagement modes, such as parent's education level and family income. The main effects were associated with age and gender.

According to our analysis, older students were more engaged with faculty and less with peers in the mode of engagement outside the classroom. According to the literature, these students may have more difficulties reconciling the different roles in their lives, may struggle with interpersonal relationships with peers, and may have previous histories of failure. All these factors can negatively affect their learning, performance, and perception of competence (Jia & Maloney, 2015; Stratton et al., 2008). According to Tinto (1997), the classroom is particularly relevant for working students, older students, and those who commute daily to attend higher education. The classroom can be the only opportunity for the student to interact with peers and teachers.

In terms of gender, female students had lower engagement with faculty and higher engagement in activities outside the classroom. Additionally, compared to male students, there was a negative effect among women in terms of curricular disengagement, meaning that female students were more engaged. There are studies that indicate that women are more likely to contend with external pressures that limit their engagement in higher education, as well as being affected by gender stereotypes present in certain knowledge areas that influence their career development (González & Arismendi, 2018). According to Pike et al. (2012), women are generally more engaged, except when it comes to interaction with faculty.

It is important to highlight the effect of satisfaction with Unicamp. In the three MRLs we run, the higher the satisfaction, the higher the engagement. The results are similar to those from Roebken (2007) study.

There is a difference between our study and the results of Brint et al. (2008b) worth mentioning. We found a similarity in the effects among students from Health and Human Sciences and Arts. However, health and welfare majors were not included in the Brint et al. (2008b) analysis because these programs are offered as graduate education in the U.S. universities.

In terms of academic trajectory, the dropout students presented negative effects in the academic engagement mode outside the classroom in comparison with those who graduated. Additionally, the still-enrolled students in 2019, seven years after the survey application[7], presented positive effects in the disengagement mode. Therefore, the results converge with other studies that show the relevance of academic engagement with the integration into university life and academic success (Pascarella; Terenzini, 2005; Polydoro & Carneiro, 2016; Santos *et al.*, 2013; Vendramini *et al.*, 2004).

There are three main limitations of the study. Firstly, the reduction of dimensionality, carried out by principal component analysis prior to the multiple linear regression, might have resulted in the loss of information and generated difficulties in making a more precise estimate. Secondly, only one measure in time of engagement was available, which limits the analysis because engagement is a dynamic variable (Fior & Mercuri, 2018). Thirdly, the analysis was carried out with the grouping of programs in great areas and this procedure can conceal the differences among programs, which are a primary source of identity and interest among students according to Brint et al. (2012).

Concluding, this study reinforces the importance of developing institutional policies regarding academic engagement. The different patterns of engagement among areas call attention to the institutional responsibility in education planning of the experiences offered to the students (Fior; Mercuri, 2018), and to do so according to each area, since there is no best educational practice (Brint et al., 2008a).

Thus, the results bring up the need for revision and renovation of the curriculum and teaching and learning methods especially in engineering programs. In these areas, the students are inclined, on the one hand, to have lower engagement in curricular activities with faculty and, on the other hand, a better engagement in curricular activities outside the classroom. Thus, the curriculum should favor more individual and group study hours rather than excessive hours in the classroom (Fior & Mercuri, 2018).

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[7] This can indicate a longer trajectory of study, since the survey was applied by students of all cohorts in 2012 and the analysis considered all the reingress that happened.

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