



Student satisfaction and interaction in higher education

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Abstract

Given the pivotal role of student satisfaction in the higher education sector, myriad factors contributing to higher education satisfaction have been examined in the literature. Within this literature, one lesser-researched factor has been that of the quality and types of interpersonal interactions in which students engage. As existing literature has yet to fully explore the contributions made by different forms of interaction to student satisfaction in higher education, this study aimed to provide a more fine-grained analysis of how different forms of interaction between students, their peers and their instructors relate to different aspects of student satisfaction. A total of 280 undergraduate students from one of the largest higher education institutions in Singapore participated in the study. Results provided an in-depth analysis of eight aspects of student satisfaction (i.e. satisfaction with the program, teaching of lecturers, institution, campus facilities, student support provided, own learning, overall university experience and life as a university student in general) and suggested that the different aspects of student satisfaction were associated with three different forms of interaction: student–student formal, student–student informal and student-instructor.

Keywords Student satisfaction · Higher education · Formal interaction · Informal interaction · Student–student interaction · Student-faculty interaction

Introduction

In higher education (HE), student satisfaction is vital both for the success of institutions and for that of individual students, particularly in our current global climate. Rapid technological advancements, in particular, have intensified competition in the HE sector in recent years. In Singapore and other countries presently, not only do HE institutions need to compete for students with branch campuses of foreign institutions set up locally, but also with digital platforms that offer massive open online courses (MOOCs) that allow students to learn without being attached to specific institutions. By 2015, there were already about 220 international branch campuses of overseas universities in operation worldwide (Maslen, 2015).

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In this cut-throat context, maximising student satisfaction has become a primary focus of many universities and colleges, irrespective of their physical location. Such move is no surprise considering that student satisfaction is now often used as a measure of HE institutions' performance (Jereb et al., 2018; McLeay et al., 2017). As reflected in recent studies on the impact of COVID-19 (Coronavirus Disease 2019) upon the HE sector, student satisfaction has been incorporated as an index to measure the extent to which attendant disruptions to services have affected the quality of HE services received by students (e.g. Duraku & Hoxha, 2020; Shahzad et al., 2020). However, this does not imply that HE institutions have no other considerations when it comes to making student satisfaction their top priorities to pursue service excellence. As discussed in the subsequent section, giving what students want most to keep them satisfied can have undesirable effects on students as well as on institutions. Hence, any discussion that frames the debate on student satisfaction should go beyond its role as a metric to measure HE institutions' performance.

The vital role of student satisfaction in higher education

Students' satisfaction with the quality of the education services they receive is a crucial index of the performance of HE institutions in today's world (Butt & Rehman, 2010; Santini et al., 2017; Weingarten et al., 2018). Student satisfaction figures are also used as a means by which to distribute precious resources across HE institutions in many countries. For instance, the Australian government has recently announced the adoption of the performance-based funding (PBF) scheme to be used in future years, in which the provision of funding to Australian universities will be based, in part, on the quality of the overall student experience (Australian Department of Education, Skills and Employment, 2020). Student satisfaction is one of the indices that may be used to measure the overall student experience within this scheme (Commonwealth of Australia, 2019).

Be it academic programs or the peripheral student support services, the ability to provide high-quality services to students has been regarded by many scholars as crucial for HE institutions to withstand the increasingly competitive HE environments in which they must now operate (Butt & Rehman, 2010; Lapina et al., 2016; McLeay et al., 2017; Paul & Pradhan, 2019). Higher service quality, driven by outstanding learning processes and high levels of satisfaction with the services delivered, has been deemed to be what will "set a HE institution apart" from its rivals (McLeay et al., 2017).

Numerous more immediate commercial benefits derived from high levels of student satisfaction have also been highlighted in the literature. When satisfied with the quality of services provided, students are more likely to continue with their enrolled institutions and recommend them to prospective students (Mihanović et al., 2016). Student loyalty is another reward that HE institutions can gain from having highly satisfied students. As loyal students are more likely to engage in alumni activities, greater alumni engagement can in turn benefit the institutions through the provision of direct financial support, as well as attractive employment opportunities for current graduates (Paul & Pradhan, 2019; Senior et al., 2017).

Concurrently, with rising government interventions in various countries to regulate their HE sectors, there have been increasing calls for HE institutions to improve their service quality (Hou et al., 2015; Dill and Beerkens, 2013). As a result, the use of quality assurance regimes by governments to regulate HE has become more prominent worldwide (Jarvis, 2014). In a recent report, it was estimated that the tuition fees for bachelor programs in some OECD countries (Organization for Economic Cooperation and Development) have

risen as much as 20% between 2007 and 2017 (OECD, 2019). With substantial cost outlays involved in the provision of HE, concerns over returns on financial investments are not limited to students and parents, but apply also to entire governments (Lapina et al., 2016; Weingarten et al., 2018). With the costs of providing HE continue to rise, many HE providers are becoming increasingly concerned about how best to meet the needs and expectations of students and keep them satisfied (Weingarten et al., 2018). Such concerns were valid particularly when student satisfaction was linked numerous institutional aspects. As discovered in a study conducted by De Jager and Gbadamosi (2010) on 391 students from two African universities, student satisfaction was reported to relate significantly to various institutional aspects including academic reputation, accommodation and scholarship, location and logistics, sports reputation and facilities and safety and security.

Student satisfaction is not only crucial to institutions, but also to learners themselves. Students' satisfaction with their learning experiences is not, however, related simply to the feelings they have about the quality of the education services they receive. Within the HE literature, high levels of student satisfaction have also been linked to the attainment of important learning outcomes in HE. For instance, scholars have recognised that student satisfaction may influence outcomes such as academic achievement, retention and student motivation (Aldridge & Rowley, 1998; Duque, 2014; Mihanović et al., 2016; Nastasić et al., 2019). Evidently, such hypothesised links between satisfaction and key learning outcomes have received some empirical support to date. For instance, positive associations between student satisfaction and student performance have been reported in two HE-based studies, with one using student grades as performance indicators (van Rooij et al., 2018) and the other using mastery of knowledge and general success of the faculty as performance indicators (Mihanović et al., 2016). In contrast, strong negative associations between student satisfaction and attrition were reported by Duque (2014).

However, in considering student satisfaction with the quality of education services, the literature highlighted some key concerns of treating students as customers. Focusing on satisfying students in the same way companies satisfying their customers may result in HE institutions emphasising less on what students *need* most as learners, such as achieving learning outcomes or training to be work-ready, and more on what they *want* most in order to feel satisfied as fee payers (Calma and Dickson-Deane, 2020). What students want best for themselves may not necessarily be beneficial for them to attain quality education, for that they may adopt short-term perspective and prefer assessment that they can score well rather than those that they can learn well (Guilbault, 2016). Additionally, with a customer mindset, students may also feel they are entitled to be awarded a degree for the fees they have paid, resulting in shifting their responsibility to learn and be engaged to institutions (Budd, 2017). If student expectations are to be met by institutions in order to keep “customers” satisfied, this can subsequently lead to grade inflation (Hassel & Lourey, 2005). As such, although it is crucial for HE institutions to improve the quality of education services provided to students by meeting their expectations and keeping them satisfied, it should be noted that such action may generate undesirable effects if students were treated squarely as customers.

The construct of student satisfaction and its predictive factors

In general, student satisfaction can be viewed as a short-term attitude, which relates to students' subjective evaluations of the extent to which their expectations of given educational experiences have been met or exceeded (Elliot & Healy, 2001; Elliot & Shin, 2002). As

students form numerous expectations in relation to their educational experiences, many scholars conceptualise student satisfaction as a multidimensional construct (Hanssen & Solvoll, 2015; Jereb et al., 2018; Nastasić et al., 2019; Weerasinghe et al., 2017).

In Sirgy et al.'s (2010) framework, for instance, overall satisfaction with college life was broken down into three components, which represented satisfaction with academic aspects, social aspects and college facilities and services. Similarly, in investigating university students' views of their academic studies, Wach et al. (2016) measured satisfaction using items across three dimensions of satisfaction. These related to the content of learning (i.e. the joy and satisfaction felt by students on their chosen preferred majors), the conditions of learning (i.e. students' satisfaction with the terms and conditions of the academic programs) and personal coping with learning (i.e. students' satisfaction with their own ability to cope with academic stress).

The recognition that student satisfaction is a multidimensional construct is also evident in the identification of *numerous* dimensions that contribute to HE students' overall satisfaction levels. Academic aspects comprise one such set of key contributors to student satisfaction in HE. These relate to considerations such as the perceived quality of teaching, feedback provided by instructors, teaching styles of instructors, quality of learning experiences and class sizes (Aldemir & Gülcan, 2004; Butt & Rehman, 2010; Duque, 2014; Jereb et al., 2018; Nastasić et al., 2019; Paul & Pradhan, 2019; Weerasinghe et al., 2017). More general attributes of the courses in which students are enrolled (e.g. curriculum, course content and teaching materials) have also been cited as significant (Aldemir & Gülcan, 2004; Butt & Rehman, 2010; Duque, 2014; Weerasinghe et al., 2017).

Empirical studies have attested to the relevance of the above-named attributes in determining HE students' satisfaction levels (Aldemir & Gülcan, 2004; Bell & Brooks, 2018; Butt & Rehman, 2010; Nastasić et al., 2019; Siming et al., 2015). However, this list is by no means exhaustive in describing the factors that students will consider in providing satisfaction ratings. More generic, institution-wide attributes, such as ease of access to student services and the level of infrastructure support provided by an institution (e.g. transportation and boarding services, internet access and administrative services), as well as the facilities it offers (e.g. teaching facilities, leisure and sports facilities, IT facilities and study areas) have also been recognised by scholars to contribute to HE students' satisfaction levels (Aldemir & Gülcan, 2004; Butt & Rehman, 2010; Duque, 2014; Hanssen & Solvoll, 2015; Jereb et al., 2018; Weerasinghe et al., 2017). Less tangible aspects of students' experiences such as the reputation and impressions of the institution (Butt & Rehman, 2010; Duque, 2014; Hanssen & Solvoll, 2015; Jereb et al., 2018), student centeredness and campus climate (Elliot & Healy, 2001) and students' own *life* experiences while at college (Mihanović et al., 2016; Nastasić et al., 2019; Weerasinghe et al., 2017) have also been noted.

Interaction and student satisfaction in higher education

Beyond the factors above, the recent student satisfaction literature has highlighted the potential role played by students' interpersonal interactions in HE as a key predictor of student satisfaction levels. This is to be expected, given the vital role of interpersonal interaction in learning. According to the social constructivist paradigm, learning is an inherently *social* process, in which interpersonal interactions are critical in the construction of knowledge and understanding (Pritchard & Woollard, 2013). Studies have affirmed that HE students recognise the importance of interpersonal interactions with their classmates and

university staff in furthering their content learning (Hurst et al., 2013). In Burgess et al.'s (2018) comprehensive study using the data of millions of university students from the UK's National Student Survey (NSS), the aspect of "social life and meeting people" was recognised as one of the key determinants contributing to university satisfaction despite it has not been included in their study.

In general, two forms of interaction have been examined in relation to student satisfaction in HE: student-faculty and student–student interactions. The proposed importance of student-faculty interactions in determining student satisfaction levels in HE is reflected in both the theoretical and the empirical literature. In one very early review, Pascarella (1980) reported that student-faculty informal contact was positively associated with college satisfaction, alongside other educational outcomes. Similarly, in Aldemir and Gülcan's (2004) conceptual framework, the authors included the variable "communication with instructors both in and outside classroom" as one of the factors that contributed to university students' satisfaction levels. This variable was then found empirically significant in predicting satisfaction levels in a sample of more than 300 Turkish university students.

Table 1 provides a broad summary of empirical studies that have examined either student-faculty or student–student interpersonal interactions as predictors of student satisfaction in HE. Collectively, these studies have reported significant associations between satisfaction and both types of interactions. Although most have focused on the context of online learning, as Kuo et al. (2014) argued, high-quality interactions are important in *all* forms of education, whether technology-based or more traditional.

The crucial role of interaction in HE has been underscored more recently by the concerns over the loss of social contact and socialisation following the suspension of in-person classes due to the COVID-19 outbreak which has impacted the students negatively (UNESCO International Institute for Higher Education in Latin America and the Caribbean, 2020). HE students have also raised their own concerns over the quality of education they receive in online, as compared to in-person formats, which differ primarily in terms of the level of interpersonal interaction they afford (Ang, 2020). Such concerns make clear the perceived significance of interpersonal interaction in the overall HE learning experience.

It should be noted that there is a need to consider the role of students' demographic background in examining the relationship between interaction and student satisfaction, with the evidence in the literature indicating that students' demographic profiles can moderate the types and levels of interpersonal interactions they have with their peers or instructors. In a study conducted by Kim and Sax (2009) using data on 58,281 US students, differences in the frequency of student-faculty interactions were attributed to gender, alongside other demographic variables (race, social class and first-generation status). Similarly, in a study by Criado-Gomis et al. (2012) on 1000 graduates from two Spanish universities, significant differences were seen in the quality of interactions between male and female students. At around the same time, Ke and Kwak's (2013) study of 392 students from a US university indicated that age was significantly correlated with the perceived quality of peer interactions that occurred in online learning environments.

Rationale and aims of the present study

The literature suggests a wide range of attributes that may contribute to student satisfaction levels in HE. This aligns with the propositions of Jereb et al. (2018), who underscored the complexity of student satisfaction and the myriad factors that influence it. Existing scholarly work is yet to provide a complete understanding on the *different aspects* of HE

Table 1 Empirical studies on interaction and student satisfaction in HE

Study	Participants	Interaction measured	Satisfaction measured	Findings
Chang and Smith (2008)	855 students enrolled in an online course of a US university	Student-instructor personal interaction Student–student personal interaction	Course satisfaction	Both interaction variables were significant predictors of course satisfaction
Johnson et al. (2014)	767 students enrolled in a course (delivered in face-to-face and online modes) of a US university	Student-to-professor interaction Student-to-student interaction	Student satisfaction with the course	Student-to-professor interaction has significant effect on student satisfaction in both face-to-face and online delivery modes Student-to-student interaction was reported to have significant effect on student satisfaction on course delivered face-to-face but not online
Kuo et al. (2014)	221 undergraduate and graduate students enrolled in online education courses in a US university	Learner-instructor interaction Learner-learner interaction	Student satisfaction	Learner-instructor interaction has weakly predicted student satisfaction, and learner-learner interaction has no predictive power on student satisfaction

Table 1 (continued)

Study	Participants	Interaction measured	Satisfaction measured	Findings
Kurucay and Inan (2017)	77 undergraduate students enrolled in an online course in a US university	Learner–learner interaction	Learners' satisfaction with the learning experience	Learner–learner interaction has no significant effect on satisfaction on learning experience
Sher (2009)	213 students enrolled in an online learning program in a US university	Student–instructor interaction Student–student interaction	Students' satisfaction with web-based course	Both interaction variables were significant contributors of student satisfaction
Siming et al. (2015)	No details provided	Student–teacher relationship	Student satisfaction	Student–teacher relationship was significant in predicting student satisfaction in higher learning institutions

students' satisfaction and establish concrete links between these aspects and the *different forms* of interpersonal interactions in which HE students may engage.

From Table 1, studies conducted thus far have tended to focus on measuring student satisfaction using generic or unidimensional measures. Similarly, the measurement of interpersonal interaction has typically been restricted to only two dimensions (student–student or student–instructor), though evidence from the literature suggests a need to divide these further into formal and informal forms (Kraemer, 1997; Mamiseishvili, 2011; Meeuwisse et al., 2010). By taking a broader view of student satisfaction and interpersonal interactions, the present study aimed to provide a more *fine-grained* analysis of how different aspects of HE students' satisfaction levels may relate to different forms of interpersonal interaction.

It has been noted that what contributes to student satisfaction levels can be highly contextual. In defining overall student satisfaction in HE, Duque (2014) contended that overall satisfaction with an organisation will be based on all encounters and experiences a consumer has with that *particular* organisation. It is acknowledged, therefore, that the results presented in this paper may be particular to the context in which the study was conducted (the details of the participating institution and the participants selected for this research were provided in the “[Method](#)” section below).

Three research questions were formulated to guide the research conducted in this study:

1. How satisfied were the students with different aspects of the HE institution studied, and how did satisfaction levels vary across these different aspects?
2. How did different forms of interpersonal interaction relate to different aspects of these students' satisfaction levels?
3. Did the types of interpersonal interaction in which students engaged vary with students' gender and age?

Method

Participants and setting

Students participated in this research were enrolled 14 international undergraduate degree programs from the UK, offered by the participating institution. The institution is one of the largest private HE institutions in Singapore at the time of the study. Established in the 1960s, the institution admits approximately 17,000 local and foreign students. Its physical campus offers a variety of facilities such as library, performing art theatre, cafeterias and sport facilities. The institution also offers a wide range of services such as counselling and career advisory services.

These students were invited to participate in an online survey in the middle of the 2018–2019 academic year, to report their satisfaction levels with different aspects of their learning experiences, and on the forms of interpersonal interactions in which they typically engaged. In all, 280 students provided complete responses to the survey. Of this sample, 105 (37.50%) were males and 175 (62.50%) were females. The respondents were aged between 18 to 40 years old, with an overall mean of 22.79 years ($SD=2.40$). One hundred and ninety-seven (70.36%) were continuing students, while 83 (29.64%) were final year students.

Measures

Student satisfaction

Drawing upon the existing literature, the present study focused on eight aspects of student satisfaction, classified into three categories (academic, institution and university life). Each of these eight aspects was represented by a single item in the student satisfaction measure, to which students responded on a 7-point rating scale (see Table 2 below). The rated satisfaction scores obtained for all the eight aspects form the eight dependent variables, each to be predicted by the four interaction variables (see next section).

Interaction

Following Meeuwisse et al.'s (2010) model, four forms of interaction were measured in the study, each representing a different dimension of interpersonal interaction. Each was measured by a number of items in the interpersonal interaction measure, as shown in Table 3. In the survey, respondents were asked to select the items that related to them, based on their own experiences of interacting with their peers and instructors/lecturers. Therefore, for each respondent, the total score obtained for each of the four types of interpersonal interaction was simply a summed total based on selected items within each type. The four scores obtained formed the four independent variables (i.e. predictors) used to predict each of the eight satisfaction variables (the dependent variables) explained above.

Procedure

The online survey was hosted on the Qualtrics platform, a web-based survey tool that allows respondents to answer online survey questions. Institutional ethics approval was first obtained prior to conducting the survey. Email invitations were sent to students to participate in the online survey. The purpose of the survey, time required to answer the survey, identity confidentiality and data protection assurances were all stated in the email. Participants were asked to consent to participate before entering the survey. Two email reminders following the initial invitations were also sent to increase participation rates. A pilot study,

Table 2 Item statements measuring student satisfaction levels on eight different aspects

Category	Satisfaction item statement with rating scale: 1 = extremely dissatisfied to 7 = extremely satisfied
Academic	1. Program 2. Teaching of lecturers
Institution	3. Institution 4. Campus facilities 5. Student support provided
University life	6. My own learning 7. My overall university experience 8. My life as a university student in general

Note: Item 7 and item 8 may appear similar, but the two items are not the same. While item 7 focuses more on the experiences in attaining university education, item 8 relates more broadly to the overall university life lived out by a student

Table 3 Item statements measuring four different forms of interaction

Form of interaction	Number of item statements available for students to select	Sample item statement
Student–student formal interaction	5	I discuss with my fellow course mates on what have been taught in class to gain better understanding
Student–student informal interaction	9	I have at least one course mate whom I can share my personal problems with
Student-instructor formal interaction	4	I meet my lecturers outside classroom hours to seek further clarification on concepts learned
Student-instructor informal interaction	5	I chat with my lecturers on non-academic-related matters

Note: Not all item statements are included in the table. For each form of interaction, only one of the items is presented here for reference

conducted before the launch of the survey, indicated that the instructions and questions within the survey were clear to a pilot sample of 14 students who attended the same university as the intended survey participants.

Analysis

The analysis was divided into three parts to address the three research questions. Descriptive statistics and repeated measures analysis of variance (ANOVA) were used to analyse and compare levels of student satisfaction across the eight aspects identified, to address research question 1 (How satisfied were the students with different aspects of the HE institution studied, and how did satisfaction levels vary across these different aspects?). This provided a broad overview of student satisfaction levels within the specific HE institution in which the study was conducted.

Stepwise regression and correlation analyses were conducted to address research question 2 (How did different forms of interpersonal interaction relate to different aspects of these students' satisfaction levels?) via SPSS V26. Using the satisfaction ratings for each identified aspect of student experience (program, institution, student's own learning, teaching of lecturers, student support provided, life as a university student in general, campus facilities and overall university experience) as the dependent variables and scores for the four types of interpersonal interaction (student–student formal interaction, student–student informal interaction, student–instructor formal interaction and student–instructor formal interaction) as independent variables, eight regression models were formulated. Results obtained were interpreted and analysed to uncover more *specific* relationships between *different dimensions* of student satisfaction and interpersonal interaction.

Bivariate correlations between two demographic variables (age and gender) and the four interaction variables were examined to address research question 3 (Did the types of interpersonal interaction in which students engaged vary with students' gender and age?). The results obtained were analysed to reveal how the age and gender of the students were associated with their engagement in different forms of interpersonal interaction, and thus, suggest how these variables might contribute differentially to student satisfaction levels.

Results

Five multivariate outliers were detected using the Mahalanobis distances, tested at a significance level of 0.001 and subsequently removed from the analysis. This is because the presence of outliers can distort the statistical analysis performed (Tabachnick & Fidell, 2013). This resulted in only 275 cases being used in the analyses for the study.

Student satisfaction on different aspects of the institution

The descriptive statistics presented in Table 4 suggest that in general, respondents were favourable about their institution in terms of the different satisfaction elements surveyed. The mean satisfaction score for all eight aspects was higher than 4 (midpoint of the rating scale). For seven of the eight aspects of satisfaction, the median and mode scores were recorded at 5. The proportion of respondents with ratings of 5 and above was in the range of 59.27–76.36% for the same seven aspects.

Table 4 Descriptive statistics of the eight aspects of student satisfaction ($n=275$)

Aspect of student satisfaction	<i>M</i> (<i>SD</i>)	Median	Mode	% rated 5 and above
Academic				
1. Program	5.12 (1.13)	5.00	5.00	76.36%
2. Teaching of the lecturers	4.96 (1.28)	5.00	5.00	71.27%
Institution				
3. Institution	4.85 (1.33)	5.00	5.00	65.45%
4. Campus facilities	4.63 (1.55)	5.00	5.00	57.09%
5. Student support provided	4.49 (1.52)	5.00	5.00	53.82%
University life				
6. My own learning	4.78 (1.33)	5.00	5.00	64.73%
7. My overall university experience	4.69 (1.31)	5.00	5.00	59.27%
8. My life as a university student in general	4.36 (1.61)	4.00	4.00	48.73%

Comparing different aspects of satisfaction, the respondents were most satisfied with the two academic aspects, particularly with the academic program in which they were enrolled. For both “program” and “teaching of the lecturers”, the mean scores were the highest among all the eight aspects of student satisfaction, and more than 70% of the respondents gave a rating of 5 or above for these two aspects.

They were least satisfied with the items referring to their university lives while studying at the institution. The range of mean scores for the three aspects within this set (4.36–4.78) was generally lower than for other aspects of satisfaction (academic, 4.96–5.12; institution, 4.49–4.85). The item “My life as a university student in general” attracted a particularly low number of positive ratings, with mean, median and mode scores ranked lowest for this item among *all* the eight aspects of satisfaction surveyed. Less than 50% of respondents gave a rating of 5 or above for this aspect. Among the three aspects surveyed, however, the respondents were most satisfied with “my own learning”.

Among all the three institutional aspects surveyed, “institution” was the aspect with the highest mean score, and the only item in this group in which more than 60% of respondents gave a rating of 5 or above. Satisfaction levels for “campus facilities” and “Student support provided” were notably lower, even when compared with some of the university life aspects.

The results from the repeated measures ANOVA showed a significant difference across the eight satisfaction mean scores, $F(7,268)=14.79$, $p<0.001$. The effect size (partial η^2) was 0.28, indicating that some 28% of variance in satisfaction scores was attributable to the type of satisfaction measure used. The pairwise comparisons also showed that each of the satisfaction mean scores was significantly different from at least two other mean satisfaction mean scores. The mean scores for satisfaction in terms of “program” and “my life as a university student in general”, in particular, were different from the mean satisfaction scores of the other six aspects measured (Table 5).

Interaction and student satisfaction

The bivariate correlations between the eight satisfaction variables and the four interaction variables are provided in Table 6. To explore relationships between these eight variables and the interaction variables, separate stepwise regression analyses were performed, in

Table 5 Pairwise comparisons of different satisfaction mean scores ($n=275$)

Aspect of student satisfaction	Mean difference with other aspect of satisfaction							
	1	2	3	4	5	6	7	8
Academic								
1. Program	–	0.15	0.27*	0.49*	0.62*	0.34*	0.43*	0.76*
2. Teaching of the lecturers		–	0.11	0.34*	0.47*	0.19	0.28*	0.60*
Institution								
3. Institution			–	0.22	0.36*	0.07	0.16	0.49*
4. Campus facilities				–	0.13	–0.15	–0.06	0.27*
5. Student support provided					–	–0.28	–0.19	0.14
University life								
6. My own learning						–	0.09	0.42*
7. My overall university experience							–	0.33*
8. My life as a university student in general								–

* $p < 0.05$

each case, with satisfaction ratings as the dependent variable, and the four interaction variables entered as predictors.

Relationships between interaction and student satisfaction with academic aspects

The two stepwise regressions performed for satisfaction scores associated with academic aspects are shown in Table 7. In both cases, the analysis stopped after one step. For satisfaction ratings related to the “program”, student–student informal interactions were identified as the only significant predictor, while for satisfaction with “teaching of the lecturers”, student-instructor formal interaction was identified as the only significant predictor.

Relationships between interaction and student satisfaction with institutional aspects

Three stepwise regressions were performed with the satisfaction scores for “institution”, “campus facilities” and “student support provided” as the dependent variables, respectively. Again, the analysis stopped after one step for satisfaction related to the “institution” and also for “student support provided”. Student–student informal interactions were identified as the only significant predictor of both ratings. There were no significant predictors of satisfaction in terms of “campus facilities”.

Relationships between interaction and student satisfaction with university life

Three stepwise regressions were performed for the satisfaction scores related to “my own learning”, “my overall university experience” and “my life as a university student in general” as the dependent variables. Again, the analysis stopped after one step in all three cases. Student–student informal interaction was identified as the only significant predictor of satisfaction on *all* three aspects of the students’ self-reflective experiences. The association between student–student informal interaction and satisfaction with respect to “my own learning” and “my overall university experience” was slightly stronger than for “my life as a university student in general”.

Table 6 Descriptive statistics and bivariate correlations of variables examined in the stepwise regression analysis ($n = 275$)

Variable	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Program	5.12 (1.13)	–	0.48**	0.59**	0.46**	0.52**	0.43**	0.68**	0.54**	0.12*	0.14*	0.06	0.01
2. Teaching of the lecturers	4.96 (1.28)	–	0.44**	0.36**	0.36**	0.60**	0.40**	0.55**	0.47**	0.12*	0.07	0.17**	0.01
3. Institution	4.85 (1.33)	–	–	0.61**	0.60**	0.60**	0.34**	0.69**	0.56**	0.09	0.14*	0.02	–0.06
4. Campus facilities	4.63 (1.55)	–	–	–	0.56**	0.29**	0.29**	0.71**	0.67**	0.10	0.11	0.04	–0.01
5. Student support provided	4.49 (1.52)	–	–	–	–	0.40**	0.40**	0.69**	0.62**	0.17**	0.17**	0.12*	0.04
6. My own learning	4.78 (1.33)	–	–	–	–	–	–	0.47**	0.52**	0.19**	0.21**	0.15*	0.11
7. My overall university experience	4.69 (1.31)	–	–	–	–	–	–	–	0.79**	0.18**	0.21**	0.10	0.01
8. My life as a university student in general	4.36 (1.61)	–	–	–	–	–	–	–	–	0.15*	0.20**	0.05	0.02
9. Student–student formal interaction	2.49 (1.69)	–	–	–	–	–	–	–	–	–	0.63**	0.22**	0.18**
10. Student–student informal interaction	3.71 (3.25)	–	–	–	–	–	–	–	–	–	–	0.24**	0.20**
11. Student–instructor formal interaction	0.75 (1.00)	–	–	–	–	–	–	–	–	–	–	–	0.47**
12. Student–instructor informal interaction	0.21 (0.55)	–	–	–	–	–	–	–	–	–	–	–	–

* $p < 0.05$

** $p < 0.01$

Table 7 Stepwise regression: student satisfaction on interaction ($n=275$)

Satisfaction variable	Significant interaction variable/s as predictor/s	Coefficient		Model statistics			Change statistics									
		β	SE	Standardised β	Sig	R	R ²	\bar{R}^2	SE	ΔR^2	ΔF	df1	df2	Sig.	ΔF	
Academic																
1. Program	Student–student informal	0.05	0.02	0.14	0.02	0.14	0.02	0.02	1.12	0.02	5.43	1	273	0.02		
2. Teaching of lecturers	Student–instructor formal	0.22	0.08	0.17	0.00	0.17	0.00	0.03	1.26	0.03	8.54	1	273	0.00		
Institution																
3. Institution	Student–student informal	0.06	0.03	0.14	0.02	0.14	0.02	0.02	1.32	0.02	5.53	1	273	0.02		
4. Campus facilities	No significant predictor was found	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Student support provided	Student–student formal	0.15	0.05	0.17	0.01	0.17	0.03	0.03	1.50	0.03	8.05	1	273	0.01		
University life																
6. My own learning	Student–student informal	0.09	0.02	0.21	0.00	0.21	0.05	0.04	1.30	0.05	12.72	1	273	0.00		
7. My overall university experience	Student–student informal	0.08	0.02	0.21	0.00	0.21	0.04	0.04	1.28	0.04	12.55	1	273	0.00		
8. My life as a university student in general	Student–student informal	0.10	0.03	0.20	0.00	0.20	0.04	0.04	1.58	0.04	11.63	1	273	0.00		

Comparison between the four forms of interaction in predicting student satisfaction

From the regression analysis, each of the four interaction variables was identified as a significant predictor of at least one aspect of student satisfaction. At the same time, no aspects of satisfaction were predicted by more than one predictor. Furthermore, satisfaction with campus facilities was not predicted by any of the four interaction variables.

Overall, student–student informal interaction was the only variable that significantly predicted more than one satisfaction aspect (one academic aspect, one institutional aspect and all three university life aspects). None of the other three interaction variables significantly predicted more than one satisfaction aspect, with student–student formal interaction significantly predicting only “student support provided”. Student–instructor formal interactions significantly predicted ratings in terms of “teaching of the lecturers”. Student–instructor informal interactions did not significantly predict any of the satisfaction variables.

Associations between demographic and interaction variables

Table 8 presents bivariate correlations between the four interaction variables and the two demographic variables of age and gender. Significant positive correlations were found between the two demographic variables and student–instructor formal instruction. The positive correlation between gender and student–instructor formal interaction indicates that male students were likely to have more formal interactions with their instructors than were female students. In the case of age, the significant positive correlation indicates that older students (this can be taken as those above the mean age of 22.79 years in the participating institution) were more likely to have formal interactions with their lecturers than were younger students (those below the mean age of 22.79 years in the participating institution).

No significant correlations were found between the two demographic variables and any other interaction variables.

Discussion

The present study aimed not only to provide a more in-depth analysis of different aspects of HE students’ satisfaction in one HE institution in Singapore, but also to provide a more nuanced analysis of relationships between these aspects and different forms of interpersonal interactions in which HE students engaged. The following sections discuss the findings of the study in greater depth, to address the three formulated research questions.

Table 8 Bivariate correlations between interaction and demographic variables

	Age	Gender
Student–student formal interaction	–0.02	0.06
Student–student informal interaction	–0.07	0.00
Student–instructor formal interaction	0.16**	0.12**
Student–instructor informal interaction	0.08	0.10

** $p < 0.01$

Student satisfaction on academics, institutions and university life

In addressing research question 1 (How satisfied were the students with different aspects of the HE institution studied, and how did satisfaction levels vary across these different aspects?), while the findings show that students were generally satisfied with the different aspects surveyed, satisfaction levels were not the same across *different* aspects. This reinforces the notion that student satisfaction in HE ought to be treated as a multidimensional construct. Findings also confirmed that the differences across various satisfaction levels were statistically significant.

More importantly, the findings suggest that general satisfaction as university students requires the fulfilments in aspects beyond what most institutions are currently providing to their students. As reflected in the results, the respondents' life satisfaction as university students was *noticeably* lower than satisfaction attained for all other aspects. Not only did "my life as a university student in general" have the lowest satisfaction mean score among all satisfaction aspects measured, it was also noted that its mode and median scores were lower than the midpoint score of 4. As depicted in Rode et al.'s (2005) and Sirgy et al.'s (2010) frameworks, HE students' life satisfaction depends upon on satisfaction attained from a wide range of academic and non-academic aspects.

Analysing the different aspects of satisfaction separately as was done here would provide more nuanced feedback to HE institutions, empowering them further to focus on various aspects of the services they provide to enhance student learning experiences and satisfaction. In this case, the fact that satisfaction with student support was notably lower than the ratings obtained for most of the other satisfaction aspects, the results strongly suggest that enhancing the usual institutional aspects such as campus facilities or administrative services will not be the most effective approach to enhancing student satisfaction. As indicated in Kakada's (2019) study, student satisfaction was found positively related to technology, academic, social and service supports provided.

The role of interaction in higher education student satisfaction

Through research question 2 (How did different forms of interpersonal interaction relate to different aspects of these students' satisfaction levels?), the study aimed to provide a more *nuanced* analysis of relationships between interpersonal interactions and student satisfaction in HE, by examining how each *specific* form of interaction related to *different* aspects of student satisfaction.

Results indicated that student satisfaction in HE was not only explained by *who* the students interacted with (peers vs. instructors), but also *how* they interacted with these individuals (either in a formal or an informal format). With three forms of interaction (student–student formal, student–student informal and student–instructor formal) found to be significant predictors of different aspects of satisfaction, this suggests that *how the students engage* with their peers and lecturers was also vital in explaining their satisfaction with their HE experiences. This further reaffirms the notion that both formal and informal interactions are crucial in HE as posited in Tinto's, 1975 model of college student attrition (Tinto, 1975).

The results also underscored the *relative importance* of different forms of interpersonal interaction in explaining different aspects of student satisfaction. From the results, *student–student informal interaction* was significantly associated with satisfaction in all three

aspects studied—academic, institution and university life. This suggests that student–student interaction could be the most critical form of interaction in terms of student satisfaction levels. Other forms of interaction were also significantly associated with *specific* aspects of satisfaction. Student–instructor formal interaction was a significant predictor of HE students’ satisfaction with the teaching of their instructors, while student–student formal interaction significantly predicted satisfaction with the student support provided by the institution. As such, the different forms of interaction appear to play *complementary* roles in predicting students’ overall satisfaction levels. With consideration on the specificity of different forms of interaction and different aspects of satisfaction, this adds greater depth to the existing literature in discussing the role of student–student and student–instructor interactions as predictors of student satisfaction as most past studies tend to draw limited distinction between different forms of interactions, or between different aspects of satisfaction (see Chang & Smith, 2008; Palmer & Koenig-Lewis, 2011).

The more granular level of findings on the relationship between interaction and student satisfaction have several possible implications for practice in the HE context. First, the findings suggest a need for HE institutions to recognise the vital role of student–student *informal* interactions as a predictor of HE students’ satisfaction levels. This finding aligns with the propositions of other scholars in the field. For example, Meeuwisse et al. (2010) posed that students’ informal relationships with their peers are vital in developing their sense of belonging. In a separate study conducted by Senior and Howard (2014), it was found that collaborative learning was fostered through friendship groups in which students interact with one another to develop conceptual understanding. From a broader perspective, this finding is consistent with the notion that peers play a significant role in HE student development. In Astin’s 1993 landmark study involving more than 20,000 college students, it was suggested that peer influences had contributed significantly to the growth and development of undergraduate students (Feldman & Astin, 1994). Thus, HE institutions who wish to bolster student satisfaction levels could identify ways to establish structures that foster more frequent and higher quality informal student–student interactions. As indicated in Burnett et al.’s (2007) study, the frequency and intensity of interaction between students and instructors and peers contributed to the students’ satisfaction levels.

Second, with the findings indicating the need to improve student support, the institution concerned should incorporate the element of formal student–student interaction in the provision of student support. One such initiative is the peer-to-peer support programs. Within the literature, such support programs have been reported to have positive impacts on HE learning in different studies (Arco-Tirado et al., 2019; Backer et al., 2015; Munley et al., 2010). As the institution concerned has already put in place a peer tutoring program (called Peer-Assisted Learning Program), it could also consider fostering greater student–student formal interaction in *other* support areas to further improve student satisfaction, as recommended by Kakada et al. (2019).

Age and gender were also found to be significantly associated with student–instructor formal interactions, which implies that institutions could consider age and gender differences in designing such structures. For example, given that male students were likely to have a greater number of formal interactions with their lecturers, HE institutions may need to consider more *differentiated* practices that faculty members can adopt to ensure that new female students engage regularly in formal interactions with them.

Overall, the more nuanced analyses provided by the present study not only expand previous understandings of student satisfaction and interaction in the context of HE, but also offer practical insights upon which HE institutions can draw to elevate their students’ satisfaction levels. From the findings, it is suggested that HE institutions should evaluate more

specifically different aspects of student satisfaction on a regular basis, as well as focusing upon enhancing the quality and quantity of interpersonal interactions in which students regularly engage.

It should be noted that, given the highly contextualised nature of student satisfaction research (Santini et al., 2017), the generality of the present study may be limited to universities that are similar to the one that participated in the present study. Future research should, therefore, seek to determine whether the results of the present study generalise to other contexts. The study could also be replicated with students studying at other levels (e.g. the postgraduate level) or those with particular profiles (e.g. international students, students at risk or students from minority ethnic group).

Also, as a construct that relates closely to attitudes and expectations, student satisfaction is likely to change over time. As such, research on student satisfaction in HE should be a *continual* process as no single study—conducted at a specific timepoint—can entirely capture the changing nature of student satisfaction over time. Thus, HE institutions themselves are likely to be in the best position to evaluate the factors which predict their own students' satisfaction levels, ideally, as an element of regular, ongoing quality improvement efforts.

Data availability Data will be made available on request to the corresponding author.

Code availability No non-commercial software or custom code used in the study.

Declarations

Ethics approval This research was approved by the University of Western Australia Human Ethics Committee, Approval Number RAJ4/20/4756.

Consent to participate All participants were required to provide consent for participation online, prior to entering the survey.

Consent for publication All participants were required to provide consent for publication online, prior to entering the survey.

Conflict of interest The authors declare no competing interests.

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