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Satisfaction, satisfactoriness, motivation and ambiental factors of second year university students

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Abstract: Research in Mathematics Education on affect-related factors that influence a university student's relationship with their studies tends to adopt a psychological approach and focus on constructs like motivation, perceived difficulty, or self-efficacy. Notwithstanding their central role, this paper explores the contribution of research in the areas of Economics and Social Sciences to include other factors, which are often considered marginal in Psychology but that can play an important role in determining a student's choice to either abandon or continue their studies and take a degree. We consider, thus, the constructs of satisfaction and satisfactoriness to address these factors and we analyse the interviews of two students enrolled in a STEM undergraduate course and attending the second year. Different characterisations of satisfaction and satisfactoriness emerge. The results hold not only in the context of mathematics learning but in general for tertiary education.

Keywords: satisfaction, satisfactoriness, SDG3 health and wellbeing, second year university students

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1 Introduction

This paper is part of a larger project on university students' well-being, focusing on the third goal in the United Nations' Sustainable Development Goals, which addresses health and well-being, and pointing out the determinants of students' well-being at university. Its focus is not on the academic performance of the students but on the main factors that determine a positive (negative) experience concerning the university environment and a successful adaptation to the requests of the courses at the undergraduate level, including their relationship with mathematics, which plays an important role especially in the transition from secondary to tertiary education (Andrà, Magnano & Morselli, 2011; Andrà, Magnano, Brunetto & Tassone, 2022). All this can be captured by the constructs of satisfaction and satisfactoriness, as they will be delineated in the section. The paper aims to test how the model for satisfaction and satisfactoriness, linked to social, economic and psychological constructs, works and can be applied in the context of tertiary education.

An indicator of unsuccessful adaptation is dropout, which involves about one-third of students enrolled at university on average in OECD countries (OECD, 2019). This paper,

however, does not regard dropped-out students, for two main reasons: the first one is that dropout students have been the focus of other studies (e.g., Andrà et al., 2011), and the second and more important one is that we aim at analysing the struggles of the students that remain, their difficulties and motivations in the second year of studies. A bunch of studies in Education has considered second year students and their difficulties. For example, Schreiner and Pattengale (2000) note that second year students report a decline in motivation and a raise of apathy, decreasing grade point averages, or a letdown from their first year. Graunke and Woosley (2005) explain this in terms of lack of direction and sense of disconnection felt by second year students. The case of second-year university students is, in our view, interesting because they can be considered somehow "halfway": they have ended the first year, which in terms of motivation and adaptation has requested some effort, but they are not yet in the third and last year when the (hopefully successful) end of studies seems to be reachable and feasible. More specifically, these students might have been faced similar difficulties of those who decided to abandon during the first year, and among which 30% mention difficulties with mathematics as the main cause of dropout (Andrà et al., 2011). But why did they decided to stay? In this paper, we set out to contribute to the field of mathematics education and affect-related issues by elaborating on the constructs of satisfaction and satisfactoriness as "umbrella concepts" that encompass psychological, economical and social factors.

We can notice that, both from inside and from outside Mathematics Education research, psychological theories for students' dropout/retainment focus primarily on motivation, beliefs, perceived difficulties and self-efficacy (see Andrà et al., 2011) but tend to lack considering the university environment as a source of information, as well as to avoid to take into account an economical approach to the phenomenon of dropout. It is argued (Aina et al., 2022) that purely economic or purely sociological models are insufficient to capture and adequately represent the complexity of the dynamics that drive a student's choices, leading to the decision to abandon or continue academic studies. Aina et al. (2022) notice that all the models developed in classical economics assume the existence of a perfectly informed individual acting in a fully rational way, leading to the conclusion that the dropout rate should be zero because it would always be convenient to continue the university studies. There is a need to make these models more realistic. Sociological studies have, in general, limited predictivity because it is difficult to handle at a quantitative level the complexity of a society; on the other hand, they offer a more accurate and complete description of all the categories useful to explain the students' behaviour (Freeberg et al., 2012). We believe combining economic, psychological and sociological approaches can overcome these problems.

The research questions that we aim at answering in this paper is: is it possible to define and operationalise a model for university students' wellbeing that takes into account psychological, relational and environmental aspects of their experience at university?

2 Literature review

Two theoretical constructs are used in this paper to understand students' well-being: the ones of satisfaction and satisfactoriness (Lofquist & Davis, 1969). University students' satisfaction is defined by Elliott and Healy (2001) as "a short-term attitude resulting from an evaluation of a student's educational experience" (p.2). We can notice that this definition of satisfaction has a solid psychological connotation. However, it can also be linked to social and economic models for students' success at university, as students' decisions to continue their studies can be defined as "the result of a sequential process made under gradually decreasing levels of uncertainty and a student's consciousness about education costs and future returns, as well as by that student's level of integration into the academic system" (Elliot & Healy, 2001, p.4). We underline that a focus on returns is mainly economic, while a focus on integration is primarily social.

Satisfactoriness is a construct developed in the context of job adaptation. However, an attempt by Dennehy (1971) to define and measure it in the scholastic context leads to a definition of student satisfactoriness as "the extent to which the individual's performance matches the environment's expectations of his performance, judged against relevant objective criteria" (p.3). Following Elsharnouby (2015), a university student's environment can be defined as an amalgam of perceived university reputation, perceived faculty competency, quality of interactions with administrative/IT staff, and interactions with other students. Not only psychological facets but also socio-economic ones also emerge in this definition. Understanding the needs of the students and deploying possible actions to fulfil them is thus an intense and multifaceted field of study. Reasons for dropout can be found in either a low level of satisfaction (e.g., students may not like what they study, even if their marks are good, or irrespective of their marks), or a low level of satisfactoriness (e.g., they might like what they study, but their marks are bad and not acceptable).

In addition, Stinebrickner and Stinebrickner (2014) commented that poor grades at the beginning of university careers influence dropout in three ways: a) through grade progression cut-offs that force students out of university (and this is related to satisfactoriness), b) by decreasing the ex-post payoffs of education (linked both to satisfaction in terms of interest and value, and to satisfactoriness in terms of social recognition), and c) by reducing the enjoyability of university (related to satisfaction).

Several studies (see, e.g. Andrà et al., 2022) show how the students' perception of mathematics changes significantly before and after the University courses start. It has also been shown by Göksoy (2017) that individual and social/environmental factors are strongly linked, and in a review of the literature on university students' dropout, Aina et al. (2022) propose to consider five homogeneous groups of determinant factors for students' retainment or dropout: (i) students' demographic characteristics, abilities, and behaviour; (ii) parental background and family networks; (iii) academic/social integration and institutional/goal commitment (relational factors); (iv) features of the tertiary education system and context (at both institution and country levels); (v) labour market performance. Aina et al. (2022) also note that the first two groups are relevant at the individual level; the third and fourth groups are important for the local institutions to offer

the adequate environment necessary to support the weaker students, those more at risk of dropout; the fifth group of variables depends on external factors, which can be influenced by regional or even national politics; they nevertheless affect the decisions of the students to stay or to abandon, because they are the final perspective for a personal accomplishment and can motivate the investment of the student in terms of money and time.

3 Theoretical framework

Satisfaction can be described as the contentment evident in the student because of their activity. It is a subjective personal feeling, and it is fundamental to keep the student willing to work to pass the exams (Göksoy, 2017). In contrast, satisfactoriness can be described as the achievement of an acceptable level of performance by the student (Lofquist & Dawis, 1969). This is possible not only if the student is fully committed to their study but also if the schedule of the lectures and exams is sustainable and if the tutoring and mentoring activities are available.

Monitoring the satisfaction and satisfactoriness of the students is particularly interesting in the case of STEM topics like Mathematics and from Aina et al.'s (2022) study, the correlation between the students' demographic characteristics, parental background, scholastic achievements before the University, motivation, and academic outcomes is quite evident. Following the definition of satisfaction and satisfactoriness, we maintain that parental background, scholastic achievements and academic outcomes can be related to the latter, particularly the effort to achieve academic success, effort tied to one's family, previous success and current results at university. Motivation, instead, can be related to the former, as motivation is a proxy for how much a student is interested in their studies. Aina et al.'s (2022) study shows that, despite the big differences in the educational systems among the different OECD countries, in almost all of them, the students who have a job during their university years show a higher risk of dropout (in our interpretation, this is linked to satisfactoriness), or slower academic progression, and this becomes more evident if working students live with their parents instead that on campus (also this is tied to satisfactoriness, as for them there are much less opportunities of comparison with their peers). In general, the students who participate in study groups are more likely to complete their studies: this is explained by Aina et al. (2022) in terms of lack of support from their peers in the case of students not living on campus. In our view, lack of support is linked to satisfaction because support is linked to the pleasure of sharing difficulties and interests. First-generation students have a higher risk of dropping out. Also, this feature can be linked to satisfaction: interest can decrease when the family cannot understand a student's environment. However, (lack of) support can also be linked to satisfactoriness because parents are people a student confronts, and they provide her with feedback. The study by Aina et al. also shows that students are more likely to stay enrolled when they are actively involved in campus activities (i.e., this might increase satisfaction) and feel a sense of community in the institution. In general, the matching between a student's initial motivation, intentions, and commitment and the institution's academic and social characteristics helps shape the degree of commitment of

each undergraduate and, thus, her probability of retention (i.e., satisfactoriness). Aina et al. (2022) also dwell on the quality of the learning environment and the labour market conditions as factors that influence students' achievement, and these factors both belong to the area of satisfactoriness.

4 Methodology

The participants in the study were three groups of students (15-20 students per group) randomly selected from three different classes of undergraduate courses in Environmental Sciences, Civil Engineering and Psychology respectively. They were all enrolled in the second year of their university studies. An even distribution of gender was considered in selecting the sample. In this paper, we showcase and examine the data from two interviewees from the Civil Engineering group. We selected these two cases because they are very different from each other and represent two critical cases for undergraduate students, namely: one (her fictitious name is Giulia) being a worker, with a family that has no experience of university life; and the other one (fictitiously called Paolo) with parents that have a degree and who pay for his studies.

All the participants were individually and orally interviewed after one of their mathematics lectures (to note, the lecturer was the second author). The semi-structured interviews aimed at letting the information about each student's background, psychological, social and environmental perceptions emerge. The specific questions asked are reported in Tables 1-3 in the section dedicated to the data analysis. The first set of questions (see first row of Table 1) investigates socio-economical factors related to living with parents or on campus, having a job and parents' educational level. The second set of questions (Table 2) investigates the students' motivation to continue their studies, while the third set of questions (Table 3) focuses on the relational and ambiental features of the students' experience at university.

After having been transcribed verbatim, the interviews have been analysed, dwelling specifically on how satisfaction and satisfactoriness emerge from the students' words, distinguishing among a student's background, individual factors, social ones and environment.

The results are presented in three different sections, and in between these the results are related to the literature background. In doing so, we aim at clarifying how satisfaction and satisfactoriness contribute to understand the students' choices.

5 Data analysis and discussion of results in terms of satisfaction and satisfactoriness

The data coming from the interviews is displayed in three tables, each one showing the questions posed in the interview, in the first row, and the answers of Paolo and Giulia, the two interviewees selected to explore how the constructs of satisfaction and satisfactoriness emerge and shape psychological, social and economic aspects of students'

experience at university.

5.1 Social, cultural, parental, and economic background

From Table 1, it is straightforward to notice that Paolo and Giulia have different backgrounds concerning the distance from the university, which belongs to the area of satisfaction as it is a proxy for the time (and effort) one invests every day to go to university: (i) Paolo lives in a small town, Collegno, located in the surroundings of a big metropolitan city, Torino (where the university he attends is located), while Giulia lives in the metropolitan city, Torino, closer to university; (ii) Paolo's parents have reached a good educational level (i.e., a degree and a high-school diploma), while in the case of Giulia the educational level is lower.

Giulia is a first-generation student, and from Aina et al. (2022), we know that this might cause difficulties for her. Regarding satisfactoriness, namely the match between student's expectations and the environments, we might say that Paolo, who lives in a family where the father has a degree, is more likely to get feedback from his family environment that is in line with the university one. Giulia and her family seem to not live alone on campus but in a flat, and her family seems to not support her economically: in fact, she has to work in order to pay for her studies. The fact that Giulia is a first-generation student is also linked to her satisfaction, as she might not find value and interest in her studies mirrored in her family's choices. Aina et al.'s (2022) paper comments that those students "who come from backgrounds characterised by low (no) participation in higher education may find it difficult to comply with the academic culture and habits as they cannot benefit from the support offered by parents and friends who already had similar experiences" (p.8). We also notice that Giulia lives on her own and is working and economically independent (namely, she pays University taxes and costs). Paolo, instead, lives with his parents, who support the costs of his studies.

Table 1. Questions about a student's background and the answers by Paolo and Giulia.

	Where do you live? What is the distance of your residence from the University?	**Are you working? Do you have regular activities, including sports and music (e.g. singing in a choir)? How much time does your job take you?**	**Who is paying for your university studies?**	**Do you have additional costs at the University (e.g. meals, transportation, learning material)?**	**Do your parents hold a university degree?**
Paolo	Collegno, 40 minutes from Torino by bus and subway	I am not working	My parents	Yes, I do. They are all paid by my parents.	My father has a degree in law. My mother went to a high school for teachers.
Giulia	I live in Torino in a flat, 20 minutes away from the University by tram	I work as a mathematics teacher in winter. In the summer I work as a lifeguard in a swimming pool.	I pay the University with the income of my jobs.	I eat at home and cover by myself all the extra costs.	They do not have a University degree.

5.2 Psychological factors: motivation

If we look at Table 2, Paolo says that, at the beginning of his studies, he had a high intrinsic motivation as he was interested in the topics per se; now, he has no pending exams and has never considered the possibility of dropping out. Being related to interest ("I am very interested in the topics") and motivation ("My motivation to continue is the challenge to see if I understand the new topics"), Paolo's words are related to his satisfaction ("I have no pending exams"), but at the same time, they are related to satisfactoriness, too. We elaborate on this in what follows. As Aina et al. (2022) observe, exemplary academic achievements at the beginning appear to influence a student's decision to continue their studies in a significant way. In other words, positive feedback about having done a good job with exams at the beginning of her studies supports the continuation of a student's career. We read these determinants in terms of satisfaction for Paolo, as he likes his studies, but also in terms of satisfactoriness, as he has good grades and, thus, sees a match between his and the university's expectations. With Aina et al. (2022), we also comment that early academic achievements reinforce a student's feeling of academic integration and her commitment to the institution, a virtuous psychological, social and economic circle.

Giulia has experience in the labour market; she thinks her studies will increase the rewards she can get from a job (satisfactoriness). These words from Giulia are in line with another finding in Aina et al.'s (2022) study, that "among the main determinants of women's completion advantage is higher ex-post payoffs to tertiary education" (p.5), as "academic integration [satisfaction, in our view] is more important than social integration [satisfactoriness, in our view] for men, while the opposite is true for women" (p.6). Thus, female students tend to consider the social advantages that having a degree entails

for them rather than the value that university studies might have per se, and this is mirrored in the motivations that Giulia and Paolo provide, respectively, for being enrolled in the second year.

Table 2. Questions about psychological factors and the answers by Paolo and Giulia.

	What were your motivations when you started your studies? Do they still hold? What do you expect after your degree? Will you continue studying or will you consider looking for a job?	**Do you have pending exams? How many? Which ones are most a reason of concern for you and why?**	**Have you ever considered, during your studies, to quit? Why? What was the reason that induced you to continue?**	**Which period in the year is harder for you?**
Paolo	I started my bachelor's study because I am very interested in the topics. I am willing to continue with a Master program. I am planning to work for a while after the end of the Master and then decide whether to apply for a PhD program.	I do not have pending exams.	I had stressful moments with the most complex exams. My motivation to continue is the challenge to see if I understand the new topics.	In the first semester the lectures are more demanding.
Giulia	In the past I worked as a surveyor. Now I am working as a teacher, but I am looking for a different job, because this is not rewarding enough for me. I started my studies 5 years ago, I am 2 years behind, but I am willing to continue after the bachelor's degree.	I have pending exams because of distracting activities (mostly my job).	Yes, if I had not passed last year's exams I would have quit.	January and February, when my job overlaps with the exam session. Starting from mid-May, because in June I work at the swimming pool and again there is an overlap with the exams.

We also notice that Giulia declares that she is not struggling to get the best marks but rather has a long-term goal, which is to get a degree. In line with the studies revised by Aina et al. (2022), having a job is a factor that undermines learning progression, but in that paper, no impact on grades is shown. Back to the case of Giulia, this can be read in terms of satisfactoriness, as she defines her job as a distracting activity, namely as if the university's feedback about her being a worker is negative. At the same time, she declares that if she had not passed any exam, she would have quit, which is another instance of satisfactoriness.

5.3 University environment

Table 3. Questions about psychological factors and the answers by Paolo and Giulia.

	Do you have a group of colleagues or friends to discuss and receive feedback and information about lectures and exams?	**Describe your relationship with the professors: are they friendly or cold?**	**Do the professors consider your requests (if any)?**	**Are the University infrastructures adequate to your needs?** **a. cantine** **b. study rooms** **c. tutoring** **d. relax areas (green areas, coffee bar and common areas)** **e. laboratories**
Paolo	I have friends but I prefer to study on my own. The information available for the exams are good.	I have met professors available to talk and willing to understand.	yes	I am not using the cantine nor the study rooms. Tutoring activities are too slow and useless.
Giulia	There is a group of peers helping me to find all the important information and the lecture notes.	The first-year professors were bad. Later, the availability of teachers has improved.	yes	I am not using the cantine. I study alone in the study rooms. I attended the tutoring activities for Physics and Calculus 1, but I have not passed the exams though.

Paolo seems to be nicely integrated in the University environment (he shows satisfaction), especially his relationship with faculty staff, but he declares that he prefers to study on his own and he does not need tutoring support (satisfactoriness because, being focused on the results, he believes that studying alone is more efficient). Giulia seems to be much less integrated into the University environment because she faced bad experiences with professors (lack of satisfaction) at the beginning, and only later did she see an improvement, and because she seems to communicate with her peers only to get information. She nevertheless tries to exploit the University's support and initiatives. Note that almost all these factors are, in Aina et al.'s (2022) review, determinants for not dropping out of the university.

6 Final remarks

This paper focuses on the constructs of satisfaction and satisfactoriness, understood in psychological, social and economic terms, to understand the factors that influence a student's decision to continue their studies and, in general, their well-being. Interestingly, these two constructs are not isolated from each other, but they seem to be intertwined in explaining the differences in the two cases analysed. This study represents a first step

toward defining and operationalising a model for university students' wellbeing that considers psychological, relational and environmental aspects of their experience at university. We consider satisfaction and satisfactoriness as factors which might affect the dropout rate in the first year of higher education, in the presence of Mathematics courses. The importance of a joint analysis of psychological, social and economical factors has been illustrated in (Aina et al., 2022). At present, a systematic study of the impact of economical and social actions, quantified by a combined usage of satisfaction and satisfactoriness indicators is, to the best of our knowledge, still missing in the literature. Our study attempts to initiate research in this direction and the two single cases seem promising. One of its limitations is the fact that no dropped-out student has been interviewed: in a follow-up phase, we aim to reach this sample. Another limitation is the small sample size: we also aim to develop a multiple-choice questionnaire to allow for a bigger number of respondents and to undertake quantitative analysis to examine the relations among the factors.

To conclude, the first results seem promising, as we have been able to confirm the results obtained in previous studies about students' dropout, but also to integrate psychological, social and economic lenses of analysis.

Author contributions

J.V.: Conceptualization, data analysis, writing—original draft preparation, writing—review and editing

C.A.: Methodology, writing—original draft preparation, writing—review and editing

C.C.: Conceptualization, data collection, writing—review and editing.

All authors have read and agreed to the published version of the manuscript.

Informed consent statement

Informed consent was obtained from all research participants.

Conflicts of Interest

The authors declare no conflicts of interest.

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