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Biology Undergraduate Students' Views of Assessment: Methods, Purposes and Effects

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Abstract

This paper draws on data from research focusing on assessment methods, its purposes and effects, effectiveness and fairness, as well as student participation and feedback. In total, 124 biology undergraduate students participated in the study. Data were collected through questionnaires and focus groups. Findings reveal written testing as the most used method. Students associate assessment mainly with a summative purpose. Although students report they negotiate some assessment-related aspects with teachers, in general they do not participate in self and peer assessment. Feedback is clearly recognized as an important feature in the assessment process. Implications of the findings are discussed.

Keywords: undergraduate; assessment; Biology; higher education

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Introduction

Earlier empirical work has shown that students' perceptions and conceptions of assessment in higher education (HE) can provide important insights regarding the influence of assessment on students' learning (Brown, 2011; Fletcher et al., 2012; Wang & Brown, 2014; Flores et al., 2015; Pereira, Barros, & Flores, 2017; Flores et al., 2020; Pereira, Cadime, Brown, & Flores, 2022). Studies in HE found that both students' assessment perceptions and teachers' practices differ according to the knowledge area (see, for instance, Yanowitz & Hahs-Vaughn, 2007; Goubeaud, 2010; Pereira, Niklasson, & Flores, 2017). In the natural sciences field, and in biology programs the literature reveals some specific features related to the assessment and learning process. The practice of formative assessment in biology classes (Wood, 2009) as well as students´ collaborative work based on problem-solving and on frequent, in-class assessment bring higher learning gains when compared with traditional lectures and traditional assessment (paper and pencil tests/exams) (Knight & Wood, 2005). According to Freeman et al. (2007) this kind of learning environment improves students' achievements, particularly of those who traditionally struggle with Biology.

Despite the gains of these interactive environments to the educational process, Brownell and Kloser (2015) suggest that such environments may be scarce in undergraduate science courses. Connel et al. (2016) state that working in student-centered active learning environments, as well as using new pedagogies and formative assessment, may be more difficult for science faculty because they had fewer opportunities to learn and to put these approaches into practice. According to Brown (2017, p. 1), "even practicing teachers need expertise in curriculum and pedagogy to exercise command of multiple methods of assessment in such a way that all learners are helped to overcome the, sometimes idiosyncratic, challenges they face". Wright and Sunal (2004) recognize that this lack of pedagogical knowledge on faculty with the science disciplines may work as an "instructional barrier."

Despite the existence of some studies focusing on assessment in HE, students' conceptions of assessment remain an under-researched area (Solomonidou & Michaelides, 2017). In addition, there is a lack of research on assessment tasks that address where the tasks are framed in a program and how they influence students' learning, instead of just addressing assessment tasks and how the students respond to them (Boud et al., 2018). This study aims at getting further insights into students' perceptions of assessment in a biology program at a Portuguese public university, contributing to redesigning the teaching, learning and assessment process in HE.

Context of the Study

The Applied Biology Programme (ABP) at the University of xxx corresponds to undergraduate education (C1, 180 ECTS) and offers a systematic and practical approach to the major fields in modern biology. Graduation requires attendance to 30 subjects along 6 semesters. In the third study year students can participate in research by doing an eight-week experimental project in a laboratory or an industry/company.

The Bologna process has implied changes in curriculum, namely in teaching, learning and assessment and the ABP was no exception. Students are encouraged to actively participate in the course and should have an active and central role in their learning and assessment processes.

Altogether this will help students to develop competencies, the scientific, technical, and soft skills needed in real life to be successful in their future careers. Conventionally used assessment

methods such as examinations and written tests still have a key role in assessment, but a wide variety of methods has been tried and implemented. In a given curricular unit, teachers ideally should use no fewer than two different assessment methods to assess students.

Methods

Research questions

The main goal of this paper is to investigate undergraduate perceptions about assessment in HE, particularly in a biology program at a Portuguese public university. The following questions are addressed in this paper:

- How do undergraduate students look at the purposes and effects of assessment?
- How do undergraduate students perceive the assessment methods?
- How do undergraduate students perceive the effectiveness and fairness of assessment?
- How do undergraduate students see feedback in the assessment process?
- How do undergraduate students look at their participation in the assessment process?

Participants

In total, 124 students responded to the questionnaire. The majority of the respondents were female (63.7%) and are between 18 and 21 years old (87.2%). Regarding the focus group, 77% of the participants (26) were female and the majority of them are between 18 and 19 years old (81%) (Table 1).

Table 1

Demographic characteristics of participants

		Questionnaire	*f*	FocusGroup	*f*
Gender	Female	63.7%	79	77%	6
	Male	36,3%	45	23%	20
Age	18-21	87.2%	18	81%	21
(years old)	22-25	9.6%	12	19%	5
	26-30	2.4%	3		
	30-35	0.8%	1		
Year	1st	33.9%	42	35%	9
	2nd	37.1%	46	35%	9
	3rd	29%	36	9%	5
	Ex students	-	-	11%	3
Total			124		26

Data collection

A questionnaire was administered in class to 124 undergraduate students, enrolled in the 1st, 2nd, and 3rd years, after having obtained permission from their teachers. The survey sample includes the students who were present in the classroom and wanted to participate voluntarily in the study. Six focus groups were conducted with 26 volunteer undergraduate students also enrolled in years 1 to 3.

Instruments

The questionnaire was designed based on previous research (Pereira & Flores, 2012; Flores et al., 2015). The group of questions was organized using a rating scale allowing a single response, except for one open-ended question concerning feedback. Questions regarding assessment-associated purposes and effects and assessment methods used a four-point Likert scale. In the remaining questions, a five-point Likert scale was used.
The focus groups were developed to gain further insights from the students and to deepen some issues arising from the questionnaire, namely regarding the most used assessment methods and their potential and limitations as well as students' perceptions of assessment and feedback.

Data analysis

Quantitative data were analysed using IBM SPSS Statistics, v. 24, and a descriptive statistical procedure was undertaken. Content analysis was used in order to identify emerging categories from qualitative data arising from the focus groups and the open-ended question of the questionnaire. Data were analysed and coded to reinterpret messages considering the research goals but also the categories emerging from the empirical material collected.

Findings

Findings are presented according to the following categories: i) purposes and effects associated with assessment; ii) assessment methods; iii) effectiveness and fairness of assessment; iv) feedback and v) student participation in assessment. For a more in-depth analysis of the results, quantitative data from the survey and qualitative data from the focus group will be reported, whenever necessary, in the same analysis category.

Purposes and effects associated with assessment

Regarding the first research question, "How do students look at the purposes and effects of assessment?", students associate assessment "fairly" and "very much" with a summative purpose such as verification of knowledge (91.9%), testing (90.4%) and grades (85.4%). Other purposes and effects also frequently associated with assessment were related to a formative purpose such as learning (76.9%), reflection, help and participation or to negative emotions such as anxiety/stress and fear (Table 2). Conflict and negotiation were less associated with assessment.

Table 2

Purposes and effects associated with assessment

		Not at all		Little		Fairly		Very much	
Ideas associated with assessment	***f***	***f***	**%**	***f***	**%**	***f***	**%**	***f***	**%**
Verification of knowledge	124	2	1.6%	8	6.5%	79	63.7%	35	28.2%
Tests/Exams	124	0	0%	12	9.6%	56	45.2%	56	45.2%
Success	124	0	0%	18	14.5%	89	71.8%	17	13.7%
Grades	123	0	0%	18	14.6%	66	53.7%	39	31.7%
Anxiety/Stress	124	5	4%	22	17.8%	62	50%	35	28.2%
Learning	123	1	0.8%	28	22.3%	69	56.2%	25	20.7%
Reflection	124	9	7.3%	45	36.2%	57	46%	13	10.5%
Help	123	2	1.6%	53	43.1%	62	50.4%	6	4.9%
Fear	123	13	10.6%	46	37.4%	48	39%	16	13%
Participation	124	4	3.2%	58	46.8%	51	41.1%	11	8.9%
Imposition	124	20	16.1%	56	45.2%	42	33.9%	6	4.8%
Unfairness	123	14	11.4%	62	50.4%	33	26.8%	14	11.4%
Conflict	124	24	19.3%	71	57.3%	25	20.2%	4	3.2%
Negotiation	123	29	23.6%	66	53.7%	25	20.3%	3	2.4%

Assessment as verification of knowledge

Data obtained through focus groups corroborate data derived from the survey. Biology students associated assessment mainly with a summative purpose, particularly with knowledge verification.

> “I think assessment is to verify what we have learned in a given moment of time. I mean, if content was well assimilated.” (P2)

> “I think it's about quantifying knowledge.” (P23)

According to students, assessment is used to assign grades, leading to classification and identification of the good and not so good students. As such, the purpose of assessment is related to students’ competitiveness, which is perceived with a sense of unfairness as students believe that it is not the fact of having better grades that will make them better professionals. Students further state that the assessment purpose is to certify if learning goals were achieved and if they acquired the required knowledge. According to the students, based on the grades, teachers may see the effectiveness of their teaching.

> "I think assessment is about differentiating the students. It is not about good or bad students, but those who get better grades and those who get not so good grades. It does not mean that the student who has lower grades is a bad student. Sometimes this is not the case. A student has more experience in practice than sometimes a student who has very high grades." (P17)

> "Through the grades teachers are able to assess what we have learned but they can also assess their teaching method and see if it is really working or not." (P16)

Unfairness in assessment

Besides knowledge certification and grades, unfairness was also associated with assessment. Participants identified different issues related to unfairness: i) teachers' attitude towards the assessment process and their professionalism; ii) valuation of the individual in the assessment process, iii) valuation of aspects other than competences development iv) and the adequacy of assessment to the working context:

> "Assessment is important for employment, or for a master degree. There must be a distinction between those who work and those who do nothing. It is a matter of fairness." (P17)

> "There are very unfair assessments. I think teaching in Portugal is a bit outdated. What I think is that the labour market requires other skills that are not assessed in Portugal. I think this is what fails a bit in our education system and in the assessment methods in particular." (P19)

Assessment methods

Concerning the second research question, "How do undergraduate students perceive the assessment methods?", the most "fairly" and "frequently used" assessment methods are tests/exams (100%), practical or experimental group work (96.8%), oral presentations in group, group reports and projects also carried out in groups (Table 3). In addition, assessment methods seldom or never used are individual poster presentations (98.4%), individual portfolios, individual elaboration of papers and individual written reflections.

Table 3

Assessment methods frequency of use

Assessment method	f	*Never used*		*Seldom used*		Fairly used		Frequently used	
		f	%	*F*	%	*f*	%	*F*	%
Tests/exams	124	0	0.0%	0	0.0%	13	10.5%	111	89.5%
Practical/experimental group work	124	0	0.0%	4	3.2%	64	51.6%	56	45.2%
Oral presentations in group	124	5	4.0%	15	12.1%	55	44.4%	49	39.5%
Reports in group	124	5	4.0%	15	12.1%	57	46.0%	47	37.9%
Project in group	124	19	15.4%	33	26.6%	49	39.5%	23	18.5%
Analysis/discussion of a paper in group	123	13	10.6%	52	42.3%	41	33.3%	17	13.8%
Elaboration of a paper in group	124	46	37.1%	34	27.4%	30	24.2%	14	11.3%
Practical/ experimental work individual	124	34	27.4%	50	40.4%	33	26.6%	7	5.6%
Group written reflections	124	40	32.3%	44	35.5%	33	26.6%	7	5.6%
Individual Project	124	40	32.2%	58	46.8%	18	14.5%	8	6.5%
Individual Reports	124	50	40.3%	50	40.3%	21	17.0%	3	2.4%
Group poster presentation	124	66	53.2%	35	28.2%	16	12.9%	7	5.7%
Portfolios in group	123	51	41.5%	53	43.1%	17	13.8%	2	1.6%
Analysis/ discussion of a paper individual	123	50	40.7%	55	44.6%	14	11.4%	4	3.3%
Individual oral presentation	124	64	51.6%	42	33.9%	14	11.3%	4	3.2%
Oral tests and examinations	123	54	43.9%	54	43.9%	13	10.6%	2	1.6%
Individual written reflections	124	60	48.4%	51	41.1%	10	8.1%	3	2.4%
Individual elaboration of a paper	123	76	61.8%	37	30.1%	8	6.5%	2	1.6%
Individual portfolio	123	74	60.2%	41	33.3%	8	6.5%	0	0.0%
Individual poster presentation	124	96	77.4%	26	21.0%	2	1.6%	0	0.0%

Table 4

Traditional and learner-centred methods of assessment

Item	*f*	Totally Disagree		Disagree		Neither Agree Nor Disagree		Agree		Totally Agree	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
Assessment based on portfolios, projects, or reflections allows me to develop critical thinking	124	3	2.4%	5	4%	26	21%	67	54%	23	18.6%
Assessment based on portfolios, projects or reflections allows developing new learning	124	3	2.4%	12	9.7%	40	32.3%	54	43.5%	15	12.1%
I spend more hours studying when assessment is performed through tests or exams	124	1	0.8%	18	14.5 %	23	18.5%	58	46.8%	24	19.4%
I feel more confident when I am assessed by assessment methods that actively participated in the tasks	124	2	1.6%	5	4%	40	32.3%	57	46%	20	16.1%
Normally I only study the syllabus that integrates the assessment tasks	124	4	3.2%	15	12.1 %	29	23.4%	63	50.8%	13	10.5%
I usually forget most of the subject studied after performing the test	124	1	0.8%	26	21%	36	29%	45	36.3%	16	12.9%
Normally I do not forget the contents I studied after performing a practical work, portfolios or projects	124	4	3.2%	29	23.4 %	33	26.6%	53	42.8%	5	4%
When preparing for an exam I only start to study shortly before the test and not during the semester	124	5	4%	38	30.6 %	28	22.6%	40	32.3%	13	10.5%
When performing a project or portfolio I am studying throughout the semester	123	6	4.9%	28	22.8%	39	31.7%	40	32.5%	10	8.1%
I feel more confident when I am assessed by methods other than tests or exams	123	2	1.6%	24	19.5%	53	43.1%	31	25.2%	13	10.6%
I feel more confident when I am assessed by tests	124	6	4.8%	31	25%	48	38.7%	31	25%	8	6.5%
I spend more hours studying when I am assessed through portfolios, projects or reflections	124	12	9.7%	32	25.8%	45	36.3%	26	21%	9	7.2%

Traditional and learner centered methods

Biology students “agree” and “totally agree” that learner-centered methods enable the development of critical thinking (72.6%) and new learning (55.6%). However, they study more hours when assessment is performed through tests/examinations (66.2%) but usually just the

contents that will integrate the assessment task. Students claim that they feel more confident when they are assessed through methods in which they participate actively in the task. However, they tend to forget part of the studied contents if assessment is performed through tests/examinations, and they study shortly before the test instead of during the semester. Additionally, students claim they do not forget the contents studied after performing a practical work and they recognize that they invest in studying throughout the semester when they need to perform a project or portfolio (Table 4).

Data obtained through focus groups also reveal that tests/exams, practical or experimental work in group and oral presentations are frequently used. Participants claim that teachers should use different assessment methods and emphasize the importance of practical work.

Critical aspects related to tests and exams

Students are critical of tests and exams. Most of the times they reported to be assessed at the end of semester. Students identify concerns regarding the nature of these assessment methods, since they promote memorization thus influencing their learning and performance. As a result of the short time devoted to study, students only study what they think will be covered in the test. They referred to other assessment methods that cover not only memorization but also other abilities, skills, and practices.

> “What teachers say we have to memorize. There are situations where we do not put into practice the critical thinking, and we don’t think about this issue. It's basically memorizing and reproducing exactly the same words that the teacher said.” (P12)

> “I was assessed through final exams at the end of the course, and the practice was completely ignored (...) It was the final exam, I had 5-6 months of classes per semester and in the end you had a single chance to take the exam. If you fail you had 6 months or a month later to make the second attempt, depending on whether it was first or second semester.” (P7)

> “When teachers say "this will be covered in the test" means that we need to focus on the learning goal. If they do not say anything, we do not take into account the content in question.” (P22)

Students also show dissatisfaction towards multiple-choice tests, stating they are unfair and may trigger the feeling of fear:

> “It will be difficult for me to pay attention in the test or to have to ensure that I will take 10, because some issues discount and the wrong ones subtract the right ones. Knowing the teachers will do that, a student is always afraid to do it and I am not at all familiar with this method of assessment.” (P3)

Benefits and pitfalls of group work

Group work is also often used, and participants emphasize its benefits to their learning, namely motivation, encouragement, help and commitment.

> "Regarding group work, the fact that there is encouragement between two people, having to be committed to study, sometimes it does not happen, but when it happens, two, three, four, or five people, there is commitment from the part of all. Thus, if one of us goes to the computer and distracts himself on Facebook, the other is already going to help and says "no, let's get some work done." (P9)

However, students identified negative aspects too, namely the lack of time they have to do the work as well as the excessive workload related to the practical component in their courses:

> "I had a notion that I'd have many works to do, in particular because of our practical component, which is very high here, but I wasn´t aware that there would be so many. Sometimes it is overwhelming. It´s clear that when we are doing some kind of practical work we are studying for the course. It´s a practical component in which we are continuously being assessed, whereas the theoretical courses need a more in-depth study (...) we are assessed through a test for which we do not have time to study." (P3)

Variety of assessment methods

Students point to the importance of using different assessment methods and strategies, not just tests or examinations. Such variety of alternatives would enable them, in their views, to develop skills for their professional future, other than the ones acquired by performing tests.

> "Assessment should be versatile. There shouldn´t only be tests and exams, but oral assessments and more diverse assessment strategies." (P22)

> "I think tests are unnecessary. In our course doing works, reports, articles and presentations makes us think about the topics and get to know all the related aspects. It compels us to work and to have more experience in what we are going to do in the near future." (P11)

Participants also indicated other learning process related-aspects. They state that practical work improves autonomous work, understanding rather than memorizing, and development of research skills.

> "I identify the content when I perform a work in which I´ve to do research and understand a certain subject. I think I keep more the information in my memory than memorizing for a test, because many concepts are given and there is a lot of topics. It is about memorizing without understanding." (P15)

Effectiveness and Fairness of Assessment

Regarding the third research question, “How do undergraduate students perceive the effectiveness and fairness of assessment?”, students “agree” and “totally agree” that assessment is most effective when it encourages knowledge application in real contexts (92.8%), enables improvement of technical (93%) or of simultaneously technical and soft skills (79%) and when it contributes to deepening learning (88.7%). Students further consider assessment to be fairer when teachers use at least two different assessment methods (77.5%) and when assessment is done individually even if it promotes teamwork (58.9%). Globally, students think that testing allows a more effective (49.2%) and fairer assessment (50%) although some critical aspects were identified in the focus groups (Table 5).

Table 5

Effectiveness and fairness of assessment

Item	*f*	Totally Disagree		Disagree		Neither Agree Nor Disagree		Agree		Totally Agree	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
Assessment is more effective when it encourages applying knowledge in real contexts	124	1	0.8%	2	1.6%	6	4.8%	67	54%	48	38.8%
Assessment is more effective when it allows improvement of technical or scientific skills	124	0	0%	2	1.6%	10	8.1%	60	48.4%	52	41.9%
Assessment is more effective when it contributes to the deepening of learning	124	1	0.8%	1	0.8%	12	9.7%	72	58.1%	38	30.6%
Assessment is more effective when it allows simultaneous improvement of technical and soft skills	124	0	0%	4	3.2%	22	17.8%	64	51.6%	34	27.4%
Tests allow a more effective assessment	124	10	8.1%	30	24.2%	23	18.5%	46	37.1%	15	12.1%
Portfolios, projects, or reflections allow a more effective assessment	124	5	4%	27	21.8%	56	45.2%	30	24.2%	6	4.8%
Assessment is fairer when teachers use at least two different assessment methods	124	1	0,8%	2	1.6%	25	20.1%	72	58.1%	24	19.4%
Assessment is fairer when is done individually even if it promotes teamwork	124	1	0.8%	13	10.5%	37	29.8%	47	37.9%	26	21%
Assessment is fairer when includes tests or examinations	124	5	4%	15	12.1%	33	26.6%	59	47.6%	12	9.7%
Assessment is fairer when students perform a self-assessment	123	3	2.4%	7	5.7%	56	45.5%	42	34.2%	15	12.2%
Assessment is fairer when there is self- and peer assessment	124	9	7.3%	13	10.5%	48	38.7%	40	32.2%	14	11.3%
Assessment is fairer when there is peer assessment	124	12	9.7%	28	22.6%	46	37.1%	33	26.6%	5	4%
Tests or examinations allow a fairer assessment	124	4	3.2%	24	19.4%	34	27.4%	53	42.7%	9	7.3%
Portfolios, projects or reflections allow a fairer assessment	124	7	5.6%	22	17.7%	54	43.5%	38	30.6%	3	2.6%

Although the participants in the questionnaire consider tests effective and fair, some participants in the focus group highlight the importance of being assessed by other methods.

> "I do not agree that teachers use only tests as a method of assessment. I think it´s not all wrong to use tests, but there should be another way to test our abilities because I think tests are done for memorization. Things that put our capacities to be tested really show what we are capable of." (P4)

Perceptions about feedback

Regarding the research question "How do students see feedback in the assessment process", feedback is seen as valuable information (59.6%) and constructive criticism (50.8%) (Table 6). In general, feedback meets the assessment criteria (51.2%) and is accompanied by availability and guidance for clarifications and doubts from the part of the teachers (60.9%).

Table 6

Students' perceptions about feedback

Item	*f*	Totally Disagree		Disagree		Neither Agree Nor Disagree		Agree		Totally Agree	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
It was accompanied by availability for my requests for clarification of doubts	123	0	0%	10	8.2%	38	30.9%	64	52%	11	8.9%
I felt it as an information I should value	123	2	1.6%	15	12.2%	45	36.6%	57	46.3%	4	3.3%
Met the assessment criteria	123	4	3.3%	16	13%	40	32.5%	61	49.6%	2	1.6%
I felt it as constructive criticism	124	1	0.8%	15	12.1%	45	36.3%	56	45.2%	7	5.6%
It enabled effectively to improve my performance	124	3	2.4%	22	17.8%	58	46.8%	38	30.6%	3	2.4%
It explained clearly, the most and the least achieved aspects of my work	124	5	4%	33	26.6%	48	38.8%	34	27.4%	4	3.2%
It gave me confidence in my work	124	3	2.4%	27	21.8%	64	51.6%	28	22.6%	2	1.6%
It was difficult to understand	123	3	2.4%	46	37.4%	46	37.4%	26	21.2%	2	1.6%
It made me feel that my work had no value	124	7	5.6%	59	47.6%	46	37.1%	10	8.1%	2	1.6%

Qualitative data obtained through the open-ended question suggest that participants consider feedback very important to improve their performance and regulate their learning. Students highlight the opportunity to improve their work after receiving feedback.

> "The feedback, in addition to the demonstration of respect for my work, is the best way to improve my performance because it allows adjusting my working method with the tasks that I have to perform. Regarding tests/examinations the only feedback received is the mark at the end and I do not consider it as a positive thing." (P21)

Students reported that sometimes teachers do not provide feedback, and, consequently, they lack the tools to improve their performance. They do not know what they have done wrong or what can be improved. Not having the opportunity to look at the tests or the completed work is seen as another negative aspect. Some of the reasons invoked are related to the (in)effectiveness of the feedback, the number of students per class, or teachers' workload among other aspects:

> "In a given course we had access to the tests. There could be two students in teacher's office and they have access to the tests and the teacher gave her correction and the mark and the two people could compare. Now, in this course, we asked the teacher "why is this wrong?" and the teacher answered "because it´s wrong" and said nothing else." (P6)

> "We have no opportunity to improve. Teachers have very limited schedules. If we all had a chance to improve (...) they would have to work double." (P19)

Student participation in assessment

Concerning the research question "How do students see their participation in the assessment process", students "totally disagree" and "disagree" about being asked to perform self (62.9%) and peer assessment (60.2%) (Table 7). When it comes to assessment times, students "agree" and "totally agree" that it takes place during the semester (55.7%) and when students carry out a task or activity (55.4%).

Table 7

Modes and periods of assessment

Item	*f*	Totally Disagree		Disagree		Neither Agree Nor Disagree		Agree		Totally Agree	
In general…		*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
I am asked to perform a self-assessment	124	17	13.7%	61	49.2%	25	20.2%	18	14.5%	3	2.4%
I usually participate in the assessment of my colleagues (peer assessment)	123	16	13%	58	47.2%	23	18.7%	24	19.5%	2	1.6%
Assessment takes place during the semester	124	3	2.4%	19	15.3%	33	26.6%	61	49.2%	8	6.5%
Assessment occurs whenever I perform a task or activity	123	2	1,6%	18	14.6%	36	29,4%	65	52.8	2	1.6%
Assessment takes place only at the end of the semester	124	5	4%	47	37.9%	37	29.8%	28	22.6%	7	5.7%

In general, according to students, there is negotiation and dialogue about the assessment methodologies in the courses or modules (51.8%) (Table 8).

Table 8

Student participation in the assessment process

Item	*f*	Totally Disagree		Disagree		Neither Agree Nor Disagree		Agree		Totally Agree	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
The assessment methodology in the Curricular Units, is discussed & negotiated with students	112	1	0.8%	21	18.8%	32	28.6%	49	43.8%	9	8%
Classification should be done, exclusively, by teacher (s)	124	10	8.1%	27	21.8%	46	37.1%	32	25.8%	9	7.2%
Assessment should be performed, exclusively, by teacher (s)	124	12	9.7%	36	29%	37	29.8%	30	24.2%	9	7.3%
The assessment methodology in the Curricular Units, is only decided by teacher (s)	113	5	4.4%	31	27.4%	42	37.2%	29	25.7%	6	5.3%

Discussion

Findings from this research show that students associate assessment mainly with summative purposes (grades, tests) although the formative dimension (e.g. success and learning) is also identified. Earlier studies corroborate these findings, stating that tests, exams, grades, or learning are the most recurring assessment ideas of undergraduate students (Flores et al., 2015; Pereira, Flores, & Barros, 2017, Pereira, Niklasson, & Flores, 2017). Participants in the present study further highlighted anxiety/stress as one of the most associated effects of assessment. These findings are in line with earlier empirical work where anxiety is frequently associated with assessment from the part of the students (Flores et al., 2015; Pereira, Flores, & Barros 2017). Kaur et al. (2018) also reported students associate negative feelings with assessment such as anxiety and depression, leading to poorer experiences and maladjustments. Nevertheless, other studies (Pekrun et al., 2002) show that even those negative emotions can bring benefits to the modes of information progression and to the learning process. Negotiation, conflict, and unfairness are the least associated aspects to assessment in the present study, again corroborating previous studies (Flores et al., 2015; Pereira, Flores, & Barros 2017). However, participants in the focus groups spoke of unfairness as the critical issue related to assessment.

According to the participants, the most used assessment methods are tests/exams as well as methods that promote collaborative work, such as practical or experimental works, whereas the least used methods are those which promote individual work. Students participating in the focus groups highlight that working in a group brings benefits to learning such as increased motivation, autonomous work, and understanding. Actually, traditional methods of assessment continue to be frequently used in HE contexts according to literature (Struyven et al., 2005; Flores et al., 2015; Panadero et al., 2019). However, other studies suggest that while formal examinations were the predominant basis of evaluating universities, there were disciplinary differences (Pereira, Flores, & Barros 2017, Pereira, Niklasson, & Flores, 2017; Lipnevich et al., 2020). Indeed, in the last decades, some studies found that collaborative work in science courses, and specifically biology courses, brings important gains for students' learning, since the scientific nature of this knowledge area presupposes frequent group activity in the classroom, promoting frequent sharing of knowledge, procedures, findings and evaluation of tasks (Springer et al., 1999; Tanner et al., 2003; Knight & Wood, 2005; Freeman et al., 2007).

Participants indicated they devote more hours to study when assessment is performed through tests/examinations. However, they feel more confident when assessed by methods that promote their active participation. Pereira, Niklasson, and Flores (2017) explain that this may be related to the stress and anxiety levels students are exposed to when taking a test. Since examinations are usually final and carry significant weight for grades, they tend to engender considerable anxiety (Pereira, Cadime, Brown, & Flores, 2022). On the other hand, students typically do not have the pressure either of memorization or of time when assessed by methods in which participate actively, as usually occurs when performing a test (Pereira, Niklasson, & Flores, 2017). In fact, biology students participating in the focus groups stressed that tests and/or exams promote memorization and lead to poorer performance, which consequently influences their

learning. A recent study (Pereira, Cadime, Brown, & Flores, 2022) corroborates these findings as students' preference for alternative methods of assessment correlated higher for assessment effectiveness, fairness, and level of participation and engagement with assessment. On the contrary, preference for traditional methods was negatively correlated with perceived fairness and with engagement with assessment. However, at the same time, it is still intriguing that the biology students participating in the survey consider that testing allows a more effective and fairer assessment.

In general, students agree that assessment effectiveness may translate into the possibility of applying knowledge in real contexts, of deepening learning and even of developing technical and soft skills. In addition, these students perceive the use of at least two assessment methods - which fits the recommendations of the biology program in the university where this study was conducted - and being assessed individually (even if the assessment task is performed in a group) to be fairer.

Students generally consider that feedback is valuable information, meets the assessment criteria, provides constructive criticism, and is accompanied by availability and guidance from the teachers. Qualitative data show that students look at feedback as a way of regulating their learning process, providing guidance and support, leading to improved performance. However, they highlighted that sometimes feedback is ineffective because it neither provides information about their performance nor gives them the opportunity to improve. This finding suggests that quality feedback must be relevant and timely. The study by Pereira et al. (2016) drawing on Zimmerman's' work (2002) show that students are unable to engage in the phase of self-reflection (in which learners react to their own outcomes once the learning process is completed), of self-regulation of learning (the degree to which learners manage their own learning processes meta-cognitively, motivationally, and behaviorally), when feedback is given at the end of the process. Thus, students see feedback as more effective and relevant during the performance phase (in which learners monitor and control their performance while developing the task) than during the forethought (during which learners set objectives and plan before a task) and self-reflection phases.

The same study found that the learner-centered assessment methods seem to be more suitable to effective and relevant feedback and to more effective feedback in all phases of self-regulation learning than traditional methods. Other assessment strategies that could improve the learning process are highlighted in this domain, such as the use of diversified instruments and techniques that promote the transparency and authenticity of the assessment process, innovative assessment practices (Struyven, Dochy, & Janssens, 2005; Struyven & Devesa, 2016) as well as real-time formative feedback (Kowalski & Kowalski, 2012). In fact, the acceptance of assessment as a mechanism for improving teaching and learning leads to a better academic performance, as self-regulation requires reflection on the performance achieved to identify the learning priorities and the academic results (Flores et al., 2020).

Participants claimed they are not asked to perform self and peer assessment. Research shows that these modes of assessment are not used very often in HE contexts (Pereira, Barros, & Flores, 2017; Barreira et al., 2017, Panadero et al., 2019). A review by Zeng et

al. (2018) shows a need for students' involvement in the assessment process, guiding them to learn and to use self and peer-assessment. However, these modes of assessment are not used in a systematic manner to develop students' abilities to assess and to adjust their own learning.

Findings from this study show that the assessment methodology is negotiated and discussed with the students. Stark et al. (2018) found that students consider important the opportunity to make their own decisions regarding the topics to be assessed as well as designing their own assessments. Regarding assessment times, the biology students report that assessment takes place during the semester and when they perform tasks, i.e., continuous assessment, but qualitative data from the focus groups suggest that assessment occurs mainly at the end of the semester.

Conclusion and recommendations

Some contradictions emerged from students' perceptions of assessment effectiveness and fairness, the nature of the assessment methods and students' ability to organize their own study behavior. Such inconsistencies may be related to the students' (lack of) assessment literacy or to the years that students were attending (first cycle).

Finally, the epistemological characteristics and the specific nature of the programs may influence assessment. According to Ewell et al. (2011), the methods teachers use to assess students' learning and how they use the results of the assessment are influenced by the different disciplines in which they teach. In fact, literature in this domain suggests that the hard sciences (where natural sciences are included) are related to the frequent use of tests (Neumann et al., 2002) and this may influence the ways in which students perceive the purposes of assessment, namely in terms of their participation in the process. However, this does not mean that other alternatives, approaches, strategies, and methods may not be used in this knowledge field.

The mixed method of this study contributed greater context and depth to the survey findings of students' perceptions on assessment. Thus, this study may provide suggestions that enable teachers re-think and re-design their assessment practices as well as clues to future research related to assessment in different fields of knowledge in HE. Although recent research focuses on similarities and differences of purposes and effects of assessment, assessment methods and the use of assessment in various HE programs (Pereira, Cadime, & Flores, 2022), it would be important to understand how students see the assessment process and the practices used by teachers in different areas of knowledge. Future research on these topics would also be interesting from the perspective of university teachers in different areas of knowledge in HE.

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