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Nursing students' evaluations of the flipped classroom using the FLAS scale: a quantitative analysis

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Abstract

Background Flipped classroom is based on the principle of student responsibility and autonomy in the learning process. It involves students engaging in independent, asynchronous study of course content using materials provided by the lecturer, followed by active learning sessions during scheduled class time through reinforcement and/or assessment activities. The aim of this study was to describe and compare first- and third-year nursing students' evaluations of their experience with the flipped classroom methodology.

Methods A descriptive and comparative study was conducted using the Flipped Learning Assessment Scale. This instrument evaluates three dimensions: quality of materials and organisation of the session, lecturer performance, and overall perception compared with traditional methodology. Flipped Classroom sessions were implemented in first- and third-year courses. Data were analysed using descriptive statistics, Mann–Whitney U tests, Spearman correlation and multiple regression.

Results A total of 432 nursing students participated: 155 first-year and 277 third-year. Participants were enrolled from the University of Huelva, the University of Zaragoza, and the San Juan de Dios School of Nursing of the University of Seville. The mean scores for the three dimensions were 4.25 for materials and organisation, 4.52 for lecturer performance, and 3.82 for overall perception compared with traditional methodology. Third-year students tended to rate all dimensions higher than first-year students. Age was positively associated with the first two dimensions but not with the third. According to the regression model, academic year emerged as the strongest predictor of perception, reaching statistical significance for the first dimension. Age showed a significant association with lecturer performance, while sex did not appear to be a significant predictor.

Conclusions Nursing students evaluated the Flipped Classroom with Moodle Book positively, especially lecturer performance and materials. Greater acceptance among third-year students suggests that academic maturity enhances engagement with active learning approaches.

Keywords Nursing education, Nursing students, Flipped learning, Flipped classroom

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Background

Generation Z, composed of digital natives who favour a more active, visual and independent learning style than previous generations, has now entered higher education [1, 2]. This shift has prompted the need for educators to revise their teaching practices, moving from teacher-centred to student-centred approaches and incorporating more innovative methodologies [1]. Several studies suggest that such innovative reforms in teaching methods can be highly beneficial at the university level [3, 4]. In response, nursing schools are adapting their educational models to current pedagogical frameworks, aiming to enhance students' motivation, engagement, and satisfaction throughout the learning process [4–6].

In this context, various authors have confirmed that a positive learning experience enhances nursing students' self-confidence [5, 7], helps bridge the gap between theoretical and practical training, and contributes to students' perceptions of themselves as more competent professionals [7, 8]. Accordingly, it is essential that university lecturers invest in the continuous innovation of their teaching practices by updating the pedagogical methods they employ [6, 9].

Among the wide array of innovative strategies currently being introduced, gamification techniques have gained particular prominence. These approaches have been shown to positively—albeit indirectly—impact learning outcomes by fostering motivation, improving educational content, and promoting constructive attitudes and behaviours [10–12].

One of the most widely implemented and researched gamification strategies to date is the Flipped Classroom (FC) model [7, 10, 13–17]. FC is based on the principle of student responsibility and autonomy in the learning process, requiring them to be more effective and improve their time management [13, 16]. It involves students engaging in independent, asynchronous study of course content using materials provided by the lecturer, followed by active learning sessions during scheduled class time through reinforcement and/or assessment activities [7, 10, 17, 18].

Some studies claim that FC transforms classroom time by replacing lectures with activities that apply knowledge to real-life scenarios and problem solving [8, 14, 16]. For teachers, this freeing up of classroom time allows them to use it more efficiently, maximising interaction between teacher and student through discussion and debate [13, 14, 19], as class time is used to address students' questions rather than just giving lectures [16].

FC also offers the benefit of repeatability of lessons (videos), allowing students to learn at their own pace, which is crucial for better understanding of topics [8, 14]. However, this flexibility is offset by the need to devote a considerable amount of time to the method, which can

be overwhelming due to the increased workload [14, 16]. Asynchronous preparation for the face-to-face session also has the disadvantage of a lack of instant feedback while watching the videos [14].

The FC model has been applied in various contexts to improve nursing students' critical thinking skills [13, 20] and to develop core procedural competences essential to the profession [10]. FC has proven effective in developing empathy and increasing active learning and academic achievement [14], as students gain a deeper and more effective understanding of the subject matter [8]. However, only some studies report notable improvements, while others found no significant differences in exam performance [7, 13, 14, 16].

FC has also been linked to higher levels of satisfaction, autonomy, and self-confidence among students [8, 10, 13, 14]. In fact, the use of FC has significantly improved motivation and intensity of preparation for participants in some studies [10, 16]. However, the requirement for active participation, which increases satisfaction for many, is also the source of major barriers for other students who expressed fear and felt nervous about the obligation to prepare for class in advance [10, 13]. For teachers, the lack of commitment to active and prior participation in the materials is one of the biggest obstacles to the success of this model [7, 10], although it offers them a greater perception of the student's learning needs, allowing them to observe their strengths and weaknesses more effectively [7, 14]. Contradictorily, some studies have identified that certain students perceive that the distance between them and their teachers increases in the learning process [14].

At the same time, the digitalisation of many areas of daily life has had a profound effect on universities, driving the development of technological resources that support teaching activities in virtual environments. Among the various learning management systems, Moodle is one of the most commonly used platforms across higher education institutions in Spain [21, 22]. Moodle offers a range of content management tools, including Moodle Book (MB), a digital resource designed for the creation of concise, multi-page materials presented in a textbook-like format. Previous studies have shown that students have positively evaluated the use of this tool in academic settings [23].

Taken together, these factors suggest that combining the MB tool with the FC strategy may offer significant benefits for enhancing student learning and motivation in higher education contexts. For these reasons, a group of professors from three Spanish universities decided to get involved in a teaching innovation project that would combine FC through MB. The Spanish university system is predominantly public, with each province having at least one university campus where various degrees can

be studied. The Bachelor's Degree in Nursing is offered at almost all public and private universities in Spain, due to its high demand and significant impact on the health of society. The teachers involved in this project are lecturers from the nursing schools at the University of Huelva (UHU), the University of Zaragoza (UNIZAR), and the San Juan de Dios School of Nursing of the University of Seville (SJD-US). The UHU is a university in Spain's southwestern most province, bordering Portugal. The UHU's nursing school welcomes 140 students per year. On the other hand, SJD-US is one of four nursing schools at the University of Seville, which accepts around 60 students per year for its nursing degree programme. UNIZAR is the public university in the province of Zaragoza, located in the north-eastern half of Spain. Its nursing school has a capacity for 160 students per year. The lectures of the nursing school at the UHU promoted the project and invited collaborators from other universities to participate, with faculty members from UNIZAR and SJD-US agreeing to take part. The project was carried out and tools were used to assess the participating students' evaluation of the innovation model, thus the aim of this study was to describe and compare the evaluation of the FC experience among first- and third-year Nursing degree students.

Methods

Research design, instrument, and dimensions

A descriptive and comparative study design was used to evaluate students' perceptions of FL as an active learning methodology, assessed using the Flipped Learning Assessment Scale (FLAS). The FLAS is a validated instrument for assessing flipped learning [24], developed from Barua's Feedback Questionnaire on FL Activity [25] and Choi's Flipped Classroom Questionnaire [26]. The scale consists of 14 items rated on a traditional five-point Likert scale (1 = strongly disagree; 5 = strongly agree) and covers three dimensions: D1: students' evaluation of the materials provided and the face-to-face session (items 1–5); D2: evaluation of the teacher's performance (items 6–8); and D3: students' overall experience with the FC strategy compared to TM (items 9–14). Regarding the validity and reliability of the FLAS scale, it presents solid psychometric evidence [24]. Its factorial structure was established through exploratory factor analysis (EFA) and subsequently confirmed through confirmatory factor analysis (CFA) in a sample of 455 students. The fit indices obtained (CFI = 0.938; RMSEA < 0.08; NFI ≥ 0.90) support the construct validity of this scale. Similarly, Cronbach's α values, with an overall value of 0.893 and subscale values ranging from 0.660 to 0.897, indicate adequate internal consistency.

Teaching intervention, data collection and participants

The lecturers developed a teaching innovation project combining the FC strategy with the MB tool. Bespoke materials were created using MB and made available to students for independent study. This was followed by an in-person session dedicated to answering questions, completing activities, and concluding with an assessment task. The teaching staff participating in the project carried out the intervention in first-semester subjects, each planning the FC session based on criteria of suitability with respect to the content and other activities of their subject. All these tasks were carried out by all the participating teachers, regardless of the course in which their subject is located.

The subjects that were part of the project were: by the UHU, in the first year History, Theoretical Foundations and Ethical Bases of Nursing and, in the third year, Administration of Nursing services; by the UNIZAR, in the first year Fundamentals of Nursing and in the third Pharmacotherapy and Diet Therapy; and by the SJD-US, in the first year Health Promotion and in the third year Maternal-Child Nursing.

The project's teaching team did not include any teachers who taught second-year courses at all universities, while fourth-year students do not have theoretical sessions at the nursing school and spend the entire course in healthcare internships. Therefore, all students enrolled in first- and third-year courses received the intervention and experienced the FC methodology through a project teacher. Which gives a total of 720 participants, 280 of the UHU's nursing school; 120 of the SJD-US; and 320 of the UNIZAR's nursing school. However, not all students enrolled in the subjects were included in this study.

The inclusion criteria applied were that participants: attended the class session in which the FC methodology was explained; had completed the asynchronous work prior to the face-to-face FC session; and, attended class on the day of the FC session.

Following this teaching intervention, the FLAS scale was administered to gather student evaluations of the methodology. The informed consent, FLAS scale and associated sociodemographic questions were formatted into a digital questionnaire, accessible via a link in the Moodle Virtual Classroom, which was provided to students who met the inclusion criteria for each participating modules. Students completed the questionnaire anonymously, online, and independently. All teachers collected responses to the FLAS one week after using this methodology in the classroom.

Data analysis

Descriptive analyses were performed on the sociodemographic variables and the questionnaire dimensions, with the quantitative variables (age, FLAS scale scores and

their dimensions) described using mean and standard deviation, and the qualitative variables (gender, academic year and university) summarised using absolute frequencies and percentages. The internal reliability of the questionnaire was assessed using Cronbach's α coefficient for the complete scale and for each dimension.

The normality of the distributions was assessed using the Kolmogorov–Smirnov test with Lilliefors and Shapiro–Wilk corrections, as well as by inspecting the asymmetry and kurtosis graphs. As the assumption of normality was not met ($p < .05$), non-parametric tests were used for the comparative and inferential analyses.

The Mann-Whitney U test for independent samples was applied to compare the mean scores on the FLAS scale between first- and third-year students, and the effect size (r) was estimated from the Z value ($r = Z / \sqrt{N}$). This was then interpreted according to Cohen's criteria (1988): small ($r \approx .10$), moderate ($r \approx .30$), or large ($r \geq .50$). Associations between qualitative variables (gender, academic year, university and age categories) were analysed using Pearson's chi-squared test and the strength of association was estimated using Cramer's V coefficient. Given the non-parametric nature of the data, Spearman's correlation coefficient (ρ) was used to examine the correlation between quantitative variables (age and FLAS scale scores and their dimensions).

Finally, multiple linear regression was used to identify the predictors of students' overall perception of the flipped methodology (i.e. their total FLAS scale score). The independent variables included the academic year, age, gender and university.

A statistical significance level of $p < .05$ was established for all analyses, which were performed using IBM SPSS Statistics, version 30.0.

Ethical considerations

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Given that this research exclusively employs anonymized socio-demographic data alongside assessment and satisfaction data pertaining to a well-established learning strategy, it is regarded as a study with limited opportunities for ethical concerns. Consequently, it does not necessitate approval from an ethics committee in accordance with Law 14/2007 on Biomedical Research, or in the guidelines of the Nuclear Safety Council. Prior to completing the questionnaire, students signed an informed consent about the aims, objectives and relevance of their participation. The questionnaire included an explanatory statement regarding the study objectives and a note explicitly stating that completion implied informed consent. Confidentiality and anonymity of all data were ensured throughout.

Results

Of the 720 students enrolled in first- and third-year courses at the three participating universities (UNIZAR = 320; UHU = 280; SJD-US = 120). 608 of them met these criteria and were invited to participate by completing the FLAS. Of these, 433 students (71.23%) gave their consent to participate, but 432 completed the FLAS in its entirety. A more detailed description of the selection process can be found in the flow chart (Fig. 1).

Participants' sociodemographic characteristics and academic affiliation

Of the 432 final participants, 82.2% (355) were women and 17.8% (77) were men. The mean age was 21.7 (SD 5.55) years, with an average age of 21.6 (SD 5.5) years for women and 22.0 (SD 5.9) years for men. In terms of academic year, 64.1% ($n = 277$) were in their third year, while 35.9% ($n = 155$) were in their first year. In terms of academic affiliation, 54.9% (237 participants) came from the UHU, 7.1% (31 participants) came from the SJD-US and 38% (164 participants) came from the UNIZAR. Table 1 provides a detailed breakdown of the sample characteristics.

Participants' perceptions of the flipped classroom according to academic year

Although the FLAS scale has been validated, this study checked its reliability and internal consistency using Cronbach's alpha analysis. The results showed good internal consistency overall ($\alpha = 0.894$) and by dimension. A more detailed description can be found in Table 2.

FLAS Scale scores show an average total of 4.2 (0.6) points, with similar values across the three dimensions: Dimension 1 (D1): 4.2 (0.6); Dimension 2 (D2): 4.5 (0.6); and Dimension 3 (D3): 3.8 (0.9) (see Table 2).

Analysis of D1 revealed that the availability of materials in 'book' format prior to the face-to-face session (item 1) received high scores (4–5 points) from 94.2% (407) of participants. Slightly lower scores were obtained by first-year students (91.6%) compared to third-year students (95.6%).

Similar results were observed in the evaluation of the perceived usefulness of the preparatory materials in relation to the face-to-face session (item 3). Here, 92.6% (400) of participants gave this item a score ranging from 4 to 5, including 87.7% (136) of first-year students compared to 95.3% (264) of third-year students.

Regarding students' perceptions of how face-to-face activities contribute to a better understanding of the content (item 4), 82.8% (357) of participants rated it between 4 and 5 points, including 74.8% (116) of first-year students compared to 87.0% (241) of third-year students.

Similarly, the assessment of students' perception of the time spent studying preparatory materials before the

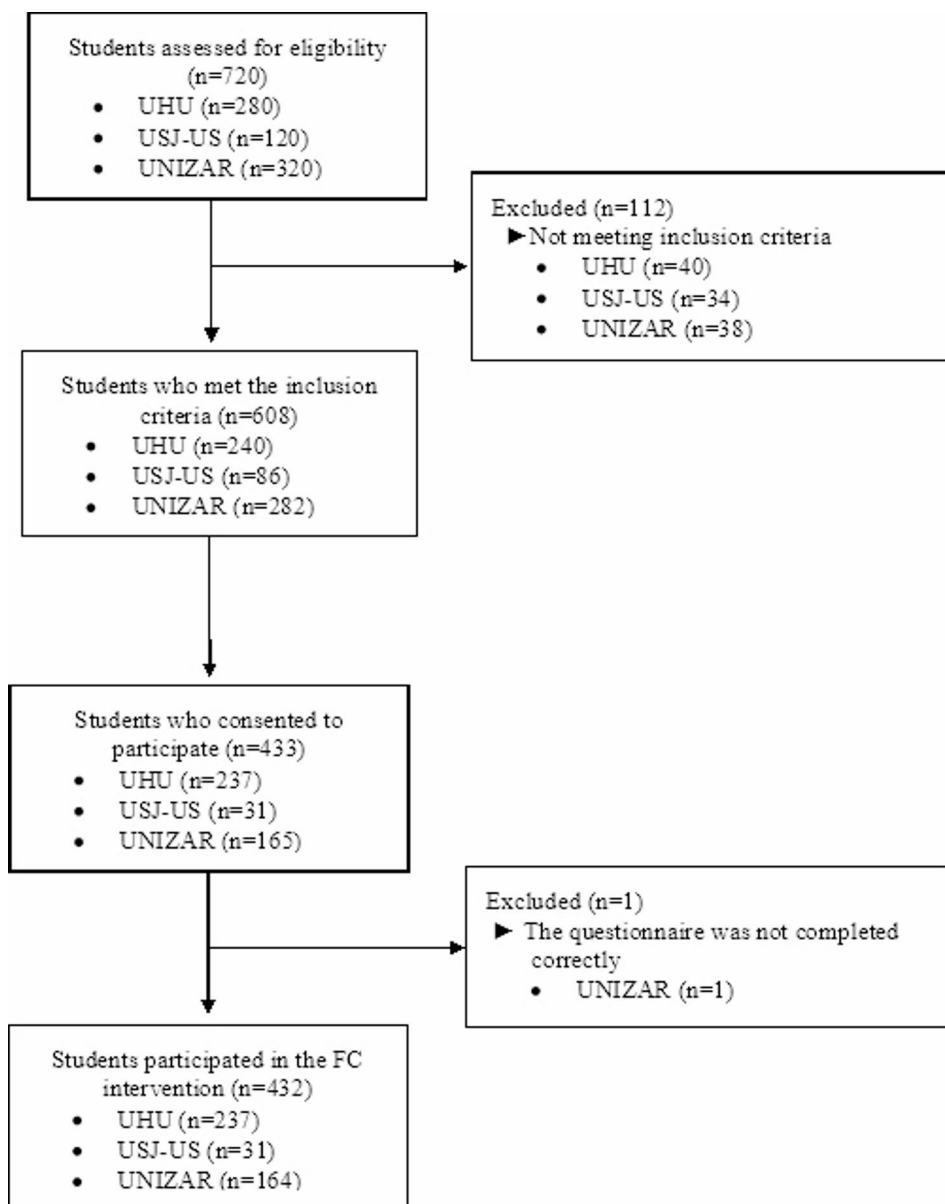


Fig. 1 Flow chart showing the number of participants at each stage of the study

face-to-face session (item 2) followed the same pattern. In this case, 67.1% (290) of participants rated it between 4 and 5 points, while 32.9% (142) expressed a lower degree of agreement by selecting scores below 2, indicating total or partial disagreement.

Finally, with regard to the assessment of motivation to continue exploring the topic in a face-to-face session (item 5), this was the item in this dimension with the lowest scores. Only 61.6% (266) of participants rated it between 4 and 5 points, of whom 49.0% (76) were first-year students and 68.6% (190) were third-year students (Table 3).

In relation to D2 (items 6–8), which assessed students' perceptions of the teacher's performance during

the face-to-face session, the item focusing on the teacher's ability to encourage student participation (item 6) received a score of 4 or 5 from 88.6% (383) of participants. Of these, 87.7% (136) were first-year students and 89.2% (247) were third-year students.

Conversely, the teacher's ability to clarify students' doubts (item 7) was assessed most highly in this dimension, with 95.6% (413) of participants scoring between 4 and 5 points. Of these, 96.1% (149) were first-year students, compared to 95.3% (264) of third-year students.

The teacher's recommendations on supplementary materials and readings (item 8) received the lowest score within this dimension. Overall, 79.4% (343) of participants gave a score of 4 or 5, of whom 73.6% (114) were

Table 1 Sociodemographic characteristics and academic affiliation of participants

Variable	Total (N=432)	Course		p
		1° (n=155)	3° (n=277)	
Age (mean, SD)	21.7 (5.5)	20.8 (5.5)	22.2 (5.5)	<.001
<= 30	90.5 (391)	91.0 (141)	90.3 (250)	<.81
> 30	9.5 (41)	9.0 (14)	9.7 (27)	
Sex (% , n)				
Man	17.8 (77)	20.0 (31)	16.6 (46)	<.38
Women	82.2 (355)	80.0 (124)	83.4 (231)	
University (% , n)				
UHU	54.9 (237)	80.0 (124)	40.8 (113)	<.001
Seville	7.2 (31)	20.0 (31)	0.0 (0.0)	
UNIZAR	38.0 (164)	0.0 (0.0)	59.2 (164)	

Abbreviations: SD standard deviation, p probability

Table 2 Analysis of reliability and consistency of the FLAS scale

Dimension	Item	Mean (SD)	Rank	α Cronbach
Total scale	1–14	4.19 (0.60)	1.22–5.00	0.894
Dimension	1–5	4.25 (0.64)	1.00–5.00	0.720
1: General perception	1	4.77 (0.64)	1.00–5.00	
	2	3.91 (0.64)	1.00–5.00	
	3	4.62 (0.67)	1.00–5.00	
	4	4.22 (0.89)	1.00–5.00	
Dimension 2: Motivation	5	3.76 (1.11)	1.00–5.00	
	6–8	4.53 (0.80)	1.00–5.00	0.635
	6	4.51 (0.61)	1.00–5.00	
	7	4.78 (0.58)	1.00–5.00	
Dimension 3: Self-efficacy	8	4.25 (1.00)	1.00–5.00	
	9–14	3.74 (1.24)	1.00–5.00	0.931
	9	3.82 (0.95)	1.00–5.00	
	10	3.46 (1.37)	1.00–5.00	
	11	3.79 (1.12)	1.00–5.00	
	12	3.91 (1.15)	1.00–5.00	
	13	3.84 (1.15)	1.00–5.00	
14	4.16 (1.04)	1.00–5.00		

Abbreviations: SD standard deviation. N=432 participants. Mean and SD were calculated for the items in each dimension. Cronbach's reliability is reported for each dimension and for the total scale

first-year students and 82.7% (229) were third-year students (see Table 3).

Analysing the data obtained in dimension D3 (items 9–14), which explored students' perceptions of the CF experience compared to MT, revealed that this dimension had the lowest overall score and the lowest score when compared between academic years.

While most items comparing CF and MT scored 4 or higher, these values were significantly lower than those in previous dimensions, with average scores for most items just below 4.

The item with the highest score in this dimension referred to whether CF was easier to use and more comfortable than MT (item 14). This item received a score of 4 or 5 from 78.0% (337) of participants. Broken down by

academic year, this was 71.6% (111) of first-year students compared to 81.6% (226) of third-year students.

Conversely, when assessing whether FC facilitates concentration more than TM (item 10), it received the lowest score: only 56.7% (255 participants) assigned it a score of 4 or more. Of these participants, 55.5% (86) were in their first year and 57.4% (159) were in their third year. The mean scores for this item were slightly below 3.5 points in both groups (Table 3).

When the D3 items were ranked by average score from highest to lowest, students perceived FC as being easier to use and more comfortable (item 14); more interesting (item 12); easier to understand (item 13); more efficient (item 11); more effective for acquiring knowledge (item 9); and easier to concentrate on (item 10) than TM.

Taking into account the results obtained after analysing the different items that make up each category, it can be concluded that students' perception of the flipped classroom methodology improves as they progress through their studies. Although the effect sizes were small in all dimensions ($r < .30$), this seems to indicate that the observed differences are not only statistically significant, but also have a relevant educational pattern. This pattern indicates that the academic experience gained during the course is associated with a greater acceptance and appreciation of the FC model. This greater acceptance may be attributed to increased autonomy, academic maturity, and a better understanding of the pedagogical potential inherent in this methodology (see Table 4).

A comparative analysis of the perception of the use of the flipped classroom methodology among first- and third-year students confirmed this trend, revealing that third-year students achieved significantly higher average scores on the FLAS Scale ($U = 25,872.0$, $p < .001$, $r = .12$) and its three dimensions: quality of teaching materials and organisation of the face-to-face session ($U = 27,055.5$, $p < .001$, $r = .22$); student perception of teacher performance during the face-to-face session ($U = 24,193.5$, $p = .022$, $r = .11$); and subjective perception of the student regarding the FC versus TM experience ($U = 24,590.0$, $p = .012$, $r = .012$) (Table 4).

Spearman's correlation was used to examine the relationship between age, a continuous quantitative variable, and the scores obtained in the three dimensions of the FLAS Scale. Positive and significant correlations were observed between age and D1 ($\rho = 0.146$, $p = .002$) and between age and D2 ($\rho = 0.182$, $p < .001$), whereas no significant association was found for D3 ($\rho = 0.069$, $p = .150$) (see Table 5). However, after analysing age grouped by ranges, no statistically significant association was found between age grouped by ranges and any of the dimensions.

Finally, a multivariate regression analysis of gender, age and academic year as predictors of student scores

Table 3 Evaluation of available materials and the development of the face-to-face session: frequencies, percentages and mean scores, overall and by academic year (D1, D2 and D3)

D1	ITEM	1-AF	1-%	2-AF	2-%	3-AF	3-%	4-AF	4-%	5-AF	5-%	Mean
TOTAL (N=432)	I1 - Pre-reading materials (i-Lecture/others) were available on eLearning portal before the FC activity	4	0.9	2	0.5	19	4.4	41	9.5	366	84.7	4.77
	I2 - Adequate time was provided to spend on the pre-reading materials (i-Lecture/additional references etc) before the FC activity	18	4.2	48	11.1	76	17.6	102	23.6	188	43.5	3.91
1ST (N= 155)	I3 - Pre-reading materials and i-lectures were relevant for the FC activity	1	0.2	4	0.9	27	6.3	95	22	305	70.6	4.62
	I4 - The activities during FC session improved my understanding of the key concepts	4	0.9	19	4.4	52	12	161	37.3	196	45.4	4.22
	I5 - The FC session inspired me to pursue further learning for the module	16	3.7	42	9.7	108	25	129	29.9	137	31.7	3.76
	I1 - Pre-reading materials (i-Lecture/others) were available on eLearning portal before the FC activity	2	1.3	0	0	11	7	24	15.5	118	76.1	4.65
	I2 - Adequate time was provided to spend on the pre-reading materials (i-Lecture/additional references etc) before the FC activity	5	3.2	18	11.6	28	18.1	47	30.3	57	36.8	3.86
	I3 - Pre-reading materials and i-lectures were relevant for the FC activity	0	0	3	1.9	16	10.3	40	25.8	96	61.9	4.48
	I4 - The activities during FC session improved my understanding of the key concepts	2	1.3	10	6.4	27	17.4	63	40.6	53	34.2	3.93
	I5 - The FC session inspired me to pursue further learning for the module	11	7.1	25	16.1	43	27.7	40	25.8	36	23.2	3.42
3RD (N= 277)	I1 - Pre-reading materials (i-Lecture/others) were available on eLearning portal before the FC activity	2	0.7	2	0.7	8	2.9	17	6.1	248	89.5	4.83
	I2 - Adequate time was provided to spend on the pre-reading materials (i-Lecture/additional references etc) before the FC activity	13	4.7	30	10.8	48	17.3	55	19.8	131	47.3	3.94
	I3 - Pre-reading materials and i-lectures were relevant for the FL activity	1	0.4	1	0.4	11	4	55	19.8	209	75.5	4.70
	I4 - The activities during FC session improved my understanding of the key concepts	2	0.7	9	3.2	25	9	98	35.4	143	51.6	4.34
	I5 - The FC session inspired me to pursue further learning for the module	5	1.8	17	6.1	65	23.5	89	32.1	101	36.5	3.95
D2	ITEM	1-AF	1-%	2-AF	2-%	3-AF	3-%	4-AF	4-%	5-AF	5-%	Mean
TOTAL (N= 432)	I6 - Instructor was able to engage me in the FC activity	6	1.4	2	0.5	41	9.5	93	21.5	290	67.1	4.53
	I7 - Instructor was able to provide clarification on difficult concepts during the FC activity	1	0.2	6	1.4	12	2.8	51	11.8	362	83.8	4.78
	I8 - Instructor was able to expand on i-lectures and pre-reading materials during the FC activity	8	1.9	21	4.9	60	13.9	111	25.7	232	53.7	4.25
1ST (N= 155)	I6 - Instructor was able to engage me in the FC activity	2	1.3	1	0.6	16	10.3	41	26.4	95	61.3	4.46
	I7 - Instructor was able to provide clarification on difficult concepts during the FC activity	0	0	2	1.3	4	2.6	20	12.9	129	83.2	4.78
	I8 - Instructor was able to expand on i-lectures and pre-reading materials during the FC activity	5	3.2	10	6.4	26	16.8	39	25.2	75	48.4	4.09
3RD (N= 277)	I6 - Instructor was able to engage me in the FC activity	4	1.4	1	0.4	25	9.0	52	18.8	195	70.4	4.56
	I7 - Instructor was able to provide clarification on difficult concepts during the FC activity	1	0.4	4	1.4	8	2.9	31	11.2	233	84.1	4.77
	I8 - Instructor was able to expand on i-lectures and pre-reading materials during the FC activity	3	1.1	11	4.0	34	12.3	72	26.0	157	56.7	4.33
D3	ITEM	1-FA	1-%	2-FA	2-%	3-FA	3-%	4-FA	4-%	5-FA	5-%	Mean
TOTAL (N=432)	I9 - Comparing with traditional class, FC is more effective to achieve learning outcomes.	34	7.9	37	8.6	86	19.9	125	28.9	150	34.7	3.74
	I10 - Comparing with traditional class, FC is easier to concentrate	54	12.5	65	15.0	68	15.7	120	27.8	125	28.9	3.46
	I11 - Comparing with traditional class, FC is more efficient	16	3.7	46	10.6	88	20.4	143	33.1	139	32.2	3.79
	I12 - Comparing with traditional class, FC is more interesting	22	5.1	34	7.9	74	17.1	132	30.6	170	39.4	3.91
	I13 - Comparing with traditional class, FC is easier to understand	25	5.8	34	7.9	75	17.4	149	34.5	149	34.5	3.84
	I14 - Comparing with traditional class, FC is more familiar and comfortable	13	3.0	22	5.1	60	13.9	125	28.9	212	49.1	4.16

Table 3 (continued)

1ST (N=155)	I9 - Comparing with traditional class, FC is more effective to achieve learning outcomes	11	7.1	11	7.1	29	18.7	61	39.4	43	27.7	3.74
	I10 - Comparing with traditional class, FC is easier to concentrate	14	9.0	26	16.8	29	18.7	51	32.9	35	22.6	3.43
	I11 - Comparing with traditional class, FC is more efficient	5	3.2	15	9.7	34	21.9	63	40.6	38	24.5	3.74
	I12 - Comparing with traditional class, FC is more interesting	11	7.1	16	10.3	33	21.3	53	34.2	42	27.1	3.64
	I13 - Comparing with traditional class, FC is easier to understand	14	9.0	12	7.7	35	22.6	53	34.2	41	26.5	3.61
	I14 - Comparing with traditional class, FC is more familiar and comfortable	8	5.2	10	6.5	26	16.8	47	30.3	64	41.3	3.96
3RD (N=277)	I9 - Comparing with traditional class, FC is more effective to achieve learning outcomes	23	8.3	26	9.4	57	20.6	64	23.1	107	38.6	3.74
	I10 - Comparing with traditional class, FC is easier to concentrate.	40	14.4	39	14.1	39	14.1	69	24.9	90	32.5	3.47
	I11 - Comparing with traditional class, FC is more efficient	11	4.0	31	11.2	54	19.5	80	28.9	101	36.5	3.83
	I12 - Comparing with traditional class, FC is more interesting	11	4.0	18	6.5	41	14.8	79	28.5	128	46.2	4.06
	I13 - Comparing with traditional class, FC is easier to understand	11	4.0	22	7.9	40	14.4	96	34.7	108	39.0	3.97
	I14 - Comparing with traditional class, FC is more familiar and comfortable	5	1.8	12	4.3	34	12.3	78	28.2	148	53.4	4.27

Abbreviations: AF absolute frequency, D1 dimension 1, D2 dimension 2, D3 dimension 3, /item of FLAS

D1 - General perception. D2 - Motivation. D3 - Self-efficacy

indicated that academic year was the most consistent predictor, although it only reached statistical significance for D1 ($F = 13.151, p = .001$) and was not significant for the other dimensions. Age was a significant predictor only for D2 ($F = 4.779, p = .029$), but not for the other dimensions. Gender was not a statistically significant predictor for any of the dimensions (Table 5).

Discussion

This study describes and compares nursing students' perceptions of their experience with the Flipped Classroom methodology, focusing on first- and third-year students. Students expressed high levels of satisfaction with materials and organisation (D1) and lecturer performance (D2), while overall experience compared with traditional methodology (D3) scored slightly lower, particularly among first-year participants. Third-year students consistently rated all dimensions higher, and age was positively associated with certain aspects of the learning experience.

In D1, the most highly rated aspects were the relevance of the preparatory materials and the ability to access them prior to the face-to-face session. Previous studies have reported that senior students are more adept at navigating digital platforms to locate and organise learning materials [27, 28]. In contrast, first-year students, who are still adapting to an unfamiliar educational environment and a new learning model, may experience some challenges related to the use of technology, which may negatively impact their satisfaction [27, 28]. Other authors have suggested that the FC approach may be better suited to students in later year, who generally display higher levels of motivation and readiness for self-directed learning [29, 30]. This may explain the greater effectiveness of the FC model observed in more senior cohorts [31]. These findings support our results, which identified academic year as the most consistent predictor—albeit statistically significant only for D1—and age as a significant predictor for D2. A gradual integration of the FC model has been recommended to help students adjust to this methodology [28, 32]. Furthermore, other studies clarified that informing the students about the nature and benefits of the approach, and helping them understand their role within it, has been identified as essential to its successful implementation [28, 31, 33].

Another positively rated aspect was the use of classroom activities to support the understanding of key concepts. The characteristics of the tasks carried out during FC sessions have been consistently identified by other authors as contributing to the overall effectiveness of this methodology [14, 31].

On the other hand, students expressed less satisfaction regarding the time available to work on materials prior to the in-person session, and their motivation to explore the

Table 4 Students' perceptions of the use of the flipped classroom according to academic year

Variable	1° Course (n = 155)		3° Course (n = 277)		U Mann-Whitney	p	r
	Median	Average range	Median	Average range			
FLAS total	4	188.1	5	232.4	25872.0	<0.001	0.17
Dimension 1	4	180.4	5	236.7	27055.5	<0.001	0.22
Dimension 2	5	198.9	5	226.3	24193.5	=0.022	0.11
Dimension 3	4	196.3	4	227.8	24590.0	=0.012	0.12

Abbreviations: p probability, r effect size

Dimension 1 – General perception. Dimension 2 – Motivation. Dimension 3 – Self-efficacy

Table 5 Influence of variables such as gender, age, and academic year on scores in the different dimensions of the FLAS scale

Variable	Type III sum of squares	gf	Quadratic mean	F	p
Dimension 1					
Age	6.515	1	6.515	0.213	0.645
Gender	0.808	1	0.808	5.549	0.019
Year	2.924	1	2.924	13.151	0.000
Dimension 2					
Age	146.419	1	146.419	4.779	0.029
Gender	0.478	1	0.478	3.282	0.071
Year	0.038	1	0.038	0.169	0.681
Dimension 3					
Age	0.158	1	0.158	0.005	0.943
Gender	0.022	1	0.022	0.154	0.695
Year	0.039	1	0.039	0.174	0.677

Abbreviations: gf degrees of freedom, F multiple regression statistician, p probability

Dimension 1 – General perception. Dimension 2 – Motivation. Dimension 3 – Self-efficacy

subject matter in greater depth. Again, lower satisfaction levels were reported among first-year students. The time required for preparation before class has been cited in previous research as a perceived burden [14, 34]. Furthermore, the ability to manage one's own time, cope with the workload, and navigate unfamiliar digital resources has been recognised as a common challenge in FC contexts, potentially influencing these perceptions [26, 31, 33]. To address these challenges, implementing structured timelines for pre-class preparation and integrating supportive scaffolding tools could improve early-year students' engagement and perceived satisfaction.

With regard to D2, students from both year groups gave favourable assessments of the lecturer's involvement during the session, including their ability to foster participation and address students' questions. Lecturer-related factors—such as skills, subject knowledge, personal attributes, experience with FC, and the ability to motivate—have all been highlighted in the literature as key elements influencing the success of the FC model [17, 31].

In relation to D3, which compared students' experiences of FC versus TM, results did not indicate a clear preference for either approach. Previous studies have

also shown that, despite the advantages reported by FC participants, this methodology did not necessarily receive higher approval ratings than traditional formats [35]. Those studies suggested that factors such as the timing of implementation, the disruption of established learning habits, and the perceived increase in preparatory workload may all contribute to lower satisfaction scores among some students [35]. Future interventions could explore combining Flipped Classroom with other active learning strategies, gamification, or digital tools to enhance engagement and perceived effectiveness.

Future research should examine the impact of Flipped Classroom on knowledge retention, critical thinking, and procedural skills [10, 14]. Longitudinal studies could determine whether positive perceptions persist and translate into improved professional competencies [8, 14]. Implementing tailored strategies for early-year students and evaluating their effectiveness would make the methodology more actionable and support broader adoption across nursing curricula [28, 32]. Exploring complementary digital tools, scaffolding, and gamification strategies could further enhance student engagement and learning outcomes, while providing practical guidance for lecturers seeking to optimise the methodology in diverse contexts.

Strengths and limitations

Strengths of this study include its multicentric design across three universities, use of a validated instrument to assess multiple dimensions of perception and, a relatively large sample size, enhancing reliability and generalisability within similar educational contexts. Limitations include reliance on self-reported data, potential social desirability bias and, an evaluation focused on perceptions rather than objective measures of learning or clinical competence.

Conclusion

The Flipped Classroom methodology was positively perceived by nursing students across all three dimensions, with particularly high satisfaction regarding the quality of preparatory materials and lecturer performance. Third-year students tended to report higher scores than first-year students, suggesting that experience and familiarity

with the academic environment may enhance engagement and appreciation of the methodology. Age was associated with certain aspects of student perception, although sex did not appear to influence outcomes.

While overall comparisons with traditional teaching did not show a clear preference, the methodology was generally considered accessible and beneficial for supporting active learning. These findings indicate that the Flipped Classroom approach can be successfully implemented in nursing education, but the level of students' prior academic experience should be considered when designing interventions.

Practical implications include the value of gradually introducing the methodology for early-year students, providing clear guidance on the use of digital materials, and supporting lecturers in facilitating participation and addressing questions effectively. Future research should explore the impact of Flipped Classroom approaches on objective learning outcomes, clinical skills, and long-term professional competencies. Tailored strategies and complementary digital tools could further enhance student engagement and ensure that the benefits of this methodology are maximized across different academic levels.

Abbreviations

D1	Dimension 1. Student evaluation of the materials provided and the face-to-face session
D2	Dimension 2. Evaluation of the lecturer's performance
D3	Dimension 3. Students' overall experience with the FC strategy in comparison to traditional methodology
FC	Flipped Classroom
FLAS	Flipped Learning Assessment Scale
MB	Moodle Book
SJD-US	San Juan de Dios School of Nursing of the University of Seville
TM	Traditional methodology
UHU	University of Huelva
UNIZAR	University of Zaragoza

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Authors' contributions

**Conceptualization: ** J.D.G.S., F.U.P.; **Data curation: ** C.T.M., M.R.P.; **Formal analysis: ** F.U.P., C.T.M., M.R.P.; **Funding acquisition: ** J.D.G.S.; **Research: ** J.D.G.S., F.U.P., C.T.M., M.R.P., D.T.E., C.F.R.; **Methodology: ** J.D.G.S., F.U.P., C.T.M., M.R.P., D.T.E., C.F.R.; **Project administration: ** J.D.G.S., F.U.P.; **Supervision: ** J.D.G.S.; **Validation: ** J.D.G.S., F.U.P., C.T.M., M.R.P., D.T.E., C.F.R.; **Writing – original draft: ** C.T.M., M.R.P.; **Writing – review & edition: ** J.D.G.S., F.U.P., C.T.M., M.R.P., D.T.E., C.F.R.

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Data availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Given that this research exclusively employs anonymized socio-demographic data alongside assessment and satisfaction data pertaining to a well-established learning strategy, it is regarded as a study with limited opportunities for ethical concerns. Consequently, it does not necessitate approval from an ethics committee in accordance with Law 14/2007 on Biomedical Research, or in the guidelines of the Nuclear Safety Council. Prior to completing the questionnaire, students signed an informed consent about the aims, objectives and relevance of their participation. The questionnaire included an explanatory statement regarding the study objectives and a note explicitly stating that completion implied informed consent. Confidentiality and anonymity of all data were ensured throughout.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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