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EDUCATIONAL AND PSYCHOLOGICAL ASPECTS IN ONLINE AND FACE-TO-FACE LEARNING ENVIRONMENT

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Abstract. Although COVID-19 pandemic is behind us, some important implications thereof are still recognised, particularly in educational context and through the prism of subjective perceptions. This article outlines a cross-sectional study among students in education at Sofia University "St. Kliment Ohridski", which collected data over three pivotal periods of time: in 2020 when the coronavirus pandemic broke out and instructional design abruptly changed from face-to-face to online modality; in 2022 at the end of the pandemic period when imposed restrictions were lifted and students returned into the university halls; and then again in 2024, two years after the end of the crisis. Research focused on how students' motivation and other affective states, as well as preferences for mode of instruction, differed over time. It also tested the role of instructors' empathy and disposition. Altogether 224 participants took part in the study. Findings revealed a constellation of coherent time-bound and instructor-bound differences.

Keywords: face-to-face and online instruction; coronavirus pandemic; motivation and affective states; teacher empathy; university education; cross-sectional studies

1.Theoretical review

In recent decades, conducting academic learning in an online environment has become the norm in many universities (Jansem 2021; Otter et al. 2013; Tucker, Halloran & Price 2013) and, particularly, during COVID-19 pandemic (Ghosh 2024; Azzi et al. 2021). Modalities, incorporating online and face-to-face instruction, such as hybrid learning (Wang, Lin & Wang 2023, Sanpanich 2019) or blended learning (Qamar et al. 2024; Fan et al. 2021), technology-mediated learning experience (Henrie, Halverson & Graham 2015), as well as use of AI applications in online learning (Jin et al. 2023; Tegos, Demetriadis & Karakostas 2012) in their turn, have also been efficiently implemented in tertiary education. These modes of instruction constitute differently the dynamics of student-teacher and student-student interactions. The analysis of learners' personal experiences in

online or face-to-face learning allows to identify more dimensions of their positive aspects and limitations.

This research aims to investigate how learners' affective responses to learning in online and face-to-face learning environments change over time. It builds on the robust set of studies conducted over the past few years by academic teams at the Faculty of Educational Studies and the Arts (FESA) on the educational and psychological implications of the shift to online learning modality during the global pandemic of COVID-19 (Aleksieva & Peytcheva-Forsyth 2023; Bakracheva et al. 2021; Zamfirov et al. 2020). The present research enriches the scope of previous studies with its cross-sectional perspective on learners' affective responses to online and face-to-face modes of instruction.

1.1. Social dimensions of online and face-to-face modes of instruction

We fully agree with the notion that "all learning happens in relationships" (Vaillancourt et al. 2021, p. 1800). Research data points to a certain deficit of human closeness in online mode of instruction (Ghosh 2024; Jansem, 2021), while face-to-face learning environments ensure a higher degree of social connection (Vaillancourt et al. 2021) and participation even in technology-mediated instruction (Moskovkin & Shamonina 2020). The greater sense of belonging learners experience, the more positive their attitudes to online learning become and the easier they adapt to the online format (Besser, Flett & Zeigler-Hill 2022). The extent and quality of interactions in online environment is a predictor of learners' satisfaction with the overall learning experience (Kim & Frick 2011).

The results pertaining to learners' social comfort in the two formats of learning are mixed. On the one hand, learners feel less connected to peers and teachers in the online mode of instruction (Otter et al. 2013), but on the other hand, younger students experience lower levels of social anxiety and feel less threatened by more powerful peers (Collins-Nelsen, Hill & Raha 2023). Web-based learning has been found to alleviate speaking anxiety (Bashori et al. 2020) when students interact with web-based tools compared to interactions to peers. Furthermore, self-reported social anxiety issues are related to more negative perceptions of online learning (Azzi et al. 2021). It is likely that such ambiguous results are a product of the so-called "paradox of technology-mediated relationships" (Luppicini & Moir 2012, p. 153), where on the one hand digital technologies facilitate and speed up the way people communicate, but on the other hand lead to less depth and personal closeness in relationships.

The potential of online learning modality for extending interaction (Garrison 2011), supporting participatory learning (Maor 2003) and collaborative learning experiences (Garrison 2011) should be acknowledged and further investigated with a view to the design of inclusive pedagogical strategies. Educational institutions need to continue their efforts to support the strengthening of online learning communities (Roddy et al. 2017).

1.2. Affective dimensions of face-to-face and online modes of instruction

The shift from the traditional face-to-face learning environment to online formats provides first of all technological challenges (Sanpanich 2021; Maor 2003) which are related to the affective responses and states of learners. Compared to face-to-face learning, online mode of instruction "places different demands on students" (Roddy et al. 2017, p. 4). Overexposure to online coursework and interaction with online content increases pressure on students (Maloney et al. 2023).

Motivation and engagement levels in learning have ambiguous manifestations in online and face-to-face learning modalities. Motivational concepts have been incorporated in the ARCS model – an acronym which stands for "attention, relevance, confidence and satisfaction" (Keller & Suzuki 2004, p. 230). Confidence can be perceived as related to self-efficacy (Kim & Frick 2011), yet in the ARCS model it is constituted as a condition for motivation which is fulfilled when students have positive expectations for success based their abilities and efforts (Keller & Suzuki 2004). Furthermore, from a technological perspective, confidence in the ability to interact online with peers, lecturers and resources enhances the online learning experience (Landrum 2020). Some research findings indicate that hybrid mode of instruction "has the potential to improve learning confidence" (Wang, Lin & Wang 2023, p. 278) compared to face-to-face and online modalities.

According to the majority of studies, the degree of personal commitment to the learning process and, consequently, learners' motivation is higher in face-to-face learning environments (Vaillancourt et al. 2021; Flett, Khan & Su 2019; Hartnett 2016). At the same time, other studies have indicated higher levels of autonomy and self-efficacy in online learning (Otter et al. 2013), as well as of learning ownership (Maor 2003). These findings might also be relevant to the factor of flexibility – especially in terms of learning time, space, and resources - provided by the online modality as evidenced in a number of studies (Ghosh 2024; Hossen & Uddin 2023; Roddy et al. 2017).

Last but not least, we should note the evidence that learners are better able to focus in online environments due to fewer classroom management issues (Collins-Nelsen, Hill & Raha 2023) although other research suggests that online mode of instruction provides distractions (Hossen & Uddin 2023) mainly in terms of digital interactions that are not learning-related yet occur within learning sessions.

Positive learning experience in online environment is also related to levels of learners' engagement (Kim & Frick 2011). Effective engagement (Roddy et al. 2017) can be fostered through coherent teachers' input (Fan et al. 2021) and it results in improved academic performance (Jaggars & Xu 2016). More research on emotional engagement of learners with online formats is necessary (Henrie, Halverson & Graham 2015), especially so with a view to the evidence of online engagement fatigue, defined as "reduction in online students' enthusiasm and motivation for engaging in course activities" (Maloney et al. 2023, p. 2).

1.3. Pedagogical dimensions of face-to-face and online modes of instruction

Some studies show that in terms of academic performance there are no significant differences between online and traditional face-to-face classrooms (Paul & Jefferson 2019). Yet, as regards the role of educators for shaping the entire learning experience in the two modes of instruction, research is fairly unanimous.

In online formats, where available interactions are less rich (Roddy et al. 2017) teachers have a direct impact on students' motivation and engagement with their studies. Students' overall satisfaction and learning outcomes are related to instructors' level of expertise and ability to facilitate learning (Baber 2020), as well as to the extent in which they relate to students (Ghosh 2024). Furthermore, positive student-teacher interaction and a flexible curriculum are among the factors that affect learners' positive attitudes to online formats (Kim & Kim 2021). Student satisfaction is also directly impacted by the manner of teaching and structuring the course content (Gray & DiLoretto 2016).

How effectively teachers manage to deliver content plays "a pivotal role in shaping student attention" (Hossen & Uddin 2023, p. 14). Provision of feedback is of critical importance for keeping students' interest and engagement (Fan et al. 2021) and is instrumental for learners' academic achievement (Kim & Kim 2021). Research findings show that teacher-led support for fostering learners' motivation is preferred to support, provided by artificial intelligence (Jin et al. 2023).

Frequent and positive student-teacher interaction encourages learners to commit to the educational process (Jaggars & Xu 2016). From a socio-constructivist perspective, effective online teaching implies "changing the role of the lecturer from an 'expert' to that of a co-learner" (Maor 2003).

To further add to the humanistic dimension of learning, the concept of the "Magic teacher" (Taeschner 2005; Sofronieva 2020) who fosters empathetic intersubjective relationships with and among learners and helps create an inclusive and joyful learning space is of particular relevance not only to face-to-face mode of instruction but also to online teaching practices as well.

2. Research design

The general aim of the research project was to conduct a cross-sectional study and offer a comparative analysis of the perceptions of pedagogical specialists (both education undergraduates and preservice teachers) related to specific educational and psychological aspects of online and face-to-face learning environments at different pivotal points in time. Hence, the study was conducted during three different periods: once in April 2020 when the pandemic broke out and instructional design at university had to abruptly change its modality - from face-to face to online; once in April 2022 at the end of the pandemic period when the imposed restrictions were lifted and students returned into the university halls and classrooms after a two-year period of online studies; and once again in April – July 2024, two years after the end of the coronavirus pandemic.

The survey instrument was designed to collect information about participants' attitudes towards how and to what extent learning in an online environment - specifically, using Sofia University E-learning Moodle platform[1], differed from face-to-face instruction at university level. Differences were sought out and looked into in relation to time-span and the related presence or absence of constraints imposed by the global pandemic of COVID-19. We wanted to monitor if students' preferences of a type of instruction and their interaction and affective states would change when there were no imposed measures and exceptional circumstances as well as when instruction was delivered by different kinds of teachers.

We had set two types of objectives. The first was to collect data points over three precise periods of time and compare:

– Students' preferred mode of instruction;

– The intensity of self-reported learners' motivation and other affective states in different learning modalities.

The second set of objectives aimed at identifying in general terms:

– Possible association between subject variables and students' expressed preferences;

– Possible associations between groups taught by different instructors in relation to learners' overall motivation and other affective states.

2.1. Research hypotheses

To address the research objectives, four research hypotheses were defined:

Hypothesis 1 (H1): There will be significant differences in students' preferences for the mode of instruction at university during the distinct periods of time (pandemic and post-pandemic times).

Hypothesis 2 (H2): There will be meaningful associations between certain subject variables (students' gender, major and year of studies) and students' preferred mode of instruction.

Hypothesis 3 (H3): There will be significant differences in students' affective responses in the virtual and face-to-face classrooms during the studied periods.

Hypothesis 4 (H4): There will be significant differences among groups taught by different instructors in relation to learners' overall motivation and other affective states.

2.2. Participants

The participants of the study (N = 224) were students at the Faculty of Educational Studies and the Arts of Sofia University "St. Kliment Ohridski" in Bulgaria. The survey was launched among undergraduate students in education, namely, students in "Preschool education and foreign language teaching" and "Media education and art communication". A third group of students who were trained for language teachers on a post graduate programme were invited to join the research project in 2024. All respondents took part on a voluntary basis. A profile of the participants is given in the table below.

Table 1. Demographic characteristics of the participants in the research: gender, major and year of studies

Characteristics	*Type*	*2020 N*	*2020 %*	*2022 N*	*2022 %*	*2024 N*	*2024 %*
Gender	female male	47 4	92.2% 7.8%	92 1	98.9% 1.1%	78 2	97.5% 2.5%
Major	preschool education students media education students preservice teachers	34 17 0	66.7% 33.3% 0.0%	54 39 0	58.1% 41.9% 0.0%	51 13 16	63.8% 16.3% 20.0%
Year	year 1 year 2 year 3 post graduates	19 15 17 0	37.3% 29.4% 33.3% 0.0%	33 27 33 0	35.5% 29.0% 35.5% 0.0%	31 29 4 16	38.8% 36.3% 5.0% 20.0%
Total (100%)	224	51	22.8%	93	41.5%	80	35.7%

2.3. Instruments and procedures

The main instrument was a questionnaire developed for the purpose of the survey. Respondents were asked to denote the degree to which they agreed or disagreed to 14 statements (7 for each mode of instruction) related to the way they felt in the virtual and face-to-face classroom. The affective responses encompassed the following categories: feeling/being 1. "motivated", 2. "anxious", 3. "tired", 4. "concentrated", 5. "indifferent", 6. "confident" and 7. "active". Responses were rated on a 4-point Likert scale (1-definitely not, 2-not; 3-yes; 4-definitely yes).

Further, participants were asked to reveal their preference by answering the question: "If it were a matter of choice, which type of instruction would you choose – online or face-to-face?"

The final section in the survey gathered information about participants' gender, age, and year of studies at university.

The survey instrument was first uploaded on the Sofia University E-learning Moodle platform[1] in the month of April, 2020. Respondents uploaded their filled in forms on the platform. Respondents in 2022 and 2024 had an alternative to either use the e-platform to reply or submit a pen-and-paper version of the survey.

English language classrooms of instruction were used for the purpose of the research project. Altogether, there were three university instructors who provided the language instruction to the surveyed groups of students in the denoted period of four years. Their levels of exhibited empathy in their teacher-student interaction was

assessed by three experts in language, empathy and communication on a 3-point Likert scale (from 1 to 3). Students' feedback was also taken into account when deciding on the specific teacher profiles. Instructors were then finally classified and referred to as "Teacher 1", "Teacher 2" and "Teacher 3" according to their levels of expressed empathy in class. Correspondingly, Teacher 1 was the most engaging teacher of the three instructors and Teacher 3 the least inspiring one.

3. Research results

We used the statistical package for social sciences SPSS 23.0 for both descriptive and inferential statistics in the analysis of data. Chi-square analyses were conducted to assess group differences by comparing distribution of different events in different groups where the outcomes were categorical variables.

First, we tested Hypothesis 1, i.e. the differences in students' preferences for the mode of instruction at university level in pandemic and post-pandemic times. Graphical representation of the results follows.

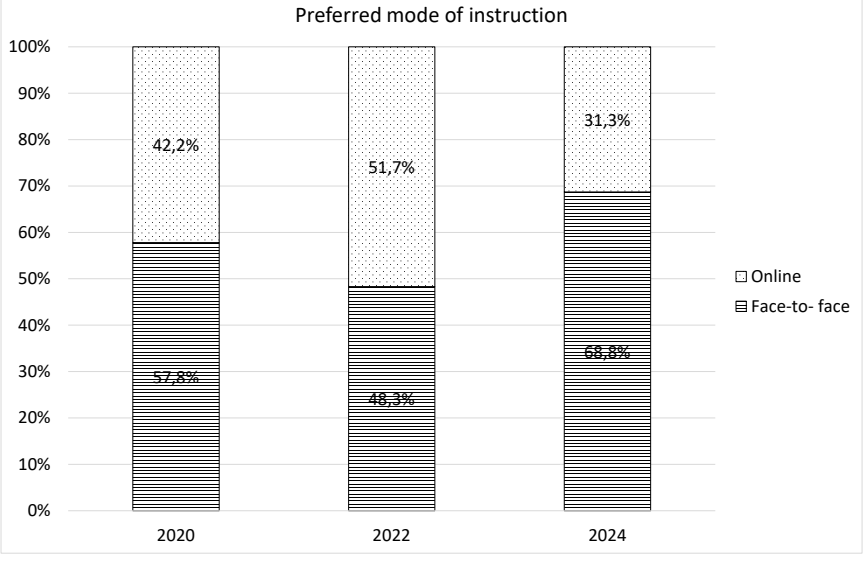

Figure 1. Students' preferred mode of instruction

As is seen, there is a tendency which could be distinctly traced over the years in relation to students' preferred mode of instruction at university. At the beginning of the coronavirus pandemic period only 42.2% of all students preferred the online

mode of instruction. At the end of the pandemic period more than half of all students (51.7%) preferred that mode of instruction. Yet again, in 2024, two years after the end of the pandemic, students' interest in the face-to-face interaction at university level increased again and it was the preferred choice of instruction for 68.8% of all students who took part in the survey.

We performed χ^2 analysis to test the registered differences which, as hypothesized, proved to be statistically significant ($\chi^2 = 7.17$, df = 2, p = 0.03).

Then, we tested (H2) possible associations between participants' preferences for online education and the subject variables (gender, university major, and year of university studies).

As hypothesized, differences revealed to be statistically significant for university major ($\chi^2 = 20.89$, df = 2, p = 0.00) and year of studies ($\chi^2 = 20.21$, df = 3, p = 0.00). Age proved to be strongly related to students' likes and dislikes. The older the students, the more voiced and expressed their preference for online education was.

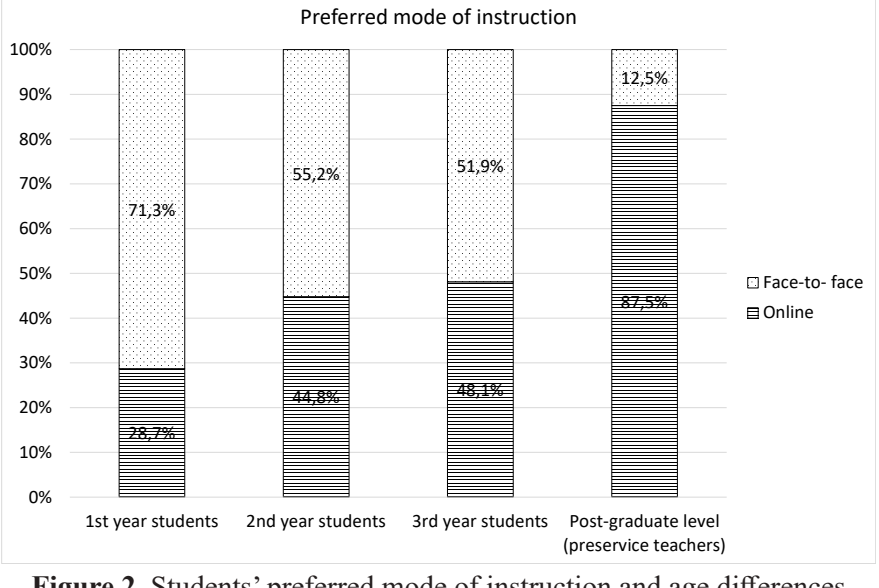

Figure 2. Students' preferred mode of instruction and age differences

When differences in relation to students' professional field and expertise were observed, it became clear that the majority of preservice teachers preferred the online mode of instruction, followed by students in media education. In contrast, the majority of the students in preschool education preferred the face-to-face type of instruction.

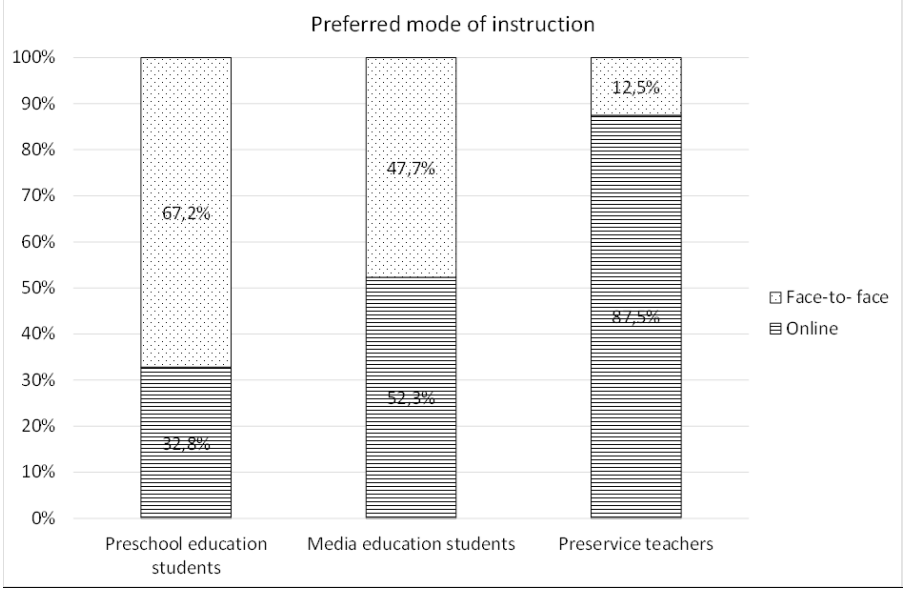

Figure 3. Students' preferred mode of instruction and differences in university major

There were no significant gender differences ($\chi^2 = 0.61$, df = 1, p = 0.44) in relation to students' preferred mode of instruction. Differences among groups taught by different instructors at university were also found to be insignificant in that matter ($\chi^2 = 1.10$, df = 2, p = 0.58). Therefore, students' preferences of online or face-to-face education were not related to differences in gender or influenced by a particular instructor at university.

Next, we wanted to analyze and compare (H3) how students felt and behaved in the virtual and face-to-face classrooms over the years (see Table 2 and Table 3). To our great satisfaction, there were no students who reported they lacked any motivation in the virtual or face-to-face classrooms during the three focal points of time studied. In total, the percentage of students who had weak motivation was also low (26.3% in the virtual classroom and 5.0% in the face-to-face classroom). Altogether, 73.7% of all students in the virtual classrooms over time and 95% of the students in the face-to-face classrooms reported that they felt "strong" or "very strong" motivation to participate in the educational activities.

Virtual classroom analysis

If we trace students' motivation over the years, we can conclude that they exhibited quite strong motivation at the beginning and at the end of the pandemic period (2020 and 2022) in the virtual classroom. However, in time, their motivational levels dropped down and in 2024, two years after the pandemic, students did not

show the same interest in and motivation towards virtual classroom activities as before. We observe the same tendency in relation to students' self-reported abilities to concentrate in the virtual classroom.

Overall, the percentage of students who felt indifferent in the virtual classroom was small. Again, congruently, this percentage was the lowest in 2022, and the highest in 2024.

When it comes to students' confidence, overall high levels of self-esteem were registered. Similarly, students felt most confident in the virtual classroom at the end of the coronavirus period in 2022, and least confident two years later, in 2024. The same tendency was observed as regards how active students felt in the virtual classroom over the years.

χ^2 analyses revealed that these differences in the virtual classrooms were statistically significant: for "motivated" ($\chi^2 = 34.69$, df = 4, p = 0.00); for "concentrated" ($\chi^2 = 22.64$, df = 6, p = 0.00); for "indifferent" ($\chi^2 = 31.11$, df = 6, p = 0.00); for "confident" ($\chi^2 = 23.62$, df = 6, p = 0.00); and for "active" ($\chi^2 = 13.48$, df = 6, p = 0.03).

Differences were found insignificant for "anxious" ($\chi^2 = 12.41$, df = 6, p = 0.53), and for "tired" ($\chi^2 = 12.55$, df = 6, p = 0.51).

Face-to-face classroom analysis

In comparison, group differences showed to be statistically significant for fewer of the affective states in the face-to-face classroom, i.e. for "motivated" ($\chi^2 = 19.35$, df = 4, p = 0.00); for "tired" ($\chi^2 = 12.84$, df = 6, p = 0.05); and "indifferent" ($\chi^2 = 17.74$, df = 6, p = 0.01. However, tendencies matched the tendencies exhibited in the virtual classroom behaviour of the students at different stages in time. Again, the greatest number of students (100%) who were motivated was in 2022, and the lowest (88.6%) in 2024.

Levels of students' tiredness and indifference in face-to-face modality also varied significantly. Students felt most tired two years after the pandemic in 2024 and least tired at the beginning of the pandemic period.

When it comes to how indifferent students felt, tendencies differed from the general trend as well. Learners felt most indifferent in the face-to-face classroom at the beginning of the pandemic period and then their interest and curiosity in the learning process were raised in 2022 and still further in 2024.

Differences were found insignificant for "anxious" ($\chi2 = 4.75$, df = 6, p = 0.58), for "concentrated" ($\chi2 = 11.58$, df = 6, p = 0.07), for "confident" ($\chi2 = 12.52$, df = 6, p = 0.05), and for "active" ($\chi2 = 7.77$, df = 6, p = 0.26).

Table 2. Statistically significant differences in students' affective responses in virtual classrooms at set time intervals

Virtual Classroom	Responses	Percent	2020	2022	2024	Total
motivated	definitely not	%	0.0%	0.0%	0.0%	0.0%
	not	%	23.5%	9.7%	47.5%	26.3%
	yes	%	35.3%	32.3%	26.3%	30.8%
	definitely yes	%	41.2%	58.1%	26.3%	42.9%
concentrated	definitely not	%	11.8%	3.2%	8.8%	7.1`%
	not	%	15.7%	9.7%	32.5%	19.2%
	yes	%	41.2%	54.8%	42.5%	47.3%
	definitely yes	%	31.4%	32.3%	16.3%	26.3%
indifferent	definitely not	%	66.7%	64.5%	38.8%	55.8%
	not	%	19.6%	29.0%	33.8%	28.6%
	yes	%	9.8%	3.2%	27.5%	13.4%
	definitely yes	%	3.9%	3.2%	0.0%	2.2%
confident	definitely not	%	5.9%	0.0%	3.8%	2.7%
	not	%	13.7%	9.7%	27.5%	17.0%
	yes	%	54.9%	48.4%	52.5%	51.3%
	definitely yes	%	25.5%	41.9%	16.3%	29.0%
active	definitely not	%	2.0%	0.0%	10.0%	4.0%
	not	%	27.5%	25.8%	22.5%	25.0%
	yes	%	49.0%	48.4%	38.8%	45.1%
	definitely yes	%	21.6%	25.8%	28.8%	25.9%

Table 3. Statistically significant differences in students' affective responses in face-to-face classrooms at set time intervals

Face-to-face Classroom	Responses	Percent	2020	2022	2024	Total
motivated	definitely not	%	0.0%	0.0%	0.0%	0.0%
	not	%	4.0%	0.0%	11.4%	5.0%
	yes	%	42.0%	35.5%	50.6%	42.3%
	definitely yes	%	54.0%	64.5%	38.0%	52.7%
tired	definitely not	%	24.0%	19.4%	11.3%	17.5%
	not	%	44.0%	41.9%	43.8%	43.0%
	yes	%	24.0%	29.0%	43.8%	33.2%
	definitely yes	%	8.0%	9.7%	1.3%	6.3%
indifferent	definitely not	%	74.0%	67.7%	53.2%	64.0%
	not	%	14.0%	25.8%	43.0%	29.3%
	yes	%	10.0%	3.2%	3.8%	5.0%
	definitely yes	%	2.0%	3.2%	0.0%	1.8%

Finally, our fourth hypothesis (H4) centered on the key role teachers play in education.

Congruent with previous studies on different teachers' profiles and existing literature (Sofronieva 2020; Taeschner 2005), we used the expertise of three professionals to assess the level of empathy exhibited by the three instructors who were in lead of the language classrooms. Results showed that instructors varied in their ability to empathize and engage their groups of students in classroom interactions. This assessment was matched by the feedback provided by students. Hence, instructors were categorized as "Teacher 1" (engaging teacher), "Teacher 2" (middling teacher) and "Teacher 3" (non-engaging teacher).

The differences found in relation to how students felt and behaved in classrooms managed by different types of instructors are given in the tables below (Table 4 and Table 5).

As is seen, the observed affective states were similar in kind for both virtual and face-to-face classrooms. Students felt highly motivated and concentrated when the

instructor was Teacher 1 and least motivated in both types of learning environment when instruction was provided by Teacher 3.

Supplementary differences of a similar kind were found significant in the virtual classrooms. Students, taught by Teacher 1, were most confident, followed by students taught by Teacher 2 and Teacher 3. Logically, this sequence was reversed for students' self-reported feelings of anxiety. Students felt most worried and tense in their interactions with Teacher 3 and experienced the greatest relaxation and comfort with Teacher 1. Tabular representation of these results follows.

Table 4. Statistically significant differences in students' affective responses in virtual classrooms managed by different instructors

Virtual Classroom	Responses	Percent	Teacher 1	Teacher 2	Teacher 3	Total
motivated	definitely not	%	0.0%	0.0%	0.0%	0.0%
	not	%	20.6%	52.9%	76.9%	26.3%
	yes	%	30.4%	41.2%	23.1%	30.8%
	definitely yes	%	49.0%	5.9%	0.0%	42.9%
anxious	definitely not	%	45.4%	11.8%	30.8%	42.0%
	not	%	41.8%	58.8%	30.8%	42.4%
	yes	%	11.3%	29.4%	38.5%	14.3%
	definitely yes	%	1.5%	0.0%	0.0%	1.3%
concentrated	definitely not	%	5.7%	23.5%	7.7%	7.1%
	not	%	16.0%	29.4%	53.8%	19.2%
	yes	%	49.0%	41.2%	30.8%	47.3%
	definitely yes	%	29.4%	5.9%	7.7%	26.3%
confident	definitely not	%	2.1%	11.8%	0.0%	2.7%
	not	%	14.9%	23.5%	38.5%	17.0%
	yes	%	52.6%	35.3%	53.8%	51.3%
	definitely yes	%	30.4%	29.4%	7.7%	29.0%

Table 5. Statistically significant differences in students' affective responses in face-to-face classrooms managed by different instructors

Face-to-face Classroom	Responses	Percent	Teacher 1	Teacher 2	Teacher 3	Total
motivated	definitely not	%	0.0%	0.0%	0.0%	0.0%
	not	%	3.6%	6.3%	23.1%	5.0%
	yes	%	39.9%	56.3%	61.5%	42.3%
	definitely yes	%	56.5%	37.5%	15.4%	52.7%
concentrated	definitely not	%	0.5%	0.0%	0.0%	0.5%
	not	%	4.1%1	12.5%	46.2%	7.2%
	yes	%	47.7%	50.0%	23.1%	46.4%
	definitely yes	%	47.7%	37.5%	30.8%	45.9%

Finally, a tabular representation of the study results found in relation to H3 and H4 is provided below. The summary discloses the presence or absence of significant group differences in different categories.

Table 6. A summary of significant differences found in different categories

Category	Online (cross- sectional)	Face-to-face (cross-sectional)	Teachers in online instruction	Teachers in face-to-face instruction
1.Motivated	yes	yes	yes	yes
2. Anxious			yes	
3. Tired		yes		
4. Concentrated	yes		yes	yes
5. Indifferent	yes	yes		
6. Confident	yes		yes	
7. Active	yes			

In hindsight, more differences were exhibited in the virtual classrooms – both time-bound and instructor-bound - than in face-to-face classrooms. Educational interactions and experienced affective states in face-to-face environment are less affected by extraordinary circumstances and in crisis. Moreover, differences in groups taught by different instructors are less in number in face-to-face format as well. Hence, it may be fair to assume that face-to-face mode is a more natural environment to best accommodate different learners' needs, styles, and affective states.

Conclusions and summary

The cross-sectional research added to the existing rich and diverse range of studies on the comparison between online and face-to-face formats by highlighting how students' affective states and attitudes to learning modes change over time.

The conducted research revealed a wide array of meaningful associations between constructs, many of which are consistent with findings of other studies. The higher extent of learners' favourable perceptions of online mode of instruction in 2022 can be viewed in the light of evidence that students' satisfaction with online learning (Landrum 2020) and positive experience (Aleksieva & Peytcheva-Forsyth 2023) of this format is positively correlated to their previous experience in online interaction for educational purposes.

The prevailing preference for face-to-face mode over the other two periods of time is congruent with the established strong inclination for classroom-based learning (Ghosh 2024) for interactional purposes.

The research also showed convincingly that students' age is positively correlated to their choice for online mode of instruction which in other studies is attributed to the greater flexibility of online format (Hossen & Uddin 2023) which better accommodates academic learning and work or family commitments (Roddy et al. 2017).

Last but not least, the research provided data in support of the vital role teachers play in education. These findings are congruent with previous studies on the role of empathy in education (Sofronieva 2020) and different teacher profiles (Taeschner 2005). As the present research verified, students experienced different affective states when classrooms were managed by different instructors.

Despite the limitations of the study mainly because of its cross-sectional design we consider results highlight some trends in subjective responses that could be useful for the design and management of educational practices which ensure robust academic process and promote the well-being of students and instructors in different situations.

NOTES

1. SOFIA UNIVERSITY E-LEARNING. Home page. Available from: https://elearn.uni-sofia.bg/?lang=en [Viewed 2024-08-29].

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