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Table 2. Initial and final cluster centres

Variable	Cluster 1 Deep Learners		Cluster 2 Strategic Learners		Cluster 3 Surface Learners	
	initial	final	initial	final	initial	final
Deep learning style scale score*	30	23.71	6	21.31	6	18.91
Strategic learning style scale score*	6	18.79	30	24.19	6	15.86
Surface learning style score *	6	17.10	6	16.96	30	22.74

*Scores on the scale from 6 to 30.

Source: own study.

To evaluate the disparities among the segments concerning stress levels, information overload, and satisfaction, an ANOVA was conducted, followed by a Bonferroni *post-hoc* test. ANOVA determines the presence of differences among the segments but without defining which specific segments differ significantly. For this reason, subsequent to a significant ANOVA outcome, the Bonferroni *post-hoc* test was employed to conduct pairwise comparisons, thereby identifying the distinct segments that exhibit statistically significant differences. All statistical analyses were conducted using IBM SPSS software, version 26.

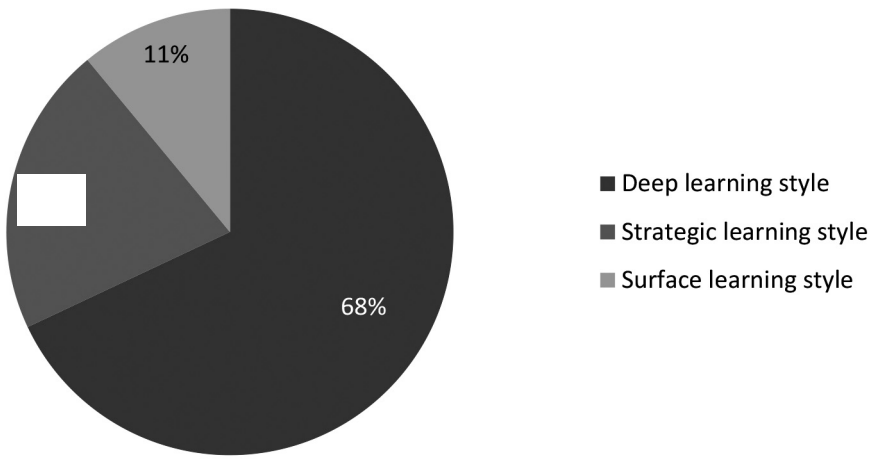
Results

In accordance with the data presented in Figure 1, it is evident that a predominant proportion of respondents (N = 356, 68%) exhibited a proclivity for the deep learning style, while 21% (N = 107) of the participants demonstrated inclination towards strategic learning style, and 11% (N = 59) manifested a surface learning style.

Regarding variations in perceived stress levels, statistically significant differences among the clusters were observed, as depicted in Table 3. Subsequent *post hoc* Bonferroni analysis unveiled that individual characterized by the surface learning style reported notably elevated stress levels (M = 3.65) compared to their counterparts in the deep (M = 2.99) and strategic learning style (M = 3.02) groups. Students adopting the strategic learning style exhibited stress levels akin to those with the deep learning style, as illustrated in Figure 2.

The clusters of students representing different learning styles also exhibit noteworthy disparities in their reported levels of information overflow, as depicted in Figure 3. Notably, students adhering to the surface learning style reported substantially

Figure 1. Respondents across clusters



Note: N = 532.

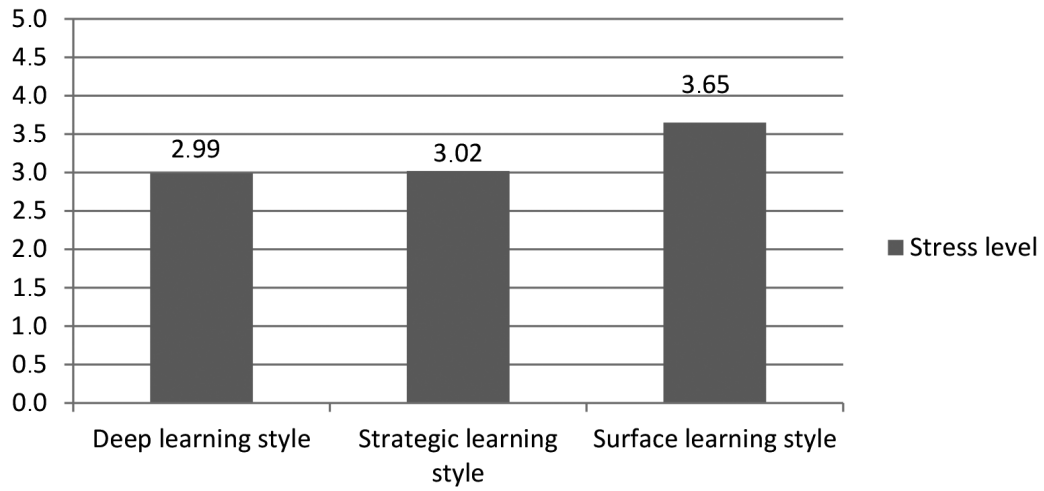
Source: own study.

Table 3. Differences between clusters ...ANOVA results

Indicator	Between/within groups Sum of Squares		df	Mean Square	F	Sig.
Stress level	Between groups	25.902	2	12.951	25.590	<0.001
	Within groups	267.722	529	0.506	–	–
	Total	293.624	531	–	–	–
Overflow level	Between groups	26.129	2	13.065	15.949	<0.001
	Within groups	433.334	529	0.819	–	–
	Total	459.463	531	–	–	–
E-learning experience	Between groups	9.857	2	4.929	15.791	<0.001
	Within groups	165.115	529	0.0312	–	–
	Total	174.973	531	–	–	–

Source: own study.

Figure 2. Differences in reported stress levels among clusters



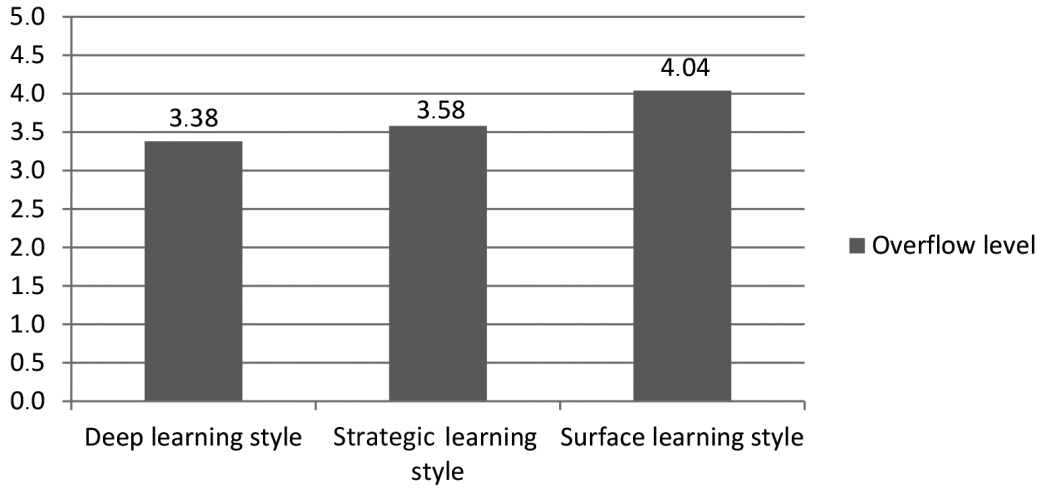
Source: own study.

higher levels of information overflow (M = 4.04) in comparison to their counterparts with deep learning styles (M = 3.58) and those with strategic learning styles (M = 3.38).

As presented in Figure 4, the overall satisfaction with the e-learning experience exhibited variations among student clusters, with the lowest satisfaction reported by students exhibiting the surface learning style (M = 2.35) and the relatively highest satisfaction observed among those belonging to the deep learning style cluster (M = 2.76). A detailed analysis using Bonferroni testing, as shown in Table 4, confirmed that statistically significant differences were evident only between the surface learning style cluster and the other two segments. It is noteworthy that none of the clusters expressed satisfaction with the quality of the e-learning experience, as all mean satisfaction scores fell below 3.0 on the 1–5 scale.

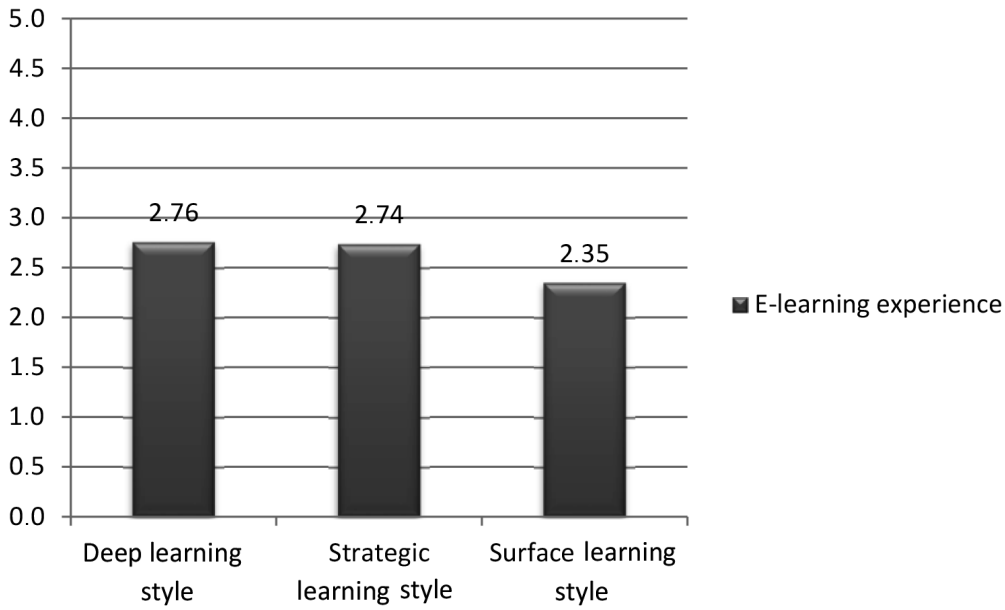
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Figure 3. Differences in reported overflow levels among clusters



Source: own study.

Figure 4. Differences in satisfaction with e-learning experience among clusters



Source: own study.

Discussion

The study results indicate that the largest group of students are Deep Learners (68%), followed by Strategic Learners (21%), with Surface Learners representing the minority (11%). Since the data is based on respondents' declarations, it should be taken at face value. This finding aligns with previous student segmentations based on value co-creation, where the largest segment consists of The Maximalists (34%), who deeply engage in various academic activities, while the smallest segment comprised The Minimalists (15%), whose low engagement is similar to surface learning approach (Dziewanowska, 2018). However, this contrasts with another study investigating factors that are important to students during their studies. As a study by Dziewanowska (2017) shows, students tend to favour functional and relational value (such as learning new skills and networking) over

Table 4. *Post hoc* Bonferroni test results ...multiple comparisons

Dependent Variable	(I) Cluster **	(J) Cluster	Mean Difference (I…J)	Std. Error	Sig.	95% Confidence Interval	
						lower bound	upper bound
Stress level	1	2	–0.04302	0.07843	1.000	–0.2314	0.1453
		3	–0.66477*	0.09357	<0.001	–0.8895	–0.4400
	2	1	0.04302	0.07843	1.000	–0.1453	0.2314
		3	–0.62175*	0.10984	<0.001	–0.8855	–0.0358
	3	1	0.66477*	0.09357	<0.001	0.4400	0.8895
		2	0.62175*	0.10984	<0.001	0.3580	0.8855
Overflow level	1	2	–0.20453	0.09978	0.123	–0.4442	0.0351
		3	–0.66193*	0.11905	<0.001	–0.9478	–0.3760
	2	1	0.20453	0.09978	0.123	–0.0351	0.4442
		3	–0.45740*	0.13974	0.003	–0.7930	–0.1218
	3	1	0.66193*	0.11905	<0.001	0.3760	0.9478
		2	0.45740*	0.13974	0.003	0.1218	0.7930
E-learning experience	1	2	0.01422	0.06159	1.000	–0.1337	0.1621
		3	0.40810*	0.07349	<0.001	0.2316	0.5846
	2	1	–0.01422	0.06159	1.000	–0.1621	0.1337
		3	0.39388*	0.08626	<0.001	0.1867	0.6010
	3	1	–0.40810*	0.07349	<0.001	–0.5846	–0.2316
		2	–0.39388*	0.08626	<0.001	–0.6010	–0.1867

*The mean difference is significant at the 0.05 level. ** 1 – deep learning style; 2 – strategic learning style; 3 – surface learning style.

Source: own study.

self-development and epistemic value, which are typically associated with deep learning approach.

It is interesting to note that respondents reported average levels of stress, though there is a significant difference between Deep and Strategic learners and those classified as Surface Learners. The stress level for Surface Learners is 3.65, while for the other two segments, it is 2.99 and 3.02, respectively. This implies that Surface Learners experienced the highest level of stress during their online e-learning experience. This result partially confirms Kulawska's study showing that students experiencing higher levels of stress rated e-learning lower, however, at the same time, students exhibited high levels of stress during the pandemic (Kulawska, 2021).

Regarding overflow, the reported level is moderately high for all respondents but significantly higher for Surface Learners (4.04) compared to 3.38 and 3.58 for Deep and Strategic Learners. This finding is consistent with Hilliger's (2023) and Gurbisz's (2021) discovery of students generally experiencing academic overflow.

The satisfaction level reported in the study is low: 2.76 for Deep Learners, 2.74 for Strategic Learners, and 2.35 for Surface Learners. Interestingly, dissatisfaction is significantly lower for Surface Learners. This contrasts with previous evidence of students responding positively to online courses (Judson et al., 2017; Olszyńska et al., 2021; Ćwiertniak et al., 2022). However, previous studies also demonstrate that the use of technology in the classroom is not positively related to the student experience (Bowden & D'Alessandro, 2011).

A consistent finding is that Surface Learners did not perform well in the online learning setting. They experienced higher stress and overflow levels combined with lower satisfaction. This aligns with previous findings that show this particular learning style is not successful in academic settings, as a surface approach has a negative correlation with academic achievement, as well as other factors such as self-efficacy and locus of control (Cassidy & Eachus, 2000). Students who adopt a surface learning approach tend to focus primarily on passing exams and obtaining their diploma, with less emphasis on engaging deeply with the material. This attitude towards learning posed a particular challenge in the e-learning environment, which demanded greater effort from students compared to traditional classroom settings. Specifically, e-learning required students to organize a suitable study space at home, manage their study schedule independently, particularly in asynchronous courses, rather than

simply attending classes and following the lead of their instructors (Rodek, 2020). This increase in responsibility and self-direction likely contributed to lower satisfaction levels and higher stress and feelings of being overwhelmed among students with a surface learning style.

Conclusion

In our research, we found that fully online learning poses significant challenges for the majority of students. It demands specific competencies, such as intrinsic motivation, proficient planning, and self-management, which not all students inherently possess. Under non-pandemic circumstances, our findings suggest that online learning should serve primarily as an adjunct to in-person instruction. Our research results suggest that exclusive online education may result in heightened stress and overflow for many students. Interestingly, the push for a transition to exclusively online courses frequently originates from students attempting to balance full-time employment with their studies (Gurbisz, 2021; Ćwiertniak et al., 2022). These students often view online learning as a more convenient option than traditional classroom-based education. It is highly probable that these individuals embody a surface learning approach, potentially unaware of the unintended consequences of their preference, such as inadvertently increasing their own levels of stress and feelings of overflow. Based on our findings, we recommend a blended learning model, which can potentially enrich the educational experience, rather than a wholly online university experience.

These findings provide guidelines for higher education institutions, especially regarding the structure of study programs (product offerings), the mode of instruction (delivery methods), cost borne (financial, psychological, emotional), and the design of communication content and strategy.

Firstly, it appears that many students declare their willingness to engage in the educational process and focus on acquiring high-quality knowledge. They independent and committed learners, capable of planning and executing learning activities. For such students, access to vast online resources creates added value they can and are ready to embrace.

Secondly, online study programs, which have recently gained popularity, may come with a significant psychological and emotional cost for those students who were primarily attracted by the promise of convenience and affordability. Therefore, it is crucial to understand the needs of the customers (students) and shape their expectations in a way that allows them to derive maximum value from the university's offerings. A combination of online and offline resources, along with a certain degree of freedom for individuals to choose the right combination, seems to be a potentially successful approach, enabling students to gain knowledge, develop the skills and competencies they need, and find satisfaction in the process.

Nevertheless, this study has its limitations. It was conducted in a single higher education institution during the unique circumstances of a pandemic, potentially amplifying stress levels beyond what might be typical. Utilizing a survey methodology meant relying on declarative responses, which carries the risk of respondents, for instance, overstating the depth of their learning approach.

For future research, there are several promising avenues. Comparative studies between fully online and hybrid courses would be beneficial, as would exploring perceptions of elective versus mandatory online modules. Replicating this study in various higher education settings and among students from diverse academic backgrounds will also be instrumental in assessing the consistency of our findings and uncovering any cross-cultural variations. An experimental design, where students experience the same course in both online and offline settings, is also recommended to more accurately gauge the differences in educational experiences.

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EDUKACJA W ZAKRESIE PRZEDSIĘBIORCZOŚCI. W KIERUNKU SYNTEZY TEORII, PRAKTYKI KSZTAŁCENIA I ETYKI

W monografii, którą oddajemy do rąk Czytelników, autorka proponuje ugruntowane w nauce i etyce ramy kształcenia w zakresie przedsiębiorczości na poziomie uczelni. Monografia służy uporządkowaniu wiedzy na temat edukacji w zakresie przedsiębiorczości, krytycznemu spojrzeniu na dynamikę postępu w badaniach i wyznaczeniu kierunków jej rozwoju pod kątem przyszłych projektów naukowych. Jak sugeruje podtytuł monografii, zadaniem pracy jest synteza teorii, praktyki kształcenia i etyki. Do zilustrowania przedstawionych wątków teoretycznych w monografii omówiono przykład kształcenia w obszarze przedsiębiorczości na poziomie uniwersyteckim. Wykorzystano do tego stworzoną przez autorkę Akademię Przedsiębiorczości, będącą egzemplifikacją omawianych teorii i podejść w nauczaniu. Zadaniem monografii jest wsparcie nauczycieli akademickich, tak by mogli zaoferować solidne, poparte wynikami badań podstawy kształcenia przedsiębiorczości na poziomie uczelni.

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