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iJEP International Journal of Engineering Pedagogy

iJEP | eISSN: 2192-4880 | Vol. 13 No. 4 (2023) | OPEN ACCESS

https://doi.org/10.3991/ijep.v13i4.37017

PAPER

International Comparison of Higher Education Representatives' and Students' Attitudes Towards Feedback Learning

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ABSTRACT

The study was conceptualized as a pilot to establish a methodology for comprehensive research on the impact of the proposed learning design on learning outcomes. We compared how representatives of higher education institutions and master's students in engineering studies perceive the lack of feedback in learning aspects by monitoring the progress of learning in the Czech Republic, as well as in Belgium, Germany, Greece, the Netherlands, and Poland. While there are many findings on the learning process documented in the literature, studies of a perceptual nature that identify differences in the attitudes of students and higher education representatives are scarcely available. To analyze differences, we employed the Mann-Whitney U test to compare Czech students with International Business Week (IBW) program studying at Czech higher education institutions. as well as to compare students and higher education institutions within and outside the Czech Republic. Czech students perceive fewer absences of these aspects in their education. From the perspective of higher education institutions, partner schools from other countries perceive the absence of the examined aspects in teaching less than higher education institutions in the Czech Republic. The study has theoretical implications for the scientific field, as it has lays the conceptual basis for further research. Furthermore, it has practical implications for the way higher education teaching is conducted.

KEYWORDS

learning, feedback, progress, higher education institution, master of engineering student, international business week

1 INTRODUCTION

In the university environment, the terms feedback, formative feedback, and student progress are increasingly prevalent. Consequently, the provision of providing formative feedback and the monitoring student progress based on behavioural,

Berková, K., Frendlovská, D., Chalupová, M., Kubišová, A., Krelová, K.K., Kolářová, D. (2023). International Comparison of Higher Education Representatives' and Students' Attitudes Towards Feedback Learning. *International Journal of Engineering Pedagogy (iJEP)*, 13(4), pp. 141–157. https://doi.org/10.3991/ijep.v13i4.37017

Article submitted 2022-11-23. Resubmitted 2023-01-28. Final acceptance 2023-02-03. Final version published as submitted by the authors.

emotional, and cognitive dimensions have become pressing issues, leading to professional discussions in the international field of modern university teaching [1].

The empirical study aims to investigate how higher education institutions and master of engineering students in the Czech Republic, as well as in Belgium, Germany, Greece, the Netherlands, and Poland, perceive the absence of feedback aspects in learning by monitoring student progress in an international context. The identified aspects include: student-centred individualisation; collaboration among students during practical activities and studies; collaboration between student and teacher during classroom interpretation and practical activities; computer-automated detection of student attitudes; utilizing computer automation to have information about each student's current abilities and progress, enabling students to make decisions about their future learning and choosing effective learning methods; using computer automation to have information about each student's current abilities and progress, enabling teachers to make decisions about their future teaching and choose effective teaching methods; and learning-enhancing animations; combination of spoken explanatory commentary with animations to support learning.

The purpose of implementing such learning approaches is to promote a modern way of teaching at the tertiary level within an international context and emphasize the importance of Learning analytics [2]. Through this field, various objectives can be achieved, such as understanding the factors influencing the student achievement, early identification of at-risk students [3], and utilizing the insights to prevent student drop out from higher education institutions [4]. Therefore, the research aims to compare the perspectives of higher education representatives and their students within the Czech Republic and in other countries, regarding feedback aspects in learning by monitoring student progress. Extensive evidence exists in the literature concerning the feedback and progression-based learning process. Additionally, prototypes of applications have been proposed that can visually depict progress over an extended duration, which holds implications for learning outcomes. Studies that investigate perceptual research and explores differences in attitudes among engineering and higher education institution students in an international context are relatively limited. The empirical study is based on a pilot survey, which was conducted in partner higher education institutions participating in the International Business Week (IBW) program. The primary focus of the pilot research was to examine the current attitudes of higher education institutions and students, rather than defining parameters for assessing long-term student progress with implications for learning outcomes. Based on the findings of this pilot research, a comprehensive research methodology was developed to investigate the impact of the proposed learning pathway on learning outcomes.

The research aimed to test the following hypotheses:

- H1: Czech higher education institutions and their Czech students perceive the absence of the examined aspects in teaching distinctly.
- H2: Higher education institutions from other countries outside the Czech Republic and their students perceive the absence of the examined aspects in teaching distinctly.
- H3: Czech students and students from the IBW programme perceive the absence of the examined aspects in teaching distinctly.
- H4: Czech higher education institutions and IBW students studying at Czech higher education institutions perceive the absence of the examined aspects in teaching distinctly.

In this context, the distinction of perceived absence of the aspects under study refers to the intensity of the missing aspect in the learning process. Further elaboration on this concept can be found in Section 3 Materials and Methods.

2 LITERATURE REVIEW

Learning can be defined as the intentional enhancement of an individual's cognitive, affective or behavioural abilities [5], [6]. Feedback plays a crucial role in facilitating effective learning by aiming to bring about positive changes in an individual's learning process [7], [8]. Feedback serves several purposes, including guiding the student's learning, fostering the teacher-student relationship, facilitating the student's understanding of the subject matter, the teacher, oneself, and one's learning style, and contributing to personal development [9]. Feedback can be classified into four distinct categories based on its functions: (a) task-oriented feedback, (b) process-oriented feedback, (c) self-regulation feedback, and (d) personality-oriented feedback [10]. In the context of this study, the second and third categories of feedback are particularly important, as these categories are closely related to a deeper understanding of the student's learning, self-assessment, and motivation to master the task (goal orientation). While the authors [10] maintain a neutral stance on the fourth category of feedback, our study does not disregard this type entirely and partially considers it in relation to aspects that support feedback learning and the monitoring of student progress.

Providing feedback is considered a crucial component of formative assessment. Formative feedback involves offering guidance on how the students can enhance their performance. Formative assessment can be viewed as an attempt to identify improvement by evaluating the quality of student responses to learning objectives [11]. In the empirical study [12], two issues associated with the way teachers provide feedback are highlighted: (i) teachers do not always choose the most effective feedback resources to support student learning; (ii) feedback is not allocated equally to students of different abilities. The French university education model [13] presents an alternative approach to providing feedback to students. This model aims to invert the traditional pedagogical sequence of lecture – tutorial – practical work. In this model, the teaching process begins with practical work, followed by tutorials, and concluding with lectures that provides an opportunity for questions and discussions. This method places a greater emphasis on teacher-student collaboration and the development and reinforcement of knowledge and skills.

Formative feedback based on learning progress and utilizing Learning analytics has gained popularity in the university environment [2]. Several studies are currently underway to develop test prototypes of learning dashboards that visualize long-term changes in learning progress [6], [14]. These visualisation-based learning programmes promotes digital and information literacy [5]. Research [6] has highlighted the lack of clarity in defining learning progress as a function of formative feedback, which consequently leads to a dearth of well-founded feedback strategies pertaining to learning progress. On the other hand, another study [15] has provided a definition of learning progression as an empirically testable framework that defines learning pathways where students move from simple to more sophisticated concepts or practices in a given domain. The study [6] also analyses several aspects of feedback learning and the functionality of tracking student progress. Such a learning model honours the individuality of the learner, and must also

incorporate an element of visualisation, animation and interactivity, and provide information to the learner about their successful progress [16]. Automated tracking of learning progress, facilitated by Learning analytics, allows the integration of technology-enhanced formative assessment and feedback applications. Such a system empowers students to take ownership of their learning [6].

The study [6] emphasizes the utilization of Learning analytics, highlighting its potential for evidence-based learning, including the identification of at-risk students and the development of effective teaching and learning practices. Learning progress, when considered in terms of formative feedback, is based on a series of student responses to a predetermined problem or task. This enables both the teacher and the student gain insights into the student's progress towards finding a solution, such as achieving an expert-level understanding of the given situation. Encouraging collaboration between teachers and students is crucial, as is fostering collaboration among students themselves [17]. Research conducted at the Australian University [18] which explored teacher education and the concept of feedback as a two-way communication and collaboration between teachers and students, supports this notion. The research confirmed that two-way communication enhances student progress. Moreover, the identification of student progress aids teachers in determining the sequence of instructional strategies.

In an empirical study [19], a sample of 146 students demonstrated a positive perception of goal-oriented feedback (mastery). Students found this type of feedback valuable as it facilitated their competence development. The significance of feedback in the learning process, as perceived by undergraduate students, was also investigated in another research [20] which aligns with the findings of the aforementioned study [19]. Both studies confirm the crucial role of feedback in the learning process for students. Another study [21] examined how 256 students in a MOOC environment perceived the feedback received from their peers and tutors. This perceptual research revealed that students with no previous experience of peer feedback had a more positive attitude towards the usefulness of feedback compared to students who had already gained such experience. The investigation of progress detection through formative feedback was explored in 2010 at an English university with a focus on engineering degree courses [22]. The study uncovered differences in perceptions of feedback between teachers and students when defined in this way. The research further revealed varying interpretations of feedback in terms of the factors that constitute it and its applications in specific situations.

Student learning based on feedback and learning progress is perceived more positively by university teachers compared to students [23]. Students testified that the quality of feedback is mainly influenced by the possibility of self-regulation of learning, promotion of intrinsic motivation, and awareness of intrinsic values. This research is complemented by another study [24] that highlights the role of self-management in the learning process and the motivation of students to learn through technology. These aspects demonstrate a positive correlation with students' self-regulatory abilities in the context of their learning competence.

Existing knowledge highlights the significant feedback-based learning that leverages modern technology [25] to effectively detect student progress. The analysis of international studies conducted in this field motivates further research, specifically exploring the disparities between students and educational institutions within an international context.

3 MATERIALS AND METHODS

The research concept builds upon the initial pilot study, which investigated the perspectives of secondary school and university students as well as teachers regarding a proposed visualization web application [26]. The first study was conducted as a year-long project and sought to gather insights from the target group regarding the visualization web application's potential for monitoring student progress and incorporating learning feedback features. This paper serves as a continuation of the initial study [26] aiming to expand our understanding within international context.

3.1 Data and procedure

The research focused on exploring aspects related to feedback learning and monitoring student progress, which contribute to enhancing the learning ability of students. These variables were investigated from the perspectives of higher education representatives and master's degree undergraduates, specifically examining their perceptions of the current absence of these aspects in the classroom.

Aspects of feedback learning and monitoring student progress with respect to analysing the current state of knowledge, [2], [6], [17], [26], [27] the following were selected and labelled:

- INDIVID: Student-centred individualisation (i.e., teaching and learning are tailored to the interests and goals of individual students and their learning needs)
- COOP STUD: Collaboration between students during practical activities and studies
- COOP TEACH: Collaboration between student and teacher during classroom interpretation and practical activities
- ATTITUDES STUD: Computer-automated detection of student attitudes (i.e. obtaining continuous information about what the student enjoys, is interested in, what surprised him/her, what gives him/her problems, etc.); the student evaluates his/her attitudes towards learning the subject after a certain period (class, semester).
- PROGRESS LEARN: Using computer automation, have information about each student's current abilities and progress on which the student can make decisions about their future learning and choose effective learning methods.
- PROGRESS TEACH: Using computer automation to have information about each student's current abilities and progress on which the teacher can make decisions about their future teaching and choose effective teaching methods.
- ANIMATION: Learning-enhancing animations
- COMBINE: Combination of spoken explanatory commentary with animations to support learning

3.2 Research sample

Since this study was designed as pilot research, the research sample, which represented partner higher education institutions from the Czech Republic and abroad and their students with a focus on engineering studies, was adapted to this purpose. The research sample was divided into two groups. The first group consisted of partner higher education institutions from the Czech Republic, Belgium, Germany, Greece, the Netherlands, and Poland. The second group consisted of Czech undergraduate and international students from the IBW programme who were studying

in time of research at partner Czech higher education institutions and whose resident higher education institution is one of the partner foreign schools.

The research involved a total of 19 representatives from higher education institutions across several countries, – including the Czech Republic, Belgium, Germany, Greece, the Netherlands, and Poland. Out of the 18 relevant public higher education institutions in the Czech Republic that were contacted, 12 Czech schools participated in the survey. It is important to note that the sample in this study was based on entities (schools) rather than individual teachers. The selection of respondents at the school level was guided by the centralised development projects by the Ministry of Education, which have engaged all public higher education institutions in the Czech Republic since 2021. In these projects, the sample has always consisted of institutions of higher education, rather than individual teachers. A representative of the institution of higher education (rector, vice-rector, or dean) commented on distance education issues at the strategic level of the institution [26]. The representative was selected from a university of economic or technical studies who was competent in the area of strategy and teaching activities at the higher education institution. The return rate of the survey was 66.7%. Due to the limited sample size, no attention given to differences between the responses of representatives of higher education institutions in terms of their field of study. Seven partner higher education institutions from different countries participated in this research. The researchers focused specifically on the partnering institutions that have been cooperating within the International Business Network (IBW). The Network was established 21 years ago by Belgian University College Leuven (University College Leuven-Limburgh since 2015) and French Institut Universitaire de Technologie de Saint-Denis, a part of the University Sorbonne Paris Nord. In 2021, the IBW comprised 13 members from various countries including Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Latvia, the Netherlands, Poland, Portugal, and Ukraine. Each partnering university or college organizes an international business week, during which students collaborate on an international business case [28]. For this research, the researchers approached selected members of the IBW Network, namely Wroclaw School of Banking (Poland), University of Applied Sciences Kaiserslautern (Germany) West Attica University in Athens (Greece) Rotterdam University of Applied Sciences (the Netherlands), and University College Leuven-Limburgh (Belgium) [26]. The response rate from university representatives from other states was 100%. Table 1 illustrates the structure of the research sample in terms of the institution of higher education and the country using absolute frequencies.

Table 1. Research sample in terms of observed characteristics – higher education institution, country

Variable	Frequency
Level of education	
Tertiary	19
Country	
Czech Republic	12
Belgium	3
Germany	1
Greece	1
Netherlands	1
Poland	1

The research sample within the first group was divided into two sets. The first set comprised representatives of higher education institutions in the Czech Republic (n = 12), while the second set consisted of representatives from partner higher education institutions in other countries (n = 7).

The second group of the research sample consisted of higher education institution students, including both Czechs and foreign students. Among them, there were 162 Czech students studying master's programs at Czech higher education institutions, and an addition of 15 students from the IBW programme who were studying at our partner institutions, and whose resident higher education institution is one of the foreign partner institutions. Table 2 illustrates the structure of the research sample in terms of students and countries, indicating the absolute frequencies.

Table 2. Research sample in terms of observed characteristics – student, country

Variable	Frequency
Level of education	
Tertiary	177
Country	
Czech Republic	162
Belgium	4
Germany	3
Greece	2
The Netherlands	2
Poland	4

The students, both Czechs and foreigners, exhibited a two-year age difference. The average age of Czech students within the sample was 22 years, while the average age of IBW students was 24 years.

3.3 Methods and instruments

The empirical research utilized a questionnaire-based approach. The data collection process took place online over a span of four months. A web-based questionnaire was sent to the email addresses of public higher education institutions in the Czech Republic and to selected partner schools abroad. In addition, the questionnaire was distributed among students of Czech higher education institutions, including students from the IBW programme of partner foreign schools. With regard to international comparison of the attitudes of higher education institutions and students, the survey explored the following areas:

- factual data about the respondents (higher education institution, student, country). and
- perceived absence of aspects that support feedback learning and monitoring of student progress.

A five-point Likert scale 1to 5 was used to subjectively assess the selected variables, and respondents were encouraged to avoid (as far as possible) using

the neutral answer (grade 3). This approach aimed to identify the most precise indication of the respondent's attitudes regarding the absence of the examined aspects. Grade 1 represented not missing at all; grade 5 expressed missing most of all.

All sensitive data has been anonymised and encrypted to ensure confidentiality. Prior to the actual research, a pre-survey was conducted with a sample of five institution of higher education representatives and five students who shared similar characteristics to the respondents from the main research, thus increasing the content validity of the research instrument. Reliability of the questionnaire was measured by computing the Cronbach's alpha [26]. The questionnaire demonstrated high reliability, as evidenced by a Cronbach's alpha value of 0.840.

3.4 Data analysis

The hypotheses were verified at the 5% significance level and were formulated as null hypotheses for this purpose:

- H_{0-1}: Czech higher education institutions and their Czech students perceive the absence of the examined aspects in teaching in the same way.
- H_{0-2}: Higher education institutions from other countries outside the Czech Republic and their students perceive the absence of the examined aspects in teaching in the same way.
- H_{0-3}: Czech students and students from the IBW programme perceive the absence of the examined aspects in the teaching in the same way.
- H_{0-4}: Czech higher education institutions and IBW students studying at Czech higher education institutions perceive the absence of the examined aspects in teaching in the same way.

The original data obtained from the questionnaire survey are of several types. The variables expressing the characteristics of the respondents, i.e., institution of higher education, student, and country, are nominal variables and are used as a sorting factor to conduct comparative analyses. The data contain ordinal variables, expressed on a five-point Likert scale from 1 to 5. Both types are commonly treated as numerical variables. The absence of aspects of feedback learning and monitoring of student progress is described using the arithmetic mean. Because these traits do not meet the normality requirement (verified by the Shapiro-Wilk test) but do meet the homogeneity of variances requirement (verified by the Levene test), the non-parametric Mann-Whitney U-Test [26] was selected from the two-sample tests to assess hypotheses H_{0-1} to H_{0-4}. The choice of statistical test depends on the violation of normality of the analysed data and meeting the requirement of homogeneity of variances. This test can be used for the evaluation of unpaired sets when the means (most often the median) of two different samples are compared. The analysed data meet this requirement. We test the null hypothesis that the means of different samples have the same probability distribution. Statistical analysis was performed in SPSS.

4 RESULTS

4.1 Descriptive statistics – differences in respondents' attitudes

The results of the perceived absence of aspects supporting feedback learning and tracking students' progress in learning from the perspective of higher education institutions from the Czech Republic and other countries (Belgium, Germany, Greece, the Netherlands, and Poland) are presented in Table 3.

Table 3. Perceived absence of aspects supporting feedback learning and monitoring of students' progress in learning from the perspective of Czech and foreign higher education institutions

Variable	*n*	Mean	Standard Deviation	Variance
INDIVID	12	3.417	1.311	1.720
	7	3.286	1.380	1.905
COOP STUD	12	2.750	1.288	1.659
	7	3.000	1.291	1.667
COOP TEACH	12	2.333	.888	.788
	7	3.286	1.380	1.905
ATTITUDES STUD	12	3.500	1.314	1.727
	7	3.000	1.291	1.667
PROGRESS LEARN	12	3.667	1.231	1.515
	7	3.286	1.113	1.238
PROGRESS TEACH	12	3.333	1.155	1.333
	7	3.143	1.069	1.143
ANIMATION	12	3.167	1.267	1.606
	7	2.714	1.113	1.238
COMBINE	12	3.083	1.240	1.538
	7	2.857	1.215	1.476

According to the arithmetic mean, it was found that Czech higher education institutions perceive the absence of aspects supporting feedback learning and progress monitoring more strongly than higher education institutions from other countries. The greatest absence of the examined aspects from the perspective of Czech higher education institutions was observed in the following areas:

- PROGRESS LEARN: detection of student's progress in proficiency for his/her effective learning (3.666)
- ATTITUDES STUD: computer-aided detection of student's attitudes (3.500)
- INDIVID: individual student-oriented learning (3.417)

On the other hand, partner higher education institutions from other countries perceived a relatively weeker absence in comparison to Czech higher education institutions, particularly in the following aspects:

- PROGRESS LEARN: detection of student's progress in proficiency for effective learning (3.268)
- INDIVID: student-oriented individualization (3.286)
- COOP TEACH: student-teacher collaboration (3.286)

It is worth noting that Czech higher education institutions did not rate cooperation between student and teacher as completely lacking.

The absence of the aspects, as perceived by Czech students from Czech higher education institutions and IBW students from Czech higher education institutions, was also analysed using descriptive statistical methods. The results are presented in Table 4.

Table 4. Perceived absence of aspects supporting feedback learning and tracking student progress from the perspective of Czech and IBW students in the Czech Republic

Variable	*n*	Mean	Standard Deviation	Variance
INDIVID	162	3.056	1.252	1.568
	15	3.600	1.352	1.829
COOP STUD	162	2.173	1.151	1.324
	15	3.333	1.397	1.952
COOP TEACH	162	2.525	1.165	1.357
	15	3.200	1.521	2.314
ATTITUDES STUD	162	2.920	1.365	1.863
	15	3.400	1.454	2.114
PROGRESS LEARN	162	3.247	1.401	1.963
	15	3.867	1.356	1.838
PROGRESS TEACH	162	2.809	1.354	1.833
	15	3.533	1.246	1.552
ANIMATION	162	3.148	1.475	2.177
	15	3.800	1.265	1.600
COMBINE	162	3.222	1.410	1.988
	15	3.800	1.265	1.600

Based on the arithmetic mean, it was observed that IBW students from partner institutions in other countries, who are studying at Czech institutions, perceive a stronger absence of all the examined aspects compared to Czech students studying at Czech institutions. The most significant absence of the examined aspects from the perspective of Czech students studying at higher education institutions was found – in the following areas:

- PROGRESS LEARN: detecting the student's progress in proficiency for his/her effective learning (3.247)
- COMBINE: combination of spoken explanatory commentary with animations supporting learning (3.222)
- ANIMATION: animations supporting learning (3.148)
- INDIVID: student-oriented individualization (3.056)

The absence of these aspects is perceived more strongly by Czech higher education institutions compared to Czech students. These aspects for which Czech students perceived the greatest absence in education are consistent with the views of IBW students studying at Czech institutions of higher education. It should be noted, however, that the perceived absence of aspects by IBW students is stronger compared to Czech students, and at the same time, the perceived absence by IBW students is stronger compared to their resident institutions of higher education (Table 4).

Based on the results of descriptive statistics using the arithmetic mean, it can be summarized that the following groups of respondents (in descending order) perceive the absence of the examined aspects supporting feedback learning and monitoring student progress most strongly:

- IBW students studying at Czech higher education institutions (the most strongly perceived absence)
- higher education institutions in the Czech Republic,
- higher education institutions from other countries (Belgium, Germany, Greece, Netherlands, Poland),
- Czech students studying at higher education institutions in the Czech Republic (the weakest perceived absence).

4.2 Differences in the perceived absence of the studied aspects of higher education institutions and students (Mann-Whitney U test)

Furthermore, the analysis revealed statistically significant differences in the perceived absence of the examined aspects between universities and students. Hypotheses H_{0-1} to H_{0-4} were tested using the Mann-Whitney U test at a significant level of 5%. The results of these tests are presented in Tables 5 and 6.

Table 5. Hypothesis testing H_{0-1} and H_{0-2} by Mann-Whitney U test

Variable	Czech Higher Education Institutions and Czech Students (*p*)	Foreign Universities and IBW Students (*p*)
INDIVID	.326	.636
COOP STUD	.096	.563
COOP TEACH	.659	.943
ATTITUDES STUD	.157	.492
PROGRESS LEARN	.329	.214
PROGRESS TEACH	.166	.424
ANIMATION	.964	.065
COMBINE	.628	.111

At a 95% significance level, the researchers do not reject the null hypothesis H_{0-1} and H_{0-2}. This indicates that there were no significant differences, at the 5% significance level, between higher education institutions and students in their perceptions of missing aspects to support feedback learning and monitor student progress. Both Czech higher education institutions and their Czech students, as well as partner

higher education institutions from other countries and their students studying at a Czech higher education institution under the IBW programme, perceive the aspects in a similar manner. However, it is worth noting that descriptive statistics methods reveals some differences among the groups of respondents can be discussed.

Table 6. Hypothesis testing H_{0-3} and H_{0-4} by Mann-Whitney U test

Variable	Czech Students and IBW Students (*p*)	Czech Higher Education Institutions and IBW Students (*p*)
INDIVID	.111	.742
COOP STUD	.002	.330
COOP TEACH	.076	.124
ATTITUDES STUD	.196	.920
PROGRESS LEARN	.094	.523
PROGRESS TEACH	.042	.528
ANIMATION	.104	.226
COMBINE	.128	.363

At a 95% significance level, the researchers reject the null hypothesis H_{0-3} for the aspect of cooperative learning (COOP STUD) and detecting student progress in proficiency for effective teacher teaching (PROGRESS TEACH). In the other aspects, no significant differences were found at the 5% significance level between Czech students and IBW students in their perceptions of the missing aspects for promoting feedback learning and monitoring student progress in teaching.

At a 95% significance level, the researchers do not reject the null hypothesis H_{0-4}. Czech higher education institutions and IBW students studying at Czech higher education institutions perceive all the aspects in the same way, although according to the methods of descriptive statistics some differences among the groups of respondents can be discussed.

5 DISCUSSION

The research study was conceptualized as a pilot study in order to establish a methodology for conducting comprehensive research on the impact of the proposed learning design on learning outcomes. The study was oriented towards finding out how our partner higher education institutions, along with their master of engineering students in the Czech Republic and in the countries such as Belgium, Germany, Greece, the Netherlands, and Poland, perceive the absence of aspects of feedback learning by monitoring student progress in learning. In this study, feedback learning was conceptualized as a learning process that emphasizes the use of feedback, post-teaching progress monitoring, and student self-regulation [10]. The study took in to account various dimensions, including behavioural, emotional, and cognitive dimensions [1].

The strongest absence of the aspects the researchers examined that support feedback learning and progress monitoring was found among IBW students studying at Czech higher education institutions. On the other hand, Czech students perceive a

lesser absence of these aspects in their education. This suggests that students from foreign countries may perceive a greater absence of such practices precisely because these practices are not used much at Czech universities and these students are more accustomed to the practices from their residential schools. This explanation is further supported by another finding from the pilot study, which suggests that partner schools from Belgium, Germany, Greece, the Netherlands, and Poland perceive a lesser absence of aspects related to learning feedback and progress monitoring compared to institutions from the Czech Republic. The reason may be the same, i.e., that schools from foreign countries already have such aspects included in their educational strategies and do not feel such a strong need for up-scaling. These findings and their rationale align with previous international research studies [19], [20], which consistently highlights the positive perception of feedback-based learning by undergraduate students. Students find such feedback useful as it enables the development of competencies.

These findings presented align with the results of a comprehensive empirical study [6]. This study documents the existence a developed test prototype of the learning panels, which demonstrates the implementation and pilot testing of progress monitoring and feedback capture through visualisation in the education sector for educational purposes. However, for these learning panels to be as functional, they need to honour other aspects such as animation, interactivity, and the ability to capture continuous information about a student's cognitive or behavioural development [16], [19]. Unfortunately, these efforts are lacking in the Czech Republic.

The pilot research findings confirmed significant differences in the perception of the absence of the certain aspects in teaching between Czech students and IBW students studying at Czech higher education institutions. Specifically, the aspect of cooperation among students during practical activities and study, as well as identification and monitoring of student's progress to determine appropriate teaching strategy by the teacher, were perceived more strongly as absent by IBW students compared to Czech students. This suggests that these aspects may be lacking in the teaching practices at Czech schools, while IBW students might be more familiar with them from their residential schools. The study also found that Czech higher education institutions have a greater need to integrate feedback and progress monitoring aspects into their teaching compared to foreign schools. This implies that education in partner countries outside the Czech Republic is more directed towards feedback learning, as they do not feel such a need now. The research is complemented by a study [21] focusing on perceptual research, which revealed that students with no prior experience with peer feedback had more positive attitudes about the usefulness of feedback compared to students who had gained such experience. While the pilot study did not reveal such a finding, the researchers will focus on such parameters in future comprehensive research and include them in the methodology and definition of variables.

Indeed, international studies have highlighted differences in the perceptions of feedback and progression-based learning by students and teachers in higher education [22]. Feedback learning has been recognised as an effective approach to support both students and teachers in their work. Students, in particular, perceive feedback as beneficial for self-regulated learning, promotion of intrinsic motivation, and fostering awareness of intrinsic values [23], [24]. The pilot study did not compare perceptions between students and teachers, but between students and higher education institutions as institutions. It should be noted, however, that significant differences in perceptions of aspects of feedback learning and progress monitoring were not

found between these entities. In particular, these causes will be explored in future periods through comprehensive research, which will built upon this pilot study. The pilot study has provided a basic conceptual framework for long-term research.

This study has several limitations that must be taken into account in light of the results found and discussed. This was pilot research, which of course provides a basic insight into the issue and is not demanding on the research sample. With some caution, it can be stated that the results, while in agreement, are also in some respects inconsistent with the above international research, but the researchers recognise that the research sample needs to be expanded. It will be necessary to examine differences in perceptions of the aspects studied not only among students, but also to involve teachers in the research. It will be necessary and interesting to focus not only on perceptions of the absence of aspects of feedback learning, but also to explore how subjects perceive the necessity, the importance of a given aspect. Long-term examination of the issue is essential, as it has implications for learning outcomes [29] and educational strategies [30].

6 CONCLUSION

The aim of the pilot empirical study was to investigate how master of engineering students from partner higher education institutions in the Czech Republic and in Belgium, Germany, Greece, the Netherlands, and Poland perceive the absence of aspects of feedback learning by monitoring student progress. Our study revealed several similarities and disparities between the situation of higher education teaching leadership in the Czech Republic and some other countries. The study holds theoretical implications for the research field, as it has established a conceptual foundation for further exploration and extension of methodologies in the area of feedback learning and possible monitoring of student progress. In the theoretical domain, the study establishes several novel ideas for more in-depth research on the influence of feedback elements in teaching on students' personal and professional development. The study also holds practical implications for the way teaching is conducted in higher education institutions in the Czech Republic and other partner countries. Particularly, it is essential to provide and maintain quality feedback that students can effectively utilize. The feedback facilitate both professional and personal development of the student. In the future, it will be necessary to focus on the use of ICT in teaching in the context of the development of visualisation tools supporting formative assessment. Emphasis should be placed on tools capable of automatically storing information regarding student progress.

7 ACKNOWLEDGMENT

This research was funded by the Internal Grant of the College of Polytechnics Jihlava No. 1170/4/1925 "Research into the need and availability of a visualization web application for the development of accounting thinking in an interactive environment" and this article is provided as one of the outputs of the research project of the Faculty of Finance and Accounting, which is realized in the framework of institutional support Prague University of Economics and Business IP100040. This research was supported by the Internal Grant IGS VŠE F1/9/2022 Issues of Distance Education in the Context of Secondary Vocational Education.

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