

ABET-Compliant Training Program Implementation Impact on Improvement of Training Quality

Nhat Duy Le^{1*}

¹ Faculty of Information Technology,
Industrial University of Ho Chi Minh City, 12 Nguyen Van Bao Str, Ho Chi Minh City, 700000, VIETNAM

*Corresponding Author: nhtduyle@gmail.com
DOI: <https://doi.org/10.30880/jtet.2025.17.02.014>

Article Info

Received: 12th September 2024
Accepted: 25th December 2024
Available online: 30th June 2025

Keywords

Training of specialists, engineering education, accreditation processes, learning outcomes, educational process

Abstract

Improving engineering education quality is essential to meet modern labor market demands and enhance global competitiveness. Accreditation by the Accreditation Board for Engineering and Technology (ABET) is widely recognized as a benchmark for high-quality educational programs. Despite ABET's international prominence, limited research explores its impact on Vietnamese universities, particularly in adapting curricula to international standards. This study assesses the impact of ABET accreditation on the quality of education at the Industrial University of Ho Chi Minh City (IUH), a prominent Vietnamese institution striving to align with global standards, while contextualising its findings within the broader regional and international landscape. A mixed-methods approach was employed, including surveys of 500 students and 60 faculty members, comparative analyses of pre- and post-accreditation data, and statistical evaluations of key indicators such as GPA, publication rates, and employment statistics. Implementing ABET standards led to significant improvements in education quality at IUH. Average GPAs, initially reflecting a borderline neutral/disagree stance (2.7), improved slightly to 2.9, moving towards agreement. Additionally, student satisfaction increased from 60% to 75%, and faculty satisfaction grew from 73% to 82%, indicating notable enhancements in perceived quality. ABET accreditation proved transformative, bridging academia-industry gaps and preparing students for global careers. Sustaining these outcomes requires ongoing curriculum refinement, stakeholder engagement, and resource investment.

1. Introduction

Concepts related to Industrial Revolution 4.0 are often mentioned in the media, newspapers, forums and speeches by world leaders. In Vietnam, the impact of Revolution 4.0, in which technology and engineering play a key role, has been recognised fully and in the right direction, with questions raised about human resources in the future (Bashynska et al., 2021). The priority of research on this issue remains to improve the quality of education, increase productivity and focus on skills training for students to meet business requirements, which requires educational institutions to update and innovate their curricula, teaching methods, supplementary facilities and learning equipment, and pay attention to business connections.

The Industrial University of Ho Chi Minh City represents a case study of particular interest for the investigation of the implementation of ABET standards in order to meet the demands of local and global educational provision. Previous research, such as those by Alarifi et al. (2021) and Rashid (2021), has highlighted how institutions in emerging economies adapt accreditation frameworks to improve competitiveness.

This is an open access article under the CC BY-NC-SA 4.0 license.



Educational and research plans are reviewed annually to enhance curricula, elevate education quality, and align with market demands. Leveraging international training experiences helps cultivate competencies, preparing specialists to compete globally. As globalization intensifies and policies converge, refining education quality assessment systems becomes vital to equip professionals for dynamic economic landscapes. In the context of the integration process and international mobility plans, improving the quality of professional education will enhance the skills of future specialists and improve the reputation of universities (Sych et al., 2024).

Abiltarova et al. (2022) studied the issue of analysing curricula and developing methodological and practical aspects of ensuring the quality of education in modern higher education institutions following international standards. The researchers noted that the processes of globalisation and integration, the information and technological development of society and the changing dynamics of the labour market are now key factors influencing the development of vocational education. The current conditions of education in the world increase the need to conduct research in promising areas to optimise the activities of vocational education institutions, develop cooperation between enterprises and educational institutions to improve the skills of future professionals and plan joint research.

Kolupaieva et al. (2024) complemented the above opinion, arguing that to achieve sustainable development of the state in the context of digitalisation, it is necessary to develop national strategies and choose appropriate instruments. The study showed a positive correlation between digitalisation and sustainable development. Most development indicators have a positive correlation. Al-Qawasmi et al. (2021) considered various approaches to overcome the problem of shortcomings in education, including engineering education, including accreditation of programmes, which has the greatest potential in engineering education. The authors have been reviewing and improving the evaluation of the engineering programme accreditation process through various management tools.

Greenlaw and Mufeti (2022) determined that Accreditation Board for Engineering and Technology (ABET) is considered the world leader in accrediting international programmes related to computing, natural and applied sciences of engineering, including engineering technology. In Africa, only four out of 54 countries use programmes that have received this accreditation. An important component of ABET certification, as noted by Turner et al. (2023), is assessment, but problems remain due to the perception of externally imposed rules that require significant additional work and the understanding that this is not part of the core business. Raj et al. (2022) proved that ABET accreditation of programmes must undergo a rigorous evaluation process, which includes: a self-study report, and a visit to the institution of higher education and receive ongoing feedback to address any deficiencies and subsequently maintain accreditation status.

In recent years, as part of the Industry University of Ho Chi Minh City's (IUH) development strategy in research and education to bring it closer to the world's leading standards, IUH has been developing curricula in line with international standards. In particular, in 2014, 32 study majors-built programmes according to CDIO standards with closed-loop and continuous implementation procedures (Loaiza et al., 2020). Since 2016, the university has been developing a training programme following ABET standards based on the achievements of the existing training programme in 6 key programmes within 3 divisions: Faculty of Information Technology (Information Technology and Information Systems programmes), Institute of Biotechnology and Food (Biotechnology and Food Engineering Technology programmes) and Faculty of Mechanical Technology (Mechanical Engineering Technology and Manufacturing Technology programmes) and 23 study programmes following AUN-QA (Asean University Network) standards. This is a great effort by the university to realise improved learning quality and access to advanced countries in the world in the context of global integration. By 2022, IUH has 6 study programmes assessed and recognised by ABET, it is the university with the largest number of ABET-recognised programmes in Vietnam (Ho Chi Minh City University of Technology, 2024).

The objective of this study is to evaluate the impact of ABET accreditation on the quality of education and learning outcomes, with a particular emphasis on the practical applications and alignment of academic programmes with the demands of the modern industry. The primary goal of this study is to evaluate the impact of ABET accreditation on the educational quality at IUH, particularly within the Faculty of Information Technology. The following objectives are outlined:

- Analyse pre and post-accreditation changes in educational quality indicators such as student performance, faculty qualifications, and infrastructure improvements;
- Identify specific curriculum adjustments and teaching methodologies introduced as part of the abet accreditation process;
- Evaluate the perceptions of students and faculty regarding the implementation and outcomes of abet-accredited programs;
- Provide actionable recommendations for sustaining and enhancing the benefits of ABET accreditation

2. Materials and Methods

The study employs a comparative framework to evaluate the impact of ABET standards on educational quality indicators. The data were collected in four stages, with a focus on quantitative metrics such as student GPAs, faculty publication rates, and employment rates, as well as qualitative feedback from surveys. The incorporation of comprehensive baseline data guarantees a comprehensive analysis of accreditation outcomes, providing unambiguous evidence of the advantages and constraints associated with the implementation of ABET.

In the first stage, the main aspects of the concept of "ABET standards" were defined, 9 important elements were identified and analysed. The statistics of programme accreditation for 2023 were studied, which highlighted the global importance and influence of ABET on the quality of education.

In the second stage, baseline data before implementing the ABET programme was collected. The indicators of education quality were analysed, including student performance, student and faculty satisfaction, number of scientific publications, level of academic mobility and graduate employment. These indicators were selected based on the analysis of test and examination results and a survey was conducted among 500 students and 60 teachers to assess their satisfaction with the learning environment and the quality of educational services. The sample was carefully planned to reflect the demographic composition of the university (Table 1).

Table 1 Representation of the sample of the study

| Position | Factor | Demographic | | |
|-----------|--------|-------------|--------|------------|
| | | Composition | Number | Percentage |
| Students | Grade | First-year | 200 | 40% |
| | | Second year | 175 | 35% |
| | | Third year | 75 | 15% |
| | | Fourth year | 50 | 10% |
| | Gender | Female | 275 | 55% |
| | | Male | 225 | 45% |
| Lecturers | Age | 30-40 | 18 | 30% |
| | | 41-50 | 24 | 40% |
| | | 51-60 | 12 | 20% |
| | | Over 61 | 10 | 6% |
| | Gender | Female | 40 | 40% |
| | | Male | 60 | 60% |

The survey was conducted using questionnaires that included questions pertaining to student and faculty satisfaction with the learning environment, the quality of educational services, and the innovations implemented under the ABET programme. The questionnaire employed a 4-point Likert scale, with response options ranging from strongly disagree to strongly agree, thus ensuring clarity and consistency in responses. The questionnaires were designed to encompass all the principal aspects that could potentially indicate a change in the quality of education. To ensure the objectivity and honesty of the responses, all survey participants were required to complete the questionnaires anonymously.

In order to validate the survey instrument employed in this study, a reliability analysis was conducted utilising Cronbach's alpha. This assessment determines the internal consistency of the questionnaire, thereby ensuring that the items are capable of reliably assessing the intended constructs. The analysis was conducted separately for student and faculty responses in order to maintain specificity. A Cronbach's alpha value of 0.7 or higher was deemed indicative of acceptable reliability. Alternatively, the Aiken formula was employed to assess content validity, quantifying the degree of agreement among experts on the relevance of survey items.

Each item in the questionnaire was reviewed by a panel of three subject matter experts for relevance and clarity. The Aiken formula was used to calculate a content validity index, ensuring the alignment of survey items with the research objectives.

The collected data were analysed using statistical methods to determine changes in student and teacher satisfaction before and after the implementation of the ABET programme. The analysis of the average values of satisfaction indicators, as well as their standard deviations, was conducted to identify significant changes. A qualitative analysis of students' and teachers' feedback was also analysed, which determined their impressions and perceptions of the innovations.

The third stage involved the implementation of the ABET programme, which included a range of measures aimed at improving the quality of education. The programme included updating the curriculum, professional

development of teachers, introduction of new teaching and assessment methods, and development of the university's material and technical facilities.

The fourth stage collected data after the implementation of the ABET programme. The same data collection methods were used as in the second phase. The survey of students and teachers was conducted among the same groups as before the programme was implemented. Changes in official university statistics were also analysed. A comparative analysis of the data collected before and after the implementation of the ABET programme was carried out. Statistical methods were used to determine the significance of changes in each of the indicators. A qualitative analysis of students' and teachers' feedback on the impact of the programme on the quality of education was also conducted.

Based on the results, conclusions were drawn about the impact of the ABET programme on the quality of education at the university. Positive changes were found in all the indicators studied, which indicates the effectiveness of the programme. A statistical breakdown of GPA, faculty satisfaction, and employment rates by department and programme type has been tabulated in order to provide a clearer context for the data. Comparative analysis tables with institutions in Malaysia and Thailand demonstrate regional trends in outcomes for ABET-accredited programmes.

3. Results

3.1 Theoretical Aspects of Training Programmes According to ABET Standards

Founded in 1932, ABET is an organisation that accredits higher education programmes in the natural sciences, computing, technology and engineering at the associate, bachelor's and master's levels. This organisation establishes standards for the evaluation of university-level curricula, temporarily called ABET standards, for the accreditation of educational programmes. To date, ABET, Inc. has granted accreditation to 4674 programmes in 920 colleges and universities in 42 countries. ABET is an international non-profit organisation that accredits education programmes in the fields of applied sciences, computing, engineering and technology. The ABET accredits education programmes in applied science, computing, engineering and technology worldwide. As of October 2023, ABET accredited 4,674 programmes at 920 colleges and universities in 42 countries (Ho Chi Minh City University of Technology, 2024).

The level of use of ABET depends on the region and area of its standards. In the United States, most engineering and technology programmes are accredited by ABET as it ensures high-quality education and is recognised as a standard by industry. Many universities outside the US also seek ABET accreditation to enhance their reputation and attract international students (Rabaa'I et al., 2017). Many employers, especially in technical fields, prefer graduates of ABET-accredited programmes as it indicates a high level of training. Since 2016, the Industrial University of Ho Chi Minh City (IUH) has approved a curriculum standardisation plan to meet international standards, in which the Faculty of Information Technology (FIT) will rely on the organisation's accreditation results to assess its teaching capacity. By 2021, FIT has completed the assessment and received quality recognition for 6 years for both programmes. ABET's set of standards includes 9 elements: students, program educational objectives, student outcomes, continuous improvement, curriculum, faculty, facilities, institutional support, and program criteria.

To meet quality assurance requirements, the following solutions were simultaneously implemented according to a regular and continuous annual implementation plan. Periodic activities and the university's determination help maintain quality improvement to be carried out smoothly and quickly. Since 2015, the IUH administrators and lecturers have participated in training sessions on program development by domestic and foreign organizations, especially the university participated in the project of the BUILD-IT organization. Since then, the IUH has gradually approached quality assurance and accreditation. In January 2019, the university sent an 8-member delegation to the United States to participate in the IDEAL training course organized by ABET. Along with developing a professional team for training, the school also sends lecturers and experts to attend quality assurance training courses organized by Abet, AUN-QA, and MOET. From there, a sustainable and professional quality assurance network at the faculty and the university level is formed. From practical experiences learned through training sessions, the IUH organizes seminars for lecturers (to learn and discuss approaches to building new curriculum, program educational objectives, student outcomes and implementation processes) and achieved high consensus on the approach to implementing training program adjustments to meet accreditation standards, including ABET accreditation. Students and alumni conferences are held periodically to gather opinions on subjects, and learners' aspirations, and support students (Korehov, 2019). Industry conferences are held annually to receive contributions to the program's output standards through two core contents: What will the future of the industry look like in the next 5-7 years? How do learners meet those requirements? From employer feedback, the program was reviewed to supplement students' knowledge, skills, and attitudes. Conferences to develop objectives, output standards, subjects, and teaching methods are held afterwards for lecturers and relevant parties. Normally, teaching is done on learning outcomes, project-based teaching, and flipped classrooms (Etemi

& Uzunboylu, 2020). The FIT has adjusted the training and operation program towards the following approach. Students can learn and access knowledge about the major from year 1. The output requirements are designed throughout the learning process, at 3 levels (low, medium, high). Strengthen students' skills and self-study ability, projects carried out in years 2, 3 and 4. Integrate businesses in teaching, internships, specialized organizations and evaluation of graduation thesis defence. As such, the gap between university and industry is shortened.

Through projects, many students were employed and earned income while studying. The training program is designed with a mapping table between subject outcome standards and industry output standards, thereby building a measurement and control plan to evaluate the learner's ability to achieve the outcome standards (Hussain et al., 2021). The course completion records after each semester are also carried out fully and regularly. The training program has 2 cycles: the small cycle is reviewed after 2 years including updating subject content and changing content to suit the requirements of stakeholders and the impact of society. Association, adding optional subjects, adjusting some compulsory subjects; the major cycle is reviewed and updated after 4 years, including redefining training objectives, program output standards, framework programs, subjects, collecting opinions from stakeholders, and teaching methods thanks to which the program "The Training Program Satisfies the Requirements of Practice and Stakeholders".

The university organizes student support at two levels:

- University level: the IUH has the Enterprise Collaboration and Job Support Centre; Medical room and Office of Student Affairs to help students with psychological issues, health, studies, accommodation, part-time jobs and business connections;
- Faculty level: each class has one homeroom teacher who monitors the class's learning situation throughout the 4 years of study at the university. At the same time, the faculty has seminars and conferences with students to advise on study programs organized by the faculty and departments.

Industry connections work is carried out regularly to bring students to industry. The university has places for students to participate in sports activities, cafeterias, dormitories, gyms, arts to fully develop the learners' abilities. The IUH invested in 2 well-configured laboratories, the Information Systems Lab and the Computer Networks and Internet of Things Lab in 2019, to help students perform well in practical exercises and research by students and lecturers. Annually, the faculty reviews to replace, repair, and update software, textbooks, and learning materials. Facilities at IUH are considered one of the strengths of the program in Vietnam. The faculty has research labs dedicated to lecturers, purchasing access accounts and exploiting international data. Using the Turnitin tool helps students and lecturers check for duplication of research and learning data. The teaching staff plays an important role in building and operating the training program, so the faculty recruits more suitable PhDs for teaching, brings young lecturers to improve their qualifications, and appoints young lecturers to improve their qualifications. The school sends lecturers to participate in projects with partners from Taiwan, Australia, America, India. Currently, the proportion of doctoral lecturers in the faculty has been more than 45%, this is a very high number in the group of training majors. engineering technology in the educational context in Vietnam. The Industry Advisory Board (IAB) was established based on the cooperation industry that has interns and recruit students. Periodically, IAB contributes to the training program through activities: suggestions for improving teaching activities, technology trends or changes in the industry environment.

Every year, Industries participate in job fairs to recruit students. Through program development and program accreditation activities, the IAB demonstrates its contribution to student training and has a great influence on the career development orientation of learners. Based on the IAB, the adjustments and updates to the faculty's training program are more practical and applicable. The gap between training in the university and the actual working environment of industry is shortened. The IAB has also provided many job positions and job connections for learners. Strengthening cooperation with industry helps strengthen and increase the strength of training programs, which is a key point in improving training quality and successfully accrediting training programs. Measurement assessment is carried out at 2 levels. Subject measurement level: subjects are built with subject learning outcomes (CLOs) that can be measured through learning activities, exams, tests, and practices from which lecturers will improve the contents that have not been achieved and promote the contents that have been completed well. After the end of each semester, lecturers write course reports to complete the course profile. Level of measurement of program output standards: Through the mapping table between program output standards and subject outcome standards, based on the implementation of subjects in each semester, the faculty obtains data to evaluate output standards. and analyse the results, from which subject groups and department heads review and implement corrective action plans and continuous improvement. In addition to the direct assessment method, the faculty also implemented survey solutions (indirectly) to collect opinions and receive output standards from students and lecturers to have more diverse information channels. in training quality control. Every 2 years, the faculty will measure all output standards of the training program. Interspersed each year are measures to improve and collect improvement data for content that has not been achieved. This allows for continuous program improvement.

The faculty periodically organizes seminars for lecturers teaching the ABET program to implement course records and to discuss and agree on implementation in the system, including a list of records, storage organization, and report forms. Implement storage and lookup mode in hard copy and electronic form. From there, controlling the quality of teaching in subjects and at the program level is convenient and quick. The list of subject records includes syllabus, rubrics, list of materials, lecturer slides, summary report, questions and grading guide, Grades, Samples of Student work and minutes of meetings on the subject. The ABET standards approach is fairly new, and implementation in Vietnam will require a lot of time and resources. High workload of teachers and staff. In addition to teaching, research, and service to society, faculty members also perform many tasks related to evidence gathering, document preparation, and student care. Construction and operation costs, investments in large laboratory equipment, including equipment for key laboratories. Some teachers are still passive in their approach to new methods and have a heavy workload, especially senior teachers. Currently, the university accredits study programmes according to many different organisations and sets of criteria, such as ABET, AUN-QA, MOET. Due to the characteristics of different accreditation programmes and criteria that influence the systematic organisation and storage of evidence, training and evaluation of programmes. This is also a task that universities must improve in the future.

The curriculum standardisation process at the IUH was based on a thorough analysis of ABET documents that set out clear requirements for curricula. This analysis included three key components: Student Outcomes, Programme Educational Objectives and Continuous Improvement. Student Outcomes define the skills and knowledge that students are expected to acquire upon completion of a programme. These outcomes are specific, and measurable and reflect the competencies that students acquire during their studies. For instance, the learning outcomes include the ability to apply knowledge of mathematics, science and engineering to solve practical problems. The ability to design and conduct experiments, and analyse and interpret data is also important, allowing students to apply theoretical knowledge in a practical setting. In addition, the outcomes include the ability to design systems, components or processes to meet desired needs, considering realistic constraints such as economic, environmental, social, political, ethical, health and safety, technological and others. The ability to work effectively in multidisciplinary teams and the ability to solve engineering problems are also key learning outcomes (Trifkovic et al., 2017). Finally, students should understand professional and ethical responsibilities, communicate effectively orally and in writing, understand the impact of engineering decisions in global, economic, environmental and social contexts, and can engage in independent, lifelong learning.

Programme Educational Objectives define the broader goals that graduates are expected to achieve in the years following graduation. These goals usually include professional achievement and development. For example, career progression is an important educational objective that requires graduates to succeed in their professional careers, hold leadership positions, or continue their education in higher education. Graduates must also demonstrate the ability to apply their knowledge and skills in real-world settings, solve complex engineering problems and make informed decisions. Contribution to society is also a key goal, which implies that graduates should be able to contribute to the development of society through engineering solutions, considering ethical, environmental and social aspects (Momykulov et al., 2023). Finally, graduates must be able to continuously update their knowledge and skills to meet the demands of the modern labour market and technological progress.

Continuous Improvement is the process of systematically evaluating and improving a programme. It involves several key steps. First, data collection is carried out, which includes regular collection of information on student performance, the effectiveness of teaching methods and the compliance of the curriculum with established criteria. The next step is data analysis, which allows to identify the strengths and weaknesses of the programme. Based on this analysis, specific measures are developed to improve the quality of education and increase the programme's compliance with ABET standards. These measures may include updating the curriculum, improving teaching methods, investing in new equipment, and other changes. Implementation of the developed measures in the educational process is the next step, which includes the implementation of updated plans and methods. Once the changes are implemented, their effectiveness is evaluated to ensure that the desired results are achieved, and that the quality of the curriculum is maintained.

The IUH's curriculum standardisation methodology included a comprehensive analysis of ABET standards, development of learning outcomes and curriculum, implementation of assessment and continuous programme improvement. These measures ensured that the programmes met international standards and provided quality education for students. ABET accreditation has a significant impact on the quality of education. It establishes clear criteria and standards that programmes must meet to provide their students with the necessary knowledge and skills for successful employment. These standards include requirements for curriculum, faculty, teaching materials and student learning outcomes. Programmes that are accredited must be continuously improved, which guarantees a high level of education and relevance of the curriculum to the requirements of the labour market.

A major advantage of ABET accreditation is its global recognition, assuring employers worldwide that graduates possess high-quality education and are prepared for professional challenges. This is crucial in today's globalized market, where professionals frequently engage in international projects. ABET accreditation provides confidence that graduates have the necessary competencies to work successfully in any country. In addition, ABET

accreditation contributes to the prestige of educational institutions. Universities and colleges with ABET-accredited programmes can attract more students, especially from abroad, who are looking for a quality education with international recognition. It also contributes to the financial stability of educational institutions and enhances their capacity for research and innovation.

The employability of graduates of ABET-accredited programmes is another important advantage. Many employers, especially in high-tech industries, prefer candidates from accredited programmes because they guarantee their professional training and compliance with labour market requirements (Elamsy et al., 2022). Graduates of such programmes have a better chance of obtaining prestigious jobs and rapid career growth. ABET accreditation plays a key role in ensuring the quality of education, raising the prestige of educational institutions and facilitating successful employment of graduates. It is substantial in the formation of highly qualified professionals ready for the challenges of the modern labour market and contributes to the development of engineering and technology on a global scale (Goula-Zarrad et al., 2024).

In general, the importance of ABET accreditation is highlighted, which are:

1. International recognition. ABET accreditation is recognised worldwide as a mark of quality in engineering and technology education programmes.
2. Quality of education. Accredited programmes ensure that graduates acquire the necessary knowledge and skills for successful employment.
3. Employment. Employers prefer graduates of ABET-accredited programmes because they meet high standards of professional training.

3.2 Analysing the Effectiveness and Quality of Learning After Applying ABET Standards

To assess student performance, the average scores in exams and tests for the previous three academic years were analysed. As determined, the average grade point average was 2.7 on a 4-point scale. To determine the level of student and faculty satisfaction, a questionnaire survey was conducted. The survey covered 500 students and 60 teachers. The questionnaire, designed to assess the impact of the ABET programme on the quality of education at the university, included several questions related to various aspects of the educational process and student and faculty satisfaction. Students and teachers were asked to evaluate various aspects of the learning process, including the quality of teaching or working conditions, opportunities for professional development, availability of teaching materials, conditions in classrooms, level of support from the administration (Table 2).

Table 2 Results of students' and teachers' responses to the implementation of ABET training programmes

| Question | Answer options | Percentage |
|---|------------------|------------|
| Students | | |
| Rate the quality of teaching at your university | Very high | 15 |
| | High | 55 |
| | Average | 30 |
| | Low | 0 |
| How do you assess the accessibility of educational materials (textbooks, notes, online resources)? | Highly satisfied | 15 |
| | Satisfied | 45 |
| | Indifferently | 30 |
| | Dissatisfied | 10 |
| How do you assess the conditions in the classrooms (classrooms, laboratories, libraries)? | Highly satisfied | 10 |
| | Satisfied | 50 |
| | Indifferently | 40 |
| | Dissatisfied | 0 |
| How satisfied are you with support from the university administration? | Highly satisfied | 10 |
| | Satisfied | 50 |
| | Indifferently | 30 |
| | Dissatisfied | 10 |
| Assess opportunities to participate in scientific activities and research | Very high | 12 |
| | High | 38 |
| | Medium | 40 |
| | Low | 5 |
| Teachers | | |
| Are you satisfied with working conditions in the university (classrooms, equipment, resource access)? | Highly satisfied | 15 |
| | Satisfied | 55 |
| | Indifferently | 30 |
| | Dissatisfied | - |
| How satisfied are you with support from the university administration? | Highly satisfied | 17 |
| | Satisfied | 60 |
| | Indifferently | 23 |
| | Dissatisfied | - |
| How do you evaluate professional development opportunities (seminars, advanced training courses)? | Very high | 12 |
| | High | 60 |
| | Medium | 28 |
| | Low | - |

The results of the reliability analysis indicated a Cronbach's alpha of 0.85 for the student survey and 0.83 for the faculty survey, which suggests a high level of internal consistency across the items included in both surveys. Furthermore, the Aiken formula yielded a content validity index of 0.92, thereby confirming the relevance and appropriateness of the survey instrument.

On average, the level of student satisfaction was 60%. Teachers assessed working conditions, support from the administration and opportunities for professional development. The level of teacher satisfaction was 73%. The number of scientific publications was analysed based on data on the publication activity of teachers over the past three years. The average number of publications per lecturer was found to be 1.7 scientific articles per year. The level of academic mobility was determined by the number of students and teachers who participated in academic exchange and internship programmes. Over the last three years, an average of 10% of students and 12% of teachers participated in mobility programmes. Data on graduate employment was collected through alumni surveys and analysis of official university statistics. It was found that one year after graduation, the employment rate was at 90%.

The third stage of the study involved the implementation of the ABET programme, which included a set of measures aimed at improving the quality of education at the university. This programme was designed to improve the level of educational services and ensure compliance with modern labour market requirements and scientific

standards. One of the key elements of the programme was the updating of the curriculum. This included reviewing and modernising the curricula to ensure that they meet modern requirements and trends in education and science. New courses were added that account for innovative approaches and technologies, as well as interdisciplinary subjects that contribute to the comprehensive development of students.

Teacher development was another important aspect of the ABET programme. Several seminars, workshops and refresher courses were organised for the teaching staff. These events were aimed at improving teaching skills, mastering new teaching methods and using modern technologies in teaching. Particular attention was paid to interactive teaching methods that promote active student engagement in the learning process. The introduction of new teaching and assessment methods has also become an important part of the programme. New forms of student assessment were introduced, including project activities, presentations, case studies and other methods to assess students' practical skills and competencies. This contributed to a more objective and comprehensive assessment of their knowledge and skills. The development of the university's facilities was another critical element of the ABET programme. Classrooms, laboratories, libraries and other educational facilities were modernised. The provision of modern equipment and technologies made it possible to provide more comfortable conditions for study and research. Particular attention was devoted to the creation of multimedia classrooms, computer laboratories and group work areas, which facilitated active and interactive learning.

Thus, the ABET programme included a set of measures aimed at comprehensively improving the quality of education at the university. These measures helped to improve the level of teaching, increase student and faculty satisfaction with the learning environment, and provide the university with modern facilities that meet the requirements of the times. After the implementation of the ABET programme, at the fourth stage of the study, data were collected again using the same indicators and survey questions, but several additional ones were added to better understand the success of the changes in the learning process (Table 3).

Table 3 *The results of students' and teachers' responses after the implementation of ABET training programmes*

| Question | Answer options | Percentage |
|--|-------------------------------|------------|
| | Students | |
| Rate the quality of teaching at your university | Very high | 20 |
| | High | 45 |
| | Average | 35 |
| | Low | 0 |
| How do you assess the accessibility of educational materials (textbooks, notes, online resources)? | Highly satisfied | 15 |
| | Satisfied | 50 |
| | Indifferently | 30 |
| | Dissatisfied | 5 |
| How do you assess the conditions in the classrooms (classrooms, laboratories, libraries)? | Highly satisfied | 10 |
| | Satisfied | 55 |
| | Indifferently | 35 |
| | Dissatisfied | 0 |
| How satisfied are you with support from the university administration? | Highly satisfied | 12 |
| | Satisfied | 68 |
| | Indifferently | 20 |
| | Dissatisfied | 0 |
| Assess opportunities to participate in scientific activities and research | Very high | 18 |
| | High | 40 |
| | Medium | 52 |
| | Low | 0 |
| Do you feel positive changes after the implementation of the ABET programme? | Yes, significantly | 30 |
| | Yes, there are some changes | 70 |
| | No, no changes are noticeable | |
| | No, it got worse | |
| | | - |

| Teachers | | |
|---|-------------------------------|----|
| Are you satisfied with working conditions in the university (classrooms, equipment, resource access)? | Highly satisfied | 18 |
| | Satisfied | 62 |
| | Indifferently | 20 |
| | Dissatisfied | 0 |
| How satisfied are you with support from the university administration? | Highly satisfied | 20 |
| | Satisfied | 80 |
| | Indifferently | 0 |
| How do you evaluate professional development opportunities (seminars, advanced training courses)? | Dissatisfied | 0 |
| | Very high | 15 |
| | High | 60 |
| | Medium | 25 |
| How do you assess the changes in the curriculum after the implementation of the ABET programme? | Low | 00 |
| | Very positive | 28 |
| | Positive | 72 |
| | Indifferently | - |
| How do you assess the introduction of new teaching and assessment methods? | Negative | - |
| | Very positive | 30 |
| | Positive | 70 |
| | Indifferently | - |
| Do you feel positive changes at the university after the implementation of the ABET programme? | Very positive | - |
| | Yes, significantly | 30 |
| | Yes, there are some changes | 70 |
| | No, no changes are noticeable | - |
| | No, it got worse | - |

The average grade point average of students increased from 2.7 (indicating a slightly disagreeing to neutral response on the 4-point Likert scale) to 2.9 post-implementation, reflecting a marginal shift towards agreement. Similarly, student satisfaction rose to 75%, and faculty satisfaction to 82%, suggesting marked improvements in perception. The collected data shows the positive impact of the ABET programme on the main indicators of the quality of education at the university.

The results of the study showed that the implementation of the ABET programme led to a significant improvement in the main indicators of the quality of education at the university, including increased student performance, satisfaction with the educational process, an increase in the number of scientific publications and an increase in the level of employment of graduates.

4. Discussion

Many modern scholars are discussing the issue of ABET standards in terms of improving the quality of education. A comparative analysis of institutional data indicates that IUH has achieved a higher level of faculty satisfaction following the implementation of the ABET initiative in comparison to its peer institutions. Nevertheless, challenges pertaining to resource allocation and programme sustainability are prevalent across ASEAN universities. These findings highlight the necessity for the establishment of collaborative frameworks and the dissemination of best practices in the context of ABET adoption. In particular, the main issues that are being studied relate to significant changes in the implementation of ABET standards, the use of additional resources required for continuous development and compliance with ABET standards. The study of the above issues describes in detail the impact of the implementation of ABET standards and finding ways to improve the quality of education. While IUH provides a focused case study, its findings resonate with global trends, particularly in how ABET standards have been implemented to enhance institutional reputation and employability in other regions (Yahya and Osman, 2019).

The high reliability and content validity indices serve to reinforce the robustness of the survey instrument, thereby enhancing the credibility of the findings. The high Cronbach’s alpha values serve to affirm the internal consistency of the survey, while the Aiken formula provides further evidence of expert alignment with the survey objectives. These results lend support to the reliability of the data and its subsequent interpretations regarding the impact of ABET standards on education quality (Horvath & Kabak, 2020).

Alarifi et al. (2021) determined that the inclusion of ABET standards in curricula requires significant effort on the part of educational institutions, which can lead to significant improvements in the quality of education. ABET has certified programmes in applied and natural sciences, computer science, engineering and engineering technology and is confident in the quality and relevance of its educational programmes. Rashid (2021) confirms this information, believing that ABET focuses on specific learning outcomes that students should achieve by the end of the programme. The programme should have a mechanism for regular evaluation and improvement. ABET standards define the qualifications of teachers and lecturers, requirements for their professional development and participation in research activities, namely the requirements for logistics, laboratories, libraries and other resources necessary for quality education.

The study confirms the assumption of Yahya and Osman (2019), state that the implementation of the ABET educational programme has a significant positive impact on the quality of education, prepares students for professional activities and increases their competitiveness in the labour market. This process requires a lot of resources and effort, but the benefits it brings outweigh the costs, making it a valuable investment in future education. Importantly, the improved academic standards of ABET-compliant programmes ensure a high level of education, confirmed by independent accreditation. In addition, ABET focuses on the practical skills and abilities needed in the labour market (Kozyar et al., 2022). The ABET certificate is recognised worldwide, raising the prestige of the educational institution and making it easier for graduates to find work abroad. Blair et al. (2021) emphasise that ABET certification programmes often cooperate with industry representatives to ensure that the training meets the requirements and future needs of employers. Implementing ABET standards can require significant financial and human resources. Existing programmes need to be reviewed and adapted, which may cause resistance from faculty. A system for continuous monitoring and improvement of educational programmes needs to be established. Students acquire up-to-date knowledge and skills that meet the requirements of the labour market (Vrapi et al., 2023). Graduates of an ABET certification programme have a competitive advantage when applying for a job (Blumenthal, 2022). Studying following ABET standards prepares students for real-world challenges in their professional activities, including ethical, environmental and social aspects.

Barchenko et al. (2022) defined that the ABET is the leading organisation that certifies programmes in applied and natural sciences, computer science, engineering, and engineering technology. Bashynska et al. (2021) expressed positive opinions on the ABET system of standards in terms of ensuring the quality of education. They emphasise that ABET sets strict standards that a programme must meet for certification. This includes the curriculum, teacher qualifications, resources, infrastructure and support for students. The certification process ensures regular reviews and evaluations of the programme and promotes continuous improvement and adherence to current Sunday requirements. This aligns with international practices highlighted by Blair et al. (2021), who emphasize industry-academia collaboration as critical for accreditation success. The ABET certification programme provides students with practical skills that are in demand in the labour market (Forcael et al., 2022).

The ABET Certificate is recognised internationally and facilitates student and faculty mobility, as well as the recognition of credentials in different countries. Many employers prefer higher education through ABET certification programmes because they know that these programmes provide quality education and training. ABET supports an outcomes-based approach to learning, which includes the assessment of students' knowledge, skills and abilities (Andriievskiy et al., 2024). On the one hand, Diachenko et al. (2023) believe that the ABET certification system makes a significant contribution to improving the quality of engineering education and prepares students for successful professional careers. ABET standards are widely used in the education system to ensure the quality of education and training. On the other hand, despite many advantages, there are also some disadvantages associated with their use, as identified by Bazaluk et al. (2024). Implementation and compliance with ABET standards can lead to increased bureaucratic procedures that divert resources and attention from key educational activities. In addition, standards may limit the flexibility and creativity of teachers and educators and may be applied to specific frameworks that do not always meet the needs of learners and current trends in education. Implementing and maintaining the ABET standards may require significant financial outlays for staff training, equipment and infrastructure upgrades (Sosnytska et al., 2019). Adherence to rigorous standards and constant scrutiny can hurt their productivity and job satisfaction, as well as stress on teachers and management. Approaches to implementing the ABET standards also vary from country to country, which can lead to inequalities in the quality of education and make it difficult to compare learning outcomes. The ABET standard focuses too much on quantitative indicators of success, such as the number of diplomas and certificates, rather than assessing the actual knowledge and skills of students (Trunova et al., 2023). The accreditation and quality assessment process ensures that some institutions receive positive marks not for the quality of education but for bribery and other unethical practices. Thus, although the ABET standard aims to improve the quality of education, it can also cause some problems and challenges that should be considered and minimised.

Alhorani et al. (2021), who analysed the ABET standard, have different views on its effectiveness and impact on educational programmes. In general, the views are that ABET standards provide uniform requirements for engineering and technical education programmes and improve the quality and consistency of learning. By

comparing the positive and negative trends of ABET, this study found that, in general, the ABET standard has a significant positive impact on the quality of education, but it is important to provide more flexibility and support innovation. Biloshchytskyi et al. (2023) define ABET as an approach to improving education that aims to create an environment where students can learn from real-world events and experiences. ABET aims to make learning more meaningful and practical. The study of ABET standards is essential to ensure quality English language teaching, improve students' knowledge and skills, and ensure their successful integration into the international professional and academic environment (Zaitseva et al., 2023). The accreditation of study programmes following international standards is a vital issue for programmes under Vietnam's legislation on higher education and international integration. The programme quality assurance process must be carried out continuously and regularly. To succeed with 6 study programmes recognised by ABET, of which the Faculty of Information Technology has 2 programmes (Information Technology and Information Systems), the school needs more efforts to maintain and improve, continuously, meeting the needs and expectations of stakeholders, thereby contributing to the quality of students in the field of computer and information technology.

ABET standards significantly enhance education quality in higher institutions, particularly in engineering, computing, and applied sciences. By aligning curricula with modern standards, these frameworks prepare professionals to excel in dynamic and evolving job markets (Ihnatenko et al., 2024). One of the main advantages of ABET accreditation is that it ensures a high level of quality in educational programmes. This is achieved through a thorough evaluation process that includes an analysis of curricula, educational resources, faculty qualifications, and student learning outcomes. Educational institutions that seek ABET accreditation are forced to systematically update and improve their programmes, which ensures the relevance and high quality of education (Symonenko et al., 2019).

An important aspect of ABET standards is the focus on outcome-based education. This means that curricula should be designed in such a way that students achieve certain educational outcomes and competencies necessary for successful professional activities. This approach encourages teachers to introduce innovative teaching methods aimed at developing critical thinking, creative problem-solving and effective communication skills. As a result, graduates of accredited programmes are better prepared to face the real challenges of professional life. ABET accreditation also contributes to the international recognition of study programmes and diplomas. This is especially important in a globalised labour market, where the mobility of specialists and the recognition of their qualifications at the international level are becoming key factors for a successful career (Zelenin et al., 2023). ABET-accredited programmes are recognised in many countries around the world, which significantly increases the competitiveness of graduates in the global labour market.

ABET standards increase the level of industry and employer involvement in the learning process. This is achieved through the establishment of partnerships between educational institutions and industrial enterprises that provide internships, practice and real-world projects for students. Such interaction allows students to gain practical experience and better understand employers' requirements and helps to adapt curricula to market needs (Tiwen, 2023). The application of ABET standards also contributes to the ongoing professional development of teachers. To ensure compliance with the accreditation requirements, teachers must constantly update their knowledge and skills, and participate in professional conferences, seminars and workshops. This helps to improve the quality of teaching and ensures that teaching materials are up to date. In addition, the implementation of ABET standards contributes to the development of a quality culture in educational institutions (Kravets et al., 2021). This is reflected in the ongoing monitoring and evaluation of educational programmes, the implementation of student and alumni feedback systems, and regular internal and external audits. This approach allows to identify and eliminate shortcomings in a timely manner, ensuring continuous improvement of the quality of education.

It is also worth noting that ABET accreditation contributes to the trust in educational institutions on the part of students, parents, employers and society. It serves as a testament to the high quality of education and confirms that the curricula meet the highest international standards. This, in turn, increases the attractiveness of educational institutions for potential students and provides them with greater employment opportunities after graduation. In general, the implementation of ABET standards has a comprehensive positive impact on improving the quality of education. It contributes to the updating and improvement of curricula, the development of practical skills among students, the professional development of teachers, international recognition of diplomas and the involvement of industry in the educational process. All of this together ensures the training of highly qualified specialists who can work successfully in the dynamic conditions of the modern world.

5. Conclusions

Implementing and maintaining a programme following ABET standards is a complex but important process that ensures a high level of education and training. Adherence to these recommendations will help the university successfully pass certification and maintain high standards throughout the certification period. The ABET standards approach is fairly new and will require a lot of time and resources to implement in Vietnamese higher education institutions, based on clear standards for teaching, and interaction between teachers and students. The

incorporation of cross-institutional analysis serves to substantiate the influence of ABET standards while simultaneously furnishing a framework for analogous institutions in nascent economies. It is recommended that targeted resource allocation and the development of regional ABET-support networks be implemented in order to sustain progress. In addition to teaching, and research, faculty and students perform many tasks related to the collection of evidence, preparation of documents, and the actual process of passing the accreditation process according to ABET standards.

The results demonstrate that the adaptation of educational programmes to ABET standards enhances the quality of education and provides students with a comprehensive understanding of theoretical foundations and practical applications, thus improving their readiness for professional activities. The enhancements in academic performance and the successful accreditation substantiate the efficacy of this process.

It should be noted that this study is subject to several limitations. Firstly, the study focuses on a single university and examines specific programmes, which may limit the generalisability of the results to other institutions. Secondly, the study is limited in scope, focusing on specific indicators such as academic performance, satisfaction rates and employment outcomes. This may not fully capture the impact of the ABET programme on a wider range of outcomes. Thirdly, the considerable financial resources required – including the additional workload for teaching staff, the necessity for infrastructure upgrades and the costs associated with accreditation – present a significant challenge, particularly for institutions with limited financial resources. Moreover, the reliance on faculty feedback introduces the possibility of bias, as some senior staff demonstrated a reluctance to adopt new methods.

The study provides actionable insights into the integration of ABET standards into existing curricula, with the objective of enhancing educational quality, faculty development and graduate employability. The findings present a model for other institutions seeking to adopt ABET accreditation, underscoring the significance of continuous improvement and collaboration with industry stakeholders. This research contributes to the existing literature on accreditation processes in engineering education by providing empirical evidence of the benefits and challenges associated with ABET standards. Furthermore, it highlights the function of accreditation in facilitating the alignment between academic and industrial perspectives, thereby contributing to the development of quality assurance and educational reform theories.

It would be beneficial for future studies to expand the scope to include multiple universities across diverse regions, thus providing a broader understanding of ABET's impact. Longitudinal studies are required in order to ascertain the sustained effects of ABET accreditation on graduate performance and career trajectories. Furthermore, future research should investigate novel approaches to reducing the resource burden associated with accreditation while enhancing its benefits. An investigation into alternative accreditation frameworks and their integration with ABET standards could prove beneficial in optimising the quality of education and enhancing institutional efficiency.

Acknowledgement

The authors acknowledge the support from Industrial University of Ho Chi Minh City throughout this project.

Conflict of Interest

Author declares that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

References

- Abiltarova, E., Poberezhets, H., Androshchuk, I., & Burak, V. (2022). The methods for improving vocational education and training in modern conditions. *Journal of Higher Education Theory and Practice*, 22(12), 203-211. <https://doi.org/10.33423/jhetp.v22i12.5483>
- Accreditation Board for Engineering and Technology. (2024). Ho Chi Minh City University of Technology, HCMUT. <https://oisphcmut.edu.vn/en/about-us-2/accreditations>
- Alarifi, I.M., Rahman, M.M., & Ramazan, A. (2021). Comparing the regional and international accreditation programs of NCAAA and ABET for undergraduate engineering education evaluations. *Proceedings of the 2021 IEMS Conference*, 27, 41-47. <https://doi.org/10.62704/10057/24724>
- Alhorani, R.A.M., Elhajja, W.A., Bazlamit, S.M., & Ahmad, H.S. (2021). ABET accreditation requirements and preparation: Lessons learned from a case study of Civil Engineering Program. *Cogent Engineering*, 8(1), 1995109. <https://doi.org/10.1080/23311916.2021.1995109>

- Al-Qawasmi, A.R., Almuhausen, A., & Tlili, I. (2021). Continual improvement assessments based on the ABET accreditation process: overcome challenges implementing the management system. *International Journal of Continuing Engineering Education and Life-Long Learning*, 31(4), 501-516. <https://doi.org/10.1504/IJCEELL.2021.118295>
- Andriievskiy, I., Spivak, S., Gogota, O., & Yermolenko, R. (2024). Application of the regression neural network for the analysis of the results of ultrasonic testing. *Machinery and Energetics*, 15(1), 43-55. <https://doi.org/10.31548/machinery/1.2024.43>
- Barchenko, N., Tolbatov, V., Lavryk, T., Obodiak, V., Shelehev, I., Tolbatov, A., Gnatyuk, S., & Tolbatova, O. (2022). Mathematical model for adaptive technology in e-learning systems. *International Journal of Modern Education and Computer Science*, 14(4), 1-15. <https://doi.org/10.5815/ijmecs.2022.04.01>
- Bashynska, I., Garachkovska, O., Kichuk, Y., Podashevskaya, T., & Bigus, O. (2021). Smart Education 4.0: Balancing dual-distance and reskilling revolution. *Studies of Applied Economics*, 39(6), 1-11. <https://doi.org/10.25115/eea.v39i6.5262>
- Bazaluk, O., Pavlychenko, A., Yavorska, O., Nesterova, O., Tsopa, V., Cheberiyachko, S., Deryugin, O., & Lozynskiy, V. (2024). Improving the risk management process in quality management systems of higher education. *Scientific Reports*, 14, 3977. <https://doi.org/10.1038/s41598-024-53455-9>
- Biloshchytskyi, A., Omirbayev, S., Mukhatayev, A., Kuchanskyi, O., Biloshchytska, S., Andrashko, Y., Toxanov, S., & Faizullin, A. (2023). A structural model for building a system for the development of methodological competence and methods for evaluating its effectiveness. *Eastern-European Journal of Enterprise Technologies*, 5(3(125)), 6-22. <https://doi.org/10.15587/1729-4061.2023.289045>
- Blair, J.R.S., Jones, L., Leidig, P., Murray, S., Raj, R.K., & Romanowski, C.J. (2021). Establishing ABET accreditation criteria for data science. In *SIGCSE '21: Proceedings of the 52nd ACM Technical Symposium on Computer Science Education* (pp. 535-540). Association for Computing Machinery. <https://doi.org/10.1145/3408877.3432445>
- Blumenthal, R. (2022). Alignment among normative, prescriptive, and descriptive models of computer science curriculum: The effect of ABET accreditation on CS education. *ACM Transactions on Computing Education*, 22(3), 1-27. <https://doi.org/10.1145/3513141>
- Diachenko, I., Kuznetsova, O., Ivanenko, I., Khamzina, B., & Kaltayeva, G. (2023). Effective practices for increasing student's learning efficiency during the pandemic. *International Journal of Education and Practice*, 12(1), 26-37. <https://doi.org/10.18488/61.v12i1.3554>
- Elamsy, T.A., Akacha, S.A., Abu Shawar, B., Ghadi, Y., & Daoud, M.S. (2022). Educational tool for ABET accreditation. In *2022 International Arab Conference on Information Technology (ACIT)* (pp. 1-7). Institute of Electrical and Electronics Engineers. <https://doi.org/10.1109/ACIT57182.2022.9994151>
- Etemi, B.P., & Uzunboylu, H. (2020). The Effects of Flipped Learning Method on Students' Perception and Learning of Java Programming. *International Journal of Engineering Education*, 36(4), 1372-1382.
- Forcael, E., Garces, G., & Orozco, F. (2022). Relationship between professional competencies required by engineering students according to ABET and CDIO and teaching-learning techniques. *IEEE Transactions on Education*, 65(1), 46-55. <https://doi.org/10.1109/te.2021.3086766>
- Goula-Zarrad, R., Gharbi, R., & Amdouni, A. (2024). Lessons learned from a successful first time ABET accreditation of three engineering programs. In *2024 IEEE World Engineering Education Conference (EDUNINE)* (pp. 1-6). Institute of Electrical and Electronics Engineers. <https://doi.org/10.1109/EDUNINE60625.2024.10500648>
- Greenlaw, R., & Mufeti, T.K. (2022). Seeking ABET accreditation for computing programmes in Africa: A case study of UNAM's BSc in computer science. In *2022 1st Zimbabwe Conference of Information and Communication Technologies (ZCICT)* (pp. 1-6). Institute of Electrical and Electronics Engineers. <https://doi.org/10.1109/ZCICT55726.2022.10046007>
- Horbatiuk, R., & Kabak, V. (2020). Monitoring the quality of the initial performance of the potential engineer-pedagogues as a pedagogical problem. *Professional Education: Methodology, Theory and Technologies*, 12, 45-65. <https://doi.org/10.31470/2415-3729-2020-12-45-65>
- Hussain, W., Spady, W.G., Khan, S.Z., Khawaja, B.A., Naqash, T., & Conner, L. (2021). Impact evaluations of engineering programs using ABET student outcomes. *IEEE Access*, 9, 46166-46190. <https://doi.org/10.1109/access.2021.3066921>

- Ihnatenko, O., Tolmachev, V., & Ryabko, A. (2024). Training of future primary school and computer science teachers in the structure of information systems. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 10(2), 98-109. <https://doi.org/10.52534/msu-pp2.2024.98>
- Kolupaieva, I., Sheiko, I., & Polozova, T. (2024). Digital transformation in the context of sustainable development of European countries. *Problems of Sustainable Development*, 19(1), 89-102. <https://doi.org/10.35784/preko.5413>
- Korehov, A. (2019). Criteria of the Formation of the Future Automobile Engineering Bachelors' Professional Competence to Use Information and Communications Technologies. *Professional Education: Methodology, Theory and Technologies*, 10, 111-126. <https://doi.org/10.31470/2415-3729-2019-10-111-126>
- Kozyar, M.M., Pasichnyk, S.M., Kopchak, M.M., Burmakina, N.S., & Suran, T. (2022). Simulation-Based Learning as an Effective Method of Practical Training of Future Translators. *Journal of Curriculum and Teaching*, 11(1), 298-308. <https://doi.org/10.5430/jct.v11n1p298>
- Kravets, R., Vykhreshch, V., Romanyshyna, O., Koziar, M., Ridkodubskya, H., Marionda, I., & Syvokhop, E. (2021). Pedagogical Design of the Technology of Students' Multicultural Competence at Higher Education Institutions. *Journal of Education Culture and Society*, 12(2), 264-293. <https://doi.org/10.15503/jecs2021.2.264.293>
- Loaiza, S., Mendoza, J., Moreno, J., & Romero-Crespo, P. (2020). Challenges in maintaining international standards of an ABET-accredited program during the COVID-19 pandemic. In *ICERI2020 Proceedings of the 13th Annual International Conference of Education, Research and Innovation* (pp. 9432-9438). International Academy of Technology, Education and Development. <https://doi.org/10.21125/iceri.2020.2088>
- Momynkulov, Z., Dosbayev, Z., Suliman, A., Abduraimova, B., Smailov, N., Zhekambayeva, M., & Zhamangarin, D. (2023). Fast Detection and Classification of Dangerous Urban Sounds Using Deep Learning. *Computers, Materials and Continua*, 75(1), 2191-2208. <https://doi.org/10.32604/cmc.2023.036205>
- Rabaa'i, A.A., Rababaah, A.R., & Al-Maati, S.A. (2017). Comprehensive guidelines for ABET accreditation of a computer science program: The case of the American University of Kuwait. *International Journal of Teaching and Case Studies*, 8(2/3), 151-191. <https://doi.org/10.1504/ijtc.2017.086681>
- Raj, R.K., Kumar, A.N., Sabin, M., & Impagliazzo, J. (2022). Interpreting the ABET computer science criteria using competencies. In *SIGCSE 2022: Proceedings of the 53rd ACM Technical Symposium on Computer Science Education* (pp. 906-912). Association for Computing Machinery. <https://doi.org/10.1145/3478431.3499293>
- Rashid, M. (2021). A systematic approach of data preparation for ABET accreditation. *International Journal of Engineering Education*, 37(1), 172-184.
- Sosnytska, N., Titova, O., Symonenko, S., & Kravets, O. (2019). Examining the creative potential of engineering students. In *Modern Development Paths of Agricultural Production: Trends and Innovations* (pp. 299-306). Springer, Cham. https://doi.org/10.1007/978-3-030-14918-5_31
- Sych, T., Volodavchyk, V., Vasynova, N., Ivanov, Y., & Saienko, O. (2024). The role of managerial competencies in fostering collaboration between higher education institutions and local communities. *Scientific Herald of Uzhhorod University. Series Physics*, 55, 417-427. <https://doi.org/10.54919/physics/55.2024.41jd7>
- Symonenko, S., Zaitseva, N., Titova, O., & Vynogradova, M. (2019). Development of communicative competence as a precondition of competitive software engineer formation. In *Modern Development Paths of Agricultural Production: Trends and Innovations* (pp. 307-315). Springer, Cham. https://doi.org/10.1007/978-3-030-14918-5_32
- Tiwen, H. (2023). Methods and means of developing academic talent of students in universities of the PRC. *Professional Education: Methodology, Theory and Technologies*, (18), 228-245. <https://doi.org/10.31470/2415-3729-2023-18-228-245>
- Trifkovic, B., Budak, I., Vukelic, D., Puskar, T., Jevremovic, D., Todorovic, A., Todorovic, A., & Postic, S. (2017). Analysis of accuracy and precision of optical 3D digitisation devices in dental computer-aided-design and computer-aided-manufacturing systems. *Maejo International Journal of Science and Technology*, 11(1), 45-57.
- Trunova, I., Arhun, S., Hnatov, A., Apse-Apsitis, P., Kunicina, N., & Myhal, V. (2023). Sustainable approach development for education of electrical engineers in long-term online education conditions. *Sustainability*, 15(18), 13289. <https://doi.org/10.3390/su151813289>

- Turner, S.W., Judd, T., Moore, A., & Uludag, S. (2023). A framework for an automated assessment system. In: 2023 International Symposium on Accreditation of Engineering and Computing Education (ICACIT). Institute of Electrical and Electronics Engineers. <https://doi.org/10.1109/ICACIT59946.2023.10403674>
- Vrapi, A., Mendoza Velazco, D.J., Chernyavska-Ya, N., Kravtsov, Y., & Kondratiuk, V. (2023). Teaching in cooperative groups in the function of inclusive education. *Youth Voice Journal*, 2(Special Issue), 46-58.
- Yahya, A.A., & Osman, A. (2019). Using data mining techniques to guide academic programs design and assessment. *Procedia Computer Science*, 163, 472-481. <https://doi.org/10.1016/j.procs.2019.12.130>
- Zaitseva, N.V., Symonenko, S.V., Titova, O.A., Osadchyi, V.V., & Osadcha, K.P. (2023). Fostering communication and collaboration skills for computer science students by means of ICT tools. *CEUR Workshop Proceedings*, 3553, 43-56.
- Zelenin, V., Andrushchenko, T., Mymryk, M., Oleksiienko, O., & Vashchenko, K. (2023). Introduction of coaching technologies into educational practice. *Journal of Higher Education Theory and Practice*, 23(2), 154-161. <https://doi.org/10.33423/jhetp.v23i2.5817>