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Table S1. Basic Matrix

	Strengths (S)	Weaknesses (W)
Internal factors	*1. Studio Learning Model:* • Availability of lecture rooms equipped with interactive tools. • Availability of trained teaching staff. • Availability of presentation material, including virtual works. • Collective work of the student group about the lesson. • The possibility of dialogue learning. • Availability of job centres.	*1. Studio Learning Model:* • Not every lecture is suitable for an active or interactive model - there are passive. • Several teaching staff lack the skills to conduct interactive classes • Different levels of interactive information perception among students. • The complexity and laboriousness of preparing relevant content for classes • An insufficient number of prepared classrooms for small groups. • The need to periodically update both the technical equipment of the audience and the presentation material. • The need to develop interactive material on the entire subject of the discipline.
	2. Chinese Maker Education Model: • The university has a design bureau with a prototyping laboratory. • Students participate in Hackathons, where they solve modern production problems. • In the topics of the course and diploma projects, the problems of enterprises with the potential implementation of student solutions are considered. • Students and undergraduates receive intellectual property certificates and patents. • Students do an internship with dual training. • Gaining knowledge through problem solving.	*2. Chinese Maker Education Model:* • The need for teaching staff with practical experience to assess the innovativeness of the project. • It is necessary to change the content of several disciplines to achieve interdisciplinarity in research. • It is necessary to involve in the process several teaching staff from different disciplines, but implement a single strategy. • The scientific and inventive component of the research is studied only in the master's program. • Reduction of time for obtaining basic knowledge when participating in the project. • A lot of time to prepare and implement a project ready for implementation.
	3. Philippine STEAM Education Model • The learning process is monitored. • Operational planning is carried out based on the analysis of academic performance. • Knowledge as a basis for decision-making. • Focus on results. • Promotes the formation of the student's skills: artistic, labour, constructive and technical. • The positive contribution of students' creative activity to the effectiveness of their individual academic subject's study. • Epistemological beliefs form cognitive structures like the schemes proposed in the theory of intellectual development by J. Piaget, which provides a tendency to change and develop during the student's academic life.	*3. Philippine STEAM Education Model:* • Development of skills in the implementation of project work by students. • Providing the teaching staff with the necessary "professional" support to the student. • There is no "Teacher-mentor" position in the vertical trajectory of teaching staff professional growth. • Not always the involvement of a student in non-core disciplines leads to an increase in his psychological resources, which can then be used to solve professional problems. • Requires strong psychological and pedagogical skills.

	4. iSTEAM Teaching Model: • The presence of special disciplines related to modelling, design. development and construction of 3D objects. • Availability of objects prototypes database that make up and apply in the specialty. • Opportunity to select the best sample from several proposed projects with a discussion of its strengths and weaknesses. • Systematization of acquired knowledge. • Possibility of real evaluation of developed projects and prototypes • Focus on personal scenarios of behaviour and actions.	*4. iSTEAM Teaching Model:* • A small number of special disciplines in which it is possible to implement this model. • Lack of spatial imagination in most students. • It is difficult to project real-world phenomena onto the studied technical disciplines. • For newly introduced disciplines, it is necessary to form a base of prototypes • Poor knowledge of team brainstorming techniques. • The theory of inventive problem solving is not applied. • No Team Project Presentations.
	5. Active Learning Model: • Students see connections between disciplines • Students see applications of knowledge in a particular subject, based on the knowledge base of other subjects, incl. non-core • Teachers interact with each other in the learning process. • Visualization of knowledge. • Systematization of knowledge based on symbolic logic. • Learning through project development. • Evolution of transactive memory focused on the accumulation and passive consumption of existing content.	*5. Active Learning Model* • High level of requirements for the preparation of educational content. • A large amount of preparatory work for the processing of material presented in the classical form. • Increasing the volume of stored information on the rate at the stage of the model implementation. • High requirements for the information infrastructure of the University. • The need to rebuild their own thinking for both the teacher and the student - today's transmission of information and its mechanical reproduction hinders the formation and consolidation of professional competencies. • Metacognition should be part of • professional baggage of the teacher - they should be easily explicated and used when working in a group.
	6. Border Removal Model: • Choosing a unique learning path. • Teaching students in special disciplines through projects. • Teaching students of different levels of training and abilities. • Several special disciplines are read by teaching staff of other departments. • Presentations, models, interactive with up-to-date information during the organization of integrated education.	*6. Border Removal Model:* • The choice of a unique learning path is difficult due to the small number of lecturers on special subjects. • The need to improve their professional competencies and continuous improvement of their professional activities. • Disclosure of the creative potential of teaching staff and students is required • Awareness that each student is individual and requires their own approach. • Requires extensive practical experience in the development and implementation of projects.
	7. Interdisciplinary Thinking Model: • A complete understanding of modern real-life problems. • Focus on innovative learning.	*7. Interdisciplinary Thinking Model:* • Requirement of full knowledge of at least one discipline.

	• Contributes to the fruitful solution of scientific problems. • Focus on vocational training and the opening of wide opportunities to demonstrate the role of disciplines in future professional activities. • Establishing links in the study and research of the fundamentals of sciences with the professional training of students.	• A sharp limitation on the possibility of the integrity of one item. • Combining the efforts of teachers of different subjects in achieving the educational effect of training. • Requirements for teachers of deeper and more thorough knowledge of related disciplines, joint planning of educational and extracurricular work forms, development of uniform requirements, consistency of terminology, notation, and interpretation of various concepts. • Requires a significant amount of time and close interaction of all teachers.
	8. Critical & Creative Thinking Model: • Development of students' independence. • Continuous development. • Success in the future profession. • Quick adaptation to new conditions. • Personal growth, self-esteem, and self-confidence. • Testing the proposed ideas. • Increasing cognitive motivation. • Active participation of students in the learning process.	*8. Critical & Creative Thinking Model:* • Low level of intellectual skills of critical analysis among teachers. • Preparing problem issues takes a lot of time for teachers. • Complicates the individual assessment of students.
External factors	*1. Studio Learning Model:* • The possibility of attracting lecturers from leading universities. • The possibility of using open, publicly available material on the topic of the lecture. • The possibility of replicating author's courses. • The possibility of improving the teaching staff of their qualifications.	*1. Studio Learning Model:* • Lack of guidelines for the development and implementation of interactive lectures for technical specialties. • Lack of financial resources and resources for the development of teaching staff in this direction. • Weak language training of teaching staff in technical disciplines. • Low level of production experience of the teaching staff for conducting discussions. • Low quality interactive course development. • The need to develop interactive material on the entire subject of the discipline.
	2. Chinese Maker Education Model: • Solving the problems and tasks of enterprises by the university. • Leading production specialists share their experience and knowledge. • The possibility to compete with students from other universities in Olympiads and Hackathons. • The possibility to commercialize your solutions. • The experience gained will allow you to get higher positions in employment • The possibility of potential employment while studying.	*2. Chinese Maker Education Model:* • Low interest in financing student projects by enterprises. • Low material interest of the leading specialists of the enterprise when working at the university and participating in joint projects. • Enterprises often donate yesterday's equipment to the university. • Enterprises do not contribute to the equipment and software of the laboratories of the University. • Often alumni associations are not patrons.

		• Enterprises do not implement innovative projects developed at the university.
	3. Philippine STEAM Education Model: • Inclusion in courses of disciplines necessary for the development of the scientific and industrial complex of the country. • Using the mentoring mechanism allows you to transfer knowledge, form the necessary skills and awareness faster than traditional methods. • Stimulating the development of a modern student's need for self-improvement, contributing to his personal self-realization and professional formation when choosing a professional trajectory. • Transition from a critical thinker to a qualified graduate.	*3. Philippine STEAM Education Model:* • Reducing of the funding level for material equipment. • Loss of technologies relevance and systems involved in training. • Inconsistency of the training level of production representatives during the classes.
	4. iSTEAM Teaching Model: • Build effective interaction with end users of innovative solutions. • Identify and analyse market needs using design thinking tools. • Use modern prototyping and testing models based on design thinking and business empathy. • Development of the creative industry process. • Development of cognitive skills.	*4. iSTEAM Teaching Model:* • Weak feedback from employers, as well as their low involvement in the learning process. • Lack of predictive need for personnel for production. • Low motivation of employers to participate in solving the main tasks of the university.
	5. Active Learning Model: • The composition and content of the competencies of pedagogical activity can be adjusted under the guidance of the employer. • Expansion of the acquired knowledge application range for various fields of science and technology. • The task of forming subject, interdisciplinary and personal competencies is considered as the main educational results of students. • Expansion of psychological, pedagogical, and organizational conditions for learning. • Formation of the student's innovative thinking, which should provide a "soft" overcoming of peak loads in the information world.	*5. Active Learning Model:* • A trained graduate may have difficulty working in a team with a classical form of education. • Many different mental "views" on the same phenomenon. • Distortion of perception and comprehension of new information - to allow unacceptable. • Professionalism of the specialist; direction of his thinking.
	6. Border Removal Model: • Provides interaction with specialists in different areas. • Expanding the scope of skills. • Reducing the psychological barrier in the study of disciplines. • Conditions for the successful socialization of a student in order to choose the most optimal	*6. Border Removal Model:* • Be in a partner position in relation to the teaching staff of other departments in solving various pedagogical situations. • Be a “reflective (i.e., observant and thoughtful) practitioner”, develop the ability for critical and systemic thinking.

	form of his education and / or integration model. • Ability to analyse and design interpersonal, group and intergroup communications. • Unleashing the potential of each student in accordance with the principle of pedagogical optimism.	• Project topics should correlate with the current scientific and practical situation in the world.
	7. Interdisciplinary Thinking Model: • The possibility to study problems through the prism of several disciplines to the synthesis and integration of ideas into a more comprehensive framework of analysis. • The possibility for students to effectively implement Start-up projects. • The possibility to go to the solution of specific practical problems. • Possibilities of complex application of knowledge from various subjects. • The possibility to provide for the development of backbone ideas, concepts, general scientific methods of educational activity. • The possibility to apply methods specific to one discipline in other areas of knowledge, generating new interdisciplinary tools.	*7. Interdisciplinary Thinking Model:* • The danger of incorrect synthesis. • Students have a low level of ability to synthesize or integrate ideas from several disciplines into a comprehensive structure of analysis. • Effective organization of joint activities of specialists of various profiles and training of specialists is required. • Students' inability to transfer the knowledge gained in the study of one discipline to explain the processes studied in other disciplines. • The ability to identify connections that are considered in the content of one discipline, and, conversely, coming from the discipline to other academic disciplines. • Low level of students' cognitive activity organization. • Students have poorly formed knowledge and skills that allow them to correctly navigate specific tasks, apply this knowledge to solve problems related to their future specialty.
	8. Critical & Creative Thinking Model: • The possibility of students to choose the best option from a variety of possible. • The possibility to build the educational process on scientifically based patterns of interaction between personality and information. • The possibility to conduct training based on the principles of cooperation, joint planning, and meaningfulness. • The possibility to reflect. • The possibility to create conditions for the formation of mental activity skills. • The possibility to present educational material, activating the mental abilities of students using the potential of their knowledge. • The possibility to make non-standard decisions, surprise with new ideas. • 8. The student's ability to verify the statements that come to him	*8. Critical & Creative Thinking Model:* • The complexity of preparing for the lesson. • Difficulties of management, control, evaluation of cognitive activity of students. • Requires more time to achieve the goal of the lesson.

Table S2–S7: Level 1 Solution Matrix

Table S2. S-O - line of force

S-O: Strengths + Opportunities		
Strengths (S)	**Opportunities (O)**	**Decisions**
Studio Learning Model		
• The possibility of presentation material, including virtual practical and laboratory work. • Collective work of the student group on the topic of the lesson. • The possibility of centers for working professions. • The possibility of interactive learning methods for the development of course projects.	• Opportunity to attract lecturers from leading universities. • The possibility of using open access to educational material on the subject of the lecture, including author's courses. • The possibility of online access for highly qualified improvement of teaching staff of their qualifications (Coursera). • Large selection of multi-level, incl. international, language courses for the preparation of teaching staff.	• Expansion of the list of presentation material through cooperation with foreign scientists. • Creation of a digital resource center for the development of MOOCs, virtual laboratories to provide the educational process with digital content. • Advanced training of teaching staff, aimed at the formation and development of highly specialized, pedagogical, language and IT competencies. • Formation of professional competencies among students through the centers of working professions, design and design bureaus. • Organization of scientific seminars for students to discuss and discuss issues of education.
Chinese Maker Education Model		
• The work of the design office using prototyping laboratories. • Participation of students in Hackathons to solve modern production problems. • In course and diploma projects, the problems of enterprises are considered with the potential implementation of student solutions. • Development by students and undergraduates of industrial products patents, including CIP. • Students undergo an internship with elements of dual training. • Conducting practical classes at the branches of the department. • Gaining knowledge through solving production problems. • Presence of related interdisciplinarity.	• Performance of work focused on solving specific production problems together with the enterprise. • Involvement of leading specialists of enterprises in the educational process to transfer the accumulated experience and knowledge. • Possibility to compete with students from other universities in Olympiads and Hackathons in terms of practical project activities. • Possibility of commercialization of own and third-party solutions. • High positions in employment due to practical experience, incl. while studying.	• Organization of training (in addition to industrial practice) at the branches of the departments together with leading specialists of partner enterprises. • Cooperation between the Centers for Working Professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Support for student start-up projects by business incubators and technology parks. • Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activities. • Creation of an industrial engineering school based on the Business Skills Park. • Orientation of special disciplines related to modeling, design development and construction of 3D objects for solving inventive problems. • Presentation to potential employers of the achievements

		of students during meetings and Job Fairs • Holding competitions and olympiads with their coverage through the media with the involvement of sponsors and recruiting agencies • Development of interdisciplinary areas of work of design bureaus
Philippine STEAM Education Model		
• Regular analysis of students' academic achievements is carried out. • Operational planning is carried out based on the analysis of academic performance. • Continuity of knowledge as the basis of decision-making and focus on results. • Formation of versatile engineering skills of the student (labor, constructive and technical, center of working professions). • The presence of students' creative activity in certain academic disciplines.	• The interest of enterprises in the subject and projects of a number of disciplines for the development of the scientific and industrial complex of the country. • The presence of a mentoring mechanism from the production side, which allows you to transfer knowledge, form the necessary skills and awareness faster than traditional methods. • Orientation of the learning process to the labor market. • Transition to critical thinking in education.	• Presentation of students' achievements to potential employers during meetings and Job fairs. • Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the scientific activity results. • Cooperation of Working Professions Centers and Business Skills of the park to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Creating conditions for the involvement of leading specialists of enterprises in mentoring programs. • Involvement of employers in designing the content of educational programs. • Application of interactive teaching methods.
iSTEAM Teaching Model		
• The presence of special disciplines related to modeling, design development and construction of 3D objects. • Possibility of objects prototypes database and their components applicable in the specialty. • Analysis of the course projects results in the process of discussion. • A sufficient level of developed projects and prototypes evaluation. • Support personal scenario of professional development.	• A sufficient level of effective interaction to obtain innovative solutions. • Prerequisites for the development of the creative industry process.	• Orientation of special disciplines related to modeling, design development and construction of 3D objects for solving inventive problems. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Support for student start-up projects by business incubators and technology parks. • Creation of an industrial engineering school based on the Business Skills Park. • Development of a methodology for assessing the parameters of the state and development of the professional development system (economic, socio-psychological, socio-cultural, ideological) to support a

		personal scenario of professional development.
Active Learning Model		
• Active use of the transdisciplinary approach. • Implementation of project-based learning. • Formation of transactive memory focused on the accumulation and consumption of existing content.	• Involving employers in the active design of the competencies of pedagogical activity and adjusting their content. • Expanding the range of application of the acquired knowledge for various fields of science and technology. • Formation of the prerequisites for innovative thinking in the student, which should provide a "soft" overcoming of peak loads in the information world.	• Involving employers in designing the content of educational programs. • Cooperation between the Centers of working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Development of "soft skills" among students by adjusting the content of the disciplines of the GED cycle. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Application of interactive teaching methods.
Border Removal Model		
• Choice of learning path. • Teaching students in special disciplines via projects. • Reading of special disciplines by specialized specialists.	• Interaction with specialists from different fields. • Expansion of the skills application scope in various technical fields in the implementation of inter-departmental projects. • Prerequisites for the student's ability to choose the most optimal form of his education or integration model. • Expansion of possible scientific collaborations in interdisciplinary areas.	• Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the scientific activities results. • Organization of training (in addition to industrial practice) at the branches of the departments together with leading specialists of partner enterprises. • Expansion of the key competencies area for the training of generalists in industries within the existing EP. • Orientation of special disciplines related to modeling, design development and construction of 3D objects for solving inventive problems. • Active use of project-based learning methods. • Obtaining and improving practical skills in parallel with theoretical training. • Reading of special disciplines by the profiling department teaching staff. • Organization of advanced training courses for teaching staff on the implementation of co-teaching methods.

Interdisciplinary Thinking Model		
• Full understanding of contemporary real life problems. • Sufficient level of information literacy among teaching staff and students	• Sufficient level of the knowledge base use obtained as a result of training for the synthesis and integration of ideas in interdisciplinary fields. • The opportunity for students to implement startup projects. • The ability to solve specific practical problems. • The possibility to provide for the development of system-forming ideas, concepts, general scientific techniques in educational activities.	• Redistribution of the GED disciplines cycle for the entire duration of undergraduate studies with mandatory revision of the content of training. • Development of interdisciplinary design bureaus work areas. • Support of student start-up projects by business incubators and technology parks.
Critical & Creative Thinking Model		
• Orientation of the educational process to the development of independence among students. • Support for students' self-awareness. • Conditions have been created for adaptation, flexibility and openness of student thinking to new conditions. • Creating conditions for personal growth among students, increasing self-esteem and self-confidence. • Willingness to discuss the proposed ideas.	• Ability to conduct learning based on the principles of cooperation, joint planning and meaningfulness. • Improving the quality of specialist training through external evaluation of emerging competencies. • Search for new ideas for cooperation in educational and research activities based on the experience of participating in competitions.	• The development of "soft skills" among students by adjusting the content of the GED cycle disciplines. • Involving employers in designing the content of educational programs. • Cooperation between the Centers for Working Professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Organization of professional skills competitions among students. • Support for student scientific projects, assistance with the publication of the scientific activities results. • Organization of competitions and conferences for students.

Table S3. W-O - improvement line

W-O: Weaknesses + Opportunities		
Weaknesses (W)	**Opportunities (O)**	**Decisions**
Studio Learning Model		
• The absence of studios-auditoriums with a variety of material and technical support (SMART-POINT). • Low degree of teaching staff preparedness (pedagogical design of Studio education-SE), development of creative and dialogical communication, interactive methods. • The format of the traditional lecture is used (the format of the teacher-centered approach lecture). • Lack of practice in the educational process of using teaching methods that promote the perception of interactive information (different perceptions of students). • Low readiness of teaching staff to develop relevant content for classes. • Low level of technical equipment of classrooms.	• The possibility to attract lecturers from leading universities. • The possibility of using open access to educational material on the subject of the lecture, including author's courses. • The possibility of online access for highly qualified improvement of teaching staff of their qualifications (Coursera). • Large selection of multi-level, incl. international, language courses for the preparation of teaching staff.	• Organization of the educational process through DLT. • Ensuring access to educational resources of partners by expanding the ways of cooperation in the field of education and science. • Organization of advanced training courses for teaching staff on the management of the pedagogical process. • Creation of a digital resource center for the development of MOOCs and the provision of the educational process with digital content. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies. • Organization of training (in addition to industrial practice) at the branches of the departments together with leading specialists of partner enterprises. • Updating the material and technical base at the expense of partner enterprises. • Reflection of teaching staff for prompt adjustment of pedagogical activity.
Chinese Maker Education Model		
• Low degree of teaching staff production experience (to assess the innovativeness of the project). • The lack of teaching staff of low readiness to change the content of a number of disciplines at once, in order to achieve interdisciplinarity in research. • Lack of teaching staff joint work of different fields of knowledge. • The absence of a scientific and inventive component in the educational programs of the bachelor's degree. • Lack of organizational skills in the management of course projects by teaching staff, in	• Performance of work focused on solving specific production problems together with the enterprise. • Involvement of leading specialists of enterprises in the educational process to transfer the accumulated experience and knowledge. • The possibility to compete with students from other universities in Olympiads and Hackathons in terms of practical project activities. • The possibility of commercialization of own and third-party solutions. • High positions in employment due to practical experience, incl. while studying	• Organization of advanced training courses for teaching staff in the management of the pedagogical process. • Organization of internships for teaching staff at enterprises and leading universities. • Orientation of special disciplines related to modeling, design development and construction of 3D objects for solving inventive problems. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises.

the choice of themes that allow optimal mastering of the course. • The complexity of implementing the results of scientific work and projects (documentation)		• Creation of an industrial engineering school based on the Business Skills Park. • Organization of advanced training courses for teaching staff on the implementation of co-teaching methods. • Holding competitions and olympiads with their coverage through the media with the involvement of sponsors and recruiting agencies. • Support for student scientific projects, assistance with the publication of the scientific activities results. • Organization of competitions and conferences for students.
Philippine STEAM Education Model		
• Insufficient development of students' project skills. • Lack of organization and management of the educational process in terms of providing consulting assistance to students in the field of solving professional problems. • The absence of the "Teacher-mentor" position in the vertical trajectory of the professional growth of teaching staff. • The lack of orientation of the GED cycle towards the formation of professionally important personality traits. • Low level of socio-psychological, pedagogical components of the teaching staff, low level of didactic skills of the teaching staff. • The EP does not provide for the individual needs of students according to the theory of intellectual development by J. Piaget, which provides a tendency to change and develop during the student's educational life.	• The interest of enterprises in the topics and projects of a number of disciplines for the development of the scientific and industrial complex of the country. • The presence of a mentoring mechanism from the production side, which allows you to transfer knowledge, form the necessary skills and awareness faster than traditional methods. • Orientation of the learning process to the labor market. • Transition to critical thinking in education.	• Motivation of teaching staff to develop and implement innovative courses. • Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the scientific activities results. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Redistribution of the disciplines of the GED cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education. • Reflection of teaching staff for prompt adjustment of pedagogical activity.
iSTEAM Teaching Model		
• Basic and major disciplines do not provide for the development of imagination and modeling skills. • Curricula of the OOD cycle do not focus on the development of imagination skills. • Formal approach of teaching staff to the discussion of the process and results of educational activities.	• A sufficient level of effective interaction to obtain innovative solutions. • Prerequisites for the development of the creative industry process.	• Redistribution of the GED cycle disciplines for the entire period of study in the bachelor's degree with a mandatory revision of the education content. • Improving the mechanisms for stimulating teaching staff to introduce innovative teaching methods.

• Low degree of readiness of teaching staff to project real-world phenomena onto the taught technical disciplines. • Low readiness of teaching staff to use team brainstorming techniques. • In the educational process, there is no application of the theory of solving inventive problems, the practice of presenting team projects		• Broadcast of master classes and open classes with discussion and development of recommendations. • Reflection of teaching staff for prompt adjustment of pedagogical activity. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Cooperation between the Centers for Working Professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Preparation of university teams for participation in scientific and educational competitions at various levels. • Organization of trainings on the ability to work in a team.
Active Learning Model		
• Low level of interdisciplinary collaboration. • Low level of co-teaching. • Lack of visual modes of communication in the process of teaching technical disciplines. • Low readiness of teaching staff to ensure the quality of the educational process. • Low level of flexibility in the thinking of teaching staff to transform the educational material in accordance with international standards. • Lack of technical capacity to store digital content. • Outdated information and communication of university infrastructure. • Insufficiency of the application level of active learning methods by teaching staff. • Low level of performance criteria for achieving learning goals aimed at developing students' metacognitive skills. • Inability to reach consensus when there are many ideas and ways to implement them.	• Involving employers in the active design of the pedagogical activity competencies and adjusting their content. • Expanding the range of the acquired knowledge application for various fields of science and technology. • Formation of the prerequisites for innovative thinking in the student, which should provide a "soft" overcoming of peak loads in the information world.	• Development of a system of material incentives for teaching staff in the field of creative thinking development. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Development of the digital ecosystem of the university. • Expansion of the area of key competencies for the training of generalists in industries within the framework of the existing EP. • Involving employers in designing the content of educational programs.
Border Removal Model		

• Low level of students' creative potential disclosure. • The uniqueness of the trajectory is not ensured due to the low percentage of specialists involvement. • Lack of applying horizontal blurring and vertical orientation of students' method. • Low level of differentiated approach to students. • Lack of extensive practical experience in the development and implementation of projects. • Low readiness of teaching staff to accept mistakes in the learning process (didactic error functions). • Low level of communicative interaction and tolerance among teaching staff in solving various pedagogical situations.	• Interaction with specialists of different directions. • Expanding the scope of skills application in various technical sectors in the implementation of interdepartmental projects. • Prerequisites for the possibility of choosing the most optimal form of education and integration model for the student. • Expansion of possible scientific collaborations in interdisciplinary fields.	• Conducting creative Olympiads and hackathons with the involvement of mentors and sponsors from among employers. • Involvement of employers in designing the content of educational programs. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Cooperation of the Centers of Working Professions and Business Skills of the park to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Organization of student-centered learning with the actualization of the tutor-facilitator functionality of the teacher.
Interdisciplinary Thinking Model		
• Low focus on innovative learning. • Formal approach to involving students in solving scientific problems. • Lack of support for student educational and scientific initiatives. • The lack of a scientific approach in the orientation of students in their future professional activities. • Lack of co-teaching. • Low level of interpersonal competencies among teaching staff. • Low level of students' ability to synthesize or integrate ideas from a number of disciplines into a comprehensive framework of analysis. • Low level of students' ability to determine interdisciplinary connections within the framework of studying disciplines. • Low level of interdisciplinary connections within the framework of studying EP courses.	• A sufficient level of use of the knowledge base obtained as a result of training for the synthesis and integration of ideas in interdisciplinary areas. • Opportunity for students to implement startup projects. • The ability to go to the solution of specific practical problems. • The ability to provide for the development of backbone ideas, concepts, general scientific methods in educational activities.	• Motivation of teaching staff to develop and implement innovative courses. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Holding creative olympiads and hackathons with the involvement of mentors and sponsors from among employers. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Organization of student-centered learning with the actualization of the tutor-facilitator functionality of the teacher. • Expansion of the area of key competencies for the training of generalists in industries within the framework of the existing EP. • Creation of conditions for the involvement of leading

		specialists of enterprises in mentoring programs.
Critical & Creative Thinking Model		
• Low level of intellectual skills of critical analysis among teachers. • Lack of approaches for individual assessment of students. • Low level of methods applicability for the motivational orientation of students.	• Ability to conduct learning based on the principles of cooperation, joint planning and meaningfulness. • Improving the quality of specialist training via external evaluation of emerging competencies. • Search for new ideas for cooperation in educational and research activities based on the experience of participating in competitions.	• Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Holding creative competitions and hackathons with the involvement of mentors and sponsors from among employers.

Table S4. S-T - line of defense

S-T: Strengths + Threats		
Strengths (S)	**Threats (T)**	**Decisions**
Studio Learning Model		
• Availability of presentation material, including virtual practical and laboratory work. • Collective work of the student group on the topic of the lesson. • Availability of centers for working professions. • Application of interactive learning methods for the development of course projects.	• The lack of a single standard for the development and conduct of interactive lectures for technical specialties. • Lack of funds and resources of various levels for the teaching staff to pass highly qualified certified courses. • Weak opportunity to gain production experience of teaching staff at enterprises.	• Creation of a digital resource center for the development of MOOCs and the provision of the educational process with digital content. • Involving employers in training and internships of teaching staff to work with innovative equipment and the creation of university-enterprise collaborations. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises.
Chinese Maker Education Model		
• The work of the design office using prototyping laboratories. • Participation of students in Hackathons to solve modern production problems. • In course and diploma projects, the problems of enterprises are considered with the potential implementation of student decisions. • Development of industrial products by students and undergraduates, participation in obtaining patents, intellectual property certificate. • Students undergo an internship with elements of dual training. • Conducting practical classes at the branches of the department. • Gaining knowledge via solving production problems. • Presence of related interdisciplinarity.	• Low interest in financing student projects by enterprises. • Low material interest of the the enterprise leading specialists when working at the university and participating in joint projects. • Transfer to a university with the collaboration of obsolete equipment. • Low participation of alumni in stakeholders. • Lack of innovative projects implementation developed at the University at enterprises.	• Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Creation of a workable alumni association. • Improving the academic reputation of the University, work on the brand and image of the University, the elitism of graduates. • Motivation of graduates to promote alma mater in society. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the scientific activities results.
Philippine STEAM Education Model		
• Regular analysis of students' educational achievements is carried out. • Operational planning is carried out based on the analysis of progress. • Continuity of knowledge as the basis for decision-making and focus on results. • Formation of versatile engineering skills of the student (labor, structural and	• Reducing the level of public funding for material equipment. • Backlog of learning technologies from the production process. • Lack of pedagogical skills of production representatives during classes. • Low level of mentoring from the production side.	• Concluding contracts with enterprises for the performance of contractual work, conducting internships at enterprises with subsequent employment of graduates. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise".

technical, center of working professions). • The presence of creative activity of students in certain academic disciplines.		• Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students.
iSTEAM Teaching Model:		
• The presence of special disciplines related to modeling, design development and construction of 3D objects. • Availability of a database of objects prototypes and their components applicable in the specialty. • Analysis of the course results projects in the process of discussion. • A sufficient level of developed projects and prototypes evaluation. • Support personal scenario of professional development.	• Weak feedback from employers, as well as their low involvement in the learning process. • Lack of predictive need for personnel for production. • Low motivation of employers to participate in solving the main tasks of the university. • Low level of design thinking tools used to identify and analyze market needs. • Low level of design thinking and business empathy in applying modern prototyping and testing models.	• Supervision of scientific projects by specialists of enterprises with students' subsequent recruitment. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the scientific activities results. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Development of the university digital ecosystem. • Expansion of student participation in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas.
Active Learning Model		
• Active use of the transdisciplinary approach. • Implementation of project-based learning. • Formation of transactive memory focused on the accumulation and consumption of existing content.	• The manifestation of conflicts in solving the tasks set for graduates with a production team trained in the classical form of education. • The use in the educational process of distorted / inaccurate information about socio-economic, technological, innovative processes. • Decrease in the quality of students' educational achievements due to the low level of subject formation, interdisciplinary and personal competencies. • The lack of the participation possibility of teaching staff in foreign programs for advanced training of teaching staff in the field of pedagogical skills, including those financed from the republican budget.	• Organization of postgraduate support for engineering personnel, advanced training courses. • Involvement of teaching staff in grant, contractual financing of scientific activities. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Revision of curricula to improve interdisciplinary and personal competencies. • Motivation of teaching staff to participate in competitions for winning grants for advanced training and pedagogical skills.
Border Removal Model		
• Choice of learning path. • Teaching students in special disciplines through projects. • Reading of special disciplines by narrow specialists.	• Low level of communicative interaction and tolerance among teaching staff in the international educational space.	• Organization of advanced training courses for teaching staff on the development of communicative interaction and tolerance, as well as language courses.

	• Low level of students' ability development to critical and systemic thinking. • Reducing the level of correlation between the topics of scientific and student projects with the current scientific and practical situation in the world. • The need for analysis and design of interpersonal, group and intergroup communications in accordance with international practice. • Reducing the level of psychological readiness of applicants for learning and searching for interdisciplinary connections.	• Organization of trainings on the ability to work in a team to solve problems. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Expanding the participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Organization of student-centered learning with the actualization of the tutor-facilitator functionality of the teacher. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies.
Interdisciplinary Thinking Model		
• A complete understanding of modern real-life problems. • Sufficient level of information literacy among teaching staff and students.	• The presence of knowledge ineffective synthesis risks in various disciplines. • Reducing the financial stability of employers, leading to a decrease in funding for the specialists training with interdisciplinary competencies. • Lack of application of methods characteristic of one discipline in other fields of knowledge for the development of new interdisciplinary tools. • Low level of knowledge complex application from various subjects.	• Organization of trainings on the ability to work in a team to solve problems. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Expanding the participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Expanding the competencies of teaching staff via participation in interdisciplinary and interdepartmental projects.
Critical & Creative Thinking Model		
• Orientation of the educational process to the development of independence among students. • Support for students' self-awareness. • Conditions have been created for adaptation, flexibility and openness of student thinking to new conditions.	• The negative impact of socio-psychological factors on the formation of critical thinking abilities. • The prevailing stereotypes in society that hinder the promotion and development of creative ideas. • A formal attitude to changing the passive role of students in	• Development of a methodology for assessing the parameters of the state and development of the professional development system (economic, socio-psychological, socio-cultural, ideological) to support a personal scenario of professional development.

• Creating conditions for personal growth among students, increasing self-esteem and self-confidence. • Willingness to discuss the proposed ideas.	the system of higher education and, as a result, the lack of students' motivation to search for new ideas and comprehend information critically. • Insufficient level of the educational process organization using popular foreign educational resources, taking into account scientifically based patterns of interaction between the individual and information.	• Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Development of the university digital ecosystem. • Development of "soft skills" among students by adjusting the content of the disciplines of the GED cycle. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies.

Table S5. W-T - warning line

W-T: Weaknesses + Threats		
Weaknesses (W)	**Threats (T)**	**Decisions**
Studio Learning Model		
• Absence of studios-audiences with a variety of material and technical support (SMART-POINT). • Low degree of the teaching staff preparedness (pedagogical design of the Studio Training of CO), the development of creative and interactive communication, interactive methods. • The traditional lecture format will be applied (teacher-centered approach). • Absence in the educational process of the practice of using teaching methods that contribute to the perception of interactive information (different perceptions of students). • Low readiness of teaching staff to develop appropriate content for classes • Low level of classrooms technical equipment	• The lack of a single standard for the development and conduct of interactive lectures for technical specialties. • Lack of funds and resources of various levels for the teaching staff to pass highly qualified certified courses. • Weak opportunity to gain production experience of teaching staff at enterprises.	• Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise".
Chinese Maker Education Model		
• Low degree of teaching staff of production experience (to assess the innovativeness of the project). • The lack of teaching staff low readiness to change the content of a number of disciplines at once, in order to achieve interdisciplinarity in research. • Lack of teaching staff joint work of different fields of knowledge. • Lack of scientific and inventive component in undergraduate educational programs. • Lack of organizational skills in the management of course projects by teaching staff, in the choice of topics that allow optimal mastering of the course. • The complexity of implementing the results of scientific work and projects (documentation).	• Low interest in financing student projects by enterprises. • Low material interest of the leading specialists of the enterprise when working at the university and participating in joint projects. • Transfer to a university with the collaboration of obsolete equipment. • Low participation of alumni in stakeholders. • Lack of implementation of innovative projects developed at the University at enterprises.	• Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Creation of a workable alumni association. • Improving the academic reputation of the University, work on the brand and image of the University, the elitism of graduates. • Motivation of graduates to promote alma mater in society. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of

		the results of scientific activities.
Philippine STEAM Education Model		
• Insufficient development of students project skills • Lack of organization and management of the educational process in terms of providing consulting assistance to students in the field of solving professional problems. • The absence of the position of "Teacher-mentor" in the vertical trajectory of the teaching staff professional growth. • The lack of the GED cycle orientation towards the formation of professionally important personality traits. • Low level of socio-psychological, pedagogical components of the teaching staff, low level of the teaching staff didactic skills. • The EP does not provide for the individual needs of students according to the theory of intellectual development by J. Piaget, which provides a tendency to change and develop during the student's educational life.	• Reducing the level of public funding for material equipment. • Backlog of learning technologies from the production process. • Lack of pedagogical skills of production representatives during classes. • Low level of mentoring from the production side.	• Conclusion of contracts with enterprises for the performance of contractual works, conducting practical training at enterprises with subsequent employment of graduates. • Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise". • Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students.
iSTEAM Teaching Model		
• Basic and profile disciplines do not provide for the development of imagination and modeling skills. • The curricula of the GED cycle are not focused on the development of imagination skills. • Formal approach of teaching staff to the discussion of the process and results of educational activities. • The low degree of readiness of teaching staff to project real-world phenomena on the taught technical disciplines. • Low degree of teaching staff readiness for the use of team brainstorming techniques. • In the educational process there is no application of the theory of solving inventive tasks, the practice of team projects presentations.	• Weak feedback from employers, as well as their low involvement in the learning process. • There is no forecast need for personnel for production. • Low motivation of employers to participate in solving the main tasks of the university. • Low level of design thinking tools used to identify and analyze market needs. • Low level of design thinking and business empathy in the application of modern prototyping and testing models.	• Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activity. • Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise". • Development of the University's digital ecosystem. • Expansion of students' participation in Olympiads, contests, hackathons in order to enrich, generate, adopt and use productive ideas.

Active Learning Model		
• Low level of interdisciplinary collaboration. • Low level of co-teaching. • Lack of communication visual modes in the process of teaching technical disciplines. • Low readiness of teaching staff to ensure the quality of the educational process. • The low level of the teaching staff's thinking flexibility to transform the educational material into compliance with international standards. • Lack of technical capacity to store digital content. • Outdated information and communication infrastructure of the University. • Insufficiency of the level of teaching staff application methods of active learning. • Low level of performance criteria for achieving educational goals aimed at developing students' metacognitive skills. • Inability to come to a consensus when there are many ideas and ways to implement them.	• Manifestation of conflicts in solving the tasks of graduates with a production team prepared according to the classical form of education. • The use of distorted/unreliable information about socio-economic, technological, innovative processes in the educational process. • Decrease in the quality of educational achievements of students due to the low level of formation of subject, interdisciplinary and personal competencies. • The absence of the possibility of teaching staff participation in foreign training programs of teaching staff in the field of pedagogical skills, including those funded from the republican budget.	• Organization of postgraduate support of engineering personnel, advanced training courses. • Involvement of teaching staff in grant, contractual financing of scientific activities. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Revision of curricula in order to improve interdisciplinary and personal competencies • Motivation of teaching staff to participate in competitions to win grants for advanced training and pedagogical skills.
Border Removal Model		
• Low level of creative potential disclosure. • The uniqueness of the trajectory is not ensured due to the low percentage of specialists involvement. • Lack of a method of applying horizontal blurring and vertical orientation of students • Low level of differentiated approach to students. • Lack of extensive practical experience in the development and implementation of projects. • Low readiness of teaching staff to accept mistakes in the learning process (didactic error functions). • Low level of communicative interaction and tolerance among teaching staff in solving various pedagogical situations.	• Low level of communicative interaction and tolerance among teaching staff in the international educational space. • The low level of the applicants' ability development to critical and systemic thinking. • Reducing the level of correlation of the topics of scientific and student projects with the current scientific and practical situation in the world. • The need to analyze and design interpersonal, group and intergroup communications in accordance with international practice. • Reducing the level of psychological readiness of applicants to study and search for interdisciplinary connections.	• Development of a methodology for assessing the parameters of the state and development of the professional development system (economic, socio-psychological, socio-cultural, ideological) to support a personal scenario of professional development. • Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise". • Development of the University's digital ecosystem. • Development of "soft skills" among students by adjusting the content of the GED cycle disciplines. • Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies.

Interdisciplinary Thinking Model		
• Low focus on innovative learning. • Formal approach to involving students in solving scientific problems. • Lack of support for student educational and scientific initiatives. • The lack of a scientific approach in the orientation of students in their future professional activities. • Lack of co-teaching. • Low level of interpersonal competencies among teaching staff. • Low level of students' ability to synthesize or integrate ideas from a number of disciplines into a comprehensive structure of analysis. • Low level of students' ability to determine interdisciplinary connections within the framework of studying disciplines. • Low level of interdisciplinary connections within the framework of studying EP courses.	• The presence of ineffective synthesis risks of knowledge in various disciplines. • Reducing the financial stability of employers, leading to a decrease in funding for the training of specialists with interdisciplinary competencies. • Lack of methods characteristic application of one discipline in other fields of knowledge for the development of new interdisciplinary tools. • Low level of knowledge complex application from various subjects.	• Organization of trainings on the ability to work in a team to solve problems. • Students' involvement and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Expanding the participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Expanding the competencies of teaching staff through participation in interdisciplinary and interdepartmental projects.
Critical & Creative Thinking Model		
• Low level of intellectual skills of critical analysis among teachers. • Lack of approaches for individual assessment of students. • Low level of methods applicability for the motivational orientation of students.	• The negative impact of socio-psychological factors on the formation of critical thinking abilities. • The prevailing stereotypes in society that hinder the promotion and development of creative ideas. • A formal attitude to changing the passive role of students in the system of higher education and, as a result, the lack of motivation of students to search for new ideas and critically comprehend information. • Insufficient level of organization of the educational process using popular foreign educational resources, taking into account scientifically based patterns of interaction between the individual and information.	• Organization of advanced training courses for teaching staff on the development of communicative interaction and tolerance, as well as language courses. • Organization of trainings on the ability to work in a team to solve problems. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Expanding the participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Organization of student-centered learning with the actualization of the tutor-facilitator functionality of the teacher. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of

		professional, language and IT competencies.

Table S6. O-T – forecasting line (mutual influence line of external factors)

W-T: Weaknesses + Threats		
Opportunities (O)	**Threats (T)**	**Decisions**
Studio Learning Model		
• The possibility of attracting lecturers from leading universities. • The possibility of using open access to educational material on the topic of the lecture, including author's courses. • The possibility of online access for highly qualified improvement of the teaching staff of their qualifications (Coursera). • A large selection of multi-level, including international, language courses for the preparation of teaching staff.	• The lack of a single standard for the development and conduct of interactive lectures for technical specialties. • Lack of funds and resources of various levels for the teaching staff to pass highly qualified certified courses. • Weak opportunity to gain production experience of teaching staff at enterprises.	• Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise".
Chinese Maker Education Model		
• Performance of work focused on solving specific production problems together with the enterprise. • Involvement of enterprises leading specialists in the educational process to transfer the accumulated experience and knowledge. • Possibility to compete with students from other universities in Olympiads and Hackathons in terms of practical project activities. • Possibility of commercialization of own and third-party solutions. • High positions in employment due to practical experience, incl. while studying.	• Low interest in financing student projects by enterprises. • Low material interest of the enterprise leading specialists when working at the university and participating in joint projects. • Transfer to a university with the collaboration of obsolete equipment. • Low participation of alumni in stakeholders. • Lack of innovative projects implementation developed at the University at enterprises.	• Low interest in financing student projects by enterprises. • Low financial interest of the enterprise leading specialists when working at the University and participating in joint projects. • Transfer of outdated equipment to the university during collaboration. • Low level of alumni participation in stakeholders. • Lack of innovative projects implementation developed at the University, at enterprises. • Motivation of graduates to promote alma mater in society. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activity.
Philippine STEAM Education Model		
• The interest of enterprises in the topics and projects of a number of disciplines for the	• Reduction of the state funding level for material equipment.	• Conclusion of contracts with enterprises for the performance of contractual

development of the scientific and industrial complex of the country. • The presence of a mentoring mechanism on the part of production, which allows you to transfer knowledge, form the necessary skills and awareness faster than traditional methods. • Orientation of the learning process to the labor market. • Transition to critical thinking in training.	• Lagging learning technologies from the production process. • Lack of pedagogical skills of production representatives during classes. • Low level of mentoring from the production side.	works, conducting practical training at enterprises with subsequent employment of graduates. • Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise". • Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students.
iSTEAM Teaching Model		
• Sufficient level of effective interaction to obtain innovative solutions. • Availability of prerequisites for the development of the creative industry process.	• Weak feedback from employers, as well as their low involvement in the learning process. • There is no forecast need for personnel for production. • Low motivation of employers to participate in solving the main tasks of the university. • Low level of use of design thinking tools to identify and analyze market needs. • Low level of design thinking and business empathy in the application of modern prototyping and testing models.	• Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the scientific activity results. • Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise". • Development of the University's digital ecosystem. • Expansion of students' participation in Olympiads, contests, hackathons in order to enrich, generate, adopt and use productive ideas.
Active Learning Model		
• Involvement of employers in the active design of competencies of pedagogical activity and adjustment of their content. • Expanding the scope of application of the acquired knowledge for various fields of science and technology. • Formation of prerequisites for innovative thinking in the student, which should ensure a "soft" overcoming of peak loads in the information world.	• Manifestation of conflicts in solving the tasks of graduates with a production team prepared according to the classical form of education. • The use of distorted/unreliable information about socio-economic, technological, innovative processes in the educational process. • Decrease in the quality of students' educational achievements due to the low level of subject formation, interdisciplinary and personal competencies. • The absence of the possibility of teaching staff participation in foreign training programs of teaching staff in the field of pedagogical skills, including	• Organization of postgraduate support of engineering personnel, advanced training courses. • Involvement of teaching staff in grant, contractual financing of scientific activities. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Revision of curricula in order to improve interdisciplinary and personal competencies. • Motivation of teaching staff to participate in competitions to win grants for advanced training and pedagogical skills.

	those funded from the republican budget.	
Border Removal Model		
• Interaction with specialists from different fields. • Expansion of the scope of application of skills in various technical fields in the implementation of inter-departmental projects. • Prerequisites for the student's ability to choose the most optimal form of his education and / or integration model or transfer to weaknesses. • Expansion of possible scientific collaborations in interdisciplinary areas.	• Low level of communicative interaction and tolerance among teaching staff in the international educational space. • Low level of development of students' ability to critical and systemic thinking. • Reducing the level of correlation between the topics of scientific and student projects with the current scientific and practical situation in the world. • The need for analysis and design of interpersonal, group and intergroup communications in accordance with international practice. • Reducing the level of psychological readiness of applicants for learning and searching for interdisciplinary connections.	• Development of a methodology for assessing the parameters of the state and development of the professional development system (economic, socio-psychological, socio-cultural, ideological) to support a personal scenario of professional development. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Development of the digital ecosystem of the university. • Development of "soft skills" among students by adjusting the content of the disciplines of the OOD cycle. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies.
Interdisciplinary Thinking Model		
• A sufficient level of use of the knowledge base obtained as a result of training for the synthesis and integration of ideas in interdisciplinary areas. • Opportunity for students to implement Startup projects. • The ability to go to the solution of specific practical problems. • The ability to provide for the development of backbone ideas, concepts, general scientific methods in educational activities.	• The presence of risks of ineffective synthesis of knowledge in various disciplines. • Reducing the financial stability of employers, leading to a decrease in funding for the training of specialists with interdisciplinary competencies. • Lack of application of methods characteristic of one discipline in other fields of knowledge for the development of new interdisciplinary tools. • Low level of complex application of knowledge from various subjects.	• Organization of trainings on the ability to work in a team to solve problems. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Expanding the participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise". • Expanding the competencies of teaching staff through participation in interdisciplinary and interdepartmental projects.
Critical & Creative Thinking Model		

• Ability to conduct learning based on the principles of cooperation, joint planning and meaningfulness. • Improving the quality of specialist training through external evaluation of emerging competencies. • Search for new ideas for cooperation in educational and research activities based on the experience of participating in competitions.	• The negative impact of socio-psychological factors on the formation of critical thinking abilities. • The prevailing stereotypes in society that hinder the promotion and development of creative ideas. • A formal attitude to changing the passive role of students in the system of higher education and, as a result, the lack of motivation of students to search for new ideas and critically comprehend information. • Insufficient level of organization of the educational process using popular foreign educational resources, taking into account scientifically based patterns of interaction between the individual and information.	• Organization of advanced training courses for teaching staff on the development of communicative interaction and tolerance, as well as language courses. • Organization of trainings on the ability to work in a team to solve problems. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities • Expanding the. participation of students in competitions, competitions, hackathons in order to enrich, generate, adopt and use productive ideas. • Organization of student-centered learning with the actualization of the tutor-facilitator functionality of the teacher. • Development of mechanisms to encourage teaching staff to participate in foreign courses on the development of professional, language and IT competencies.

Table S7. S-W - line of mutual influence of internal factors

S-W: Strengths + Weaknesses		
Strengths (S)	**Weaknesses (W)**	**Decisions**
Studio learning model		
• Availability of presentation material, including virtual practical and laboratory work. • Collective work of the student group on the topic of the lesson. • Availability of centers for working professions. • Application of interactive learning methods for the development of course projects.	• Absence of studios-audiences with a variety of material and technical support (SMART-POINT). • Low degree of preparedness of the teaching staff (pedagogical design of Studio Training of CO), development of creative and interactive communication, interactive methods. • The traditional lecture format will be applied (teacher-centered approach). • Absence in the educational process of the practice of using teaching methods that contribute to the perception of interactive information (different perceptions of students). • Low readiness of teaching staff to develop appropriate content for classes. • Low level of technical equipment of classrooms.	• Organization of training in a virtual environment. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Obtaining and improving practical skills in parallel with theoretical training. • Organization of training (in addition to industrial practice) at the branches of the departments together with leading specialists of partner enterprises. • Application of interactive teaching methods.
Chinese Maker Education Model		
• The work of the design office using prototyping laboratories. • Participation of students in Hackathons to solve modern production problems. • In course and diploma projects, the problems of enterprises are considered with the potential implementation of student solutions. • Development by students and undergraduates of industrial products patents, including CIP. • Students undergo an internship with elements of dual training. • Conducting practical classes at the branches of the department. • Gaining knowledge via solving production problems. • Presence of related interdisciplinarity.	• Low degree of production experience of teaching staff (to assess the innovativeness of the project). • The lack of low readiness of teaching staff to change the content of a number of disciplines at once, in order to achieve interdisciplinarity in research. • Lack of teaching staff joint work of different knowledge fields. • The absence of a scientific and inventive component in the educational programs of the bachelor's degree. • Lack of organization skills in the management of course projects by teaching staff, in the choice of topics that allow optimal mastering of the course. • The complexity of implementing the results of scientific work and projects (documentation).	• Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Support for student start-up projects by business incubators and technology parks. • Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activities. • Organization of advanced training courses for teaching staff on the management of the pedagogical process. • Organization of internships for teaching staff at enterprises and leading universities. • Expansion of the area of key competencies for the training of generalists in industries within the framework of the existing EP.

Philippine STEAM Education Model		
• A regular analysis of the educational achievements of students is carried out. • Operational planning is carried out based on the analysis of progress. • Continuity of knowledge as a basis for decision-making and focus on results. • Formation of versatile engineering skills of the student (labor, structural and technical, center of working professions). • The presence of creative activity of students in certain academic disciplines.	• Insufficient development of project skills of students. • Lack of organization and management of the educational process in terms of providing consulting assistance to students in the field of solving professional problems. • The absence of the position of "Teacher-mentor" in the vertical trajectory of the professional growth of teaching staff. • The lack of orientation of the GED cycle towards the formation of professionally important personality traits. • Low level of socio-psychological, pedagogical components of the teaching staff, low level of didactic skills of the teaching staff. • The EP does not provide for the individual needs of students according to the theory of intellectual development by J. Piaget, which provides a tendency to change and develop during the student's educational life.	• Organization of advanced training courses for teaching staff on the management of the pedagogical process. • Creation of an industrial engineering school based on the Business Skills Park. • Creation of conditions for the involvement of leading specialists of enterprises in mentoring programs. • Introduction of the discipline "Academic Writing" for senior undergraduate and graduate students. • Redistribution of the disciplines of the GED cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education. • Reflection of teaching staff for prompt adjustment of pedagogical activity.
iSTEAM Teaching Model		
• The presence of special disciplines related to modeling, design development and construction of 3D objects. • Availability of a database of prototypes of objects and their components applicable in the specialty. • Analysis of the results of course projects in the process of discussion. • A sufficient level of evaluation of developed projects and prototypes. • Support personal scenario of professional development.	• Basic and major disciplines do not provide for the development of imagination and modeling skills. • Curricula of the GED cycle do not focus on the development of imagination skills. • Formal approach of teaching staff to the discussion of the process and results of educational activities. • Low degree of readiness of teaching staff to project real-world phenomena onto the taught technical disciplines. • Low readiness of teaching staff to use team brainstorming techniques. • In the educational process, there is no application of the theory of solving inventive problems, the practice of presenting team projects.	• Redistribution of the disciplines of the GED cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education • Orientation of special disciplines related to modeling, design development and construction of 3D objects for solving inventive problems • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Cooperation between the Centers for working professions and the Park's Business Skills to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises. • Implementation of postgraduate support programs

		• Creation of an industrial engineering school based on the Business Skills Park.
Active Learning Model		
• Active use of the transdisciplinary approach. • Implementation of project-based learning. • Formation of transactive memory focused on the accumulation and consumption of existing content.	• Low level of interdisciplinary collaboration. • Low level of co-teaching. • Lack of communication visual modes in the process of teaching technical disciplines. • Low readiness of teaching staff to ensure the quality of the educational process. • Low level of flexibility in the thinking of teaching staff to transform the educational material in accordance with international standards. • Lack of technical capacity to store digital content. • Outdated information and communication infrastructure of the University. • Insufficiency of the application level of active learning methods by teaching staff. • Low level of performance criteria for achieving learning goals aimed at developing students' metacognitive skills. • Inability to reach consensus when there are many ideas and ways to implement them.	• Organization of advanced training courses for teaching staff on the implementation of co-teaching methods. • Establishment of the Technical Support Center for teaching staff for the development of digital content. • Financial incentives for teaching staff to develop digital content. • Creation of a digital resource center for the development of MOOCs and the provision of the educational process with digital content. • Development of interdisciplinary areas of work of design bureaus. • Development and implementation of Minor programs, taking into account the requirements of the labor market. • Active use of project-based learning methods for the development of transactive memory and metacognitive skills of students.
Border Removal Model		
• Choice of learning path. • Teaching students in special disciplines through projects. • Reading of special disciplines by narrow specialists.	• Low level of creative potential disclosure. • The uniqueness of the trajectory is not ensured due to the low percentage of specialists' involvement. • Lack of method for applying horizontal blur and vertical orientation of students. • Low level of differentiated approach to students. • Lack of broad practical experience in the development and implementation of projects. • Low readiness of teaching staff to accept mistakes in the learning process (didactic functions of mistakes). • Low level of communicative interaction and tolerance among teaching staff in solving various pedagogical situations.	• Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Application of interactive teaching methods. • Organization of internships for teaching staff at enterprises and leading universities. • Obtaining and improving practical skills in parallel with theoretical training. • Reading of special disciplines of the teaching staff of the profiling department. • Broadcast of master classes and open classes with discussion and development of recommendations. • Increasing the differentiated approach to students by reducing the number of students in the group.

Interdisciplinary Thinking Model		
• Full understanding of contemporary real life problems. • Sufficient level of information literacy among teaching staff and students.	• Low focus on innovative learning. • Formal approach to involving students in solving scientific problems. • Lack of support for student educational and scientific initiatives. • The lack of a scientific approach in the orientation of students in their future professional activities • Lack of co-teaching. • Low level of interpersonal competencies among teaching staff. • Low level of students' ability to synthesize or integrate ideas from a number of disciplines into a comprehensive framework of analysis. • Low level of students' ability to determine interdisciplinary connections within the framework of studying disciplines. • Low level of interdisciplinary connections within the framework of studying EP courses.	• Motivation of teaching staff to develop and implement innovative courses. • Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students. • Holding competitions and olympiads with their coverage through the media with the involvement of sponsors and recruiting agencies. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities. • Reading of special disciplines of the teaching staff of the profiling department. • Organization of trainings on the ability to work in a team.
Critical & Creative Thinking Model		
• Orientation of the educational process to the development of independence among students. • Support for students' self-awareness. • Conditions have been created for adaptation, flexibility and openness of student thinking to new conditions. • Creating conditions for personal growth among students, increasing self-esteem and self-confidence. • Willingness to discuss the proposed ideas.	• Low level of critical analysis intellectual skills among teachers. • Lack of approaches for individual assessment of students. • Low level of methods applicability for the motivational orientation of students.	• Motivation of teaching staff to develop and implement innovative courses. • Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies. • Creation of an industrial engineering school based on the Business Skills Park • Creation of conditions for the involvement of enterprises leading specialists in mentoring programs. • Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities.

Table S8. Solution Matrix of the Second Level .

Studio Learning Model		
Internal factors **External factors**	Strengths 1. Availability of presentation material, including virtual practical and laboratory work 2. Collective work of the student group on the topic of the lesson 3. Availability of canters for working professions 4. Application of interactive learning methods for the development of course projects	**Weaknesses** 1. The absence of studios-auditoriums with a variety of material and technical support (SMART-POINT) 2. Low degree of preparedness of teaching staff (pedagogical design of Studio education SO), development of creative and dialogical communication, interactive methods 3. The format of the traditional lecture is used (the format of the teacher-cantered approach lecture) 4. Lack of practice in the educational process of using teaching methods that promote the perception of interactive information (different perceptions of students) 5. Low readiness of teaching staff to develop relevant content for classes 6. Low level of technical equipment of classrooms
Opportunities 1. Opportunity to attract lecturers from leading universities 2. The possibility of using open access to educational material on the subject of the lecture, including author's courses 3. Availability of online access for highly qualified improvement of teaching staff of their qualifications (Coursera) 4. Large selection of multi-level, incl. international, language courses for the preparation of teaching staff	**Possible strategies:** 1. Expanding the list of presentation materials through cooperation with foreign scientists (S1, O2). 2. Creation of a digital resource center for the development of MOOCs, virtual laboratories to provide the educational process with digital content (O4, O2,S2). 3. Advanced training of teaching staff aimed at the formation and development of highly specialized, pedagogical, language and IT competencies (S4, O3, O4) 4. Formation of students' professional competencies through the centers of working professions, design and design bureaus (S2, S3, S4, O1, O2) 5. Organization of scientific seminars for students to discuss and discuss learning issues (S4, O1) 6. Organization of advanced training courses for teaching staff on the development of creative thinking and the use	**Possible strategies:** 1. Organization of the educational process through DLT (W1, W6, O1, O2, O3) 2. Ensuring access to educational resources of partners by expanding ways of cooperation in the field of education and science (W3, W4, W5, O1, O3, O4) 3. Organization of advanced training courses for teaching staff on the management of the pedagogical process (W2, W3, W4, W5, O3) 4. Creation of a digital resource center for the development of MOOCs and provision of the educational process with digital content (W1, W2, W4, O3) 5. Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies (W2, W3, W4, W5, O3) 6. Organization of training (in addition to industrial practice) at the branches of departments together with

	of innovative pedagogical technologies (C1, C4, B3, B4) 7. Cooperation of Working Professions Centers and Business Skills of the park to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises (S3) 8. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (S3, S4, O2) 9. Organization of training in a virtual environment (S4, S1, O1, O2, O3, O4)) 10. Organization of training (in addition to industrial practice) at the branches of departments together with leading specialists of partner enterprises (S2, S3)	leading specialists of partner enterprises (W3, W6, O2) 7. Updating the material and technical base at the expense of partner enterprises (W1, W6) 8. Reflection of teaching staff for operational correction of pedagogical activity (W2, W4,W5,O3) 9. Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies (W2, W3, W4, W5, O3) 10. Obtaining and improving practical skills in parallel with theoretical training (W3, W4, O3) 11. Application of interactive teaching methods (W2, W3, W4, W5, O1, O2, O3)
Threats 1. The lack of a single standard for the development and conduct of interactive lectures for technical specialties 2. Lack of funds and resources of different levels for the passage of teaching staff of highly qualified certified courses 3. Weak possibility of obtaining production experience of teaching staff at enterprises	**Possible strategies:** 1. Creation of a digital resource centre for the development of MOOCs and provision of the educational process with digital content (S1, S2, S3, O1), 2. Attracting employers to training and internship of teaching staff to work with innovative equipment and creating University-Enterprise collaborations (S3, Th2, Th3) 3. Cooperation of Working Professions Centers and Business Skills of the park to fulfill the tasks of involving teaching staff and students in the production process of partner enterprises (S3, Th2, Th3) 4. Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies (S1, S3, S4, Th1, Th2, Th3)	**Possible strategies:** 1. Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies (W2, W3, W4, S5, Th1, Th2) 2. Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies (W4, W5, Th1, Th2) 3. Cooperation of Working Professions Centres and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises (W6, Th3) 4. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (W1, W6, Th3)

Chinese Maker Education Model		
Internal factors **External factors**	**Strengths** 1. The work of the design bureau using prototyping laboratories 2. Participation of students in Hackathons to solve modern production problems 3. In course and diploma projects, the problems of enterprises with the potential implementation of student solutions are considered 4. Development of production products by students and undergraduates' patents, including the SYSTEM 5. Students undergo practical training with elements of dual training 6. Conducting practical classes at the branches of the department 7. Gaining knowledge through solving production problems 8. The presence of related interdisciplinarity	**Weaknesses** 1. Low degree of production experience of the teaching staff (to assess the innovativeness of the project) 2. The lack of readiness of teaching staff to change the content of several disciplines at once, to achieve interdisciplinarity in research 3. Lack of joint work of teaching staff of different fields of knowledge 4. Lack of scientific and inventive component in undergraduate educational programs 5. Lack of organizational skills in the management of course projects in teaching staff, in the choice of topics that allow you to optimally master the course 6. The complexity of implementing the results of scientific works and projects (documentation)
Opportunities 1. Performance of works focused on solving specific production tasks together with the enterprise 2. Involvement of leading specialists of enterprises in the educational process to transfer the accumulated experience and knowledge. 3. The opportunity to compete with students of other universities in Olympiads and Hackathons in terms of practical project activities 4. The possibility of commercialization of their own and third-party solutions 5. High positions in employment due to practical experience, including during studies	**Possible strategies:** 1. Organization of training (in addition to industrial practice) at the branches of departments together with leading specialists of partner enterprises (S5, S6, S7, O1, O2, O5) 2. Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises (S2, S3, S4, O1, O4) 3. Support of student start-up projects by business incubators and technology parks (S1, S4, S7, O3, O4) 4. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (S1, S3, S7, O1, O4, O5) 5. Creation of a school of industrial engineering based on the park's Business Skills (S2, S4, S8, O1, O3, O4) 6. Orientation of special disciplines related to modelling, design development and construction of 3D objects to	**Possible strategies:** 1. Organization of advanced training courses for teaching staff on the management of the pedagogical process (W2, W4, O2) 2. Organization of teaching staff internships at enterprises and leading universities (W1, W4, O2) 3. Orientation of special disciplines related to modelling, design development and construction of 3D objects to the solutions of inventive tasks (W4, O1, O4) 4. Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises (O1, O4, W6, W4) 5. Создание школы индустриального инжиниринга на базе Business Skills парка (O1, O3, O4, W2, W4) 6. Organization of advanced training courses for teaching staff on the implementation of co-teaching methods (W2, W3, O1, O3) 7. Conducting competitions and Olympiads with their coverage

	the solutions of inventive tasks (S1, S3, S7, O1) 7. Presentation of students' achievements to potential employers during meetings and Job fairs (S3, S5, S6, O5) 8. Conducting competitions and Olympiads with their coverage through the media with the involvement of sponsors and recruiting agencies (S2, O2, O5) 9. Development of interdisciplinary areas of work of design bureaus (S8, O3)	through the media with the involvement of sponsors and recruiting agencies (B2, B5) 8. Support of student research projects, assistance with the publication of the results of scientific activity (W4, W6, O3, O4) 9. Organization of competitions and conferences for students (O3, O4, W1, W4) 10. Support of student start-up projects by business incubators and technology parks (O3, O4, W4, W6) 11. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (O1, O4, O5, W1, W4, W6) 12. Organization of advanced training courses for teaching staff on the management of the pedagogical process (W2, W3, O1) 13. Expansion of the field of key competencies for the training of specialists of a wide profile in the branches of production within the framework of the existing EP (W4, O1, O2, O3, O5)
Threats: 1. Low interest in financing student projects by enterprises 2. Low financial interest of the leading specialists of the enterprise when working at the University and participating in joint projects 3. Transfer of outdated equipment to the university during collaboration 4. Low level of alumni participation in stakeholders 5. Lack of implementation of innovative projects developed at the University, at enterprises	**Possible strategies:** 1. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (S5, S6, Th1, Th2 Th5) 2. Creation of a workable alumni association. (Th1, Th4) 3. Improving the academic reputation of the University, working on the brand and image of the University, the elitism of graduates. (S1, S2, Th1, Th4, Th5) 4. Motivation of graduates to promote alma mater in society. (S2, S4, Th4) 5. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (S3, S7, Th1) 6. Supervision of scientific projects by specialists of enterprises with subsequent	**Possible strategies:** 1. Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students (W4, Th1, Th5) 2. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (Th1, W1, W2, W4, W6) 3. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (W4, Th1, Th2 Th5) 4. Creation of a workable alumni association. (Th1, Th4, W4) 5. Improving the academic reputation of the University, working on the brand and image of the University, the elitism of graduates. (W1, W3, Th5) 6. Motivation of graduates to promote alma mater in society. (Th4)

	recruitment of students (S7, Th1, Th4, Th5)	
Philippine STEAM Education Model		
Internal factors **External factors**	**Strengths:** 1. Regular analysis of students' academic achievements is carried out 2. Operational planning is carried out based on the analysis of academic performance 3. Continuity of knowledge as the basis of decision-making and focus on results 4. Formation of versatile engineering skills of the student (labour, constructive and technical, centre of working professions) 5. The presence of creative activity of students in certain academic disciplines	**Weaknesses:** 1. Insufficient development of students' project activity skills 2. Lack of organization and management of the educational process in terms of providing consulting assistance to students in the field of solving professional problems 3. The absence of a "Teacher-mentor" position in the vertical trajectory of professional growth of teaching staff 4. The lack of orientation of the GED cycle on the formation of professionally important personality qualities 5. Low level of socio-psychological, pedagogical components of teaching staff, low level of didactic skills of teaching staff 6. The EP does not meet the individual needs of students in the theory of intellectual development Zh. Piaget, which provides a tendency to change and develop during the student's academic life
Opportunities 1. The interest of enterprises in the topics and projects of several disciplines for the development of the scientific and industrial complex of the country 2. The presence of a mentoring mechanism on the part of production, which allows you to transfer knowledge, form the necessary skills and awareness faster than traditional methods 3. Orientation of the learning process to the labour market 1. 4. Transition to critical thinking in education	**Possible strategies:** 1. Presentation of students' achievements to potential employers during meetings and Job Fairs (O1, O2, O3) 2. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (S3, S4, S5, O4) 3. Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises (S1, S3,S4, O1, O2) 4. Creating conditions for the involvement of leading specialists of enterprises in mentoring programs (S2, S5, O2,O3) 5. Involvement of employers in designing the content of educational programs (S1, S2,O1, O3) 6. Application of interactive teaching methods (S5, S6, O4)	**Possible strategies:** 1. Motivation of teaching staff to develop and implement innovative courses (W3, W4, O4) 2. Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students (O1, O4, W1, W6) 3. Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity (O4, W2, W3) 4. Cooperation of the Centres of Working Professions and Business Skills of the park to perform tasks to involve teaching staff and students in the production process of partner enterprises (O1, O2, W3, W4, W5) 5. Redistribution of the disciplines of the GED cycle for the entire duration of undergraduate studies with mandatory revision of the content of training (W4, W6, O3)

	7. Conclusion of contracts with enterprises for the performance of contractual works, practical training at enterprises with subsequent employment of graduates (S1, S3, S5, O3, O4) 8. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (S3, S4, O1, O4) 9. Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students (S4, S5, O1, O4)	6. Reflection of teaching staff for operational correction of pedagogical activity (W5, O3, O4) 7. Orientation of special disciplines related to modelling, design development and construction of 3D objects to solutions of inventive tasks (W1, W6,O1,O4)
Threats 1. Reduction of the state funding level for material equipment 2. Lagging learning technologies from the production process 3. Lack of production representatives pedagogical skills during classes 4. Low level of mentoring from the production side	**Possible strategies:** 1. Conclusion of contracts with enterprises for the performance of contractual works, conducting practical training at enterprises with subsequent employment of graduates. (C2, S3, S4, Th1, Th2, Th4) 2. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (S3, S4, Th1, Th2, Th4) 3. Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students (S5, Th3, Th4)	**Possible strategies:** 1. Conclusion of contracts with enterprises for the performance of contractual works, conducting practical training at enterprises with subsequent employment of graduates. ((Th1, Th2, Th4, W1, CW3) 2. Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise" (Th1, Th2, Th4, W2) 3. Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students (W1, Th3, Th4)

Table S9. Solution Matrix of the Third Level.

№	Possible decision	Factors of influence
	Studio learning model	
1.	Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise"	S3, S4, O2, W1, W6, Th3
2.	Ensuring access to educational resources of partners by expanding ways of cooperation in the field of education and science	W3, W4, W5, O1, O3, O4
3.	Updating the material and technical base at the expense of partner enterprises	W1, W6
4.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	S1, S4, O3, O4, W2, W3, W4, W5
5.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	W2, W3, W4, S5, Th1, Th2
6.	Organization of advanced training courses for teaching staff on the management of the pedagogical process	W2, W3, W4, W5, O3
7.	Organization of scientific seminars for students to discuss and discussion on issues of education	S4, O1
8.	Organization of training in addition to industrial practice at the branches of the departments together with leading specialists of partner enterprises	S2, S3, W3, W6, O2
9.	Organization of training in a virtual environment, including through DLT	S4, S1, O1, O2, O3, O4, W1, W6, O1, O2, O3
10.	Advanced training of teaching staff aimed at the formation and development of highly specialized, pedagogical, language and IT competencies	S4, O3, O4
11.	Obtaining and improving practical skills in parallel with theoretical training	W3, W4, O3
12.	Involving employers in training and internships of teaching staff to work with innovative equipment and creating collaborations University-Enterprise	S3, Th2, Th3
13.	Application of interactive teaching methods	W2, W3, W4, W5, O1, O2, O3
14.	Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies	S1, S3, S4, TH1, Th2, Th3, W2, W3, W4, W5, O3
15.	Expanding the list of presentation materials through cooperation with international scientists	S1, O2 .
16.	Reflection of teaching staff for operational correction of pedagogical activity	W2, W4, W5,O3
17.	Creation of a digital resource centre for the development of MOOCs and provision of the educational process with digital content	S1, S2, S3, Th1, W1, W2, W4, O4,O2,O3
18.	Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S3, S3, Th2, Th3, W6
19.	Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S2, S3, S4, O1, O2
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20.	Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity	S1, S3, S7, O1, O4, O5, W1, W4, W6
21.	Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity	S3, S7, Th1, W1, W2, W4, W6
22.	Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise"	W4, S5, S6, Th1, Th2 Th5
23.	Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students	W4, S7, Th1, Th4, Th5
24.	Motivation of graduates to promote alma mater in society.	S2, S4, Th4
25.	Organization of competitions and conferences for students	O3, O4, W1, W4
26.	Organization of advanced training courses for teaching staff on the implementation of co-teaching methods	W2, W3, O1, O3
27.	Organization of advanced training courses for teaching staff on management of the pedagogical process	W2, W4, W3, O1,O2

28.	Organization of training in addition to industrial practice at the branches of the departments together with leading specialists of partner enterprises	S5, S6, S7, O1, O2, O5
29.	Organization of internships for teaching staff at enterprises and leading universities	W1, W4, O2
30.	Orientation of special disciplines related to modelling, design development and construction of 3D objects for solving inventive problems	S1, S3, S7, W4, O1, O4
31.	Improving the academic reputation of the University, working on the brand and image of the University, the elitism of graduates	S1, S2, W1, W3, Th1, Th4, Th5
32.	Support for student scientific projects, assistance with the publication of scientific results	W4, W6, O3, O4
33.	Support for student start-up projects by business incubators and technology parks	S1, S4, S7, W4, W6, O3, O4
34.	Presentation of student achievements to potential employers during meetings and Job Fairs	S3, S5, S6, O5
35.	Presentation of student achievements to potential employers during meetings and Job Fairs	S2, O2, O5
36.	Development of interdisciplinary areas of work of design bureaus	S8, O3
37.	Expansion of the area of key competencies for the training of specialists in industries within the framework of the existing EP	W4, O1, O2, O3, O5
38.	Establishing a Workable Alumni Association	Th1, Th4, W4
39.	Creation of an industrial engineering school based on the Business Skills Park	S2, S4, S8, W2, W4, O1, O3, O4
40.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S2, S3, S4, O1, O4, W6, W4
	Philippine STEAM Education Model	
41.	Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activities	S3, S4, S5, W2, W3, O4
42.	Concluding contracts with enterprises for the performance of contractual work, conducting internships at enterprises with subsequent employment of graduates	S2, S3, S4, S5, W1, W3, O3, O4, Th1, Th2, Th4
43.	Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise"	S3, S4, Th1, Th2, Th4, O1, W2,O4
44.	Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students	S4, S5, O1, O4, W1, Th3, Th4, W6
45.	Motivation of teaching staff to develop and implement innovative courses	W3, W4, O4
46.	Orientation of special disciplines related to modelling, design development and construction of 3D objects for solving inventive problems	W1, W6,O1,O4
47.	Redistribution of the disciplines of the GED cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education	W4, W6, O3
48.	Presentation of student achievements to potential employers during meetings and Job Fairs	S5,O1, O2, O3
49.	Involving employers in designing the content of educational programs	S1, S2,O1, O3
50.	Application of interactive teaching methods	S5, S6, O4
51.	Reflection of teaching staff for prompt adjustment of pedagogical activity	W5,O3, O4
52.	Creation of conditions for the involvement of leading specialists of enterprises in mentoring programs	S2, S5, O2,O3
53.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S1, S3,S4, O1, O2, W3, W4, W5
	iSTEAM Teaching Model	
54.	Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities	S2, S3, S4, S5, O1, O2, W2, W5, W6, Th4, Th5
55.	Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise"	S5, O2, Th1, Th2, Th3, W3, W6
56.	Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students	S2, S3, S4, O1, O2

57.	Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students	S2, S3, S4, W4, W5, Th1, Th3, Th4, Th5
58.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	S1, S3, S5, W3, W4, W5, O1, O2
59.	Organization of trainings on the ability to work in a team	W3, W4, W5, O1
60.	Orientation of special disciplines related to modelling, design development and construction of 3D objects for solving inventive problems	S1, S2, O1, O2
61.	Redistribution of the disciplines of the OOD cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education	W1, W2, O2
62.	Preparation of university teams for participation in scientific and educational competitions at various levels	W6, O, O2
63.	Support for student start-up projects by business incubators and technology parks	S1, S5, O1, O2
64.	Development of the University's digital ecosystem	S1, S2, S4, S5, Th4, O1, W1, W4, B2
65.	Development of a methodology for assessing the parameters of the state and development of the system of professional development, economic, socio-psychological, socio-cultural, ideological to support the personal scenario of professional development	S5, O2
66.	Expansion of students' participation in Olympiads, contests, hackathons in order to enrich, generate, adopt and use productive ideas	S3, S4, S5, O1, O2, W6, Th4, Th1, Th5
67.	Implementation of postgraduate support programs	O1
68.	Reflection of teaching staff for operational correction of pedagogical activity	W4, O1
69.	Improving the mechanisms for stimulating teaching staff to introduce innovative teaching methods	W3, W4, W5, O1
70.	Creation of a school of industrial engineering based on the park's Business Skills	S2, S3, S4, S5, W1, W2, O1, O2
71.	Cooperation of the Centres of Working Professions and Business Skills of the park to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	W6, O1, O2
72.	Broadcast of master classes and open classes with discussion and development of recommendations	W3, W4, W5, O1
	Active Learning Model	
73.	Active use of project-based learning methods for the development of transactive memory and metacognitive skills of students	W9, W10, O3
74.	Involvement of teaching staff in grant, contractual financing of scientific activities	S2, O3, W4, W6, W8, Th2, Th3, Th4
75.	Financial incentives for teaching staff to develop digital content	W5, W8, O1, O2
76.	Motivation of teaching staff to participate in competitions for winning grants for advanced training and pedagogical skills	S2, S3, O3, W2, W4, W6, W8, Th2, Th3, Th4, Th5
77.	Organization of advanced training courses for teaching staff on the implementation of co-teaching methods	W1, W2, W5, O3
78.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	S2,S3, W5, W4, W2, W6, W8, O1, O2, O3, Th2, Th4, Th5
79.	Organization of postgraduate support of engineering personnel, advanced training courses	S2, S3, O2, O3, W9, Th1, У2
80.	Revision of curricula in order to improve interdisciplinary and personal competencies	S1, S3, W1, W9, W10, Th2, Th3, Th4, O1, O2
81.	Involvement of employers in designing the content of educational programs	S1 W9, O1, O2
82.	Application of interactive teaching methods	S2, S3, O3
83.	Development of "soft skills" among students by adjusting the content of the disciplines of the GED cycle	O2, O3, S3
84.	Development of a system of financial incentives for teaching staff in the field of creative thinking development	W5, W2, W10, O1, O2
85.	Development of the University's digital ecosystem	O2, W7, W6, W3
86.	Development and implementation of Minor programs taking into account the requirements of the labour market	W1, W9, W10, O2
87.	Development of interdisciplinary areas of design bureaus work	W1, W2, W10, O2, O3

88.	Expansion of the field competencies field for the training of a wide profile specialists in the branches of production within the framework of the existing EP	O1, O2, W9, W1
89.	Creation of a Technical Support Centre for teaching staff for the development of digital content	W4, W5, O2, O3
90.	Creation of a digital resource centre for the development of MOOCs and provision of the educational process with digital content	W4, W5, O2, O3
91.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S2, S3, O3
	Border Removal Model	
92.	Active application of project-based teaching methods	S2, O1, O2, O4
93.	Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity	S2, O2, O4, Th2, Th4, Th5
94.	Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise"	S3, W2, W5, O3, O4
95.	Organization of advanced training courses for teaching staff on the implementation of co-teaching methods	S2, O1, O4
96.	Organization of advanced training courses for teaching staff on the development of communicative interaction and tolerance, as well as language courses	Th1, Th4
97.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	W4, W5, W6, W7, O3, O4
98.	Organization of training in addition to industrial practice at the branches of departments together with leading specialists of partner enterprises	S1, S3, O1, O3
99.	Organization of teaching staff internships at enterprises and leading universities	W1, W6, W7, O1, O2
100.	Organization of student-cantered learning with the actualization of the tutor-facilitator functionality of the teacher	S2, Th1, Th5, W3, W4, W6, W7, O2, O3
101.	Organization of trainings on the ability to work in a team to solve problems	S2, Th2, Th5
102.	Orientation of special disciplines related to modelling, design development and construction of 3D objects for solving inventive problems	S2, O2, O4
103.	Increasing the differentiated approach to students by reducing the number of students in the group	W4, O3
104.	Obtaining and improving practical skills in parallel with theoretical training	S1, O3
105.	Involvement of employers in designing the content of educational programs	O1, O2, W2, W3
106.	Application of interactive teaching methods	W3, O2, O3
107.	Conducting creative Olympiads and hackathons with the involvement of mentors and sponsors from among employers	O3, W1, W2
108.	Development of "soft skills" among students by adjusting the content of the disciplines of the GED cycle	S1, O2, O3, W1, W3, Th5
109.	Development of the University's digital ecosystem	O1, O2, W3, W5, Th1, Th3
110.	Development of a methodology for assessing the parameters of the state and development of the system of professional development, economic, socio-psychological, socio-cultural, ideological to support the personal scenario of professional development	S1, O2, O3, W, W4, W6, W7, Th1, Th2, Th5
111.	Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies	S1, O1, O3, W5, W6, W7, Th1, Th3, Th4
112.	Expansion of the competencies field for the training of specialists of a wide profile in the branches of production within the framework of the existing EP	S1, S2,S3, O2, O3, Th3, Th4
113.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	W1, W2, S5, O1, O4
114.	Broadcast of master classes and open classes with discussion and development of recommendations	W2, W4, O1, O2, O3
115.	Reading of special disciplines of the teaching staff of the profiling department	S3, O1, O2 W3, O4, W4

	Interdisciplinary Thinking Model	
116.	Involvement of students and teaching staff in the work of project bureaus with the subsequent implementation of the results of scientific activities	S1, S2, Th1, Th2, Th3, Th4, O2, O3, W2, W3, W4,
117.	Changing attitudes towards the University in society - moving away from the provider of educational services towards partnership, a member of the consortium "University-Enterprise"	S1, S2, W1, Th2, O1, O4
118.	Supervision of scientific projects by specialists of enterprises with subsequent recruitment of students	W2, W7, W8, O3
119.	Motivation of teaching staff to develop and implement innovative courses	W5, W6, O1, O4
120.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	W4, W5. W6, O1, O4
121.	Organization of student-cantered learning with the actualization of the tutor-facilitator functionality of the teacher	W4, W5. W6, W8, W9, O1, O3, O4
122.	Organization of trainings on the ability to work in a team	S1, W5, W6, O1, Th1, Th3, Th4
123.	Redistribution of the disciplines of the GED cycle for the entire period of study in the bachelor's degree with a mandatory revision of the content of education	O1, O4
124.	Support for student start-up projects by business incubators and technology parks	S1, S2, O2, O3
125.	Holding competitions and Olympiads with their coverage through the media with the involvement of sponsors and recruiting agencies	S1, S2, O2
126.	Holding creative Olympiads and hackathons with the involvement of mentors and sponsors from among employers	W1, W2, O2, O3
127.	Development of interdisciplinary areas of work of design bureaus	S1, O2, O3
128.	Expanding the competencies of teaching staff through participation in interdisciplinary and interdepartmental projects	S1, S2, S3, O1, O3, O4, W1, W5, W6, W7, W8, Th3, Th4
129.	Expansion of the area of key competencies for the training of generalists in industries within the framework of the existing EP	S1, S2, W1, W2, W7, W8, O1, O3, O4, Th1, Th2, Th3, Th4
130.	Creation of conditions for the involvement of leading specialists of enterprises in mentoring programs	W1, W2, O2, O3
131.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	W1, W2, W3, W9, O2, O3
132.	Reading of special disciplines of the teaching staff of the profiling department	W5, W8, W9, O1, O4
	Critical & Creative Thinking Model	
133.	Involvement of students and teaching staff in the work of design bureaus with the subsequent implementation of the results of scientific activity	S3, S4, S5, O1, O3, W1, W2, W1, W2, W3, Th2, Th3
134.	Changing attitudes towards the University in society – moving away from the provider of educational services towards partnership, a member of the consortium "University-enterprise"	S3, S4, TH4
135.	Motivation of teaching staff to develop and implement innovative courses	W2, W3, O1
136.	Organization of competitions and conferences for students	S1, S2, S4, S5, O2, O3
137.	Organization of professional skill competitions among students	S1, S2, S4, O3
138.	Organization of advanced training courses for teaching staff on the development of communicative interaction and tolerance, as well as language courses	S3, S4, O1, O3, W1, W2, W3, Th3
139.	Organization of advanced training courses for teaching staff on the development of creative thinking and the use of innovative pedagogical technologies	W1, O1, O3
140.	Organization of student-cantered learning with the actualization of the tutor-facilitator functionality of the teacher	S1, S2, S3, S4, S5, O1, O3, W1, W2, W3, Th2, Th3
141.	Organization of trainings on the ability to work in a team to solve problems	S3, S4, S5, O1, O3, W1, W2, W3, Th3

142.	Support for student scientific projects, assistance with the publication of scientific results	S1, S2, S4, S5, O3
143.	Involving employers in designing the content of educational programs	S3, O2, O3
144.	Holding creative Olympiads and hackathons with the involvement of mentors and sponsors from among employers	W3, O1, O3
145.	Development of "soft skills" among students by adjusting the content of the disciplines of the GED cycle	S1, S2, S3, S4, S5, O1, Th2, Th3
146.	Development of the university digital ecosystem	S1, S2, S3, S4, Th4
147.	Development of a methodology for assessing the parameters of the state and development of the system of professional development, economic, socio-psychological, socio-cultural, ideological to support the personal scenario of professional development	S1,S2, S3, S4, Th1, Th2, Th3
148.	Development of incentive mechanisms for teaching staff to participate in foreign courses on the development of professional, language and IT competencies	S3, S4, O1, O3, W1, W2, W3, Th4
149.	Expansion of students' participation in Olympiads, contests, hackathons in order to enrich, generate, adopt and use productive ideas	S1, S2, S3, S4, S5, O1, W1, W2, W3, Th2, Th3
150.	Creating conditions for the involvement of leading specialists of enterprises in mentoring programs	O1, O2, O3
151.	Creation of an industrial engineering school based on the Business Skills Park	W2, W3, O1, O3
152.	Cooperation between the Centres for Working Professions and the Park's Business Skills to fulfil the tasks of involving teaching staff and students in the production process of partner enterprises	S4, O1, O3

Table S10. STEAM Approaches in the University Process.

Academic Process
1. Recommendations for the development of a new discipline aimed at the implementation of the STEAM methodology, taking into account the specifics of the training area 2. Recommendations for making changes to the content of the taught disciplines within the educational program based on the STEAM approach 3. New trajectory development in the field of training with a focus on interdisciplinary collaboration 4. Minor program development based on the integration of the engineering field of knowledge and art (art component) 5. Methodological recommendation development for the introduction of STEAM teaching methods in the learning process of training technical specialists
Methodological process
1. Guidelines for changing the organizational forms of teaching 2. Micro-qualification development and nano-degree programs 3. The concept of STEAM education 4. Recommendations for making changes to the organization of teaching the disciplines of the General Educational Disciplines' cycle 5. Development of regulations for the involvement of employers in the design of educational programs 6. Development of requirements for Minor programs design 7. Creation of the STEAM-Networking centre
Research work(Students)
1. Concept Development of Creative Industry School (CRIS) 2. Consulting through CRIS 3. Development of a methodology for organizing practice-oriented Western-style conferences 4. Creation of sustainable links with industry and socio-economic institutions through online dialogue platforms. 5. Guidelines for the implementation of problem-based learning methods during graduation and course design 6. Creation of the STEAM-Networking centre
Extracurricular process
1. Amendments to the Concept of extracurricular policy of the university 2. Recommendations for making changes to the organization of teaching disciplines of the General Educational Disciplines' cycle 3. Recommendations for making changes to the teaching methods of several disciplines of the Basic Disciplines and Professional Disciplines' cycles
Management of the learning environment and social partnership
1. Development of proposals for amending the Strategic Plan of the University 2. Changing the indicators of the annual Comprehensive University Development Program

3. Development of recommendations for digital content preparation with an emphasis on the specifics of online communication 4. Development of recommendations on online learning methodology 5. Conducting training and master classes on online learning methodology, the development of cross-cultural collaboration 6. Making changes to the incentive mechanisms for teaching staff based on foreign experience 7. Recommendations for organizing the educational process based on a differentiated approach, considering the art component 8. Recommendations for the development of the direction of marketing 9. Development of assessing parameters methodology of the personal, professional development system 10. Proposals for amendments to the normative documents regulating the activities of the alumni association 11. Creative Industry School Creation (CRIS) 12. Educational program development for supplementary education in the humanities and technical profile 13. Recommendations development for the implementation of the Bottom-Up approach 14. Creative educational environment formation (recommendations) 15. Develop recommendations for creating a creative thinking team
Advanced training
1. Teacher excellence long-term program development
Updating the infrastructure
1. Recommendations development for making changes to the organization of the classroom fund (studio training, smart-points, co-working zones) 2. Recommendations development for university digital ecosystem development as part of the creative educational environment formation 3. Recommendations development for adapting students with special educational needs via the art component.