European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2022.02.88

LEASECON 2021
Conference on Land Economy and Rural Studies Essentials

THE HISTORY OF MADI AND IGIP COOPERATION

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Abstract

International Society for Engineering Pedagogy (IGIP) founded in 1972 occupies a unique position among other world engineering education organizations focusing on the problems of training teaching staff for technical colleges and universities. Moscow Automobile and Road Construction State Technical University (MADI) has been cooperating with IGIP for over 30 years. MADI initiated the establishment of the Russian Monitoring Committee (RMC) in 1995. Since then, RMC has been coordinating the contribution of MADI teachers in various activities of IGIP: participation and organization of annual IGIP international and regional conferences; teachers' work in IGIP Working Groups; publication of scientific and educational materials on engineering pedagogy; training of technical teachers in IGIP Centre of Engineering Pedagogy, etc. RMC contributed greatly to the dissemination of engineering pedagogy not only in Russia but in other countries as well. Thanks to long-time and fruitful MADI and IGIP cooperation, MADI has recently received the status of the Federal Innovative Platform for developing an effective model of technical teachers' professional development with the certificate of International Engineering Educator (ING.PAED.IGIP). Technical teachers can apply for this title only in case the training program is based on the IGIP Prototype Curriculum. Its design requires critical analysis of the experience acquired by international and Russian IGIP Training Centres including the content of IGIP Prototype Curricula that have been implemented in them in different periods of their history. The paper describes the results of the comparison of the three IGIP Prototypes Curricula.

Keywords: Cooperation, engineering pedagogy, IGIP, IGIP Prototype Curriculum, MADI

https://doi.org/10.15405/epsbs.2022.02.88
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Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

1.1. International Society for Engineering Pedagogy

The International Society for Engineering Pedagogy (IGIP) was founded at the First Symposium of Engineering pedagogy that was held at the University of Klagenfurt (Austria) in 1972. The Society occupies a unique position among other world engineering education organizations because it focuses on the problems of training teaching staff for technical colleges and universities. Among the main aims of IGIP, there are improving teaching methods in technical subjects, developing practice-oriented curricula that correspond to the needs of students and employers, encouraging the use of media in technical teaching (The mission of IGIP, 2021). For almost 50 years IGIP has been disseminating the ideas of engineering pedagogy all over the world. The theory of the Klagenfurt School of Engineering Pedagogy was developed by Professor Adolf Melezinek who initiated the foundation of the Society, being the IGIP President for 30 years and its Life Honorary President until his death in 2015.

1.2. Participation of MADI in IGIP activities

The year of 1990 may be considered to be a symbolic starting point of cooperation of IGIP and Moscow Automobile and Road Construction State Technical University (MADI). At that time representatives of Russian engineering universities were invited to the 19th joint IGIP, ASEE and IEEE symposium “Engineering education 2000” in Vienna (Austria) and Budapest (Hungary). MADI Vice-Rector Professor Viacheslav Prikhodko was among the participants. Realizing the relevance of engineering pedagogy, he initiated establishing IGIP Russian Monitoring Committee (RMC) (now Russian IGIP National Section) in 1995 with the headquarters in MADI. RF Vice Minister of Higher Education V. Zhurakovskiy was its first President. V. Prikhodko has been the RMC President since 1997.

Since 1990 the cooperation has been developing and now it covers almost all the spheres of IGIP activities. MADI teachers took part in IGIP annual international symposiums at first as participants, later as presenters, plenary speakers, session chairs. It was a valuable exchange of opinions of educators. In 1998 MADI was the organizer of the 27th annual international IGIP Symposium “Pedagogical Problems in Engineering Education” in Moscow (Prikhodko & Polyakova, 2015). In 2008 MADI hosted the 37th IGIP symposium “Engineering Competences – Traditions and Innovations”.

The symposiums contributed greatly to the dissemination of engineering pedagogy ideas in Russia. And later, with the support of RMC, two symposiums in Russia were organized: the 31st annual IGIP symposium “Engineer of the 21st century” in Saint-Petersburg Mining University in 2002 and the 42nd IGIP and the 16th ICL joint conference “The Global Challenges in Engineering education” in Kazan in 2013. In 2011, the annual MADI seminar “Innovative Pedagogical technologies in Engineering education” received the status of the IGIP international regional conference and since that time MADI has organized ten regional conferences. IGIP President Michael E. Auer and other IGIP Executive Committee (EC) members regularly take part in them.

IGIP Working groups are considered to be cornerstones of IGIP, and MADI teachers participated in the activities of many of them, e.g. in the groups “Working with projects”, “Technical teacher

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training", "Language and humanities in engineering education". Now Tatiana Polyakova is working on compiling the IGIP Multilingual Glossary of engineering pedagogy.

MADI regularly published and edited collections of scientific articles on engineering pedagogy, released IGIP Symposium Proceedings (Prikhodko & Polyakova, 2015) and MADI was the first in IGIP to release them on CD in 1998. From 2005 to 2012 MADI editorial board published the official IGIP journal "Report" that described the latest news of the Society. In 2015, Prikhodko and Polyakova published the monograph "IGIP: the Past, the Present and the Future" that was awarded with the first prize at one of the international contests of scientific literature.

In Russia MADI was one of the first universities that opened IGIP Training Centers, where young teachers and graduates improved the quality of their lectures and practical classes. Not once Adolf Melezinek was a visiting professor during their studies. Some of them got interested in the problems of education and began their own research in engineering pedagogy.

RMC paid special attention to the dissemination of engineering pedagogy not only in Russia but in other countries as well. Thanks to the support of RMC IGIP, National Sections were established in Ukraine, Estonia and Kazakhstan.

From 2002 to 2016 MADI was the coordinator or a member of consortiums within International Tempus and Erasmus+ projects (DIERUU, TREM, MULTICEP, ILAN, HDMCuRF, EQUASP). All the projects contributed to the development of engineering pedagogy educational materials, teachers' training and integration of engineering universities at national and international levels.

As a result of this mutual work and activities of RMC, MADI teachers represent Russia in IGIP EC and IGIP International Monitoring Committee (IMC). Many MADI teachers received the ING.PAED title that certifies that the teacher possesses pedagogical competences of an international engineering educator. For outstanding achievements and longtime active work for and within IGIP, some of them were awarded with most prestigious IGIP prizes: Adolf Melezinek Meritorious Service Award and the title of IGIP Senior Member.

Long-time and fruitful MADI and IGIP cooperation is determined by high attention that has always been paid to technical teachers' professional development in Russia, the experience of MADI department for teaching staff training, competencies and enthusiasm of MADI teachers interested in engineering pedagogy.

2. Problem Statement

In January, 2021 according to the Order of RF Ministry of Science and Education, MADI received the status of Federal Innovative Platform for developing effective model of technical teachers' professional development with the certificate of international engineering educator (ING.PAED. IGIP). One of the problems to be solved is designing a new innovative curriculum for the MADI Center of Engineering Pedagogy that will allow graduates to apply for the ING.PAED. IGIP title to be included in the IGIP ING.PAED. Register.

For solving this problem, it is necessary to take into consideration that the IGIP ING.PAED. Register is the most important IGIP instrument for qualifying engineering educators. The abbreviation "ING.PAED" stands for "International Engineering Educator". The international register was created by

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IGIP to introduce internationally recognized standards for engineering teachers. It has become a confirmation of their engineering qualification and pedagogical competence. The register lists qualify educators, trainers or instructors whose education, training, and professional experience meet IGIP standards and provides potential employers with detailed information on their education, training, and professional experience. Nowadays "ING.PAED.IGIP" has become a kind of brand name. The ING.PAED register is monitored by IMC. One of the main criteria for the "ING-PAED" title is graduation from the program that is based on the IGIP Prototype Curriculum in one of the Centres of Engineering Pedagogy. It guarantees a high level of competence for engineering educators.

So, in order to solve the above-mentioned problem, it is necessary to begin with the analysis of the IGIP Prototype Curriculum.

3. Research Questions

3.1. IGIP Prototype Curricula

The concept of the IGIP Prototype Curriculum is based on the ideas of Klagenfurt School of Engineering Pedagogy, respects the particular character of the technician and the analytical-methodological approach in the fields of engineering science. The qualifications of a technical discipline teacher are based on three components: engineering qualifications, psychological and pedagogical knowledge and skills, and teaching experience. IGIP considered that special attention should be paid to basic pedagogical training and retraining of technical teachers. Melezinek (1986) demonstrated that although the success of engineering education greatly depends on educational programs, training materials, laboratory equipment, etc., it is the lecturer possessing pedagogical and psychological skills who determines the quality of the educational process.

So, the goal of the IGIP prototype Curriculum is to provide a training course aimed at developing technical teachers' pedagogical competences. The Curriculum is regularly updated. Up to now, three versions of the IGIP Prototype Curriculum have been implemented in various IGIP Training Centres including the MADI Training Centre. They were designed in different situations.

3.2. First IGIP Prototype Curriculum

The First IGIP Curriculum was created by A. Melezinek in the 1970s. It was the time of technological revolution thereby sustaining the prestige of the engineering profession and keeping it in high demand on the technical employment market. The demand for engineers gave a tremendous boost to engineering education but it resulted in the shortage of technical teachers. In some countries the problem was seemingly solved by hiring qualified professional engineers to teach in secondary and higher educational institutions. So, professional people not ready for teaching began their carrier in education and they needed acquiring psychological and pedagogical skills and habits. Melezinek (1986) designed the Curriculum for their training and the educational process was based on the book "Engineering Pedagogy".

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3.3. Second IGIP Prototype Curriculum

The Second IGIP Curriculum was approved in 2005. At the end of the 20th century many countries were joining the Bologna process aimed at the creation of European Higher Education Area, introduction of two main study cycles, European Credit Transfer System (ECTS). At the same time, this period is characterized by implementation of new educational technologies, such as ICT, computer simulations, e-learning, blended learning, distance learning, problem solving, and others. The work on the updating of the IGIP Curriculum was initiated and coordinated by the Working Group "Technical teacher training" according to the current trends in engineering education. Among the main trends IGIP members named the transfer from knowledge and skills approach to competence approach, teacher-oriented to student-cantered teaching process, measuring workload in the terms of ECTS. Besides, it was the time of introducing modular teaching content structure. Some members of the Society were sure that IGIP should play a key innovative role as a disseminator of new approaches and educational technologies. In their opinion, the new curriculum should illustrate the improvement of the educational process and the efficiency of recent technological and educational developments (Van Engelshoven, 2003). In 2005 IGIP issued two documents: “IGIP Criteria for Accreditation of Engineering Pedagogy Studies” (2005) and “IGIP Recommendations for Studies in Engineering Pedagogy Science” (2005). Both documents were approved by the IGIP Executive Committee on the same day, on September 11th, 2005. The latter contains two alternatives of the Second IGIP Prototype Curriculum known as “Alternative 1” and “Alternative 2”.

“Alternative 1” was designed by Adolf Melezinek. Some IGIP members considered it a rather cautious development of the first traditional IGIP curriculum (IGIP Recommendations…, 2005). The second variant, Alternative 2, was worked out by a team of specialists and Vera Ziroff Gut, the head of the working group "Technical teacher training", was responsible for this project. The authors of Alternative 2 considered this variant to be a more serious step forward (Kammasch & Ziroff Gut, 2005). It was designed in close cooperation with A. Melezinek by mutual efforts of several IGIP working groups, e.g. “Technical teacher training” (Bernd Lübben), “Curriculum development” (Traugott Schelker), “Working with projects” (Ralph Dreher and Fritz Kath), “Knowledge management and computer aided technology” (Hans-Bernhard Woyand), “Language and humanities in engineering education” (Robert Ruprecht).

In 2005 at the annual symposium in Istanbul, one of the keynote lectures was devoted to the results of the work. It described the main characteristics that new ING.PAED Curriculum should obtain close links between theory and praxis, the importance of human values. As a result, the Second IGIP Curriculum applies the philosophy, according to which it must respect the following human and pedagogical values. The human being is a person with all his/her human rights: modern pedagogical attitudes giving room for individual learning as well as working in teams: knowledge as a whole not just as a sum of random information (Kammasch & Ziroff Gut, 2005).

MADI Training Centre followed mainly Alternative 1 and used the most well-known book by A. Melezinek “Engineering Pedagogy” that had been translated into Russian by that time by Prikhodko and Arutunova (2015). The workload of the MADI Curriculum increased by 70 contact hours (Sazonova, 2010).

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3.4. Third IGIP Prototype Curriculum

The Third IGIP Curriculum approved in 2013 was further development of the previous ones. The work at its modernization was initiated by IGIP President M. Auer. For that purpose, a task force was formed that included Zafoschnig (2013) as the moderator, Dana Dobrovska, Pavel Andres, Teresa Restivo, Tia Rüütmann, Jose Marques, Roman Hrmo, Melany Ciampi, Claudio da Rocha Brito, Danilo Garbi Zutin, Ralph Dreher. MADI took an active part in this process as Alexander Soloviev also participated in the work of the task force (Zafoschnig, 2013).

The members of the task force made intensive preparations for updating the IGIP Prototype Curriculum. They came to the conclusion that it was not necessary to change radically the curriculum structure, but rather to have a thorough look at the teachers' profiles and competences, to take into account the possibility of training and retraining, problem-based learning, assessment as well as reflexing process. New module descriptions were made under the leadership of Pavel Andres. The third version of the IGIP Curriculum incorporated the best features of many programs for teachers' professional development (Zafoschnig, 2013):

- the PH Kärnten modular curriculum for the certified engineering educator program aimed mainly at technical teachers at VET colleges (classroom and laboratory);
- the study program for engineering didactics of Dresden Technical University designed under the supervision of Hanno Hortsch and consisting of a combination of theoretical and practical modules;
- the approach of the University of Wuppertal emphasizing the importance of project-based assessment;
- the new curriculum for the Austrian technical colleges developed by the Austrian Ministry of Education focused on learning outcomes and prototypical examples, both educational and occupational standards;
- the curriculum of the University of Porto that was, on the one hand, classical following strictly the structure of the IGIP Prototype Curriculum and, on the other hand, flexible introducing new modules such as "Thinking skills and creativity", "Infoliteracy" and "Final project".

While updating the IGIP Curriculum, special attention was paid to the module "ICT in Engineering Education". The aim of the module was to train technical teachers to identify, to select, to design, to produce, and to use the most appropriate ICT or their combination for specific educational needs. The module was supposed to show the advantages of e-learning, internet searching, blended learning, various communication services and tools.

4. Purpose of the Study

The purpose of the study is to find out most relevant invariant characteristics of the three IGIP Prototype Curriculums that have already been implemented in various engineering institutions all over the world and if it is possible to determine the main trends of their further modernization. The achieving of the purpose requires revealing similarities and differences of the three Prototype Curriculums including Alternative 1 and Alternative 2 of the Second Curriculum.

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5. Research Methods

The choice of the methods used is determined by the purpose of the research. Theoretical methods were applied for pedagogical analysis of scientific articles, research, and Internet resources as well as for comparative analysis of the First, the Second (with two alternatives) and the Third IGIP Prototype Curricula that have already been implemented in the educational process of many IGIP Training Centers in many countries including Russia. Besides, empiric methods were used for studying longtime experience of technical teachers' professional development in MADI Centre of Engineering Pedagogy.

During the comparative analysis of different variants of IGIP Prototype Curricula, the following parameters were supposed to be taken into account:

- the total workload;
- the structure of the curricula;
- the number of modules;
- the description of modules.

6. Findings

6.1. The total workload of IGIP Prototype Curricula

The workload in the First IGIP Prototype Curriculum was measured in contact hours and was equal to 204 hours. Beginning with the two alternatives of the Second Curriculum the workload was expressed in credit points and in all the variants of the Curriculum the minimum standard was equal to 20 credit points.

For the compatibility of the curricula workload being analysed it is necessary to bear in mind that in IGIP Curricula one credit point corresponds to 30 hours of total work, of which at least 12 hours are supposed to be contact. That means that 20 credit of the Second and the Third Curricula should provide at least 600 hours of total workload, of which at least 240 should be contact hours. That means that their workload is 36 contact hours higher in comparison with the First Curriculum that had minimum of 204 contact hours. Taking also into consideration, as it was mentioned above, that some Training Centres could add some modules (up to 70 contact hours), it is possible to state that we observe the tendency of workload increase.

6.2. The structure of the Curricula

As far as the First Curriculum is concerned it is difficult to speak of any distinct structure of it. The Curriculum provides just a list of disciplines. However, its author A. Melezinek always underlined the specific role of the disciplines **"**The Fundamental Principles of Engineering Pedagogy" and "Engineering Education Practice" that united all the other subjects. He was also sure that the first of them was the integrating part of the whole study course. The titles the subjects also show that it is possible to distinguish theory- and practice-oriented subjects (Table 1).

Both alternatives of the Second Prototype Curriculum and the Third Curriculum are structured and have a modular organization (Table 1).

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In Alternative 1 of the Second Curriculum worked out by A. Melezinek there are three types of modules: required, required elective and elective modules (Table 1). Required modules (RM) are compulsory. Required elective modules (REM) are also compulsory but learners can choose one module on their own from the list offered. Elective Credit Points (FCP) are electives that students are completely free to choose. The modules are theory- or practice-oriented.

Table 1. The comparison of IGIP Prototypes Curricula modules

I Prototype Curriculum	II Prototype Curriculum (Alternative 1)	II Prototype Curriculum (Alternative 2)	III Prototype Curriculum
-------	--------	**Core modules** (8 CP)	**Core modules** (7 CP)
-------	**Required Modules**	**Required Modules**	**--------**
Fundamental Principles of Engineering Pedagogy (36 hours)	Engineering Pedagogy Science in Theory and Practice (6 CP)	Engineering Pedagogy in Theory (3 CP)	Engineering education in Theory (2 ECTS)
Engineering Education Practice (36 hours)	(Joined)	Engineering Pedagogy in Practice (3 CP)	Engineering education in Practice (3 ECTS)
Laboratory Didactics (12 hours)	Laboratory Didactics (2CP)	Laboratory Didactics (3 CP)	Laboratory Didactics (2 ECTS)
_____	----------	**Theory modules** (4 CP)	**Theory modules** (5 ECTS)
	Required Modules	**Required Modules**	
Selected Principles of Psychology (16 hours)	Psychology (2CP)	Psychology and Sociology (3 CP)	Psychology (2 ECTS)
Selected Principles of Sociology (8 hours)	Sociology (1 CP)	Joined	Sociology (1 ECTS)
----------	**Required Elective Modules**	**Required Elective Modules**	----------
	Ethics (1 CP)	Ethics (1 CP)	Engineering ethics (1 ECTS)
Principles of Biological Development (8 hours)	Biological and Intercultural Competences (1 CP)	Intercultural Competences (1 CP)	Intercultural Competences (1 ECTS)
----------	--------	**Practice Modules** (6 CP)	**Practice Modules** (5 ECTS)
_____	**Required Modules**	**Required Modules**	---------
Rhetoric (12 hours)	Joined	Joined	----------
Actual Communication and Discussion Training (32 hours)	Rhetoric, Communication (2 CP)	"Rhetoric, Communication (2 CP)	Presentation and Communication Skills (2 ECTS)
Fundamental Principles of Understandable Text Creation (16 hours)	Understandable Text Creation, Scientific Writing (1 CP)	Scientific Writing" (1 CP)	Scientific Writing (1 ECTS)
----------	"Working with Projects" (1 CP)	"Working with Projects" (2 CP)	"Working with Projects" (1 CP)
Fundamental Principles of Educational Technology (12 hours)	"Media, E-learning, Computer-aided Technologies" (2 CP)	"Media, E-Learning and Computer Aided Technologies" (2 CP)	ICT in Engineering Education (1 ECTS)
Other Subjects (total of 16 hours)	**Elective credit points** (1 CP)	**Elective credit points** (2 CP)	**Elective modules**

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2 subjects			Evaluation of Student Performance (1 ECTS) Quality Management (1 ECTS) Portfolio Assessment (1 ECTS) Creative Thinking (1 ECTS) Coaching and Mentoring in Education (1 ECTS) Collaborative work (1 ECTS) Teaching Subject in English (1 ECTS) Infoliteracy (1 ECTS)
Total at least **204 hours**	Total at least **20 CP**	Total at least **20 CP**	Total at least **20 CP**

The authors of Alternative 2 also used this classification of modules of RM and REM but introduced an extra division (Table 1). The modules are grouped into core modules, theory modules, practice modules and elective credit points. So, the differentiation of theory- and practice-oriented modules is evident.

In general, the comparison of the structure of the two Alternatives of the Second IGIP Curriculum shows that having the same platform they demonstrate more similarities than differences. There is a slight difference which is not really significant in the names of modules and distribution of credit points for them. For example, in “Alternative 1” we find two modules – “Psychology” with 2 CP and “Sociology” with 1 CP whereas in “Alternative 2” there is one module “Psychology and Sociology” with 3 CP.

Besides both alternatives of the Second Curriculum introduced the same uniform system of results evaluation. It is a final exam held by a commission of at least three members. During the exam, the candidates had to show the competencies of an engineering pedagogue that they had acquired. For the first time Alternative 2 provided also a presentation and discussion of a candidate’s portfolio and an interview concerning its components. Portfolio should contain the confirmations of the lecturers in all the modules completed, written plan and performance of a teaching session, including video recording, and a subsequent analysis as well as the problem solving of at least one didactic case study. The portfolio is discussed at the "Engineering Pedagogy Colloquium". The exam is marked as "passed" or "failed".

The task force dealing with the Third Curriculum made the decision to preserve the structure of core, theory, practice and elective modules but did not use the classification of RM and REM modules (Table 1). As far as the organization of studies is concerned, two forms of program realization are recommended: an independent course and a course integrated into engineering training. The latter must take place in the second part of Master programs of engineering studies.

The analysis shows that the most relevant feature of the Curricula structure is the differentiation of theory- and practice-oriented modules that we can find in all the variants of the Curriculum. At the same

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time there are modules that constitute the core of the curriculum allowing learners at a later stage to choose disciplines according to their individual interests.

6.3. The number of modules

The First Curriculum contained 10 subjects and two additional ones that could be determined by National Monitoring Committees according to the situation in engineering organisations. Alternative 1 and Alternative 2 of the Second Curriculum contained also 10 modules.

It is difficult to compare the number of modules in the Alternatives as some of the modules were split (e.g. “Phycology and sociology” was split into two separate modules “Phycology” and “Sociology”) and some of them were joined (e.g. “Rhetoric, communication, scientific writing”) (Table 1). Nevertheless, it is possible to notice the tendency of increasing the number of modules. First of all, beginning with the Second Curriculum a new module “Working with projects” was introduced. Second, it was recommended to use electives in order to add another required subject, to reinforce required modules or to introduce a self-defined elective in accordance with the educational institution.

The Third Curriculum contains 19 modules. Eleven of them are compulsory and eight of them are electives. The greatest difference is that the Third Curriculum instead of recommendations on the content of electives gave a list of elective modules and the number of them is impressive.

The comparison of the number of the modules shows that the total number of them is increasing due to their splitting and adding new modules. It is possible to speak about more or less constant number of compulsory modules and significant increase of electives that provide individual choice of learners. Thus, there is a tendency that the IGIP Curriculum is becoming more and more learner-oriented.

6.4. The description of modules

The First Curriculum gave a brief overview of the content of the subjects and the description of phycological and pedagogical skills and habits (Prikhodko & Polyakova, 2015). The Second Curriculum (IGIP Recommendations…, 2005) and the Third Curriculum (Zafoschnig, 2013) are characterized by a more detailed description of the modules. The modules comprise not only the description of the contents but precise definition of the modules objectives, the topics to be studied, the methods used by the instructor, the requirements to the “input” knowledge and skills of learners, the competences to be developed, lists of recommended literature, learning forms, recommendations to the instructors. There is a correlation of the modules and the parts of portfolio to be presented during the final exam. One can find a wide range of pedagogical methods and technologies, e.g. a lecture, a seminar, a colloquium, a theoretical or experimental exercise, a laboratory session, a project, and excursion, a scientific guidance, a case study, implementation of visual aids, etc.

7. Conclusion

IGIP and MADI cooperation has a long history of more than 30 years. For that period MADI educators took an active part in all spheres of IGIP activities: participation and organization of

international and regional conferences, research in engineering pedagogy, dissemination of its ideas in Russia and other countries, publication of scientific and educational materials, etc.

MADI opened one of the first IGIP Training Center in Russia. Now the university has received the status of Federal Innovative Platform for developing effective model of technical teachers' professional development with the certificate of international engineering educator (ING.PAED. IGIP). In order to design an innovative program for teachers' professional development that meets the requirements of IGIP it was necessary to take up comparative analysis of the three IGIP Prototype Curricula.

The comparative analysis shows that new Curricula are always further development of their previous versions and all of them are based on the main principles of engineering pedagogy. It is possible to notice the tendency of some increase of the Curricula total workload and the number of modules. This increase is mainly connected with the increase of the number of elective modules. The most relevant feature of the Curricula structure is the differentiation of theory- and practice-oriented modules. At the same time there are core modules ("Engineering Pedagogy in Theory and Practice" and "Laboratory Didactics") that form the spine of the curriculum. These core modules allow learners at a later stage to choose various disciplines according to their individual interests. The IGIP curriculum can serve as a basis for short-cycle or long-cycle engineering education programs.

Acknowledgments

The study has been conducted in MADI as an activity under the project "Effective training model of technical discipline lecturers for the purpose of obtaining "International Educator of Engineering University" certificate - "ING-PAED IGIP"". MADI is recognized as a Federal Innovative Platform according to Order No. 1580 of 25.12.2020 (registered on 03.02.2021).

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