

WHAT ABOUT GEOMETRICAL DIDACTICS? THE RESULTS OF THE QUESTIONNAIRES

Anna BŁACH¹, Andrzej KANIA², Monika SROKA-BIZOŃ³

Silesian University of Technology, Geometry and Engineering Graphics Centre
Krzywoustego st. 7, 44-100 Gliwice, Poland

¹ e-mail: anna.blach@polsl.pl

² e-mail: andrzej.kania@polsl.pl

³ e-mail: monika.sroka-bizon@polsl.pl

Abstract: Currently we live in the era of questionnaires when we carry them or we are being polled. Nevertheless, the amount of feedback information acquired with the well filled in questionnaire should not be overestimated. It is becoming more and more difficult for national representation of people dealing with descriptive geometry didactics as well as subjects related to that field, to meet at the annual conferences organized by Polish Society of Geometry and Engineering Graphics and the Centre of Geometry and Engineering Graphics of the Silesian University of Technology. These meetings are always a good opportunity to present one's own achievements and didactic experience. Questionnaires allow collecting data, including figures, which after being processed can be published and thanks to that become known. The first part of carried questionnaires research on didactics of descriptive geometry, engineering geometry and subjects related to geometry allows to gather information on status of geometry in 2011. The paper presents the results of questionnaires carried on 19 respondents, representatives of 8 Polish technical universities. The collected data refer to the names of geometrical subjects which are used at curricula of different courses of 8 Polish technical universities, the number of teaching hours devoted to these subjects, the number of ECTS points for these subjects, teaching contents realized at particular courses of study, recommended textbooks, methods and didactic 'tricks'.

The collected information allow to estimate roughly the status of realized didactics of descriptive geometry and related subjects in 2011 at Polish universities. The authors would like to express their gratitude to respondents, who devoted their time to fill in the questionnaires and share their opinions. At the same time the authors are willing to continue so that the questionnaires become known among academic staff dealing with geometry in broad sense, and in this way a broader picture of the status of didactics of descriptive geometry, engineering graphics and related subjects can be achieved.

Keywords: geometry, descriptive geometry, didactics, questionnaire

1 Didactic questionnaire – didactics of geometry in 2011

The questionnaires were sent to 30 respondents. They were sent together with an invitation to the General Meeting of the Polish Society of Geometry and Engineering Graphics, and thus in the first group of respondents were well known, active members of the Society who participate in many conferences organized by the organization. In respond we got 19 questionnaires where 12 academics of 8 technical universities presented information on didactics of descriptive geometry and related subjects.

The following nine names of subjects were mentioned in questionnaires:

- descriptive geometry – 10,
- descriptive geometry (study in English) – 1,

- descriptive geometry with technical drawing – 1,
- engineering graphics – 1,
- engineering graphics and descriptive geometry -1,
- engineering graphics and elements of descriptive geometry – 1,
- geometry and engineering graphics – 1,
- geometry and engineering graphics in AutoCAD – 1,
- technical drawing and descriptive geometry – 1.

These subjects were taught at the following courses of studies:

- architecture and urban-planning - 4,
- civil engineering – 4,
- electrotechnics – 1,
- environmental engineering - 3,
- geodesy and cartography – 1,
- interior design – 1,
- international faculty of engineering – 1,
- spatial management -2,
- transport – 1.

At the faculty of Architecture and Interior Design, Descriptive Geometry is still traditionally taught and it is so at 4 of the presented technical universities. A little bit different situation is at the Faculty of Civil Engineering where a student depending on the university can study Descriptive Geometry in Gdańsk and Białystok, Descriptive Geometry and Technical Drawing in Kielce, the same name of the subject is at the Silesian University of Technology. At the Wrocław Technical University the students of Civil Engineering study two separate subjects i.e. Descriptive Geometry and Technical Drawing. Similar situation occurs at the Faculty of Environmental Engineering where there are also two types of subjects.

In Gdańsk and Łódź students study Descriptive Geometry whereas in Gliwice and Wrocław Technical Drawing and Descriptive Geometry. Other courses of studies were represented in single cases therefore there is no base to draw conclusions and form generalizations. However, it can be stated that the adjective ‘descriptive’ occurs in five out of nine names of the mentioned subjects. It is difficult to state the reasons of introducing the word ‘descriptive’ back to the names of subjects instead of ‘engineering’, nevertheless, this is what happens. This situation occurred at the SUT where The Board of Faculty of Civil Engineering gave back the traditional name to this subject in 2008, similarly The Board of Faculty of Environmental Engineering did so in 2007 giving back the name of Technical Drawing and Descriptive Geometry, with Engineering Graphics for the students of the course of Environmental Protection.

The name of subject is as a kind of entry which could cover different contents. Three basic issues, which were discussed in questionnaires, connected with curricula realized during classes were the following:

- marking projection (is it realized, if yes at which level of the course),
- method of describing lines and planes in Monge’s projection,
- minimum curriculum of the course with information how many didactic hours are necessary for realization of such minimum.

Table 1: Scientific units which were represented in the first part of questionnaires research

| | | |
|----|------------------------------------|--|
| 1. | Bialystok University of Technology | Faculty of Civil and Environmental Engineering Division of Spatial Information |
| 2. | Gdansk University of Technology | Faculty of Architecture Department of Visual Arts Faculty of Civil and Environmental Engineering Department of Mechanics of Structures and Bridges |
| 3. | Cracow University of Technology | Faculty of Architecture Department of Descriptive Geometry, Technical Drawing and Engineering Graphics |
| 4. | Technical University of Lodz | Faculty of Civil Engineering, Architecture and Environmental Engineering Department of Geodesy, Cartography of Environment and Descriptive Geometry |
| 5. | Rzeszow University of Technology | Faculty of Civil and Environmental Engineering Division of Geometry and Engineering Graphics |
| 6. | Silesian University of Technology | Geometry and Engineering Graphics Centre |
| 7. | Kielce University of Technology | Faculty of Civil and Environmental Engineering Department of Architecture and Urban Planning Division of Descriptive Geometry and Technical Drawing |
| 8. | Wroclaw University of Technology | Faculty of Architecture Division of Descriptive Geometry and Perspective |

Table 2: Names of subjects with courses of studies, numbers of hours and number of ECTS points

| University | Course of study | Name of subject | Number of hours | ECTS |
|-----------------------------------|--------------------------------------|---|-----------------|---------|
| Kielce University of Technology | civil engineering | Descriptive geometry with technical drawing | 60 h | |
| Silesian University of Technology | environmental engineering | Technical drawing and descriptive geometry | 30 h | 2 |
| Wroclaw University of Technology | architecture and urban-planning | Descriptive Geometry I | 60 h | 6 |
| Wroclaw University of Technology | spatial management | Descriptive Geometry | 60 h | 5 |
| Cracow University of Technology | architecture and urban-planning | Descriptive Geometry | 90 h | 4 |
| Cracow University of Technology | electrotechnics | Geometry and engineering graphics In AutoCAD | 30 h | 5 |
| Gdansk University of Technology | civil engineering | Descriptive Geometry | 45 h | no data |
| Gdansk University of Technology | environmental engineering | Descriptive Geometry | 45 h | no data |
| Gdansk University of Technology | geodesy and cartography | Engineering graphics and elements of descriptive geometry | 30 h | no data |
| Gdansk University of Technology | transport | Engineering graphics and descriptive geometry | 24 h | no data |
| Technical University of Lodz | environmental engineering | Descriptive geometry | 30 h | no data |
| Technical University of Lodz | architecture and urban-planning | Descriptive geometry | 75 h | no data |
| Technical University of Lodz | spatial management | Engineering graphics | 45 h | no data |
| Technical University of Lodz | international faculty of engineering | Descriptive Geometry | 45 h | no data |
| Technical University of Lodz | interior decoration | Descriptive Geometry | 45 h | no data |
| Gdansk University of Technology | architecture and urban-planning | Descriptive Geometry | 90 h | 9 |
| Politechnika Bialostocka | civil engineering | Descriptive Geometry | 45 h | 4 |
| Politechnika Bialostocka | civil engineering | Geometry and engineering graphics | 90 h | 4 |

2 Marking projection

The marking projection is realised in framework of 13 courses of subjects which were discussed in questionnaire, in framework of 6 courses such subject matter is not discussed, in one case of these courses (Wrocław University of Technology), marking projection is realised during higher, elective course. In 10 cases marking projection is realised after Monge's projection. All responders but Edwin Koźniewski did not motivate in wide way such method of realisation of these geometrical issues.

It is interesting to compare courses of studies where marking projection is discussed with these courses where this aspect is not included in the syllabus of a given subject.

Table 3: Courses of studies where marking projection is or is not realized

| courses of studies – 'geometry with marking projection' | courses of studies – 'geometry without marking projection' |
|---|--|
| architecture and urban-planning | architecture and urban-planning |
| civil engineering | interior design |
| Geodesy and cartography | electrotechnics |
| spatial management | international faculty of engineering |
| environmental engineering | environmental engineering |
| Transport | |

In the presented questionnaires three courses of Descriptive Geometry (at Gdańsk and Łódź Technical Universities) and Technical Drawing and Descriptive Geometry (SUT) for Environmental Engineering course realize marking projection but in three versions: after Monge's projection, before Monge's projection and is not realized at all. It undoubtedly confirms proprietary character of the realized curriculum. At courses realized at the architecture and urban planning the issues of marking projection are taught after Monge's projection as a kind of ending of the course, and in one case (Wrocław Technical University) it is realized as elective subject at the seventh semester.

Based on the analysis of the obtained responses on the way of realizing the theme of marking projection, one can form a statement that there is Łódź school of geometry and connected with it approach to the issues of marking projection. Both Zdzisław Andrzejowski and Wiesław Pawłowski, academics of the Division of Geodesy and Descriptive Geometry of the faculty of Civil Engineering, Architecture and Environmental Engineering of Łódź Technical University, realize the issues of marking projection before Monge's projection similarly to classical textbooks of Descriptive Geometry. Maybe the name of the division obliges them to take interest in the first projection?

Edwin Koźniewski from Białystok Technical University has justified the incorporation of the marking projection in the syllabus of Descriptive Geometry in an interesting way. Within his course of Descriptive Geometry for the students of Civil Engineering marking projection is taught after Monge's projection as a kind of orthogonal projection and the knowledge of basic constructions such as rabattement which were discussed during Monge's projection allow free application of that construction in marking projection. As the authors think, it is interesting to pay attention to marking projection in American textbooks on Descriptive Geometry, where as the author says 'marking projection is not talked about directly, one can even say it is not present, but in fact this projection is widely discussed as an interpretation of orthogonal projection 'pretending' that this is nothing new.' It can be an attempt to teach students an ability without paying attention to this fact.

3 Trace method or without trace?

The second aspect in the questionnaires was the way of realizing classes in Descriptive Geometry and related subjects concerning determination of lines and planes in transformations and basic constructions in Monge's projections.

The authors of questionnaires were interested in how the idea of trace is used and common in contemporary didactics of geometry.

In 16 questionnaires responders answered that they used without trace method for describing lines and planes in Monge's projection; in 2 cases didactics of Descriptive Geometry is realized with trace method; one responder claimed that „considerations about geometry with trace or without it are useless nowadays.”

Responders admitted that without trace method as:

- the one which is easier to get to students,
- it gives more free way of describing,
- the method which is more universal,
- the most universal method and the easiest method for understanding using common sense,
- more universal method,
- more readable method in construction,
- more independent of the position of object according to projection plane.

Additionally, as a reason for using the method without trace, tradition of the department was given – such explanation appeared in questionnaires from Cracow University of Technology and from Technical University of Lodz.

The comparison of justifications for using the methods with and without trace. According to Tomasz Bogaczyk from Wrocław Technical University, who uses the method of determination of lines and planes in transformations and basic constructions of Monge's projection by means of trace, this method allows to determine the special 'contact' with the environment which in his opinion is especially important for architects.

4 The basic textbooks

Among the textbooks which are recommended for students as basic textbook responders mentioned 22 items. Among them it is possible to distinguish books which were indicated several times:

- Grochowski B.: Geometria wykreślna z perspektywą stosowaną – 3,
- Andrzejewski Z., Pawłowski W., Przewłocki S.: Geometria wykreślna w praktyce inżynierskiej – 2,
- Jankowski W.: Geometria wykreślna – 2,
- Otto F., Otto E.: Podręcznik geometrii wykreślnej – 2.

Almost in each opinion, publications from respondents' university publishers are shown:

- Kielce University of Technology,
- Wrocław University of Technology,
- Cracow University of Technology,
- Gdansk University of Technology,
- Warsaw University of Technology,
- Silesian University of Technology,
- Technical University of Lodz.

In case of Gdansk University of Technology multimedia materials have been elaborated for students and offered free (the authors: Helenowska-Peschke M., Przyłucka K. and Wanclaw A.) or with limited access e.g. only for students of a given faculty (Kotarska-

Lewandowska B. and Chróścielewski B.). Edwin Koźniewski also mentions as recommended his own materials from lectures and classes in the Internet but there is no information regarding their form or the way of accessibility (with or without limitations).

It seems that the abundance of recommended textbooks may indicate great degree of individualism of descriptive geometry courses and related subjects offered at different universities. It can result from the fact of decreasing number of teaching hours of the subjects. The smaller number of hours extorts reduction of the course, sometimes limitation of some issues which in the teacher's 'tailored' requires also 'customized' textbook. Such a specially chosen textbook perfectly meets the needs of the first year students, who in this way have their 'own' textbook in the same way as they did in secondary school with all topics realized during classes.

In the same way, this need of having own materials is met by putting resources for classes or lectures in the Internet. It also fulfils the need to use modern forms of media and communication. Multimedia materials prepared by our Gdansk colleagues have additional value of modernity- numerous animations which explain geometrical issues.

Table 4: Textbooks which are recommended by responders for individual courses of studies

| Course of study | Recommended books |
|---|---|
| civil engineering | Dobosz P., Ochoński S., Rola H.: Materiały pomocnicze do geometrii wykreślnej, Wydawnictwo Politechniki Świętokrzyskiej Mirski J.: Zastosowania geometrii wykreślnej w budownictwie, Wydawnictwo Politechniki Świętokrzyskiej Szerszeń S.: Nauka o rzutach, PWN |
| environmental engineering | Jankowski W.: Geometria wykreślna |
| architecture and urban planning spatial management | Grochowski B.: Geometria wykreślna z perspektywą stosowaną, PWN Bogaczy T., Romaszkiwicz-Białas T.: 13 wykładów z geometrii wykreślnej |
| architecture and urban planning | Pałasiński Z.: Zasady odwzorowania utworów przestrzennych cz. I i cz. II |
| electrotechnic | Vogt B.: Podstawy rzutów Monge'a w zadaniach Vogt B.: Kolineacja i powinowactwo w zadaniach Vogt B.: Kula i bryły obrotowe w zadaniach |
| civil engineering environmental engineering transport geodesy and cartography | Kotarska-Lewandowska B., Chróścielewski J.: Materiały pomocnicze do wykładu z Geometrii Wykreślnej, electronic version is available for students on the website - www.okno.pg.gda.pl WILIŚ PG Kotarska-Lewandowska B., Chróścielewski J.: Materiały pomocnicze do ćwiczeń z Geometrii Wykreślnej, electronic version is available for students on the website - www.okno.pg.gda.pl WILIŚ PG Bieliński A.: Geometria wykreślna, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005 Błach A.: Inżynierska geometria wykreślna (podstawy i zastosowania), Wydawnictwo Politechniki Śląskiej, Gliwice 2006 Grochowski B.: Elementy geometrii wykreślnej, PWN, Warszawa 2002 Jankowski W.: Geometria wykreślna, Wydawnictwo Politechniki Poznańskiej, Poznań 1999 Otto F., Otto E.: Podręcznik geometrii wykreślnej, PWN, Warszawa 1998 |
| environmental engineering | Andrzejewski Z., Pawłowski W., Przewłocki S.: Geometria wykreślna w praktyce inżynierskiej, Wydawnictwo Politechniki Łódzkiej |
| architecture and urban planning spatial management architecture and urban planning (part time study) | Andrzejewski Z., Pawłowski W., Przewłocki S.: Geometria wykreślna w praktyce inżynierskiej, Wydawnictwo Politechniki Łódzkiej |
| international faculty of engineering interior design | Grochowski B.: Geometria wykreślna Bartel K.: Perspektywa malarska |
| architecture and urban planning | Otto F., Otto E.: Podręcznik geometrii wykreślnej, PWN, Warszawa 1998 Multimedia materials which are available on the www.pg.gda.pl Helenowska-Peschke M., Przyłucka K.: Wykłady z geometrii wykreślnej Helenowska-Peschke M., Waclaw A.: Zadania z geometrii wykreślnej Helenowska-Peschke M., Waclaw A.: Konstrukcje cieni |
| civil engineering | Lectures and tasks which are presented on the website Grochowski B.: Geometria wykreślna z perspektywą stosowaną Przewłocki S.: Geometria wykreślna w budownictwie |

5 Didactic tricks

Didactic tricks which are shown in questionnaires could be divided into two groups – traditional methods which are used for a long, long time and a little more new methods which are based on computer techniques.

To traditional ‘didactic tricks’ the following can be accepted:

1. a lecture which is illustrated by free hand drawings prepared in colour chalks – 2,
2. free hand drawings as an illustration of issue – 1,
3. ‘materialization geometrical elements’, using such elements of lecture room as its space or walls or using a pencil as a representation of line - 2,
4. real models which are used to show spatial relation – 6,
5. using such application as geometry of roofs, observation of shadows, analysis of photography as a method for explanation of geometrical issue – 1.

To new didactic tricks which are based on computer techniques the following can be accepted:

1. computer animation – 2,
2. computer presentations, which are used as an illustrative material during lectures – 4,
3. Internet is used as a way for communication with students (materials from lecture or materials for classes) – 5,
4. multimedia lectures i.e. computer presentations which are prepared earlier (a form of visualization of lectures) – 1.

Therefore, it can be stated that within the used didactic methods we observe the state of balance with a slight dominance of traditional didactic methods (5 out of 4). However, decisively our respondents favoured the use of real models in didactics of geometry, with half of the respondents claiming to use this as their own trick.

The questionnaires show interesting solutions concerning facilitation of designing classes by means of preliminary preparation of sheets for classes. This way of classes preparation definitely demands greater work load from the teacher, nevertheless it allows students to use this time totally to solve a given geometrical problem. The problem left here is how to verify preliminary assumptions for solutions which even greater increases work load necessary for preparation for classes and sustaining the same level of difficulty and different variations of tasks.

A didactic trick worth mentioning is giving special, designing form of solving a task i.e. solving individually a task first in Monge’s projection and then elaboration of its computer model and preparation of unified mock-up presenting both solutions. This approach is close to Edwin Koźniewski’s concept of the necessity of correlation between the discussed projection and axonometry so that a student is forced to transform an object from one projection to the second one.

6 Minimum geometry curriculum

It was rather difficult for responders to describe a minimum geometry curriculum which should be realized during a course of descriptive geometry or any other geometrical subject. Some of the opinions are limited to rather short issues or entries such as: polyhedrons, section of polyhedrons, intersection of polyhedrons, roof polyhedrons, section of second degree surfaces, intersection of second degree surfaces. It is rather complicated to imagine to discuss these issues without understanding these ideas in more detailed opinions. Such issues as affiliation, perpendicularity, rotation by right angle, auxiliary projection planes, rotation were mentioned. The authors of the first group of topics, think that it is obvious that this second group of topics must be realized during geometrical course.

In some opinions such projections as Monge's projection, axonometry, perspective, marking projection – without more detailed descriptions, were mentioned.

Colleagues from Gdansk University of Technology submitted 30 topics for the course of Descriptive Geometry, which is realized by students of architecture course from their university. In their opinion this course it is a geometrical minimum curriculum.

It seems to be important in our respondents' opinion to present such issues as elements of collineation and central projection which were mentioned independently to perspective.

Only 2 persons gave information how many hours they need for such 'minimum course'. Definite didactic hours were for Descriptive Geometry which is realized at environmental engineering course – now it is 30 h but it should be 45 h. The next case was for Geometry and Engineering Graphics in AutoCAD for electrotechnic course – now it is 30 h but it should be 60 h.

Maybe in the opinion of the rest of responders number of didactic hours is a kind of minimum for minimum program? Or they even do not dream about bigger amount of hours for geometry?

7 Conclusions

The obtained results from the first part of questionnaire indicate the necessity of their continuation so that full information on Geometry Didactics 2011 can be acquired. Eight representatives of Polish technical universities took part in the questionnaires. In order to get a full picture it is necessary to get to greater number of academics dealing with the didactics of Descriptive Geometry and related subjects. Wide polls can help acquire valuable information in a broader range, on the status, soundness of descriptive geometry, engineering graphics and related subjects at Polish universities.

The collected information about curricula, the number of teaching hours and the allocated ECTS points can be especially important in the time of adaptation of curricula of particular university courses to the so called effects of teaching elaborated by given universities. This adaptation of curricula at the study courses carried by a university, is a requirement imposed by the new modification of Law on Higher Education coming into force on 1st October 2011.

Up till now standards become invalid and universities determine their own teaching effects which must be congruent with National Higher Education Frameworks of Qualifications. The draft of new act, accepted on 14th Sep. 2010 by the Council of Ministers, i.e. *'The Act on Higher Education and the Act on the Academic Degrees and Academic Title, as well as the Art Degrees and Title and Amendment to Certain Other Acts of law'* assumes introduction of National Higher Education Frameworks of Qualifications. According to the assumptions of the above mentioned act National Frameworks of Qualifications broaden the autonomy of university in the domain of didactics, allowing creation of curricula with the proper method for Frameworks of Qualifications. Curricula will be based on the teaching effects, using appropriate description for National Frameworks of Qualifications levels and the areas of education. [3]

The acquired, processed and published information present realized curricula at particular universities as well as used didactic methods and suggested textbooks, which facilitate their popularity and recommendation. Making the questionnaires results popular, carried among the members of the Polish Society of Geometry and Engineering Graphics, by means of their publication gives a great possibility to spread the didactic methods used in

teaching of descriptive geometry and related subjects by teachers who originate from traditional Divisions of Descriptive Geometry.

References

- [1] www.pwr.wroc.pl - web page of Wroclaw University of Technology
- [2] *Ustawa z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym* (DZ.U. Nr 164, poz. 1365, z późn. Zm.)
- [3] www.nauka.gov.pl

CO Z TĄ DYDAKTYKĄ GEOMETRII? WYNIKI BADAŃ ANKIETOWYCH

Żyjemy w dobie badań ankietowych. Ankietujemy i sami jesteśmy ankietowani. Jednakże nie sposób przecenić ilość informacji zwrotnych uzyskiwanych wraz z otrzymaniem rzetelnie wypełnionej ankiety. Coraz trudniej spotkać się ogólnopolskiej reprezentacji osób zajmujących się dydaktyką geometrii wykreślnej i przedmiotów „około – geometrycznych” na corocznie organizowanych przez Polskie Towarzystwo Geometrii i Grafiki Inżynierskiej oraz Ośrodek Geometrii i Grafiki Inżynierskiej Politechniki Śląskiej konferencjach. Takie spotkania są zawsze okazją do zaprezentowania własnych osiągnięć i doświadczeń dydaktycznych. Badania ankietowe pozwalają zebrać dane, w tym dane liczbowe, które usystematyzowane i opracowane, mogą zostać opublikowane, a poprzez publikację rozpowszechnione. Przeprowadzona pierwsza część badań ankietowych poświęconych dydaktyce geometrii wykreślnej, geometrii inżynierskiej oraz przedmiotów „około – geometrycznych” pozwoliła zebrać szereg informacji na temat stanu dydaktyki geometrii Anno domini 2011. W artykule przedstawiono wyniki ankiety przeprowadzonej wśród 19 respondentów, przedstawicieli 8 polskich politechnik. Uzyskano dane mówiące o nazwach przedmiotów geometrycznych jakie są używane w programach różnych kierunków studiów 8 polskich politechnik, ilości godzin jakie przeznaczane są na te przedmioty w siatkach godzin, ilości punktów ECTS jakie są przypisane do przedmiotów, treściach programowych realizowanych na poszczególnych kierunkach studiów, zalecanych podręcznikach, metodach i stosowanych „chwytach” dydaktycznych. Zebrany zestaw informacji pozwala w pierwszym przybliżeniu nakreślić obraz stanu realizowane w 2011 r. dydaktyki geometrii wykreślnej i przedmiotów „około – geometrycznych” w polskich uczelniach. Autorzy bardzo dziękują respondentom, którzy zechcieli poświęcić swój czas na wypełnienie ankiety i podzielenie się swoimi przemyśleniami. Jednocześnie wyrażają chęć kontynuowania badań tak, aby w jak najszerszym stopniu rozpowszechnić wśród nauczycieli akademickich zajmujących się dydaktyką szeroko rozumianej geometrii, ankietę, aby uzyskać jak najpełniejszy obraz stanu dydaktyki geometrii wykreślnej, geometrii inżynierskiej i przedmiotów „około – geometrycznych” obecnej doby.