Regional Computer Graphics Competition As A Tool Of Influence On The Profession Choice: Experience Of Sumy Region Of Ukraine

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Abstract - **Recently, the IT-industry has become increasingly popular in Ukraine. Young people are aware of the prospects of their own realisation as programmers, system administrators, web designers, etc. At the same time, the prestige of teachers' work decreases. Pedagogical universities face the problem of small recruitment for pedagogical specialties, where the specialty of a computer science teacher is not an exception. The article describes the experience of the regional computer graphics competition "Colour Your Life" as one of the solutions to the problem of professional orientation of young people in the computer science teaching profession in Sumy region of Ukraine. The authors studied the following problems: 1) confirmation of the competition status as a regional level competition by determining the geography of the participants; 2) determining the most popular graphic editors among youth; 3) determining the preferences of the competition participants for the future profession choice; 4) confirmation of the relationship between the number of participants and the number of applications for the specialty "014 Secondary Education. Computer science" (results are illustrated with infographics). Based on correlation analysis, a direct relationship between the total number of participants and the number of applicants to Makarenko Sumy State Pedagogical University was confirmed.**

Keywords - computer graphics competition; computer science teacher; professional orientation; future profession.

I. INTRODUCTION

Recently, the IT-industry has become increasingly popular in Ukraine. Young people are aware of the prospects of their own realisation as programmers, system administrators, web designers, etc. At the same time, the prestige of teachers' work decreased. Pedagogical universities face the problem of small recruitment for pedagogical specialties, where the specialty of a computer science teacher is not an exception [2].

The findings of M. I. Zhaldak, N. V. Morze, O. H. Kuzminska concerning spesialized education in computer science [8], N. O. Ponomarova on the theory and practice of professional orientation work at secondary schools [3], N. V. Zhyteniova concerning the formation of cognitive interests of adolescents based on IT [9] suggest solving the problem. At the same time, the analysis of scientists' findings indicates a point-based solution to the issue of professional orientation in the direction of computer science teachers' training.

Among the ways of solving the problem, we consider the involvement of young people in activities conducted based on the pedagogical university and popularized the teacher's profession, in particular in the field of computer science.

The purpose of the article is to describe the conducting of the regional competition on computer graphics "Colour Your Life" as one of the options for solving the problem of professional orientation of youth for the computer science teacher's profession in Sumy region (Ukraine).

II. DESCRIPTION OF THE TECHNOLOGY FOR CONDUCTING "COLOUR YOUR LIFE" COMPETITION FOR PROFESSIONAL ORIENTATION WORK

Due to the fruitful cooperation of the Computer Science Department of the Makarenko Sumy State Pedagogical University, Laboratory of the use of information technologies in education and Sumy Regional Institute of Postgraduate Pedagogical Education, a regional competition on computer graphics "Colour Your Life" (further the Competition) has been held since 2015 among students of secondary schools of Sumy region (Ukraine).

The Competition statute [4] states that its purpose is to promote the teaching profession and to develop the information and digital competence of young people by promoting among young people computer graphics software; stimulating the creation of high-quality information resources; distribution the best youth projects on the Internet; questionnaires and interviews for entering university.

Pupils from different secondary schools are allowed to compete in two age categories: 1) from 8 to 13 years old; 2) from 14 to 17 years old.

The participant may submit several works, but each work can be attributed only to one of the nominations.

Each year, participants are offered a subject, according to which pupils should submit a work for consideration.

The Competition is held in two rounds. The first (distance) is the verification of the work to match the subject of the Competition and technical requirements. At this stage, the organizing committee informs the participant about the acceptance of the work to the Competition or the rejection with explaining the reasons.

The second round is held based on the Computer Science Department of Makarenko Sumy State Pedagogical University. Its goal is not only to define winners in computer graphics, but also to promote the computer science teacher's profession, which can be mastered in the University. Participants must complete qualifying work, which involves communicating with the university teacher, and then using computer with the software installed.

All the author's works of the second round are evaluated by a highly qualified commission (jury), which consists of IT specialists, designers, computer graphics teachers and computer science teachers, whose pupils proceeded to the second round of the Competition.

The assessment is carried out in accordance with the criteria established and known in advance for each nomination of the competition. The highest rating points (the sum of all ratings of all jury members) determine the winners of the competition in each of the nominations.

Below we will describe the nominations and criteria for their assessment.

Nomination "The Best 2D Raster Graphics". This nomination includes works, representing any raster images, collages created in raster graphic editors.

Nomination "The Best 2D Vector Graphics". This nomination includes works, representing various vector-format images, which are described by mathematical formulas and created using geometric primitives.

Nomination "The Best GIF-Animation". This nomination includes works that represent computer gif-animation (both raster and vector).

Nomination "The Best Flash-Animation". This nomination includes works representing interactive animations, applications, cartoons that contain control buttons, accompanied by audio track and programmed elements, etc. These are computer animations developed with Adobe Flash or Adobe Animate.

Nominations "The Best 2D Raster Graphics" and "The Best 2D Vector Graphics" are rated by the following criteria:

− *originality* – the peculiarity, originality, identity to other similar works, originality of the idea (up to 10 points) is assessed;

− *completeness* – it is determined how much the idea is implemented in the work (up to 10 points);

− *artistry, mood* – artistic expressiveness and aesthetics of work, brightness and level of emotions that cause work (up to 10 points) are assessed;

− *compositionality* – the unity, integrity and subordination of all elements of work are assessed, the general correspondence of the light-shadow elements, the harmony of colour and font decisions, etc. (up to 10 points);

− *technicality* – the level of proficiency of the computer tools of the software, in which the work was performed (up to 5 points), the correspondence of the file size and the resolution to the functional purpose of the work (up to 5 points), as well as the quality (up to 5 points) and the complexity of the work (up to 5 points).

The criteria for rating works in the nominations "The Best GIF-animation" and "The Best Flash-animation" are defined:

− *the idea of animation work* – the level of figurative reproduction of a plot on the basis of animation means, its logically-linked sequence (up to 10 points) are assessed;

− *compliance with the principles of animation* – the adherence to the basic principles of creating animation is assessed [1]: squash and stretch, anticipation, staging, straight ahead action and pose to pose, follow through and overlapping action, slow in and slow out, arc, secondary action, timing, solid drawing, appeal (up to 10 points);

− *naturalism (realism) of animation* – the degree of correspondence of graphic objects to natural analogues (up to 10 points) is assessed;

− *aesthetic design* – the general impression of the animation, its general design and relevance to the subject (up to 10 points) are assessed;

− *complexity* – the amount of work on the creation of animated images (up to 10 points) is assessed.

The assessment of works involves filling out a Google form (Fig. 1), access to which only members of the jury have and the data from which are entered into a specially created general database for automating the calculation of the total score (Fig. 2).

Figure 1. Created Google-form for works assessing

№	Вікова група	ПІБ	Номінація	Місто	Загальна кількість балів	Місце у віковій групі	Загальне місце у номінації
1	8-13рр	Рубан Іван Олегович	Краща 2D растрова	Охтирка	420	1	1
2	14-17рр	Хекало Альона Іванівна	Краща 2D векторна	Ромни	418	1	1
3	8-13рр	Волков Сергій Павлович	Краща 2D растрова	Липова Долина	410	2	2
4	8-13рр	Гарцунова Анастасія	Краща 2D векторна	Суми	390	3	2
5	14-17рр	Гончаров Роман Артемович	Краща GIF-анімація	Охтирка	350	2	1
6	8-13рр	Гундар Кіріл Андрійович	Краща 2D векторна	Охтирка	344	4	3
7	14-17рр	Калемі Марія Дмитрівна	Краща GIF-анімація	Суми	330	3	2
8	8-13рр	Калмикова Юлія Юріївна	Краща GIF-анімація	Ромни	321	5	3
9	8-13рр	Клюєва Катерина Олексіївна	Краща Flash-	Суми	319	6	1
#	8-13рр	Корюк Маргарита Олександрівна	Краща 2D векторна	Суми	307	7	4
...	...	...	...	...	...	...	...

Figure 2. Screenshot of a general framework
for automating score counting

Within the framework of the Competition, there are excursions to the classrooms and laboratories of the Computer science Department. The talks with potential entrants about the courses taught at the department, about the research activity of the Laboratory of using IT in education [7], about specialized software in various fields of knowledge, which is used in prepare future computer science and mathematics teachers' preparation are held [5].

III. RESULTS

During the four years of the Competition (2015-2018), more than a thousand works were presented. They were made in various artistic techniques in the field of visualization and design.

The subject of the Competition changed from year to year: 2015 – "I See the World in such a Way!"; 2016 – "My Digital World"; 2017 – "The Future in the Hands of the Teacher"; 2018 – "Education is a Treasure, and Labour is the Key to It".

The winners' works of the Competition (2018) in different nominations of two age groups are in Fig. 3.

Figure 3. Winners' works (2018)

IV. STATISTICAL ANALYSIS OF THE RESULTS

The authors investigated the following positions:

1) confirmation of the Competition status as a Regional Level Competition by defining the geography of the participants;

2) identifying the most popular graphic editors among youth by questioning participants about their preferences;

3) determining the preferences of the Competition participants for choosing a future profession by questionnaire;

4) confirmation of the connection between the number of Competition participants and the number of applications for entering submitted to the specialty "014 Secondary education. Computer science".

Let us describe the results for each position.

1. Confirmation of the Competition status as a Regional Level Competition

We have created the infographics (2015-2018), which confirms the distribution of the competition within the region: the green points mark the participants, and the red points marks the Competition winners (Fig. 4-7). The number of sent works in the regions is proportional to the diameter of these points. Infographics confirms that the Competition is a truly regional competition with equal opportunities for all its participants.

Figure 4. Distribution of works in the nomination "The Best 2D Graphics"

Figure 5. Distribution of works in the nomination "The Best 2D vector graphics"

Figure 6. Distribution of works in the nomination "The Best GIF-animation"
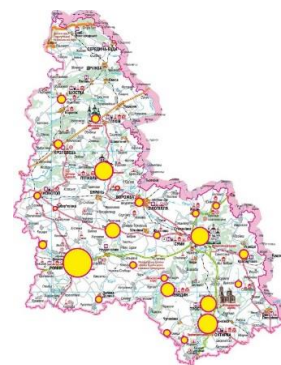

Figure 7. Distribution of works in the nomination "The Best Flash-animation"

The developed infographics demonstrate additional trends in the study of types of computer graphics in Sumy region. In particular, from the south of the region, more works are presented in the nomination "The Best GIF-animation" and "The Best Flash animation". The works in the nomination "The Best 2D vector graphics" represent the eastern part of the region. At the same time, the analysis of works from Sumy did not identify priority directions in the nominations. We explain this with the preference of computer science teachers in the region

regarding the choice of software and their own preferences in computer graphics.

2. Identifying the most popular graphic editors among youth

To identify the most popular graphic editors among youth, we used data for 2015-2018 to select the software in which the participants want to create their works in the second round. We should note that such an analysis was carried out by the Laboratory of the use of IT in education to determine the preferences of students, future teachers, and secondary school teachers for the use of dynamic mathematics software in their professional activities [6].

The analysis showed that:

– Adobe Photoshop, Microsoft Paint and Krita are the most popular (the nomination "The Best 2D Graphic");

– CorelDraw is the most popular, Adobe Illustrator and PaintTool SAI are less popular, but demanded (for the nomination "The Best 2D Vector Graphics");

– Adobe Photoshop, Microsoft GIF Animator, Autodesk Animator are the most popular (the nomination "The Best GIF-animation");

– Adobe Flash or its updated version Adobe Animate are the most popular (the nomination "The Best Flash-animation") (Fig. 8-10).
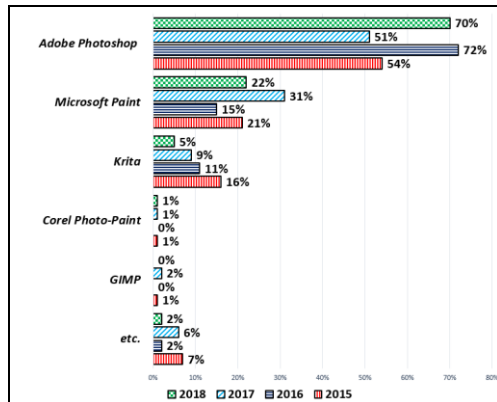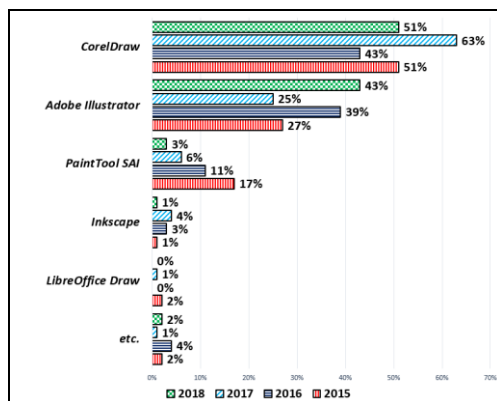

Figure 8. Required raster graphic editors

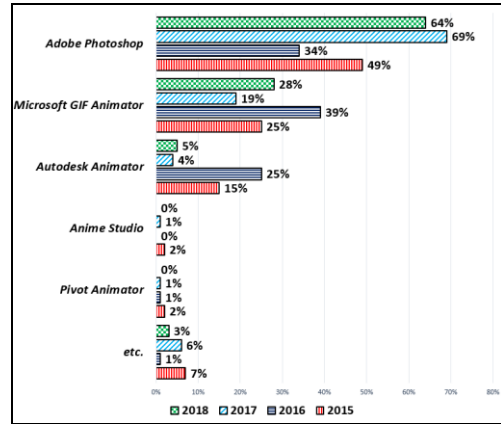Figure 9. Required vector graphic editors

Figure 10. Required editors to create gif-animations

3. Determining the preferences of the Competition participants for choosing a future profession

We conducted a questionnaire to determine the Competition impact on the preferences of its participants in choosing a future profession. Respondents had to answer the questionnaire (Table 1), which was also offered to competition participants in the Google form.

TABLE 1. QUESTIONNAIRE OF THE COMPETITION PARTICIPANT (SELECTION OF SEVERAL FROM PLENTY)

№	Question	Answer variants	Commentary
1	How did you get know about the competition?	A) from teacher; B) from social networks; C) from the University resource; D) from friends; E) other _____	With the help of this question, we found what the source of information about the Competition was.
2	Why do you take part in the Competition?	A) my friends take part in it; B) I want to master my skills in the field of graphic design; C) I want to get more about pedagogical university; D) I want to feel myself a winner; E) other _____	Motives of competition participation were revealed.
3	Computer science teacher is for you:	A) authority; B) older friend; C) mentor in IT questions; D) stranger; E) other _____	We determined how computer science teacher is perceived by each participant.
4	How does the work of a computer science teacher affect your future profession?	A) I want to be like him; B) he knows a lot in IT; C) he is a modern person, because he works with youth ; D) doesn't affect at all; E) other _____	We determined the reasons for choosing computer science teacher's profession.
5	Do you see yourself in the future as a computer science teacher? If so, what influenced your choice?	A) parents; B) the university itself and organised events on its basis, in particular the competition; C) job prospective; D) no; E) other _____	We determined the subjective factor of influence the choice of computer science teacher's profession.

The analysis of the answers of the questionnaire made it possible to draw the following conclusions:

1) the official website of the University and social networks are a source of information for potential entrants, along with information from teachers (33% and 37% respectively), and therefore it is worthwhile to inform about activities of professional orientation topics in various Internet sources;

2) the desire to learn more about the pedagogical university and the specialties that it offers is partially satisfied with activities carried out at its base (23% of respondents);

3) a computer science teacher for the participants of the Competition in most cases is a mentor (89%), and therefore we consider the cooperation with the computer science teachers important for work in the direction of professional orientation of entrants to the pedagogical specialty (in particular, the computer science teacher);

4) for the participants of the Competition, who see themselves as teachers of computer science in the future, it is important to communicate with young people (35%), to satisfy parents' desires (34%), and to have opportunities to get a job (23%).

5) the Competition impacts on the positive perception of the University as a base for professional training (54%), the computer science teacher's profession as a demanded profession of the future (45%).

4. Confirmation of the connection between the number of Competition participants and the number of applications for entering submitted to the specialty "014 Secondary education. Computer Science"

We conducted a quantitative analysis of data (Table 2), which were accumulated during the Competition.

TABLE 2. QUANTITATIVE ANALYSIS OF DATA

Year	Number of participants	Number of participants, who are school-leavers (11-th grade)	Number of those entering the specialty "014 Secondary education. Computer Science"	Number of those entering, who took part in the Competition
	Data Set A	Data Set B	Data Set C	Data Set D
2015	68	27	94	2
2016	109	29	89	15
2017	160	26	77	21
2018	176	29	69	25
Coefficient of correlation between A and B.	0,11383688 (there is no connection)			
Coefficient of correlation between A and D.				0,97695291 (there is a connection)
Coefficient of correlation between B and D.				0,25992252 (there is no connection)

We can claim that the number of Competition participants increases each year (Data set A, Table 2), while the number of participants, school-leavers (grade 11) is approximately the same – 26-29 people (Data set B, Table 2). The number of those entering the University (Data set D, Table 2) is constantly increasing. The number of those entering the specialty "014 Secondary education. Computer Science" is constantly falling (Data set C, Table 2).

Correlation analysis of data demonstrated:

- the direct connection between the total number of Competition participants and the number of those entering, who took part in the Competition ($r = 0.97$);

- the absence of connection between the number of participants, who are school-leavers, and the number of those entering, who took part in the Competition ($r = 0.26$).

The analysis of the obtained results are statistically confirm according to Student's test (at the level of significance 0.05, number of freedom degrees of 2) with hypotheses: "H_0: $r = 0$" and "H_a: $r \neq 0$".

Calculations using the formula $t = r * \left((n-2)/(1-r^2)\right) * 0.5$ confirmed that the increase in the number of those entering, who took part in the Competition, is not random. The critical value of the test $t = 2.1$ is smaller according to the statistical $t = 6.47$. Therefore, an alternative hypothesis about a direct connection is taken. We conclude that the Competition really influence the number of those entering the specialty "014 Secondary education. Computer Science".

V. CONCLUSIONS

1. The prestige of a computer science teacher's profession in Ukraine is small; therefore, work on the professional orientation of young people should be strengthened.

2. Among the ways to strengthen the professional orientation of young people into the teacher's profession and effective tools of influence on the choice of profession for secondary schools graduates, we have chosen to hold popular competitions in the field of computer science based on pedagogical university.

During 2015-2018 at Makarenko Sumy State Pedagogical University, the computer graphics competition "Colour Your Life" was held. For the competition works, topics related to the teaching profession are offered.

3. The statistical analysis of the accumulated results confirmed the positive impact of the Competition on the number of applications from the entrants.

REFERENCES

[1] Basic principles of animation from Disney. Available: https://en.wikipedia.org/wiki/12_basic_principles_of_animation [accessed 25-1-2019].

[2] Information system "Konkurs". Available: http://www.vstup.info/ [accessed 25-1-2019].

[3] Ponomareva, N.O. Theory and practice professional orientation as a reflection features of public. Scientific notes of Volodymyr Vynnychenko Kirovograd State Pedagogical University. Series: Problems of Methodology of Physical-Mathematical and Technological Education, 2016, issue 9(2), pp. 271-278.

[4] Scientific laboratory "Use of information technologies in education". URL: https://vito.sspu.sumy.ua/

[5] Semenikhina, E., Drushlyak, M., Shishenko, I. Using a praxeology approach to the rational choice of specialized software in the preparation of the computer science teacherю TEM JOURNAL – Technology, Education, Management, Informatics, 2018, vol.7, No.1, pp. 164-170.

[6] Semenikhina, O., Drushlyak, M. On the Results of a Study of the Willingness and the Readiness to Use Dynamic Mathematics Software by Future Math Teachers. 11th International Conference on ICT in Education, Research, and Industrial Applications: Integration, Harmonization, and Knowledge Transfer (ICTERI 2015), Lviv, pp. 21-34. May, 2015.

[7] Shamonya, V., Shypylenko, A. Use of IT in Education: Analysis of Works of Scientific Laboratory at the Department of Informatics of Sumy State Pedagogical University Named after Makarenko. Physics and Mathematics Education, 2015, issue 3(6), pp. 119-130.

[8] Zhaldak, M.I., Morse, N.V., Kuzminska, O.G. Specialized informatics education. Computer-oriented systems of teaching: a collection of scientific works, 2004, issue 8, pp.13-18.

[9] Zhyteniova, N.V. Formation of cognitive interests of adolescents with the help of information technologies. Scientific notes of Kirovograd State Pedagogical University, 2007, issue 72, pp. 152-155.