

Teaching and Learning of 3D Graphics and Animations at Dennis Gábor College

3D grafika és animáció-készítés tanítása és tanulása a Gábor Dénes Főiskolán

Antónia Berecz

Dennis Gábor College /Institute of Basic and Technical Sciences, Budapest, Hungary
berez@gdf.hu

Abstract – 3D computer graphics and animations are widespread used in nowadays. Theoretical and practical knowledge is basic requirement for BSc in Computer Engineering students at this discipline. More of core curriculums of Dennis Gábor College contents 3D graphic applications. Besides more and more students deal with 3D graphics on student workshops, in Student Scientific Associations or theses.

Author provides a subjective image about teaching/learning of 3D graphics at the college and about student's results in the managed by herself in the Dennis Gábor Talent Point, where the students research in addition to the requirements of the subjects.

Some of best practices are presented applied at her College blended learning method. It is developed continuously in curriculums Computer Graphics and Virtual Reality Modeling or at the student workshops of Dennis Gábor Talent Point.

Összefoglalás – A számítógépes grafika, azon belül a 3D grafika és animáció korunkban széles körben használt. A BSc mérnök informatikus hallgatóknál alapkövetelmény, hogy megfelelő szintű elméleti és gyakorlati tudásuk legyen ezen a tudományterületen. A Gábor Dénes Főiskolán alaptantervük szerint több tantárgy során is foglalkoznak a 3D grafikával. Emellett TDK-kutatói témákban, diákműhelyekben, szakdolgozatokban merülnek el benne egyre többen.

Az előadás szubjektív képet ad arról, hogy a Főiskolán milyen tantárgyakban, milyen módszerekkel tanítják/tanulják a hallgatók a 3D grafikát, hogyan támogatja a hallgatók kutatását a tantárgyak követelményein túlmenően a Gábor Dénes Tehetségpont – amelynek koordinátora a szerző, illetve a hallgatók milyen eredményeket tudnak felmutatni.

Bemutatóra kerül néhány bevált gyakorlat a Főiskolán alkalmazott blended learning tanítási formából, amely folyamatosan fejlődik a dolgozatban hangsúlyos Számítógépes grafika és Virtuális valóság modellezése tantárgyak, valamint a 3D grafikával/virtuális valósággal foglalkozó Gábor Dénes Tehetségpont diákműhelyekben.

Keywords: 3D graphics, student workshop, computer graphics, talent development, virtual reality.

Kulcsszavak: 3D grafika, diákműhely, számítógépes grafika, tehetséggondozás, virtuális valóság.

I. PLACE OF 3D COMPUTER GRAPHICS AT DGC ON EDUCATION BSC IN COMPUTER ENGINEERING

Computer graphics penetrate almost every aspect of life. The following **curriculums** of Dennis Gabor College (DGC) strongly deal with it in BSc Computer Engineering education this school year: Digital Image Processing, Audio and Video Technology, Multimedia, Technical Presentation, Computer Graphics, Modeling, Remote Sensing, Geographic Information System, Virtual Reality Modeling. Specially designed for 3D graphics on the theme of these curriculums: Computer Graphics, Modeling, Virtual Reality Modeling.

We can be meet with using of computer graphics at the DGC. First of all at the **homepage of DGC**. Even the last item of the homepage menu of College 3D virtual walk takes us through the campus¹ [5].

Subject folders on LMS ILIAS of college consists many multimedia contents – for example 3D animations, simulations. The e-learning materials with multimedia are compulsory elements of DGC's blended learning system. The elements' places are fixed in the subjects folders. In the upper part of the following figure is the start page of the subject Database Management. The subject guide and description, presentation outline, syllabus, sample exam duties are compulsory elements on it. This course contains many specific multimedia elements such as video tutorials.

Second basic elements of DGC's blended learning system are the face-to-face encounters at the campus of College – see the people who talk with each other around the monitors/table in the bottom right corner on Figure 1.

Third element of the blended learning system is the e-consultation. One of the possible locations is the ILIAS, which all the teaching-learning activities bringing together. For example we can use forums like chat, but we could use ILIAS chat module or conferences with third service providers. E-consultations work via Skype, ooVoo², Facebook or of course wiht e-mail – which is the

¹ <http://www.gdf.hu> / About us / Virtual tour on DGC, <http://virtualiseta.gdf.hu/>

² ooVoo: Skype-like free software for audio and video conference and screen sharing.

more appropriate for the teacher and the consulting student(s).



Figure 1. Basic concept of DGC's b-learning

Talent Point has been operating at our College since 2008. Here we have been working at **student workshops**, too. The Digital Painting, the Photo-School or the 3D Graphics and Animation are the most active of them. The 3D Technologies for Web Student Workshop has started in the last semester. The last two student workshops specifically create or research in the 3D graphics field.

Topics of **Student Scientific Associations** (Tudományos Diákkör, TDK, is Hungaricum) researches, **essays** are in 3D graphics very often. 3D graphics are the selected discipline by members of student workshops and outsiders.

Educators of College seek to involve to research students or members of workshops. Significant results reached students get **publishing** options within or besides the College.

Below I will review the above mentioned areas, and I will show examples mainly from my activities, courses and managed by me student workshops or Talent Point.

II. COURSES COMPUTER GRAPHICS AND VIRTUAL REALITY MODELING

A. Course Computer Graphics

Course Computer Graphics is a compulsory subject for the BSc level Computer Engineering students. Its main goal is cognition of the most important concepts, procedures, standards and tools of the discipline. Students learn useful in the long run knowledge, terminology and approach. The subject trains students recognize special side of computer graphics (CAD, advertising design, etc.) and practical application of general purpose, open source, free, animation maker software Blender.

Credit value of the subject is 4 – so, it needs $4 \times 30 = 120$ hours learning. It consists theoretical and practical curriculums and related them examination. Theoretical part has realized in object type ILIAS native online curriculum. Basic textbook [1] continuously expands with new proceedings. It consists many multimedia elements and 3D substance, because of video tutorials which has made within the framework of theses (for example [2]; one of its video tutorials can be seen in the Figure 2), and we put practical example into it connected with the known theory. Testing of theoretical learning material is done in writing by essay questions.

Students learn basics of the Blender within practical lessons. These lessons are mainly made by members of

3D Graphics and Animation Student Workshop step by step video and PDF tutorials. Students have created a short animated video and present/defend it during practical examination.



Figure 2. Screenshot from a step by step video tutorial [2]

Learning also is supported by the compulsory items defined by the College and an online ILIAS glossary which contains 500 terms (Figure 3). Theoretical part of curriculums is completed by chapter with linked to right topics self-tests. The theoretical study material control questions can be found at the end of the online curriculum chapter and links to appropriate content pages, and also a separate PDF file. Required elements of curriculums are a forum and a course-rating questionnaire.

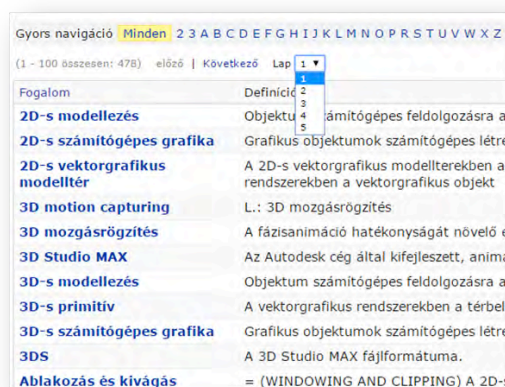


Figure 3. Screenshot of Computer Graphics glossary [3]

Theoretical and practical parts of curriculums are supplemented by many varied additional material – for example former readings and high level 3D theses. Link collections and increasing semester by semester earlier exam-animations assist practical work (Figure 4 gives you a taste from the latter).

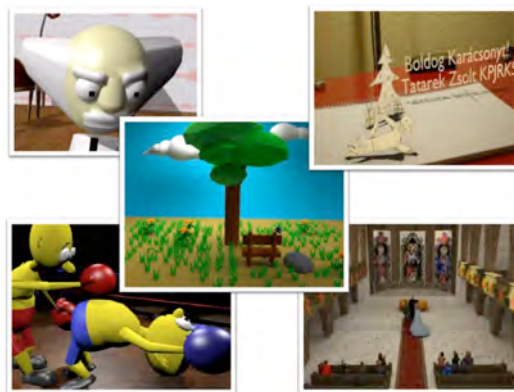


Figure 4. A selection of well-done Computer Graphics exam-animations [3]

B. Course Virtual Reality Modeling

Virtual Reality Modeling course is facultative for BSc in Computer Engineering and Business Informatics and BA in Business Administration and Management students. Its main goal is learning most important technological possibility of the 3D simulation and acquirement of knowledge what is necessary for description or traversal any virtual worlds.

Credit value of the subject is 3 – so, it needs $3 \cdot 30 = 90$ hours learning. It contains theoretical and practical parts or related with them exam. Theoretical part has realized in form object type ILIAS HTML online curriculum as a “text collection” – it contains a disciplinary review and PPT slide shows. Examination of theoretical part is done by essay questions.

Practical tasks can be performed in computer classroom or individually at home by technologies: game making in Blender, VRML 2.0, WebGL, Augmented Reality, game making in jMonkey, OpenGL, Java 2D and 3D, modeling in Google SketchUp.

There is more type of aid: complete curriculum, step by step tutorial or slide show with the sketch of the main steps. Practical examination is done by an individually made presentation, which targets a lifelike application. The used technology is the student's own choosing.

Subject folder also consists more additional material – for example well done theses, which are readings material for the above technology or well done exam-works (from the latter shows a selection Figure 5).

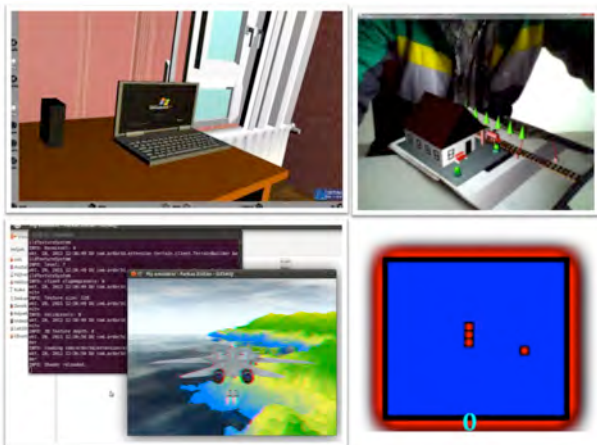


Figure 5. Screenshots of creative, high-quality Virtual Reality Modeling exam-works [4]

C. A Selection of Recommended as Reading Theses Connected to the Two Courses

Some inspired by two subject essays or their continuation theses will be shown in this chapter. Author was their supervisor – except the last one, where she was the reviewer. The writer of the first and the last theses are members of the 3D Graphics and Animation Student Workshop. They serve as example or recommended reading for next students.

Most of this works was made with open source, free software or developing tools – as the majority of tehseis. They place emphasis on proper planning and methodology, the use of process development.

Kristóf András Benei: Vector-Graphical Display Methods – Video-Tutorials for Beginner Blender Modelers, 2015 [2]. Hungarian and English subtitled video-tutorial series effectively supports the Vector-graphical visualization chapter of the subject Computer Graphics or learning of Blender's base. Videos were published in the DGC ILIAS curriculum, the public site of DG Talent Point and the Youtube platform.

All videos were made by the following free softwares and their main functions:

- Blender: for creating models and scenes or video and audio editing.
- Open Broadcaster Software, KeyCastOW: for video recording of practical lessons.
- GIMP: for image editing (for example to align images, create textures).
- SubTitle WorkShop: for creating subtitles.

Kristóf András Benei presented his work and methods at many conferences and events.

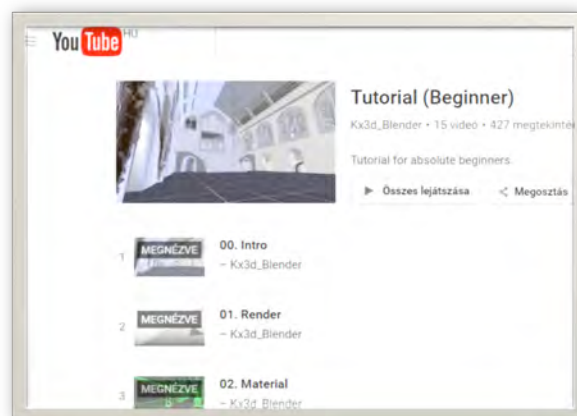


Figure 6. Youtube screenshot of Blender Video-Tutorials for Beginners [2]

Alexandra Orbán: Demonstration of SketchUp 3D Modeling Software by Campus-Model of DGC, 2015 [5].

This thesis consists a model for virtual traversal of DGC campus in internet browser without any additional program or plugin. Virtual walk is interested also alumni of College, because it recalls the spent here years.

The model itself was very complicated and its creating or publishing needed synchronizing many programs. Used software and them main functions were the following:

- SketchUp 3D: design software for creating of the building-model.
- Blender: for virtualization.
- Babylon.js framework: for running in browser.

The virtual walk is available at the DGC homepage since state examination of Alexandra Orbán (screenshots about the application in Figure 7).

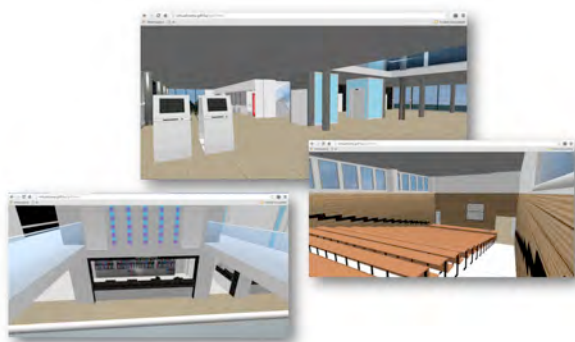


Figure 7. Screenshots of the virtual walk at the DGC homepage [5]

Péter Gyöngyik: Developing of SceneForge Track Editor Software by Delphi, 2014 [6].

Developed in this thesis software is an easy to use, highly customizable track editor, which suitable editing tracks of any 3D games (its menu see Figure 8). Open source program free available on GitHub portal. The software meets conditions of GNU General Public License 3 – so, it is freely redistributable or can be freely modified and tailored by anyone.

Used in developing tools and standards were the followings:

- Delphi developing environment: for programing.
- OpenGL: for drawing of SceneForge's graphical elements.
- COLLADA: for exporting of SceneForge made tracks.
- Inkscape: for drawing of icons.

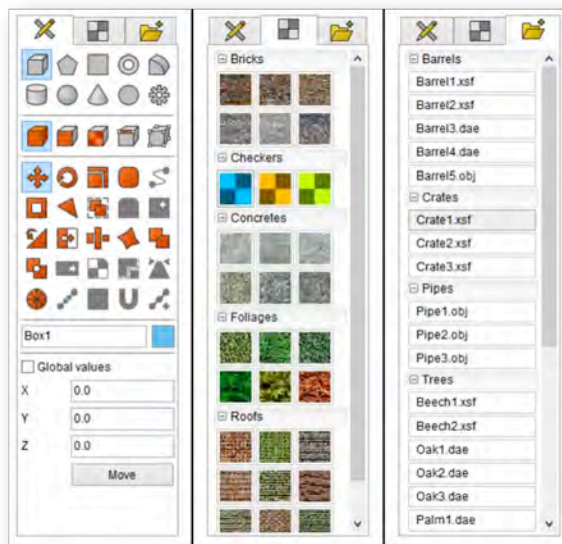


Figure 8. A menu of track editor program SceneForge [6]

Rudolf Hergát: Developing of „The Provinces Of Dintena” Game with jMonkeyEngine, 2014 [7].

Result of this thesis is an open world, role play type game software – so, player acting in accordance with the free will, or the world and set of rules are own. The game world, its system of rules is the own of the writer.

Used in work software were the followings:

- Blender: for modeling.
- MakeHuman: for creating of human characters.
- GIMP: for making textures.
- jMonkeyEngine 3: game engine.

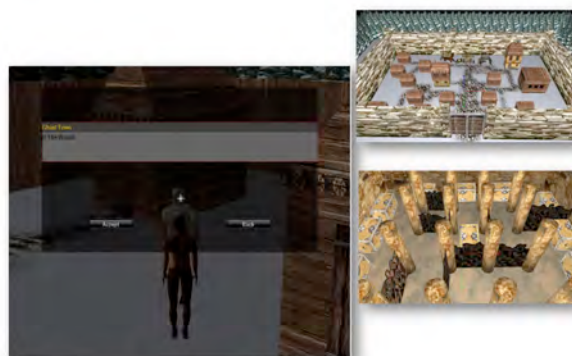


Figure 9. Screenshots from game „The Provinces Of Dintena” [7]

Ottó Hoffer: Making 3D Animation with Special Effects, 2014 [8].

This thesis is a 20 minutes animated film Desert War – from cherished by authors since many years idea. Beside this the author wanted to help the students, who start to work with special effects.

Used in making the film software was the followings:

- 3D Studio Max: for modeling.
- Fusion: for compositing.
- Adobe After Effects: for compositing and audio mixing.
- FL Studio 11: for music and voice editing.
- Sony Vegas, Adobe Premiere: for video editing.



Figure 10. Screenshots from film Desert War [8]

Ádám Katona Horváth: Creating 3D Characters for Game Software, 2014 [9].

Thesis shows steps and pitfalls of creating usable in game software characters for beginners. Author has created (modeled and textured) planned by him game character Reduar with low numbers of polygons (Figure 11).

Introduced and used in the thesis software were the followings:

- Adobe Photoshop, Paint.NET, Gimp Shop, Mudbox, xNormal: for making plans, conception drawings or textures.
- 3D Studio Max, Maya, Blender: for modeling and texturing.
- ZBrush: for modeling with sculpture.



Figure 11. 3D character Reduar for game software [9]

Gábor Krupa: Inspecting the Possibilities of 3D Printing at Home Through Printing and Checking of a Freely Developed Sample Designed in Solidworks, 2015 [10].

Thesis show how much precision and structural similarity can be access with an especially designed for home using 3D printer. Can be the printed model fulfill function of original object? Used printer was free system RepRap (REplicating RAPid Prototyper) type, because this technology is able for further development or modification and remanufacturing part of itself.

Paper pass along the reader interesting in software and hardware problems from acquisition of printer to finishing of printed and improved object, and analyzes and solves several arisen issues. Of course the paper covers future of 3D printing possibilities.

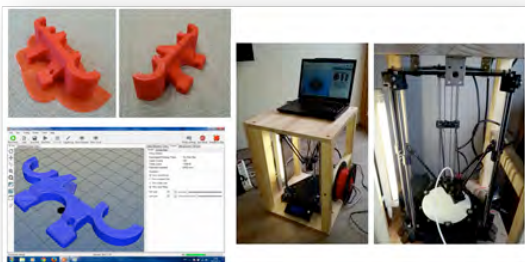


Figure 12. Pictures from thesis about home possibilities of the 3D printing [10]

Member of 3D Graphics and Animation Student Workshop Gábor Krupa had been appeared at many events and presented/explained the technology in practice for people who have been interested in it.

III. STUDENT SCIENTIFIC ASSOCIATIONS PAPERS

Important tasks of higher education establishments are involvement of students into research, work in Student Scientific Associations, prepare paper and publishing of papers at the home or the National Student Scientific Associations (OTDK) conferences.

Most successful 3D computer graphics or virtual reality researches were realized at our College in cooperation with MTA SZTAKI (Institute for Computer Science and Control of Hungarian Academy of Sciences) led by Sándor Kopácsi PhD.

Organized at DGC Virtualization Subsection of Informatics Science Section of XXXI National Conference of Student Scientific Associations in 2013 was successful for us also because Gyöngyi Neumann and Bernadett Zsiga had placed second and got special award. They work are the portals 3D web and MTA SZTAKI (Figure 13, 14).



Figure 13. Home site of the 3D web portal³



Figure 14. 3D web site of MTA SZTAKI⁴

For semesters active member of 3D Graphics and Animation Student Workshop Judit Zsuzsanna Tövisy got into subsection Computer Signal Processing of National Conference of Student Scientific Associations in 2015 with her documented work in paper "Automatic 3D Image-Conversion on Web Sites" researches. Result of her other work was also the anaglyph web site Daidalika of TEI of Crete [25], which supplies content of original homepage [26] (Figure 15).

³ <http://3dweb.hu/>

⁴ <http://www.sztaki.hu/?type=3>



Figure 15. 3D web site of Daidalika [25]

IV. 3D GRAPHICS STUDENT WORKSHOPS OF DENNIS GÁBOR TALENT POINT

A. Short Introduction of the Talent Point

Student workshops run since formation of DGTP in 2008. In its frames special requested by students or linked to education and scientific profile of Institutes of College workshops are functioned. Workshops concentrate supporting of talents among high school or college students. They are filled the gap and novel.

Our Talent Point are accredited by National Board of Talent Aid, and it is authorized to using of title Excellent Accredited Talent Point, and it had been included into European Talent Support Network⁵ from the beginning of 2016.



Figure 16. Facebook site of DGTP [17]

You can be informed about life of DGTP at several internet sites, and these sites link into each other, too.

- Hungarian: at portal of College⁶, at GDF ILIAS and at Twitter (last in Figure 16).
- English: at portal of College (Our introduction on the College website, Figure 17) and at GDF ILIAS (DG Talent Point on the website of DGC ILIAS).



Figure 17. Contents of homepage of DGT at DGC portal [18]

One and a half dozen different topics workshops have held at least a semester till last academic year. Operated on area one of the computer graphics great past workshops are the 3D Graphics and Animation, the Digital Painting and the Photo-School. A short show of two 3D graphics workshops are below: the 3D Gaphics and Animation Workshop and the 3D Technologies for Web.

B. 3D Gaphics and Animation Workshop

Members of 3D Graphics and Animation Student Workshop are mostly Computer Engineering students, but some high school or alumni students and educator join us in all semesters. Workshop also has correspondents members, who was active earlier, honorary members, who has done a lot for the workshop, or life members, who has produced imprescriptible values in the workshop.

Deepening of funds is made in autumn semester – results are pictures and written or video tutorials. In the spring semester the focus is on animation-making and so-called workshop-films are born in this period of academic year.

One of the traditions of the workshop is the initial academic year lecture, when a just graduated student presents own research/thesis results on the topic 3D gaphics and animation – it is also the open day of the Talent Point.

Student members of workshop lecture for each other almost always. These lectures are practical tutorials, presentations about new version or open project of Blender⁷, Lectures are held about an artistic era or style etc. Occupations about not Blender, but for example about 3D Max, Maya, SkethUp, Photoshop are successful, too.

Written and video step-by-step tutorials are made continuously for Computer Engineering students to use them as learning materials in Computer Graphics course.

Managing of such widespread membership can be made easy with e-learning tools. That's why we use GDF ILIAS for contact list, mail merge, work collection/storage/show, project support, publications. Skype, ooVoo and Facebook also are useful in contacting among members.

⁶ <http://www.gdf.hu/szervezet/gdf-tehetsegpont/aktualitasok>

⁷ Blender open projekt: Organized by Blender Institute film-maker project, in which a short film or computer game is made for aid actual Blender developing, with free software – mostly Blender. All of made in project creation is published on a CD/DVD.

⁵ <http://www.echa.info/high-ability-in-europe>

Some characteristic works/results from life of the workshop are shown on Figure 18.

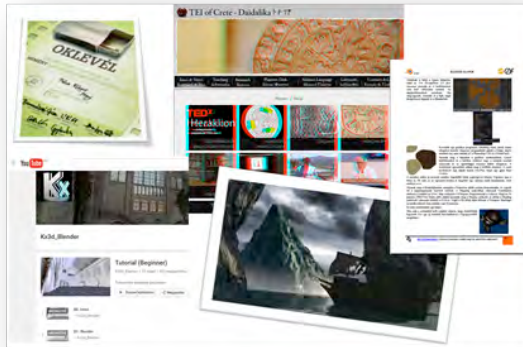


Figure 18. Pictures from life of 3D Graphics and Animation Student Workshop [21]

C. 3D Technologies for Web Student Workshop

3D Technologies for Web Student Workshop begins work in this, second semester of 2015/16 academic year in English language. Its leader is a PhD student of our College in framework program Erasmus+.

Members was met many 3D technologies, deal with web-ergonomics and web-accessibility (Figure 19). Focus of work was on WebGL, which fits interesting and previous experience of participants. Luckily found each other students and customer of project Webshop Peacock-Eye (Hungarian stands for Pávazsem Webáruház) and its application Furniture Clothing. Project was made in framework of a free web-shop. For furnished room was used Blender and for interactive web-app was used Unity game-engine, or WebGL.

Member's life of the workshop is shaped actively. They participate in events of our Talent Point, too. Their last rich semester is documented on own public site [19].



Figure 19. Photos and related logo from life of the 3D Technologies for Web Student Workshop [19]

V. LIFE OF DG TALENT POINT

A. Specific Form is the Team- and Individual Project Work

Sessions of workshops take place weekly or biweekly when all team works controlled manner. Usually members themselves lecture voluntarily to each other in by them best-known and most interesting topic. Workshops accommodate curious students from among people who stand out talent – not only on specialization of the workshop. These study groups provide varied, rich programs and allow development of personality and skills. There is important the good team atmosphere and the friendship, because professional interest and motivation is not enough for systematic community work in addition to learning.

Individual project works are preparation to lead tutorial or lecture, image creation – a three-hours lecture is not enough for creating a 3D image. Team work are films and applications' creating. Problem there is not learning of professional tricks, but secret of success is evolution of team-communication. All of project works are intended to develop independent members in own pace and to support/cooperate each other.

In the last semester four members of our Talent Point – one of them is member of 3D Graphics and Animation Student Workshop – was awarded scholarship For Young Talents of the Nation (Figure 20). For this purpose, they made a competition (code: NTP-EFÖ-P-15) with personal developing plan-project.

Figure 20 shows characteristic pictures of project works. In the left upper corner a member of the 3D workshop shows his result in practice for other members. He did this work independently the workshop in the Scientific Student Associations.

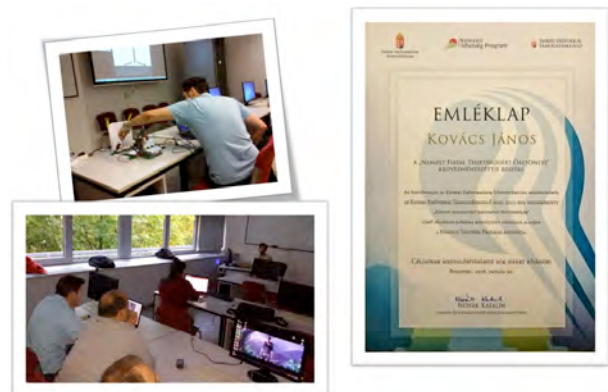


Figure 20. Pictures from life of 3D Graphics and Animation Student Workshop [20]

B. Conference Participation and Publishing

Members of our Talent Point systematically participate and lecture at conferences of our College and other organizations, or publish their results in scientific periodicals. Below are mentioned a few publications from 2015/16 academic year.

Some members of student workshops and supervisor educator – including members of workshop 3D graphics and Animation – lectured on first at DGC Night of Researchers (Figure 21) [11].



Figure 21. Headline of brochure of first at DGC Night of Researchers [11]

Members of our workshops showed results of their work at conferences of NJSZT MMO (Multimedia in Education section of John von Neumann Computer Society) and published papers in its conference proceedings. A new paper of Digital Photo-School Student Workshop was published at online periodical Jampaper in 2015 (Figure 22). Members of dealing with 3D workshops held three lectures at conference of section in 2016.

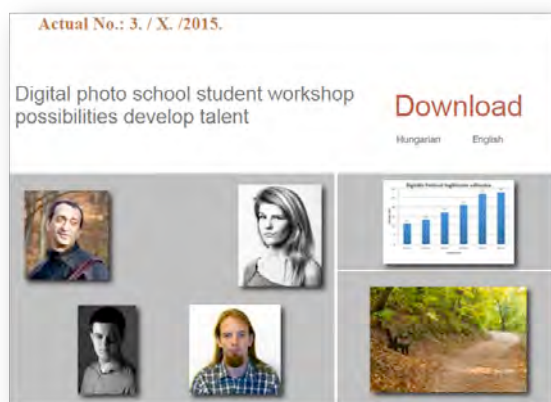


Figure 22. Screenshot of the Jampaper number 3. / X. / 2015 [12]

3D Graphics Professional Days were organized second time at our College involving foreign Erasmus students in this school year. Both of our 3D workshops were represented with more lectures [13]. Figure 23 show flyers about 3D printing.

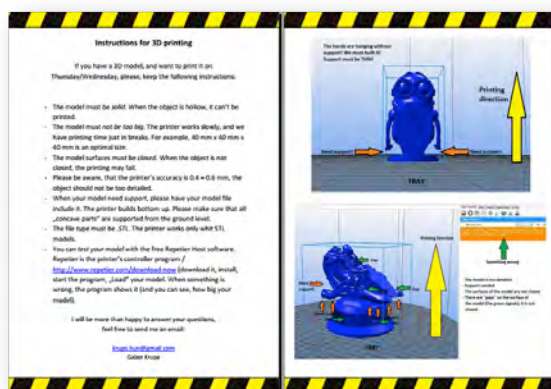


Figure 23. Instructions for 3D printing [13]

Members of the Workshop 3D Technologies for Web Students reported progress creating of application Furniture Clothing (Figure 24, 25).



Figure 24. Screenshot of application Furniture Clothing of Webshop Peacock-Eye in Unity [15]

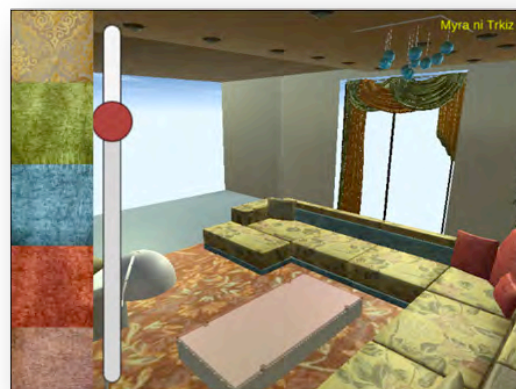


Figure 25. Screenshot of demo application Furniture Clothing of Webshop Peacock-Eye in Unity [16]

Performances of our 3D workshops were made up most of Informatics Section's work of Conference Báthory-Brassai, and the case study of anaglyph animation about Phaistos-disc (Figure 26) was presented in section Arts, Book-Publishing.



Figure 26. Animation about Phaistos-disc on Youtube [14]

C. Excursions and Events – Participating or Organization

Outstanding event of last semester was the Talent Day “Creating is Good!” for our Talent Point [27]. There we met with representatives of partner Talent Points, and showed our life/results for each other. All – include 3D – workshops take part in organization/hospitality/lectures/presentations.

Cooperation with Talent Points of Gábor Egressy Bilingual Vocational School is strong for years. We participated in jury of Nightingale Informatics race in the spring, and we showed our Talent Point during Talent Day by a short presentation this year, too. Our representatives were members of student workshops in last two years, and they invited present students of primary and secondary schools into our workshops.

There are more events and programs in every semester, where focus is on experience in addition to culture. Left side of Figure 27 shows workshop’s members on Dennis Gábor Awards Ceremony in the Parliament – we have participated here from the forming of workshops. Two characters of the right one are supervisors of 3D workshops on the 3D Graphics Days excursion at Visegrád.



Figure 27. Pictures from life of DGTP [20]

Other traditional event is the End of Year Gala. Preparing for well coming-out on it gives motivation for members all year. This event is homely, for which family members, friends and educators or employees of College are invited.

Workshops report about their annual work, make picture-exhibition and show new animated films. The best creations are chosen by audience secret ballot, and its creators will be known and respected on all College (Figure 28).



Figure 28. Pictures about the End of Year Gala of the DGTP [21]

D. Our Issues and Systematic Exhibitions

Bi-annual Newsletter is the oldest issue of our Talent Point. This was issued as multipage the first time in the spring semester of the 2015/16 academic year (Figure 29). In it was summarized our activities/results/news of summer and autumn and begun in spring workshops were advertised.



Figure 29. 2nd Newsletter of Dennis Gábor Talent Point in 2015/16 academic year [22]

A calendar was issued with images of student workshop’s members already second time. 2016 year wall calendar of the 3D Graphics and Animation Skype team of Kállósejmen students is seen on Figure 30.



Figure 30. 2016 year wall calendar of the 3D Graphics and Animation Skype team of Kállósejmen students [20]

Our exhibitions are continuously organized in the Aula of the College. These exhibitions are published online on public areas of DGC ILIAS, on Picasa or on Facebook site of DG Talent Point (Figure 31, 32).



Figure 31. Exhibition at the end of the first semester 2014/15 academic year of 3D Graphics and Animation Student Workshop in the Aula of the College [23]

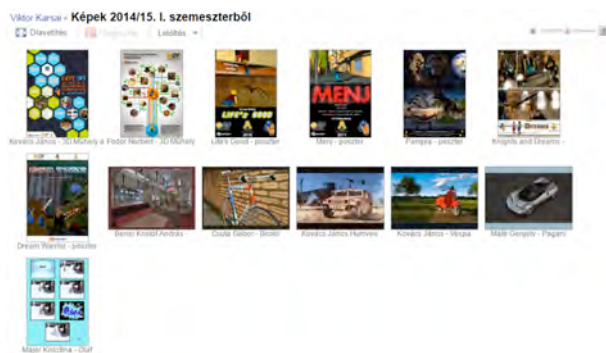


Figure 32. Virtual exhibition of 3D Graphics and Animation Student Workshop in the Picasa⁸

E. Involvement of Primary and Secondary School Students into Workshops

1) „Full Members”, Who Attend Workshop in all Semester

Workshops of our Talent Point try to involve as many primary and secondary school students into their work as possible. Some invited kids take part in workshop 3D Graphics and Animation Student Workshop all semester or school year, perform community work and lecture practical tutorials.

Students from Kállósején participate at work by Skype in first semester of 2015/16 academic year. Most talented member of them lead/tutored the interested kids in modeling in second semester already. He reports about his experiences and results on our second talent day Creating is Good! [27].

2) Course Basics of Blender

A 60 hours supported by a tender course Basics of Blender was organized especially for secondary school students in 2010/11 academic year (tender number NTP-OKA-XII-006). Child from Budapest and the provinces showed 11 films and a lot screenshot images from lectures 3D on the End of Year Gala (Figure 33).



Figure 33. Photos from secondary school students Basics of Blender course at workshop 3D Graphics and Animation [24]

3) Summer Kids Camps in 2016

We advertised full-day/day-care system skills development camps, especially for primary and secondary school students at third week of July 2016, including 3D graphics topic. One of camp goals is showing College life (big lectures, labs, classroom tests, cooperative teamwork, reports, presentations).

One of the DG Talent Point Free Summer Student Workshops is Technical Applications in Self-Supporting Home⁹, which's tender is under examination. Planned student workshops are the followings:

- 3D printing: collocating 3D printer, editing models, printint model, printing.
- Raspberry PI microcomputer: learning it, configuring it, creating a weather-application.

The other camp is DGC Kid-College¹⁰, which attend to software-developing side of the College. Planned student workshops are the followings:

- 3D animation making: With general modeling software Blender, by ready components, own scenario, making a short film.
- Website making: CMS, HTML and CSS scripting languages, making an own blog with WordPress.

Poster's graphics and logos of summer camps made by a member of our Talent Point like all of our issues (Figure 34).



Figure 34. Posters of summer kids camps 2016 of DGTP [22]

⁹ <http://www.tinyurl.com/gdt-nyari-diakmuhelyek>

¹⁰ <http://www.tinyurl.com/GDF-Gyerekfiskola>

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