# Producing Creative Artistic Projects by Grouping Students' Computer Graphics Research Topics

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**Abstract**

*For the last 2 years, our CG Art department experiments new pedagogical methods for our master's second year program in order to place the research right at the heart of the course syllabus. The main idea is to combine individual research and collective projects: on one side, each student focuses on a computer graphic research topic during the whole year, and on the other side, they produce an artistic group project during a 3-week intensive period, defined by the combination of each team members topic.*

Categories and Subject Descriptors (according to ACM CCS): K.3.2 [Computer and Information Science Education]: Computer Science Education—

## 1. Introduction

To define the background, our department teaches 3D computer graphics for artistic purposes, mainly visual effects (VFX), 3D animation movies, video games and interactive art installations. Applicants must have completed a DipHE (diploma of higher education /level 5) from various artistic, scientific or uncommon backgrounds, resulting in a multi-profile class. Since its inception in 1984, the main philosophy of our program relies on the combined acquisition of both artistic and technical skills: during the first 2 years (bachelor degree/level 6, and master degree's first year/level 7), our students learn programming skills (from principles and algorithms of computer graphics to tools development and scripting), and use of 2D/3D softwares thanks to hands-on artistic exercices. The implicit goal is to give them a deep technical understanding of the tools rather than button-pushing techniques, and therefore, the ability to be autonomous in their creative process, as well as in artistic problem solving. This approach is very close to one introduced by the National Centre for Computer Animation (NCCA) at Bournemouth University [CMA09]. The resulting profiles are very appreciated by the entertainment industry, as they can become good technical directors [Mor98], but also CG artists who can communicate easily with R&D people.

In this paper, we detail the innovative pedagogical methods applied for the last 2 years to our master's second year program. It is necessary to specify that before introducing theses changes, the master's second year used to focus on the production of an artistic project — mostly 3D short films or real time interactive installations — leading to the writing of a thesis and a defense. This project-centered way of working settle progressively, influenced by a global trend, as most of french animation schools perpetuate the principle of a last-year production project. It is also comforted by the relationship established with festivals which are fond of graduation films and have become the showcase of students' talent and schools' reputation. So university students expect the same from their undergraduate studies.

## 2. Issues

However, working on a graduation project during a whole year implies lot of motivation and constant work. For good results, it also needs a sustained supervision, and some production tracking that our understaffed team can not handle on a day to day basis. We were expecting an effort of independent work, also considering that it is a way to guide students on the professional track. But we had to struggle with recurrent students' problems: mismanagement of the size or



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ambition of the projects, difficulties to schedule their time, demotivation or gradual despondency throughout the year, radical changes of the initial ideas, leading to unfinished or poorly and quickly-done projects. We had to face with uneven results even when working in groups. Only strong-minded students with organizational skills and capacity to work autonomously were succeeding with high artistic and technical level results.

But, above all, the research and experimental aspects of a university project were often eluded; the students, caught up in the turmoil of their "big" project, were confining themselves into a productive mode without reflexive times or ability to remain detached. The delivered thesis were summarizing their production workflows. And even if we could find interesting developments, we were missing in-depth studies on a specific subject. When we thought about reorganizing this year, our first leitmotiv was to bring back the research right at the heart of the program.

## 3. Program framework

The idea came while thinking about animation studios' workflows, when working on serious projects like animation series or 3D feature films: the production doesn't start without a deep research and technical development phase, to test and consolidate the pipeline, and to solve specific artistic stakes. For example, Pixar's short films are used to experiment new tools and techniques, like wiggly splines on "Lifted" [KA08] which determined a way to animate oscillatory motions. We've been inspired by this approach to build our 34 weeks program's schedule, as detailed below.

The first week, early october, is called the "open-minded intensive week": we invite senior lecturers (including the teachers), phD students, and R&D professionals, to present their research to the class. The goal is to stimulate students' ideas by broaching a huge panel of artistic and technical subjects in computer graphics, and show methods of research. Moreover, a traditional theoretical course explains what is a research field, a problematic, a state of the art and so on.

Then, each student has 2 weeks (WEEKS 2 – 3) to find his research topic. They have individual appointments with senior lecturers to be guided and finally identify and formulate the most appropriate subject. Then, a day of oral presentations marks an important milestone: each student has 10 minutes to expose his selected topic to his class, in the form of: 1) field; 2) research question and subquestions; 3) list of hands-on experimentations for the next 9 weeks; 4) suggestion of know-hows which he can offer for a group project. At this time, all the students have to pay close attention to each presentation in order to notice the useful competences they can join to assemble a crew. For instance, if a student works on a subject in relationship with animation, he will perhaps be more interested in people working on rigging development.

From then on, the students have 2 weeks (WEEKS 4 – 5) to build a 3 or 4-person team and define an artistic project. But here is the constraint: this project has to be defined in such a way as to need all the research topics of the team's members. For example, if member 1 is working on hair simulation research, member 2 is studying dancing simulation, and member 3 is focusing on non-photorealistic rendering, they will have to combine the presence of dance, hair and non-photorealistic rendering in the shared project.

Each team delivers a statement of intent which succinctly explain their project, summarize their individual research, and describe their individual forecast planning: indeed, the production does not start immediately. Students have to get back to an individual upstream work for 9 weeks (WEEKS 6 to 14) to have a look at the state of the art, do technical tests and small visual experimentations according to their subject. They are not allowed to work directly on the project but all their theoretical and practical researches lead them to be better prepared for it. We ask them to log their daily work in an informal research diary, and to have bi-monthly appointments with a lecturer.

In January, they start the 3-week intensive period of production (WEEKS 15 to 17). Our students are used to deal with this kind of deadline because 3-week projects are already organized during the master's first year. The only difference is the upstream individual work which consolidate their knowledge on a specific aspect of the project.

After a debriefing on the contribution of the project regarding his problematic, each student reworks on his research and small visual artistic experimentations for a 9-week period (WEEKS 19 to 27). At this time, students are also allowed to refine parts of their project, while they explore and progress deeply in the knowledge of their subject. On the last 7 weeks (WEEKS 28 to 34) they write their dissertation, relying on their research diary. For their defense, they present their research, their visual experimentations, and the project as a part of the whole.

## 4. Project samples

### 4.1. "Plouf !"

"Plouf !" [Plo13] is a short movie resulting from the association of 3 research topics:
1) the first student was working on "transposition of children's drawings in animation by mixing 2D and 3D techniques": on the project, she achieved character designs, modeling and 2D facial expressions, after a preliminary study consisted in collecting and analysing children's drawings;
2) the second student was working on "methodology of development for artistic challenges", in relationship with his internship in a R&D team. For this project, his goal was to simulate watercolor rendering. He used a successfull simple pipeline based on rendered layers and post-processing treatments (scripted in a compositing software);

3) the third one was doing research on "how to improve empathy on 3D anthropomorphic cartoon characters". He worked on the animation, more as a training exercice than a true in-depth study of his subject.

### 4.2. "Liten"

"Liten" [Lit13] (figure 1) is a realistic 3D short. These 3 students had a subject in relationship with macrophography:
1) the first research was about "how to reproduce the complex look of nature using procedural tools". This student solved specific visual needs like veins, spiders' filaments, drops and random vegetation, using node scripting;
2) the second student was investigating "animated life in the macro world". In the short, she achieved the butterfly, as well as all the details making things more alive and believable;
3) the third student was studying the "relationship between matter and light". On this project, she focused on subsurface scattering shaders (mushrooms, leaves...) and volume lights.

**Figure 1:** *3D short film "Liten"*

### 4.3. "Sainte Faustine"

"Sainte Faustine" [Sai13] is a video game where the player take photos to solve the mystery of an abandoned city.
1) the first student was inquiring about "composition in immersive interactive images" and how to guide the eye when the spectator can freely explore a virtual world. So he worked on the lighting and the atmosphere;
2) the second one was doing research on "the characterization of an action set". He tried to enhance the acting part of the city through the gameplay and the level design.
3) the last one was working on "realtime crowd simulation". On the project, he experimented differents IA algorithms for the rat swarm (steering behaviour, path finding, hierarchical finite state machine...) in order to blend realism, autonomous virtual agent, interactivity and complex crowd movement.

## 5. Conclusion

Taking a global perspective of this pedagogical experience, we would like to point out the main advantages: students try to keep their motivation high during the year and become aware of the workload. The whole class get suitable results, with an in-depth theoretical and practical works. Also, thanks to the integration of research topics as the main constraint to define the group projects, the artistic results are surprising and definitively more creative. At the beginning of the year, students were quite worried about these pedagogical changes, and we had to highlight the research as an university founding principle that will give them methodological skills to face problems during their professional life. Also, by considering them as young researchers, we make them realize, at this point of their studies, that they are skilled enough to do the same job as their teachers. This psychological step helps them grow up and be proud. Furthermore, we can add few comments:

- Sometimes, in the first few weeks, students get anxious with their topic which is missing clarity. In this case, we ask them to describe precisely the artistic hand-on experiments they want to achieve. It is a good way to narrow the research problem.
- The most sensitive step is the definition of the group project: some reserved students can be penalized because they do not impose what they need in the project to improve their research.
- The informal research diary is a very good method to ease the writing of the thesis.
- This program is compatible with an internship concurrently with their studies: some students have negotiated with a company to work on tasks closed to their topic, or have chosen a subject in relationship with their professional work. They have also managed to be free during the 3-week production period and for regular appointments with the teachers.
- Finally, the good employement rent of our students (80% within a few weeks) conforts us in the fact that a "big last year project" is not a sine qua non condition to get hired.

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