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Comparison between Approaches Used in Two WalkAbout Projects

Derek O Reilly, Piotr Milczarski, Shane Dowdall, Artur Hłobaż, Krzysztof Podlaski, Hiram Bollaert

***Abstract*—**Learning through creation of contextual games is a very promising approach when undertaking interdisciplinary and international group projects. During 2013 and 2014 the authors organized two intensive student projects. The two projects were in different countries and different conditions. Between them, the two projects involved 68 students and 12 mentors from five EU countries and from various academic disciplines. In this paper we share our experience of these two projects and we suggest approaches that can be utilized to strengthen the chances of succeeding in short (12-15 days long) intensive student projects.

***Keywords*—**Contextual games, mobile games, GGULIVRR, WalkAbout, Erasmus Intensive Programme.

I. Introduction

WALKABOUT is a project that assembles students from different EU countries and different degree programmes and gets them to create a mobile game in an given context. The students are challenged with the task of building functioning GGULIVRR (Generic Game for Ubiquitous Learning in an Interactive Virtual and Real Reality) [6] games on the given context. The usual time span of the project is 12 days. During this time, the teams investigate the context and its learning content, study instructional design to find attractive and inviting formats, explore the game platform with its technical constraints and learn to communicate effectively with their team mates so that they can optimize their collaboration.

GGULIVRR is a concept for contextual and mobile learning games that can be built by diverse teams. The goals of the project are: firstly, to realize an enticing game that can effectively unlock the virtual double of a context; secondly, to practice 21st century skills so that students' idiosyncratic strengths and weaknesses are recognized and combined to allow synergy to occur.

GGULIVRR games are to be played in a certain context. NFC (Near Field Communication) tags or QR (Quick Response) tags spread throughout the context link physical objects with the digital information. This information becomes available through interaction with a mobile device. Game elements are used to motivate the visitor to learn more about the context.

Contextual mobile learning games provide interesting benefits. Applying game elements answers the increased demand for greater interactivity to be built into learning material and brings motivation to the learning process. The physical whereabouts of a person offers explicit in-time in-place learning opportunities.

Some authors [2] point also that interest in using digital games for formal education has steadily increased in the past decades. But, at the same time, it remains limited when it comes to actual use of games in the classroom. We [1], [3] and other authors [4], [5] show that it only depends on buy-in from the teachers or mentors.

This paper is organized as follows. In Section II, we describe two projects that took place in 2013 in Porto, Portugal and in 2014 in Lodz, Poland. In Section III, we analyze how the schedule impacted on the students' projects during both events. We show how and when groups were organized and the games were defined. Section IV focuses on the location influence on the two projects' outcomes. In Section V, we analyze the impact of student preparedness, technologies and methodologies that were used on the level of games completion. Section VI presents our conclusion and outlines our proposed future work.

II. Description of Our Two WalkAbout Projects

To date, two WalkAbout projects have taken place: WalkAbout Porto 2013 and WalkAbout Lodz 2014.

A. WalkAbout Porto2013

1. Location

The first Walkabout IP took place in Parque Biológico de Gaia, Portugal in April 2013. Parque Biológico de Gaia is a 35 hectare park containing woodlands, farms, zoological gardens, a hostel, restaurant and library.

2. Accommodation

Parque Biológico de Gaia had many advantages as a location. It not only provided a setting for a suitable game, but also provided an on-site hostel where our students could reside. During their stay, the students shared rooms for four and had access to a kitchen.

3. Students

During the programme, students grouped themselves into

D. O Reilly and S. Dowdall is with the Dundalk Institute of Technology, Dublin Rd., Dundalk, Co. Louth, Ireland (e-mail: derek.oreilly@dkit.ie, shane.dowdall@dkit.ie)

P. Milczarski is with the Faculty of Physics and Applied Informatics, University of Lodz, Pomorska str. 149/153, Lodz90-236, Poland (corresponding author, phone: +48 666233839; fax: +484263554261; e-mail: piotr.milczarski@uni.lodz.pl).

A. Hłobaż and K. Podlaski are with the Faculty of Physics and Applied Informatics, University of Lodz, Poland (e-mail: artur.hlobaz@uni.lodz.pl, podlaski@uni.lodz.pl).

H. Bollaert is with the AP University College Antwerp, Belgium (e-mail: hiram.bollaert@ap.be)

teams of five, one from each of the countries involved: Belgium, Finland, Ireland, Poland and Portugal. The students came from a range of disciplines including Applied Informatics, Games Development, Teacher Training, Telecommunications and Tourism. The students' year of study ranged from year 1 to year 3. Thus, each team consisted of an international and interdisciplinary group whose composition also varied in terms of gender, age and educational experience.

4. General Requirements and Incentives

While it was deemed important to get a wide range of disciplines involved, it was also necessary to have some students who had good programming skills on each team. Thus, the method used to attract students onto the programme varied between the colleges involved. Some simply advertised within the college while others targeted particular students.

5. Framework

A WalkAbout framework architecture was developed prior to commencement of the project in Portugal. Its use was meant to cut down the time required to implement a game, thus making it feasible for teams to finish in the required time. The framework used HTML5, CSS & Javascipt to facilitate a cross-platform game. Furthermore, the framework was intended to facilitate the game being used in places where there was no internet connection.

Using the framework limited the type of game that could be developed. However, this constraint also aided the students to focus their attention on content. As a result, all the games developed by the students involved finding and then scanning QR codes with their phones or tablets. Once a QR code was scanned, the user would be told some facts and then asked a question. To answer a question, another QR code would have to be found and the cycle continued.

6. Social Events

The students underwent a very intensive programme. This was substantially due to the students' motivation and drive. While it was planned to create a programme that was stimulating, it was a surprise to find just how seriously the students took their work. Thus, the planned social events were even more necessary than first perceived. As the programme took place over a ten day period, only a small number of social events were arranged. Toward the end of the project, a day trip was planned to show off the local city of Porto. It was interesting to note that many students did not wish to go on the tour as the deadline for their final submission was looming. However, it was deemed important that we ensure they took a break from the intensity and also get to see what the city being visited had to offer. On the final evening a party was arranged to celebrate the success of the students' work.

7. Financing

This first programme was funded through the EU Erasmus Intensive Programme (IP) funding mechanism in Portugal. The funding covered flights, accommodation and social events. Limited funding was provided towards the cost of food and other travel expenses for both students and mentors.

8. Outcome

One of the main goals of the first IP was to prove that it was possible for students to produce a game or a reasonable 'proof of concept' within a short time-frame. To this end, the IP was a great success. However, we also learned how to make improvements. Restricting the game so that users had to scan a QR codes in order to progress proved to be useful, as it focused the students' minds on the game content. The chosen setting was ideal, as everything the students needed was on-site. In addition, the site was safe, reasonably compact and had a friendly atmosphere. The only significant problem that was encountered was that the custom framework proved to be overly complex and problematic for the students. The programme provided a tremendous learning experience for the students involved.

B. GGULLIVRR@Lodz – WalkAbout 2014

1. Location

The second Walkabout project took place in Lodz, Poland in September 2014. Lodz has a large academic and cultural significance in Poland. Lodz is a city that has a short, but complex and fascinating, history. The history of the city is the result of input from four cultures: Polish, Jewish, German and Russian. Because of its diversity and the impact of so many different cultures, Lodz is a very interesting place for tourists to visit. It has a lot of religious, industrial and residential architecture. It has many tourist attractions, such as murals monuments, museums and shopping areas. The city provided the context for the WalkAbout Lodz 2014 project.

2. Accommodation

The students were accommodated in one of the dorms of the University of Lodz. One of its main advantages was that it was located only 100 meters from where the main work on the projects was done, in the Faculty of Physics and Applied Informatics. In the dormitory, students lived in four person accommodation, which consisted of two double rooms, a shared bathroom and a shared kitchen. There was also a canteen and a laundry in the building.

3. Students

Students participating in the project were grouped into five teams of five or six people. In each of the teams there was at least one representative from each country participating in the project (Belgium, Finland, Ireland and Poland). In addition, each team was also interdisciplinary. There were students from technical disciplines - such as programming, games development, and graphics - and humanities disciplines – such as tourism, business studies and teacher training.

4. General Requirements and Incentives

On the basis of the experience gained during the WalkAbout Porto 2013 project, an effort was made to involve some students with graphic design skills in the project. This allowed for the creation of games that were visually very well refined. This increased the games' value from the player point of view.

5. Framework

Students had the opportunity to choose between the two frameworks. The first framework to choose was the one that had been used in Portugal (see section 2.1).The second framework was based on PhoneGap. Both solutions are open source and both enable software programmers to build applications for mobile devices using JavaScript, HTML5 and CSS. Although some of the teams started with the Portugal framework, all five groups decided to work with PhoneGap.

6. Social Events

There were two social events during the intensive program in Lodz. Both were sponsored and organized by two locally based IT companies: Ericpol and Mobica. The most important of the social events was the first one. This took place on the opening evening and consisted of the group playing bowling at a location in the center of Lodz. The main task of the event was to integrate the students and create a positive environment for the creation of project teams. The event was preceded by an interactive city tour and game. At the beginning of the city game, students were divided into international groups. The aim of the game was to reach the bowling alley as soon as possible, while visiting various checkpoints on the way. The checkpoints were selected places of interest in Lodz, such as important buildings, monuments and squares. At each checkpoint, the groups had to take a photo of the object and send it to the organizers by MMS, so as to get information about the next object that they had to visit.

On the last evening of the programme, the students were taken to a restaurant in the centre of Lodz.

7. Financing

In contrast to the WalkAbout Portugal 2013 project, the WalkAbout Lodz 2014 was not financed from EU funding. The project was organized thanks to the involvement of three parties: University of Lodz, City of Lodz and local IT companies that cooperate with the Department of Physics and Applied Informatics in the University of Lodz. The university provided accommodation for the students and mentors in the dormitory. The City of Lodz organized a guided tour through the city and provided materials about the city. Companies such as Ericpol, Mobica and AMG.NET provided the project budget and helped to organize and sponsor social events. The only costs that the students and mentors had to cover were costs of travel to Lodz and food while in Lodz. Some of the participating colleges covered the travel cost for their students. It should be noted that Poland has the lowest cost of living from all the countries participating in the project. Therefore, the costs of food were not too burdensome for the participants.

8. Outcome

There are several main conclusions from the WalkAbout Lodz 2014 project. Because the students had a whole city upon which to base their games, the resultant game ideas were very diverse. It proved to be also very important that the students were not forced to use an imposed framework. This allowed them to be more productive and resulted in them producing high quality games.

The students' work received extremely positive feedback from the representatives of the City of Lodz and the sponsor companies at the final presentation of projects. This provided a level of comfort for the sponsors that their funding had been put to good use.

III. Analysis of Schedule Impact on Students Projects

In both Porto and Lodz, it was vital that the student teams were constructed in such a way as to maximize the learning experience for all of the students. The mix of students for both programmes included students who studied business, tourism, education, games development and general computing. The order of priorities that we applied when creating teams was: firstly, the ideal size of a team is five, but team size can range between four and six; secondly, if possible, students from the same college should be placed on different teams. The makeup of the student groups affected how well we could apply the two team selection priorities.

In Porto, we started with eight students from each of the five participating colleges. This allowed us to set up eight teams of five. On the first morning in Porto, the students were informed of the game building task that lay ahead of them and they were told to form their own teams of five with each team having only one student from each college. It was explained to the students the importance of having people with different skill sets on the team. We informed the students that when building their team, they need to be able to explain a role for each team member. The students were also told that each team would need to come up with at least one game concept within the first couple of hours. Forcing the students to discuss their own roles within their team and forcing teams to identify potential game ideas meant that the students engaged in a huge amount of communication and interaction. This approach worked surprisingly well. Within an hour we had eight, well-balanced, teams. Importantly, all 40 students felt that they could make a positive contribution to their team.

In Lodz, the student numbers from each participating college varied. We had a total of 28 students, so we made five teams of size five or six. Some of the teams had two members from the same college. In Lodz, the host University organized a social get-together on the evening when the students arrived. The students were all taken to play bowling. As expected in such a friendly environment, the students made an effort at chatting to students from other colleges. Once all of the students were comfortable with their environment, we instructed the students of the criteria for team selection. They were given the evening to construct their teams. As in Porto, the importance of the different student skill sets needed to form a good team was emphasized. When the evening was coming to a close, the teams were instructed to come up with their first game ideas for the following morning. This meant that the team members had to communicate after the social event was finished. It was striking how the groups stayed together for the evening and how quickly the students spent the majority of their time with their team rather than with the students from their own college. Having a social evening at the start of the project proved to be a particularly good way at

getting the project off to a good start. We would highly recommend this approach as the ideal way to begin any such project.

The focus of the games in both Porto and Lodz was determined by the physical surroundings that the respective projects took place in. In Porto, the students were told that their games had to relate to the Parque Biologico de Gaia. This is a zoological garden in Porto. The students' accommodation was in the park. This meant that they became very familiar with the environment that their games were to be focused on. In Lodz, the students were accommodated in the University of Lodz, which is close to the center of the city. Students were encouraged to tour the city to come up with games ideas. Local knowledge played a major role for every team in the selection of their initial game ideas. In Porto, all students were able to contribute equally to the initial game ideas. This is because the location was very generic and all students had an equal prior exposure to zoos. In Lodz, the local Polish students lead the way in coming up with games. Clearly, in a city, local knowledge is vital.

In both Porto and Lodz, the game concepts evolved over the course of the project. Once the teams were formed, they were given a morning to identify one or more initial game ideas. The games had to be aimed at users of mobile devices and had to use QR codes as a method of user interaction. In both Porto and Lodz, the first morning was used to get initial game ideas. During this time, the mentors went around the various groups to give some informal feedback and direction. By the end of the first afternoon, the student teams had to give a short, informal, overview of their game ideas. The various ideas were discussed among all the students and the mentors and some of the ideas were refined.

By the end of the first afternoon, the initial, informal, games concept process was complete. In both Porto and Lodz, at this point the process became more formal and was results driven. The students were given one day to prepare a full presentation, which would be given in front of the other groups in a lecture hall setting. Upon completion of the first presentation, the students were given a three day period to prepare for their next presentation. The students had to give a final presentation on the last day of the project. Each of the three presentations increased in intensity. Local industrial guests were invited to the latter presentations in order to give them an added importance to the students. These three, formal, presentations were vital to the success of both projects. They gave the students a real short-term deadline to focus on. Each presentation focused on a different aspect of the game. The first presentation focused on the games design. This included such things as a game overview and potential target audience. The second presentation focused on students producing a simple prototype of a part of their game and on explaining in detail, the complete game design. Students were also expected to explain how they would get their game to market. The final project involved a demonstration of one part of the game, a business plan for the future development of the game and a professional promotional video for the game. The three presentations ensured that the students remained focused throughout the duration of the project. The presentations also ensured that there was sufficient work to be done by the non-technical students on the various teams.

In both Porto and Lodz, the games evolved over the period of the project, as students came up with solutions and changes to deal with various problems that they encountered.

The quality of all of the games was surprisingly high. In Porto, two of the teams were asked by the management at the Parque Biologico de Gaia to further develop their games. In Lodz, two external companies asked their student groups to continue on with the development of their games. We believe that the high quality of the games was as a direct consequence of the high level of engagement that the students had with the process. The regular presentations allowed all teams to see what the level of quality was in the other teams' games. Teams were able to observe and copy best practice. The students competed among themselves to show off their game designing abilities. The friendly competition and sharing of best practice between the teams ensured that no team drifted away from the project goals.

We were very interested in the fact that there was a large amount of cross-team collaboration. We believe that, because of the regular presentations, teams had no secrets to hide from other teams and that this lead to them being more willing to share ideas.

IV. Analysis of Location Impact

Organizing events like WalkAbout have to take into account the location impact on the project results. We can define two very different approaches to location selection: closed and open. During the WalkAbout Porto 2013 project, everything happened in the pre-defined space that is the Parque Biológico. Each of the created games had to be placed in that space. In the end, all of prepared games had much in common and could be easily adapted to different locations. In the WalkAbout Lodz 2014 project, the city was chosen as the location. In this case, each of the games was very different. The observed that in choosing a location we also strongly influence the target group for whom the games will be aimed at. In Parque Biológico, all the games were created for children. This is compatible with the fact that the park is mainly visited by school children. In a city, such as Lodz, there is no one specific target group. In Lodz, therefore, students had many more possibilities in terms of who they aimed their games at.

Despite the different types of location, many of the games that were developed in both Porto and Lodz were similarly constructed. This was because of the requirement that the games be QR code event driven.

Looking at Lodz, we can say that if local members of a project group have a strong interest in some city social or cultural activity, then that person is able to "infect" the rest of the group with a game idea. If that happens, then the project is very promising. If the group of local students does not contain people with a strong interest in an aspect of their location, then it is difficult to develop games in an open location. This is because the non-local students do not have the necessary

knowledge of the city to come up with interesting games that make sense in the context of the city location.

The location could also impact on the productivity of the teams. In Porto, the park was some distance from the city. Therefore, the students spent most of their time in the park. When students had to collect some data for their games they did not have to go outside the complex. There were also not too many opportunities for the students to be distracted. In Lodz, however, students had to go to the city centre to gather content for the games. This takes time and can be a distraction. However, well organized teams were able to manage this well. In both Porto and Lodz, the mentors encouraged the students to relax in the evenings and to visit the city in the evening time. However, because of project time pressure, almost all of the students choose to stay and work late on their games.

V. Analysis of Framework, Technologies, Methodologies Impact

Two frameworks were used in the projects, GGULIVRR [7] and PhoneGap [8].

PhoneGap (Cordova) is a framework that allows programmers to build applications for mobile phones and tablets. Although PhoneGap is theoretically a multiplatform [8] framework, the students were asked to focus on preparing a prototype of the game that would work on Android mobile devices.

Fig. 1 Park Heros, game map, screenshot iPad

GGULIVRR stands for Generic Game for Ubiquitous Learning in Interacting Virtual and Real Realities. This is an open-source framework designed for learning games and is designed by Philippe Possemiers [7]. With the help of the framework, we can develop the applications for iOS, Android and BlackBerry platforms. Both frameworks require only HTML, CSS and JavaScript technical skills.

During the Porto project, only GGULIVRR was used. In Lodz GGULIVRR was initially used in one project and PhoneGap in the other four projects. The one GGULIVRR project transferred over to using the PhoneGap framework toward the end of the project cycle. In Porto, the use of GGULIVRR was obligatory. During Lodz project students responsible for programming were provided with notes on the PhoneGap framework and were given workshops in the use of the GGULIVRR framework. The group that used GGULIVRR consisted of two programmers that had previous used it in Porto.

The students in both Porto and Lodz tried to make their application prototypes workable.

During Porto, some project teams did not have graphics design specialists. During the Lodz project, there were five graphics students This meant that each team had a graphics design specialist. This brought a significant visual value to the projects.

In both programmes, students had to use QR codes as the mode of user interaction.

During the WalkAbout Porto 2013 project, student programmers took part in workshops about GGULIVRR framework (see Figs. 1-3).

Fig. 2 Evo Park, main screen, screenshot iPad

The screen output was usually static images and text messages inside speech bubbles. One team used audio as a way of communication.

For the final presentations, students used and relied much on their prototypes. Two teams managed to prepare applications that consisted of several levels and were fully playable.

Three teams showed one to three screens of their games that were fully playable.

During the Walkabout Lodz 2014 programme, the mentors gave the students a choice of frameworks to use. Students had workshops on the GGULIVRR framework over the first three days in Lodz, after which time they had to decide which framework they would use. Two of the students from one group had taken part in the WalkAbout Porto programme, so they decided to use the GGULIVRR framework (see Fig. 8). Four of the five teams chose to use the PhoneGap framework (see Figs. 4-7).

Students were encouraged to make their apps more alive and responsive. Firstly, the students introduced animation to the prototypes of their games. All but one team had at least one prepared and working animation in their prototypes for the final presentation.

Fig. 3 Project Bird poster

Secondly, at the final presentation, students focused strongly ont heir prototype games. One team managed to prepare an application that consisted of several small and simple mini-games and the other four teams showed one to three screens of their games that were fully playable.

Fig. 4 Urban Legend, main screen, screenshot from BlackBerry Z10Ltd

Students were encouraged to consider the real-world business applications of their games. In Porto, the park management asked that two of the prototype games be developed further. In Lodz, two business partners asked that the prototype games that were developed for them be continued further.

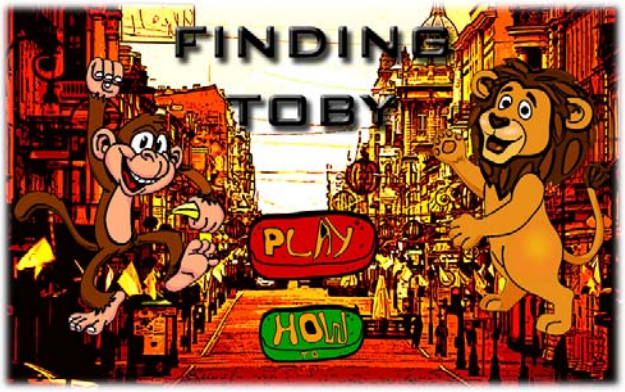

Fig. 5 Finding Toby, Phoenix level, screenshot

In both Porto and Lodz, students used the Agile software development methodology [9].

Fig. 6 Game of dolls, screenshot from BB Z10Ltd

Each team had one mentor. The mentor's task was to explain the crucial role of the manager and level of workload that had to be done by each team member. Mentors appointed the student project manager from the team's members. The mentors selected the management students as the natural candidate for the student project manager position.

Most mornings there was general meeting of all of the participants. The aim of this meeting was to get all the students together, explain the steps all teams had to do, give important general notes and answer any questions and problems that arose since the last meeting.

After that meeting, there was a team meeting with the mentors. Team members were daily posed with questions, such as:

- What has been accomplished since last meeting?
- What will be done before the next meeting?
- What obstacles are in the way?

The team meeting considered what tasks had to be done that day. This work was allocated to the team members and they got to work.

One of the options for the teams was workshops. In both projects, the developers attended workshops on the GGULIVRR framework. In both projects, there were additional workshops for the creative students and team

leaders. These meetings had a great impact on the teams. It gave the students a chance to share their experience and to appreciate their creative and business strengths as being of the same importance as the work being done by the technical students.

Fig. 7 Weavers game, screenshot from Samsung Galaxy S3

Fig. 8 Rays of History, screenshot from iPad

The mentors usually finished their formal meetings with their teams in the late afternoon. However, in both Porto and Lodz, it became common for the students to seek an additional meeting with their mentors in the evening time. These meetings were less formal than the timetabled morning meetings, but they served as a good aid in directing the teams' evening work.

Although the mentors were responsible for one team, they made themselves available to all the teams. This made sense, as each mentor had a different skill set. Seeing the mentors willingly engage with the other teams encouraged the teams to collaborate with each other more.

Between the two projects, only one team from the 13 teams did not succeed. This was due to a team member becoming very ill. Even so, that team prepared a paper version of their game.

As mentors, we could see the impact of the framework on the students. When the team programmers used their chosen framework they felt safe and felt motivated to get the best out of the framework. In Porto students had more time than in Lodz to finish the projects. However, the initial lack of the framework knowledge between programmers resulted in development time being lost. As a result, in Porto, several teams did not implement a sophisticated game.

In Lodz the team that had chosen GGULIVRR framework used it on purpose. Both programmers felt confident with it and in three days they got working prototype as well as the other teams. In the end, they too, chose to use the PhoneGap framework.

VI. Conclusions

In these conclusions we present succinct advice for organizers of similar projects. We shall take what we have learned into our own future events as well!

Firstly, frequent student presentations are key to running a successful project. Initial presentations should focus on creating storyboards for a game. Feedback from the mentors then guides the students on how to improve. As the programme progresses, the mechanics of the game crystallizes. Well defined criteria for the prototypes at each presentation ensure that the students properly understand their goals.

Secondly, regular meetings with and without mentors and easy access to mentors is needed to obtain project outcomes. Two meetings a day with the team mentor is important for the teams to remain focused during the project.

Thirdly, each project should start with an intensive set of integration events. The integration events ensure natural group creation. The events can also spark ideas for games.

Fourthly, the location has little impact on students' creativity and the project outcome. If the location is more open, as in Lodz, the games seem to look different and more interesting. A closed environment often means that the games developed will have a similar theme.

Fifthly, it matters which framework the teams choose. Students should feel confident in using it and they should be able to get to grips with it quickly. Providing good tutorials and other reading material is important and having at least one mentor who understands the technology is vital. The students should focus on preparing a prototype of the game on a single platform, such as Android.

Sixthly, in such a short period of time it is unrealistic to assume a polished and professional game could be developed. However it is realistic to assume that the prototype developed can be of sufficient quality to attract potential investors. Thus the focus for each team should not only be on building a working game. It is as important to be able to give a good presentation that shows off students' creativity, demonstrates a game's game play and gives a solid business plan. Therefore, the programme should focus primarily on the students' communication and collaboration skills rather than purely technical skills.

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Derek O Reilly is a Senior Lecturer in the Department of Computing & Mathematics at Dundalk Institute of Technology, Ireland. He is the director of the BSc (Honours) in Computing in Games Development.

He has a BSc (Honours) in Computing from Dublin City University, Ireland, an MSc in Computing from Dublin City University, Ireland and an MA in education from Durham University, UK.

He has extensive game development experience. He has worked on television game shows, PlayStation console games and Apple, Android and Windows mobile game apps.

He has published in the areas of technology and education.

Piotr Milczarski is Adjunct PhD in the Department of Physics and Computer Science, University of Lodz, Poland. Piotr obtained a PhD in Quantum Physics at the University of Lodz, Poland. He has MSc in Physics at the University of Lodz in Poland.

From June 1999 until now he is leading his IT company in Poland. He is involved in innovative IT startup projects, especially mobile and web ones. He in image processing, Android applications and software systems (Java, Adobe AIR/Flex, JavaScript).He is Java instructor and Cisco CCNA Instructor.

From September 2001 until December 2009 he was Adjunct PhD at Academy of Humanities and Economics, Lodz in Poland. He was working in the Institute of Creative Activity (IPT) as the Chief of Programming Department, Lodz, Poland. From 2008 until March 2010 he was Deputy Director in the Institute of Distance Learning.

Shane Dowdall lectures in mathematics, artificial intelligence and physics in Dundalk Institute of Technology, Ireland. He acts as a consultant on projects for local companies.

Artur Hlobaż is Adjunct PhD in the Faculty of Physics and Computer Science, University of Lodz, Poland. He holds PhD degree in Technical Sciences in the field of Computer Science. He has defended his PhD dissertation ("Protection of data transmission in measurement systems") at the Technical University of Lodz in 2008. His interests are in IT security, privacy, computer networks and software engineering. Artur is Department coordinator of cooperation with employers and business. He is also Cisco CCNA Instructor.

Krzysztof Podlaski is a Senior Lecturer in Faculty of Physics and Applied Informatics at University of Lodz.

Main fields of interest in Computer Science are: software engineering and web and mobile applications development, reversible circuit design.

He has Ph.D. in Physics from University of Lodz.

He has published in areas of computer science and physics.

Hiram Bollaert is a lecturer and a researcher at the AP University College Antwerp. He obtained a Master degree in mathematics from the University of Antwerp. After having taught mathematics, statistics, and computer literacy at various colleges for several years, he moved on to the university college as a statistics and operations research lecturer for professional bachelors and international Erasmus students. There he discovered the capabilities of virtual learning environments using systems as Blackboard and Moodle and started creating adaptive e-courses.

His experience as a provider of e-learning reflects on his research projects and his strong vision on implementing and using e-learning and m-learning.

Hiram uses his creativity to encourage colleagues and students to discover the virtual playground and to incorporate ICT as a learning tool.