CSEDU 2012

4th International Conference on Computer Supported Education

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16 - 18 April, 2012

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Brief Contents

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Selected Papers Journal

A short list of papers presented at CSEDU 2012 will be selected for publication of extended and revised versions in the Journal of Education and Information Technologies. This selection will be done by the Conference Chair and Program Co-chairs, among the papers actually presented at the conference, based on a rigorous review by the CSEDU 2012 Program Committee members.

Foreword

This book contains the proceedings of the 4th International Conference on Computer Supported Education (CSEDU 2012) which was organized and sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC) and technically co-sponsored by SPEE (Portuguese Society for Engineering Education), IGIP (International Society for Engineering Education), ROLE (Responsive Open Learning Environments) and IFIP TC3 (International Federation for Information Processing – Technical Committee 3 – ICT and Education).

CSEDU has become an annual meeting place for presenting and discussing learning paradigms, best practices and case studies that concern innovative computer-supported learning strategies, institutional policies on technology-enhanced learning including learning from distance, supported by technology. The Web is currently a preferred medium for distance learning and the learning practice in this context is usually referred to as e-learning or technology-enhanced learning. CSEDU 2012 is expected to give an overview of the state of the art in technology-enhanced learning and to also outline upcoming trends and promote discussions about the education potential of new learning technologies in the academic and corporate world.

This conference brings together researchers and practitioners interested in methodologies and applications related to the education field. It has five main topic areas, covering different aspects of Computer Supported Education, including "Information Technologies Supporting Learning", "Learning/Teaching Methodologies and Assessment", "Social Context and Learning Environments", "Domain Applications and Case Studies" and "Ubiquitous Learning". We believe the proceedings, demonstrate new and innovative solutions, and highlight technical problems in each field that are challenging and worthwhile.

CSEDU 2012 received 243 paper submissions from 58 countries in all continents. A double-blind review process was enforced, with the help of the 297 experts who are members of the conference program committee, all of them internationally recognized in one of the main conference topic areas. Only 29 papers were selected to be published and presented as full papers, i.e. completed work (10 pages in proceedings / 30' oral presentations). 73 papers, describing work-in-progress, were selected as short papers for 20' oral presentation. Furthermore 37 papers were presented as posters. The full-paper acceptance ratio was thus 12%, and the total oral paper acceptance ratio was less than 42%. These ratios denote a high level of quality, which we intend to maintain and reinforce in the next edition of this conference.

The high quality of the CSEDU 2012 programme is enhanced by three keynote lectures, delivered by distinguished guests who are renowned experts in their fields, including (alphabetically): Joseph Trimmer (Ball State University, United States), David Kaufman (Simon Fraser University, Canada) and Hugh Davis (University of Southampton, United Kingdom).

For the fourth edition of the conference we extended and ensured appropriate indexing of the proceedings of CSEDU including DBLP, INSPEC, EI and Thomson Reuters Conference Proceedings Citation Index. Besides the proceedings edited by SciTePress, a short list of papers presented at the conference will be selected for publication of extended and revised versions in the Journal of Education and Information Technologies. Furthermore, all presented papers will soon be available at the SciTePress digital library.

The conference is complemented with two special sessions, focusing on specialized aspects of computer supported education; namely, a Special Session on Enhancing Student Engagement in e-Learning (ESEeL 2012) and a Special Session on Serious Games on Computer Science Learning (SGoCSL 2012).

Building an interesting and successful program for the conference required the dedicated effort of many people. Firstly, we must thank the authors, whose research and development efforts are recorded here. Secondly, we thank the members of the program committee and additional reviewers for their diligence and expert reviewing. We also wish to include here a word of appreciation for the excellent organization provided by the conference secretariat, from INSTICC, who have smoothly and efficiently prepared the most appropriate environment for a productive meeting and scientific networking. Last but not least, we thank the invited speakers for their invaluable contribution and for taking the time to synthesize and deliver their talks.

Looking forward to an inspiring world-class conference and a pleasant stay in the beautiful city of Porto for all delegates, we hope to meet you again next year for the 5th CSEDU, details of which will be available at http://www.csedu.org.

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CONTENTS

SHORT PAPERS

POSTERS

THE METAFORA PLATFORM TOOLS AND LEARNING TO LEARN SCIENCE TOGETHER

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Keywords: Learning to Learn Together (L2L2), Inquiry-based Learning, Modeling, Science, Constructionist Learning, Visual Language.

Abstract: As Science and Mathematics teaching and learning in Europe decays, the Metafora project offers a proposal for the promotion of a new pedagogy based on online social learning through the use of the platform's tools. Our Pilot study aimed at exploring how students can enhance their science learning by engaging in meaning generation processes using the Metafora tools. These processes include making sense of motion in Newtonian space using one of the tools, the 3D Juggler Microworld. The students also engaged in group discussion and argumentation using Lasad and collaborative planning of actions using the Planning tool of the Metafora platform. The role of the tools is promising in enhancing students' scientific meaning making. Yet, further research is needed in exploitting the tools' potential to contribute in collaborative, social learning and enhance the learning climate with an emphasis on togetherness which seems to be missing from our schools.

1 INTRODUCTION

This paper presents data collected in Greece during our Pilot Study in the framework of Metafora – a European project- which incorporates inquiry-based, modeling, and constructionist processes for science learning.

Using the Metafora platform's tools mentioned above (3D Juggler Microworld, Lasad, and Planning tool) students at the 2nd high school grade, with very limited prior knowledge of Physics, were asked to solve an open-ended challenge in Physics in teaching and learning physical concepts.

Students worked collaboratively having the chance to interact face to face (among the in subgroup members) or using the Metafora argumentation tool Lasad (the only means of comunication among subgroups). In this argumentation and discussion workspace the students gathered their findings and arrived at an agreed solution. Lasad played the role of a Web 2.0 tool which helped them organise their learning and disseminate educational content.

They had to explore and build models of 2d and 3d motions and collisions in the 3d Newtonian space of the 3D Juggler microworld of the platform. As most 3d gaming environments, known for their success with young people, 3D Juggler gave students the chance to operate in a complex, fun and engaging domain while at the same time they collaborated to address the challenge developing communication, strategic thinking and problem solving skills. Finally, the students had to present their plan of actions in order to address the challenges using the Planning Tool of the platform.

Although our findings are encouraging as regards the role of the tools in helping students engage in scientific meaning making, we do believe that the students did not take full advantage of the tools's potential for the enhancement of their collaborative, social skills. This is partly due to the complexity and the confusingly great number of alternatives given by the cards especially in the Planning tool. The limited time for familiarization also played a negative role as did the lack of a deeper culture of collaboration in our schools.

2 THEORETICAL FRAMEWORK

The role of modeling as an inquiry-based learning process has proven to be of great importance in helping students to better their reasoning and understanding of scientific concepts. This process is further enhanced when technology-based educational tools are used Moreover, the process of exploring, designing and building personally meaningful computer models, which can be shared, allows students to realize their own conceptualizations and ideas regarding the scientific quantities and concepts. As they study these concepts it gives them the chance to test these ideas using their models in accordance with the constructionist approach. When these models are created in collaboration with their peers, they become subjects of discussion and reflection thus leading them to deeper understanding of the scientific phenomena behind them

At this time and age, when computer gaming is part of the students' interests and daily reality, game microworlds, specially designed to engage them in the study of academic subjects, offer them the opportunity to learn in a way they are familiar with. Incomplete by design, half–baked microworlds (Kynigos, 2007) as the one the students worked with during our study, namely 3D Juggler, can work as idea generators and vehicles of scientific meaning making. At the same time, the students working with them have the chance to explore, (de)construct them according to their understanding.

In addition to our claim that in Sciences planning may be associated with the process of problem solving, Planning has been addressed as an element, among others, of self-regulated learning (SRL) or as one of the three phases of cognitive regulation (along with monitoring and evaluation) and it has been described as a general domain metacogitive skill (Schraw 2007). Numerous research studies have examined the self-regulated learning in a cognitive and social cognitive perspective. Self-regulated learning is a process whereby learners think about their thinking (metacognitive process), act in a strategic way (plan, monitor, evaluate personal progress) and they are motivated to learn). For some researchers what has particular significance is the emergent planning in the context of constructionistic environments. For others, as a key tool that guides them to find strategic solutions to solve complex problems. The majority agree that it may be a means of representation, reflection, expression, communication and self-regulation.

Apart from problem solving, in Physics we are interested in what they learn about the scientific content and the scientific language. As far as the former is concerned, we know from relevant research that the creation of scientific meanings starts from the intuitions, the initial representations of students the phenomenological descriptions, the descriptions of actions or events perceived as scientific concepts and relationships between concepts (Smyrnaiou & Weil-Barais, 2005).

3 RESEARCH QUESTIONS

The study examined the following research questions:

- What is the impact of the Metafora Platform/learning on students' ability to conduct science inquiry & constructionism and overall, modelling and to use the inquiry skills of questioning, planning, implementing, constructing a model, concluding, arguing and reporting?
- What is the impact of the Metafora tools in orchestrating learning to learn together (L2L2) meaning generation processes and, more specifically, Physical concepts and scientific methods?

4 RESEARCH METHOD AND PROCEDURE

4.1 Use of the Metafora Tools

Before dividing the students to subgroups we made a short presentation of each of the tools they would work with, namely the 3d Juggler Microworld (J), Lasad (L) and Planning tool (P) of the Metafora platform (See Figure 1 below).

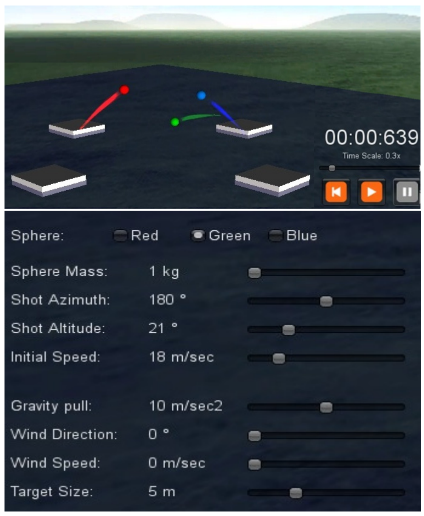

Figure 1: The 3D Juggler microworld.

In this short presentation we told them that they would "play" in the 3d juggler microworld in the same way as they do with any other computer game, in order to deal with a certain challenge. We also told them that they could use Lasad as a Web2 discussion and communication tool. Using it they could discuss any issues needed in order to solve the challenge together. We briefly presented the discussion cards included in it. We emphasized that their ultimate mission was to work together on the Planning tool so as to present the plan they followed in order to solve the challenge and showed them the different cards they could use in it to make their plan.

Next, our students were given the Research Protocol (worksheet) with a simple warm-up challenge they had to address in order to familiarize themselves with the tools and the main challenge later.

- Warm up: "Keeping the blue and the green balls still, shoot the red ball vertically upwards".
- Main Challenge: "The balls should hit each other's base in a circular manner" (e.g. the red ball should hit the blue ball's base etc.)

4.2 Data Collection

A screen-capture software, was used to record the students' interactions both with the digital tool and their verbal ones with each other.. Voice recorders, the researchers' field notes, the students' answers to the Research Protocol, as well as their maps in LASAD and in the Planning Tool complete the corpus of data.

4.3 Description of the Setting and Participants in the Pilot Study

The pilot study took place in one of the Public Junior High Schools in Athens (2nd Experimental Junior High School of Ambelokipi).

The four teachers/researchers offered a short presentation of the tools before the activity started. We tried to limit our intervention and let students work independently but we often had to remind them to use the discussion tool to keep the other subgroup posted about their progress or planned moves. Our intention was to let them discover for themselves how they should manipulate the microworld objects and variables and build their communication and planning without any external influence. Nevertheless, there were instances when our intervention was more obvious. One such case has to do with our effort to turn their attention to the guidelines given in the Research Protocol which they seemed not to read or pay attention to.

The students who took part in this pilot study were in the second junior high school grade (13 years of age), had very limited knowledge of Physics and had not been taught kinematics or projectile motion yet. Nevertheless, they worked with quantities such as "shot Azimuth" and managed to work out what they represented and their role for the solution of the challenges.

Each subgroup of two students worked on one computer and the collaboration between the subgroups was only possible through the Metafora platform tools (Lasad discussion maps –the chat feature was not enabled-and Planning tool). The face to face collaboration was possible between the two members of the same subgroup only.

5 RESULTS

The students had to work with the physical properties and concepts in their effort to succeed in manipulating the microworld's objects to solve the challenges, although they did so rather unconsciously. To be more specific, they, for example, decided to "play" with the value of "gravity pull" (gravitational acceleration) in order to make the blue and green balls stay still, which is rather surprising as one would have expected them to zero these objects' initial velocity instead by zeroing "power". Another such example is also the fact that they wanted to use "wind speed" and "wind direction" in order to help carry the red ball where they wanted.

The following flow chart is cited to demonstrate what was done and discussed in the real activity while addressing the main challenge, using the three tools (table 1).

The results show that the students still have not clarified the difference between the Shot Altitude and the Shot Azimuth. We assume that they are confused by the fact that both are measured in angle degrees. Students do not realize that in order to comprehend what each of the variable does, they need to isolate them. After several efforts and disagreements, they finally manage to isolate the Shot Azimuth and to give the right value to it, so as to direct the red ball to the blue ball's base. Students altered the values of the Power and of the Shot Altitude simultaneously so as to achieve the right combination. We also observe that they changed the mass of the ball, perhaps because they believed that

Table 1: The flow chart represents what is done and discussed in the real activity.

SUBGROUP A		SUBGROUP B
Experiment with “shot altitude” and “shot azimuth”. Disagree on the role of “power” (J)		Reflect on the guidelines. Follow them to set the variable values (J)
Experiment with “gravity pull” and wind ignoring the guidelines (J)		Experiment with the key variables “Shot Azimuth’ and “Shot Altitude” (J)
Fail to realize how to isolate the variables (J)		Disregard (probably unintentionally) the given instructions and experiment with “wind direction” (J)
Isolate the “shot azimuth” variable and start to realize its key role for the direction of motion on the horizontal level (J)		Experiment with the key variables “Shot Azimuth’ “Shot Altitude” and “power” but fail to isolate them (J)
Disagree on the value “shot azimuth” should take in order for the red ball to hit the blue ball’s base (J)		Experiment with “mass” Before they can draw a conclusion they give up (J)
Experiment in order to solve their disagreement (J)		(with help by the researchers) isolate variables. Realize how azimuth affects the ball’s direction (J)
Solve the challenge creating a linear motion model (“shot altitude”=0^0) (J)		Experiment with “power” and “shot Altitude” and get close to their goal (J)
Reflect on the role of “shot azimuth” (J)		Communicate their findings so far with subgroup A through a“Microworld Idea” card in Lasad (L)
Refine their solution (J)		By trial and error manage to solve the challenge (J)
Communicate their findings with subgroup B through a Lasad “Comment” card (L)		
Evaluate solution and refine it by turning the linear motion of the shot into a projectile (J)		
Experiment with “power” to modify height but affect range instead (J)		
Fail to “fix” the ball’s Range by experimenting with mass (J)		
Go to Lasad and get help from subgroup’s B “microworld Idea” card (L)		Share their findings with subgroup A by a “Microworld Idea” Lasad card. (L)
Evaluate subgroup B’s solution by experimenting with the specific values for the variables (J)		Reflect on their moves and start creating the plan using two Planning tool cards: “Find hypothesis and “Experiment”

Table 1: The flow chart represents what is done and discussed in the real activity.(cont.)

Reflect on their moves and start creating the plan using an “experiment” card to report on their experimentations with “angle degrees” (P)		Check the values they gave the variables (J)
Reflect on the role of the “shot Azimuth” for the ball’s direction on a “Make Predictions” card (P)		Unsure of the role of mass, they start experimenting with it. Conclude mass does not affect the Range or direction of the ball (J)
Ask subgroup B to complete their Plan. Tool “Draw Conclusions card through a Lasad “Comment” card (L) Read subgroup’s B “Find hypothesis” card (P)		See subgroup A’s “comment” card. Choose a “Microworld Idea” card to write an answer in but leave it blank (L)
React to subgroup’s B “Find Hypothesis” card” warning them on their “Comment” Lasad card and reminding them to fill out the “Draw conlusions”with text (L)		Connect the Planning Tool cards (P)
Intrude subgroup’s B “find Hypothesis” card to erase their text and rephrase it to sound like a hypothesis (P)		Report their success to solve the challenge on their “microworld idea” Lasad (L)
Reconsider their “experiment” Planning tool card and correct it so as to make sense (P)		Add text on their “DrawConclusions” card reflecting on the role of S.Altitude, Azimuth for the shot (P)
Give subgroup B instructions how to write their “hypotheses” on Planning tool without giving specific values (L)		Read A’s “comment” card and ask for helping ideas to improve their“ Draw Conclusion” card (L)

this affects the range. We assume that they think that the lighter ball can move easier and reach farther than a heavier ball.

Subsequently, students communicated through Lasad and they started to construct a joint plan with the moves that led to the solution of the challenge in the Planning tool. From the comments that students recorded on the cards of the Planning Tool, we realize that they have comprehended the fact that the Shot Azimuth is the one that defines the direction to which the ball will move on the horizontal level. In addition, they understood that the combination of the Shot Altitude and the Power is the one that defines the range the ball can reach. Lastly, the cards students chose to construct their plan as well as the order with which they placed them, leads to the assumption that they have approached the scientific method (observe, hypothetize, experiment, e.t.c.).

At first subgroup B ignores subgroup’s A comments. Later however, subgroup B responds and the two subgroups manage to cooperate. On the other hand, we notice that whereas subgroup A started the discussion and the cooperation, we realize that they expect subgroup B to announce specific results (with numbers), while subgroup A just announces the fact that they have resolved the challenge.

6 CONCLUSIONS / DISCUSSION

The physical concepts and quantities the students had to work with and understand deeper while addressing the challenges, are those which have to do with projectile motion in a Newtonian space. The fact that the microworld was a 3D environment gave them the chance to generate meanings about not only simple Physical concepts and quantities e. g speed, power but also complex ones e. g Azimuth. The activities succeeded in engaging the students in the (de)construction of the microworld while at the same time offered them an open-ended challenge. They approached the challenge in a creative and alternative way. One of the subgroups e.g. managed to address the challenge and make the red ball hit the blue ball's base following linear motion on the horizontal level. Yet, they decided to reject it as not spectacular enough and looked for a way to make it "fly" towards the target (projectile motion) which they eventually accomplished

There was a point at which the two subgroups erased each other's cards on their Planning tool map and destroyed the whole map. This though, led them to reconciliation and collaboration since they had to rebuild their plan together from scratch.

In any case, they needed to understand what their classmates said to the group and to express their own opinion

They had the chance, and took full advantage of it, to "play" with the physical quantities of the microworld and see how they affected the objects' motion thus starting to form mental representations about them. They had no previous idea of what e.g. "Shot Azimuth" might mean but they figured it out quite easily while they seemed engrossed and enthusiastic in the process (Figure 2). The students gained deeper understanding of scientific concepts and the relations between them by experimenting with motion in Newtonian space.

Consequently, they had the chance to Learn to Learn Together (L2L2): how to collaborate, how to plan their moves, how to argue, scientific concepts and physical quantities, scientific methods and approaches.

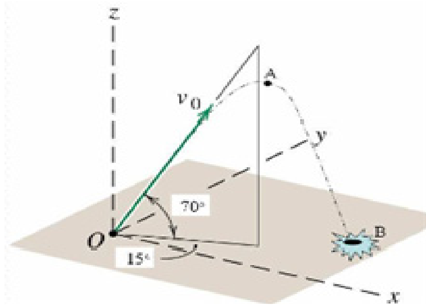

Figure 2: The role of the "Shot Altitude" and "Shot Azimuth" angles (70 and 15 degrees respectively in the drawing below) for the direction of the ball.

The following findings pose questions and considerations as regards possible changes and improvements to be employed in the future main study:

The students seemed reluctant and unwilling to post their findings and share with the other subgroup. In most cases they did so after the researchers persistently asked them to. They seemed confused about how to construct a plan using the-admittedly too many- planning cards. They could not make a plan before experimenting and knowing how to address the challenges first. They resorted to the same cards again and again to add text which, at times, was irrelevant to the card's label. Therefore, we conclude that in the future main study, we will have to allocate more time for the familiarization session. In the familiarization session we will have to give students ready made sample models of both argumentative discussions and plans in Lasad and Planning Tool respectively so as to help them realize the use of each card in them. The issue of collaboration and feeling comfortable with sharing questions, findings etc. with others may also have to do with the lack of a school culture of collaboration. Admittedly, our schools encourage competitiveness more than collaboration. This fact makes it even more necessary and urgent to introduce such tools as the ones our study presents, in order to help emphasize the need for collaboration and togetherness in learning.

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USER'S ACCESS TO THE ROBOTIC E-LEARNING SYSTEM SyRoTek

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Abstract: SyRoTek is an e-learning platform for mobile robotics, artificial inteligence, control and other related domains that provides access to mobile robots moving in the restricted area. The user is able not to only observe a gathered data using internet interface, but also control the robots in real-time. Unlike majority of existing e-learning robotic systems developed in the world in which the user can only tele-operate robots, behaviour of the robots in the SyRoTek system can be modified, as the system allows to run own algorithms developed by the user. The paper presents two interfaces providing access to the user: web pages and extension of IDE NetBeans. Furthermore, two courses based on SyRoTek taught at two universities are described and discussed.

1 INTRODUCTION

With a huge expansion of artificial intelligence and mobile robotics technologies into many industrial applications as well as day-to-day activities it is necessary to train students to understand and manage these technologies. Already young children get familiarize with the world of science and technology in kindergartens (Pekárová, 2008) (Stöckelmayr et al., 2011), where children (besides other activities) play with robotic toys like Bee-bot or the animatronic pet dinosaur Pleo. Older children at basic and secondary schools are introduced to toy building bricks Lego Mindstorms or Fischertechnik, which allow to design and build own robot models and program and control these models making use graphical software (Altin et al., 2010). Children thus understand main principles of robotics and problems needed to be solved to build an autonomous mobile robot. On the other hand, poor sensor equipment and fragile construction disqualify these tools for real-world problems and long-term experiments. Universities teaching robotics therefore use more powerful platforms like Videre Erratic or Pioneer or build their own robots. The main drawback of this approach is a price and a necessity of a continuous maintenance. This is more important when more than one robot is used.

The other stream focuses on building robotic laboratories accessible via Internet. These laboratories allow to share a robotic hardware among a large group of users from different places. One of the first robots controlled at distance and available to public was Telegarden (Telegarden, 2008). It has been running since 1995 with 9000 users registered to the system in the first month of operation. Bradford Robotic Telescope (Telescope, 2008) is a part of an e-learning course of which goal is to popularize astronomy. In addition to open up a unique equipment to a broad public, the many research programs use telescope for research of galaxies, supernovas, and black holes. The system thus combines a basic research with education by sharing limited sources. The project RHINO (Rhino, 2008) combines tele-operation with visualization as it offers a robotic guide in a museum. The robot Xavier (Simmons et al., 2000) is an autonomous robot operating in indoor environments of university hallways. The robot autonomy allows the users to enter high-level tasks (e.g. go to a specified position), which are performed by the robot autonomously. Robotoy (Robotoy, 2008) - a robotic arm with a gripper - allows the users to control it via a web interface. The user can choose between two cameras from which it can see robot's working environment. The robot is controlled in the command regime, i.e. the user enters a command which is immediately fulfilled. One of the most complex robotic e-learning laboratories was developed at Swiss Federal Institute of Technology in Lausanne (EPFL). The RobOnWeb project (Siegwart