

Teaching Informatics in High School With "Role-Play":

A Teaching Scenario

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Abstract: The article examines an educational scenario for teaching Informatics in high school, using the technique of "role-playing game". First, it analyses the pedagogical approach and the theoretical framework in which it is embedded, with a focus on STEM subjects. Then, a complete development of the teaching scenario is made, following the model of the new curricula of the Institute of Educational Policy (I.E.P.), and worksheets and evaluation sheets are proposed. After its implementation in a real classroom, at the Experimental Secondary School of the University of Macedonia, conclusions are drawn and briefly discussed.

Key words: role-playing game, informatics in high school, teaching scenarios

1. Introduction

A role-play (or role-playing game) is a type of game in which players assume the role of fictional characters and through collaboration create or watch stories (Role-play game, 2023). Role-play, a derivative of social drama, is a method for exploring the issues involved in complex social situations. It can be used to train professionals or in a classroom to understand literature, history, and even science (Blatner, 2009). Through role-play, teachers can help students develop social skills and empathy (Anderson, 2004). Through role-play, children can develop their emotions and distinguish between good and evil, the relationship between the weak and the strong. This helps them to develop and improve their relationships with those around them (Bolton, 2002). It is a teaching technique that brings together the factors for effective contemporary learning and is particularly useful for teaching scientific concepts (Evangelou & Kotini, 2012). Several studies and personal opinions of important artists, from Hemingway to Marisa Meyer (former CEO of Yahoo), the creators of MediaLab from MIT, or Frank Gehry (the architect of Guggenheim Museum), support the counterintuitive idea that limits trigger creativity; Yi-Ming, Lin & Sun (2008) tackle the study of this counterintuitive idea, developing address studying that enabling students to think outside of concept boundaries in hope of enhancing creative potential with an integrated concept mapping system (ICMSys) the role of computer support for building conceptual self-awareness — that is, enabling students to think outside of concept boundaries in hope of enhancing creative potential. Based on meta-cognition theory, we developed an integrated concept mapping system (ICMSys) (Yi-Ming Kao et al., 2008).

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2. Modern Learning Design Methodologies

2.1 Theoretical Background

Modern methodologies for designing learning environments look forward to student-centered, collaborative, and creative contexts through authentic activities (Styliaras & Dimou, 2015). These theories have contributed to the design and development of educational computing environments that support active, collaborative, and meaningful learning (Styliaras & Dimou, 2015).

The fundamental theory behind role-play in education is often associated with constructivism. Role-play aligns well with the principles of constructivism as it provides opportunities for learners to actively participate in simulated real-world scenarios, engage in problem solving, and construct meaning through their experiences (Jonassen & Land, 2000).

In addition, role-play can draw on social learning theory, which emphasizes the importance of observing and imitating the behavior of others, as well as the impact of social interactions on learning. Through role-play, students can observe and imitate different roles or perspectives, interact with their peers, and learn from their experiences and feedback (Bandura, 1977).

Relevant is also the theory of experiential learning, developed by David Kolb (1984). It refers to the way in which people acquire knowledge and adapt to their environment. According to this theory, role-play provides a practical, experiential learning experience where students engage in specific experiences, reflect on them, conceptualize new knowledge, and apply it through active experimentation within the role-play scenario (Kolb, 1984).

Finally, role-play is close to the active learning strategy. It provides an engaging and interactive experience for students, allowing them to actively engage with the content, apply knowledge and skills, and develop critical thinking and problem-solving skills. By taking on different roles, students are encouraged to think from multiple perspectives, make decisions, and interact with their peers in a dynamic learning environment (Freeman et al., 2014; Prince, 2004). It is a safe space to make mistakes, learn from them, and receive constructive feedback from peers and instructors.

2.2 Success Implementation Factors

It is important to stress that while these theories provide a basis for understanding the mechanisms of role-play in education, the actual implementation and effectiveness of role-play may vary depending on the specific context, learning objectives and educational design. The effectiveness of role-play depends on proper implementation and requires careful planning, training of instructors and provision of supportive classroom environments (Freeman et al., 2014). Other factors include the nature of the learning task, student characteristics, instructor support and facilitation, and the learning environment. The proper design and implementation of active learning and role-play activities is vital to maximize their benefits (Wieman, 2014) in all environments and particularly in science (Hughes, & Barlex, 2019), where Informatics belongs.

Current evidence suggests that STEM educators will begin to question the continuation of solely traditional teaching practices, in light of recent work showing that active learning offers disproportionate benefits for STEM students even for those from socially disadvantaged backgrounds and for women in male-dominated fields (Freeman et al., 2014).

There is, of course, a counter argument that criticizes the limited understanding of learning that refers to the

transfer and assimilation of knowledge and skills and that learning styles and their effectiveness have not been robustly demonstrated to be commonly accepted (Coffield, 2008, 2012).

However, it is hard to disagree that traditional learning strategies and methods are no longer the most effective and have to be adapted to the new times, as well as their tools, which are the Teaching Scenarios.

3. The Teaching Scenario (T.S.)

The following is an analysis of the teaching scenario which was implemented for the subject of Informatics at the Experimental junior jr. High School of Macedonia University, Greece. The T.S. was implemented throughout the academic year 2022–2023, involved 52 students of the jr. High School (12–13 y.o.) and was taught in bunches of 13 students in 3 two-hour sessions.

3.1 Identify the T.S

Title: Copyright and Software Piracy with role-playing game

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Grade: 1st or 2nd junior jr. High School.

Cognitive domains: (5). Digital Technologies and Society, Theme: (1). Digital Citizenship.

Duration: three consecutive teaching sessions.

3.2 Purpose of T.S. — Expected Learning Outcomes

According to the new curriculum for Informatics in the Secondary School, the T.S. covers the subject area "5. Digital Technologies and Society" and the thematic unit "5.1 Digital Citizenship". Thus, after the end of the module, students are expected to identify, understand and explain the concept of copyright, license, the basic principles and rules for the protection of software copyright, digital content what software and content licenses mean, how to use and apply them; acknowledge the free software license and use it; be able to discuss the consequences of software piracy and copyright protection; if necessary, to change their attitude and behaviour in order not to infringe copyright. In addition, they should be able to always make references in their works of the sources but also protect the rights of their own works. Finally, to develop the skills of presenting all the above through role-play, with clarity, completeness, and eloquence.

3.3 Basic IT Practices — Horizontal Competences

Promoting an inclusive culture in IT, Collaboration around IT, Communication about IT.

3.4 T.S. Outline — Scientific/Cognitive Content

The main concept is for pupils to understand the power of digital content and the impact it has on their personal and wider social lives in all its dimensions. Pupils have many misconceptions about what intangible and digital products mean, their ownership, their licensing. They often assume that as long as it exists on the Internet, a digital product can be used without further thought or consequence. Moreover, on these issues there are some conceptual difficulties for students as well as entrenched attitudes, such as about using digital content without permission or mention of its creator.

Regarding the IT course, they erroneously believe that the course is only related to the basic tools of IT and not to the broader issues related to "Digital Technologies and Society" such as scientific, economic, social, ethical, professional dimensions. All the above were taken into account in the planning and implementation of the T.S.

3.5 Prerequisite Knowledge and Desirable Skills

It is good for students to know in advance what "intangible products" are; what's the meaning of "Software"; to have Internet search skills and how role-play works.

3.6 Organization of Teaching and Required Infrastructure

A Computer lab with the appropriate number of computers available and available space/room for role-play; video-projector; good/fast Internet access; collaborative online tools for group text editing; a printer; Groups can be organized in 3–4 pupils.

3.7 Didactic Approach

The basic pedagogical principles were developed in an earlier section of this study. The didactic approach is to develop critical thinking, to change/improve attitudes and behaviors towards the issues identified by the T.S. The basic methodology is active and experiential learning, and the technique is role-play.

At the same time, as students take the worksheet and prepare at home, the "flipped classroom" is implemented. Students use collaborative ICT tools to communicate and produce a script of the roles they will play.

Knowledge and attitudes are tracked through the initial class discussion and how students eventually develop the dialogues in their own way. These show their deeper knowledge and attitudes to the issues. A rubric assessment is suggested to track students' performance. It is carried out by the teacher and the other members of the groups with peer evaluation. Each group receives grades during the presentation of the role-play by all. The final grade is obtained by averaging the teacher's and the other groups' marks.

Finally, there is a reflection on the experience through discussion and comments at an appropriate time (usually in the last session) in class and/or through a questionnaire.

3.8 Detailed Description of the Learning Pathway

A description of the activities, stages/phases, teacher and student actions follows:

Stage 1: Attract the students' attention and interest with a video presentation and a short workshop discussion on the topics.

Stage 2: Exploring the worksheet and activities: understanding terms, analyzing needs, planning implementation such as team building, etc.

Stage 3: Application, starting in the workshop with groups of students, sharing documents between them via a collaborative platform, searching for resources on the Internet (e.g., texts, multimedia) and continuing as homework for the groups.

Stage 4: Presentation of work, reflection, and class discussion

Stage 5: Evaluation of activities and achievements: Rubric evaluation, self-evaluation, peer-evaluation.

Stage 6: Metacognitive activities: Synthesis of knowledge, reflection, synthesis of findings.

In the first session, the first three (3) phases of the T.S. are implemented. Students are given the worksheet with all the details and activities needed for their work. Questions about the implementation are answered. Then three short educational videos are shown to stimulate discussion. The first one is about the copyright of intangible products, the second one is about software piracy and the third one is an example of a role-play scenario as a model for creating their own scenario. The students are organized into groups of their choice (in practice, for each group of thirteen people, there were four (4) working groups of three members and one working group of four

members). They have one week to write a short script with a ten-minute role-play. They create a shared document on a collaborative platform (e.g., MS Teams, Google Drive, Sch.gr shared documents).

The worksheets include steps to follow, detailed examples of roles, role descriptions and conflicts of interest between roles, and more. They are asked to negotiate as much as possible on the issues of software licensing, copyright, and software piracy and less on some other intangible products (e.g., music, video). They are also asked to develop at least three (3) aspects of the issues to be discussed, whichever they prefer.

In the second session, phase 4 above can be carried out. The students have already presented their first script to the teacher and each group discusses it with the teacher for questions, comments, and improvements. Concepts are clarified, roles are clarified, and practical problems of cooperation and role-sharing are solved, as well as details of the role-play presentation, such as the use of printed labels to explain their role, clothes or accessories, multimedia, e.g., sounds, pictures, videos to support the performance. A test performance can be done for observations and improvements.

The third session involves phases 5 and 6 and is the final re-enactment of the ten-minute role-play for each team. The rubric based assessment given to each group is immediately applied and after filling in the scores, they immediately submit it to the teacher to arrive at the final score. Comments to the teams to improve their script or presentation can be made by anyone. Grades for each team can be announced.

It is possible that self-assessment and peer-assessment between members of each group is used to ensure fairness between group members based on the work done by each. This is done by means of a special evaluation form which the teacher must ensure has been given to the members of each group in paper or electronic form. The students must hand it to the teacher in confidence before the presentation of the role-play and the teacher takes it into account when giving the final grade to each student. Finally, reflection takes place through discussion and/or a questionnaire.

3.9 Potential Extensions & Adaptations

The T.S. can be implemented in two hours sessions, depending on the readiness of the students. The single worksheet can be also done in two or even three individual worksheets. In addition, instead of presenting the role-play live, teams can present it with a video. The above has been implemented through a collaborative MS Teams platform where students and teachers have personal accounts under a school license.

Any available online platform can be used. Finally, in the case of distance learning, each team uses a camera and microphone on an available online conferencing platform.

Difficulties encountered: The difficulty of communicating in a group — and even outside school — is always there, but the overriding issue was finding inspiration for effective, enjoyable, even entertaining dialogues. This is where the creativity of each pupil played a role, and some groups were not inspired enough and will need more support from the teacher. Also, some students, because of their character, probably do not want to be exposed to appearing in a role and prefer to participate in anything but playing a role.

3.10 Annex

Find Worksheet, The Evaluation Rubric at the end of this paper, and the self-evaluation/peer-evaluation form at the Annex below.

Click on the links below to view the corresponding videos:

- Copyright: https://youtu.be/4RYdsJ5NB-g
- Software Piracy: https://youtu.be/NVp3VklYHxo

• Role-play Game Example: https://youtu.be/QeHsMIZgeEE

4. Summarizing

Role-play is an applicable teaching technique for science modules, such as Informatics. In this scenario, role-play is proposed as an approach to teach digital citizenship issues in jr. High School. The approach is mainly based on active learning and even in a collaborative group context. It asks students to develop knowledge and skills in a critical way to acquire attitudes and perceptions on the topic through deeper intellectual, creative, and participatory processes.

The results show that most teaching objectives were achieved. Via a questionnaire more than 60% of students said that they have changed their opinion on copyright and royalty issues and will stop downloading software illegally. More than 68% said that through this experience they realized the concepts deeper than through a typical teaching method. There was universal and active participation by the students, more than 85% of whom said that they were "very satisfied" or "highly satisfied". Most said that it was difficult at first, but eventually enjoyed it and gained knowledge and new perceptions. They would like to see the technique repeated in other modules.

In addition, the implementation of this scenario confirmed the need for effective initial planning, clear learning objectives and a stimulating, supportive and flexible learning environment.

More extensive practical application and in-depth research may produce more practical results.

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Annex

Worksheet: Intellectual Property & Software Piracy @2024 n.yagoulis@gmail.com

Title: script for a role-playing game on the issues of "Copyright, Intellectual Property and Software Piracy"

Type of work: Teamwork Place: IT laboratory

Duration: 4 to 6 Hours

Purpose: to consolidate the issues of copyright and intellectual property and pirated software.

Final Deliverable: A Script with dialogues on the issues of "Copyright, Intellectual Property and Software Piracy"

Presentation time: 10 minutes for each group.

Evaluation: It **will be based on the Assessment Rubric Role-play, peer-assessment among groups and by the teacher.** (find the Rubric below)

Description: To solidify the issues, the assignment asks you to work in groups to create a scenario of dialogue between teenagers that illustrates the above issues in a vivid way. Using the example below, make a similar SCENARIO with dialogues and then present it to the class. You should address at least three (3) issues related to the topic "Copyright, Intellectual Property and Software Piracy".

Initially, watch the videos created for this purpose.

- Intellectual Property and Software -Copyright (https://youtu.be/4RYdsJ5NB-g)
- SOFTWARE PIRACY -Software Piracy (https://youtu.be/NVp3VklYHxo)
- Scenario Example (https://youtu.be/QeHsMIZgeEE)

(Note: for English use automatic translation)

INSTRUCTIONS

- Each student will have his/her role as described in the Worksheet. If necessary, they can have two roles. It is advisable that you create role cards to hold when presenting each role so that the audience knows who speaks each time.
- You can learn the dialogues by heart but if you want you can keep the script with the dialogues to make it easier.
- You will present within 10 minutes at most.
- You should consider the Evaluation Rubric to create a good script.
- PROPS: Use any aids you want to use such as pictures/photos for the projector, sounds, music, costumes, role cards and others that will
 make your presentation even more convincing. Set up an appropriate setting for your Script presentation. You can find Pictures or
 Videos to show in the background. You can use behind you via a projector/TV set.

Additional help:

- Identify the main conflict: The conflict between the characters should focus on copyright, intellectual property, and software piracy. For example, the customer may want to use the software without paying for it, while the software developer may be interested in protecting its intellectual property.
- Important Information about the characters:
- Provide information about each character, including their motivations, goals, and personalities. This will help participants build character and make the scenario more realistic.
- Potential Roles: Software Developer, Company/Salesperson, Customer and/or student/teenager, Lawyer, Police Officer, Judge. For example, the scenario could be a meeting between a software developer and a customer who wants to use the software illegally. So, some characters include a software developer, a client or teenage student, a lawyer, a police officer, or judge, etc. Include characters who have different views on software piracy. For example, a teenage student who uses pirated software because they cannot afford the legal version or a business owner who relies on pirated software to run their business. Originality and authenticity in the roles and in the Script in general are rewarded.

Indicative Roles

Software developer:

- Protecting their intellectual property is important because it is their livelihood.
- Pirated software hurts the software industry by reducing revenues and investment in research and development.
- Using pirated software is unethical, as it takes something without paying for it.

Customer and/or student/teenager

- They cannot afford to pay for legitimate software.
- Software piracy is a victimless crime and harms no one.
- Everybody does it and it's not that big of a deal.

Below is an example of a teenage character who wants software, including games, and wants to avoid paying royalties: ROLE Teenager:

- They want the latest games and software but can't afford them.
- They believe that software companies overcharge for their products.
- They consider that downloading pirated software is simply a way to avoid paying high prices.
- They may not be aware of the legal consequences of software piracy or understand the impact on the software industry.
- This character may offer a different perspective on the issue of software piracy and may encourage other participants to examine the motivations behind this behaviour. The goal is to educate the adolescent about the importance of respecting intellectual property and the consequences of software piracy and to encourage them to make informed decisions about how to use software in the future.
 - ROLE: Lawyer:
- The legal consequences of software piracy can be severe, including fines, lawsuits, and even criminal prosecution.
- The customer may face legal problems if they use pirated software, which could damage their business.
- It is important to understand the legal implications of software piracy before deciding.

Law enforcement officer, e.g., police officer, judge:

- Their role is to enforce intellectual property laws and protect software developers and the software industry.
- Software piracy is a serious crime that they are committed to fighting.
- The consequences of software piracy can include not only legal problems but also damage to the software industry and the economy.

These are only a few examples, and you can certainly find additional arguments as you see fit during the role-play scenario. The goal is to have an informed and thoughtful discussion on the topic of intellectual property and software piracy.

Extension: You may want to use chat GPT to start with and then you can enhance the outcome to meet your goals.

Strategy for better prompting in ChatGPT: Property: Treat ChatGPT as someone who can be anyone so you will ask them to have a specific Property - explain who you want them to be i.e. what role you want ChatGPT to play, e.g. "you're an expert teacher of", or "you're a playwriter and you want to", or "you're a role-playing expert and you want to...." Goal, Explain what your goal is , what you want it to do for you, e.g., "you want to create a script for a theatre play on the topicthat ...", Audience: explain what audience your objective is aimed at, e.g., "for a group of high school students so that ...", describe outcomes and objectives in detail ("so that they create a role-play script on the topic and present it for examinationThey should have at least the following roles.....". Provide any other information that is relevant and related to your objective (especially from step 4), e.g., "The rules of the script are that...." and/or "the time constraint is....", and/or "there will be a rubric evaluation that looks at the following....." Add any other information you think and experiment until you get a good result. Then take this text, correct the various errors it may have and format the text in your own words. Carefully form complete sentences that make sense as if you were describing it to a human being.