THE EDUCATIONAL GAME CHOICO AS DIGITAL LEARNING ENVIRONMENT FOR SUPPORTING STRATEGIES FOR CAREERS DECISION MAKING PROCESS

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The transition from education to the labor market, through the choices of tertiary education institutions, is an important stage in the life of young people. Problem-solving skills, rooted in mathematics education are a basic component of young' career readiness. In the digital age of the 21st century how could educators support students in developing employability skills? Can digital tools support the design of strategies for a smooth and safe transition from education to the labor market? This paper presents a case study of the implementation of the Educational Game Choico (Choices with Consequences), as a digital tool for integrating computational thinking in the educational process. By simulating roles as co-designers in learning technologies, students actively participate in building the knowledge of strategies that will support them in the career decision-making process.

Keywords: computational thinking, careers decision-making process, problem solving-skills, digital tool, Choico Game.

INTRODUCTION

The rapidly evolving modern society makes the role of school vital in preparing young people for the transition to the labor market and above all to equip them with the knowledge, attitudes and problem solving skills to play an active role as future citizens in actions and decisions that will have a positive impact in their personal and social life (Argyri & Smyrnaiou, 2021). The development of mathematical thinking is a necessary condition for development problem-solving skills, that also deals with such other skills as adaptability, decision-making, flexibility, creativity and even innovation (Geisinger, 2016). Analysis and problem solving are included in the list of the transversal skills related to career paths and be considered for young people as requirement for coping with the challenges of the modern labour market and the need to reach a successful school-to-work-transition (Caena & Punie, 2019). Computational thinking involves the application of mathematical skills to solve problems and has been seeking its place in the educational field in the new society dominated by new technologies (Wu & Yang, 2022). Computational thinking is regongised as part of mathematical problem-solving process and its application doesn't limited only to mathematical problems and it could be extended to educational processes and relationships in the arts and sciences (Shute,et. al, 2017). Moreover, digital tools could provide powerful new techniques for deepening the learning and experience of mathematics as basis to model complex phenomena (Rycroft-Smith & Connolly, 2019). Mathematics achievement, are related with selfefiency and career adaptability (Shapka, et.al, 2009; Mau, 2003) in order students judge their own capacities to execute a specific performance, to be able to cope with the unpredictable adjustments caused by the changes to the workplaces conditions, to take advantage of opportunities and deal with barriers and setbacks (Koen, et.al, 2012; Bandura, et.al, 2001). This means that one hand educators has to transform teaching and learning practices in mathematics under the terms of

shool-to-work transition and on the other hand one of challenges of the Digital Transformation Era is the use of digital tools for development of students' problem solving skills. This paper provide a case study of combination the development students' careers readiness with computational thinking skills as part of the mathematical problem-solving process.

COMPUTATIONAL THINKING IN THE EDUCATIONAL PROCESS OF MAKING CAREERS DECISION.

Computational thinking can be integrated into the educational process within frameworks that recognize learning (1) as the acquisition of knowledge and skills, emphasizing preparation for future careers, (2) as identity formation through creative expression and social engagement in digital media information and (3) as developing an understanding of how social-cultural reality is shaped, emphasizing strategies for solving problems (Kafai, et. al, 2019 cited in Kafai & Proctor, 2022). Computational thinking is re-conceptualized as a 'thinking model', in a way that makes it possible to integrate it in all subjects of the curriculum and it could be considered a way of thinking to solve real problems (Li, et.al, 2020). Such an approach advocates for the removal of computer literacy from the narrow limits of the possibilities of using computers and can be considered a powerful tool for students to realize, discuss and deal with complex socio-scientific issues and problems (Kafai & Fields, 2013). By using digital tools, students can become capable of discovering and expressing scientific ideas through the construction, modification and sharing of structures, such as models, programs and simulations (Smyrnaiou, et.al, 2011; Smyrnaiou & Moustaki, 2012). "Computational participation" is included to describe the different dimensions of integration of computational thinking in the educational process, where planning and application systems are not only the function of the algorithmic way of thinking but of the practices, which are necessary to join, within wider social networks and understand the cultural and social nature of a networked society (Kafai & Burke, 2014). Under this framework, how could educators integrade computational thinking and participation in process of preparation to transition to the working life that presupposes students need not only to learn about the requirements for their future careers but also to support them to create their personal meaning and knowledge of how to learn for those?

EDUCATIONAL GAMES AS DIGITAL TOOLS FOR INTEGRATING COMPUTATIONAL THINKING

Children's ability to learn based on their own thoughts, to modify digital games when game functions are not as expected, and to engage in error-finding strategies for improvement helps them understand the ever-changing nature of digital media, and in the development of problem-solving skills (Gee, 2003; Grimes & Fields, 2015) For this reason, the focus of interest in game creation is system thinking as a framework for approaching science learning and computational thinking as a design system. "Designer mindset" refers to the development of educational game design skills, the synthetic and analytical nature of design or system thinking, and less to the use of programming language (Games, 2010). To integrate digital tools as systems thinking tools, it is necessary for teachers to be able to harness the power of using digital technology and put it at the service of the educational process. Teaching is recognized as an art because it requires creativity and imagination. Teaching is not a theoretical science that describes and explains some aspect of the physical or social world. It is closer to the kind of science, such as engineering, computer science or architecture aimed at improving social reality: a design science (Laurillard, 2013). The use of digital tools is placed at the service of the educational process for students to interact with multiple representations to construct digital structures (Kynigos, 2004; Kynigos 2015) under the terms of 'microwords'.

MICROWORDS AS COMPUTATIONAL EDUCATIONAL GAME ENVIRONMENTS

Papert (1980), used the term 'Microword' in order to describe a computational learning environment rich in meaning-making opportunities involving dynamic representations (Healy & Kynigos, 2010). The concept of the "half-baked microword", has been proposed by Kynigo (2007a, 2007b), serves to engage students by assimilating ideas and representations, but where they are asked to modify, expand, but also improve with the aim of creating a new version of the original microword, which will reflect their own ideas (Kynigos & Yiannoutsou, 2018). Microwords can function as digital learning environments of educational games (Grizioti & Kynigos, 2018), in order to allow students: i) The dynamic manipulation of objects, to discover their properties and the relationships that govern their behavior, ii) To make assumptions and use feedback from the digital environment to check them, in turn to correct his own ideas about the field formed by processing and debugging the microword.

THE CASE STUDY OF THE EDUCATIONAL GAME: CHOICO

The Educational Game Choico (Choices with Consequences, http://etl.ppp.uoa.gr/choico/) integrates the processes of computational thinking into 'half-baked microword' computational learning environments to engage students in decision-making for socio-scientific problems. The Choico digital learning environment enables the reproduction, modification and creation of "choice-driven simulation games" through three interconnected computational capabilities: a) design of the game scene based on the selected social-scientific issue b) visual representation and processing of the data and available game options. c) programming the rules and actions of the game using a specialized programming language. Choices, consequences, rules and relationships can easily be modified by the user, who could create different versions of the represented game system (Grizioti, et.al, 2017; Grizioti, & Kynigos, 2018; Kynigos, & Grizioti, 2020; Grizioti, & Kynigos, 2021).

RESEARCH FRAMEWORK

In the framework of the doctoral study 'Connecting Secondary Education with Workplaces' at the Department Educational Studies of National Kapodistrian University of Athens, have been researched worked based learning strategies and methodologies that could enhance the career readiness of young people in the terms of development skills, knowledge and attitudes in order to support them in transition from education to the labor market. In this study, the educational game selections are based on the career's readiness indicators (Covacevich, et al., 2021; OECD. 2021) (educational visits to workplaces, assessments of personal skills/interests, entrepreneurship competitions, volunteering, writing research scientific essays. job fairs, internship at workplaces, career counselor, job shadowing ,careers talks with guest speakers) and the consequences of the choices have a positive or negative impact on the academic knowledge, self-esteem, communication skills and stress. Career readiness depends on academic knowledge and skills, but also refers to the ability to transfer them in specific situations. Future careers also, require the development of critical thinking, the ability to solve problems, the ability to adapt to changes, but also social and communication skills, that are called 'transversal skills' (Argyri, 2019; Smyrnaiou, et. et al., 2017). Among the personal learning skills that will support young people to manage the challenges and changes in their personal lives in the changing modern world, self-confidence has been selected as a value of optimism, hope, resilience, self-efficacy and a sense of purpose. Stress, could be considered as a value of well-being that is a search for life satisfaction, care for physical, mental and social health and adoption of a sustainable lifestyle (Sala,et.al, 2020).

Methodology

The pilot study lasted 6 hours with 14 students of the STEM club of Evangeliki Model High School of Smyrna in Athens. Participants were familiar with the activities that provided of indicators of career readiness, as they are also the sample of doctoral study. Through Lee et.al's 3-stage model, "Use-Modify-Create " (UMC) (cited in Grizioti & Kynigos, 2021; Lytle et.al,2019) students used the first version of the educational game, which contained errors. With the support of inquiry questions they exchanged views and discussed modifying it and finally attempted to create their own versions.

Data collection

The educator- researcher has the role of supporter and facilitator and she observed the implementation while keeping notes and recording students' discussions.

Data analysis

The assessment of pilot activities based on the analysis of the following statements: i) If students agree with the career guidance stations (the selection points in the main scene) and if they suggest modifications, ii) if they suggest modifications to the values by selected points, iii) if they modify the termination rules, iv) what are the positive or negative features that they recognize with participation to implementation of Choico Educational Game.

Results

At the first stage of the model while they used it, most of them try to exchange ideas for the strategy of winning and terminations rules. In this stage they mentioned that there were 3 points that if select them, then they directly lost , so they understood that the object of the game for the player is to stay in the game for as long as possible and the player who manages to select points to stay the longest is considered the best. While students interact with the game they tried to discover the structure and discover patterns in the effect of their choices, they expressed different views of the positive or negative impact of selected points. In their discussions:

Student: Why does selecting a career counselor have a negative impact on stress?

Student: Why do I select career talks with guest speakers that haven't had a positive impact on my communication skills?

Student: The impact of volunteering in communation skills is very low.

In the second stage of modification the model most of them agree with the selected points and fields that selected points had consequences.

Student: There are not only entrepreneurship competitions but in general we could add all kinds of competitions where students could be participants.

Student: Yes, I think that as we have mentioned in our educational visits to workplaces the requirement for employment is a combination of academic skills, but also we need management skills and critical thinking. So, instead of communication skills there are more skills that we could add.

Student: Unfortunately, stress is presented in all stages of our careers making decision.

From the above discussions, we could highlight that they consider that game includes all the neseccary stations (points) has to follow in the process of making decision careers. Only one student express the opinion that expept of entrepreneurship competitions there are more kinds of

competition that have impact in values of the game. Moreover they put in priority the stress that all students feel in the transition of education to labor market and it confirms that careers guidance is a complex problem and needed to develop problem solving skills.

In the the third stage of creating a new one version they were very enthousiast, as they could easily use the specialized programming language. Most of them try to change the number of values According to their personal intetests they put diffenent impacts of the selected points. Addiotionally they tried to change the end rules, but as they tried to test their new versions playing in teams, they ascertained that they have to be carefull in order to select strategies based on new numbers that they have selected. They created a matrix, they put the values and sum each colomn to find the max and the min of each them. Then based on the sums, they tried to put new end rules, but they weren't sure of these selection, so they decided to test the new ones with their classmates. Unfortanenly the time in school classroom is limited for this pilot activity, but we hope it will be held in the future.

Students didn't recognise any negative aspect of their participation in the Choico Game, but they expressed positive comments and they consider that is was very supportive in order to mention that the transition to employability needs many different stations for making careers decisions.

Student: I learned about the ways to careers as well as about the possible advantages and disadvantages of these methods.

Student: It supports me to investigate the pathway of careers making decisions.

The addiotional value of this case study was the combination of digital tools in the procedure of development students' problem skills as they try to discover diferents strategies for career guidance.

Student: I have never participated in activities such as this…it was amazing using digital tools for investigating the guidance of my future career.

CONCLUSIONS

The role of the school is to support young to access activities for development career readiness skills and it presupposes that students need not only to learn about the requirements for their future careers but also to support them to learn use them through direct experiences in the workplaces. Computational thinking could be part of educational process for the development of problem solving skills as part of mathematical thinking for the successful transition from school to work. This paper addresses the affordances of the Educational Game 'Choico', as a digital tool that integrates the computational learning environments into the educational process for making decision for making decision careers. The Educational Game Choico could be an effective digital tool to support the role of school based on integration computational thinking and constructivism learning theory, not only on an academic level, but also in a personal, social and cultural context. Students' ability to learn based on their own thoughts, to modify digital games when game functions are not as expected, and to engage in error-finding strategies for improvement helps them understand the ways of their careers guidance.

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