

ENCOURAGING STUDENTS' CREATIVITY THROUGH INTERDISCIPLINARY-ORIENTED LEARNING PROCESS

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Abstract: *This publication represents a study of the interdisciplinary-oriented learning process as an innovative method for encouraging students' creativity and innovation. The integration is achieved by means of building interdisciplinary links between the discipline Multimedia systems and technologies and Web design. The interdisciplinary approach has a positive effect on improving motivation to learn as well as on students' engaging, studiousness and curiosity towards the learning content. This approach contributes to the establishment of essential knowledge and skills that favors the learner's personal and professional realization in the new information society.*

Keywords: *interdisciplinary-oriented learning, creativity, teaching, learning.*

INTRODUCTION

The interdisciplinary approach to promote and encourage creativity and innovation is a relatively new method with a lot of potential for advancing teaching practices in web design. Constantly emerging new technologies challenge the field of education. Proper use of contemporary educational technologies can enhance learning and teaching. However, to be helpful, these technologies need to be incorporated in advanced pedagogical methods, which on the other hand stimulate collaboration, communication and mobility.

What is the innovation of interdisciplinary approach? Above all, this is the experience of the teachers of various subjects to work together with a focus on the educational needs of the learners. Secondly, this is the mastery of the teacher to highlight the interdisciplinary links from the point of view of common topics, concepts, problems. And thirdly – IA is innovative in its aims, that is to say:

- Creating conditions for an improved and faster acquisition of skills and knowledge;
- Developing and maintaining an adequate and sustainable competence in the domain of Multimedia systems and technologies;
- Developing and enriching the qualities of personalities with integral, comprehensive thinking and understanding.

1. CREATIVITY AND INNOVATION

The society change towards knowledge economy is a natural and logical process. It turns to happen faster in countries with a better overall understanding of the role of information and communication technologies (ICT) for social and economic development [6].

The definition and characterizations of creativity vary from one researcher to another. "Creativity is a state of mind in which all of our intelligences are working together. It involves seeing, thinking and innovating" [8]. This statement demonstrates that creativity is the combination of many intellects and is not its own independent intelligence. While the mental process of creativity is hard to identify, "we know creativity when we see it" [8].

Creativity is also presented as a system of four high levels organized and connected systems [7]:

- Creative personality – characteristics: general, creative, mathematical, research or other abilities; general and specific knowledge in the area of interest; skills, necessary for self-creative work; motivation, interest, etc.
- Creative product – characteristics: original, socially valuable. The student's creative product is a new result (both for the student and the target audience) which is valuable for the student himself at the moment of its creation, rather than for the future society.
- Creative process – characteristics: joint and self-activities of a creative person which concern the personal interests and depend on abilities, knowledge and skills; intuition; insight, etc. The students' creative process always involves thinking or behaving imaginatively. It is prepared for a target student audience.
- Creative environment – characteristics: beneficial conditions for stimulating the peoples' creativity.

Teaching creatively occurs when the process of learning becomes more exciting, engaging, and effective because teachers use unconventional imaginative approaches. Teaching for creativity happens when various pedagogical methods are targeted to promote students' own creative thinking [8].

Studies of the conditions that encourage students to be creative in their learning work identify three different ways. The following pedagogies encourage and support the creative development of learners [5]:

Pedagogies for creative development

- Encouraging learners to think about and understand their own creativity in the different contexts they inhabit.
- Engage learners with the unfamiliar, perplexing, complex and unpredictable, that encourage them to take risks
- Involve learners in challenges that demand new understandings, meanings and capabilities.

Drawing inspiration from the discipline

- Encouraging students to care deeply about the subject they are studying and to want to become an experts in their discipline. .
- Understanding and making explicit what creativity means in the discipline.

2. IMPLEMENTATION OF THE INTERDISCIPLINARY APPROACH

The main factors that affect the training process are a subject to a number of studies. One of the basic tasks of the teaching methodology in computer science and IT is related to the determination of the learning activities system. Decisive for the assimilation of the knowledge system of the computer area are:

- Knowledge system's structure represented by the volume of educational content;
- The combination of specific approaches to organizing the system of concepts, understanding the characteristics of objects and associated operations;
- Methodological system of introducing new knowledge;
- A system of practical tasks and formal algorithms for their solution;
- A system of interdisciplinary connections related to computers, information, communication and multimedia technologies;
- A system of relations of Informatics and IT to other areas of knowledge.

Multimedia systems and technologies training methodology is a system that includes in its structure a few basic elements – objectives, contents, methods, tools and organizational forms of education. Each one of the learning process's five components and their rational combination can modernize and improve the training's quality.

A. Preparation

In the application of the interdisciplinary approach, as well as in any other training approach, the greatest amount of time and effort are required by the teacher during the stage of planning. As the most important components of the preparatory stage we should point out:

- diagnosis of students' needs and problems in acquiring new knowledge and skills;
- analysis of the need for applying a new approach and the adaptability of students;
- attracting followers – collaboration with teachers from other disciplines;
- Preparation of integral materials in the form of tasks, helping for better assimilation of educational content.

B. Teaching

During the stage of teaching, along with obtaining feedback from students through reinforcing knowledge assignments, the implementation of the interdisciplinary approach stands out the most. This may be accomplished by the following ways:

- Implementation of information from other disciplines in the statement process (teaching of new learning material) in order to:
 1. support the process of acquiring new knowledge;
 2. increase the level of students' awareness of the interdisciplinary relationships;
 3. internalizing knowledge from different areas and its global adoption.
- The use of the interdisciplinary approach in order to enhance learning motivation by engaging the students' attention with topics and issues from their personal life;
- Integration of information from other fields of science, art, etc., according to the teacher's estimation and the emerging educational needs.

C. Evaluation

During the evaluation process the teacher can actually find out the results of applying the approach. At this stage, he should analyze the effect of the application of the IP on both individual learners and on the group as a whole. The teacher must be able to collate the results with those from previous tasks where other types of approaches have been applied. The evaluation provides a good feedback on the effectiveness of the IP in relevant educational cases occurred during the process of working with students, and is an occasion for further debate on the issues by teachers from different disciplines.

D. Fundamental principles in the implementation of the interdisciplinary approach

- Through interdisciplinary links – so-called 'investment' – taking a loan from another object

Integration is a complicated process that has a structure that consists of two or more disciplines, connected by common methodological binding units. It has a positive effect on students' psychics, indicating that acquiring knowledge is not an end in itself.

- Implementation of the interdisciplinary approach.
- Through transfer of information from other areas of everyday life that personally engages learners.
- Implementation of the interdisciplinary approach – in the learning process – tasks for acquiring new knowledge – instead of giving an abstractive work to the students, the teacher could replace it with a topical one regarding the knowledge needed in everyday life.
- By using a common theme, a concept, and a problem in the input of a new concept.
- Implementation of the interdisciplinary approach.

3. DESCRIPTION OF THE STUDY

Aim of the study

The aim of this study is to investigate the potentials for establishing an interdisciplinary – oriented learning process in the discipline Multimedia System and Technologies (MST). By this it is meant the establishment of interdisciplinary links with other disciplines, studied by the students, for the purpose of offering an efficient and methodologically substantiated solution for encouraging students' creativity and defining the optimal teaching style.

Training through multimedia environment in disciplines of the field of computer science of student future teachers of information technologies, is a reality. It applies more and more often because lecturers of the higher education are in continuous search for innovative and digital methods that would increase the efficiency of the learning process [3]. Interactive multimedia environment has been used for more than two decades in teaching information technologies. For that reason its essence and functions, as well as the semiotic resources it uses, have been argued in the present article. Its efficiency has been proven [4].

In order for the aim to be achieved, the following research tasks are performed:

- An analysis is carried out of the student groups.
- A research process is organised for the selection and in-building in the study units of theoretical material which links the teaching of MST with other disciplines, by means of real practical problems.
- An activity is carried out for identification of the starting level of the students by using the computer technologies studied (practical link).
- A model is designed for studying the potentials for linking the teaching of MST and a new improved teaching methodology is implemented.
- Students are taught using the new methodology, based on the developed model and the outcomes are studied.

The **object** of the study is the learning and practical activity of the students – the educational and qualification degree “master” in the major Information and Education Technologies.

The **subject** of the study is the effect of the use of computer applications and methodological guidance on the creation of conditions for integrated instruction in the discipline Multimedia systems and technologies. The methodological guidance is based on the proposed model for improvement of the quality of education, by means

of designing various modules of the learning content. The objectives are the mastering of the required system of concepts and skills with the potential for their use when teaching other subjects to the students, whereby computer technologies will facilitate their learning and investigative activity.

Hypothesis

In accordance with the aim, subject and object of the study, the following hypothesis has been formulated:

It is expected that the students, using computer applications and methodological guidance on creating conditions for an interdisciplinary learning process in the discipline *Multimedia systems and technologies*, will achieve a longer lasting knowledge of the learning content and will be able to apply it and use it successfully during the following semesters in the disciplines which require multimedia skills, in their extracurricular activities, related to the use of computers and in the work domain in which they need to realise themselves as professionals after finishing their higher education.

Significance of the study

The theoretical importance of the study lies in the methodology which was developed for the teaching of the subject *Multimedia systems and technologies*. This methodology combines modules for establishing interdisciplinary links with other academic subjects studied by the students.

The practical importance of the study may be classified as follows:

- Use of a new teaching methodology in the discipline, which is enriched with various practical tasks for every studied module, supporting the acquisition of new knowledge by the students, the revision of knowledge and independent studies.
- Use of various ways of establishing interdisciplinary links of the discipline *Multimedia systems and technologies* with other disciplines.
- Use of various individual projects, through which the students build skills for acquiring additional knowledge and competencies for work with research literature.

4. GENERAL CHARACTERISTICS OF THE USED STATISTICAL METHODS

In the statistical presentation of data there was made a comparative analysis between the groups at the entrance level for ascertaining the previous knowledge of the learners, and at the exit level for ascertaining the efficiency of the applied methodology in the three control groups.

In order for the achievements to be compared, dispersion analysis was used with three factors: METHODOLOGY – belonging to one of the three groups; FS – belonging to one of the two forms of study – full-time and distance; and GENDER – male and female. When the results of the dispersion analyses were graphically represented, the average values were noted, together with 95% of confidential intervals. Details of the significance of the differences between the individual average values may be obtained with the aid of the Post-Hoc analysis which was carried out for the purpose of completeness of data after each dispersion analysis. The null hypotheses in this analysis, in applied form state, that the respective factor has a null effect (null result), and all verifying statistics have an F-distribution. The presence of a statistically significant effect on the methodology at specific location of the average values is the main indicator for a positive result of the main model.

The decision on rejecting or accepting the null hypothesis, i.e. the decision of the presence of statistical significance of the observed effect (result), is taken on the basis of the value of evaluated level of significance p , which allows for main

interpretation as a probability for error (first order error) when rejecting the hypothesis of null effect. The small values of p give grounds for rejecting the null hypothesis and accepting the assumption that the observed effect is statistically significant. Normally, at $p < 0.05$ it is accepted that the observed effect is significant. When the value of p is closer to 0.05, the decision whether the effect is significant or not depends on the author; in that case the effect is classified as a marginally significant one [1].

The factor analysis serves to ascertain the actual dimensions of the latent space which determines the obtained results. Here, we have used a factor analysis based on the method of principal components, where the number of factors is determined by the number of the own significances which are larger than 1.

The classical analysis for reliability is carried out by means of calculating the Cronbach's alpha coefficient with a maximal value of 1, as well as of the discrimination indexes which are individual for each element (correlation with the total score), with a maximal value of 1 [2].

Main conclusion: The statistical analysis of the pedagogical study gives grounds to claim that the proposed variable teaching methodology which includes the establishing of conditions for an interdisciplinary-oriented learning process, contributes to the achievement of higher results and for encouraging the students' creativity in the discipline Multimedia systems and technologies as compared to the standard method of teaching. It was noted a considerable difference in the knowledge and skills attained in Group 2 and Group 3 as compared to Group 1 (the traditional methodology). The results also show an advantage in favor of group 3, as opposed to Group 2.

5. CONCLUSION

The integration of the discipline Multimedia systems and technologies with other disciplines is an important factor for the purpose of broadening students' knowledge in various specialized domains. The interdisciplinary approach may be applied to any discipline and courses. Its application depends on the teacher's discretion in the context of educational needs and learners' knowledge, skills and competencies.

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НАСЪРЧАВАНЕ КРЕАТИВНОСТТА НА ОБУЧАЕМИТЕ ЧРЕЗ ИНТЕРДИСЦИПЛИНАРНО ОРИЕНТИРАН ПРОЦЕС НА ОБУЧЕНИЕ

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Резюме: Публикацията представя изследване, свързано с интердисциплинарно ориентиран процес на обучение като иновативен метод за насърчаване креативността и иновативността на студентите. Интердисциплинарността се постига чрез осъществяване на междудисциплинарни връзки между дисциплините Мултимедийни системи и технологии и Уеб дизайн. Интердисциплинарният подход има позитивен ефект за повишаване мотивацията за учене на студентите, повишава тяхната любознателност и интерес към учебното съдържание.

Ключови думи: интердисциплинарно обучение, креативност, преподаване, учене.

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