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RELATIONSHIP BETWEEN EDUCATIONAL SUCCESS AND A TEACHING METHOD IN ICT SUBJECTS

Ida Panev¹, Vlatka Davidović² and Anamarija Ivanušić³

¹²³Polytechnic of Rijeka, Business Department,
Vukovarska 58, 51000 Rijeka, Croatia

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ABSTRACT

In recent times, the use of Information and Communication Technology (ICT) has become more and more incorporated in education. The integration of ICT in education has changed the teaching and learning process. This has led to a growing interest in exploring the effectiveness of different teaching methods in ICT subjects with the goal of enhancing the learning experience of students. The aim of this paper is to investigate the relationship between educational success and a teaching method in ICT subjects. In particular, the paper will examine the correlation of educational success with teaching method and student's predominant learning preferences.

KEYWORDS: learning preferences, educational success, ICT.

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1. Introduction

Information and Communication Technology (ICT) has become an inevitable part of everyday living. Its influence is felt in all areas of social life, including education. The use of ICT in education has brought out a significant shift in the teaching and learning process. This shift has also led to a growing interest in exploring the effectiveness of different teaching methods in ICT subjects with the aim of improving students' educational success. The teaching method used in ICT education can have a huge impact on the success of students. The purpose of this paper is to analyze the relationship between educational success and a teaching method in ICT subjects regarding to students' sensory modalities. In particular, the paper is focused on positive impact of interactive teaching methods on educational success in ICT subjects.

Sensory modalities, or learning preferences, are the means by which a student adopts information from the environment [16]. Identification of a student's learning preference makes the learning process more successful [1]. As it is stated in [10], the interaction with students, their reactions to the course activities and exams, and the learning outcome of the course show the necessity of accepting students' different learning preferences. There is a strong connection between a way of teaching and students' learning process and outcome.

There are a lot of different models that analyze learning preferences. This paper analyzes students' learning preferences according to VARK model [9] with the goal of pointing to a relationship between educational success and teaching method. If teacher could offer educational alternatives and individualize the learning experience, the learning outcome of the course would improve [10]. Students who participated in this research are second-year students of Undergraduate Professional Study of Information Science at the Polytechnic of Rijeka, Croatia. The course on which the research was conducted is called Data and process modeling.

2. Models of learning preferences– literature review

One model for determining students' learning preferences is called VARK model created by Neil Fleming at the end of 20th century. VARK covers four learning preferences used by individuals when acquiring information. V represents Visual, A represents Aural, R represents Read / Write and K represents Kinesthetic (Tactile) sensory modality [9].

Before Fleming's model, current model was Visual / Aural / Kinesthetic model (VAK) [2]. Fleming divided the visual part into the symbolic part (visual – V) and text part (read / writes – R). In this way the fourth part was created. This is where the acronym VARK comes from as a new concept, learning model and questionnaire.

Peter Honey and Alan Mumford in 1986. Also developed a model for determining student's learning preferences. They divided learners to Activists, Theorists, Pragmatists and Reflectors [11]. Activists are students who learn by doing. They often learn by trial and error. Theorists are students who prefer to read all available information so they can understand and get the whole theoretical picture about learning topic. Pragmatists are student's who try to apply their learning into practice. Reflectors are students who learn by watching from the sidelines and by deeply thinking about the learning topic. Honey and Mumford made a questionnaire which helps individuals to find out in which category they fit [12].

Psychologist David Kolb also developed a model in which he divides learners to four types: Accommodating, Converging, Diverging, and Assimilating [13]. Students with Diverging learning style learn through observation and reflecting about the observed. Students with Assimilating learning style learn by using analytical models, concepts and abstract ideas. They prefer readings, formal lectures, analytical activities, and they want to have time to think about what they learned [10]. Students with Converging learning style prefer to apply learned to practice. Students with accommodating learning style learn by experience and experimentation [13].

3. Learning preferences - explanation

According to VARK model, if a student has a strong visual modality, then he/she prefers learning information to be displayed in a way that it is arranged in mental maps, various diagrams, graphs, hierarchical structures, symbols, pictures, animations etc. In that way, it can be said that a student with a visual modality prefers learning by watching, that is, he/she prefers the use of visually presented materials for learning information instead of written materials. A student with strong visual modality will successfully acquire information if, in addition to written words, he/she uses underlining, different colors, markers, symbols, patterns and shapes for the purpose of highlighting and conveying information[9].

If a student has a strong aural preference, then he/she prefers the information he/she hears or says aloud. A student with an auditory modality learns best by listening to lectures, radio or audio recordings and participating in group speeches and discussions. Such student also prefers reading and rehearsing aloud, with a possibility of using an audio recorder. He/she also prefers the usage of mobile and online audio communication [9].

If a student has a strong reading preference, then he/she prefers information that is written down in the form of words because such person learns by reading and writing. This kind of learning can be made with a help of all sorts of text forms like notes, manuals, reports, essays, lists, dictionaries, books, Power Point presentations etc. In other words, all sorts online and offline information that is written down in text form [9].

If a student has a strong kinesthetic modality, then he/she prefers to learn by practice or using his/her own experience. Learning opportunities can be simulated or real. In other words, student who prefers the kinesthetic modality acquires information through personal physical experiences, real examples, experiments, practical work, projects, simulations, demonstrations, case studies, manipulating objects and real application of available knowledge [9].

4. Determining students' learning preferences by using a questionnaire

According to Fleming's research [6], it is rare for a student to have just one learning preference. This is precisely why the VARK test offers four answers for each question, each of which represents one modality. The test is designed in a way that, if necessary, student can choose more answers for each individual question (multiple – choice questions). Students who choose more than one answer belong to the multimodal individuals. According to Fleming, there are two types of multimodal students [7]. VARK types 1 are students who change from one learning preference to another according to the content they are learning. For instance, if they have to learn history facts, they can apply their reading modality, and if they have to learn some practical skills by taking part in a demonstration, they can apply their kinesthetic modality. This type of students can have more learning preferences shown as the results of taken VARK test. VARK type 2 students aren't content until they receive information, or create information in every of their learning preferences. This kind of students will need more time to organize an input and output of learning material in different ways. As a result, they will have a better and wider comprehension of learning information, so their learning will be of higher quality.

The VARK test is a tool used to determine the preferred learning modality of a student. This test considers the representation of each of the four learning preferences within the student respondents. Each student can possess one or more learning preferences.

Below are the examples of some of the 16 questions retrieved from the Fleming's VARK test [8], as well as the offered answers, among which the student can choose that entire suit him/her. Next to each answer, it is shown which modality it is (V for Visual, A for Aural, R for Read/Write and K for Kinesthetic).

1. I have finished a competition or test and I would like some feedback. I would like to have feedback:

- a. From somebody who talks it through with me. A
- b. Using graphs showing what I achieved. V
- c. Using a written description of my results. R
- d. Using examples from what I have done. K

2. I want to learn about a new project. I would ask for:

- a. An opportunity to discuss the project. A
- b. Examples where the project has been used successfully. K
- c. Diagrams to show the project stages with charts of benefits and costs. V
- d. A written report describing the main features of the project. R

3. When I am learning I:

- a. Read books, articles and handouts. R
- b. Like to talk things through. A
- c. See patterns in things. V
- d. Use examples and applications. K

4. When choosing a career or area of study, these are important for me:

- a. Communicating with others through discussion. A
- b. Applying my knowledge in real situations. K
- c. Using words well in written communications. R
- d. Working with designs, maps or charts. V

5. When learning from the Internet I like:

- a. Videos showing how to do or make things. K
- b. Interesting design and visual features. V
- c. Interesting written descriptions, lists and explanations. R
- d. Audio channels where I can listen to podcasts or interviews. A

6. I want to learn how to take better photos. I would:

- a. Use examples of good and poor photos showing how to improve them. K
- b. Use the written instructions about what to do. R
- c. Ask questions and talk about the camera and its features. A
- d. Use diagrams showing the camera and what each part does. V

7. I want to find out more about a tour that I am going on. I would:
- Read about the tour on the itinerary. R
 - Look at details about the highlights and activities on the tour. V
 - Use a map and see where the places are. K
 - Talk with the person who planned the tour or others who are going on the tour. A
8. I want to learn to do something new on a computer. I would:
- Read the written instructions that came with the program. R
 - Talk with people who know about the program. A
 - Follow the diagrams in a book. V
 - Start using it and learn by trial and error. K
9. I prefer a presenter or a teacher who uses:
- Demonstrations, models or practical sessions. K
 - Question and answer, talk, group discussion, or guest speakers. A
 - Handouts, books, or readings. R
 - Diagrams, charts, maps or graphs. V

5. Analysis of the learning preferences questionnaire results

At the end of the semester, students of Undergraduate Professional Study of Information Science completed the VARK test to examine their sensory modality during learning. As it is shown in previous paragraph, each of a total of 16 questions has 4 offered answers. Each answer refers to one learning preference. Students could choose more than one answer to every question and they had to answer each question. No one was forced against their will to fill in the test and no identifying information was collected. On the basis of the selected answers to the questions, the preferred learning style has been determined for each individual student. There were 50 students who took the test. According to their answers, the following can be concluded:

Most respondents (56%) have a kinesthetic preference in learning. Of these, 40% are determined to be purely kinesthetic type and 15% are a combination of more than one type of learning: kinesthetic and auditory type (6%); kinesthetic and read / write type (8%); kinesthetic, auditory and read /write type (2%).

Next in number of respondents are students with aural preference, 37% of them. Of these, 27% are determined to be exclusively auditory types, 6% of students are auditory and kinesthetic, and 2% are auditory and visual types.

The third in number are students with read/write preference, 21% of them. In this group of respondents, 10% are exclusively reading type, and the rest are a mix of different types: 8% are a mix of read /write and kinesthetic type; 2% are a mix of read /write, kinesthetic and auditory type; 2% are a mix of read /write and visual type.

The least common are students with visual preference. Only 8% of respondents belong to this type. Of these, 4% are purely visual type, 2% are a combination of visual and read /write type, and 2% are visual and auditory type.

Out of 50examinees, 81% of them have one strong modality: visual 4%, aural 27%, read/write 10% and kinesthetic 40%.Among the examinees, 19% have multimodal learning preference, of which 17% are bimodal (combinations were: visual +read/ write;visual +aural;aural +kinesthetic;read/write +kinesthetic), and 2% is trimodal (one combination: aural +read/ write + kinesthetic).

6. Analysis of the students' educational success after completing the course

The respondents are second-year students of Undergraduate Professional Study of Information Science at the Polytechnic of Rijeka, Croatia. The course on which the research was conducted is called Data and process modelling. The course consists of two parts. Students attend theory classes and practice (exercises) classes. During theoretical classes, students are mostly in the role of listeners, observers or speakers, while the learning resources are in a form of PowerPoint slides, textbooks and professor's spoken lectures. So, it can be said that teaching, learning materials and student obligations are adapted for visual, aural and read/write learning modality. During the exercises, students actively participate in creation of various data models and process models on their computers. Besides participating in data and process modelling during classes, students also have an obligation to create their own practical project which they present to the rest of the class at the end of the practical part of the course. So, it can be said that teaching, learning materials and student obligations are adapted for kinesthetic learning modality. After each part of the course (theoretical and practical) students take tests. Theoretical test consists of a written theory questions on which students must give written answers. Practical tests (two of them) consist of practical tasks. Based on these tasks, students have to analyze or create required data models and process models on their computers.

The result analysis showed that the passing rate of the students on the final tests was as follows: Total 65% of students passed theoretical test after first try. Total 87% of students passed practical tests after first try. According to the mentioned results, it is obvious that the students had a much better passing rate on the practical tests than on the theoretical test.

7. Instead of Conclusion: Correlation of educational success with teaching method and student's predominant sensory modality

The conclusion of this paper is that there are significant associations between learning preference and educational success. The same result was found in several other papers [3],[4], [5],[14], [15],[17].

The results of a questionnaire used in this study have shown that the highest percentage of students has dominant kinesthetic modality. Related to this, it has also been shown that the educational success of the students was significantly higher on the practical part of the exam, taken at the end of the semester, than on the theoretical part of the exam, taken at the end of the semester. As it was explained before, practical test was taken after the practical part of the course called exercises, which are, due to its practicality and interaction, related to kinesthetic modality.

It can be concluded that investigating learning preferences of students is important to help adjusting the way of teaching. Although it is difficult to adapt lectures to each individual student and his/hers dominant learning modality, it is possible, at least in global, to adjust the teaching method to majority. As it is said in [5] “professors that better understand the preferred learning styles of their students can tailor the course information to the styles that are most effective for their students”. Related to that, there is a possibility of making teaching materials adapted to different sensory modalities, in order for students to choose the way of receiving and remembering information that allows them the highest educational success. The best teaching method for ICT education depends on the needs of the students and the teacher's experience. The challenge for educational system here is the need for training teachers and the need of full access to all ICT resources needed. Also, it is necessary to point to the students the need of raising awareness of the learning method that suits them best. For this reason, it is useful for students to participate in a sensory modality questionnaire at the beginning of the course. In this way, students can understand their own learning style and organize the educational material according to their own needs. Some studies [4] have shown that the sensory modality is changing at different levels of education. Because of this, it is important to continuously conduct sensory modality questionnaire over students. In this way, professors can adapt their teaching methods to the needs of students, and the students themselves can adjust the teaching materials and learning style with their preferences after they become aware of them. Ultimately, this paper underscores the importance of continuing to explore and innovate in teaching methods to ensure the best possible learning outcomes for students in ICT subjects.

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Author Profile

Ida Panev- senior lecturer at Polytechnic of Rijeka, Croatia. She received her PhD at the Faculty of Philosophy in Zagreb in the field of information and communication technologies. Her area of interest is the development of information systems and the influence of technology in IT education. Currently she teaches courses: Development of Information Systems, Data and Process Modeling, Databases, Multimedia Systems, Introduction to Information and Communication Technologies.

Vlatka Davidović - senior lecturer at Polytechnic of Rijeka, Croatia. She completed her studies in mathematics and computer science in Rijeka. Her area of interest is software engineering with an emphasis on application development. Currently she teaches Object-oriented Technology courses, Building Object-oriented Applications, Web Application Development. She is a doctoral student at the Faculty of Informatics and Digital Technologies, where she works in the field of artificial intelligence.

Anamarija Ivanušić - student at Polytechnic of Rijeka, Croatia. Her area of interest is implementation of ICT in all segments of higher educational system: administrative as well as teaching processes.