INFLUENCE OF PROJECT-BASED LEARNING IN INFORMATICS ON THE MENTAL CONDITION OF HIGH-SCHOOL STUDENTS

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Abstract: The Conduction of the research is being done in the Faculty of Education (the University of West Bohemia in Pilsen in 2010 and 2011) .The aim of the research is to map the Influence of project-based learning in Informatics on the mental condition of high-school students. It also includes the personal input of the students to the course to experience the influence of teaching through computer sciences. From a methodological point of view it is a combination of quantitative and qualitative techniques using psychometrics and narrative analysis.

Keywords: Project-based learning, Informatics, Mental condition, Components of experiencing.

I. INTRODUCTION

Building the informational society is currently one of the most important processes taking place in all economically developed countries. Education in the implementation options and the use of information and communication technologies is therefore a necessary condition that affects the success of the individual and the whole community. The choice of teaching methods in computer science therefore should correspond to the most current needs to be practiced. A suitable and the equivalent of these all requirements which we can set and design in the school environment are Project-based learning (PBL). Potential PBL in the field of approximation to the real life has already been discussed by many authors, eg. 'Methodologies in the Buck Institute for Education [1] and [2]'. The issue of implementation of PBL in the development of knowledge and skills in information and communication technologies are being disputed in terms of research for quite often times. Existing research groups focus mainly on the analysis of ICT as a means of promoting learning project [3] [4], [5]. Fewer studies, however, focuses on the benefits and pitfalls of the use of project learning in computer science as a school subject, eg [6], [7]. Very little research focuses on the area in which to combine the two approaches [8]. Due to the project of teaching the mental status of students in the Czech Republic dealing mainly Kratochvilová [9] were not focusing only on the first grade pupils of elementary schools. Mental status of students was observed mainly in order to support pupils with emotional and behavioural problems, or in connection with the occurrence of socio-pathological phenomena in school. Kratochvilova researches are oriented mainly in the areas of teaching and social strategies that a teacher has to vote to all pupils to fulfil their educational potential [10] [11] [12]. It addresses whether teachers have sufficient support in the form of educational and institutional interventions [13] and follow the teacher's personal characteristics influence on the psyche of students

[14]. Studies that primarily deal with the psychological state of high school students are less. They are often specifically focused on the possibility of developing social, emotional and behavioural skills in secondary school pupils [15] [16] or to meet them in the context of emotional and social health.

The article describes research that tries to remove any aforementioned shortcomings and focuses directly on the impact of PBL in mental status of secondary school pupils. As one of the important aspects are shown procedures for teachers as teacher's learning. Method to design methodology, as well as solutions to the more extensive study presents qualitative research [17], which maps factors of emotional wellbeing in secondary school students in the categories of self-esteem, autonomy, confidence, frustration, sadness, anxiety, and irritability and so on.

II. OBJECTIVE RESEARCH

Research is focused on the impact of PBL in computer science in mental status of secondary school pupils. The goal was to find out how the subjective perception of mental status changes occur at the high school students for the project included teaching computer science, and the personal characteristics of students followed the course of mental status changes affect. The wording of the research is based on the objective characteristics, by the very mental state, which is more widely understood as "a dynamic variable which is characterized by the variability of activation along with the changes in mental qualities of emotional tuning" [18]. The dynamic nature reflects the fact that mental status changes are inherent in any situational changes, in both the basic features (mental activation and survival). The situation changes with the inclusion of such students are considered. Mental status changes, however, can only be assessed in the context by a particular entity versus a particular situation. They are strongly tied to the personality structure of the wearer. To fulfil the objective of the research process was designed by the following research:

1. *Preliminary stage* - the choice of target group of students, preparation of project proposal for the organization of teaching and research,
2. *Implementation phase* - the methods for data collection were used in terms of validity and reliability of unstructured interviews with teachers and standardized questionnaire SUPSO.

All data obtained from the questionnaire were evaluated according to standardized procedures manual SUPSO. Mathematical processing of results was solved using a weighted average of relative abundance. The statistical treatment of results was used T-test and F-test. The results are formulated in terms of relational findings.

III. SAMPLE OF RESPONDENTS

The study was chosen as a target group of two students of second year from Czech secondary schools where computer science is considered as one of the profile subjects. It was the Central School of Electrical Engineering and Industrial High school computer science and financial services. Pupil's second classes are already at a level that can be independently carried out by medium-term projects and educational content as standardized. The implementation of the research included 4 classes. At each of these schools, class comparison with the application and methods of PBL are held. The sample included a total of 47 students in the experimental group and 40 students in the comparator group. Examined sample consisted of 90% of boys. Age assessed ranged from 17 to 19 years.

IV. ORGANIZATION RESEARCH

Before starting the experiment all the pupils were detected with quality mental status psych diagnostic methods. Two classes (one from each school), followed by prepared teaching projects in the

remaining two classes ran teaching the same content without changing the mode of teaching. After completion of the project have been teaching students of all 4 classes again measured, and consistent tool as before. On-going discussions were held with two different teachers, each of which led one normal project and one normal teaching.

V.   APPLIED PROJECT DESCRIPTION

In order to comply with the principles of PBL and eliminate elements of other alternative methods such as problem teaching or integrated thematic instruction, projects were designed by teachers' guides Buck Institute for Education [1] [2]. The content of the projects dealt with, has been designed in such a way which corresponds to the curriculum subject areas in the two comparison classes. The topic has been teaching block editing and creation of raster and vector graphics. The outcome of the projects should be designed and solved by a graphical presentation of the web design company with a real implementation of the existing gallery presenting company products and processes. The techniques and procedures of processing the resulting graphic design fishbowl method were presented and defended before the rest of the class, teacher and co-owner of the company.

VI. SCREENING METHODS USED

6.1. Questionnaire SUPSO [18]

The questionnaire SUPSO (assessing the structure and dynamics of subjective experiences and conditions) enables monitoring of the dynamics of the relationship between mental status and situational and interactional variables. It focuses on seven components of mental status:
1. *Psychological well-being* (PWB) - tells whether the individual feels sufficiently refreshed, happy, emotionally balanced, optimistic and well-tuned,
2. *Vigorousness* (V) - a feeling of strength and energy associated with readiness to actively interact and respond to situational changes,
3. *Impulsivity* (I) - is a moody, explosiveness, irritability and problems with self-control,
4. *Mental restlessness* (MR) - shows the mental and motor restlessness, dissatisfaction, impatience, and distraction,
5. *Mental depression* (MD) - contains a tendency to passivity and apathy, pessimism, feelings of weakness,
6. *Fear* (F) - includes a complex of feelings of insecurity, psychological stress, anxious mood, fears of the future and,
7. *Sadness* (S) - characterized by passively experiencing the negative effects of psychological stress, which represent the feelings of sadness, hypersensitivity, loneliness, unhappiness and so on.

These components can be divided according to the polarity of emotional comfort and discomfort. The category of components comfortable advising "PWB" and "V" as they are subjectively perceived as pleasant, and their quality is increasing the saturation of scalable items. Dimension of discomfort fills the remaining components. Subjective experience and express uncomfortable interaction tune over the previous dimension of quality growing non-carbonated. Under the direction of the individual components of mental status distinguished dimension survival versus activation. Components of "PWB", "S" and "F" represent different survival and quality of components "V", "I", "MR" qualitative aspects of responding. The category "MD" (mental depression, feelings of exhaustion) we consider the limit and transient, because depressions always include components and emotional dynamogenicism.

6.2. Unstructured interviews

Unstructured interviews were with two teachers being realized which were designed further to characterize the individual student also contained elements of narrative analysis because of its potential to maintain sensitivity to subjective experience. Data were collected on the set of research questions: "What experience have teachers with individual students?" Data evaluation was performed by cluster analysis [19] and categorical content analysis on factors SUPSO.

VII. THE RESEARCH RESULTS

The experimental group at baseline measurements showed a positive tune in categories "I" (impulsivity and recreation) and "MR" (mental restlessness, moodiness). The right of other factors "PWB" (psychological well-being), "V" (vigorousness, strenuousness), "MD" (depression, exhaustion), "F" (anxiety) and "S" (sadness), we find that positive tuned comparison group.

7.1. The component PWB

The subjectively perceived level of psychological well-being (PWB) occurred during the experiment in terms of overall weighted average aggravation and the comparator group and more. For more insight into the distribution of changes within the experimental group does not detect significant differences in the proportions of students who experienced a deterioration, improvement or stagnation of perceived psychological well-being.

7.2. The component V

In both groups we register decline in the overall weighted average of the activities and liveliness. In the comparator group, however is a significant negative shift. This tendency corresponds to the distribution of response categories. The proportion of students of experimental group students to comparative groups in the "deterioration of survival" was 47%: 76%. In the experimental group were shown a statistically highly significant differences between the first and second measurement (p = 0.0005).

7.3. The component I

The overall weighted average impulsive and spontaneous abreaction needs to be decreased in both groups, with the experimental group but less than the benchmark. This corresponds to the interests of students in various categories of quality content, where the experimental group fell worse. Compared to the comparator group reported a smaller proportion of pupils for whom survival improved (55%: 47%) and increase the proportion of pupils with worsening survival (20%: 28%). The value p-value by a factor I = 0.0007.

7.4. The component MR

The area of mental unrest and out of tune with both groups showing a slight decline in the overall weighted average greater in the experimental group. Distribution of shares of pupils in mainstream quality categories indicate significant differences between groups (p = 0.0007).

7.5. The component MD

In the experimental group, during the course of the project occurred to minimize the depressive feelings. In contrast, the comparison group overall weighted average of the negative state has increased. Looking at the proportions of students in quality categories, we find that the gap between students of comparative and experimental group who were in the improvement of depressive states is 44%. However, worse survival was observed in the experimental group at 19% of students compared to 55% of students in the comparator group. The value p-value is on the borderline of statistical significance, p = 0.036.

7.6. The component F

The overall weighted average is uncomfortable lived by anxiety and concern over the cushion of teaching in both groups which is more pronounced in the experiments. Percentage distribution within the groups in this area speaks in favour of the experimental group. This time, however the category of stagnation was the worse survival.

7.7. The component S

By including the design of teaching it was also a mean reduction of feelings of dejection and resignation. In a comparative group the registers slightly increased. In 55% of students who ran training project, have recorded improved survival in this area. The comparison group was 30%. Impaired survival occurred in 30% of pupils in the comparison group and only 15% of the experimental groups. In addition to factor in all the other factors found statistically significant difference in variance, while the second measurement was always higher variance.

A detailed look at changes in individual components of survival observed in the experimental group shows the following comparative chart.
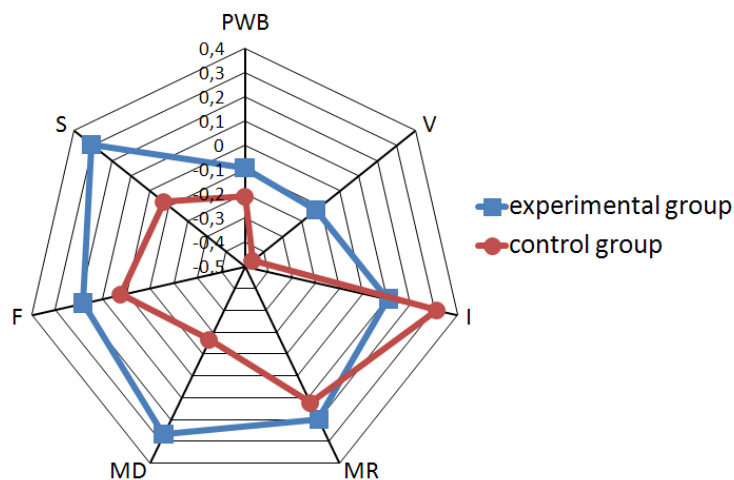

Figure 1. Details of changes in the course of the experiment

This graph shows the positive potential of the project of teaching across all components except for impulsive and spontaneous abreaction. To summarize the above results according to key dimensions of comfort and discomfort, we find that comfort components do not move in the positive polarity. Discomfort as components of the experimental group is always positive. In other words, the inclusion of design education has failed to enhance positive emotions, but in all cases there was a reduction of negative feelings that can accompany the learning process. The most significant variables are the reduction of depressive moods and feelings of dejection and also significantly smaller decline in activity and lively. In Inclusion of the project within the scope of teaching computer science students studied the experimental group clearly shifted from a passive and passive negative survival, pointing to an active interaction.

Based on cluster analysis revealed that the teachers surveyed in their spontaneous statements to evaluate students according to the following categories: performance in the subject and object of interest, communication skills, a holistic approach to school work, creativity, temperament, and specific traits of individual students (such as increased impulsivity anxiety, social role in the classroom, etc.). Description of the pupils on the range of their behaviour and options. In relation to the appearance of course of PBL as a key factor are: a holistic approach to work performance in the subject and interest in the subject. The latter factor has proved to be important. Based upon the categorical content analysis differed pupils which have experienced a subjective improvement in all measured components of mental status. If you showed a responsible approach to work, the project provided an opportunity to teach them to apply their skills on several levels. The performance-oriented

students, this means an opportunity to demonstrate its potential, including its design awards and the class group. This allowed them to become team managers. For the subject of the personal aspects of aspiration, the design allows to obtain teaching awards within the meaning of "to be a specialist on partial issues." This category can also include the introverted individuals. The third group, in which we register positive experience, are students who manifested their potential in preventing some of the internal blockage, for instance 'Anxiety'. In the case of conscious psychological protection group, and thus reduced the proportion of subjectively perceived personal responsibility, these students also received awards for their social work. As a prerequisite for survival of a positive learning project, however, in all these positions appears to be well socialized approach to responsibilities and work.

VIII. CONCLUSION

Project learning is one way to link the classical training with modern, efficient and motivating way [20]. Project-based learning may seem highly versatile with respect to individual learning styles [21], but may not suit all students. In our research we have shown that this method is particularly suitable for students who are oriented to the management of own learning process, the results suggest that the subjective factor in survival of project learning is the developmental stage of maturity of the students.

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