Emotional Graphs with Adapted PANAS Scale as a tool to Measure Emotional Affect within Educational Activities

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Abstract: Positive or negative emotional affect seems to play important role in learning efficiency and motivation. To track emotional affect and compare it across different educational techniques, we developed emotional graphs with adapted PANAS scale as an evaluation tool, and tested it within experimental study comparing game-based learning, live action role-playing and classic lecture. The graphs can bring promising results for educational research; moreover it reveals interesting data about emotions crucial for learning, such as attentiveness, self-assurance and fatigue.

Background

Emotional experience during learning may have significant influences on learning outcome and motivation. Isen et al. (1978) suggest that a positive emotional state improved recall and positive emotions helped as retrieval cues for long-term memory. As positive and negative emotions can be activating (happy, angry) or deactivating (satisfied, calm), they impact learning activation (Russel, 2003). Moreover Craig et al. (2004) suggests that learning gains might be positively related to flow and slight confusion and negatively with boredom. Use of educational games and simulations for learning is well-evaluated for positive emotional induction (e.g., Eunjoon et al., 2012), but emotional state is mostly monitored within class observations or direct questioning that may not always provide comparable data and mostly lack the ability to capture inner emotional richness.

Emotional Graphs as an Evaluation Tool

To track emotional experience of learning we developed a qualitative measurement tool: emotional graphs; a modified Meyer's life-chart (Meyer, 1950) capturing respondents' positive and negative emotions and their development during the lesson. Meyer used graphs to correlate a psychiatric patient personal history and his/her subjective condition experiencing.

We piloted emotional graphs within a quasi-experimental comparative study conducted in 2011 on high-school students (N=74; age 16 – 18). The study (Šisler et al., 2012) compared various cognitive and affective variables. Students were randomly divided into two groups: experimental group used an educational game (*Europe 2045* featuring EU political and social affairs; *Orbis Pictus Bestialis* animal training; or *Bird Breeder* genetic heredity), while control group was taught the same topic by a classic lecture. After the educational session, students were asked to draw a curve representing their emotions/mood development during the session. They draw into a graph with horizontal axis representing a value of emotion on negative-positive scale (-10 – 0 – +10) and vertical axis capturing the learning time divided into three sections: before, during and after the lesson.

Students drew graphs with no problem and included many additional comments appropriate to content analysis. Within the study we revealed some problems taken into account in further adjustment of the tool: in the graphs appeared (1) huge individual differences in emotional range and (2) we experienced difficulties in evaluation of emotions and their polarization. According to (1) some students used the whole scale of graph, others worked with a short range. To specify emotional depth, we added a scale description where -5 – +5 was specified as a classic "school experience" and everything above/below as an exceptional experience. However the values are mainly subjective without any definitive significance, variations between different activities (e.g. learning session, break, etc.) proved more important. For (2) we supplied students with stickers of emoticons covering a 20-item scale of Positive and Negative Affect Schedule (PANAS). PANAS (Thompson, 2007) was designed to provide brief measures of positive and negative affects; and covers 10 positive and 10 negative emotions. To this list we added a fatigue, because it spontaneously appeared in many students' comments.

In autumn 2012 we started experiment, comparing learning experience and outcome of three educational techniques within theme of EU: (1) educational multiplayer role-playing PC game *Europe 2045* (exp. gr.), (2) classic lecture (contr. gr. 1), (3) live action role-playing game copying *Europe 2045* without PC (contr. gr. 2). The experiment is in progress thus we present the data concerning the emotional graphs within a limited sample (N=149). We expect final results in autumn 2013. The emotional curve for the classic lecture group peaked at lunchtime. The difference

from other learning activities was in average 3.9 (SD=3.5), while in the contr. gr. 2 it was 2.6 (SD=3.2) and in exp. gr. 1.2 (SD=3.3). Students from exp. gr. did in the graphs minimally reflect a fatigue within whole educational program (Figure 1). In introductory morning part, students taught by classic lecture mentioned a fatigue in 29% of cases, while students from game groups only in 6% (contr. gr. 2) and 8% (exp. gr.). The most pronounced affection was experience of self-assurance (scale 0-1) with score of 0.1 (SD=0.2) for classic lecture gr., 0.5 (SD=0.3) for exp. gr. and 0.4 (SD=0.3) for contr. gr. 2. In content analysis of written comments we observed differences across the groups. While retrospectively evaluating beginning of the workshop, students from both game-groups mostly recalled and positively or negatively evaluated the introductory presentation about EU. But the classic lecture group used mainly comments about initial positive expectations. That may suggest a disappointment in the end of the day. Comments in the end part of the graph suggest a similar outcome. The students after the classic lecture added many comments showing joy at possibility of going home, students from other two groups commented the end of the workshop minimally.

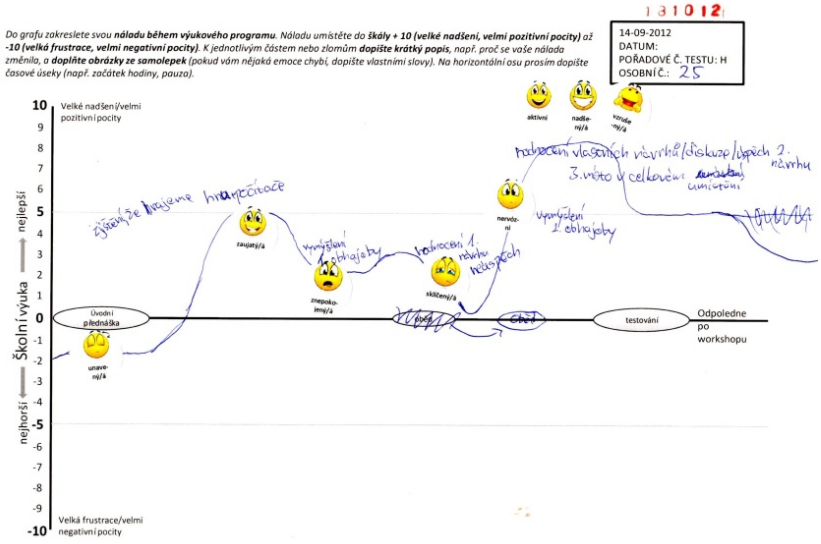

***Figure 1*: Emotional Graph, experimental group.**

Conclusion

The emotional graphs can bring promising data into evaluation of educational activities. The tool allows for capturing the subjective evaluation of activities, the emotional changes and its sources, general positive and negative affects, self-assurance, attentiveness, fatigue etc. Furthermore our results indicate differences between classic lecture and game-based learning activities. Most notably, the games seem to activate self-assurance and reduce fatigue.

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Acknowledgments

M. Buchtová is supported by projects *Digital Technologies in Education* (GAUK 581012) and *Digital Simulations in Lifelong Learning* (VG012 161873). C. Brom and V. Šisler are supported by project LEES: *Learning Effects of Educational Simulations* (P407/12/P152, GAČR).