Digital Diversions in Education: Interactive Multimedia for Adolescent Motivation in Unilateral Classroom Scenarios

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In this paper we examine the effects of interactive diversions on adolescents, in the context of the fact that they in many cases they may be subject to stressful learning scenarios. Such scenarios may be normal classroom or workshop environments, which for some reason could produce more than average stress or anxiety on young learners. It is true that adolescents are already burdened by a growing curriculum and its competing pressures. Both costs and advantages of involving adolescents in educational programs that employ games and multimedia have been examined in the literature. An interactive program developed by Mark Siprut, and adapted for an experiment, was targeted to measure how adolescents exposed to hierarchically disposed pedagogical systems might respond to brief diversions. Could such admissible diversions promote pleasure in learning and produce better, or positive behavioral re-inforcements? The interactive media was designed to check whether a short real-time intervention (of approximately 30 seconds to 1 minute duration) could act as a mood changer. Respondents react to the multimedia diversion kit, indicating their preferences on a combined emotional-valence scale. First results are collected from a visual questionnaire indicating the emotional state of the participant *prior* to the game. This scale is based on response choice emoticons designed to assess both emotion and valence for a PANAS-type index of mental proclivity. Subsequently, the interactive game was offered to assess what kind of variations in mood these interactive programs bring about in learners.

Introduction and conceptual proposition

It has been argued fairly recently, that recess plays an important role in education, especially for children in the elementary school system (Pellegrini 2005). Pellegrini and colleagues have also studied the effect of cognitive development of children. Studies on timing of recess on education shows that there may be positive effects of recess in which students engage in physical exercise or sports (Smith and Boulton 1990). Stevenson and Lee (1990) showed that a more regular format of breaks greatly increases performance in educational formats adopted for children (Stevenson and Lee 1990).

We propose to introduce an interactive digital media app that could act as a diversion or recess-equivalent re-inforcer for young adolescents and teenagers in the contemporary education scenario. Since teenagers are always subjected to a burden it may be a good idea to check if a strategically good implementation of diversional technology may have a positive effect on students. Diversions, if intelligently employed will not only enable to refresh students but we believe, create conditions conducive to learning more and for longer periods of time. The fact that digital platforms could be used during a diversional recess provides an opportunity for developing a valuable kit in educational programs on many levels, but especially involving students at the high-school and adolescent age groups. Overburden in learning has been described, we know, in terms of "cognitive intereference" (Pellegrini and Bjorklund 1997). Environmentally imposed cognitive interferences, and especially for long periods of instruction could impair a child's capacities of understanding, and interpretation. To minimize cognitive overload and to introduce short-term diversions in the form of digital games or interactive media could be thus useful, rather than proving to be a distraction in the learning process.   For this purpose, we developed an interactive multimedia of very short duration to check if digitally open recess and diversions – if they are wisely incorporated within learning schedules, may actually help the learner to refresh and re-invigorate the passion for further learning. The primary objective is hence to investigate if such diversions could be used for re-inforcement of learning behaviors in adolescents who study within normal unilateral educational contexts of school and college.

The role of Digital Media in educational psychology

It may be argued that digital technologies in the forms of games, multimedia entertainment and similar diversions is not an entirely novel concept. Indeed, a good of research has already

introduced us to the question of how differently abled persons may be empowered to cope with stress and imposing factors of the environment. Not only this, the effects of digital media on veterans and seniors have been closely studied. Digital platforms may provide independence as well as shared opportunities of entertainment and positive attitude building for broader social acceptance. It is a new area and has much potential for application, especially where digital media and various multi-method strategies could be used to alleviate depression and isolation of seniors, veterans, retired and challenged personnel (Banks and Cole 2017).

The experiment for this paper is based on the assumption that in modern scenarios young children are also prone to a growing and an almost obsessive engagement with social media - involving multimedia, video and video-games, and various kinds of interactive formats (Song et al. 2004; Staford et al. 2004; Yarush 2016). Here we may observe a note of caution. The increasing availability of internet-based interactive portals in developed economies (and also in developing countries) may often lead to addictive behavior in young teenagers.

Both costs and advantages of educational programs involving games however have been examined in the literature. But there is a general trend towards considering positive effects of digital media on children, especially in contemporary settings in which they use not just computer, i.e. desktop, or TV and similar stationery portals, but also increasingly, devices like mobile phones, or internet enabled devices like tab. Indeed, such media are implicating more time as also depth of involvement among all segments of users (Song et al 2004; Gross 2004). Our question is to examine if non-serious viewing and interaction may *not* be detrimental in all cases (Ridley 2000; Roaten 2011; Courage et al 2015; Mallon 2015). How performance is affected by diversions like Facebook, Vines, Vlogs, Podcasts, Snapchat *etc.,* have been studied. Also, the advantages of diversions and game induced attention have also been already acknowledged (Abate and Benghiat 1993; Ophir et al 2009; Bekele 2010).

Such studies, specifically on advantages of interactive media, may have some promise for enhanced perception and learning (Bekele 2010; Courage 2015; Rosen 2011). We should describe this process as one in which diversional entertainment administered during a temporary or strategic recess could push the candidate to return and feel more motivated, and hence self-reinforce learning ability. The whole idea of recess is meant to create opportunities of reinvigorated and energised behaviour, and its application to education is only more necessary (Waite-Stupiansky

and Findlay 2002; Jarrett 2002). We designed our clicker-enabled digital diversions to check how a narrative of humor in them might affect and modify moods of teenagers in incremental learning scenarios. Data could be collected for such project by allowing participants in the targeted age group to access the programs on their PCs so that they could view and respond to them in an interactive manner.

Measuring affect in clicker-type interactive diversions

As for the individual games themselves the idea of a motivational, mood enhancer media was derived from theory of Diversional Therapy (Bauze and Quirke 2000). Study of *instructional motivation* through games (and by extension interactives) rather than Diversional Therapy have been the general trend in recent experiments (Reed and Sanderson 1999; Lee 2003; Cunningham 2009).

How games and active participation could enhance learning have been studied for example in Keller's classic ARCS gaming questionnaire, further developed by Dempsey and Johnson to include multiple variances. For us, what is primarily of concern is how only stress, produced on teenagers from conventional pedagogical performances, could be effectively handled or lessened. We emphasize solely on possibilities inherent in very *brief* recess or diversional moments punctuating a continuing session of instructions. Hence, we argue in favour of micro-temporal diversions in a longer or structured learning process. Hence, the need for incorporating quick and efficient humor. Though brief their practical effects may be used for non-clinical *diversional therapy* for chronic stress in educational contexts.

Thus, the media here is designed as a clicker diversion, or what is really a click enabled program that introduces a short, almost vine-length diversion containing an actor's gesticulations and words. Edited video and sound inputs combine to create a story in which the "actor" emotes something interesting and funny. It should be capable of eliciting immediate curiosity of the teenager. In responding to the humor the teenage viewer identifies with the *affect* that is represented. Needless to say, that the content of the diversion could have been produced only with empathy and experience of media on the artist's part and knowledge relevant to preferences of more contemporary adolescents (Sudres 2013; Jang 2015). A combination of techniques involving incongruities of selfies, dance performances, clip art, interactive game *etc.*, helps in creating a comic

effect. The individual games are christened 'Walking in the Woods', 'Hit Me', 'Anti-War', Dancing in My Kitchen' and 'Selfies'.

Various considerations had to be made for extraction of responses through a successful interactive media (Whitney-Vernon, K. 2004). It would have to be based on a psychologically pragmatic strategy which could directly examine the effects of diversion on the adolescent subject. The media questionnaire was constructed with precepts from the standard PANAS-POMS questionnaire. The answers were adapted to measure both emotion and valence from the responses to the media. At least three direct measurement modules were considered: (A) the 3D emotive circumplex recommended by Lane and colleagues (1990). (B) personality traits (Cattell and Schuerger 2003). (C) Possible variations of response categories on 'facial' prototypes of emotions as in the standard FAPS emoticons (Bittorf and Wuethrich 2012). Click-answer type question-answers are generated conscientiously by maintaining brevity and inspiring disinhibition. Response correlates should therefore indicate towards the extent of involvement and affect that a diversion generates.

Participants

We examined the effects of such media mostly on teenagers in the Freshman to Senior (n=56), and early undergraduate school levels. Participants in the category were chosen at random. The game was administered online; each participant was given a recess during the class sessions in which they were at liberty to test the interactive videos. The target audience consisted mostly, adolescent students in high school or first years of their undergraduate curriculum. Only English or bilingual Spanish language speakers who could read and respond most appropriately to the questions on the screen were allowed to play. We ensured that all participants were familiar with emoticons representing a reasonably well-understood range of emotions.

Methodology: the development of a diversional App

The "app" essentially contains a multimedia performance-art video. It was developed on an Adobe Shockwave viewer's platform (https://www.adobe.com/products/shockwaveplayer.html), and as an online program not exceeding approximately 1 minute of interactive game for each of the five game-types in the suite. The purpose was that teenagers who could actually use it during a learning session without hassles. As such they could act like secret outlets within classroom or workshop environments, and lead us to test how playing them could reinforce mood, and consequently any post-session attentivity.

A psychometric scale based on PANAS-POMS-like questionnaire was incorporated in the program to assess if the media was influencing mood-states. Presumable such media would produce better results for an overload of assignments; consequently, as both listening activity and classwork tend to become monotonous or uninteresting, and even confusing (Whitney-Vernon 2004; Barnes et al 2007).

Pre-game questionnaire

In the first part of the media there was a pre-game questionnaire, which was also developed from the psychometric literature on valence and emotional affect. This initial questionnaire was crucial to the dynamics of each participant as it helped to determine the mood state before the game. We may assume that the mood indicated prior to game determines any students take on the learning task with which he or she is involved at the moment. Whether contemporary high school curriculum is already overloaded depends on the students' or teenagers' individual perception. But factors would be: classroom environments, or teacher student hierarchies and social career complexes. The initial questionnaire was designed with the intention of determining the perception of students exposed to a combined environment of such factors. Hence at least three questions of a PANAS-type questionnaire was designed to secure an understanding of the subjects'mood that is implicated at a point of time. Once a brief but eliciting response (of a duration of about 10 seconds) was secured the subject could transition to the actual game.

Interactive Media questionnaire in the actual game phase

The second part of the media may be described as the games proper, numbering five, but not in order. Each participant whose mental state is already revealed in the pre-game questionnaire is consequently lead down to interact with the individual games. We ignore effects of download time, and mental initiation. As the games are played in an interactive manner the media tends to generate a certain reaction in the teenager. This part of the responses is similarly measured on a Likert-Type scale of 1 to 5, although here the emoticons to which participants have to respond are slightly different as they depict more immediate facial reaction types or equivalents.

Figure 1 (a). The questionnaire for the individual game, in this case 'Dancing in My Kitchen. Notice the five point Likert-type scale used to measure emotive-valence reaction.'
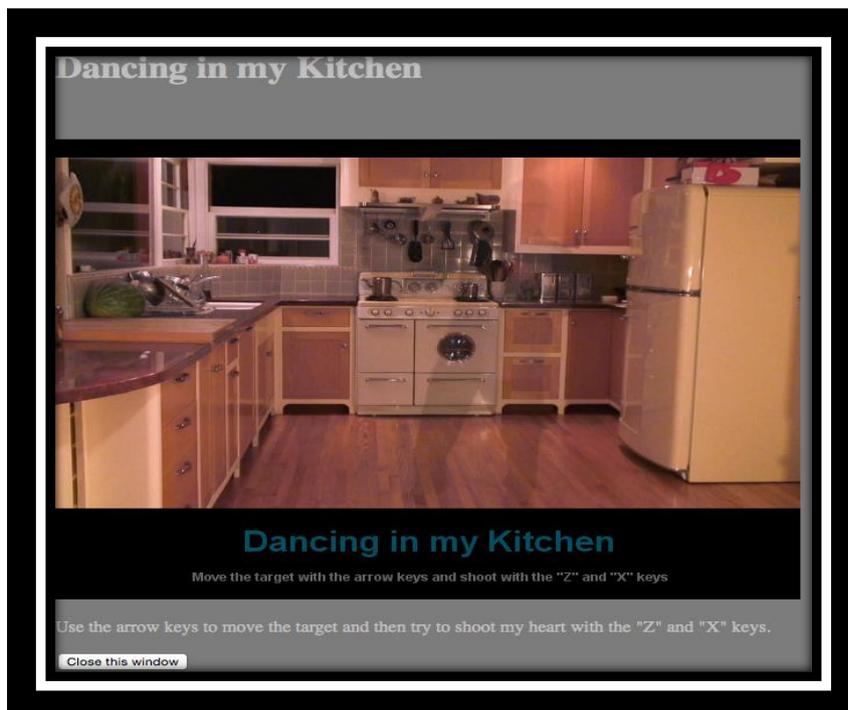

Figure 1 (b). Dancing in My Kitchen produced the maximum number of positive responses to diversional sessions
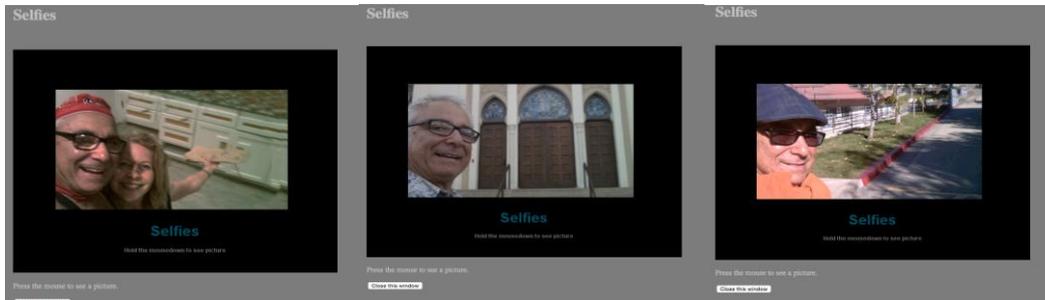
Figure 2. Interface of interactively changing 'selfies' projected comically against an abruptly popping backdrop.

Results from pre-game questionnaire

The first of the experiment was also, as we said, conducted on the isomorphic emotive–valence scale. Responses to this initial questionnaire shows that percentages of participants who played could be separated into clusters depending on their emotive-valence states prevalent during a long class session, and immediately before interaction with game. Here too the range of Likert-type 1 to 5 was used. Responses were captured on a Likert-type scale of 1 to 5 where 1 = maximum dislike and 5 = maximum like.

From the responses *three* distinct clusters appeared: these are respectively "negatively motivated", "neutral" or "positively motivated"- and are determined by the score of emotional-valence before they begin the actual game. Those students whose combined response scores were < 3 are considered "negatively motivated" students. "Neutral" refers to a cluster who marked a total of 4 from questions on pre-game mood. Those scoring ≥ 5 were clustered as "positively motivated" – i.e. already in a positive state of pleasure-valence before the start of the media.

Post-game results and interpretation

Based on results obtained from responses to questionnaire of emotive-valence states prior to game – it was noticed that about 33% of participants who would play were at first negatively disposed to their environment, or shared more introverted psychological dispensation. Since the test assumed psychometric assessment of the participants for the moments prior to when the actual interactive media was administered we could say that the indications for self-assessment were more

temporal, and susceptible to change over the duration of the experiment. The format of using emoticons, on a 3D FAPS scale measure also recommended: it is distinctly comic and ludic, and presumably induced better or sharp mood change. Thus, based on findings of participants who are initially predisposed to off-mood conditions and who are more likely to find long periods of working in learning environments stressful it was seen that the Games 1 (Walking in the Woods) and 2 (Hit Me) did not precipitate mood change. Reasons for this may vary (a) the mood change resistance for Game 1 (Walking in the woods) and Game 2 (Hit me) could be content-related, or may have been constricted by their being part of a warm-up phase. Mood change of participants negatively motivated at first are however remarkable for Game 4 (Dancing in the Kitchen), the score being 33.34% and for Game 5 (Selfies), the score being 66.67% (Table 1).

Prior to Game (Negatively Motivated Score < 3, Initially 20% were negatively motivated)	Walking in the forest	Hit Me	Anti-War	Dancing in the Kitchen	Selfies
Percentage of negatively motivated players who gave Negative Scores to Individual games	33.33%	100%	33.33%	33.33%	0%
Percentage of negatively motivated players who gave Neutral scores to games	66.67%	0%	0%	33.33%	33.33%
Percentage of negatively motivated players who gave positive scores to games considered individually	0%	0 %	66.67%	33.34%	66.67%
Wilcoxon Rank Sum Test 0Statistic	0.9428	0	0.9428	0.8944	1.3608
P-Value	0.0173	0.5	0.0173	0.0185	0.0468

Table 1. Showing response of participants who were initially *negatively motivated* before start of game. Score of Negative Motivation on Likert-type scale < 3. Initially 20% of total participants who interacted with the media were negatively motivated.

Wilcoxon rank sum test was used to determine if multimedia acts as a mood catalyser for negatively motivated participants in a positive direction. For practical purposes, Null hypothesis considered that the multimedia has a negative effect on the emotive-valence scale of learners. Results show low positive values, which are much lower than the standard critical value for all games with $p \geq$

0.05 (Table 1). Chronbach's α is set at 0.05. The Null hypothesis is rejected, as is shown by the range of values for individual games. We may say that the multimedia does induce positive emotive-valence changes in the mood of participants engaged in a continuous learning session. The games are multimedia performances designed very delicately in order to elicit humor. Such representations require expertise and success, sometimes even a "hit" package. Whereas testing of the multimedia in front of a large audience always produced very successful results its specific diversional application might need adaptive strategies for *better* success with young learners.

Prior to Game (Neutral Motivation Score = 4, Initially 40% were positively motivated)	Walking in the forest	Hit Me	Anti-War	Dancing in the Kitchen	Selfies
Percentage of neutrally motivated players who gave Negative Scores to Individual games	0%	0%	16.67%	0%	16.67%
Percentage of neutrally motivated players who gave Neutral Scores to Individual games	33.33%	16.67%	33.33%	16.67%	16.66%
Percentage of neutrally motivated players who gave Positive Scores to Individual games	66.67%	83.33%	50.00%	83.33%	66.67%
Wilcoxon Rank Sum Test Statistic	1.8	2.087	1.5011	2.087	1.8333
P-Value	0.0359	0.0184	0.0667	0.0184	0.0334

Table 2 Participants with *Neutral Motivation* prior to game. Neutral Motivation Score on Likert-Type scale = 4. Initially 40% were neutrally motivated, meaning participants were neither positively nor negatively oriented on a valence scale

Prior to Game (Positively Motivation Score = 5,6 Initially 40% were motivated)	Walking in the forest	Hit Me	Anti-War	Dancing in the Kitchen	Selfies
Percentage of positively motivated players who gave Neutral Scores to Individual games	16.67%	33.33%	16.67%	16.67%	16.67%
Percentage of positively motivated players who gave Neutral Scores to Individual games	50.00%	16.67%	0.00%	16.67%	16.67%
Percentage of positively motivated players who gave positive Scores to Individual games	33.33%	50.00%	83.33%	66.66%	66.66%
Wilcoxon Rank Sum Test Statistic	-10	-6	-1	-3	-3
P-Value	1	1	1	1	1

Table 3. Participants with *Positive Motivation* prior to game. Neutral Motivation Score on Likert-Type scale ≥ 5. Initially 40% of total participants were positively motivated, meaning they were positively oriented on a valence scale

Discussion

As was initially expected the funny media games were played by both "neutrally motivated" and "positively motivated" participants in the other two clusters respectively. This is of course more readily visible for participants who were initially positively valenced in their attitudes (Table 2 and 3). Both neutrally valenced and positively valenced participants show a marked increase in positive mood, namely to the extent of 66.67 % for both Game 4 (Dancing in the Kitchen) and Game 5 (Selfies). What is statistically significant here is the fact that mood change in a more positive direction is clearly indicated for those experiencing "negatively motivated" valence-conditions, and that playing them actually triggers and sustains a more positive response, even *more* than those initially "positively motivated". Same trajectories of increase are noticed for those "neutrally motivated", especially for Game 4 (Dancing in the Kitchen), which is almost 83% (Table 2). Wilcoxon rank sum test demonstrates in Table 2, that against the same Null hypothesis as in Table 1., low positive values were recorded: these are much lower than the standard critical value for all

games with p ≥ 0 .05 (Table 1). Chronbach's α = 0.05. The Null hypothesis is rejected, as is shown by the range of values for individual games. Multimedia does induce positive emotive-valence changes here as well.

Those displaying a positively activated or high valence prior to experiment, on the whole reflects a liking for Games 2 to 5; preference for Game 1 is underrated (20%), with a maximum preference rating for Games 4 and 5 among participants. Reasons for this may be traced to game content, especially for "Dancing in the Kitchen", and "Selfies". It is possible that these interactive arts engaged teenage participants with readily identifiable incongruities in the comedy depicted therein. As it happens the game design for Game 4 and 5 was based on comic types with which adolescents are more familiar. In Game 5 especially which reflects a series of randomized selfies - participants tended to appreciate the innovativeness and unexpectedness associated with individual moments, and the expressions generated in the selfie. Such selfies create quirky moments out of the generally popular selfie images encountered on social media and the participants' possible close ties or empathies towards these. Similarly, Wilcoxon for participants' responses in Table 3
recommends the Null hypothesis that the multimedia does not demonstrate a negative effect on the emotive-valence changes in the mood of participants. Results show high positive values much higher than the standard critical value for all games with p ≥ 0.05 (Table 1). We choose Chronbach's α as 0.05. Higher P-values show that the test fails to reject the Null, as is shown by the range of values for individual games. We could say that the multimedia does induce positive emotive-valence changes during the class hour.

The trend shows another significant trajectory, namely that teenage participants with either positive and negative states of motivation were both - on the whole - positively affected (Table 1, 2 and 3) - though the trajectory of activation is more accentuated in case of learners who were *initially more passively motivated* (Table 1).

Conclusion

On the whole games designed by Siprut, and colleagues for the specific experiment still left encouraging indications for the future. Video Game portals are already being used, as Anguera and his colleagues (2013) showed, for art therapy, especially for seniors and related clinically tested cases such as mild dementia. Engagement with games and arts may be appropriated by artists of

the digital generation. It may have tremendous opportunities for education, especially for adolescents whose behavioral engagements with the new media are irreversible and inevitable in the coming years, more as such portals become increasingly available, and also more user-friendly, to students all over the world, including disadvantaged developing economies. It may be worthwhile to include the new technology for competence development tasks which require more and more alertness, diversion and consequently positive reinforcements for learning.

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