

**A Comparative Analysis of the Attitudes of Primary School Students and Teachers
Regarding the Use of Games in Teaching**

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Abstract

This paper provides an overview of the attitudes of students and teachers toward the use of educational games in the teaching process. The study encompassed a didactic experiment, and adopted interviewing techniques and theoretical analysis. Likert distributions of attitudes to particular game types are presented in tables and the arithmetic means of Likert values are used as indicators of centrality. Spearman's rank correlations between teaching and student attitudes are also discussed. The research has shown that word associations, memory games, anagrams and quizzes are games that enhance students' motivation the most, whereas crosswords and rebuses have been found to be least interesting. Teachers, on the other hand, find that self-made games are better than ready-made games, as they inspire creativity in teaching.

Keywords: educational games, teaching, motivation, primary school, students, teachers

Introduction

For children, most learning comes from play, which is their most natural activity. As many as 91% of American children between the ages of 2 and 17 play video games (NPD Group, 2011). The Entertainment Software Association (2012) states the following reasons for playing games: they are fun, challenging, they bring families and friends together and provide entertainment.

Educational games are games used for educational purposes. There are numerous definitions of educational games. However, one of the generally accepted definitions is that a game is a system in which players engage in an artificial conflict, defined by rules, which results in a quantifiable outcome (Salen & Zimmerman, 2004). The strategy of educational games is to place students in situations where a competitive spirit and intelligence need to be brought into play. Students are guided by the competitive spirit towards gaining a certain knowledge which helps them win the game and, at the same time, relieves stress and provides additional motivation.

Many scientists believe that educational games make up an important area of research in the field of developmental psychology (Erikson, 1977; Piaget, 1962; Vygotsky, 1978). The characteristics of every educational game should be as follows: clear goals and objectives, opportunity to apply what is being learned, ensuring that the learner can only succeed in the game if they have the required knowledge, learning based on experience, providing immediate feedback on the results achieved, encouragement to learn from mistakes, enabling cooperation, presenting challenges tailored to students' abilities, the visual appearance, and animations that help maintain learner's attention (Fischer, 2005; Kelly, 2005; Prensky, 2002). One of the most important features of educational games lies in considering wrong answers as part of the cognitive process and the possibility for a student to learn from their own mistakes (Groff, Howells, & Cranmer, 2010; Ke, 2009; Klopfer, Osterweil, & Salen, 2009). Many research studies have shown that games are a great motivational tool in learning (Chang, Yang, Chan, & Yu, 2003; Schwabe & Goth, 2005). However, as the selection of activities and games depends on the teaching that is carried out by a teacher, it is necessary to analyze the teachers' opinions on educational games.

Apart from being used as a teaching technique geared towards acquisition of knowledge, a game is also a highly motivational tool for better learning, and a tool for affirmation and expression of students' attitudes. In fact, a game shapes the content of a course, stimulates cognitive abilities and makes otherwise boring contents interesting (Facer, 2003; Prensky, 2003). A successful educational process entails not only motivated students, but also motivated teachers. It is therefore important to allow teachers to independently create teaching materials for teaching classes including educational games. If a teacher is highly motivated then so are their students, and the teaching process overall is better (Maehr, 1984). Some research studies have shown that teachers are motivated when they see students achieving desirable results (Lortie, 1975; Menlo & Low, 1988). One of the important factors that determines teachers' motivation level is the selection of, and access to, contemporary teaching aids (Namestovski, 2013).

The majority of previous research studies have revolved around the use of ready-made software games in classrooms. This study seeks to analyze the possibilities for teachers to design educational games on their own and adjust them to the needs and abilities of students, as well as to the lesson plan. The aim of this research is to assess the capacities of teachers to create

self-made games, the impact of such games on students' motivation level, and their role as a complement to theoretical knowledge. In addition, one of the main objectives of this research study is to describe the games that motivate students the most from those considered to be least interesting. Previous research studies have not sufficiently tackled teachers' attitudes toward educational games, which is why this paper provides a comparison of teachers' and students' opinions on the use of educational games in teaching.

Materials and Methods

An experiment was conducted with both teachers and students to explore their attitudes to educational games designed by teachers. The part of the experiment that involved teachers as a target group entailed practical training on the creation of educational games, followed by a survey. The practical training for teachers, entitled "Using educational games in the classroom", was approved by the Institute of Education of Montenegro, and listed in the Catalogue for the Professional Training of Teachers for the school year 2015–2016 (Institute of Education of Montenegro, 2015). As many as 270 teachers from 8 Montenegrin primary schools underwent the practical training. Out of the said total number, 148 teachers (54.8%) teach classes to younger children between the ages of 6 and 11, whereas 122 of their peers (44.2%) teach pupils in the upper elementary grades between the ages of 11 and 15. After completing the training, the teachers went on to apply the skills for creating games in their classrooms. The teachers conveyed their attitude regarding the use of these games in teaching through a survey. After the classes involving educational games were delivered, the students who were learning through play were also surveyed. A total of 428 pupils were surveyed, 217 (50.08%) being those between the ages of 6 and 11, while 221 (49.02%) were pupils aged 11–15. The research involved students from city schools in Montenegro. The students who participated in the survey were of similar social status. A flowchart of the research process is presented in Figure 1.

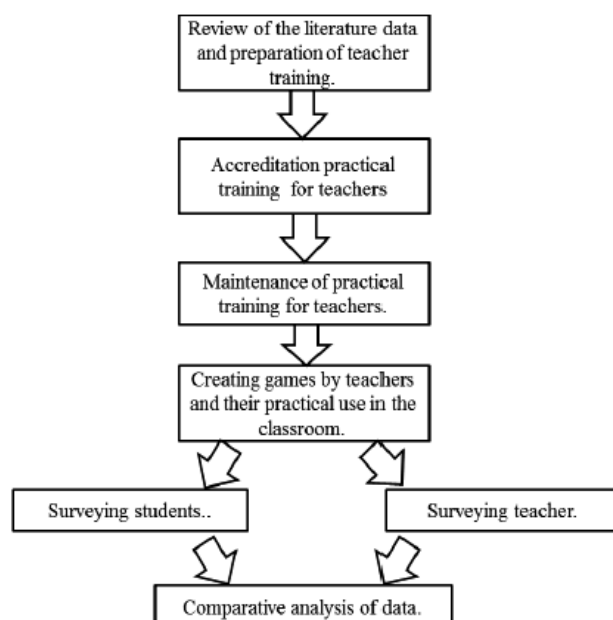


Figure 1: The layout of the research study stages.

Games used in the research

For the purpose of this research, the following educational games that teachers can create on their own were chosen: rebuses, anagrams, crosswords, word associations, memory games, quizzes and “Break the Wall”. Rebus is an educational game that engages students’ logical thinking, combinatorics, linking of concepts, and helps transform explicit into experiential knowledge. The solutions to rebuses are meaningful notions that are reached through conversion of characters and images into words. An anagram is a type of letter-rebus educational game which requires that a meaningful notion be figured out from an illogical combination of words. With crosswords, answers to questions are entered in a grid. Word association is an educational game in which an associative pattern between concepts leads to the solution to the game. A memory game requires students to locate and pair up several hidden notions, hidden notions with images or several associated images. A quiz is an educational game in which students opt for one of the offered answers to a question. An impact of quizzes in the teaching process is not clarified so far, so additional research in this direction is needed (Wang, Øfsdal, & Mørch-Storstein, 2009). “Break the wall” is a game in which an image is hidden behind a set of questions. With each correct answer, another brick gets torn down, thus uncovering a part of the image. The aim is to provide as many correct answers as possible, so as to unveil the entire image. The teachers were trained to use Microsoft PowerPoint for designing all of the abovementioned games, so that they could, at any point in time, independently design games and use them to achieve lesson goals.

The survey

The survey for teachers comprised 12 questions, 8 closed-ended and 4 open-ended questions. The closed-ended questions pertained to teachers’ evaluations of each game and its purpose as a motivational teaching aid, as well as its benefits and disadvantages. The games were rated on a scale of 1 to 5. In the open-ended questions, teachers were asked to write down suggestions on how to improve the use of educational games in classrooms, and on which parts of a class these games would be most suitable for. The survey for students contained 8 closed-ended questions in which students were to rate each game, as well as 4 open-ended questions asking for their suggestions for the further use of educational games.

Data processing

The results obtained through the study are presented in tables and a graph. Statistical processing of data involved calculation of the arithmetic mean of Likert values and correlation coefficients between teacher and student Likert returns. Likert results obtained served as input data for calculating Spearman’s correlation coefficient, and in this case, they represent the extent to which quantitative assessments provided by teachers match those provided by students. Finally, the said results were compared to other published findings by students. Finally, the said results were compared to other published findings.

Results and Discussion

Of the total of 270 teachers, 67 (23.7%) had already used the existing computer-based educational games in classroom teaching, whereas 203 (76.3%) had never used them. The survey has shown that 165 (61%) teachers find their schools to be technically equipped for the use of educational games in teaching, whereas 135 (39%) believe the opposite. The majority of teachers, 228 (84.4%), claim that they will be using educational games in classrooms on a regular basis, owing to the positive experience gained through such activities, whereas 42 (15.6%) say otherwise.

The opinions of teachers on self-made educational games used in the teaching process are presented in Table 1.

Table 1: Attitudes of teachers toward games as being a motivational factor (5=Excellent, 4=Good, 3=Average, 2=Below Average, 1=Poor)

Question:	Answers:									
	1		2		3		4		5	
	n	%	n	%	n	%	n	%	n	%
How would you rate educational games as a means for increasing students' motivation for the teaching process?	0	0	0	0	8	2.96	101	37.41	161	59.63
How would you rate the "associations" game as a means for increasing students' motivation for the teaching process?	0	0	0	0	3	1.11	89	32.96	178	65.93
How would you rate the "memory" game as a means for increasing students' motivation for the teaching process?	0	0	2	0.74	16	5.93	123	45.56	129	47.78
How would you rate the "quiz" game as a means for increasing students' motivation for the teaching process?	0	0	0	0	5	1.85	11	4.07	254	94.07
How would you rate the "Break the wall" game as a means for increasing students' motivation for the teaching process?	0	0	6	2.22	17	6.30	128	47.41	119	44.07
How would you rate the "anagram" game as a means for increasing students' motivation for the teaching process?	18	6.67	34	12.59	72	26.67	89	32.96	57	21.11
How would you rate the "rebus" game as a means for increasing students' motivation for the teaching process?	8	2.96	13	4.81	34	12.59	96	35.56	119	44.07
How would you rate the "crosswords" game as a means for increasing students' motivation for the teaching process?	9	3.33	17	6.30	54	20	124	45.93	66	24.44

The average grade that teachers have assigned to educational games serving as a motivational factor in teaching is 4.56. Out of a total of 270 teachers who have undergone training for self-made games to be used independently in the classroom, 161 (59.6%) found educational games to be a very good motivational tool, marking them with the highest grade. The lowest grade assigned to games as being a motivational tool was a Likert category of three (3), assigned by 8 or 2.96% teachers. These attitudes of the teachers are consistent with those expressed in previous research studies in this area (Gee, 2001; Kebritchi, Hirumi, & Bai, 2010; Liu & Chu, 2010; Woo, 2014; Yang, 2012). Students find learning through play to be very interesting,

giving it an average grade of 4.77. As many as 332 (77.57%) students rated the interest-triggering aspect of games with the highest grade, whereas 96 (22.42%) assigned the grade of four (4), being the lowest grade overall. Table 2 provides the review of students' opinion on games.

Table 2: Attitudes of students on the use of games in teaching
(5=Excellent, 4=Good, 3=Average, 2=Below Average, 1=Poor)

Question:	Answers:									
	1		2		3		4		5	
	n	%	n	%	n	%	n	%	n	%
How interesting do you find the use of games in classroom teaching?	0	0	0	0	0	0	96	22.43	332	77.57
How interesting do you find the "word association" game to be?	0	0	0	0	23	5.37	221	51.64	184	42.99
How interesting do you find the "memory" game to be?	0	0	0	0	0	0	156	36.45	272	63.55
How interesting do you find the "quiz" game to be?	0	0	0	0	28	6.54	157	36.68	243	56.78
How interesting do you find the "Break the wall" game to be?	0	0	12	2.80	0	0	223	52.10	193	45.09
How interesting do you find the "anagram" game to be?	0	0	0	0	2	0.47	134	31.31	292	68.22
How interesting do you find the "rebus" game to be?	29	6.78	56	13.08	12	2.80	243	56.78	88	20.56
How interesting do you find the "crosswords" game to be?	24	5.61	37	8.64	82	19.16	148	34.58	137	32.01

According to the teachers, the best motivation-triggering game is the quiz game, giving it the 4.92 score, while students rated it with 4.50. This educational game is a very good motivational tool in the teaching process, a conclusion that follows up on the results from the previous studies such as Wang, Øfsdal, & Mørch-Storstein (2008) and Anđić & Malidžan (2015). Teachers find anagrams to be least motivational, assigning an average grade of 3.47, whereas students described this game as a very interesting one, giving it a score of 4.68. The data from the relevant literature correlate with the students' opinion, describing anagram as a very good motivational tool (Deci, 1991; Melero & Hernández-Leo, 2014). The students surveyed found the rebus game to be least interesting, giving it an average score of 3.74 while the teachers' score was 4.12. Some research studies have shown that the rebus game helps pupils master the skill of reading in an interest-inducing manner (U.S. Department of Education, 2005).

For classroom teaching with educational games to be successful, a balance needs to be struck between the games that educators find to be motivational and those that students find to be appealing. By using a Spearman's rank correlations coefficient, a comparison of teachers' and students' ranks (1 to 5; $n=5$) frequencies is made for each game. This research reveals a high correlation between opinions of teachers and students when it comes to games such as quizzes, word associations, memory games and crosswords, the Spearman's correlation coefficient being $\rho=0.90$. A lower Spearman's coefficient of correlation between opinions of teachers and

students was recorded with rebuses, anagrams and “Break the Wall,” and amounts to $\rho=0.70$ or less. The overall correlation of opinions for each question is presented in Graph 1. The teacher-student responses Spearman’s correlation coefficient is fairly high, and its average value in this research amounts to $\rho_{avr}=0.85$.

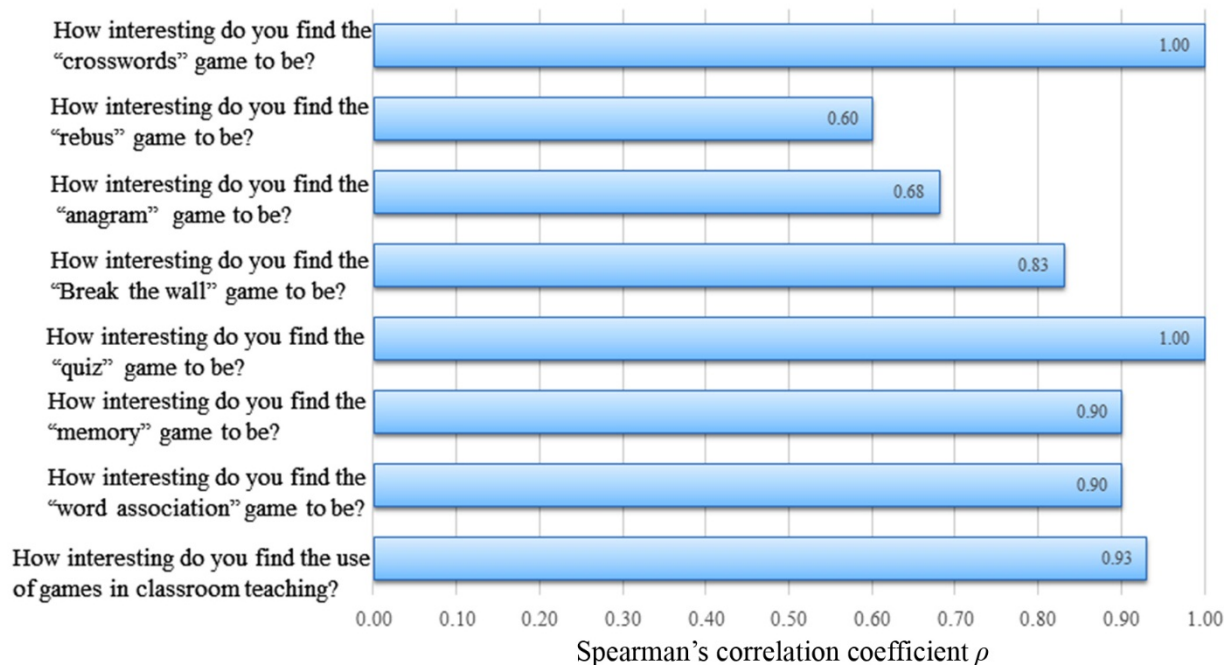


Figure 2: Educational games in teaching – the Spearman’s correlation coefficient ρ between opinions of teachers and students ($n=5$ for each game).

In the open-ended questions of the survey, students and teachers were to provide answers in their own words. When asked about the shortcomings of educational games in teaching, teachers stated the lack of IT equipment, preparation of games as being time-consuming, and computer illiteracy. The lack of IT equipment in schools in developing countries has been noted in the report “ICTs and Education” (UNESCO Institute for Statistics, 2006). The promotion of computer literacy and use of computers in teaching has been designated as one of the priorities in the report “Conclusions and recommendations to UNESCO and CEI” for the entire Southeastern Europe (UNESCO, 2006). The time-consuming preparation of games to be used in teaching has to do with the moderate computer literacy of teachers who underwent the training for designing games. Students do not see educational games as having any shortcomings whatsoever, and think they should be used as much as possible in classroom teaching. Both students and teachers believe that games can be used during any part of a single class, as well as both in the course of introducing a new lesson and while reviewing previous ones.

When asked about other ways to induce motivation with students, teachers mostly stated the use of computers, outdoor classes and more advanced teaching aids. In addressing the very same question, students responded with: classroom experiments, practical work and the use of computers. Both groups of respondents agree that use of computers in classrooms induces motivation as a number of papers have shown (Dale, 2008; Mellar et al., 2007; Strzebowski & Kleeberg, 2002; Turvey, 2006). Teachers also give preference to creating games themselves, as it is thus easier to tailor them to the lessons being taught, as well as to students’ capabilities,

whereas fewer teachers feel that ready-made games would be more suitable to them, mostly due to the reason of time-saving.

The Implications of Educational Games in the Teaching Process

Educational games impact positively on the teaching process and encourage greater motivation for learners for learning. Students have different attitudes about different games which significantly affect the success of the teaching process. Therefore, each teacher of the game should adapt primarily to the teaching content, but also to the students for whom the games are intended. In this way, it is likely to achieve the best pedagogical and educational benefits of educational games.

Conclusion

This research has shown that educational games serve as a solid motivational tool. In addition, there is a high level of correlation between opinions of teachers and students on educational games, with Spearman's correlation coefficient of $\rho=0.85$. The average grade that students assigned to educational games to be used in classroom teaching amounts 4.77, whereas teachers gave an average grade of 4.65. From the students' perspective, the best games used in classroom teaching are word associations, memory games, anagrams and quizzes, whereas crosswords and rebuses have been said to be least interesting. When comparing games that teachers create and adjust themselves with ready-made educational games, the preference has been given to the former, since teachers thus have the freedom to customize the games to the lessons being taught, as well as to students' capabilities. Future research studies should be directed toward the development of educational software that enable teachers to use games that are adapted to the material being taught and to students' capacities.

References

- Andić, B., & Malidžan, D. (2015). Educational game quiz as a motivational tool in the biological education. 6th International Symposium of Ecologists of Montenegro. Ulcinj, Montenegro, 15–18 October 2015.
- Chang, L.J., Yang, J. C., Chan, T. W., & Yu, F. Y. (2003). Development and evaluation of multiple competitive activities in a synchronous quiz game system. *Innovations in Education and Teaching International*, 40(1), 16–27.
<http://doi.org/10.1080/1355800032000038840>
- Dale, C. (2008). iPods and Creativity in Learning and Teaching: An Instructional Perspective. *International Journal of Teaching and Learning in Higher Education*, 20, 1–9.
- Deci, E. L., Vallerand, R. J., Pelletie, L. G., Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*, 26(3–4), 325–346.
http://dx.doi.org/10.1207/s15326985ep2603&4_6
- Entertainment Software Association. (2012). Essential facts about the computer and video game industry. Retrieved from www.theesa.com/facts/pdfs/ESA_EF_2012.pdf.
- Erikson, E.H. (1977). *Toys and reasons: Stages in the ritualization of experience*. New York, NY: Norton.
- Facer, K. (2003). *Computer games and learning*. Retrieved August 27, 2007, from http://www.futurelab.org.uk/resources/documents/discussion_papers/Computer_Games_and_Learning_discpaper.pdf
- Fisch, S. M. (2005). Making educational computer games "educational". In *Proceedings of the 2005 conference on interaction design and children* (pp. –61). Boulder, Colorado.
- Gee, J.P. (2001). Progressivism, critique, and socially situated minds. In C. Dudley Marling, & C. Edelsky (Eds.). *The fate of progressive language policies and practices* (pp. 31–58). Urbana, IL: NCTE,
- Groff, J., Howells, C., & Cranmer, S. (2010). *The impact of console games in the classroom: Evidence from schools in Scotland*. UK: Futurelab.
- Institute of Education of Montenegro (2015). Katalog programa stručnog usavršavanja nastavnika za školsku 2015/2016. godinu [Catalog of professional teacher training program for school 2015/2016 year].
- Ke, F. (2009). A qualitative meta-analysis of computer games as learning tools. In R. E. Furdig (Ed.), *Handbook of research on effective electronic gaming in education* (pp. 1–32). New York: IGI Global.
- Kebritchi, M., Hirumi, A., & Bai, H. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. *Computers & Education*, 55(2), 427–443. <https://doi.org/10.1016/j.compedu.2010.02.007>
- Kelly, H. (2005). Games, cookies, and the future of education. *Issues in Science & Technology*, 21(4), 33–40.
- Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward*. Cambridge, MA: The Education Arcade.
- Liu, M., & Rutledge, K. (1997). The effect of a “learner as multimedia designer” environment on at-risk high school students’ motivation and learning of design knowledge. *Journal*

- of Educational Computing Research, 16, 145–77. <https://doi.org/10.2190/27AT-YLJ3-3PVV-L0JY>
- Liu, T. Y., & Chu, Y. L. (2010). Using ubiquitous games in an English listening and speaking course: Impact on learning outcomes and motivation. *Computers & Education*, 55(2), 630–643. <https://doi.org/10.1016/j.compedu.2010.02.023>
- Lortie, D. C. (1975). *Schoolteacher*. Chicago: University of Chicago Press.
- Maehr, M. L. (1984). Meaning and motivation: Toward a theory of personal investment. In R. E. Ames, & C. Ames (Eds.), *Research on motivation in education* (pp. 115–144). New York: Academic Press, Inc.
- Melero, J., & Hernández-Leo, D. (2014). A model for the design of puzzle-based games including virtual and physical objects. *Educational Technology & Society*, 17(3), 192–207.
- Mellar, H., Kambouri, M., Logan, K., Betts, S., Nance, B., Moriarty V. (2007). *Effective teaching and learning: Using ICT*. Research report for NRDC. ISBN: 9781905188338.
- Menlo, A., & Low, G. T. (1988). A comparison of the sources of enthusiasm in teaching across five countries. Paper presented at the *Society for cross cultural research annual meeting*. Texas, USA.
- Namestovski, Z. (2013). *Analysis of the effects of applying educational software tools on pupils' and teachers' motivation level in primary schools*. (Unpublished doctoral dissertation). University of Novi Sad, Serbia.
- NPD Group (2011). The video game industry is adding 2-17-year-old gamers at a rate higher than that age group population growth. Retrieved October 03, 2016, from http://www.afjv.com/news/233_kids-and-gaming-2011.htm.
- Piaget, J. (1962). *Play, dreams and imitation* (Vol. 24). New York, NY: Norton.
- Prensky, M. (2002). The motivation of gameplay: The real twenty-first century learning revolution. *On the Horizon*, 10(1), 5–11. <https://doi.org/10.1108/10748120210431349>
- Prensky, M. (2003). Digital game-based learning. *ACM Computers in Entertainment*, 1(1), 1–4. <https://doi.org/10.1145/950566.950596>
- Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge, MA: MIT Press.
- Schwabe, G., & Goth, C. (2005). Mobile learning with a mobile game: design and motivation effects. *Journal of Computer Assisted Learning*, 21(3), 204–216. <https://doi.org/10.1111/j.1365-2729.2005.00128.x>
- Strzebkowski, R., & Kleeberg, N. (2002). *Interaktivität und Präsentation als Komponenten multimedialer Lernanwendungen*. In *Information und Lernen mit Multimedia und Internet*; BeltzPVU: Weinheim, Germany, 229–246.
- Turvey, K. (2006). Towards deeper learning through creativity within online communities in primary education. *Computers & Education*, 46, 309–321. <https://doi.org/10.1016/j.compedu.2005.11.004>
- U.S. Department of Education (2005). *Helping your child become a reader*. U.S. Department of Education Office of Communications and Outreach. Jessup, MD.
- UNESCO (2006). *Conclusions and recommendations to UNESCO and CEI*. Workshop on Information Literacy Initiatives for Central and South East European Countries.

- International Center for Promotion of Enterprises Ljubljana, Slovenia, March 27-28, 2006.
- UNESCO Institute for Statistics (2006). *ICTs and education indicators – Suggested core indicators based on meta-analysis of selected international school surveys*. Communication Statistics Unit UNESCO Institute for Statistics CP6128 Succursale Centreville Montreal H3C 3J7, Québec, Canada.
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological functions*. Cambridge, MA: Harvard University Press.
- Wang, A. I., Øfsdal, T., & Mørch-Storstein, O.K. (2008). An evaluation of a mobile game concept for lectures. In *Proceedings of 21st conference on software engineering, education and training* (pp. 197–204). IEEE Computer Society. <http://doi.ieeecomputersociety.org/10.1109/CSEET.2008.15>
- Wang, A. I., Øfsdal, T., & Mørch-Storstein, O.K. (2009). Collaborative learning through games characteristics, model, and taxonomy, Retrieved October 03, 2016, from <http://www.idi.ntnu.no/grupper/su/publ/alfw/LectureGameTaxonomyPaper.pdf>
- Woo, J. C. (2014). Digital game-based learning supports student motivation, cognitive success, and performance outcomes. *Educational Technology & Society*, 17(3), 291–307.
- Yang, Y. T. C. (2012). Building virtual cities, inspiring intelligent citizens: Digital games for developing students' problem solving and learning motivation. *Computers & Education*, 59(2), 365–377. <https://doi.org/10.1016/j.compedu.2012.01.012>

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