Proceedings of the International Conferences

MOBILE LEARNING

and

EDUCATIONAL TECHNOLOGIES

VIRTUAL 3 - 5 March 2021

Edited by
Inmaculada Arnedillo Sánchez
Piet Kommers
Tomayess Issa
Pedro Isaías

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international association for development of the information society

INTERNATIONAL CONFERENCES

ON

MOBILE LEARNING 2021

AND

EDUCATIONAL TECHNOLOGIES 2021

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Associate Editor: Luís Rodrigues

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FOREWORD

These proceedings contain the papers and poster of the 17th International Conference on Mobile Learning (ML 2021) and 8th International Conference on Educational Technologies (ICEduTech 2021), which were organised by the International Association for Development of the Information Society. Due to an unprecedented situation caused by the COVID-19 pandemic, this year the conference was hosted virtually during 3 to 5 March.

The Mobile Learning 2021 Conference seeks to provide a forum for the presentation and discussion of mobile learning research which illustrate developments in the field. In particular, but not exclusively, we aim to explore the theme of mobile learning under the following topics:

- Learning analytics and mobile learning
- Cloud computing and mobile learning
- Pedagogical approaches, models and theories for mLearning
- mLearning in and across formal and informal settings
- Strategies and challenges for integrating mLearning in broader educational scenarios
- User Studies in mLearning
- Learner mobility and transitions afforded by mLearning
- Socio-cultural context and implications of mLearning
- Mobile social media and user generated content
- Enabling mLearning technologies, applications and uses
- Evaluation and assessment of mLearning
- Research methods, ethics and implementation of mLearning
- Innovative mLearning approaches
- Tools, technologies and platforms for mLearning
- mLearning: where to next and how?

The Educational Technologies 2021 Conference is the scientific conference addressing the real topics as seen by teachers, students, parents and school leaders. Scientists, professionals and institutional leaders are invited to be informed by experts, sharpen the understanding what education needs and how to achieve it. The 2021 edition comprised a special theme: "COVID-19 Opportunities and Challenges for Teaching and Learning Innovation in a Global Pandemic".

Other topics for this conference were:

- **Education in Context:** Education in the Network Society, Educational Games, Social Media in Education, Home Schooling, Students' Rights, Parents' Rights, Teachers' Rights, Student-Safe Searching, School Violence, Education and Tolerance for Peace and Education in Developing Countries.
- **Education as Professional Field:** Teacher Education, Teachers' Professional Development, Teachers' Workload, Teacher Support for Grading, Time Tabling, Grading, Learning Tools, and Online Learning Software, Teachers' learning in Communities of Practice, Web-based Communities for Teacher Support, Teachers'

Career Planning, Legal and Financial Issues, Conflict Resolution and Mediation, Governance and Servant Leadership and Educational Policies.

- **Curricular Evolution:** Problem-based Learning, Critical Thinking Skills, Creativity Skills, Learning Citizenship, Global Education, Media Literacy / Pedagogy, Multicultural Education and Alternative Assessment Methods.
- **Learner Orientation:** Student-Oriented Learning, Peer- and Collaborative Learning, Learning Strategies: Learn how to Learn, Motivating Students, Recognizing Students' Learning Styles and Special Education.
- **Integrating Educational Technologies:** Social Media and Social Networking, The Semantic Web 3.0, Podcasting for Broadcasting Video Lectures, Podcasting feedback to students, Wiki and blogs in Higher Education, Mobile, Virtual and Vicarious Learning and Simulations and Modeling.
- **International Higher Education:** Marketing Higher Education as a Business Case, Pitfalls and Solutions in Joint and Double Degree Programs, Enculturation and International Teacher Accreditation, Web-based, Mobile, Virtual Presence and Social Media to Overcome Student Mobility, Blended Learning and Student Assessment at a Distance, Student Mobility and Distance Education, New-Emerging Standards and Benchmarks for Higher Education, Education, Research, Exchange an Capacity Building, 21st Century Academic and Industrial Brain Exchange, Academic Salaries, Faculty Contracts, Residence Permits and Legal Issues, International Student Exchange Funding Programs: Erasmus Mundus, the U.S. Council on International Educational Student Exchange, and the Euro-American "Atlantis" program, Networks for International Higher Education in the Pacific, Australia, Europe, Asian and European countries and Higher Education, Cultural Diversity, Tolerance and Political Conflict.

These events received 119 submissions from more than 21 countries. Each submission has been anonymously reviewed by an average of 4 independent reviewers, to ensure that accepted submissions were of a high standard. Out of the papers submitted, 21 received blind referee ratings that signified acceptability for publication as full papers (acceptance rate of 18%). A few more papers were accepted as short papers, reflection papers, doctoral paper and poster. An extended version of the best papers might be considered for the publication in the Interactive Technology and Smart Education (ITSE) journal (ISSN: 1741-5659), IADIS International Journal on WWW/Internet (ISSN: 1645-7641) and IADIS Journal on Computer Science and Information Systems (ISSN: 1646-3692). Authors of selected papers from ICEduTech 2021 will be invited to extend their papers into book chapters to be published in a book from IGI Global.

Besides the papers' presentations, the conferences also feature three keynote presentations from internationally distinguished researchers. We would therefore like to express our gratitude to Professor John Traxler (Professor of Digital Learning, University of Wolverhampton, UK); Professor Yiyu Cai (Nanyang Technological University (NTU), Singapore) and Professor Johannes Cronjé (Dean of Informatics and Design, Cape Peninsula University of Technology, South Africa) for accepting our invitation as keynote speakers. These events also feature a Special Talk presented by Professor Cathie Norris (Regents Professor, Co-Director, Center for Digital Curricula, University of North Texas, Denton, TX, USA) and Professor Elliot Soloway (Arthur F. Thurnau Professor, Co-Director, Center for Digital Curricula, University of Michigan, Ann Arbor, MI, USA).

A successful conference requires the effort of many individuals and this year we faced a new challenge that brought us more together. We would like to thank the members of the Program Committees of both conferences, for their hard work in reviewing and selecting the papers that appear in this book. We are especially grateful to the authors who submitted their papers to these conferences and to the presenters who provided the substance of the meeting. We wish to thank all members of our organizing committee.

Last but not the least, we hope that everybody enjoyed the presentations and we invite you all to next edition of the International Mobile Learning Conference and International Conference on Educational Technologies.

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March 2021

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AI-ENABLED GAMIFICATION FOR LEARNING
AND ASSESSMENT

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ABSTRACT

Games and gamification can potentially inform and transform learning by providing meaningful and engaging learning environments. The application of Artificial Intelligence (AI) algorithms and systems in education is envisaged as an opportunity to provide students with adaptive and personalized learning, especially in the context of mobile learning and assessment. However, such endeavors highly contrast with the provision of standardized test-driven curricula, which continue to force assessment practices to endure a meagreness of pedagogical innovation and transformation (Perrotta and Whitelock 2017) and which remain the fixation of formal educational institutions (Hazelkorn 2014). This short paper comprises of the initial theoretical framework for a proposed academic research, which seeks to critically analyze the traditional quantification of learning and the processes for measuring and certifying academic achievement, in view of a more adaptive, personalized and engaging learning and assessment experience, put forth and underpinned by gamification and AI. Consequently, the main research question that will be addressed is: What is the effect of AI-powered gamification on students' learning and assessment experience? A mixed-methods approach involving both qualitative and quantitative data at different stages of the research will be adopted. A number of distinct data sources will be targeted, including students, educators, game designers and AI scientists. The proposed research, has the potential to contribute new and original insights to the body of knowledge and practice in the fields of Gamification and Artificial Intelligence, whilst providing a solid foundation for future academic studies.

KEYWORDS

Learning, Assessment, Gamification, Artificial Intelligence

1. INTRODUCTION

Early influential scholars and academics in the field of psychology and education have closely linked play and games to cognitive development and learning (Bruner 1983, Dewey 1910, Piaget 1962, Vygotsky 1978). This has nourished the professional interest of educators in using games for educational purposes (Dingli et al 2013, Gee 2017, Steinkuehler 2016, Wernbacher et al 2020), as the native game environments, including gameplay and game mechanics, have begun to resemble and support prime learning contexts (Camilleri et al 2017, Franco & DeLuca 2019). Similarly, Artificial Intelligence (AI) has lately risen to the fore as an emerging technology underpinned by autonomous and adaptive functions, which are capable of providing personalized education in view of 'the persistent and unsolved challenges of learning in the 21st century' (Luckin et al 2016, p 51), especially in the context of mobile learning and assessment (Liu et al 2010).

This short paper comprises of the initial theoretical framework for a proposed academic research, which seeks to critically analyze the traditional quantification of learning and the processes for measuring and certifying academic achievement, in view of the adaptive and personalized learning and assessment, underpinned and put forth by gamification and AI, in a truly anytime anywhere context. Such endeavors highly contrast with the provision of standardized test-driven curricula, which continue to force assessment practices to endure a meagreness of pedagogical innovation and transformation (Perrotta and Whitelock 2017) and which remain the fixation of formal educational institutions (Hazelkorn 2014).

2. GAMIFICATION AND ARTIFICIAL INTELLIGENCE

The broad use of games in teaching and learning, defined as and exemplified in game-based learning (Homer et al 2020), has resulted in the design and development (Dingli and Seychell 2015) and actual deployment of games in education (Panoutsopoulos and Sampson 2012, Sykes 2018). Research suggests that, potentially, digital games and other game-based methods can support and allow for higher cognitive gains and improved attitudes towards learning than traditional didactic methods (Posso 2016). In recent years, games have also seen their adoption in education materialize on a novel conceptual dimension. The theoretical basis underpinning the term gamification or the 'use of game design elements in non-gaming contexts' (Deterding et al 2011, p 1), moves away from the deployment of actual games in learning contexts but instead focusses on the use of specific design elements, including game mechanics and thinking to engage and solve problems (Pfeiffer et al 2020). Initial empirical research on the utilization of gamification in education suggests positive effects on students' engagement and motivation (Kingsley and Grabner-Hagen 2015, Leaning 2015). On the other hand, critics argue that gamification largely relies on basic reward systems like points, badges and leaderboards which simplify and exploit game design elements, resulting in a false sense of achievement (Woodcock and Johnson 2018). The relationship between gamification and cognitive development and learning remains largely unexamined as the limited empirical evidence existing with respect to gamification in education is mostly related to students' motivation and engagement (Alsawaier 2018, Jayalath and Esichaikul 2020).

As an interdisciplinary field, AI has been adopted to diverse contexts, ranging from healthcare, criminology to linguistics and education (Canbek and Mutlu 2016). Over the last twenty years, the field of AI in Education (AIEd) has undergone important developments in areas such as grading automation, adaptation to students' needs, predictive analysis of students' learning, differentiation and personalization of learning activities, real-time learning analytics, anytime-anywhere support from AI tutors and targeted individualized feedback (Dingli and Montaldo 2019, Montebello 2018, Roll and Wylie 2016). The application of AI algorithms and systems in education continues to gain momentum. As such, as a prominent emerging technology that is pushing new boundaries in the educational sector, AI has the potential to improve the overall quality of teaching and learning (Chen et al 2020). However, notwithstanding that various AIEd systems have been developed over the years, limited scientific evidence of the impact on the quality of learning is available (Canbek and Mutlu 2016).

In the context of mobile learning and assessment, continued access to a motivating and engaging educational environment, which provides students with personalized and adaptive learning is even more crucial for the holistic learning and assessment experience. As such, the proposed research will investigate the use of machine learning and behavioral analytics to improve the overall gamification experience of students learning and assessment. Through the build of intrinsic motivation, this will be aimed at improving the students' cognitive learning, whilst gaining insights and anticipating risks, by allowing for dynamic learning objectives, feedback and rewards (amongst others), underpinned by AI.

3. AIM AND RESERCH QUESTION

The aforementioned conceptual and pragmatic novelties in education contrast with the paucity of pedagogical and technological innovation that traditional assessment modes and practices have continued to suffer along the years (Perrotta and Whitelock 2017). The ability of games to resemble active and constructivist learning environments (Homer et al 2020) and the potential of AI in education to power teaching and learning (Luckin et al 2016) can possibly transform assessment tasks into a more authentic, situated and experiential form of assessment for learning (Bezzina 2019, Mohamed and Lebar 2017). However, due to the fairly novel pedagogical models underpinned by gamification and AI, specifically in the field of learning and assessment, extremely limited empirical evidence exists regarding the effectiveness, especially in terms of pre-defined learning outcomes (Attali and Arieli-Attali 2015). As such, the aim of the proposed research is to constructively align gamification and AI to digital assessment, in order to provide a more personalized and adaptive assessment experience for students.

Consequently, the main research question that will be addressed is: What is the effect of AI-powered gamification on students' learning and assessment experience? In order to investigate how gamification and AI can potentially inform the learning and assessment practices and effectively improve the overall students' assessment experience, this overarching question will be further broken down into four research questions. More specifically, the research project will seek to answer the following:

(Q1) How are educators conducting learning and assessment?

(Q2) How are educators using gamification and AI for learning and possibly assessment practices?

(Q3) What are the principles of learning and assessment found in gamification and AI, which could potentially inform assessment practices?

(Q4) Does an AI-powered gamification approach to learning and assessment improve students' satisfaction, engagement and cognitive learning?

4. METHODS

A mixed-methods approach involving both qualitative and quantitative data at different stages of the research will be adopted. A number of distinct data sources will be targeted, including students, educators, game designers and AI scientists. Initial data in the first part of the research, will involve preliminary interviews with a small, purposive sample of educators on the themes of learning and assessment, gamification and AI. Data elicited from these interviews will be used to create a survey aimed at a wider audience of educators. This will investigate the different ways in which educators are conducting learning and assessment in their own contexts (Q1) and more importantly, will examine the use of gamification and AI for learning and possibly assessment practices (Q2). In the second phase of the first part of the research, another round of interviews, again with a small, purposive sample of educators and the inclusion of a sample of game-designers and AI scientists will be held. These will examine the views of the interviewees on the principles of learning and assessment found in gamification and AI and how these could potentially inform assessment practices. This will serve as the basis for another survey, again aimed at educators (Q3).

In the second part of the research, the resulting data from Q1, Q2 and Q3 will be quantitatively evaluated through the capacity of AI-powered gamification approach to act as a catalyst for improvement in the students' learning and assessment experience, in terms of satisfaction, engagement and cognitive learning (Q4). The latter will be operationally defined as the score or grade obtained on standardized tests measuring the different levels of the cognitive domain set by Bloom's taxonomy of educational objectives (Bloom 1956). This will be achieved through a switching replications quasi-experimental design (Trochim 2001). This type of non-equivalent group design allows for the lack of random assignment of the two intervention groups and is built on two phases and 3 stages of measurement. Both groups of students start with a pre-test on the constructs of interest. As such, a survey attesting students' satisfaction and engagement in digital assessment practices, together with a standardised test measuring students' cognitive learning will be administered to all participants. One group will then act as the control for the experimental group. At the end of the AI-powered gamification intervention, both groups will be post-tested on the respective constructs. In the second phase of the design, the groups switch their functions (the control group becomes experimental and vice-versa) and again, both groups are post-tested on the same constructs. This research design is very strong with respect to internal validity and may enhance external validity and reliability, while being one of the most ethically just and unbiased quasi-experiments since all participants receive the educational intervention (Trochim 2001). Thematic analysis will be used to analyse the data resulting from the interviews, while the surveys' data will be analysed in SPSS (IBM 2010) using frequency and crosstabs analysis, while a reliability-corrected analysis of covariance (ANCOVA) (Trochim 2001) will determine whether there are any statistically significant differences, including effect size, between the means of the scores for the constructs of interest (satisfaction, engagement and cognitive learning), between the two groups, attributed to the educational intervention.

5. CONCLUSION

The proposed research, based on the author's personal and professional development interests, has the potential to contribute new and original insights to the body of knowledge and practice in the fields of Gamification and Artificial Intelligence. The critical evaluation of the innovative application of AI-powered gamification to learning and assessment is aimed to inform and influence future thinking and practice in the respective scholarly areas. Although not immediately generalizable, the theoretical and empirical stances of the proposed research are aimed at a paradigm shift in formative assessment conceptualizations and practice, while providing a solid foundation for future academic studies.

REFERENCES

Alsawaier, R. S., 2018. The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology*.

Attali, Y. and Arieli-Attali, M., 2015. Gamification in assessment: Do points affect test performance? *Computers & Education,* Vol 83, pp 57-63.

Bezzina, S., 2019. Games, Design and Assessment: How Game Designers are Doing it Right. *European Conference on Games Based Learning* Odense, Denmark, pp 67-73.

Bloom, B. S., 1956. *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. David McKay Co Inc, New York, USA.

Bruner, J., 1983. Play, thought, and language. *Peabody Journal of Education* Vol. 60, No. 3, pp 60-69.

Camilleri, V. et al, 2017. Games and Citizen Engagement: Towards Democracy 3.0. In *World of Games 360° - Anthology of the Center for Applied Games Research*. Danube University Krems.

Canbek, N.G. and Mutlu, M.E., 2016. On the track of artificial intelligence: Learning with intelligent personal assistants. *Journal of Human Sciences* Vol. 13, No. 1, pp 592-601.

Chen, L. et al, 2020. Artificial Intelligence in Education: A Review. *IEEE Access* Vol 8, pp 75264-75278.

Deterding, S. et al, 2011. Gamification. using game-design elements in non-gaming contexts. In *CHI '11 Extended Abstracts on Human Factors in Computing Systems*. New York, USA, pp 2425-2428.

Dewey, J., 1910. *How We Think*. MA: D.C. Heath & Co, Boston, USA.

Dingli, A. et al, 2013. Games in the classroom. *ICERI2013 Proceedings*, pp 2846-2852.

Dingli, A., Montaldo, L., C., 2019. Aspects of an Artificial Intelligence Assisted Learning (AIAL) System, In *Embracing Digital Learners in an Age of Global Educational Change and Rapid Technological Advancements* (IGI Global): pp 317-338.

Dingli, A., Seychell, D., 2015. *The New Digital Natives: Cutting the chord.* Springer, Berlin, Germany.

Franco, P. F. and DeLuca, D. A., 2019. Learning through action: Creating and implementing a strategy game to foster innovative thinking in higher education. *Simulation & Gaming* Vol 50, No 1, pp 23-43.

Gee, J.P., 2017. Affinity spaces and 21st century learning. *Educational Technology* pp 27-31.

Hazelkorn, E., 2014. Reflections on a Decade of G lobal Rankings: what we've learned and outstanding issues. *European Journal of Education* Vol 49, No 1, pp 12-28.

Homer, B. D. et al, 2020. Games as Playful Learning: Implications of Developmental Theory for Game-Based Learning. In *Handbook of Game-Based Learning*. J. L. Plass, R. E. Mayer and B. D. Homer (Eds.) MIT Press, Cambridge, USA, pp 25-52.

Jayalath, J. and Esichaikul, V., 2020. Gamification to Enhance Motivation and Engagement in Blended eLearning for Technical and Vocational Education and Training. *Technology, Knowledge and Learning* pp 1-28.

Kingsley, T. L. and Grabner-Hagen M. M., 2015. Gamification: questing to integrate content, knowledge, literacy, and 21st-century learning. *Journal of Adolescent & Adult Literacy* Vol 59, No 1, pp 51-61.

Leaning, M., 2015. A study of the use of games and gamification to enhance student engagement, experience, and achievement on a theory-based course of an undergraduate media degree. *Journal of Media Practice* Vol 16, No 2, pp 155-170.

Liu, Q., Diao, L. and Tu, G., 2010. The application of artificial intelligence in mobile learning. In *2010 International Conference on System Science, Engineering Design and Manufacturing Informatization* Vol 1, pp 80-83.

Luckin, R. et al, (2016). *Intelligence unleashed: An argument for AI in education*. Pearson, London, UK.

Mohamed, R. and Lebar, O., 2017. Authentic assessment in assessing higher order thinking skills. *International Journal of Academic Research in Business and Social Sciences* Vol 7, No 2, pp 466-476.

Montebello, M., 2018. *AI Injected e-Learning*. Springer, Switzerland.

Panoutsopoulos, H. and Sampson, D, 2012. A study on exploiting commercial digital games into school context. *Educational Technology and Society* Vol 15, No 1, pp 15-27.

Perrotta, C. and Whitelock, D., 2017. Assessment for learning. In *Technology Enhanced Learning*. Springer, Cham, Switzerland, pp 127-135.

Pfeiffer, A. et al, 2020. Beyond Classical Gamification: In-and Around-Game Gamification for Education. In *Proceedings of the 19th European Conference on E-Learning*. C. Busch, M. Steinicke and T. Wendler (Eds). University of Applied Sciences HTW, Berlin, Germany, pp 415-420.

Piaget, J., 1962. *Play, Dreams and Imitation in Childhood*. Norton, New York, USA.

Posso, A., 2016. Internet usage and educational outcomes among 15-year old Australian students. *International Journal of Communication* Vol 10, p 26.

Roll, I. and Wylie, R., 2016. Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education* Vol 26, No 2, pp 582-599.

Steinkuehler, C., 2016. Videogames as a serious medium. *On the Horizon* Vol 24, No 2, pp 175-178.

Sykes, J.M., 2018. Digital games and language teaching and learning. *Foreign LanguageAnnals* Vol 51, No 1, pp 219-224.

Trochim, W. M. K., 2001. (2nd ed.) *Research Methods Knowledge Base*. Atomic Dog Publishing, Ohio, USA.

Vygotsky, L. S., 1978. *Mind in Society*. Harvard University Press, Cambridge, USA.

Wernbacher, T. et al, 2020. Create Digital Games for Education: Game Design as a teaching Methodology. In *Proceedings of ICERI2020 Conference* Vol 9, pp 10-16.

Woodcock, J. and Johnson, M. R., 2018. Gamification: What it is, and how to fight it. *The Sociological Review* Vol 66, No 3, pp 542-558.

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