Co-Designing Visual Novels in Literary Education Classes: Instruments for Measuring Learner Engagement

Cláudia Silva[1], Marlene Migueis[1] and Filipe Moreira[2]
[1]Research Centre on Didactics and Technology in the Education of Trainers (CIDTFF), Department of Education and Psychology (DEP), University of Aveiro (UA), Portugal
[2]Polytechnic Institute, Guarda, Portugal

claudiaesilva@ua.pt
mmigueis@ua.pt
filipertmoreira@ua.pt

Abstract: Immersive didactic resources have been gaining popularity, with researchers and educators seeking to align their practices with students' affinity for technology. Digital Game-based Learning (DGBL) has emerged as a promising learning opportunity, occupying a prominent place in the global discussion about the modernisation of education. This stems from the benefits of educational video games, namely their ability to foster learner engagement, an igniter of meaningful learning experiences. Nonetheless, their use and rigorous assessment in Humanities subjects, in interventions where secondary education students co-design didactic material, remain a gap in current investigation. There is also a tendency for research to describe standardised instruments for each subject. As such, this study seeks to describe instruments specifically created to assess students' level of engagement in co-designing a type of story-driven video games – Visual Novels – in the context of Literary Education. The underlying goal is to present tools that evaluate actions devoted to engaging students in a domain which is often perceived as demotivating. The resulting instruments will be used in a case study aimed at fostering Portuguese secondary education learners' engagement in Literary Education by having them co-design educational Visual Novels inspired by a Portuguese classic literary work, "Os Maias" by Eça de Queirós. To meet our goals, we subjected two questionnaires (pre- and post-intervention) and a class observation grid to a qualitative analysis. We considered the feedback of a multidisciplinary team of experts and implemented their suggested changes. Afterwards, we conducted a pretest of the first questionnaire with a sample of students, obtaining their feedback and calculating Cronbach's alpha for measuring reliability. The second questionnaire, identical to the first but centred on the upcoming video game intervention was not pretested. Experts and students' perspectives suggested a favourable appraisal of the instruments, while contributing to its improvement. Concerning the questionnaire, the Cronbach's alpha obtained is above 0.7, implying a high level of consistency among items. By making these instruments available, we endeavour to promote more efforts of implementation of rigorously designed activities destined to the co-design of video games in the field of Humanities.

Keywords: Instruments' validation, Educational visual novels, Co-Design, Secondary education, Literary education

1. Introduction

The intersection between technology and education is transforming teaching practices, challenging traditional methods through innovative and digital approaches. In this context, educational video games have emerged as promising tools to enhance student engagement, fostering interactive learning experiences. Among them, Visual Novels, a genre of narrative video games, stand out for their potential to bring students closer to literature, offering them an active role in shaping and transforming stories.

Considering this reality, the present study aims to validate instruments to be used in a case study, inserted in a doctoral project centred on designing educational Visual Novels as a strategy to promote engagement in Literary Education among secondary education students (with ages ranging from 15 to 17). Acknowledging the central role of affect in learning, with engagement at its core, and the need to adapt school practices to the reality of the new generation, increasingly linked to technology, we seek to evaluate a process for creating authentic digital materials, in a way that reflects students' interests while improving their attitudes towards a field commonly seen as demotivating.

Despite the popularity of video games as educational resources, empirical studies aimed at finding rigorously built or adapted instruments that measure the impact of these immersive technologies on the affective dimension of learning remain scarce, especially in the field of Humanities.

In Literary Education, where it is essential that the methods and objects of teaching reflect the advances that have revolutionised society and the ways we now consume literature, it makes special sense to organise activities centred on video games, as they are favourable to exercising one's critical spirit, creativity and aesthetic fruition. However, it is crucial to use reliable tools to assess their potential and ensure a meaningful and engaging learning experience.

The instruments this study describes draw on validated engagement scales (e.g., Flow State Scale, Four-Dimensional Scale) to address the specificities of co-designing Visual Novels within Literary Education. Nonetheless, by incorporating Humanities-related concepts, they are transferable to other subjects of that domain. Likewise, the instruments are adaptable to activities involving other narrative game genres that emphasise storytelling, role-play, and choice-making.

2. Theoretical Framework

In this section, we elucidate the structuring concepts of our study. We also refer to instruments that have already been validated, which served as a basis for the surveys and class observation grid created.

2.1 Co-Design of Educational Visual Novels: Potentialities for Literary Education

Visual Novels are a genre of narrative video games resembling digital books, which offer an interactive and immersive experience (Camingue et al, 2020). When playing a Visual Novel, the player takes on the role of the protagonist of a story, responsible for making decisions and solving challenges, which mark a sequence of events, graphically represented through scenarios and dominated by text (in the form of descriptions and dialogues). This story appears in parallel with other graphic elements – the characters and clickable objects, for example – evolving according to the player's behaviour (Øygardslia et al, 2020).

When designed for pedagogical purposes, Visual Novels qualify as educational or serious video games. Practices based on the use of these resources correspond to DGBL – Digital Game-based Learning – a concept proposed by Prensky (2001). Since then, this notion has been enriched by empirical, more current and comprehensive approaches, recognising the risk associated with the use of the term "digital native", introduced by the author, to name the members of Generation Z (Khan et al, 2017).

Indeed, despite their high degree of exposure to technology and preference for using it, this does not necessarily translate into digital proficiency (Ball et al, 2020). To acquire such skill, it is important to be inserted in contexts which cultivate attitudes and knowledge conducive to the effective, creative and responsible use of technology.

In turn, the collaborative design of digital artifacts is an innovative practice, favourable to the development of skills of co-negotiation of meaning, self-regulation of learning, creative problem solving and interpersonal skills (Thumlert et al, 2018). According to Järvenoja et al (2020), collaborative learning helps students to assess their understanding of an activity, and the contents inherent to it, as a team. This allows them to find solutions to possible issues, while discerning the best ways to act, in terms of maintaining their enthusiasm for learning.

Designing educational Visual Novels for learning literature is of special significance, as narrative video games share characteristics with literary works. As a distinctive trait, they have an interactive and agentive character, since the way the narrative evolves in Visual Novels depends on the player's interaction with the game. This results in a rewarding reading experience, promoting learner engagement.

Engagement, as defined by Csikszentmihalyi (1990), is a driving force for learning, as it enables students to immerse themselves in a task recognised as relevant and pleasurable. Knowing that they will be rewarded with enjoyment and opportunities for personal development, during an arduous activity, helps to carry out time-consuming and complex cognitive exercises, such as abstraction and the discovery of hidden meanings, actions that characterise the act of reading (Calvino, 2015). As explained by Glessner and Olufemi, (2019), engagement leads to effective learning experiences, as it is characterised by joyful feelings stemming from “a potpourri of minds-on and hands-on activities […] beyond mere completion of worksheets” (p. 1). For Shernoff et al (2014), who delved into optimal learning in high school contexts, “if engagement with learning arises from the reciprocal interaction between learners and a learning environment […] then teachers’ potency to engage students may lie in their ability to create, shape, and influence the whole learning environment” (p. 167).

Thus, one can infer the advantages of integrating in a complex area such as Literary Education, which many students face with disinterest, initiatives that encourage them to be active, by creating and interacting with resources while learning. This is conducive to a continuum of cognitive and affective investment in the subject, which prevents students from giving up when tasks become challenging. Given this, promoting the co-design of Visual Novels to increase engagement, by encouraging teamwork and valuing students’ interests and agency, allows to build effective didactic material, which results in optimal learning environments.

2.2 Instruments Dedicated to Measuring Engagement in Literary Education

According to Nkomo and Nat (2021), most research assessing engagement in using educational digital tools describes standardised instruments for each subject. Furthermore, they tend to focus on student behaviour and do not combine instruments and techniques for assessing engagement, which jeopardises rigour. The instruments we built aim to address that gap, while intersecting concepts specific to Literary Education, such as aesthetic fruition and written comprehension, with characteristics of educational video games (their interactivity and multisensorial nature, for example) and collaborative game making. These tools will be used in a study case aimed at measuring engagement stemming from co-designing Visual Novels inspired by an important work by Eça de Queirós, "Os Maias". For consultation and adaptation, an English translation of the instruments is available: https://shorturl.at/N62o4. The table below summarises the structure of the survey, the instrument we pretested, including the studies which informed it and examples of questions or scale items:

Table 1: Summary of the structure, constructs to be assessed and samples of questions/items characterising the pre-intervention survey

Sections of the survey	Constructs to assess	Type of questions	Examples of questions/items
My engagement in classes dedicated to Literary Education	Learner engagement, based on the "Four-Dimensional Scale of Student Engagement at School scale" (Silva et al, 2016) and "The Flow State Scale" (Csikszentmihalyi, 1990; Jackson and Marsh, 1996)	7-point Likert scales	Cognitive dimension: "I identify the themes and messages present in the works I am studying with ease"
			Affective dimension: "My perception of time changes when I do activities centred on narrative texts (time passes more slowly or faster)"
			Behavioural dimension: "I follow the teacher's instructions in classes dedicated to Literary Education"
			Agentive dimension: "I like it when I can choose what Literary Education activities to do"
My habits, preferences and perceptions related to video games	Perceptions and habits related to narrative video games (Alrajhi, 2020)	Multiple choice	"What types of narrative video games do I like to play?"
	Perceptions of educational video games (Fu et al, 2009) and their compatibility with Literary Education (Silva et al, 2023)	7-point Likert scales	"Video games can make learning fun and engaging/immersive"
			"Narrative video games can be used to learn about narrative texts, as both tell a story"
	Perceptions of designing educational video games and collaborative work (Järvenoja et al, 2020; Thumlert et al, 2018)	7-point Likert scales	"It is more fun to carry out activities centred on narrative works in a group, with the possibility of interacting and talking with colleagues"

The survey, whose administered online version is two-pages, comprises 11 questions, divided into two sections. The first contains 7-point Likert scales relating to the multidimensional nature of engagement. These categories, extracted from the "Four-Dimensional Scale of Student Engagement at School (EAE-E4D)" (Silva et al, 2016), include items that range from the cognitive work dedicated to achieving a task (cognitive dimension) to the emotional relationships established with the activities, the teachers who promote them and the colleagues with whom the student collaborates (affective dimension). The scales also cover the behaviours manifested by students (positive or disruptive) – behavioural dimension – as well as the degree of initiative they exhibit – agentive dimension (Veiga and Abreu, 2014). Although this system of classifying engagement pertains to the experiences inside and outside the classroom, we decided to apply it exclusively to classroom activities, to ensure greater adequacy to our project.

From the definition of engagement proposed by Csikszentmihalyi (1990), later used on a scale – The Flow State Scale (Jackson and Marsh, 1996) – we derived characteristics such as the balance between students' abilities

and the level of challenge of the task they are fulfilling ("I carry out activities on a narrative work autonomously, without significant difficulties"), as well as the level of immersion in a task ("When I read or study a narrative work, I imagine myself experiencing the adventures of the characters"). Other items correspond to reported changes in their perception of time ("My perception of time changes when I do activities centred on narrative texts") and a sense of intrinsic reward ("I do not feel rewarded on a personal level when I successfully perform activities centred on narrative works"). We opted for first-person phrasing and 7-point Likert scales to guarantee relatability and a nuanced range of responses, improving data quality (Kusmaryono et al, 2022).

As for the second section of the questionnaire, it features three multiple-choice questions, based on a survey by Alrajhi (2020), aimed at ascertaining students' perceptions concerning educational video games. Such questions deal with students' contact with narrative video games; the time they dedicate to them and the genre they prefer. This is followed by four Likert scales. The first, informed by the concept of "egameflow" by Fu et al (2009), refers to the "the learner's cognition of enjoyment during the playing of e-learning games" (p. 111). It determines whether students consider that video games can be effective and immersive learning tools, as seen in the item "Video games can be educational if their design is appropriate for the established learning goals". The second scale, which determines whether, from students' perspective, learning based on narrative video games is compatible with Literary Education, is anchored in the premise that video games can elevate the reading experience by materialising plots "through the use of written text, sounds and imagery, which give video games a multimodal and diegetic nature" (Silva et al, 2023). The item "Narrative video games contain aspects (visual, interactive, sound-related) that generate immersion/engagement in learning" is illustrative of this idea.

The third and fourth scale gauge students' interest in video game design, their perception of activity's relevance and students' predisposition towards collaborative work. To build those, we resorted to Thumlert et al (2018), who address the importance of designing artefacts with value for the makers ("It is rewarding to know that I am responsible for designing a creative and educational digital resource") and Järvenoja et al (2020), who describe high-order thinking skills enriched by teamwork, such as problem-solving ("Exchanging ideas with colleagues increases my problem-solving skills").

The post-intervention questionnaire is similar to the pre-intervention survey, replacing, however, "narrative video games" with "educational Visual Novels" (now familiar to participants) while removing gaming-habit questions. To triangulate data, we also created a yes/no observation grid, from the researcher's standpoint, to be administered before the game making intervention. Based on the described survey's first section, its items concern engagement dimensions. Throughout the activities, where participant observation will take place, we plan to make descriptive field notes.

3. Methodology

To assess the reliability (the consistency of a test's results) and validity (the accuracy of the test's object and its ability to measure it) of the data collection instruments to be used (Furr, 2017), we followed the steps of a pretest (Hashim et al, 2022).

3.1 Validation of the Instruments by Experts

Both questionnaires and class observation grid were sent to four experts in the areas that our project combines: Literary Education, Educational Psychology and Educational Technologies. The goal was to compare their opinions to obtain a comprehensive interdisciplinary assessment. This qualitative analysis – linked to construct validity (evident in the relationship between the instrument and the measured construct) and content validity (associated with the ability of the instrument's content to reflect the measured construct) (Furr, 2017) – resulted in the improvement of the instruments, so that they became more scientifically rigorous and intelligible (Coutinho, 2014).

3.2 Pretest of the First Questionnaire

We selected as the main object of the pretest, to be administered to a sample of students, the first questionnaire. We aimed to get feedback from a group of students with a similar profile to the one that will participate in the project. In doing this, it is possible to ensure the intelligibility of the questions, scales and items, through a qualitative analysis. To complement it, a statistical evaluation of its reliability was carried out. Since the second questionnaire evaluates an experiment that, at the time of the pretest, did not occur, we

chose not to include it. Because they are identical in terms of content, formulation of items and structure, one can infer that the validity and reliability of the first extends to the second.

3.2.1 Approval by the ethics council

The procedures described were approved by the Data Protection Officer of the University of Aveiro, as well as the Ethics and Deontology Committee of the university. It is thus ensured that the project follows the ethical guidelines relating to GDPR and DPIA.

3.2.2 Selection of respondents

The pretest sample comprises 18 eleventh-grade students, attending a private school in Portugal, indicated by the school's principal and the class's Portuguese teacher, given the availability and interest of the latter, the interest expressed by this class, and the high degree of similarity between the profile of this class and that of the group involved in the intervention (in terms of age and school year). To determine whether its size is adequate, we followed the recommendation of Perneger et al (2015), based on the calculation of the ability of a pretest to identify problems in an instrument. According to the authors, it is important to have a sample of more than 15 elements to avoid difficulties in filling out a questionnaire (occurring in 10% of the participants). Thus, a sample of 18 elements is admissible, suggesting the pretest is likely to succeed.

3.2.3 Applying the pretest

The questionnaire was completed by the respondents in the classroom, in the presence of the researcher, through the FormsUA platform. To avoid collecting personal data, we displayed a QR Code on the board, instructing students to access it through their mobile phones. We opted for the online modality, due to the access of respondents to mobile phones and the ease with which the data obtained can be organised and processed. This test took place in December and lasted about 20 minutes.

The students were instructed to identify problems of intelligibility in the different items, in terms of syntax and lexis. At the end of each section of the questionnaire, as proposed by Hashim et al (2022), we included closed-answer questions: "Are the questions and scale items easy to understand?", followed by a comment box with the indication: If the answer is no, identify the questions/scale items and explain why it was difficult to understand them".

4. Results

A total of 18 complete responses were collected, corresponding to all respondents. Their feedback was used to assess the validity of our questionnaire, more specifically their ability to measure the targeted construct (Marôco, 2018). All students, concerning the questions related to their level of comprehension of questionnaire, selected the option stating the items were easy to understand. In the comment box, some stressed this idea, adding that the scales and questions were clear, diverse enough to accommodate respondents with different profiles, and well-structured. A student suggested, however, that it is important to define "narrative video game", to avoid misinterpretation of the term.

To assess the internal consistency of the instrument and contribute to its reliability, we calculated Cronbach's alpha, using SPSS (Furr, 2017). Regarding the first part of the questionnaire, we selected all items, in other words, the scales relating to the four dimensions of engagement – cognitive, affective, behavioural and agentive. The resulting number was 0.876, higher than the minimum recommended (0.7). As for the second part of the questionnaire, we selected all questions and scales, except for the ones addressing students' preferred video game genres and preferred ways of working inside the classroom (individually or in group). This decision was due to our intention to limit our calculation of Cronbach's alpha to items measuring the same construct – students' perceptions on educational video games. The resulting number, 0.925, suggests a good consistency among items.

5. Discussion

The need for data collection instruments specifically targeting learner engagement in the co-design of educational Visual Novels in Literary Education led to the creation and validation of two questionnaires and one class observation grid. The steps followed – literature review, creation of the instruments, obtainment of expert feedback and the execution of a pretest of the first questionnaire – were completed with success, resulting in adaptations that contributed to the instruments' rigour in terms of validity and reliability. Regarding the pretest, the number of responses received from our sample, comprised by Portuguese students

attending 11th grade in a private school, corresponds to 18. According to Perneger et al (2015), it is an admissible number as it abides by their recommendation that sample size should be above 15 to prevent difficulties related to the intelligibility of a questionnaire.

In turn, 7 students, despite having already checked the box stating the questionnaire easy to understand, decided to leave a positive comment, which reinforces their favourable appraisal of the instrument. One student wrote a suggestion for improvement – clarifying the term "narrative video game". This feedback will be used for improving the questionnaire before it is applied in the intervention relating to our doctoral project. As explained by Hashim (2022), respondents' feedback in pretests is important for making the items clearer for the population represented by the sample. Given this, we seek to add a short clarification, by writing "a story-driven video game" next to the term when it is first introduced in the questionnaire. After assessing the questionnaire's validity, in other words, how the questions and scale's items are related to the measured constructs, we performed a Cronbach's alpha test to calculate the instrument's internal consistency. The obtained results were higher than 0.7, which indicate that the items are related and measuring the same constructs: engagement in Literary Education (for the first part of the questionnaire), and students' perceptions related to educational video games (for the second part of the questionnaire).

Concerning their usefulness, although these tools respond to the intrinsic demands of our study, they hold potential for being adapted across various Humanities subjects, with a focus on interdisciplinarity and narrative-based pedagogies. By incorporating narrative game making practices into educational contexts, teachers can have their students create authentic and immersive didactic resources while increasing their engagement with written text. Besides allowing to rigorously assess such practices, this work brings greater visibility to Visual Novels, video games with a choice-based structure, whose design process aligns with key educational goals in the Humanities (creative writing, reading comprehension, and critical thinking, for example). The agency they give designers and players, when reflecting on and shaping the characters' path, is linked to an improvement of engagement and higher-order thinking skills, which can be enriched by teamwork. This makes a case for these video games, or similar genres, to be the target product of activities dedicated to collaborative game design.

6. Conclusion

To help filling in a gap in investigation, we validated instruments dedicated to assessing learner engagement in Literary Education, stemming from the co-design of narrative video games, more specifically Visual Novels. By creating and sending two questionnaires, to be used in a study case following a pre- and post- test design, and a class observation grid, to a multidisciplinary team of experts, we were able to adapt them according to their feedback, contributing to the instruments' validity in terms of the scientific fields it intertwines – Educational Psychology, Educational Technology and Literary Education. Concerning the first questionnaire, by subjecting it to a pretest, it was possible to collect a group of students' perceptions of its intelligibility, strengthening the instruments' validity. This is a crucial step, as it helps making these instruments more accessible to the target audience – students in secondary education. Given its similar content and structure, one can deduce that its validity extends to the second questionnaire, ensuring robustness across both instruments. The results of the Cronbach's alpha test add to the instruments' rigour, suggesting that they are reliable.

The qualitative and quantitative assessments support the adaptation of the questionnaires and observation grid to different interventions, in Humanities' subjects, articulating narrative video games and affective learning constructs, namely engagement. It is, indeed, important to include immersive technology and collaborative digital creation in subjects such as Literary Education, as this makes learning more consonant with students' profiles, interests and preferred ways of consuming art in written form. By evaluating such practices' effectiveness, we counter the tendency for embodying technology in the classroom without critically reflecting on its outcomes and the central role of rigorous pedagogical actions in engaging and meaningful learning. Concerning limitations, one should point out the small size of our pretest sample (despite being enough for identifying problems and improving the instruments accordingly) and the specific context in which the study took place – a Portuguese private school. As such, it is expected that this study encourages practitioners and researchers to adapt or replicate it with larger samples in different educational settings.

Acknowledgements

We thank Professors José Loureiro, Paulo Pereira, Isabel Santos and Mónica Aresta for their insightful feedback. We extend our gratitude to André Martinez and Prof. Adelaide Freitas for sharing their statistical expertise. Finally, we thank the principal, students and teacher involved for their valuable contributions.

Ethics declaration: Research funded by the *Fundação para a Ciência e a Tecnologia*, I.P. (FCT), under the projects UIDB/00194/2020 (10.54499/UIDB/00194/2020) and UIDP/00194/2020 (10.54499/UIDP/00194/2020) (CIDTFF) and the grant no. 2024.03157.BD. For purposes of Open Access, a CC-BY public copyright license was applied to any Author 's Accepted Manuscript (AAM) version arising from this submission.

AI declaration: Microsoft Word was used for obtaining a translated draft of our instruments (manually refined) and DeepSeek was used for obtaining revision suggestions.

References

Alrajhi, A. S. (2020) "English Learners' Perceptions of Video Games as a Medium for Learning and Integration into the English Curriculum", *MEXTESOL Journal*, Vol. 44, No. 4, pp. 1–17.

Ball, C. et al. (2020) "Gaming the SySTEM: The Relationship Between Video Games and the Digital and STEM Divides", *Games and Culture*, Vol. 15, No. 5, pp. 501–528. https://doi.org/10.1177/1555412018812513

Calvino, I. (2015) *Porquê ler os clássicos? (original 1991)*, Dom Quixote, Amadora.

Camingue, J., Melcer, E. F. and Carstensdottir, E. (2020) "A (Visual) Novel Route to Learning: A Taxonomy of Teaching Strategies in Visual Novels", *ACM International Conference Proceeding Series*. https://doi.org/10.1145/3402942.3403004

Coutinho, C. P. (2014) *Metodologia de investigação em ciências sociais e humanas*, Leya, Alfragide.

Csikszentmihalyi, M. (1990) *Flow: The Psychology of Optimal Experience*, Harper, New York.

Fu, F. L. and Su, R. G. (2009) "EGameFlow: A scale to measure learners' enjoyment of e-learning games", *Computers & Education,* Vol. 52, No. 1, pp. 101–112. 10.1016/j.compedu.2008.07.004

Furr, R. M. (2017) *Psychometrics: An Introduction*, SAGE Publications, Inc., USA.

Glessner, M. and Olufemi, D. (2019) "Pedagogy of Flow", in Peters, M. A. (Ed.) *Encyclopaedia of Teacher Education*, Singapore: Springer. https://doi.org/10.1007/978-981-13-1179-6_295-1

Hashim, S. et al. (2022) "Pretesting Survey Questionnaire: A Guide on Dissemination", *International Journal of Academic Research in Economics and Management Sciences*, Vol. 11, No. 3, pp. 408–416. http://dx.doi.org/10.6007/IJAREMS/v11-i3/15228

Jackson, S. A. and Marsh, H. W. (1996) "Development and Validation of a Scale to Measure Optimal Experience: The Flow State scale", *Journal of Sport and Exercise Psychology*, Vol. 18, pp. 17–35.

Järvenoja, H. et al. (2020) "A Collaborative Learning Design for Promoting and Analyzing Adaptive Motivation and Emotion Regulation in the Science Classroom", *Frontiers in Education*, Vol. 5, pp. 1–16. https://doi.org/10.3389/feduc.2020.00111

Khan, A., Ahmad, F. H. and Malik, M. M. (2017) "Use of digital game-based learning and gamification in secondary school science: The effect on student engagement, learning and gender difference", *Education and Information Technologies*, Vol. 22, No. 6, pp. 2767–2804. https://doi.org/10.1007/s10639-017-9622-1

Kusmaryono, I., Wijayanti, D. and Maharani, H. R. (2022) "Number of Response Options, Reliability, Validity, and Potential Bias in the Use of the Likert Scale Education and Social Science Research: A Literature Review", *International Journal of Educational Methodology*, Vol. 8, No. 4, pp. 625–637. https://doi.org/10.12973/ijem.8.4.625

Marôco, J. (2018) *Análise Estatística com o SPSS Statistics*, ReportNumber, Lisbon.

Nkomo, L. M. and Nat, M. (2021) "Student Engagement Patterns in a Blended Learning Environment: an Educational Data Mining Approach", *Tech Trends*, Vol. 65, pp. 808–817. https://doi.org/10.1007/s11528-021-00638-0

Øygardslia, K., Weitze, C. L. and Shin, J. (2020) "The Educational Potential of Visual Novel Games: Principles for Design Investigating the potential of gameful design for enhancing student engagement and motivation in the collaborative writing process using Google Docs", *Replaying Japan*, Vol. 2, pp. 123–134. 10.34382/00013369

Perneger, T. V. et al. (2015) "Sample size for pre-tests of questionnaires", *Quality of Life Research*, Vol. 24, No. 1, pp. 147–151. https://doi.org/10.1007/s11136-014-0752-2

Prensky, M. (2001) *The Games Generations: How Learners Have Changed*, McGraw-Hill, New York.

Shernoff, D. J., Tonks, S. M. and Anderson, B. (2014) "The Impact of the Learning Environment on Student Engagement in High School Classrooms", *National Society for the Study of Education*, Vol. 113, No. 1, pp. 166–177.

Silva, C., Migueis, M. da R. and Moreira, F. T. (2023) "A position paper on digital game-based learning: affective potentialities of playing and designing video games in the humanities classroom", *RPIE*, No. 25, pp. 1–15. https://doi.org/10.34632/investigacaoeducacional.2023.15929

Silva, C. R., Ribas, A. C. and Veiga, F. H. (2016) "Students' Engagement in School Four-dimensional Scale (SES-4DS): Confirmatory Factorial Analysis and Internal Consistency", in Veiga, F. H. (Coord.) *Students' Engagement in School: International Perspectives of Psychology and Education*, Lisbon: University of Lisbon, pp. 35–46.

Thumlert, K., De Castell, S. and Jenson, J. (2018) "Learning Through Game Design: A Production Pedagogy", in Ciussi, M. (ed.) *Proceedings of the 12th European Conference on Game-Based Learning ECGBL*, UK: ACPI, pp. 704–714.

Veiga, F. and Abreu, S. (2014) "Family factors of student engagement in school", in *Students' Engagement in School: International Perspectives of Psychology and Education*, Lisbon: Instituto de Educação. pp. 176–195.