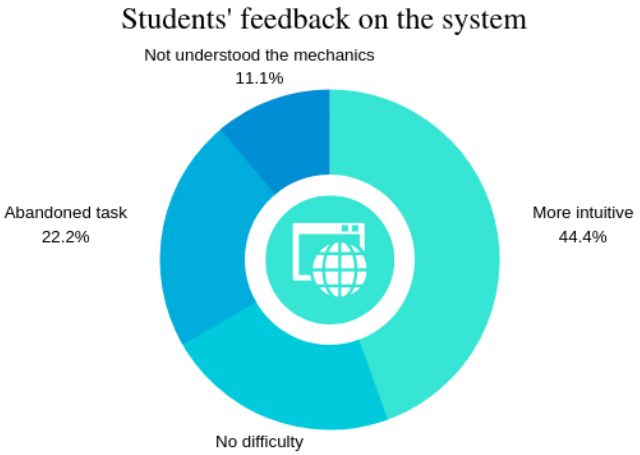

Figure 3. Students feedback regarding the IT use

conflicts between colleagues because of the high level of involvement with the characters and the story (which some authors call gaming the system [Pedro and Isotani 2016]). Because of this, although they were working around problems, the overload on the lecturer became greater than in a traditional classroom. Also, this kind of approach will not work on larger classes, because the content the lecturer needs to read, create, moderate and mediate would be too large.

As future works, we intend to use this experience to create an experiment to validate an instance of a narrative framework of gamification (*i.e.* use of game elements in contexts external to them [Kapp 2012]) applied to educational environments [Palomino et al. 2019a, Toda et al. 2019b], as an aid in the teaching of subjects related to Computer Science undergraduate courses.

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References

Bissell, T. (2011). *Extra lives: Why video games matter*. Vintage.

Craik, F. I. and Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of verbal learning and verbal behavior*, 11(6):671–684.

Ertmer, P. A. and Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance improvement quarterly*, 6(4):50–72.

Filippo, Denise; Roque, G. and Pedrosa, S. (2019). *Pesquisa-ação: possibilidades para a Informática Educativa, In: PIMENTEL, Mariano; SANTOS, Edméa O.; PIMENTEL, Edson (Org.) Metodologia de Pesquisa em Informática na Educação: Abordagem Qualitativa de Pesquisa.(Série Metodologia de Pesquisa em Informática na Educação*, volume 3. SBC, in press.

Gygax, G. and Arneson, D. (1974). *Dungeons and dragons*, volume 19. Tactical Studies Rules Lake Geneva, WI.

Hammond, M. and Wellington, J. (2012). *Research methods: The key concepts*. Routledge.

Harrigan, P. and Wardrip-Fruin, N. (2010). *Second person: Role-playing and story in games and playable media*. The MIT Press.

Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. NYU press.

Kapp, K. M. (2012). The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education.

Lewis, C. (2007). New literacies. *A new literacies sampler*, pages 229–237.

Manovich, L., Malina, R. F., and Cubitt, S. (2001). *The language of new media*. MIT press.

Mayer, R. (2005). *The Cambridge handbook of multimedia learning*. Cambridge university press.

Murray, J. H. (2017). *Hamlet on the holodeck: The future of narrative in cyberspace*. MIT press.

Palomino, P., Toda, A., Oliveira, W., Rodrigues, L., Cristea, A., and Isotani, S. (2019a). Exploring content game elements to support gamification design in educational systems: narrative and storytelling. In *Brazilian Symposium on Computers in Education (Simpósio Brasileiro de Informática na Educação-SBIE)*, volume 30, page 773.

Palomino, P. T. (2015). *We will hold the line: O Fandom como forma de participação dos fãs no desenvolvimento do universo transmidiático do jogo Mass Effect*. PhD thesis, Universidade Federal de São Carlos - UFSCar.

Palomino, P. T., Toda, A. M., Oliveira, W., Cristea, A. I., and Isotani, S. (2019b). Narrative for gamification in education : why should you care ? In *International Conference of Advanced Learning Techniques - Icalt 2019*.

Pedro, L. and Isotani, S. (2016). Explorando o Impacto da Gamificação na Redução do Gaming the System em um Ambiente Virtual de Aprendizagem. *Anais dos Workshops do Congresso Brasileiro de Informática na Educação*, 5(August):81–90.

Piaget, J. (1964). Part i: Cognitive development in children: Piaget development and learning. *Journal of research in science teaching*, 2(3):176–186.

Policarpo, C. and Santaella, L. (2018). The aesthetics of knowledge in digital networks. *DIALOGIA*, (28):29–45.

Protagonist Labs, I. Storium - the online storytelling game. `http://www.storium.com`. Accessed: 2019-05-15.

Rau, M. A., Aleven, V., and Rummel, N. (2009). Intelligent tutoring systems with multiple representations and self-explanation prompts support learning of fractions. In *AIED*, pages 441–448.

Salen, K., Tekinbaş, K. S., and Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. MIT press.

Toda, A., Oliveira, W., Klock, A., Palomino, P., Pimenta, M., Bittencourt, I., Shi, L., Gasparini, I., Isotani, S., and Cristea, A. (2019a). A taxonomy of game elements for gamification in educational contexts: Proposal and evaluation. In *2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT)*, volume 2161, pages 84–88. IEEE.

Toda, A. M., Klock, A. C. T., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., and Cristea, A. I. (2019b). Analysing gamification elements in educational environments using an existing gamification taxonomy. *Smart Learning Environments*, 6(1):16.