

Playing Games: A Case Study in Active Learning Applied to Game Theory

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Abstract

A paper about active learning and using some example of this in a class on Game Theory

1 Introduction

Modern pedagogic theories as to how learning takes place such as constructivism and socialism [6, 7], indicate that an **active learning** approach is of benefit to student learning. As stated in [9] there are a variety of complementary definitions of active learning, however the general definition given in [9] is the one assumed in this paper:

“Active learning is generally defined as any instructional method that engages students in the learning process. In short active learning requires students to do meaningful learning activities and think about what they are doing.”

One could argue that all learning is active as students simply listening to a lecture are perhaps taking part in a ‘meaningful learning activity’, however as stated in [2] active learning is understood to imply that students:

- read, write, discuss, or engage in solving problems;
- engage in higher order tasks such as analysis, synthesis and evaluation.

A variety of studies have highlighted the effectiveness of active learning [4, 5, 9]. These two papers are in fact meta studies evaluating the effectiveness an active student centred approach. Note that the definition used in [4] corresponds to simply any pedagogic approach in which students are not passive consumers of a lecture during the class meeting.

Some examples of active learning in a variety of subjects include:

- The flipped learning environment in a Physics class: [1].
- Inquiry based learning for the instruction of differential equations: [8].
- Using collaborative learning in a pharmacology class: [3].

The above sources (and references therein) generally discuss the pedagogic approach from a macroscopic point of view with regards to the course considered. This manuscript will give a detailed description of two particular active learning activities used in the instruction of Game Theoretic concepts.

2 An exemplar: a course in game theory

- Discuss other examples of how game theory is taught
- Describe this course
- Give description of the general philosophy of the course (no content: purely examples, which give data for games)

2.1 Best responses

- The two thirds of the average game: how this is a basic game
- How it is played in class
- Description of data and discussion that ensues

2.2 Repeated and random games

- The theory
- Tournaments:
 - Basic type.
 - Infinitely repeated game.
 - Markov games.

3 Summary

- Give some examples of feedback.
- Mention how methods could be applied to other courses.
- Certain class management ideas (mainly that I will not speak first a lot of the time) ;- Not sure if this is useful.

References

- [1] P. S. Bates and R. Galloway. “The inverted classroom in a large enrolment introductory physics course : a case study .” In: ().
- [2] C. C. Bonwell and J. a. Eison. *Active Learning: Creative Excitement in the Classroom. 191 ASHE-ERIC Higher Education Reports*. 1991, p. 121. ISBN: 1878380087.
- [3] I. Depaz. “Using Peer Teaching to Support Co-operative Learning in Undergraduate Pharmacology”. In: *Bioscience Education e-Journal* 11.June (2008). ISSN: 14797860. DOI: 10.3108/beej.11.8.
- [4] S. Freeman et al. “Active learning increases student performance in science, engineering, and mathematics.” In: *Proceedings of the National Academy of Sciences of the United States of America* 111.23 (2014), pp. 8410–5. ISSN: 1091-6490. DOI: 10.1073/pnas.1319030111. URL: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4060654&tool=pmcentrez&rendertype=abstract>.
- [5] R. R. Hake. “Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses”. In: *American Journal of Physics* 66.1 (1998), p. 64. ISSN: 00029505. DOI: 10.1119/1.18809.
- [6] K. Illeris. *Contemporary theories of learning : learning theorists – in their own words*. 2009, p. 244. ISBN: 9780415473439. DOI: 10.1080/0158037X.2011.577173.
- [7] a. Jordan, O. Carlile, and a. Stack. *Approaches To Learning: A Guide For Teachers: A Guide for Educators*. 2008, p. 278. ISBN: 0335226701, 9780335226702. URL: <http://books.google.com.kw/books?id=C82nud-9W6MC>.
- [8] O. N. Kwon, K. Allen, and C. Rasmussen. “Students’ Retention of Mathematical Knowledge and Skills in Differential Equations”. In: *School Science and Mathematics* 105.5 (2005), pp. 227–240. ISSN: 00366803. DOI: 10.1111/j.1949-8594.2005.tb18163.x. URL: <http://www.questia.com/PM.qst?a=o&se=gglsc&d=5009565207>.
- [9] M. Prince. “Does Active Learning Work ? A Review of the Research”. In: *Journal of Engineering Education* 93.July (2004), pp. 223–231. ISSN: 1069-4730. DOI: 10.1002/j.2168-9830.2004.tb00809.x.