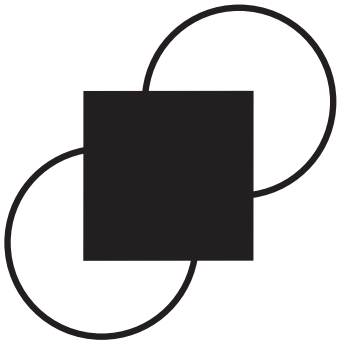
iCERi 2015

8TH INTERNATIONAL CONFERENCE OF EDUCATION, RESEARCH AND INNOVATION

CONFERENCE PROCEEDINGS

SEVILLE (SPAIN)
16-18 NOVEMBER 2015



iCERi 2015

8TH INTERNATIONAL CONFERENCE OF EDUCATION, RESEARCH AND INNOVATION

CONFERENCE PROCEEDINGS

SEVILLE (SPAIN)
16-18 NOVEMBER 2015

Published by
IATED Academy
www.iated.org

ICERI2015 Proceedings
8th International Conference of Education, Research and Innovation
November 16th-18th, 2015 — Seville, Spain

Edited by
L. Gómez Chova, A. López Martínez, I. Candel Torres
IATED Academy

ISBN: 978-84-608-2657-6
ISSN: 2340-1095
Depósito Legal: V-2722-2015

Book cover designed by
J.L. Bernat

GAME MAKING FOR LEARNING: A SYSTEMATIC REVIEW OF THE RESEARCH LITERATURE

Jeffrey Earp

Institute for Educational Technology, National Research Council (ITALY)

Abstract

Game making as a strategy for supporting learning processes is a research topic that has roots stretching back to the constructionist movement of the 1980s and 1990s. However, the current popularity of digital gaming, Game Based Learning (GBL), 21st century skills development and learner-centred strategies is sharping interest in the affordances that digital game making offers and how these can be harnessed in education to enhance learning. This contribution charts the emergence and establishment of learner-driven digital game making through a systematic review of the global literature on the topic published since the early 1980s. It maps out the research concerns under investigation in the field, as gleaned from a dataset of almost 500 publications of different types specifically dedicated to the topic. The review forms part of the author's research activities in game making for learning carried out with an EC co-funded project called MAGICAL (Making Games in Collaboration for Learning). The review begins with a description of the method and procedure adopted for carrying out the literature search and producing a comprehensive dataset of records. This is followed by reporting and analysis of the generated data. The review concludes with a brief discussion and reflection on the results.

Keywords: game making, game based learning, educational innovation, 21st century skills, collaboration.

1 INTRODUCTION

The current booms in digital gaming and Game Based Learning (GBL) have led to a noticeable increase in the opportunities and tools allowing young people to design and make their own digital games. At the same time, educational practitioners and researchers are focusing on the affordances game making offers in education and how these can be best harnessed for learning [1]. This exploration is rooted in the seminal work on constructionism carried out by Seymour Papert and colleagues at the MIT Media Lab in the 1980s and 1990s [2], [3]. However, the current popularity of GBL and the interest in 21st Century skills, computational thinking, coding and so on appear to be giving new impetus to this line of investigation [4].

So this appears an auspicious juncture for establishing a clear picture of the field's general development and overriding concerns. Accordingly, this paper presents a review of the research literature based on a *comprehensive* and *systematic* search of the global literature on learners' game making from 1980 to 2015. This work complements the efforts of authors who have contextualised their investigations of game making by identifying cornerstone research concerns under exploration in the field [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30].

The present systematic review is based on a dataset of almost 500 records retrieved from a structured literature search performed in early 2015 using a variety of services and channels. The records gathered comprise academic papers, book chapters, conference proceedings, dissertations and official project reports. While the main interest of this review lies in tracing the development of *digital* game making, studies concerning other game types have nonetheless been retained in the dataset.

The review forms part of the author's research in game making for learning [31], carried out with an EC co-funded project called MAGICAL (Making Games in Collaboration for Learning[1]). It begins with a description of the method and procedure adopted for the literature search, which is followed by reporting and analysis of the generated data. The review concludes with a brief discussion and reflection on the results.

[1] http://tinyurl.com/magicaldoor

ISBN: 978-84-608-2657-6

2 DATA COLLECTION AND PROCESSING

This study was performed following the steps identified by Rickinson & May [32] and the University of Central London's EPPI Centre [33] for systematic literature reviews, namely **scoping, searching, selecting, analysing, synthesising** and **reporting**.

Scoping: the review concentrates on journal papers and conference proceedings but also includes book chapters, dissertations and project reports. The timespan stretches from 1980 to early 2015, thus encompassing the emergence of *digital* game making. In an effort to ensure breadth and depth, both general and domain-specific sources were identified for searching (see Table 1 below). The search latitude was restricted to the title field only; previous experience with GBL literature searches [34] revealed that the semantically broad search strings characterising GBL (e.g. terms like *learning* and *game design*) generate unwieldy, fuzzy and diluted results, thus calling for drastic re-scoping and selective filtering. Informal analysis of over 120 sector-specific publications collected since 2011 by the *Collaborative Game Design for Learning* group on the Mendeley platform[2] led to identification of the following search terms and syntax: *TITLE=((gam*) AND (mak* OR design* OR creat* OR author* OR produc* OR construct*, build*) AND (learn* OR teach* OR educ* OR school OR pupil* OR student*) NOT (gambl* OR decision))*; some variations in the syntax were applied to account for the different advanced search functions available.

Searching: this was carried out in the early 2015. A total of 854 results were generated from the different sources, as shown in table 1 below.

Table 1. Number of search results returned from each source queried in the game making literature search

source	records returned
Google Scholar	172
Scopus	148
Research Gate	129
EDITLib	98
Mendeley	93
Web of Knowledge	63
academia.edu	55
ERIC	41
ACM Digital Library	34
Games Learning Society (GLS) conference	11
Science Direct	8
Creativity & Constructivism (C&C) conference	2
total	**854**

About a third of these 854 records (299 – 34.8%) are unique results, i.e. retrieved from only one of the above sources, while the remaining two thirds (555 – 65.1%) comprise multiple instances. The most commonly appearing record was by Reynolds & Caperton [22], which was returned by seven of the above sources.

Selection and processing of the 854 retrieved results was performed so as to derive a coherent dataset of single-instance, on-topic records. Accordingly, records regarding gaming and Game Based Learning in general were filtered out, as were those on game design/implementation initiatives led by academics and/or professionals (including participatory co-authoring and user testing). Additionally, results concerning game making in higher education computer science (CS) and game design courses were excluded, as were those on rapid game creation for professional training in object-oriented programming. The rationale for these last two filters lies in the review's focus on game making as an approach to general learning rather than as a step in professionally-oriented IT and game-design training. A partial exception to this was the inclusion of papers dealing with game making in schools,

[2] http://www.mendeley.com/groups/1932391/magical-collaborative-game-design-for-learning/

community centres and youth clubs as a way to *introduce* and *promote* computing. Here, game making has an attitudinal (and inclusive) dimension that stretches beyond strict professionalization. Likewise, results on game making as a component of undergraduate courses in subjects like art and media studies were retained.

The final dataset that emerged from filtering and processing totals 494 unique records with five data fields: **title**, **author name/s**, **publication date**, **publication source** and **abstract**. Of the 494 records, 477 (96%) are complete, while 17 (3.4%) lack data in one of the five fields and 2 (0.4%) lack data in two fields.

3 DATA ANALYSIS

This section reports the output from analysis and synthesis of data gathered in the above-mentioned fields.

3.1 Date and type of publication

Publications on game making span almost the entire reference period from 1980 to the present.

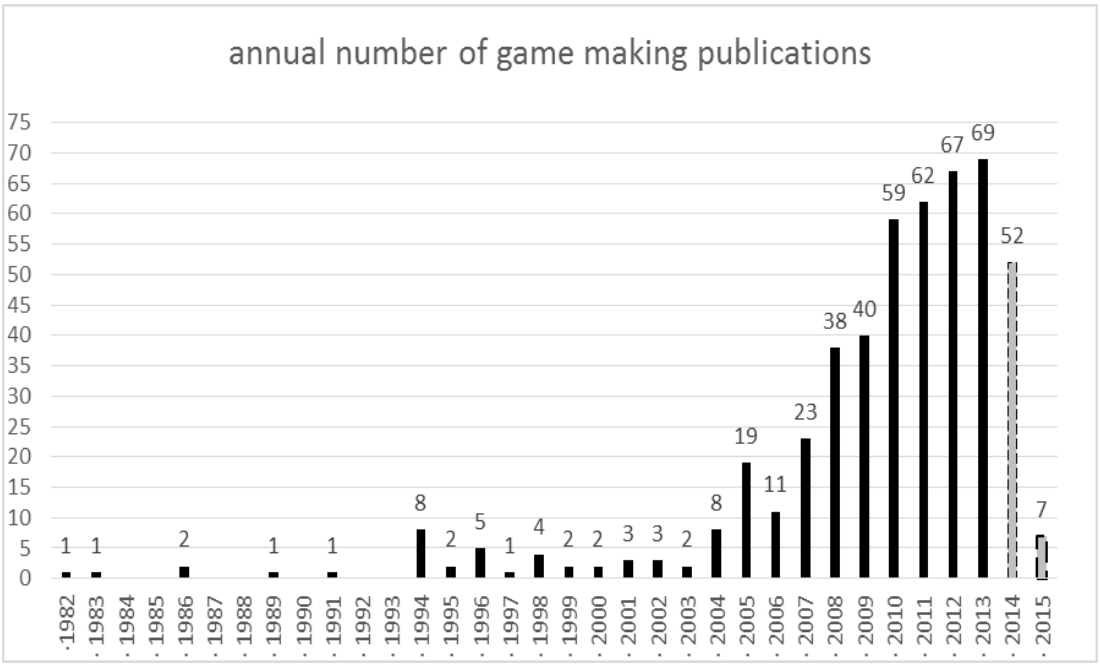


Figure 1. Number of game making studies published annually

Fig.1 above portrays the development of a 21st century research topic with late 20th century roots. The earliest record is a 1982 paper on non-digital game making for learning English as a Second Language (ESL) [35]. This testifies to the strong GBL tradition in language learning, especially of English [36]. The earliest record in the digital sphere is the landmark 1994 book by Yasmin Kafai, "Minds in Play" [37] (the eight chapters are treated here as distinct records). The dramatic rise from 2004 onwards has undoubtedly been fuelled to a degree by the blossoming of digital GBL and Technology Enhanced Learning (TEL) generally. The figures for 2014 and especially 2015 are indicated as partial, given that the search was performed at the beginning of 2015.

In terms of **publication type**, conference proceedings predominate (251 - 50.8%), followed by journal papers (155 - 31.4%), book/chapters 43 (8.7%), dissertations (25, 5%) and other types (20, 4%). Interestingly, the records retrieved from the three networking platforms (ResearchGate, academia.org, Mendeley) revealed an almost identical breakdown, even though they permit researchers themselves to catalogue a wide variety of research outputs, including grey literature. The academic source yielding the highest number of records is *Proceedings of the Society for Information Technology & Teacher Education International Conference* (USA) with 31 records published from 2005 to 2014, comprising 6.3% of the total dataset.

3.2 Context & target population

Where authors refer to an **educational context** in their title or abstract (353 records, 71.5%), mainstream formal education contexts (K-12 and HE) predominate (293 – 59.3 %). Forty-six papers (9.3%) regard other education contexts such as after-school programs, summer camps, community initiatives, etc. Other contexts were mentioned in 13 cases (2.6%). Fig.2 below provides a detailed breakdown of the mainstream formal education segment.

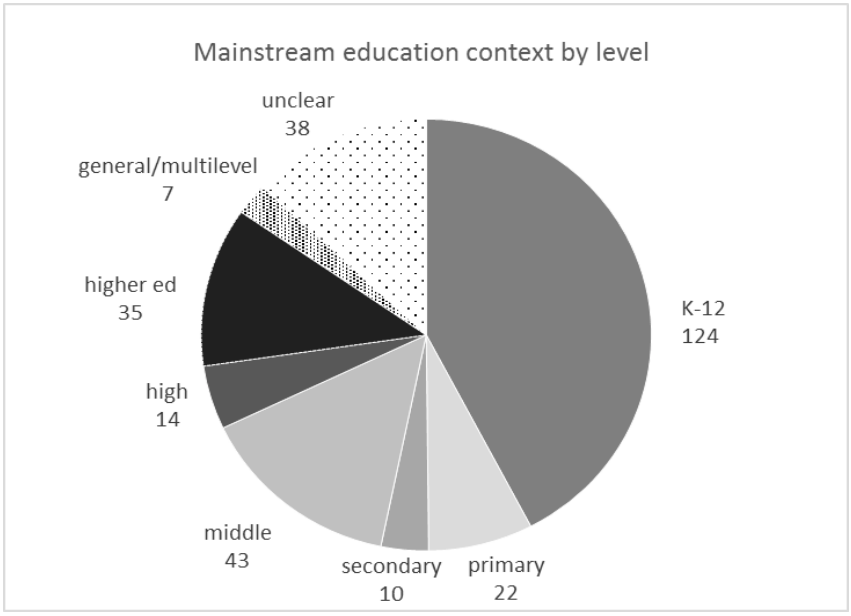


Figure 2. breakdown of mainstream education contexts mentioned in game making studies

The most common level indicated is K-12 in general (124 – 42.3%), followed by middle school (43 – 14.7%), Higher Education (HE) in general (35 – 12%) and primary/elementary school (22 – 7.5%). The other levels were below 5% of the total. In 38 cases (7.8%) the title and abstract fields mentioned students, teachers, classes etc. without any further specification. It should be noted that post-elementary schooling in the USA is often referred to by the sublevels *middle/high school* or *junior/senior high*, while outside the U.S. *secondary* tends to be used to cover the entire post-elementary phase of K-12.

This picture is confirmed by the data on **target learner type:** 309 records (62.6%) regard students in mainstream formal education, i.e. K-12 and HE, including Initial Teacher Education. Targets are also described simply as young people or youth (75 – 15.2%), while others (47 – 9.5%) concern people identified either as socially disadvantaged/at risk (minorities, populations underrepresented in gaming/computing) or who have Special Education Needs. The remainder are described as learners in general (12 - 2.4%), teachers (2 - 0.4%) and others (5 - 1%). In 44 records (8.9%) no specification of the target is made in either the title or abstract fields.

To categorise **target populations by age**, a scale of age bands was established (0-5, 6-10, 11-14, 15-18, 19-22, 23+) and the age range specified in each title/abstract was attributed to the band of closest correspondence (see Fig.3 below). Where the range covered two or more bands, or was evenly split across bands, the record was allocated to one of two generic categories: School Age or Not Specific In records with a context descriptor like *third grade* or *middle school* in lieu of target age, a context-sensitive age conversion was performed.

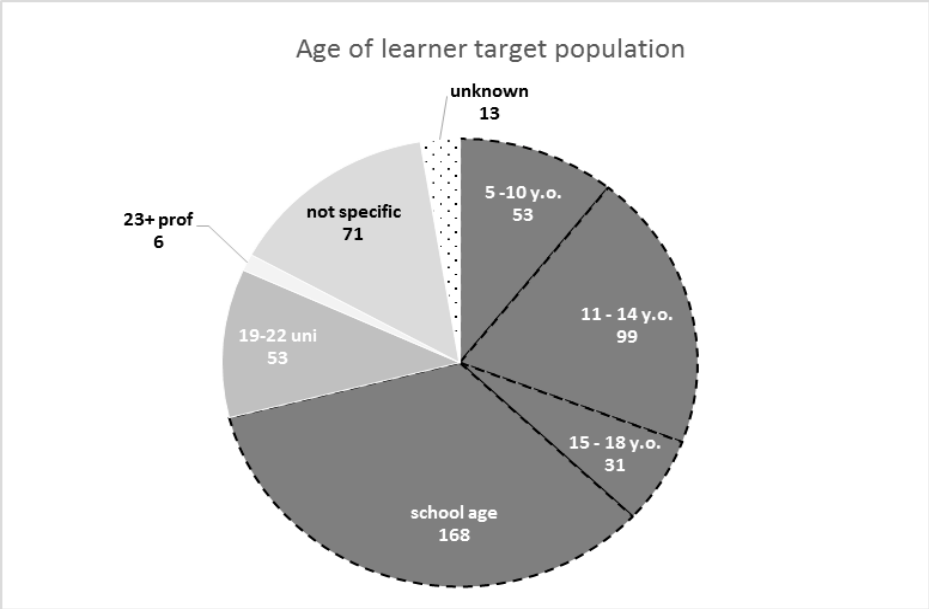


Figure 3. Age of target learner population mentioned in game making studies

Together, the four dark segments in Fig.3 represent records in which the target is youth: children, youngsters and teenagers. These make up almost three quarters of all cases (351 - 71.1%). Almost half of these (168 - 47.9%) are mentioned in general or wide-ranging terms - *children*, *young*, *8-16,* etc.: these are labelled as school age. The other half falls into more specific age bands: 99 (20%) are in the 11-14 range, 53 (10.7%) in the 5-10 range and 31 (6.3%) in the 15-18 range. The very youngest targets mentioned are seven year-olds and third graders. Outside the youth segments, 53 targets (10.7%) fall into the 19-22 range (largely HE), while the 23-plus band accounts for 6 records (1.2%). In 71 cases (14.4%), the age range is not specific or relevant, while for 13 (2.6 %) no data is given.

The combined findings on **context** and **target population** derived from Figs. 2 and 3 suggest that gaming making research has focused primarily on young school-age learners, specifically those in the 11 to 14 bracket attending middle school. Outside of this range, attention is directed mainly towards primary school and – to a lesser extent – high school. These populations are also targeted outside of mainstream school activities, in clubs, youth camps and other community-based initiatives.

In 85 of the 494 records (17.2%), the abstract specifically mentions the **number of learners** involved. These range from a minimum of two to a maximum of 992. To gain an idea of the distribution, the population numbers were grouped into five bands: 1-50; 51-100; 101-150; 151-200; 201+. Not surprisingly, most of the reported populations (54.1%) fall into the 1-50 bracket; indeed in 35 cases (41.2%) the figure given is 30 or below, i.e. single class size. A less foreseeable result is that 15.3% of records report a population over 200. Caveats apply here, however. Of these 13 records, four are publications by one group working with the same learner population. Furthermore, large population numbers are more likely to be mentioned in abstracts than small ones.

3.3 Specific research topics within game making

To shed some light on the perspectives and concerns pursued in game making research, the 494 titles were subjected to a manual semantic analysis designed to identify significant subtopics in the field. This analysis drew on similarity-based methods adopted for clustering concept hierarchies from text [38]. The titles were manually parsed in iterative cycles in order extract a reference corpus of “flag terms”. These are locutions and collocations (e.g. *creativity, geography, critical thinking, project-based learning*) subjectively considered semantically relevant to the disciplinary milieu of game making research and praxis. The terms in the original search strings (see Section 2) were disregarded as they were instrumental in shaping the dataset itself.

No limit was placed on the number of flag occurrences that could be harvested from any single title. Ultimately, the 494 titles yielded 566 flag instances. In 110 titles (22.6%) no flags at all were present; 322 titles (67.7%) yielded one flag; 51 titles (10.3%) had two flags; ten titles (1.8%) had three flags;

and one title (0.2%) had four flags. The mean occurrence rate is 1.2 flags per title overall, or 1.5 flags within the set of 383 titles containing at least one flag.

The 566 flag instances that were harvested obviously bore numerous semantic and syntactical interrelations. These include: duplication (multiple occurrences of the same flag); inflection, e.g. *collaborate, collaborated, collaborating*; part-of-speech variance, e.g. *collaboration, collaborate, collaborative*; synonymy, e.g. *collaboration* > *cooperation*; disciplinary hyponymy/hypernymy, e.g. *algebra* > *maths*, *English* > *language arts*. So, following [39], duplicates and inflected forms were merged, parts of speech were lemmatized, synonymous flags were clustered in synsets[3] labelled with the most frequently occurring sibling, and hyponym children were clustered with hypernym parents.

The result of this processing was a set of 77 unique 'core' flag locutions, which were subsequently arranged in a process of loose semantic mapping. The result was the semi-formal classification shown in Table 2 below, with flags grouped into seven distinct – but closely related – classes: *literacies & skill sets*, *individual learning attributes*, *inclusion*, *pedagogy*, *social issues*, *technology* and *curriculum*.

Table 2. Core flag locutions occuring in titles of game making studies, arranged by category

literacies & skill sets	**individual learning attributes**	**inclusion**	**pedagogy**	**social issues**	**technology**	**curriculum**
– literacy / literacies	– intrinsic motivation	– **gender balance**	– constructionism	– in-out of school bridging	– 3D graphics	– architecture
– 21st century literacy/skills	– academic self-efficacy	– **social disadvantage / risk**	– constructivism	– civic issues	– augmented reality	– art
– contemp. learning abilities	– affect	– **special education needs**	– research methods	– college counseling	– co-design	– cross-disciplinary
– digital & media literacies	– communication		– discovery-based learning	– community issues & interactions	– computing	– culture/multi/interculture
– information literacy	– complexity thinking		– empowerment	– digital divide	– ICT	– curriculum
– game literacy	– computational thinking		– exergaming	– habitus	– gaming fluencies	– design
	– concentration		– experiential learning	– social outreach	– multimedia	– developmental psychology
	– critical thinking / reasoning		– innovation skills	– socio-economic status		– economics
	– design strategies		– inquiry-based learning	– youth agency		– engineering
	– design thinking		– instructionism			– language arts
	– engagement		– learning by doing			– environmental science
	– identity		– learning design			– ethics
	– innovative thinking		– location based learning			– geography
	– metacognitive strategies		– m-learning			– health
	– problem solving		– outdoors learning			– history
	– systems thinking		– pedagogy			– physical education
	– logic		– project-based learning			– landscape architecture
	– creativity		– teaching practice			– library based instruction
	– collaboration					– logic
						– mathematics
						– media education
						– natural sciences
						– nutrition
						– physics
						– science /STEM

[3] See the glossary of the WordNet Reference Manual at http://wordnet.princeton.edu/man/wngloss.7WN.html

This is not intended as a formal taxonomy of game making for learning but rather as a grounded distillation of its primary concerns, as signalled by researchers in the field. For simplicity's sake, it is presented here as a two-level structure of 77 instances grouped into seven classes. Actually, the three items in the **Inclusion** class are nested sub-classes clustering flags like *girls*, *women*, *gender*, *minority*, *inner-city youth*, *black*, *autistic*, etc. The other 74 flag names derive directly from instances in the flag corpus, as described above.

The frequency of flag occurrences in the 384 titles expressing a specific research interest or other is shown below in Fig. 4, which gives the breakdown for the seven classes and also some individual core flags that make highly significant contributions to the **learning attributes** and **technology** classes.

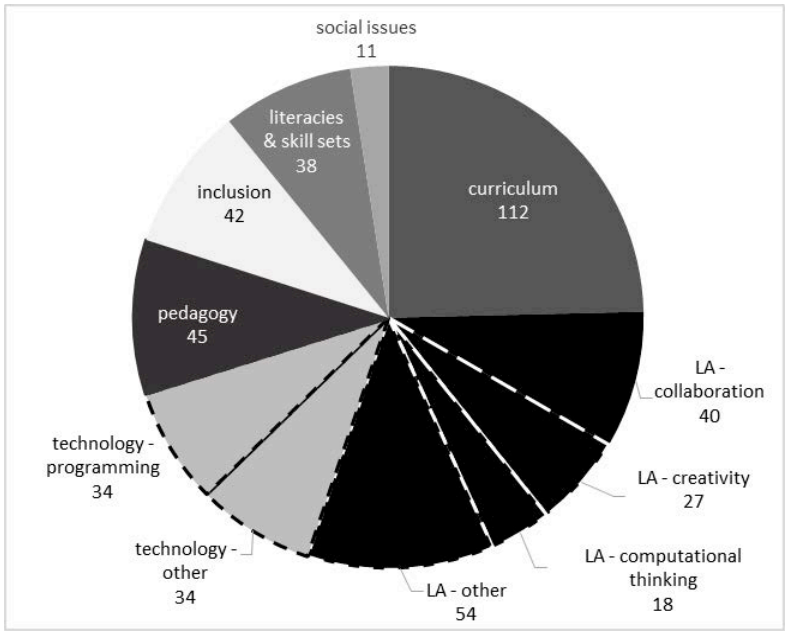


Figure 4. Areas of specific research focus mentioned in titles of game making studies

The class attracting strongest attention is **learning attributes**, represented by the combined sub-segments shown in black with dashed white border; this accounts for 139 (30.6%) of the 566 identified flags. In order of prevalence, **learning attributes** is followed by **curriculum** (112 – 24.6%), **technology** (68 – 15%), **pedagogy** (45 – 9.9%), **inclusion** (42 – 9.2%), **literacies & skills sets** (38 – 8.4%) and **social issues** (11 – 2.4%).

To get a clearer sense of research priorities, we need to consider the major contribution that some specific core flags make to some of these categories. For example, the total for **learning attributes** is largely driven by *collaboration* (40 – 28.8% of the category, 8.8% of all flags), *creativity* (27 – 19.4%, 6%) and *computational thinking* (18 – 13%, 2.3%). Out of the 384 titles containing some flagged topic or other, 81 (21.1%) mention one or more of these three, and these represent 16.4% of all the game making publications considered in the review, from 1982 to the present day. Another noteworthy result - not shown in Fig. 4 - is that the aggregation of flags containing the word "thinking" (computational thinking, design th…, systems th…, innovative th…, critical th…, complexity th…) totals 30 occurrences, i.e. 21.6% of learning attributes and 5.3% of the whole.

Another frequently occurring flag denoting a strong research interest is *programming* (34 – 50%, 7.5%), which represents half of the **technology** flags. This result is partly due to authors' use of the term "game programming" as a synonym of game design / making / construction etc., a use that nonetheless reflects a certain attitude to the activity, if not to expected learning outcomes.

The flags in the **curriculum** category cover a wide range of subjects that vary considerably in scope, from the very general (cross-disciplinary) to the very specific (parasitology). Interestingly, titles mentioning subjects and topics in the humanities/arts/languages domain (50 – 44.6%) figure very strongly, belying the superficial view of digital game making as an ostensibly STEM-oriented activity. The relatively low frequency of **pedagogy**-related core flags (45 - 10%) may lie in the reluctance of authors to include in their titles the often contentious, conceptually-loaded terminology typifying this domain (see table 2). The comparatively strong presence of **inclusion** flags is mostly due to

publications dealing with game making as a strategy for addressing the underrepresentation of girls and women in computing. Indeed, *gender imbalance* flags account for 22 of the 42 inclusion-oriented flags (52.4%); the topic is mentioned in 6.8% of titles with flags and 4.5% of all game making papers. **Literacies and skills sets** covers what might be termed the 'modern' education agenda at a more general level than individual **learning attributes**.

The flags within the **social issues** category reflect not just the reported objectives of game making research but also, in many cases, the organisational context in which those objectives have been pursued in the field. For the most part this entails community engagement in some form or other.

4 DISCUSSION

This paper is an attempt to shed light on the academic research that has been, and is being, carried out in the field of game making for learning. While the wider field of Game Based Learning continues to attract enormous attention in academia, education and the media generally, by comparison learners' game making remains a niche, albeit a very active one. Pelletier [29, p.32] attributes this to the predominance of an artefact-oriented view of GBL:

> *The recent interest in computer games for learning has conceptualized games as interfaces (forms) rather than practices, and so does not perceive … making games as relevant.*

Although there are signs that this narrow conceptualisation GBL is changing, it continues to be fuelled from various directions. In the serious games sector, efforts continue to gravitate around how digital artefacts can be designed and engineered to make interaction with educational content engagingly gameful [40]. At the same time, the educational publishing market is churning out a myriad of 'turnkey' digital game solutions that purport to make learning fun and (ipso facto) easy.

By contrast, game making draws inspiration from the constructionist concept of 'hard fun', whereby learning is the outcome of a process that "combines the pleasure of accomplishing something with the intense concentration and motivation involved" [38, p.304] This fits well with several recent trends in educational policy and practice, such as support for student-centred learning-by-doing and 21st century skills and literacies. It also resonates with the worldwide maker movement, which posits people as creators rather than passive consumers of innovative technological solutions, an approach that is gaining increasing interest in formal education [41].

Taken together, the outcomes reported in this systematic literature review form a picture of a research topic that has roots in 20th century traditions of game based learning and constructionism but which has truly begun to blossom in the past decade. In part, this is the result of the strategic position that digital game making occupies in the overlap between game based and technology enhanced learning, and the shift towards active, learner-driven approaches in education, themes that in recent years have been attracting considerable interest in educational research and praxis. These relations are also manifested in authors' general research concerns, as brought to light in this literature review. The findings on this aspect clearly indicate that the affordances which authors see in learners' game making include - but stretch well beyond - building familiarity and confidence with digital technology in the classroom, as beneficial as these factors may be. Indeed, they encompass a broad sweep of declarative and procedural knowledge related both to the curriculum and to important transversal skills like collaboration, creativity, and thinking skills.

The next step in this ongoing process of review is to investigate authors' specific research activities and outcomes in greater depth. This would involve a detailed examination of the research methods adopted throughout this field and also a meta-analysis of the findings that authors have attained so far. Building on the outcomes of the present review, these could represent a helpful framework of reference for those embarking on game making for learning and might also provide a useful benchmark for tracing progress in research and praxis. Ultimately, it is hoped that these efforts prove beneficial for all those investigating, advocating and supporting the uptake of game making as an approach to learning.

REFERENCES

[1] Bermingham, S, Charlier, N., Dagnino, F.M., Duggan, J., Earp, J., Kiili, K., Luts, E., Van Der Stock, L. & Whitton, N. (2013). Approaches to Collaborative Game Making for Fostering 21st

Century Skills. In: Dr Carlos Vaz de Carvalho, Dr Paula Escudeiro (Eds.), Proceedings of the 7th European Conference on Games-Based Learning. API, Reading, UK.

[2] Papert, S. (1980). Mindstorms: Children, Computers, and Powerful Ideas. ISBN 0-465-04674-6

[3] Papert, S. & Harel, I. (eds). (1991). Constructionism: research reports and essays 1985 – 1990. The Media Lab, Massachusetts Institute of Technology, Ablex Pub. Corp, Norwood, NJ, USA.

[4] Gee E., & Tran K. (2015). Video Game Making & Modding. Chapter to appear in Lesley, M., & Guzzetti, B. (Eds.), Handbook of Research on the Societal Impact of Digital Media, IGI Global.

[5] Burke, Q., & Kafai, Y. B. (2014). Decade of Game Making for Learning; From Tools to Communities. In Angelides, M. C. & Aguis, H. (Eds.), Handbook of Digital Games. NY. Wiley.

[6] Busuttil, L. (2014) I want to be a game maker: experiences of digital game making with eleven year olds. PhD thesis, University of Sheffield, UK.

[7] Johnson C. (2014) 'I liked it, but it made you think too much': A case study of computer game authoring in the Key Stage 3 ICT curriculum. PhD thesis, University of East Anglia, UK.

[8] Akcaoğlu M. (2013) Cognitive and Motivational Impacts Of Learning Game Design On Middle School Children. PhD dissertation, Michigan State University (MI), USA.

[9] Marone V. (2013). Constructing Meanings By Designing Worlds: Digital Games as Participatory Platforms for Interest-Driven Learning and Creativity. PhD thesis, Padua University, Italy and University of Tennessee, USA

[10] Siko, J. P. (2013) Changing the way we build games: a design-based research study examining the implementation of homemade powerpoint games in the classroom. Doctoral Dissertation, Wayne State University, Detroit (MI), USA.

[11] Siko, J., & Barbour, M. (2013). Game Design and Homemade PowerPoint Games: An Examination of the Justifications and a Review of the Research. Journal of Educational Multimedia and Hypermedia, 22 (1). 81-108.

[12] Stiklickas D.M. (2013). Student Game Design: What Do Students Learn While Designing Games? MA Dissertation, Hofstra University. Long Island, NY, USA.

[13] Denner, J., Werner, L., & Ortiz, E. (2012). Computer games created by middle school girls: can they be used to measure understanding of computer science concepts? Computers & Education 58 (2012). 240–249.

[14] Marlow, C.M. (2012) Making Games for Environmental Design Education: Revealing Landscape Architecture. IJGCMS 4(2): 60-83.

[15] Richards, K., & Wu, M. L. (2012). Learning with educational games for the intrepid 21st century learners. In P. Resta (Ed.), Proceedings of Society for Information Technology & Teacher Education International Conference. 55–74. Chesapeake, VA. USA. AACE.

[16] Robertson, J. (2012). Making games in the classroom: benefits and gender concerns. Computers and Education. 59(2). 385-398.

[17] Aubrecht, M. (2011) Using Gamestar Mechanic with Elementary Art students: An exploration of one teacher's experiences. MA thesis. Ohio State University (OH), USA.

[18] Howland, K. (2011). Narrative threads (A rating scheme for narrative-based computer games created by young people). PhD thesis, Sussex University, UK.

[19] Reynolds R., & Caperton I. H. (2011) Contrasts in student engagement, meaning-making, dislikes, and challenges in a discovery-based program of game design learning. Education Tech Research Dev. 59:267–289 DOI 10.1007/s11423-011-9191-8.

[20] Sprung, G., Zimmermann, L., Strohmaier, R., Schadenbauer, S., & Nischelwitzer (2011). How to support educators who want to use the creating games approach to teach IT courses. Proceedings EDULEARN11. Barcelona, Spain. 2271-2279.

[21] Wilson, A., Connolly, T., Hainey, T., & Moffat, D. (2011) Evaluation of Introducing Programming to Younger School Children Using a Computer Game Making Tool. Proceedings of the Fifth European Conference on Games Based Learning. 639-649.

[22] Patton R.M (2011) Games as artistic medium: interfacing complexity theory in game-based art pedagogy. PhD dissertation. Pennsylvania State University, PA, USA

[23] Oldaker, A. (2010). Creating video games in a middle school language arts classroom: a narrative account. Voices from the Middle, 17-3. 19-26.

[24] Games, I. A. (2009). 21st Century Language and Literacy in Gamestar Mechanic: Middle School Students' Appropriation Through Play of the Discourse of Computer Game Designers. PhD dissertation, University Of Wisconsin-Madison, USA.

[25] Harris, R., Fadjo, C.L., Carson, E., Hallman, G., & Swart, M. (2009) Creativity in video game design as pedagogy. SIGGRAPH 2009, New Orleans, Louisiana, USA. August 3–7, 2009.

[26] Yatim, M. (2009) Children, computer & creativity: usability guidelines for designing a game authoring tool for children. PhD dissertation, University of Magdeburg, Germany.

[27] Howland, K., Good J., & du Boulay B. (2008) A game creation tool which supports the development of writing skills: interface design considerations. 5th International Conference on Narrative and Interactive Learning Environments (NILE 08), 6-8th August, 2008. Edinburgh, UK.

[28] Pelletier C. (2007) Learning through Design: Subjectivity and Meaning in Young People's Computer Game Production Work. PhD Thesis, University of London Institute of Education.

[29] Veelo K. (2007) Games Atelier: Learning environment for producing and playing location-based mobile games. MA thesis, University of Twente, the Netherlands.

[30] Kafai, Y. B. (1996) Electronic play worlds: Gender differences in children's construction of video games. In Yasmin K., & Resnick M. (Eds.), Constructionism in practice: Designing, thinking and learning in digital world, (pp.97-123): Mahwah, N.J. USA. Lawrence Erlbaum Associates.

[31] Earp J., Dagnino, F.M., & Caponetto, I. (in press). An Italian Pilot Experience in Game Making for Learning. Huang Ronghuai, Kinshuk, Jon K. Price (Eds.), ICT in education in global context, Lecture Notes in Educational Technology, Springer-Verlag. ISBN: 78-3-662-47956-8.

[32] Rickinson, M. and May, H. (2009) A comparative study of methodological approaches to reviewing literature. The Higher Education Academy. Accessed at: https://www.heacademy.ac.uk/resource/cfd1c67a-0c2a-4146-89e6-cbc0689410ae.

[33] EPPI-Centre (2007). EPPI-Centre methods for conducting systematic reviews. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

[34] Caponetto, I, Earp, J. & Ott, M. (2014). Gamification and Education: a Literature Review. Professor Dr.-Ing. Carsten Busch (ed.), Proceedings of the 8th European Conference on Games-Based Learning - ECGBL 2014, 50-57. Academic conferences and publishing international Limited, London (Regno Unito). ISBN: 978-1-910309-55-1.

[35] Gagne A. (1982) ESL Teachers & Students Making & Playing Games. SPEAQ, 6-1 p39-58

[36] Peterson, M. (2010) Computerized Games and Simulations in Computer- Assisted Language Learning: A Meta-Analysis of Research. Simulation & Gaming 41(1) 72– 93.

[37] Kafai, Y. B. (1994) Minds in Play - Computer Game Design as a Context for Children's Learning. Hillsdale, N.J. USA. Lawrence Erlbaum Associates.

[38] Cimiano. P., Hotho A., & Staab S. (2004). Clustering concept hierarchies from text. In Proceedings of LREC 2004, Lisbon, Portugal.

[39] Manning, C.D., Raghavan p., & Schütze H. (2008) Introduction to Information Retrieval. Cambridge University Press. Available at: http://nlp.stanford.edu/IR-book/

[40] De Gloria, A.; Bellotti F.; Berta R. (2014). Serious Games for education and training. International Journal of Serious Games (IJSG) 1-1. Serious Games Society.

[41] Rosenfeld Halverson E. & Sheridan K. (2014). The Maker Movement in Education. Harvard Educational Review. 84 (4). 495-504.