

Review of Educational Benefits of Game Jams: Participant and Industry Perspective

*Przegląd edukacyjnych walorów game jamów.
Perspektywa uczestników i branży gier.*

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Abstract: There are some studies on the educational potential of game jams, but their number seems insufficient given the hundreds of thousands of game jam participants every year. What emerges as the largest research gap is the game industry perspective: its involvement in game jamming and motivations for doing so. This study is a reaction to this research gap. Current research defined some educational benefits of game jams, but how these benefits are relevant for the game industry is radically underresearched. Clarifying this missing link might be essential to the widespread use of game jams as platforms for collaboration between the academia and the game industry. This explorative study answers the following questions: What do we know about the learning outcomes of game jams for participants? How are (or are not) those outcomes relevant for the game industry? How and why do (or do not) video game studios engage with game jams? If so, are the studios also motivated by educational benefits? Our paper is based on a systematic review of resources from 10 academic databases using search operators and pre-defined criteria,

and also on direct data collection from the video game industry. The study suggests that game jams can improve soft and hard skills that the video game industry appreciates. Also, the findings suggest that the video game industry is aware of game jams' educational benefits and that these benefits are one of the main motivators for game companies to get involved in game jams.

Keywords: collaborative learning; STEM skills; game jams; video games

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Introduction

There is no denying the fact of the rising popularity of game jams. In 2010, Global Game Jam had 4,300 participants at 138 sites creating 900 games (Global Game Jam, 2022). Ten years later, this number increased ten-fold: 48,753 participants, 934 sites, and 9,601 games. A similar growth has been seen in the Ludum Dare initiative (Kasprzak, 2010; Ludum Dare, 2022). Hundreds of game jams happen each month, online and offline (see e.g. indiegamejams.com or itch.io/jams). Academic research on game jams is also gaining momentum: one only needs to look at the International Conference on Game Jams, Hackathons, and Game Creation Events held annually since 2016. What we focus on is the educational dimension of game jamming and its value to the video game industry.

We already know a lot about the educational benefits of game jams. One can begin with the comprehensive literature review by Meriläinen et al. (2020). It covers 37 papers from 2010–2019, found through Google Scholar, ACM digital library, ScienceDirect, and ResearchGate. The list of educational benefits, compiled from multiple authors, includes the category of “Game Dev Skills”. It begins with gamedev-relevant technical skills: learning new game dev tools; building low-level skills in software development; learning the process of design/development from start to finish; practice in rapid prototyping, participatory design, collaboration and communication.

The latest Finnish paper, “Game Jams in General Formal Education” (Aurava et al., 2021), is informed by three years of research in Finnish schools. It covers game jams targeted at students aged between 16 and 19 years. The researchers explored the impact of game jam participation on the development of 21st century skills, in particular: metareflection, epistemic flexibility, communication and cooperation, learning-to-learn, problem solving, critical thinking, STEAM and ICT skills, plus creation and innovation. Student self-assessment reports give priority to programming and other ICT skills, teamwork, self-regulation, and time management. Not surprisingly, many of the skills in Aurava et al. (2021) also appear in Meriläinen et al. (2020).

Our take on game jams’ edu-values has a different focus. Meriläinen et al. (2020) adopt a general view of game jams in various environments, with “Game Dev Skills” being one of several sections. Aurava et al. (2021) narrow

their scope to the formal school education of 16-19-year-olds, with a focus on 21st century skills. Our perspective is industry-oriented; i.e. on the benefits not only for participants but also for gaming companies as organisations.

We draw inspiration from Valença et al.'s (2019) metareview of 49 studies on the social, technical, and business-related benefits of hackathons as perceived by software companies. According to that, the key social benefits are "Promoting knowledge sharing and opportunities for learning" (in 52% of analysed papers) and promoting interactions among participants (48% of papers). Next comes "promoting cultural change" (33%) and attracting new partners (30%). The technical benefits open with "innovating the software product/platform" (81%). Promoting a particular software platform is mentioned in 19% of papers and assessing that software in 15%. Business-related value involves "improving company and product image" (22%) and "promoting the creation of new start-ups/companies" (11%).

Game jams are similar to hackathons but not a 1:1 equivalent. Thus, they deserve academic attention on their own merit. As far as we know, there is currently no review of their learning potential as perceived by the video game industry. Information on this topic is fragmented; e.g., 11.5% of Czech game developers surveyed in 2020 by the Czech Game Developers Association (2021) identify game jams as one of the places where they acquired their development skills. We intended to replicate Valença et al.'s (2019) literature review, replacing hackathons with game jams and software developers with video game developers. What we found was a huge research gap: compared to hackathons, the industry perspective on game jams seems to be drastically underresearched.

We divide our literature review into two parts. Part 1 investigates what we know about game jams' learning potential from the perspective of participants, with a particular focus on empirical findings. Part 2 investigates game jams' learning potential as perceived by the video game industry. Each part has two central questions.

Questions for Part 1:

- Q1. What do we know about the learning outcomes of game jams for participants?
- Q2. How are (or are not) those outcomes relevant for careers in the game dev industry?

Questions for Part 2:

- Q3. How and why do (or do not) video game studios engage with game jams?
- Q4. If so, are the studios also motivated by educational benefits?

At the intersection of Q2 and Q4 lie industry-relevant learning outcomes appreciated on both sides: for the participants' individual development and for the interest of gaming companies. Around this core lies space for a wider research context: learning outcomes (Q1) not considered relevant by the industry (Q4), and industry-perceived benefits (Q3) not related to education (Q4).

Looking for answers, we ran a systematic search of 10 academic databases, identifying 362 potentially relevant articles. However, in the selection process, we reduced this number to 15 papers for Part 1 (papers on the participant's perspective on learning) and 12 papers for Part 2 (exploring the industry point of view). Compared to the 49 papers on hackathons reviewed by Valença et al. (2019), we deemed this score to be relatively low. Due to the limited number of studies, we decided to reach out directly to the industry. Therefore, in addition to a review of (scarce, as it turned out) available research, we proposed directions for expanding it. Plus, we decided to make the first step in doing so, which adds Part 3 to our exploration: a questionnaire-based survey of 14 Czech video game studios. The latter aims to answer the same questions as Part 2, supplementing prior studies with a brand new one.

1. Part 1 – Participant Report

1.1. Methodology

The aim of the literature review in Part 1 was to analyse information in academic databases on game jams' educational and learning potentials for participants. We looked for empirical data. The search took place on 24 May 2021.

Inclusion criteria: We adopted the following criteria to identify relevant studies:

- Focused on game jams;
- Containing any type of data on educational/learning/teaching benefits for participants;

- Practical constraints: the study was available in English and the paper's full text was accessible (open or paid access).

Search strategy and selection of studies: We used a simple, relatively inclusive search string in 10 academic databases:

- (“gamejam*” OR “game jam*”) AND (learn* OR education* OR teach*).

Using various translations of the above-mentioned search string across the 10 databases (see Table 1) allowed us to identify 452 studies. The elimination of duplicates brought this number down to 362 (349 from databases + 13 from citation search). Studying the abstracts, we selected 79 papers as promising resources for further analysis in our literature review either in Part 1 or 2 (72 from databases + 7 from citation searching; for the full list see the supplementary materials).

Ultimately, we identified 15 studies for Part 1: those that discussed game jams' benefits for participants on the basis of collected empirical data. The selection process is illustrated in the Prisma Flowchart (Page et al., 2021) (see Fig. 1).

1.2. Findings

The majority of studies collected self-reported data from participants in questionnaires (10 cases) or interviews (3 cases). Only two studies measured learning outcomes using a different method: a comparison of participants' academic performance by analysing their university results. In total, these studies collected data from 5,096 participants. With the exception of two larger studies with 1,920 and 1,714 participants and two medium-sized studies with 532 and 531 participants, all studies had fewer than 100 participants.

Concerning research design, only five of those studies used between-subject design with a control group. Out of these five studies, two focused on academic performance in general in relation to results of performance at university. Three were more focused on learning outcomes regarding the topic of the specific game jam (change in attitudes towards accessibility in design after a game jam focused on accessibility). The rest of the studies used within-subject design using pretest-posttest design

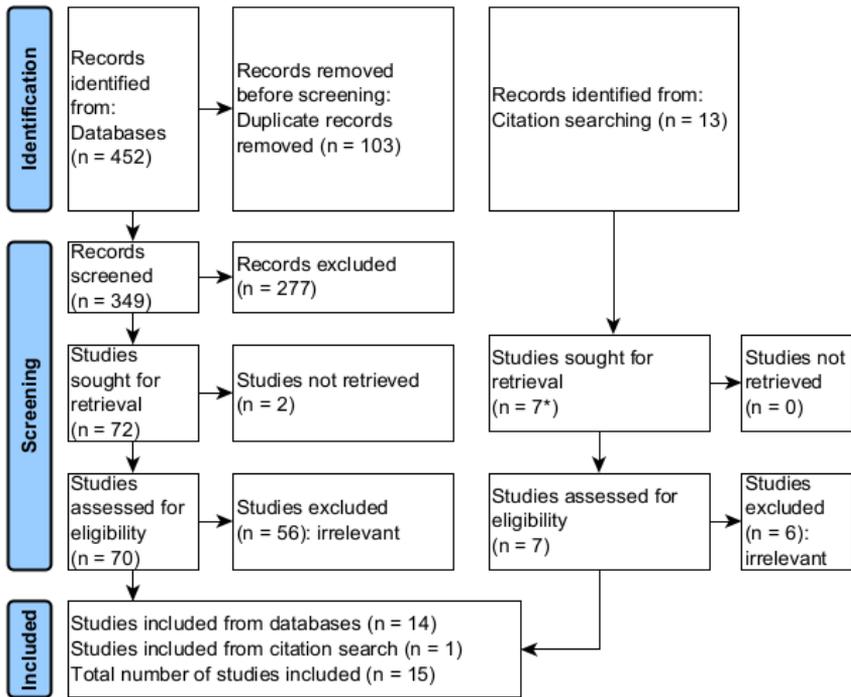
Table 1. Number of identified articles in the academic databases

Database	Search String	Number of Articles
Scopus	TITLE-ABS-KEY (((„gamejam*” OR „game jam*”) AND (learn* OR education* OR teach*))))	77*
Web of Science Core Collection	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	37**
ACM	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	130
Eric	(gamejam OR gamejams OR „game jam” OR „game jams”) AND (learn OR learning OR teach OR teaching OR education OR educational)	5
Science Direct	(gamejam OR „game jam” OR gamejams OR „game jams”) AND (learning OR learn OR teach OR educational OR education)	26
Springer Link	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	140
IEEE Explore	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	10
Psychinfo	noft((((„game jam” OR „game jams”) OR gamejam*) AND (learn* OR teach* OR education*))).)	9***
Taylor & Francis	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	14
Wiley Online Library	(„gamejam*” OR „game jam*”) AND (learn* OR teach* OR education*)	4

Note: * Searched in Title Abstract and Keywords; ** Searched in Topic; ***Searched anywhere but full text

(four cases), or they used one group posttest-only design (six cases). For further details, see Table 2.

The sample of identified studies is relatively low, and with a very diverse focus and different study designs. Fewer than half of the studies used control conditions. Therefore, it is not possible to compare meaningfully their results in a meta-analysis. We can conclude that current empirical knowledge is limited, which stands in contrast to the growing popularity of game jams worldwide. The following section reviews our findings from those papers.



Note. * during the screening process of the records identified in citation search, 6 more studies were considered irrelevant and excluded

Figure 1. Prisma Flowchart about the selection of studies focused on educational benefits for participants

In general, all of the selected studies reported positive learning outcomes in their respective participants. With the exception of two studies, all of the measured areas showed positive trends. We identified a positive impact in the following areas (some studies focused on multiple areas):

- **Social skills (7)** – this includes a broad variety of soft skills including better cooperation in teams, communication or networking, and socialisation.
- **Hard skills (5)** – general improvement; for example, in programmer/art/game design skills.
- **Self-efficacy (4)** – feeling of competence or preparedness for a game development related-task.
- **Game jams for change (4)** – general improvement of attitudes or knowledge regarding the game jam’s theme. For instance, improving

participants' knowledge and attitudes towards accessibility in games after participation in an accessibility-focused game jam.

- **Academic performance (2)** – student performance in university courses in general.
- **Self-learning (2)** – ability or motivation to learn on one's own.
- **Creativity (2)** – improvement in creative thinking.
- **Project management (1)** – production-related skills.
- **General gamedev skills (2)** – this includes unspecified improvement of skills in game development.

Only two areas were identified as not improved in two studies. However, those particular studies confirmed improvement in different areas. The two areas were specifically: Self-learning (1) and Hard skills (1).

Based on the currently available empirical knowledge, we can conclude that game jams have positive educational benefits for their participants. The available data is very conclusive about this (see Table 2). In the GAMEHIGHED project, we converted these findings to a formal list of game jam learning outcomes, included in *Game Jam Organisation Handbook* (Černý, Gemrot, Kolek & Mochocki, 2022).

2. Part 2 – Industry Report

2.1. Methodology

The aim of the literature review in Part 2 was to analyse information in academic databases on game jams' benefits (in particular: educational ones) as perceived by the video game industry.

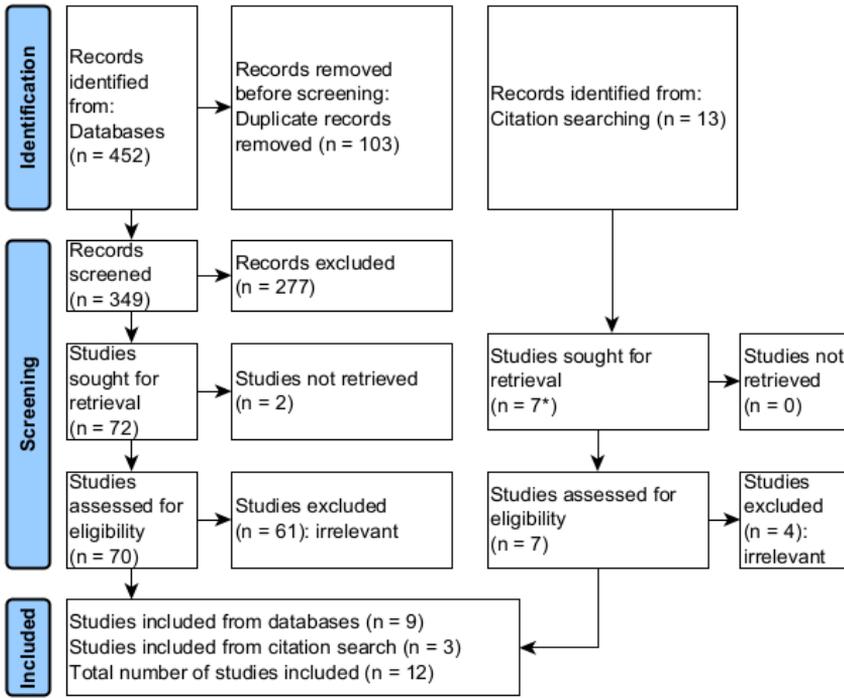
Inclusion criteria: We adopted slightly different criteria for identifying relevant studies than in Part 1:

1. Focused on game jams in conjunction with the game industry and potential educational/learning/teaching benefits;
2. Containing any type of data or industry observation on game jams, their participants, and companies involved;
3. Practical constraints: the study was available in English and the paper's full text was accessible (open or paid access).

Table 2. Research sample of studies and description of their results

Citation	Year	Positive outcome	Category	Experiment design	Number of Participants
Arya et al.	2013	No	Hard skills	Within subject	265
Arya et al.	2013	Yes	Hard skills Social skills Self-efficacy	Posttest only	532
Aurava et al.	2021	Yes	Self-efficacy Self-learning	Posttest only	27
Faas et al.	2019	Yes	Hard skills Social skills	Posttest only	15
Fowler et al.	2013	Yes	General gamedev skills Social skills	Posttest only	1740
Fowler et al.	2018	Yes	Academic performance	Between-subject	1912
Juraschek et al.	2020	Yes	Game jam for change General Posttest-only gamedev skills Social skills	Between-subject + Posttest only	18
Meriläinen	2019	Yes	Hard skills Self-learning Creativity Self-efficacy	Posttest only	4
Miller et al.	2019	Yes	Self-efficacy	Within subject	26
Pimentel et al.	2021a	Yes	Game jam for change	Between-subject + Within subject	64
Pimentel et al.	2021b	Yes	Game jam for change	Between-subject + Posttest only	531
Pirker et al.	2016a	Yes	Social skills Project management Creativity Hard skills	Posttest only	25
Pirker et al.	2016b	Yes	Social skills Hard skills	Posttest only	22
Preston et al.	2012	Yes	Academic performance	Between-subject	95
Scott et al.	2014	Yes	Game jam for change	Between-subject	35
Smith & Bowers	2016	Yes	Social skills	Within subject	50
Smith & Bowers	2016	No	Self-learning	Within subject	50

Search strategy and selection of studies: The search was identical to that in Part 1. We checked the 79 identified papers against the above-mentioned criteria. Ultimately, the number of studies selected for analysis in Part 2 was reduced from 79 to 12: those that discussed game jams' benefits for the industry. The selection process is illustrated in the Prisma Flowchart (see Fig 2).



Note. * during the screening process of the records identified in citation search, 6 more studies were considered irrelevant and excluded

Figure 2. Prisma Flowchart focused on perceived game jam benefits as perceived by video game industry

2.2. Findings

Game Industry Perspective – review of academic sources: In our research sample, we identified only 12 relevant studies out of the 362 reviewed. The game industry perspective on game jams and their potential benefits

represents a significant research gap. The following is a summary of information found in this area.

Kultima's 10-year-long study (2018) of game developers from four continents allowed her to conclude that the game industry is intertwined with game jam cultures. This is because companies utilise jamming as part of their development cultures. They repeatedly give game jams credit for having developed new tools and technologies and increased professional confidence. In addition to education, game companies benefit from jams by recruiting staff, industry networking, connecting with players, and picking jam prototypes for commercial development. Companies also organise game jams as internal creativity boosts (Kultima, 2018, p. 146). In-house game jams organised by companies should be distinguished from public ones. Public game jams are often community events accessible to anyone; their outcomes are usually made public. In-house game jams are closed to the public, often attended only by company employees or collaborators. The outcomes of in-house game jams are rarely accessible to the public (see Goddard et al., 2014, for further distinctions).

The study of Goddard et al. (2014) is one of the few industry-focused overviews of game jam benefits. According to their work, professional studios use internal game jams for fast-prototyping. These events provide breaks from long development cycles. They offer an occasion to work in interdisciplinary teams, try other roles in the development team, work on one's own ideas, train time management skills, and experiment and innovate while fast-prototyping. They mention several companies using jams for these reasons, e.g., Valve Corporation and Double Fine. They conclude that the game jam format could lead to innovative ideas resulting in commercially successful products.

According to Fowler et al. (2016), based on their comparison with the industry's general needs from computer science students, they conclude that it is also essential to teach game development students soft skills to prepare them for work in the game development industry and to increase their employability. This could be problematic in traditional teaching environments, but game jams can teach many skills listed as crucial by the industry; namely, communication, problem-based thinking, creative problem solving, and the ability to learn new things quickly. They also mention that game jams train the ability to work in multidisciplinary

and multicultural teams, which can prepare participants for the current situation in the industry. Arya et al. (2013) come to similar conclusions regarding the benefits of work in diverse teams for future careers in the industry. The methodology of their study and observations stems from their ten years of professional and academic experience with game development. They also emphasise the learning effect of using skills under time pressure as having a positive effect on performance in the industry.

Hrehovcsik et al.'s (2016) study also benefits from its authors' experience in teaching game development and professionally developing video games. In the study, they identify game jams' benefits in formal curricula. In this regard, they highlight the opportunity to practice skills and competences needed in professional game development, which requires flexibility, innovation, and readiness for fast-paced and complex work environments. As such, game jams are a way to connect formal education with industry practices. Ingram et al. (2020) suggest that industry-academia cooperation brings mutual benefits: academics collaborating with the industry create higher quality research outputs with higher funding, and companies collaborating with universities create more innovative products.

Kankainen et al. (2019) interviewed 13 game jam organisers who organised their events as part of their jobs with a company or an institution (in the game industry or in education) in Finland. According to them, internal game jams are often used to generate new ideas. Organising public game jams is often seen as a recruitment opportunity or a relaxing event for employees. However, they are also used for marketing and image building purposes. Turner et al. (2013) observed in one regular public game jam that the game studios' motivations to participate in the event was a chance to explore an idea or a new technology.

As evident in Farhan and Kocher's study (2016), different game jam formats can provide different benefits from the industry perspective. Usually, teams in game jams consist of less than 10 people. The authors argue that these smaller formats can easily simulate indie game development; however, not so much AAA game development. Therefore, they organised and analysed game jams for teams bigger than 10 people in order to let them learn from a big production experience. Those events provide participants with similar skill improvements, but in a different

production context that can be especially valuable in countries without any AAA video game studios.

A study by De Salas et al. (2016) focuses on game jams' impact on the development of the local gaming industry and communities in Tasmania: an Australian state with a weak game development ecosystem. Their data, based on organising two local game jams, suggests that the game jams helped to slightly increase interactions between local game developers. Also, the majority of participants enhanced their social networks as a direct result of the two jams. The vast majority also felt predominantly closer to local game developers. Concerning finding potential work partners (after the first game jam), 14.8% of participants indicated that the jam was moderately or largely useful. This number increased to 43.3% among participants in the second game jam. In general, this study suggests that game jams are a useful format for establishing a game development industry in areas with underdeveloped game development communities.

Smith and Bowers (2016) collected data from 50 US participants at GGJ 2016 in Orlando (28% industry professionals, 50% game design students or graduates) that suggests game jams have a positive effect on the socialisation of game developers. The authors subsequently assumed that, as a result of game jams, developers might continue professional collaboration, create new studios, and encourage new people to get involved in the industry. Another confirmation of game jams' crucial role in establishing local game development communities comes from Finland: Kultima et al. (2016) emphasised the role of game jams in the rise of the successful industry.

Game Industry Perspective: Given the scarcity of research on the game industry approach to jamming, we recommend that academic literature be supplemented with non-academic publications by industry professionals (practitioners). The page limit does not allow for a full-scale study, so we only point to two examples from opposite ends of the spectrum. One addresses the perceived benefits of events from an indie developer's perspective through personal introspection, while the other evaluates the benefits from the company's perspective.

Theo Clarke is a young England-based QA tester who participated in game jams each month for a year. This was his private after-hours activity

aimed at skill development. In his blog post on Gamasutra (Theo, 2021), he observes: time constraints train goal-setting and decision-making; multiple small projects develop creativity and a diverse skillset better than one/few larger projects; jams help reassess one's skills by exposing strengths and weaknesses; quick progress and completion increase satisfaction and confidence; public release brings a sense of accomplishment and validation, and also feedback that may direct further learning.

US-based Peet Cooper is a senior creative director and artist whose fifteen years of experience include blockbuster AAA titles. In his GDC 2018 talk (Cooper, 2018), he speaks about company game jams held at Riot Games during regular working hours. Key benefits included a boost in motivation and creativity; cross disciplinary integration (art, design, engineering, etc.); and learning new things. Riot Games made a deliberate effort to use in-house jamming to improve their regular development process by speeding it up through rapid prototyping, making staff learn new things quickly in new tasks, and actively involving more staff (including those with no gamedev experience, like HR people). In his closing thoughts, he lists six key items he feels are of importance: teamwork skills, creative problem-solving, time management, fresh perspective, sense of accomplishment, and creative freedom.

3. Part 3 – Industry Survey

3.1. Survey Methodology

To supplement the literature review, we decided to collect empirical data from companies in the Czech Republic. Data collection occurred between 12 Feb. 2021 and 10 Mar. 2021. The questionnaire was addressed to higher management or executives in Czech video game companies. We used Czech Game Development Association's contacts to disseminate the questionnaire directly to the representatives of each company in Czech Republic within their network. The questionnaire is attached below:

1. Where is your company or the branch you represent located geographically? (country) (open question)
2. How many people work in your company? (options)
3. How many games do you release per year on average? (options)

4. How many games do you prototype per year on average? (options)
5. Have you done any activities related to game jams in any way within your company in the last 2 years? (multiple options): A) Yes B) No
6. (If 5 = Yes) Had you done any activities related to game jams in any way within your company in the past? (Multiple options): A) Yes B) No
7. (If 6 = Yes) What activities had you done in relation to game jams in the past? (multiple options):
 - A) We organized or participated in the organization of public game jams.
 - B) We organized in-house game jams.
 - C) We provided our employees with incentives to participate in game jams (extra days off or salary bonuses).
 - D) We promoted participation in game jams among our employees.
8. What was your reason for not continuing those activities? (open)
9. (If 6 = No) What was your reason for not doing any activities related to game jams? (open)
10. (If 5 = Yes) What activities have you done in relation to game jams? (multiple options):
 - A) We organized or participated in the organization of public game jams.
 - B) We organized in-house game jams.
 - C) We provided our employees with incentives to participate in game jams (extra days off or salary bonuses).
 - D) We promote participation in game jams among our employees.
11. (If 5 = Yes) What are your reasons for doing these activities? (open)
12. Is there anything else you would like to add or share with us? (open)

3.2. Czech survey findings

We collected responses from fourteen Czech companies. We note two variables between the companies. With regard to the number of employees, we had eight smaller studios with up to 9 employees and six larger studios with 10+ employees. Two studios from these six had more than 100 employees. With regard to annual productivity, we had seven studios

doing less prototyping (0–1 prototypes per year) and also seven studios doing more (2+ prototypes per year). Productivity and company size seem unrelated in this sample.

Involvement rate. Eight of the fourteen companies declared in closed questions that they had engaged in game jam activities. Interestingly, two other companies declared they had not, but nonetheless their answers to open questions clearly demonstrated otherwise. Thus, we included them among the companies that did have game jam experience, raising the total number from eight to ten, or 69% of companies. The percentage reflects the general global trend of the industry’s high integration with the game jam culture (see Goddard et al., 2014). Czech companies are no exception: most of them are involved in jamming in one way or another.

Correlations? Company size does not seem to predict involvement in game jam activities: 83% of larger and 62% of smaller studios expressed being active in this area. Productivity, however, seems to correlate: only 43% of companies developing one or less prototypes per year were active in game jams, compared to 100% of those that created at least two prototypes per year. Obviously, our sample is too small to generalise, but we think it signals a potential trend that merits further investigation.

Activity types. The most common activity among companies is organisation of in-house game jams and promotion of jam participation (Fig. 3). Only one of the ten companies has organised a public game jam or coordinated its staff’s collective attendance at a public game jam.

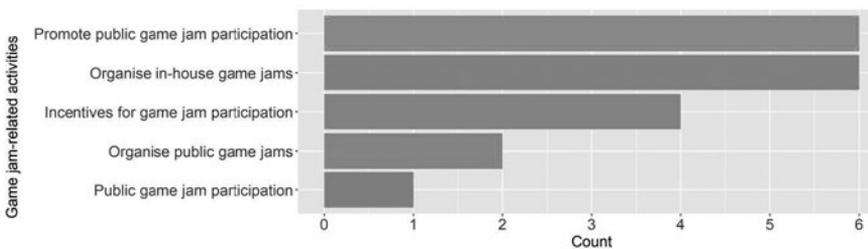


Figure 3. Reported type of activities studios do with regard to game jams

Motivations. Company motivations for organising or supporting jam-related activities was an open question. An average response stated two reasons per company. Self-education featured the most frequently;

followed by team-building; then creating/iterating ideas; supporting creativity; public image; trying new things/roles; and discovering hidden potential among staff (Fig. 4).

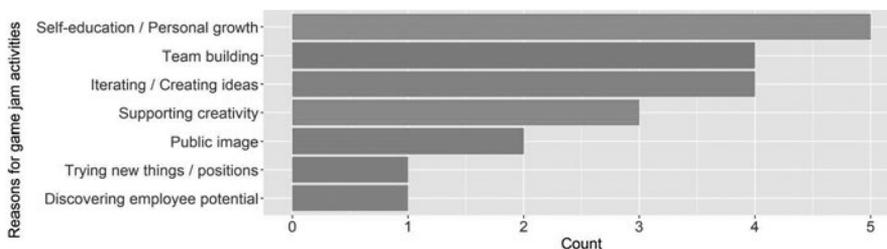


Figure 4. Reasons why companies do game jam-related activities

In summary, five things are certain:

1. Attending game jams is common among game development professionals.
2. It is common for game companies to support (often: organise) game jams.
3. Besides public events, it is not uncommon for larger companies to host internal game jams.
4. A commonly cited motivation for attending/supporting jams is learning (of industry-relevant competences).
5. Other industry-related motivators also play a role.

These observations are mutually supported by three types of sources: academic literature review, industry publications, and our survey (not to mention anecdotal and tacit knowledge). But there is no estimation of the exact scale of institutional and individual involvement. Another unexplored area is the organisational model of public and internal jamming. Yet another is the characteristics of educational and non-educational motivations, and the degree to which these are realised and exploited (for instance, by HR or PR departments).

Our survey of 14 Czech companies shows directions for further research that may ultimately answer those questions. 69% of our surveyed companies reported involvement in game jams; larger companies did so a bit more frequently than smaller ones. All companies with a higher productivity (two or more prototypes per year) were involved in jams (one had been

in the past, but not anymore), compared with 42% of those with a lower productivity. Also, the most commonly reported activity is organising the companies' own in-house jams. These facts indirectly suggest that video game companies are aware of game jams' positive effect on creativity.

Only one company organised or co-organised public game jams, and just three provided their employees with incentives to take part in jams. Our sample is too small to generalise, but it paves the way for a larger survey. In addition to the statistics, we also wish to highlight the local context. For instance, it is likely that no incentives inside companies are needed in the Czech Republic, where game jams are commonplace and have a relatively large scale (100+ participants) – they are regularly attended by students as well as community and industry employees.

4. Conclusion

Game jamming has already become integrated with game-focused educational programs in multiple countries, often with industry support and participation (Çatak et al., 2020). There is some quality research on the educational potential of game jams, but its amount seems hardly sufficient given the hundreds of thousands of participants every year. What emerges as the largest research gap is the game industry's perspective: their involvement in game jamming and motivations for doing so. This includes motivations related to jamming as a learning experience.

Starting with a relatively high number of 362 papers identified with key search words, our ambitious review of academic literature in 10 databases ultimately dwindled to 15 papers that we actually found relevant for Part 1 (participants) and 12 papers for Part 2 (industry). Unsatisfied with this result, we decided that literature review should be supplemented with reaching out directly to the game industry. This can be done in two ways: 1) by conducting surveys in game companies to understand institutional practices in/around jams and their motivations – related and unrelated to learning; or 2) by cross-referencing the literature survey findings with opinions expressed by industry professionals in non-academic media. In this paper we show examples of such cross-referencing and surveys, taking a first step in the direction we recommend be given more attention in further research.

The discussion of our findings should be contextualised in the wider debate on industry-relevant skills and competences. The scarcity of academic sources that would state directly “industry professionals appreciate the educational value of game jams in XYZ areas” can be redeemed by combining two related areas of research: on game jams’ educational potential in general and on key competences valued in the game industry. This would build the following argument:

1. Game jam research states that jamming develops skills XYZ.
2. Game industry research states that XYZ skills are highly valued.
3. Therefore, we can expect the industry to appreciate the power of game jams in providing training in XYZ skills.

Academic research on game development competencies has systematically developed since the 1990s, with particular credit going to the IGDA and their Game Education SIG working on a games-educational curriculum framework since around 2000. The line between academic and industry sources is routinely blurred, as much of the academic work consists of collecting and compiling information communicated by industry professionals in various media: from blog posts and YouTube videos to books. In this context, “academic” research has not yet been contrasted with industry experience. Conversely, it relies on the latter with the added value of research methodology and/or relevant academic theory. For instance, Mochocki (2018) takes seven key game design skills from Portnow’s industry survey for “Extra Credits” and reworks them with educational theory as five actual skills (communication, collaboration, logical thinking, lateral thinking, and scope), one attitude (love of learning), and one knowledge (breadth of knowledge). The academia/industry divide is even more blurred by authors who combine the roles of academics and game development practitioners, or academics, game development practitioners, and games educational instructors. See for instance Fullerton (2019, Chapters 6–11), for whom key skills in game design are communication, teamwork, process, inspiration, becoming a better player, and creativity. Other development skills besides game design include programming, audio design, visual design, interactive storytelling, game production, game business, and knowledge areas such as: game studies, media studies, and games and society (IGDA, 2008). Within the limits of this report, we build the following argument:

- Communication, teamwork, creative problem-solving, iterative design process, time management, specialised tech skills (programming, art, audio, etc.), and motivation for learning emerge as key competences in game development. There is widespread support for this list in industry sources, game industry research, and game development/design handbooks and education.
- Game jam research identifies all of these qualities as ones that can be developed during game jamming.
- Our research on public messages from the industry as well as the pilot survey of Czech companies confirms that the industry realises this educational potential and considers it a good motivation.

Non-educational (or not directly educational) motivators include:

- Employment: starting/continuing a career for a person; talent acquisition for the company.
- Creating games: portfolio for the person; acquisition of prototypes and assets for the company.
- Networking: with/in the industry, partner institutions, and community.
- Fostering company culture: inspires creativity, innovation, team-building, and learning.
- PR: Company image.

Again: these motivations reappear in messages from industry professionals, in our Czech survey, and in the (scarce) research on game jams' place in professional game industry practices. Moreover, they strongly overlap with the social, technical, and business benefits of hackathons according to software developers interviewed in the studies metareviewed by Valença et al. (2019). This comes as no surprise, as hackathons have much in common with game jams, just as video game development does with software development.

Game jams still represent a non-traditional form of education. Larger experimental studies could convince more institutions and participants of game jams' benefits. The format itself could be useful in various areas, including dealing with research problems, developing serious games, or teaching about particular issues through thematic game jams. With regard to the industry perspective, one of the Czech Game Developers Association's top priorities for 2021 was to support the educational sector in adapting

to the demands of the growing game industry. As a format familiar to both the industry and the education system, game jams can be a platform for industry-academia collaboration: with benefits to both parties (see Ingram et al., 2020) and to local gaming communities. Thus, a better understanding of how the industry benefits from various game jam formats is not only an academic pursuit. This knowledge may inform policies and practices within the industry and perhaps even more so in cross-sectoral collaboration between the game industry, education, and communities. Ultimately, the development of a multi-stakeholder game jam culture may become a strong ecosystem that supports further industry growth.

References

- Arya, A., Chastine, J., Preston, J., & Fowler, A. (2013). An international study on learning and process choices in the global game jam. *International Journal of Game-Based Learning (IJGBL)*, 3(4), 27-46.
- Aurava, R., Meriläinen, M., Kankainen, V., & Stenros, J. (2021). Game jams in general formal education. *International Journal of Child-Computer Interaction*, 28, 100274.
- Barák, P., Adamcová, J., Staszkievicz, M., & Jan, K. (2021). Czech video game industry: Pc, console and mobile game developers. *Czech Game Developers Association*.
- Çatak, G., Bostan, B., Aker, Ç., Akan, E., Gemrot, J., Kolek, L., ... & Schreiber, P. (2020). *GAMEHIGHED Initial Report: Output 1: Initial Research & Analysis Report. Higher-ed Programmes for Careers in Game Design & Development (2019-2022)*.
- Černý, V., Gemrot, J., Kolek, L., & Mochocki, M. (2022). *Game Jam Organisation Handbook*. Prague: GAMEHIGHED.
- Cooper, P. (2018). Art direction bootcamp: Inspiring creativity through internal game jams. <<https://www.youtube.com/watch?v=V6CyLZSIhmo>>. Date of access: 6 November 2022.
- De Salas, K., Lewis, I., & Bindoff, I. (2016). Game jams as an opportunity for industry development. In *1st International Joint Conference of DiGRA and FDG (DiGRA/FDG'16)* (pp. 1-14).

- Faas, T., Liu, I. C., Dombrowski, L., & Miller, A. D. (2019). Jam today, jam tomorrow: Learning in online game jams. *Proceedings of the ACM on Human-Computer Interaction*, 3(GROUP), 1-27.
- Farhan, E., & Kocher, M. (2016, March). Big Team Game Jams: A framework to emulate big production using game jams with big teams. In *Proceedings of the International Conference on Game Jams, Hackathons, and Game Creation Events* (pp. 1-7).
- Fowler, A. (2016, March). Informal stem learning in game jams, hackathons and game creation events. In *Proceedings of the International Conference on Game Jams, Hackathons, and Game Creation Events* (pp. 38-41).
- Fowler, A., Khosmood, F., Arya, A., & Lai, G. (October 2013). The global game jam for teaching and learning. In *Proceedings of the 4th Annual Conference on Computing and Information Technology Research and Education New Zealand* (pp. 28-34).
- Fowler, A., Ni, X., & Preston, J. (September 2018). The pedagogical potential of game jams. In *Proceedings of the 19th annual SIG conference on information technology education* (pp. 112-116).
- Fullerton, T. (2019) *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*. AK Peters/CRC Press.
- Global Game Jam (2022). Global Game Jam history. Online: <<https://globalgamejam.org/history>>. Date of access: 6 November 2022.
- Goddard, W., Byrne, R., & Mueller, F. F. (December 2014). Playful game jams: guidelines for designed outcomes. In *Proceedings of the 2014 conference on interactive entertainment* (pp. 1-10).
- Hrehovcsik, M., Warmelink, H., & Valente, M. (December 2016). The game jam as a format for formal applied game design and development education. In *International Conference on Games and Learning Alliance* (pp. 257-267). Springer, Cham.
- IGDA (2008). *IGDA Curriculum Framework: The Study of Games and Game Development*. International Game Developers Association.
- Ingram, C., Chubb, J., Boardman, C., & Ursu, M. (June 2020). Generating real-world impact from academic research: Experience report from a university impact hub. In *Proceedings of the IEEE/ACM 42nd International Conference on Software Engineering Workshops* (pp. 611-618).

- Juraschek, M., Büth, L., Martin, N., Pulst, S., Thiede, S., & Herrmann, C. (2020). Event-based education and innovation in Learning Factories – concept and evaluation from Hackathon to GameJam. *Procedia Manufacturing*, 45, 43–48.
- Kankainen, V., Kultima, A., & Meriläinen, M. (August 2019). Motivations of game jam organizers: Case of Finnish game jam community. In *Proceedings of the 14th International Conference on the Foundations of Digital Games* (pp. 1–8).
- Kasprzak (2010). Ludum dare 18 results! Online: <<https://web.archive.org/web/20100911155204/http://ludumdare.com/compo/2010/09/06/ludum-dare-18-results/>>. Date of access: 6 November 2022.
- Kultima, A. (2018). *Game Design Praxiology*. Online: <<https://trepo.tuni.fi/handle/10024/103315>>. Date of access: 6 November 2022.
- Kultima, A., Alha, K., & Nummenmaa, T. (October 2016). Building Finnish game jam community through positive social facilitation. In *Proceedings of the 20th international academic mindtrek conference* (pp. 433–440).
- Ludum Dare (2022). Ludum dare 47. Online: <<https://ldjam.com/events/ludum-dare/47/stats>>. Date of access: 6 November 2022.
- Meriläinen, M. (2019). First-timer learning experiences in Global Game Jam. *International Journal of Game-Based Learning (IJGBL)*, 9(1), 30–41.
- Meriläinen, M., Aurava, R., Kultima, A., & Stenros, J. (2020). Game jams for learning and teaching: A review. *International Journal of Game-Based Learning (IJGBL)*, 10(2), 54–71.
- Miller, M., DeLuca, J., & Khosmood, F. (March 2019). Can game jams boost confidence and sense of preparedness?. In *Proceedings of the International Conference on Game Jams, Hackathons and Game Creation Events 2019* (pp. 1–5).
- Mochocki, M. (2018). *Game Design Curriculum White Paper 2.0*. Online: <<https://repozytorium.ukw.edu.pl/handle/item/5723>>. Date of access: 6 November 2022.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Systematic reviews*, 10(1), 1–11.
- Pimentel, J., Cockcroft, A., & Andersson, N. (2021a). Game jams for cultural safety training in Colombian medical education: A pilot randomised controlled trial. *BMJ open*, 11(5), e042892.

- Pimentel, J., Cockcroft, A., & Andersson, N. (2021b). Impact of game jam learning about cultural safety in Colombian medical education: A randomised controlled trial. *BMC medical education*, 21(1), 1–12.
- Pirker, J., Kultima, A., & Gütl, C. (2016a). The value of game prototyping projects for students and industry. In *Proceedings of the International Conference on Game Jams, Hackathons, and Game Creation Events* (pp. 54–57).
- Pirker, J., Economou, D., & Gütl, C. (2016b). Interdisciplinary and international game projects for creative learning. In *Proceedings of the 2016 ACM conference on innovation and technology in computer science education* (pp. 29–34).
- Preston, J. A., Chastine, J., O'Donnell, C., Tseng, T., & MacIntyre, B. (2012). Game jams: Community, motivations, and learning among jammers. *International Journal of Game-Based Learning (IJGBL)*, 2(3), 51–70.
- Scott, M. J., Ghinea, G., & Hamilton, I. (2014, October). Promoting inclusive design practice at the Global Game Jam: A pilot evaluation. In *2014 IEEE Frontiers in Education Conference (FIE) Proceedings* (pp. 1–4). IEEE.
- Smith, P. A., & Bowers, C. (2016, March). Improving social skills through game jam participation. In *Proceedings of the international conference on game jams, hackathons, and game creation events* (pp. 8–14).
- Theo, C. (2021). What I learned from doing a game jam every month for a year..." Online: <https://www.gamasutra.com/blogs/Theo-Clarke/20210128/376613/What_I_learned_from_doing_a_game_jam_every_month_for_a_year.php>. Date of access: 1 July 2021.
- Turner, T. A. J., Thomas, L., & Owen, C. (2013, September). Living the indie life: Mapping creative teams in a 48 hour game jam and playing with data. In *Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death* (pp. 1–10).
- Valença, G., Lacerda, N., Rebelo, M. E., Alves, C., & de Souza, C. R. (2019, November). On the benefits of corporate Hackathons for software ecosystems – a systematic mapping study. In *International Conference on Product-Focused Software Process Improvement* (pp. 367–382). Springer, Cham.

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Przegląd edukacyjnych walorów game jamów. Perspektywa uczestników i branży gier

Abstrakt: Na podstawie przeglądu literatury i danych od 14 producentów gier wideo artykuł omawia edukacyjne walory game jamów pod kątem kariery w branży gier. Jest to obszar słabo zbadany – wśród 362 wstępnie wybranych tekstów z 10 baz naukowych znaleziono 15 odpowiednich do części 1 (z punktu widzenia uczestników) i 12 do części 2 (z punktu widzenia samej branży). Część 3 uzupełnia ten przegląd o dane pozyskane przez autorów z wstępnego badania 14 czeskich firm. Wnioski końcowe potwierdzają, że game jamy mogą rozwijać miękkie i twarde umiejętności cenione przez branżę gier. Można stwierdzić, że nie tylko branża jest świadoma tych walorów edukacyjnych, ale należą one do głównych motywacji, które sprawiają, że firmy angażują się w game jamy. Oprócz korzyści edukacyjnych inne motywy to korzyści w obszarach rekrutacji, networkingu, PR, firmowej kultury organizacyjnej, a także wartość samego tworzenia gier (jako produktów komercyjnych lub dla portfolio). Game jamy często są też platformą współpracy między branżą a akademią, a ponadto stymulują rozwój lokalnych społeczności branżowych.

Słowa kluczowe: *game jam*, edukacja, branża gier, produkcja gier, *gamedev*, umiejętności
