THE EDUCATION OF DIGITAL GAME TESTERS – PRACTICAL EXPERIENCE

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Abstract:

The paper is aimed at analyzing the importance of digital game testing as one of the key segments for successful game development. As game testers often perform very complex tasks and assignments, this research identified a set of characteristics, competencies, and skills that a professional in this field should possess to be a successful one. To answer the market demand for IT professionals in this specific field, the Faculty of Technical Sciences in Čačak adapted the curriculums of adequate teaching subjects and started continuous assessment of student performance that included additional areas of expertise. The initial survey was performed aimed at identifying some key factors during 2021 and 2022, and these results were presented in the paper.

Keywords:

Game Testing, Education, IT.

INTRODUCTION

Digital game testing represents a process of software testing with the intent to control its quality by detecting and documenting software errors or even conceptual or artwork flaws. In layman's terms, it could sound like an easy process, but actually, it is one of the most demanding and crucial steps in digital game development as it implies extensive competence and skills in programming, game analytics, critical thinking, etc. Game testers must play, observe and identify shortcomings in the game software. The important goal of game testing is also to improve its stability and performance.

Game testing should begin the moment the first code is written and increase in volume and complexity as the game development process progresses towards the end. In the early development stages, a team of game testers is usually very small and focused on daily feedback while analyzing new code. As testing approaches its final stage, more game testers become included in the team and final plans are made.

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Software bugs and even artwork or design flaws must be noticed and reported so that a quality bug report can help developers, designers and programmers successfully fix them. Those unfamiliar with this area of work often think of the game tester profession as fabricated and unnecessary, but various researches and use cases prove the importance and necessity of these team members.

If game testing is neglected, several game production key risks become more probable:

- The game does not create impressive experiences for players;
- Fun factor and/or addictive play are missing;
- The game is not unique, competitive, fast, etc.;
- Gameplay is violated;
- The game fails due to technical problems (broken features, critical errors, poor audio/video, etc.).

The rest of the paper is organized as follows. Section 2 focuses on a brief overview of research related to digital game testing through an educational aspect. In Section 3, the identification and main characteristics of game testing are presented. The last section gives concluding remarks on the topic.

2. RELATED RESEARCH

The literature on digital game tester education is scarce. Digital games are an integral part of the everyday lives of many, and the digital game itself has practically become the source of every modern culture and important economic and social good [1]. It is interesting to observe that with its diverse content and interactive elements, digital games attract children, teenagers, and adults alike. As a combination of visual, acoustic, cognitive, affective, psychomotor, and social stimuli in a simulated space/world, the digital game became a medium through which everyone can test their abilities, interests, and profiles or even present themselves in a completely different way. When analyzing papers published on the topic of digital game testing, one gets the impression that this topic will hardly ever be fully explored as various variable factors continuously change the demand and focus. [2] pointed that digital gaming is an important economic phenomenon, as well as an integral part of media culture in postmodern societies. While hundreds of millions of people spend hours manipulating their digital avatars, digital games have become the subject of a lot of research, showing that this new digital media culture is extremely complex and diverse. As digital games overgrow pure entertainment, they spawned in multiple aspects. Therefore, the serious procedure of digital game testing nowadays requires expertise in multiple fields, not all intuitively connected to the IT industry, which presents a specific problem and complexity of game tester education. [3] observed how the proliferation and influence of digital games increased significantly in recent years and addressed this topic from the perspective of media ethics. They analyzed and evaluated some moral concerns and effects of digital gameplay which game testers should also check when testing digital games. [4] explored the modalities in which digital games can be used in learning English, specifically Never Alone and No Man's Sky. They observed the positive correlation with contemporary educational practice and methods, so in this light, game testers should strengthen their pedagogical competences to recognize and correct possible pedagogical/educational aspects and effects of digital games on the audience. [5] covered referent research in digital game development and design in various genres and disciplines with enough detail and references for professional programmers, so that game tester should use it in their practice. [6] analyzed metaphors that can be used in digital games to encourage various methods in developing new gaming platforms. This approach can be very useful in testing digital games as one can quickly and easily come up with the solution to some identified problem. [7] provided an overview of using creativity in developing digital games and the professional game tester should imply curiosity about the history and future directions of digital games development.

3. EDUCATING GAME TESTERS

As in other occupations, a professional approach to educating game tester is necessary. An inexperienced team leader often assigns a beginner/junior programmer to test the game in a development phase, and this is almost always a sure path to trouble. The game tester must have properly founded knowledge and skills needed to master the work of testing games. They must study a vast amount of reference literature and develop operational and functional skills needed for the job. The surest path to achieve this is through invaluable practical experience in developing games. A game tester can get basic informal education via various game tester courses, which can even provide a certificate of training, but the skills of creative and analytical thinking and an (often required) good knowledge of English are a prerequisite for their future working success. One of the main tasks of a tester is to use the game in as many ways as possible, taking

actions that few users will ever perform. It may seem like a long and monotonous task, but it is a crucial one. The tester is expected to perform all possible actions in the game to identify all possible errors and omissions. An error occurs when a player gets stuck somewhere (e.g., falls into a trap) or when the character animation does not work properly. Many mistakes can appear in the game, but most published games are almost flawless thanks to the game testers. Game testers must continuously work on their development and improvement, and gain as much experience as possible to become reliable team members and earn respect. It should be borne in mind that the ability to look at the system from various angles is necessary so the task of the game tester is to check all possible ways of interacting with the game, even those that the game developer did or could not expect and predict.

So, which characteristics, competencies, and skills should a professional digital game tester possess? First of all, as game testers often work solely or in a very small group, it is self-awareness, organization, flexibility, and responsibility. The tester must fully understand the process of digital game development and design, which includes at least intermediate level skilled programming and artwork design. In order to excel, a game tester should have good problem-solving skills, attention to detail, and patience (while often performing repetitive tasks). While often neglected, a good knowledge of the quality control process provides the tester with a comparative advantage and better team integration.

Having in mind previously stated, the Faculty of Technical Sciences in Čačak integrated a teaching section named "Digital game testing" in curriculums of Digital game development and Digital game design subjects taught in undergraduate and master IT studies.

4. METHODS

The research problem was to examine the current level of competencies and skills of IT students that were identified as important if they found themselves in the role of a digital game tester. To establish the professional competence profile of students as game testers, a series of 13 practical tasks, assignments, and tests in various areas was conducted voluntarily and anonymously by the students. The proficiency levels of technical and digital literacies, (game) project management, creative thinking, and documentation manipulation were assessed via assignments. A series of practical tasks were designed to determine the level of skills in 2D drawing, 3D modeling, computer animation creation, digital video manipulation, and digital design. Two discipline tests were performed. The first one was used to observe and assess the level of student focus while doing repetitive tasks on computers, while the second one observed their precision and persistence in a similar environment. All activities were time-restricted. The research was conducted at the Faculty of Technical Sciences in Čačak.

5. RESULTS AND DISCUSSION

The research was conducted between October 2021 and February 2022, on a sample of 48 students aged 22-26, N = 32 male and N = 16 female, as shown in Table 1. In total, N = 27 (56,3 %) students lived in urban, while N = 21 (43,8 %) lived in rural areas.

Student	Age	N	Percent
Age	22	4	8,3
	23	40	83,3
	24	3	6,3
	26	1	2,1
	Total	**48**	**100**
Gender	Male	32	66,7
	Female	16	33,3
	Total	**48**	**100**

Table 1 – Students' demographic characteristics

When students were asked how often they play games, N = 12 (25 %) answered that they play every day, N = 9 (18,8 %) played 2-3 days a week, N = 3 (6,3 %) played once a week, while the other half of examinees played games rarely, or didn't play games. The t-test revealed a statistically significant difference in gameplay frequency between male and female students (t = 3,50; df = 34,95; p = .001). Male students (M = 3,41; SD = 1,52) played significantly more often weekly than did females (M = 1,94; SD = 1,29). Most of the students played longer than 10 years (N =29; 60,4 %).

Students mostly play games on their laptops (N = 19; 39,6 %), home computers (N = 13; 27,1 %) and smartphones (N = 11; 22,9 %). No statistically significant difference between genders was revealed. When asked about their daily average gameplay time, N = 7 (14,6 %) played more than 4 hours per day on average, N = 12 (25,1 %) played 2-4 hours daily, which makes about 40 % of examinees. The t-test revealed a statistically significant difference in gameplay time between male and female students (t = 3,06; df = 36,16; p = .004). Male students (M = 3,16; SD = 1,63) played significantly more daily than did females (M = 1,81; SD = 1,33).

Students mostly liked playing action, shooting, and platform games (N = 8; 16,7 %), as shown in Table 2. That said, it can be concluded that students were very familiar with digital games and that they often played them.

The highest mean value was achieved in the technical literacy assignment M = 9,07 (SD = 2,41), while the lowest values were recorded in the 1st discipline test that observed examinees focus while doing repetitive tasks M = 3,93 (SD = 3,80), as shown in Table 3.

A series of independent samples t-tests were conducted to examine whether there was a significant gender difference between students concerning their expertise in various areas of interest. The test revealed a statistically significant difference in 2D drawing area between male and female students (t = 2,78; df = 17,42; p < .001). Males (M = 8,47; SD = 1,76) presented significantly higher levels of expertise than did females (M = 5,73; SD = 3,59). The test also revealed a statistically significant difference in 1st discipline test between male and female students (t = 3,33; df = 42,58; p = .002). Males (M = 4,97; SD = 4,04) presented significantly higher levels of focus while doing repetitive tasks than did females (M = 1,87; SD = 2,20). As several factors indicated that male students were performing significantly better than females, it can be presumed that this population of students could be more inclined to excel as game testers. As no other research data was available at the time this paper is written, more extensive research is needed to confirm this presumption.

No statistically significant difference in results between students living in urban and rural environments was observed.

A one-way ANOVA analysis was conducted to explore the impact of current academic success (GPA) on student professional competence profile. Students were divided into four groups according to their GPA (excellent, very good, good, almost good). There was a statistically significant difference at the p < .05 level in Digital video [F (3, 41) = 3,54; p = .023], 1st discipline test [F (3, 41) = 3,75; p = .018], Project management [F (3, 41) = 5,24; p = .004] and Creative thinking [F (3, 39) = 3,96; p = .015] areas.

Genre	N	Percent
Action, shooting, platform	8	16,7
Adventures	3	6,3
Sports, fighting	5	10,4
Driving and flight simulators	1	2,1
Strategy	5	10,4
Logical, puzzle, etc.	6	12,5
Mobile games	5	10,4
RPG	3	6,3
MMO	2	4,2
No favorite genre or didn't play games	10	20,8

Table 2 – Students' favorite game genre

Area of expertise	M	SD
Technical literacy	9,07	2,41
2D drawing	7,56	2,80
3D modeling	8,60	2,47
Computer animation	6,67	1,65
Digital video manipulation	8,33	2,90
1st discipline test	3,93	3,80
Project management	7,93	1,40
Creative thinking	7,88	1,76
Digital literacy	7,95	1,69
Digital design	8,16	1,91
Documentation	7,59	2,17
Game project management	7,95	1,89
2nd discipline test	8,12	2,04

Table 3 – Descriptive results of practical tasks, assignments, and test

Despite reaching statistical significance, the actual difference in mean scores between groups was quite small. Post-hoc comparisons using the Tukey HSD test indicated that:

- the mean score in performing Digital video task for students with excellent GPA (9,01 ÷ 10,00) [M = 10,00; SD = 0,00] was statistically significantly better task than students with almost good GPA (6,01 ÷ 7,00) [M = 5,00; SD = 4,40];
- the mean score in performing 1st discipline test for students with excellent GPA (9,01 ÷ 10,00) [M = 7,14; SD = 3,44] was statistically significantly better task than students with good GPA (7,01 ÷ 8,00) [M = 2,13; SD = 3,22];
- the mean score in performing project management assignment for students with excellent GPA (9,01 ÷ 10,00) [M = 9,00; SD = 1,16] was statistically significantly better task than students with good GPA (7,01 ÷ 8,00) [M = 7,38; SD = 1,15] and almost good GPA (6,01 ÷ 7,00) [M = 6,50; SD = 1,00];
- the mean score in performing creative thinking assignment for students with excellent GPA (9,01 ÷ 10,00) [M = 9,29; SD = 0,756] was statistically significantly better task than students with good GPA (7,01 ÷ 8,00) [M = 6,94; SD = 1,61].

As expected, students with higher grades excelled in the level of competencies and skills needed for proficient digital game testing.

A one-way ANOVA analysis was also conducted to explore the impact of level of English knowledge on student professional competence profile. Students were divided into five groups according to the level (e.g., 1 - Poor; 5 - Excellent). There was a statistically significant difference at the $p < .05$ level in the areas of technical literacy [$F(3, 41) = 3,14$; $p = .035$], computer animation [$F(3, 41) = 2,95$; $p = .044$], digital video manipulation [$F(3, 41) = 3,71$; $p = .019$] and game project management [$F(3, 39) = 3,44$; $p = .026$]. Post-hoc comparisons using the Tukey HSD test indicated that:

- the mean score in computer animation for students with excellent knowledge of English [M = 7,67; SD = 1,86] was significantly better than for students with good level of English [M = 5,55; SD = 1,92];
- the mean score in digital video manipulation for students with very good knowledge of English [M = 9,17; SD = 1,43] was significantly better than for students with sufficient level of English [M = 4,80; SD = 4,55];
- the mean score in game project management for students with very good knowledge of English [M = 8,68; SD = 1,52] was significantly better than for students with sufficient level of English [M = 6,20; SD = 2,17].

Based on previous analysis, it can be concluded that the knowledge of English positively correlated with some key factors for proficient digital game testing.

There was no statistically significant difference in mean scores between other groups.

6. CONCLUSION

Digital game testing is an integral part of every game development cycle, and as this process is repetitive, there may be errors in each new build so testing should be continuous. For some time, game testing was observed as a somewhat less important factor in digital game design, but nowadays it is perceived as one of the key factors for the whole game project to become successful. The gaming industry finances the research in automated game testing (e.g., using AI) for years, and this resulted in a great number of powerful and reliable software systems and agents, but human game testers are still much more versatile and flexible when performing advanced tasks. The key risk of testing digital games by humans is that it does not create a compelling experience for the people that perform it, therefore not everyone who loves playing games can be a good digital game tester, but it can be perceived as a good precondition.

The importance of empowering student competences in the field of game testing was recognized and the first steps in its integration into existing subject curriculums were taken. The results of initial research presented in the paper show that some key factors in identifying adequate students (future IT professionals in this specific field) emerged, but also some problems that future teaching practice can address in order to correct.

7. REFERENCES

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