Teachers' Perceptions about using Serious Games in Formal Education in Jordan: Possibilities and Limitations

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***Abstract*— Over the past few years, academics have witnessed an increasing amount of attention being accorded to games as learning tools. According to several researchers, Serious Games (SGs) can assist learning by emerging as an alternate means of presenting instructions. Whilst SGs are increasingly gaining acceptance as a learning tool, their application in formal education remains rather limited, which underpins the importance about understanding what makes a game effective and how it must be used in classrooms. Given that teachers play a key role in shaping and responding to the intricate contextual factors influencing the manner in which games are experienced across educational settings, their opinions on what SGs can possibly accomplish in educational settings would inexorably impact the decisions relating to when, how, and for what purposes they would be incorporated in classrooms. Against this backdrop, this study administered a survey online and in hardcopy to ascertain teachers' perceptions on SGs and their effect on their contribution as a teacher. It also pinpointed the challenges and impediments of utilizing SGs in classrooms through teachers' perspective, which illuminated the attitudes teachers generally bring to games-based learning environments. According to the findings, teachers are typically open to using SGs in their classrooms. Overall, it can be inferred that the design/development of SGs aimed at formal education can benefit significantly by adopting game features and surmounting the hurdles addressed by teachers.**

Keywords*— *Serious Games, Formal Education, Teacher Perception, Primary Schools, e-Learning

I. INTRODUCTION

Both game-based learning and serious games (SGs) can foster student interest and motivation in the subject matter, thereby enhancing the efficacy of learning. Making the learning process fun and engaging is not only known to make learning more compelling, but also more efficacious by engaging the participants in an emotional and cognitive manner [4]. To that end, one of the key traits of SGs is their ability to integrate the element of fun whilst delivering informative instructions. Through their ability to engage with students at a deeper level, SGs help increase learners' attention, motivation and in effect, learning. There is credible research that suggests that students today have a gaming-enabled learning style.

Examining various young professionals, [5] found that their learning style was deliberately overlooking the format and structure of formal education. Using trial and error extensively, they gladly accepted instruction and contribution from peers; they were amplified on 'just in time' learning to conclude their tasks and meet their needs. All such skills are deemed essential in modern scenarios and SGs can help students develop and practice them.

It is believed that SGs have the potential of being used across schools. However, in order to draw maximum benefits from SGs in classrooms, it is important to acknowledge the influence of context concerning how games are played and understood, as well as to understand the critical role played by teachers in shaping and manipulating such contextual scenarios.

The efforts in the development of serious games and affiliated learning materials concerning schools are primarily focused on chronicling the utilization of games in classrooms and elucidating the learning principles as well as pedagogies. Nevertheless, problems tend to arise when games are specifically designed and introduced for schools with incomplete awareness of the teachers' role in shaping a gaming experience [6]. Unfortunately, most of these challenges manifest when the educational advantages of games are spoken about without understanding the role of teachers within games-based classrooms, or when they are deemed complete.

The rising interest in SGs as tools of learning are typically geared towards the benefits of games contributing to students' learning [7]; the rationale behind why games are suited to learning contours of the 21st century; as well as the specific domains of application which could benefit from the utilization of digital games [8]. A large part of this research indicates that games tend to almost always enhance student learning and achievements. In particular, 'black box' notions of games, in the context of learning, underpin the importance of context as well as the manner in which teachers influence what games eventually manage to achieve in classrooms.

According to many researchers, games-based learning in schools is closely linked to the manner in which teachers perceive games. For instance, [9] contends game play's educational value is derived from the creative utilization of

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educational media along with efficacious pedagogy in order to encourage students to take part in meaningful learning practices. Analogously, [10] opines that although games can support a gamut of learning styles, manner in which teachers work with games can directly impact the success or failure of game-driven initiatives.

While there are individual studies that specifically focus on how teachers influence game-based learning outcomes, their role in SGs' design and development has generally be neglected in past researches in the parlance of serious literature on games [11][12]. Therefore, this study aims to bridge this gap by sharpening the focus on understandings, attitudes and expectations about serious games on the part of different primary school teachers across Jordan.

Since not many studies have explored the nuances of game-based learning in the Middle East, this study is aimed at reviewing teachers' perceptions concerning the application of serious games in Jordan's primary schools. It also aims to determine the vital factors that affect teachers' attitudes on integrating digital games in their teaching practice.

II. Existing Research

Generally, the literature related to teachers' views on digital technologies and game-based learning has presented conflicting results. For example, [13] probed the use of digital game-based learning and the utilization of game creation tools in the Curriculum for Excellence across Scotland's private schools. To that end, a web-based survey was followed by interviews of some teachers. The survey covered 49 primary schools, and as many as 62 responses were received from teachers who were all females, with their mean age being 32.8. Nearly 50% of the teachers conceded that they had never used game creation tools or computer games; 39% had only used computer games, while 3% reported that they had only used creation tools. Meanwhile 8% had used both game making tools and computer games. Teachers were found to largely use free online mathematics along with language games. According to their conclusions, computer games do not eradicate the importance or role of the teacher; however, there is a need to train and expose teachers to game-based learning to help them increase their understanding and ability to use this approach.

In a study on augmenting teachers' use of digital content, [14] examined the design principles in technology adoption. He opined that the increasing use of technology is primarily aligned to the action of education and government authorities, which reinforces the importance of collaboration between educational stakeholders. He also concluded that the role of teacher training institutes and universities cannot be ruled out since they provide the in-service training and develop a theoretical framework involving learners, teachers and policy makers.

Similarly, [15] studied the teachers' reflections and experiences on game-based learning in primary classrooms, which evidenced 89 responses across primary school teachers in Italy and England. Close to 70% of teachers in both countries stated that they did not have any previous experience of teaching game design. As per [15], barriers such as limited access to equipment and the curtailed ability of schools' information and communications technology (ICT) capability, coupled with the paucity of relevant games relevant can limit the use of digital games in classrooms.

Correspondingly, [16] examined the data collected for a research project that focused on learning and teaching of digital games across Australian classrooms. This study explicitly focused on different teachers' understanding, attitude and expectations about digital games. This study's central observation was that teachers were very optimistic about the potential impact of games on learning environments. In addition, it reported data concerning teachers' views on the limitations of digital games. Teachers exhibited some concerns associated with the effect of games on teachers' control of learning as well as the learning environment. They also voiced concerns about the limitation of time and resources.

In the previous related literature, we found that utilizing game-based learning in classrooms is usually associated with some classic impediments like the availability of ICT and action of government authorities, which games' engineers cannot do much about them. This study investigates the hurdles more thoroughly by seeking the opinion of teachers and exploring their attitude about SGs and the actual limitations that hurdle their use. This will provide more accurate input to the design/development process of SGs, and help creating more acceptable and usable SGs.

III. Education and ICT in Jordan

Jordan's educational system comprises of a two-year cycle of preschool education followed by 10 years of compulsory basic education as well as 2 years of vocational /secondary academic education after which, students appear for a General Certificate of Secondary Education Exam, also referred to as Tawjihi. Notably, secondary education does not entail any charge in government schools [17].

Jordanian schools can be divided into two main categories, private and public. The private sector educates nearly 20%-40% of the nation's student population [18]. The same textbooks are used by all government schools and most private ones. The School Curricula and Textbooks Division of the Ministry of Education produces and prints textbooks that are distributed free of charge in the compulsory stage, but at a nominal fee during the secondary stage.

While some private schools do provide better educational opportunities than public schools, others are set up in order to bridge the gaps created by public education authorities. In turn, this makes the infrastructure differ between private and public schools. Whilst the Ministry of Education has strung hard to integrate computer laboratories across all schools – almost 93% of primary and secondary schools currently have functional computer laboratories [19], the number of learners who share a computer remains relatively high. [19] suggests that in public schools, the learner-to-computer ratio is 25, whereas it is 29 in private schools. With regard to connectivity, 61% of computers have Internet connectivity across public schools, as compared to 71% in private schools [19]. The Ministry of Education is taking proactive steps to make available a sizeable number of computers for pedagogical purposes across all educational levels. When preparing its policy framework, Jordan addresses ICT allocation for both administrative and pedagogical purposes by directing its efforts to cost-efficient measures in order to acquire resources, as opposed to only depending on education budget [20].

With regard to usage, ICT in Jordanian schools is limited and largely reliant on the availability of Internet connectivity and adequate infrastructure. For this reason, Jordan emphasizes Computer Assisted Instruction (CAI) in primary as well as secondary schools. Close to 88% of primary schools currently offer CAI, which is available in 97% of all secondary schools [19]. Since Jordanian children as well as youth are acquainted with majority of the computer skills informally outside of schools, ICT's integration in primary and secondary curricula at an early stage is paramount since it plays a key role in ensuring the implementation of ICT in school classrooms.

Given that teachers are believed to have the strongest important influence on classroom learning, it is they who play a vital role in making sure that students make effective use of ICT both inside and outside school premises. Consequently, they not only know how to instruct their students to make effective use of ICT, but also require training in using ICT to teach different subjects and integrate ICT across the curriculum in order to elevate the overall learning experience whilst enhancing students' academic achievement.

Meanwhile the integration of digital games in game-based learning is confined to individual initiatives across some schools – [21][22]- and cannot be considered to be a general orientation for government's educational policies. Therefore, this study aims to shed light on the potential use of digital games as educational tool, as well as to create awareness about contribution of SGs in the educational system, whilst exploring the possibilities and limitations for adopting game-based learning in Jordan's formal education curricula.

IV. Survey

In this study, data were gathered via a survey that was administered both online and in hardcopies. Aimed at primary school teachers in Jordan, it was supplemented using direct contact with school directors and teachers. This survey was shared through email as well as on social media networks, while its hardcopies were delivered for schools that did not have any Internet access.

When teachers were invited to complete the survey online or offline, the participants were specifically informed about consent and right of withdrawal. They were given provided information about the purpose of this investigation and were made aware that this survey was primarily targeted at primary teachers. Originally written in English, the survey was translated to Arabic and formulated into 2 open questions and 20 closed questions.

The responses to survey were indicated by checking one (or more) of the items from a list of answers. Fig. 1 illustrates a sample question of the survey (English version) used for most of the questions.

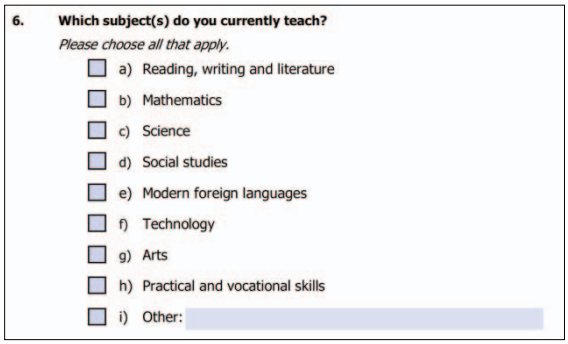

Fig. 1. Sample question of the survey's English version

The term "Serious Games" is not very commonly used in Jordan, so, a brief introduction about SGs was presented at the beginning of the survey to make sure that teachers are aware about the subject of the study. As we will see in the results later, some teachers had already used games in their classrooms and were more familiar with "Game-based Learning" expression.

Questions were grouped in three categories. Under the background information group, teachers were requested to share some basic data such as age-group and gender, education level, duration of teaching experience, and the subject(s) taught by them. They then indicated the ICT (Information and Communication Technologies) made available in their schools, as well as to estimate the number of hours they put in a typical school week as duties.

The second group meanwhile targeted the teacher's game play experience as a player. In this group, teachers were asked to provide information about what genre of games they play (if any), and the amount of time they spend while playing games every week. In addition, they were asked about the platforms they used to play such games. In addition, information about teachers' thoughts and experiences about SGs was gathered in the survey's third part. They were asked to indicate their acceptance about the idea of using SGs to gain knowledge and to know their willingness to use such games within their classrooms. The survey also intended to investigate teachers' beliefs about the benefits of SGs (if any) in classroom settings, the features which a same must use in education, as well as the obstacle(s) that impeded their usage in school, if any. Teachers were also asked to describe how teaching with games could impact their role in classroom in an open question.

V. Findings and Discussion

As many as 76 responses were received. Table 1 depicts the number as well as each gender's whole percentage falling into different age-groupings.

TABLE 1. NUMBER OF TEACHERS FOR EACH GENDER IN DIFFERENT AGE-GROUPINGS

Age	Female %	Male %
Less than 25	3.4%	0.0%
25 – 29	10.2%	40.0%
30 – 39	50.8%	40.0%
40 – 49	30.5%	20.0%
50 – 59	5.1%	0.0%
60 and more	**0.0%**	**0.0%**

More than 85% of all participants were females and the majority of them were aged between 30 and 49 (more than 80%). Meanwhile 80% of male teachers were between the ages of 25 and 39. In this relatively small sample, participants can be considered to represent the overall Jordanian primary teaching populations with regard to both age and gender (The World Bank, 2018). Over 53% of teachers were found to have teaching experience of between 5-15 years (Fig. 2).

In terms of ICT infrastructure, teachers were asked to choose all the technology tools available for educational purposes in their schools. Nearly 51% of teachers reported using PCs and/or Laptops in teaching their subjects, whereas 50% mentioned the availability of interactive-whiteboards for their students; similarly, 13% of teachers stated that students access smartphones and tablets in the class. Nearly 23% of teachers meanwhile do not use any ICT devices within their schools.

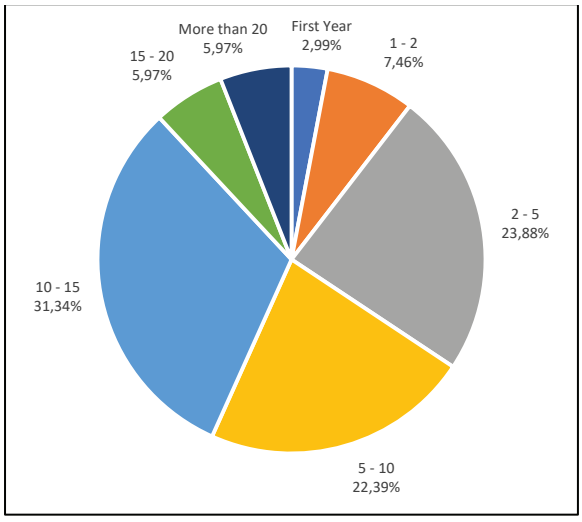

Fig. 2. Teachers' experience in years

During the survey's second part, teachers were asked to share their experience with digital games along with the devices they are using to play games. It was found that over 80% of teachers played games for less than one hour per week, whereas 16% spent 1-5 hours weekly on gameplay. Not surprisingly, tables and smartphones were reported as the preferred devices to play games with 80%, followed by Laptops and PCs with 20%. According to the findings, 68% of teachers preferred puzzle games while nearly 22% opted for strategic games. Fig. 3 illustrates the most preferable genre of games played by teachers.

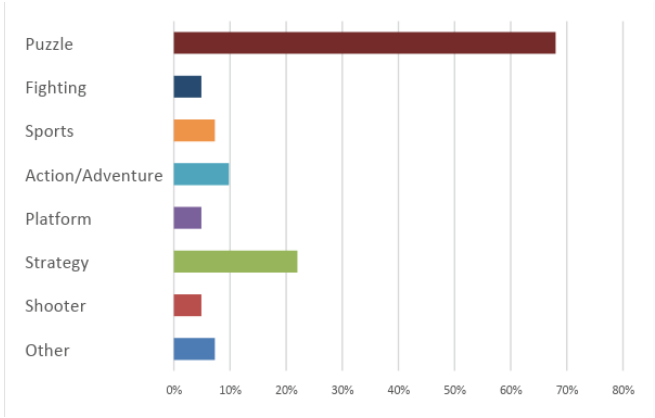

Fig. 3. Games Genre Played by Teachers

Meanwhile the last part of this survey encompassed teachers' interest in SGs as well as their features. When they were asked to share their thoughts on using SGs in formal education, 97% of teachers said they did believe that games could be used to acquire knowledge. Teachers also exhibited a strong willingness towards using SGs within their classrooms (Fig 4). With regard to the question: Are you ready to use SGs to teach your subject(s)? Over 84% of teachers answered in the affirmative (Yes) and nearly 16% answered Maybe.

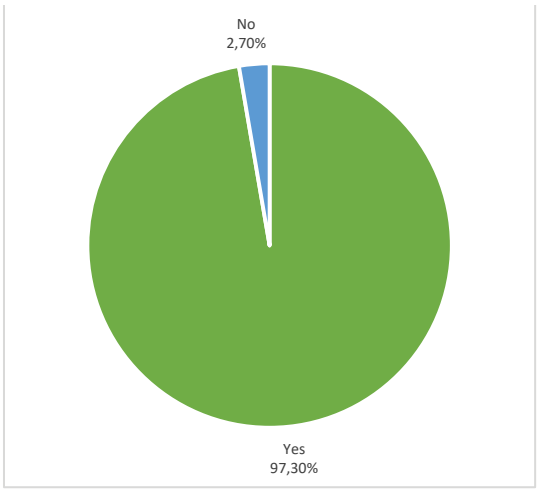

Fig. 4. Teacher's believes about using SGs to acquire knowledge

Notably, teachers did emphasis on the several potential advantages of SGS in education. Close to 65% of teachers believed that SGs can enhance student engagement in the subject being taught and boost student academic achievement (65%). In addition, 62% of teachers opined that SGs can improve students' skills in using technology, with 58% reporting that SGs can foster creativity.

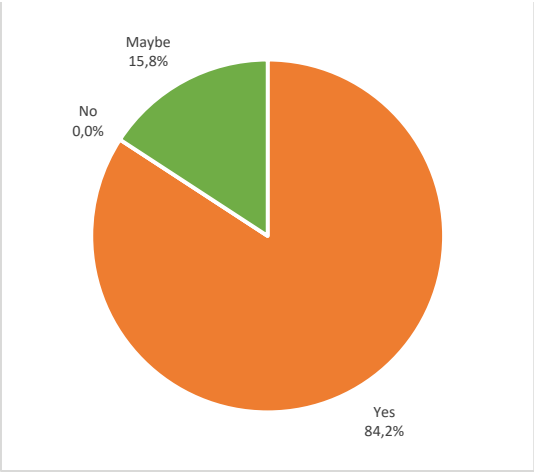

Fig. 5. Teachers' Willingness to use SGs in classrooms

When asked about the impediments for using SGs in school, 'Teacher's attitude towards using SGs' was found to be the most reported obstacle followed by the availability of SG that is relevant to the curriculum. One plausible explanation for this could be that teachers tend to stick to school curriculum in order to make sure that their educational program are completed on time. They also avoid playing games which are not directly related to their plan. According to a considerable number of teachers, Preparation Time could also be deemed as a major barrier against SGs, which is not surprising since the use of games can increase the quantum of workload on teachers. Rather surprisingly, 'Lack of ICT' was the fourth most reported obstacle.

In an open question, teachers were requested to explain the manner in which the use of SGs affected their role as teachers. Most teachers emphasized the positive ramifications of using SGs in classrooms.

In fact, one of the teachers replied, "Using games in classroom will increase teacher-student interaction in an enjoyable environment, which can speed up knowledge delivery with less time and effort." Meanwhile another teacher said: "When using games in classrooms, the student will be the core of the educational process, where teacher role will be only to supervise, coordinate, and encourage the students by providing appropriate educational environment." Additionally, teachers underpinned the significance of using games which are closely associated with the subject: "If the learning tool (the game) is easy to use and closely related to learning contents, this will facilitate student integration in the subject to be learned." Only one teacher expressed some apprehensions about using games in classrooms: "Eventually, students will be tied to the game and deny the role of the teacher."

The last question of the survey sought clarity about the characteristics which a good SG must possess in the context of formal education. Attributes such as availability for different platforms (Web, PCs, smartphones), and including some fun elements were frequently reported. In this regard, one of the most frequently reported characteristics demanded by teachers was their ability to control the game's learning contents and game elements through which they could keep track of the learning objectives and feel a greater degree of confidence about their contribution as class-leaders.

Furthermore, teachers also evinced a strong in games that could be attributed to Learning Management Systems (LMS) such as moodle and Sakai, something that could be justified for teachers already utilizing LMSs within their schools and wanting to have some level of integration between game-based learning and LMS. According to some teachers, a successful SG should be able to provide multi-player mode, which indicated that they appreciated collaborative teamwork.

VI. Conclusion

This research is premised on the view that SGs can potentially improve student engagement and student learning, and the context within which they are used impacts the final decision of implementing games-based learning. We are also of the view that teachers play a pivotal role in creating and shaping such an environment. For this reason, teachers' understanding and views about SGs affect where, how why and when they work with games.

According to the data gathered by Jordanian teachers, they are very interested in integrating SGs into their teaching that a majority of them consider digital games to be an efficacious educational tool. Since Jordanian authorities lack a clear framework on game-based learning in the curriculum guiding the efforts of teachers within the classroom, SGs efficacy in teaching would be very limited. The many challenges faced by teachers exacerbate the problem further: this includes finding SGs that are relevant to the curriculum and the lack of student assessment in SGs, among several others.

Whilst the majority of teachers in the country generally have limited experience in digital games, they were confidently aware about the direct as well as indirect gains that SGs can bring to educational processes across many levels. To that end, the impact of games on developing transferable skills like critical thinking, problem solving, creativity and collaboration were frequently mentioned by surveyed teachers.

Due to the absence of specific national policies pertaining to game-based learning, the involvement of digital games in education can vary considerably from school to school, wherein the decision is left to school managers or to individual teachers in many cases. Therefore, we believe it is vital that research institutes that are focused on game-based learning ensure a constant two-way communication with teachers in order to integrate game-based learning into formal education.

In addition, we also argue that SGs must match the needs of teachers in addition to meeting their demands. Given that teachers will be largely pleased to come across feasible games for their curriculum, empowering SGs via dynamic authoring tools which enable teachers from editing learning content could catalyze the integration of SGs in classrooms. Thus, encouraging teachers' control over SG elements and content should improve cross-curricular SG utilization whilst reducing barriers that impede the adoption of game-based learning.

The grounded and optimistic nature of these observations is an important motive towards shaping ongoing research for the purpose of improving SGs development and coming up with flexible models of game-based learning spaces to improve learning outcomes. They also establish the

foundation on which intersections can be found between pedagogical decision making and the factors influencing what actually transpires when games are introduced into schools.

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