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Games for Learning: Are Schools Ready for What's To Come?

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ABSTRACT

Games Studies is still a relatively new field where much basic research remains to be done. This study asks K-12 teachers about their attitudes towards the use of games for teaching, what factors facilitate their use and what barriers exist? Information about attitudes, and what things assist and prevent the adoption of games in the classroom can help identify areas of need for the development of support. Concerns about the state and accessibility of computers in classrooms are known, and may not be addressable by those interested in providing games for learning, but other factors may be. This study outlines several target areas suitable for further research as well as a few suggestions for approaches that might help in the promotion of games as learning objects.

Keywords

Games, Attitudes Towards Adoption, Integration of Games

INTRODUCTION

Leona Huggins knew something was not quite right when she pulled her two boys away from a favourite computer game to do their homework.

"There was a lot of deep-level thinking going on. Then I'd have to say, 'OK, stop. We have to do your homework. We have to study your spelling words,' " Ms. Huggins said. "I had to interrupt what I thought was deep-level thinking for homework that I didn't think was."

Ms. Huggins, a Vancouver kindergarten teacher and mother of Sean, 6, and Jeffrey, 11, is part of a new generation of parents and educators pushing to bring digital games into the classroom.

Excerpt from "The Learning Game:

A New Generation of Parents and Educators Wants to Bring Digital Games into the Classroom" [1]

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Leona Huggins is certainly not alone. A growing number of teachers, parents and researchers are becoming involved in examining and promoting the viability of computer games, including commercial, off-the-shelf (COTS) games, for academic and social learning in school settings. Marc Prensky, among others [2, 3] suggests that today's youth are fundamentally different from the baby boomers in the ways they work and learn as a result of their exposure to games. Even if games have not become part of *our* culture, they are certainly part of *their* culture [4]. Many have suggested we can use these games to teach valued curricular outcomes [5-8], and numerous studies of game use in classrooms are now complete or underway [7, 9-12] to check the validity of this suggestion. However, the study of computer games for learning is still a relatively new field, and much basic research remains to be done.

PURPOSE OF THE STUDY

The present study was designed to address a gap in our current understanding about the status of digital game use for learning in public school classrooms. This study asks classroom teachers about their practice and attitudes towards the use of computer games in the classroom, and the factors that facilitate or prevent the use of games for learning.

Compared to other forms of instructional intervention, there is still relatively little data on the use of computer and video games in classroom settings. This study forms part of the required body of knowledge on the use of games for teaching and learning in public school. The given work is a pilot study, since few studies of this nature have been reported in the literature [10, 13], and this study could serve as a template for further studies.

The primary goals for this study were to determine who is currently using games in the classroom and who might be willing to try. An additional goal is to compare the respondents' comfort level with technology, based on what applications they are already using as well as how regularly they are used with their willingness to use games in class. It is expected that a significant relationship exists. Addressing the one may help advance the other.

PROCEDURES

The instrument consisted of a single online questionnaire, offered to K-12 teachers in all schools in four local school districts. The request to participate was submitted to the schools by email, and it was up to the principals of each school to determine whether or not to pass the request on to their teachers. The survey was specifically designed to be easy to answer. It contained mostly multiple choice style questions, but space was provided at the end for additional comments. The survey was available online for three weeks, and there were three requests for participation, including the initial one. All data was collected online, and no individually identifying information was attached to any of the responses. Each was simply assigned a unique ID number.

The survey consisted of 25 questions, broken into three sections. The first section contained background information on the general location of the school, which grades were taught (this year and before), and which subjects were taught. Respondents were also asked about how long they'd been teaching, how many students they taught, and their average class size. The second section asked more general questions about their access to and use of computers in general, and the final section sought answers to questions about what factors have contributed to or interfered

with their use of game software in class. They were also asked about their willingness to try specific types of applications often considered as games.

LIMITATIONS

The response rate for this survey was quite disappointing, in that there were only 109 respondents from slightly more than 400 schools in four districts. However, the proportion of responses from each district was roughly equal to the proportion of schools for each, so no one district was better represented than any other. Possible mitigating factors for the poor response rate include an unfortunate timing of the survey, which coincided with the end of a reporting cycle, as well as several provincial reports that were due around the same time. It was known at the outset that being forced to conduct this survey entirely online would result in a fairly biased sample, but exactly how biased is impossible to tell. Since the principal determines the participation of each school, there is no way to survey teachers directly, and thus, at the minimum, the results may be affected by the bias of the school's administration. Further, with a survey conducted entirely online, it must be assumed that we could only attract participants who are already fairly comfortable with the use of technology. Unfortunately, a lack of funding precluded the possibility of offering a paper version of the survey. Nonetheless, there were sufficient responses to at least begin to form some hypotheses that could then be tested further in subsequent studies.

ANALYSIS AND RESULTS

There were insufficient responses to allow grouping by grades or subjects, so most of the results were simply tabulated to get a sense of the distributions. The values that indicate which grades the respondents taught would imply that there was a reasonably even distribution (Table 1.1). It is expected that the numbers would show an increase in the middle and high school levels as teachers are more commonly assigned to teach in more specialized subject areas, but across multiple grades. Similarly, the subjects taught would appear to be fairly representative (Table 1.2). Full-time teachers made up 89% of the respondents, 8% held administrative positions (principal and vice- or assistant principal), 2 were part-time teachers, and the remaining one was an itinerant¹ teacher.

Table 1.1: Grades taught by respondents.

	ECS	1	2	3	4	5	6	7	8	9	10	11	12	Post-Sec.	Other
This Year	4	18	15	15	19	23	20	35	32	30	36	37	32	0	5
Before	13	27	32	35	33	40	44	52	58	60	42	44	42	6	11

Table 1.2: Subjects taught by respondents.

	Language	Social				Second		Fine	Health,	
Elementary	Arts	Studies	Science	Math	Computers	Languages	Music	Arts	Phys. Ed.	Other
39	28	25	25	27	16	14	11	9	34	28

¹ Someone who teaches at more than one school.

The largest group of respondents listed their experience in terms of years teaching in the 5-10 year range, while those with more than 20 years' experience making up the next largest group, followed by those in the 3-5 year range (Table 1.3). Teachers were not asked about their age, as it was felt to be inappropriate, but it is possible to make some inferences based on the years of teaching experience. This may be a factor when looking at game playing by teachers themselves. Not surprisingly, the number of students seen weekly peaked at around 25, and again at over 100. The first group consists primarily of elementary level teachers who stay with a single class all day, and the second group is comprised of middle and high school teachers who teach the same subject to multiple classes. Class size plots as a normal curve, with the peak at 25-35 students per class. All of these values indicate that the respondents constitute a reasonably representative sample, with the acknowledgement that the sample may be somewhat self-selected for those willing to use the Internet to respond to surveys.

Table 1.3: Experience.

Years Teaching		Ave. N of Students per Week		Ave. Class Size	
one year or less	7.5 %	< 10	2.0 %	<10	4.8 %
1-3 yrs	5.7 %	10-25	15.2 %	15-20	3.8 %
3-5 yrs	15.1 %	25-50	18.2 %	20-25	23.8 %
5-10 yrs	34 %	50-75	8.1 %	25-30	36.2 %
10-15 yrs	6.6 %	75-100	10.1 %	30-35	21 %
15-20 yrs	8.5 %	100-150	25.3 %	>35	10.5 %
> 20 years	22.6 %	>150	21.2 %		
Total	106	Total	99	Total	105

The next set of questions asked about the amount of time respondents spent on the computer for personal use. All but one reported using the computer themselves, with the majority reporting between 5 and 25 hours of use per week (Table 1.4). 37.5% say they play games for entertainment, most for less than 5 hours a week. If Canadians follow the same general pattern as Americans [14], then it would be expected that about half of the population plays games, and given that: 1) the average age of American game players is 29 [14], and 2) the sample in this survey almost certainly included no minors; a result of nearly 40% who play games is still in line with expected values².

Table 1.4: Respondent's Personal Computer Use.

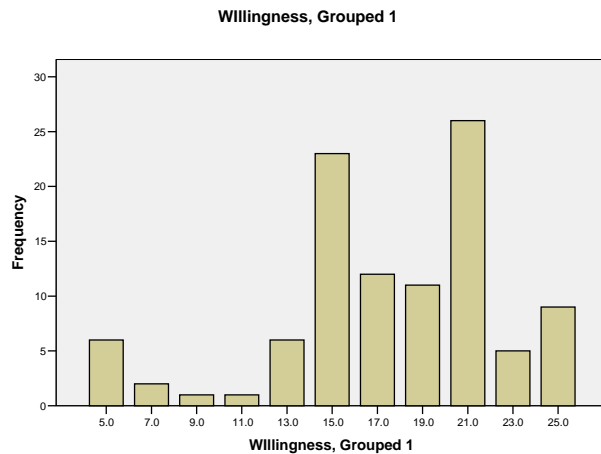
	Using the Computer	Playing Games for Entertainment	Playing Games for Other Reasons
0 (no time)	1.0 %	62.5 %	91.5 %
< 1 hour	1.0 %	13.5 %	4.3 %
1 – 3 hours	8.2 %	12.5 %	3.2 %
3 – 5 hours	5.1 %	5.2 %	1.1 %
5 – 10 hours	25.5 %	3.1 %	-
10 – 25 hours	43.9 %	2.1 %	-
25 – 40 hours	6.1 %	1.0 %	-

² Anecdotal evidence gathered in conversations with various researchers indicates that the actual percentage of game players among teachers might be significantly lower than expected for a population of the given age. What role this might play in teachers attitudes towards the use of games for learning is, of course, not known.

40 – 50 hours	6.1 %	-	-
> 50 hours	3.1 %	-	-

Several combinations of questions were used to compute several new values. A measure of access to computers was calculated by summing the responses to three related questions. Respondents were asked whether they had computers in the classroom, whether the teacher had Internet access in the class, and whether the students had Internet access in the classroom. All valid responses were “yes” to similar questions about access to computers located nearby, as in the library or a lab, so these could not be used to distinguish anything. The survey also asked a series of yes/no questions about which tasks students perform using the computer. In decreasing order of use, these were: supporting individualized learning, working with written text, creating visual presentations, organizing and storing information, creating visual displays, making pictures or figures out of non-data products, communicating information from investigations, dealing with data (manipulating, analyzing, and interpreting), compensating for a disability or limitation, remediation of basic skills, entertainment, calculations, data collection, model-making and simulations, and other uses. These results were used to compute a value for “technology comfort level”. The assumption was that teachers who are more comfortable with technology will use a greater variety of applications than those who are not.

When simulations and games are taken together, 70% of respondents reported that they had used these in their class. This included: creating or using simulations, drill and practice programs, and games for both learning and entertainment or reward. If only games and drill and practice programs are examined, the response drops to 67%, and if only games are considered, 57% have used them, but most of those (53%) reported using games for learning. Although it is not believed that this number is actually representative of teachers in general, it does provide enough responses to begin to get an idea about what has facilitated or interfered with their integration of



games into their classes. This, in turn can be used to suggest directions for further examination.

Figure 1.1: Reported willingness to try game-related applications: a combination of 5 questions, each rated on a scale of 1(no) to 5(yes).

Respondents were asked directly about how willing they would be to try game applications and the results are shown in Table 1.5. Not all of the choices were clearly identified as game applications. The ambiguity was intentional, as it is suspected that both the source of the software and what it is called will affect teachers' willingness to try using it. One possible interpretation for the results below is that the more an application *sounds* like a game, the less willing they were to try it. Again, further study could help distinguish whether or not labeling is a significant factor in teachers' attitudes towards the use of games in class.

Table 1.5: How willing are you to try these applications? (In %)

	1 Not at All	2	3 Not Sure	4	5 Yes
Downloads from an Educational Source	5.0	4.0	18.0	32.0	41.0
Simulations & Interactive Demonstrations	8.9	5.0	16.8	31.7	37.6
Edutainment Titles	9.9	4.0	34.7	23.8	27.7
Commercial Off-The-Shelf Games	25.5	10.2	27.6	17.3	19.4
Made-To-Order Games	16.3	1.02	35.7	23.5	14.3

All respondents were asked the remaining two sets of questions, whether they had used games in class or not. Approximately 90% of respondents answered the questions about what barriers they thought existed to the use of games in the classroom, but only about 57% answered the questions about who facilitated their use, which is about the same number of teachers who reported using games for learning, although some teachers who did not report using games still answered these questions. The results would indicate that the teachers themselves, either through their own efforts, through professional development opportunities, or through help from their students or nearby colleagues provided the greatest amount of help. For anyone trying to make inroads into the adoption of games in the classroom, it would appear that offering professional development opportunities is an approach that could have a significant impact. Also, the highest rated factor that was a major help was the teacher her- or himself. This could be taken to imply that providing easy access to useable games and resource material may be key in promoting adoption. On the other hand, it could also imply that teachers who use games tend to be fairly self-sufficient in their approach to the development and use of learning materials. This could tie back to their general comfort level when it comes to using technology, which, of course, could imply that increasing teachers' facility with computers in general will have a positive effect on the use of games as well.

Table 1.6: Who Facilitated the Use of Game Software for Instructive Purposes? (In percent)

	No Help	Minor Help	Major Help	Help
Students	44.4	44.4	11.1	55.5
Self	44.6	29.7	25.7	55.4
Professional Development	46.9	40.6	12.5	53.1
(This) School Colleague	50.7	35.8	13.4	49.2
Instructional Technology Specialist	54.0	33.3	12.7	46.0
Outside friend	56.5	25.8	17.7	43.5
School Media Specialist	57.8	26.6	15.6	42.2
School Admin	61.9	22.2	15.9	38.1
District Admin	65.5	23.0	11.5	34.5
Curriculum Specialist (my area)	65.6	23.0	11.5	34.5
(Other) School Colleague	66.7	25.4	7.9	33.3
User Support Specialist	73.3	20.0	6.7	26.7

Financial Aid, school	73.8	18.0	8.2	26.2
Financial Aid, grant	89.9	5.1	5.1	10.2
Parent / Volunteer	89.8	10.2	0.0	10.2

The final question would tend to support the general direction of the data and conclusions, which seem to point towards the notion that teachers are generally willing to try using games. More than 90% reported that a lack of interest or an opposition to the use of games were no barrier or at most, just a minor barrier to the adoption of games. By far the most commonly cited barriers had to do with inadequate facilities (both hardware and software) and a lack of knowledge or support for how to use games within the context of their classes. The majority of the teachers in this sample were ready or willing to try using games, but were not sure which games to use, how to find them, or just how to incorporate them into their courses and curricula.

Table 1.7: What are the barriers to the use of games in the classroom? (In percent)

	No Barrier	Minor Barrier	Major Barrier	Barrier
Lack of Time for Projects that Use Games	19.0	31.0	50.0	81.0
Not Enough of Limited Access to Computers	27.3	32.3	40.4	72.7
School has no Games	28.3	35.4	36.4	71.8
Games Integration not a School Priority	29.3	36.4	34.3	70.7
Lack of knowledge about ways to integrate games	32.3	42.4	25.3	67.7
Game use not integrated into curriculum documents	33.3	36.4	30.3	66.7
Not enough teacher training opportunities	34.0	39.2	26.8	66.0
Students have insufficient access to computers	37.5	36.5	26.0	62.5
Lack of adequate technical support	40.6	33.3	26.0	59.3
Difficulty finding subs in order to attend training	44.8	33.3	21.9	55.2
Lack of support for adequate supervision of students during use.	50.5	28.4	21.1	49.5
We have no audio facilities	53.7	26.3	20.0	46.3
Our Machines Can't run Games	54.6	24.7	20.6	45.3
No training available	28.1	38.5	33.3	41.8
Not Interested	60.2	30.6	9.2	39.8
Requires Parental Consent.	64.2	33.7	2.1	35.8
Opposed to Use of Games	68.4	24.5	7.1	31.6
Most of my students don't know about games.	71.6	25.3	3.2	28.5

When the respondents' willingness to try games was compared against the results for access to computers in the classroom, and current technology use, there was no significant relationship. Similarly, no relationship was found between the teachers' own game playing habits and their willingness to try games in the classroom. There was, however a significant positive relationship ($p > 0.05$, $X^2 = 16.269$, 8 df) between the current use of games in the classroom and the teachers willingness to try them. This could be interpreted to mean that teachers respond that they are willing because they already are using games, or that their use of games has encouraged their willingness. In either case, the use of games in the classroom does not seem to deter teachers' willingness.

DISCUSSION

While none of the results of a pilot study could be claimed as conclusive, the results do suggest a number of directions where further studies could help to answer some of the questions raised here. In particular, it would be helpful to narrow down what are the most important factors that

affect a teacher's willingness to try games in the classroom? This study suggests that current use of game is one, but this cannot easily be used to encourage teachers to try games. It would seem reasonable to assume that increasing the teachers' willingness to try games will have an effect on the integration into the classroom, and eventually, the curriculum.

Two key areas that were identified as sources of barriers were inadequate facilities, and a lack of sources for games and resources for how to use them. Those interested in promoting the use of games for learning may have little or no control over what is available in terms of facilities, but retaining a keen awareness that classroom teachers rarely have access to top quality, new machines and they also typically must contend with sharing a limited resource that is in high demand can help to keep the time and system requirements as modest as possible. At least in the short term, creating and offering relatively lightweight games that do not require much in the way of time or compute power could help to increase the exposure of this medium for learning.

Finally, noting that the most noted facilitators to the incorporation of games in the classroom are the teachers themselves, along with the people in closest proximity to them, anything that can be done in the way of support in this arena, including online resources and repositories that are easy to find and navigate, is likely to have a positive impact. Professional development opportunities were high on the list of elements that were found helpful and so have a critical role to play in increasing the profile of games as well as providing teachers with sources and resources for using them. A comment often heard after professional development functions in almost all teaching professions is that although many people come away from these meetings with lots of interesting ideas, when they get back to the classroom, they find they lack the time to incorporate them. In order to turn these ideas into practice it is essential to provide at least some instructional ideas that require virtually no preparation, and can be literally "dropped" into a class in such a way that the teacher can feel confident as a facilitator.

ACKNOWLEDGEMENTS

Finally, we would like to publicly thank all the teachers who took the time to respond to this survey, and those administrators who passed the survey on to their teaching staff. Many who responded were quite generous with their comments, and while this paper reports primarily on the quantitative analyses performed on the data, the written comments are also worthy of note. This paper ends with a small selection of the comments that were volunteered.

"My biggest obstacle is finding worthwhile games (at affordable prices) that are relevant to curriculum concepts."

"The use of games and interactive presentations are great ideas and motivators. It is difficult when the computers are old and cannot all connect or constantly have issues with their ability to work adequately."

"In fact the ONE computer I did have in the classroom had to be moved out to accommodate more desks for a larger class sizes."

"Most students have lived their lives with technology and most teachers don't have the time to seek out methodologies for this purpose."

"A major barrier in the use of games is the quality. There are a few good K-1 that reinforce skills but there are fewer and fewer for the upper grades."

"If kids are not held accountable for the time spent on the computer, the learning will be minimal and the entertainment will be maximal."

"Since our inception, the computers we have in our school are being used continually by many different courses."

"I think that the time to use games, the quality of the games and a limited number of computers are the key factors in not using computer games. As a parent I object to having my child "play" on the computer when he has

completed some piece of work. I want my kids working at school....My students come to school to learn not to be entertained. Would you want your university profs. entertaining you?"

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