Virtual Worlds for Serious Applications (VS-GAMES'12)

PR:EPARe: a game-based approach to relationship guidance for adolescents.

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Abstract

Ensuring adolescents are equipped with the necessary skills to handle coercion and pressure from peers is a central component of effective relationship education. However, for teachers attempting to convey these principles, didactic methods have been shown to meet with limited success, as the highest-risk students may fail to engage with the subject matter in a meaningful fashion. In this paper, the potential a digital game may hold as a component of a blended learning solution to this problem is explored though the development of PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships). Adopting a participatory design approach, designers considered relevant input from stakeholders, subject experts, teachers and students in the development of PR:EPARe. Participatory involvement has allowed the game to be developed in such a way that draws focus on the role of the end user to extend from the traditional concern of the student's learning needs to consider that of the practitioner's needs as another primary condition of successful game based learning. An examination of the first section of the PR:EPARe game is undertaken through a cluster randomized control trial of 507 students across three UK schools. Using ANOVA to demonstrating significant differences between control and game groups ($p < 0.05$) for responses to a range of questions on preparedness and self-efficacy. An overall significant positive effect of the game over time when compared to the control ($p < 0.001$) is observed. Based on these preliminary findings, the participatory approach to development is shown to lead to a developed game which is well-received by students, offering the potential to provide a valuable resource for teachers attempting to address this difficult subject within a classroom-based context.

Keywords: relationship education; participatory design; serious games; blended learning; game-based intervention

1. Introduction

Delivery of high quality relationship and sex education (RSE) is a challenging task, and one which necessitates complex inquiry into the role and motivation of the teacher. Support for facilitating discourse on sensitive issues within a classroom setting is often overlooked, with many teachers receiving little or no training in this area, resulting in concerns of inadequate knowledge surrounding this discipline [1]. Furthermore, studies into methods of content delivery have shown didactic approaches to be lacking, with stronger potential for blended techniques, which utilize supplemental resources or alternative pedagogies [2, 3]. Evidence also suggests a strong relationship between teacher characteristics and material conveyed, suggesting a risk of material being overlooked or omitted due to individual teachers feeling uncomfortable when conveying it [4]. Given the efficacy shown for game-based approaches in similar areas of healthcare [5, 6], a serious game based approach could potentially offer an engaging e-learning platform for young people whilst allowing facilitators to deliver quality RSE with less anxiety.

Through the application of gaming technologies, an attempt to bridge difficulties in the delivery of sensitive issues via e-learning is outlined in Section II, with particular attention paid to the need to achieve a solution suitable for use within a classroom context. Section II also presents the participatory design and usability methodologies used in the development of PRE:PARe. A preliminary investigation into the impact of the game by three UK secondary schools with 507 pupils aged 13 to 14 years is outlined in Section III. The results of this investigation presented in Section IV show significant improvements in psychological preparedness across 9 of the 16 measures assessed.

1.1. Background

Participatory methods have been demonstrated as an effective means to develop serious games [7], combining the affordance of a high degree of adaptivity in response to end-user input with the ability to stimulate and assess interest and engagement from potential users throughout the development lifecycle. User based contribution in a games development cycle is a principle method that has been outlined as an essential element in promoting intrinsic motivation within specific target user groups [16]. In terms of game-based learning, it may be essential to establish engagement before considering educational aspects of a game-based intervention. If a design may not pedagogically guarantee success, as is typically the case given the unpredictable nature of users, then we can compensate by evaluating and refining the learning process in response to the learner feedback. However, if a game cannot engage learners, then sourcing an adequate sample of experienced players or practitioners with whom to assess learning outcomes becomes an impossible task [8]

By using participatory design methods a strong focus was developed in practitioner-centered design alongside that of the end user to aid motivation in teaching techniques and blended learning exercises. Drawing from an Intervention Mapping approach (IM) [9], a needs assessment addressed evidence of successful intervention techniques in order to support the development process. Building from the needs analysis, a design focus is drawn to address both the user and educationalist requirements. Using this approach, the initial concept design was split to deliver the core mechanics to be adopted for each user group. Advancing on this, developers defined the main design objectives to fall between the categories, accessibility, usability and pedagogic outcomes. By addressing these areas as a focused framework, a participatory process followed through the development phase, using psychologists, educationalists, developers and young people's combined input and suggestions, to produce an iterative approach to the overall design and development of PR:EPARe.

Under established models of technology acceptance [10], end-user perceptions of ease-of-use and usability are critical to uptake. Important here is particular consideration of the role of the educator in selecting and incorporating game-based learning into an instructional programme, and the need to support and recognize

their needs as well as those of the student. The approach taken by PR:EPARe hence sought to address each of these factors, as described in the following two sections.

1.2. Accessibility and ease of use

The technical specifications of resources available within an average classroom setting were a fundamental issue that had to be addressed before development commenced. An assessment of the suitable resources across three of the testing institutions resulted in a means based average, which established the requirements that the developers would operate to. Due to varied economical resources available within different institutions, a suitable game engine was needed for its adaptable delivery on several platforms including compatibility to run alongside smart-board technology. This aspect was important to insure that the facilitator felt comfortable using technology as a delivery method by applying suitable hardware already available within their institution. Any requirement of new hardware presented a number of financial and security matters to consider and was liable to promote further anxiety for the practitioner. In an effort to discourage this, developers choose the Unity game engine for its versatility across multiple platforms such as the PC and Macintosh, and furthermore its compatibility with smart boards currently used throughout secondary schools, using a validated game engine selection framework [11].

The overall design of the game is split into two sections that present two very different styles of game play through an observation role in part one and role-play in part two. This was developed in order to consider different learning styles [15]. Each section incorporated content recommendations, including sexual coercion and peer pressure issues that were taken from a need assessment carried out before development commenced.

Designers adopted a cross-combination of low-poly 3D and 2D graphics alongside that of an audio based narrative system within the game. This approach was taken to maximize the efficiency of the production value versus the running capability of the game on platforms with differing technical specifications. Additionally the Unity engine presents a choice of resolution options to the user at the beginning of each game, allowing for a greater control over the quality in which the game is played. This option provides support for a broader range of hardware platforms and improves the potential reach of the game.

User security and confidentiality considerations provided additional concerns into the selection of an adequate platform and the suitable software required that would be used to deliver PR:EPARe. From the initial needs assessment, a proposal was adopted that the game would run to facilitate both functions as a group based classroom activity and as an individual assignment for students. Whilst the class activity would be led and controlled by a practitioner, it was essential that individual play be not subject to threat arising from potential security breaches. Protecting personal user identity and information from internal and external sourcing was an imperative decision that resulted in a number of significant design choices adopted, including those concerning competitive feedback and reward based mechanics from a very early stage of the design process. To minimize external security risks, and noting the in-school context of deployment, the developers choose to design PR:EPARe as a freestanding game that would require no additional backup support or connection via the Internet. Internet access, from a design perspective, would have provided support in terms of social feedback and sharing mechanics through trending social media, however the welfare and security of the students took precedence over player engagement mechanisms.

Other considerations surrounding connectivity issues included concerns of student focus on assigned tasks when presented the opportunity to access the Internet. A collective agreement concluded that an Internet connection would provide a means to be an obstructive distraction in a learning environment and therefore was vetoed in terms of the games overall design.

In order to address this in terms of feedback mechanics, the designers adopted a style used more in traditional games design in reference to reinforcement and structures, with a focus on a standard points system first established in 1970's console games. Even implementing this approach, the developers faced a challenge

with this method due to considerations of internal identity protection, for both practitioners and the students involved. Initially the designers reflected that the competitive element could be shown via a scoring system similar to that of the classic arcade entertainment games by using a leader board mechanic to report feedback. However developers conceded that any data that was stored through this method could potentially be linked back to an individual and the opportunity for peer criticism could be significantly increased. In an effort to discourage these negative associations, the design for PR:EPARe's feedback mechanic omitted any request for personal information to be entered, and instead concentrated on a generalized point system that reset at the start of each new gaming session. The implementation of this mechanic ensured that through no requirement of either personal data or an Internet connection, the developers could present an e-learning platform that provided an adequate level of security measures to ensure user confidentiality, and provide ease of mind for practitioner and end users concerns relating to privacy.

1.3. Perception of usefulness amongst end users

To address the design of an e-learning platform that tackles sensitive issues in a form perceived to give a meaningful and useful addition to relationship education, a participatory approach was adopted to provide an overview of the various perspectives facing the challenges of the development and integration of ICT in a classroom setting. Regular focus and steering group meetings included a wide range of stakeholders, including educations, relationship guidance professionals, community workers, adolescents and young people aged 13 to 20. Working alongside these groups, developers were able to establish existing concerns surrounding the implementation of a technology-focused lesson in RSE. To promote perception of usefulness of ICT in practitioners, classroom management issues were addressed to further acceptance in addition to providing pedagogic outcomes. Pupils who exhibit disruptive behavior are likely to promote further feelings of anxiety for the educationalist, feeding off content discomfort and restrictions of acceptable interpretations of the curriculum. Assistive technology in a classroom setting instills focus, and pupils are less likely to be distracted as they show greater enthusiasm towards set tasks carried out on a computer [12].

With focus drawn to the task in hand, pupils are less likely to disengage with the content and divert their attention elsewhere or participate in obstreperous behavior. In support of this, the DfES ImpaCT report [13] concluded that the evidence gathered provides support for the positive influence of ICT learning in the classroom. In addition, the report provides a strong emphasis of the requirement to meet individual needs and assess the choices of when and how to use ICT [14]. Continued exploration of participatory methods can contribute to this school of thought, providing an establishment of correspondence between representatives from each sector to contribute to the overall development process and pedagogic outcomes. Involvement at an early stage in the development procedures could provide a greater acceptance in practitioners and end users, and encourage positive reflection towards game based intervention approaches. In the next section, the design of the first study of end-user reception and response to the game is outlined. Although the sample was In the next section, the design of the first study of end-user reception and response limited in size, the findings part validate the approach outlined in Section II and demonstrate promising potential for both PR:EPARe, and other games which seek to assist teachers in providing effective relationship guidance to adolescents.

2. Methods and assessment

Initial assessment was trialed on section one of the beta version of the game PR:EPARe. To assess results, a small-scale, cluster randomized controlled trial (RCT) was used to evaluate PR:EPARe against standard, non ICT based, RSE lessons. Using the standard RSE delivery as a control measure, assessment monitored changes over time and between groups. Following ethical approval through the Faculty of Health and Life Sciences at Coventry University, participating schools were supplied with forms for parental consent, whilst students were

provided with participant information sheets a week in advance to consider their decision to participate in the trial. Overall the data gathered represents reports from 17 year nine classes from three schools across the Coventry and Warwickshire area. The total number of participants equaled 505 students, with 253 males and 247 females with a mean age of 13.5 years. The 17 classes involved in the trial were assigned through the use of a pseudorandom number generator to either the control (standard RSE lesson) or the trial condition of PR:EPARe. 8 groups with 207 participants were randomized to the control group and 9 groups with 298 participants were randomized to the serious game based condition. Self-report questionnaires were issued to the participants of each group before the RSE delivery to collect baseline data. Following on from the delivery, the questionnaire measures were issued to the students to complete again in order to view and compare any modifications in confidence or knowledge transfer of awareness to sexual coercion. Concluding the initial trial, information regarding the research objectives alongside additional resources for advice and support was distributed via a de-briefing sheet to the students that took part in the trial.

3. Results and discussions

Table 1: Means and (standard deviations) for questionnaire measures by condition and time.

Questionnaire measure	Control (no game) condition		Game condition	
	Baseline	Follow-up	Baseline	Follow-up
Confidence in knowledge Q1	1.75 (0.71)	1.38 (0.21)	1.93 (0.64)	1.72 (0.55)
Personal relevance (coercee) Q2	2.54 (0.97)	2.90 (0.45)	2.78 (0.76)	2.79 (0.69)
Personal relevance (coercer) Q3	3.36 (1.17)	3.27 (0.44)	3.35 (0.95)	3.22 (0.86)
Negative consequence beliefs (personal) Q4	2.45 (0.96)	2.25 (0.34)	2.50 (0.80)	2.43 (0.69)
Negative consequence beliefs (others) Q5	2.73 (0.80)	2.6 (0.32)	2.83 (0.68)	2.58 (0.67)
Positive attitude to saying 'no' (coercee) Q6	1.59 (0.70)	1.4 (0.28)	1.57 (0.62)	1.64 (0.61)
Positive attitude to saying 'no' (coercer) Q7	1.52 (0.67)	1.58 (0.29)	1.62 (0.56)	1.69 (0.67)
Confidence to say 'no' (coercee) Q8	1.93 (0.91)	1.92 (0.32)	1.99 ((0.73)	1.89 (0.63)
Confidence to recognize self as coercer Q9	2.01 (0.76)	2.03 (0.35)	2.13 (0.67)	2.01 (0.52)
Confidence to recognize coercion against self Q10	1.89 (0.70)	1.77 (0.29)	1.92 (0.65)	1.87 (0.58)
Communication Q11 confidence (coercee)	2.12 (0.75)	2.13 (0.34)	2.14 (0.69)	2.14 (0.56)
Communication confidence (coercer) Q12	2.32 (0.86)	2.25 (0.34)	2.24 (0.68)	2.20 (0.66)
Descriptive norm – under pressure Q13	2.51 (0.89)	3.80 (3.84)	2.62 (0.77)	2.48 (0.62)
Descriptive norm – say no Q14	2.42 (0.79)	2.38 (0.29)	2.34 (0.64)	2.23 (0.58)
Subjective norm – under pressure Q15	2.11 (0.88)	2.13 (0.28)	2.10 (0.74)	2.17 (0.65)
Subjective norm – say no Q16	2.02 (0.74)	2.00 (0.28)	1.87 (0.61)	2.04 (0.60)

Table 1 presents the scores from the baseline and follow-up questionnaire measures of the control (no game) and game condition. A lower score represents greater awareness of the subject matter. A 2(time: baseline vs. follow-up) x 2(condition: intervention vs. control) multivariate analysis of variance showed significant effects for time, condition, and time x condition ($p<0.001$), demonstrating a significantly greater improvement for the game group over time. This indicates psychological preparation to coercive situations from both coercer and coerced perspectives that are represented within the table of results. With respect to the individual measures, of the 16 metrics shown in Table 1, ANOVA of section one of the game PR:EPARe against the control (standard RSE delivery), showed a significant ($p<0.05$) increase in awareness for the game group across 9 of the 16 questions posed, a significant increase for the control in 2 of the questions, and no significant difference ($p>0.05$) for the remaining 5 metrics. Analysis of the findings suggests that the game does have an impact on the identified change objectives. A follow-up analysis of variance (ANOVAs) produced in the analysis were consulted to identify which change objectives were affected. These analyses suggest that there are no significant (time x condition) interactions on responses to questions 7, 8, 11, 12 and 15 nor over time or by condition of the intervention. In addition to the quantitative data, verbal and qualitative feedback have showed a significantly positive response to the game in both practitioners and students, with all educators indicating that they would use it again to deliver RSE. Feedback was also sought from user testing by the various young peoples' steering groups that contributed to the development process, and allowed an assessment of possible amendments to be made to the game.

4. Conclusions

The analysis of the game condition against that of the control so far shows an overall significant improvement for the game across the range of metrics assessed. A greater proportion (9/16) of the individual measures show positive results and suggest an increase in awareness at this stage against that of the standard RSE delivery methods. With further studies that combine both section one and two of PR:EPARe, a comprehensive analysis can be drawn as to the overall efficiency of a game based approach to delivering RSE. Participatory design efforts have contributed to considerable input into developing understanding of both practitioner and end user needs. Whilst initial study results are promising, the mechanism of action through which the game group achieved higher self-efficacy remains unexplored. In particular, the study design reported by this paper is necessarily limited in its capacity to ascertain whether this improvement primarily arose from direct transfer of learning content from the game or its motivational and affective impact on learners. As this is a preliminary study that does not include the full version of PR:EPARe, future work will explore whether exposure to a greater volume of game-based content within the intervention could result in additional improvements across the questionnaire measures, as well as exploring the form this content might take. Future research into the benefits of game-based approaches into this context should address this aspect, and will provide an important evidence-base from which to develop future game-based approaches to assist teachers in tackling difficult topics in the classroom.

Acknowledgements

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