

AnswerPro: Designing to Motivate Interaction

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ABSTRACT

This paper describes the design and initial testing of AnswerPro, a mobile academic peer support system for UK Key Stage 3 and 4 pupils (11-16 year olds). AnswerPro is a web application that enables pupils to seek support from their knowledgeable peers on various subjects. This paper correlates the findings from a previous requirements-gathering exercise, and from research into academic motivation, to propose design elements embedded within AnswerPro. A pilot study was conducted with 7 school pupils over 3 weeks. Participants then engaged in a focus group which discussed their experience using AnswerPro and the motivational elements embedded within it. Findings from their use of AnswerPro, and from the subsequent discussion, highlighted some problems with the embedded motivational features. As a result, suggestions for potential solutions and their merits are proposed for the next version of AnswerPro.

Author Keywords

Motivation, peer learning, peer support, design.

INTRODUCTION

Mobile phone ownership and use has become widespread among young people and teenagers: as much as 75% of American teens (Lenhart et.al, 2010) and 86% of UK children aged 8-16(National Literacy Trust, 2010), own one. Mobile phones, and most prominently texting, are commonly used for day-to-day communication with peers, for both social and academic reasons, with 70% of American teens specifically texting friends to discuss school-related activities. Research shows that teens consider their peers as potential sources of academic support (Myers and Paris, 1978; Nelson-Le Gall and Glor-Scheib, 1985). Various studies have found that peer interaction improves academic performance (e.g. Sporer and Brunstein, 2009) and may lead to adopting problem-solving strategies from their peers (Manion and Alexander, 1997). Therefore, it is anticipated that a system that combines the elements of mobility, social communication and learning may enhance pupils' academic experience. However, pupils need to be motivated enough to use it frequently Morris et.al (2010). This paper reports on work aiming to integrate research findings in the field of motivation into the design of a mobile phone application that enables young peers to provide/seek academic support.

LITERATURE REVIEW

Peer Learning

Peoples' social ties can act as potentially rich resources for information (Liccardi et.al, 2007), which can be tailored to their specific needs in a more efficient manner than other resources. This has been found to be especially true for children. Various studies (e.g. Nelson-Le Gall and Glor-Scheib, 1985; Good et.al, 1987) have shown that older children (from around the age of 11) consider their peers as important potential sources of academic support. This 'peer learning' has been shown to have many benefits such as encouraging the development of accurate and superior understanding, and promoting creative thinking (Manion and Alexander, 1997; Sporer and Brunstein, 2009). As such, social media and mobile technologies could potentially be used to support such learners, although, we believe it necessary to design features that would motivate pupils' recurrent use of such solutions.

Academic Motivation

Research has broadly distinguished two types of academic motivation: intrinsic and extrinsic (Ryan and Deci, 2000b). Intrinsic motivation refers to a learner's inner self-motivation for engaging with a learning activity, such as enjoyment and general interest in the activity itself (Ryan and Deci, 2000b). Extrinsic motivation instead relies on external incentives that motivate engagement with the activity, such as rewards, or on external penalties that occur upon failure to complete a task (Ryan and Deci, 2000b). High intrinsic motivation has been found to foster high academic achievement in various studies (e.g. Gottfried, 1985). However, the relationship between extrinsic motivation and achievement seems to be a matter of some debate amongst researchers. Some consider that extrinsic motivators hinder academic achievement. Other researchers believe that although rewards or penalties start as extrinsic motivators, they sometimes result in internalized values and beliefs within the learner, after they see the benefit or the outcome of the academic tasks (Deci et.al, 1999). It is also believed that motivation is more of a continuum, ranging from purely intrinsic at one end to purely extrinsic at the other. This continuum is the view adopted by the Self-Determination Theory (SDT), which proposes that some forms of extrinsic motivation can be integrated and adopted within a person until it eventually

becomes part of their intrinsic motivational values. This integration must be aided by the person's sense of relatedness within the environment, of perceived competence and of experienced autonomy (Ryan and Deci, 2000a).

Additionally, the effect of extrinsic rewards on intrinsic motivation is a somewhat controversial topic, as reported by Deci et al. (1999). They categorized studies according to a) the method by which intrinsic motivation was measured; b) free-choice of the task and c) learner self-reported interest in said task. It was found that the effect of rewards on intrinsic motivation depended on the type of reward, anticipation and what their perceived intention was and whether the rewards were intended to control behaviour or to demonstrate competence. The perceived intention behind the rewards affected intrinsic motivation differently; if it was perceived as controlling behavior, it had a detrimental effect. Informational rewards were thought to be regarded as references to competence and were thus found to increase intrinsic motivation.

Therefore the proposed system should aim to foster intrinsic motivation through fostering free-choice behavior and, where appropriate, providing informational rewards to learners. This is of particular relevance as it has been established that children's intrinsic motivation linearly declines as they grow older (Corpus et.al, 2009; Gottfried et.al, 2009). Since the age group targeted here is considered to be less intrinsically motivated than their younger peers, it is of utmost importance that both intrinsic and extrinsic methods of motivation are appropriately employed in the system design.

DESIGN

The requirements for the proposed system were gathered by involving learners in the system's design process through: questionnaires (n=74), interviews (n=8 and n=10) and focus groups (n=34). The main requirement established from those studies was the need for mobile one-to-one communication with potential knowledgeable peer helpers (AlSugair et.al, 2012). The analysis of this requirements-gathering exercise, combined with findings from research in motivating interaction, has resulted in our design and implementation of AnswerPro. AnswerPro is unique to pupils' currently used tools of communication by providing them with a common interaction platform that would enable contacting peers outside their social circle of friends. If tied into Virtual Learning Environments (VLEs) used by most schools, this system would enable academic interaction and peer learning across multiple year groups. Moreover, such a system would encourage pupils, from this young age, to engage in self-help systems. A description of the motivational features that are implemented in our mobile web-based application, AnswerPro, is provided below.

Relatedness/Relationships

This is considered to be a crucial element for enhancing and encouraging intrinsic motivation (Ryan and Deci, 2000a, 2000b) and is thus the focal feature of the system. A sense of relatedness is encouraged through the creation of a connected society of learners who aim to support each other academically. Furthermore, it is hoped this sense of relatedness is strengthened through the frequent interaction between the members of the community. The sense of connection to the community is thought to be better supported when the interacting members are known to each other.

The importance of the pupils' sense of relatedness was demonstrated in the requirements-gathering by their reports of only seeking support from people who were known to them; parents, peers and teachers. Furthermore, the pupils demonstrated the need to feel a sense of relatedness to potential helpers by requesting that those helpers' age or school year be a part of their profiles. From these findings we propose that members should have either their pseudo or real names displayed with their interaction. It is hoped this lack of total anonymity will encourage the sense of connectedness between interacting members, thus enhancing relatedness within AnswerPro's environment.

Competence

When people perceive themselves as possessing a level of competence in a given task, this perception aids in increasing their intrinsic motivation in continuing their engagement with the task (Ryan and Deci, 2000a, 2000b). During the requirements-gathering, an option of displaying knowledge levels (through star ratings) was presented to pupils and all of the pupils (N=10) considered this to be an important feature. Some pupils (N=7) also stated that the display of their star ratings would motivate their recurrent use of the system in an attempt to increase their points. One such pupil specifically mentioned competing with friends in order to gain a higher rating.

It is proposed that AnswerPro points (and ratings) are computed for each member on each subject and that this will exploit the effect of perceived competence on the users' intrinsic motivation for using it. This feature has been designed into AnswerPro and we propose a number of factors significant in calculating the number of points. These factors are determined based on our research into user generated content, content trust and reputation management mechanisms (e.g. FitzGerald, 2012). The factors proposed are: the number of answers given on the subject, the ratings those answers received (1 to 5), the number of points the asker has and the number of points and ratings of the respondents to the same question. This method of reward - the display of competence through points (and ratings) - is used as it represents a form of informational reward for the helpers, which was found to enhance the perception of competence, and thus enhances intrinsic motivation (Deci et.al, 1999). Moreover, this recognition by other members and the value they place on a peer's knowledge may act as an ego enhancement that may encourage a learner to interact with the system, either to 'show off' or in order to learn more and thus improve their own expertise. This type of encouragement could be classified as 'introjected regulation' (Ryan and Deci, 2000b), which is a form of extrinsic motivation that has the potential to be internalized within the pupil.

Autonomy

Supporting a person's sense of control over the task facilitates the internalization of motivation for engagement from

extrinsic to intrinsic (Ryan and Deci, 2000b). Autonomy is thus crucial in bringing together elements of relatedness and competence. It fosters the internalization of extrinsic motivational features used to enhance relatedness and competence.

The importance of being in control over the help-seeking interaction was one of the findings from the requirements-gathering; nearly all of the pupils requested being able to choose who their question was sent to as opposed to the system automatically routing the questions to potential helpers. The sense of autonomy is thus emphasized in the proposed system, as it is fully controlled by its end users. Pupils are therefore not forced to provide/seek support through the system and no penalties on expertise levels are given should a pupil fail to provide requested support as this might be of detriment to the pupils' intrinsic motivation to use the system (Ryan and Deci, 2000b).

TESTING

Subjects

Seven pupils, aged 14-16 years old, took part in testing the prototype.

Materials

Prior to the study, pupils were given information letters and consent forms for their parents/guardians to complete. Additionally, a small inconvenience allowance was provided to participants towards their mobile phone costs.

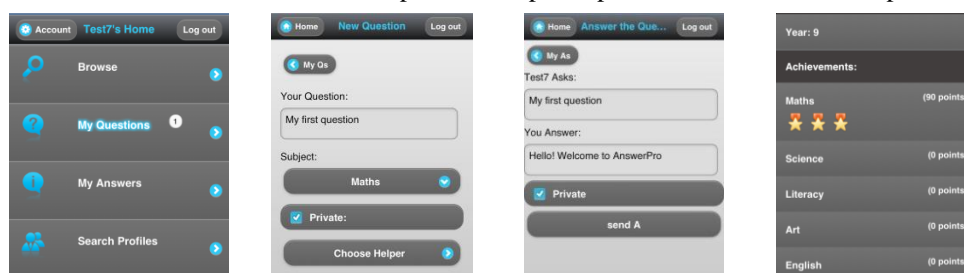


Figure 1: AnswerPro Homescreen, asking a question, answering a question and a user's profile

Procedure

On the first day of the study, pupils took part in an introductory session where AnswerPro (Figure 1) was demonstrated to them. They also took part in an informal focus group that discussed their general attitudes and practices towards academic support; the provision and request of such support. The participants were then registered on AnswerPro and members and were asked to use it for their help-seeking activities for the next 3 weeks. Upon completion of the study, the participants took part in a focus group session that discussed their experiences in using AnswerPro.

Findings

During the introductory session it was observed that pupils quickly grasped the application's functionality. At the conclusion of the study, the total number of interactions amongst the participants through AnswerPro was 57, 20 questions and 37 answers. Of the 37 answers, only 20 were rated by the participant who asked the question.

Volume of Use

Although the participants' use of AnswerPro is not considered as high, the participants attributed this to the size and composition of the group. All of the participants were close friends and already had an established method of communication between them prior to using AnswerPro; leaving little added benefit in using AnswerPro for academic support. The participants stated having a wider circle of pupils on AnswerPro, especially those they might not be close to, as an incentive to their future use of it. Additionally, since AnswerPro is a web-based app – not a device-based app – it lacks a method of on-time alerts for its users upon receiving incoming information. This lack of an alerting mechanism was cited as a probable cause for the participants' low volume of use; they reported forgetting to check their AnswerPro account for incoming questions or answers. Since AnswerPro is fully driven by users' interactions, this issue is deemed to be a critical flaw in its design. Therefore, the next version of AnswerPro should have an alerting functionality within it – such as SMS text messages – informing users of noteworthy activity on their accounts.

Ratings

The somewhat low number of ratings is considered as a main hindrance for the system in its current state. The ratings are the driving force behind earning points, which – as discussed earlier – was implemented as a means to display competence. When participants were asked about rating answers – and the reasons for providing or failing to provide them, they mentioned using ratings as a method to communicate to the responder the quality of his/her answer and would only do that if their answer was below or above average. A solution to this issue, without compromising the asker's sense of autonomy (by keeping the rating optional) and while still enforcing the responder's sense of competence, would be to alter the rating's mechanism. The granularity of the rating scheme would be decreased from 5 levels to 3 (low, medium and high) and a default value of medium would be set for all answers sent.

Profiles

The profiles are an essential part of the system for demonstrating users' competence and motivating interaction. Therefore, the frequency of participants' access to their own and others' profiles was among the points discussed in the focus group. Participants reported rarely accessing profiles in general. This could be due to the effort involved in accessing profiles; by searching for members or through account settings for a participant's own profile. In order to

minimize the effort, whilst still exploiting the motivational value of the profiles and the points they display, leader-boards will be introduced in the next version of AnswerPro. Leader-boards will bring pupils' competence to the forefront and may also encourage competition between members.

SUMMARY

This research set out to establish a direct connection between findings from research into motivation and the design of a mobile academic peer support system, AnswerPro. AnswerPro was tested by a group of Key Stage 4 pupils for a period of 3 weeks. Although the study yielded promising results, some issues regarding motivational elements were uncovered. One of the main findings from the study was the need for a larger group of users who might not all have established methods of communication amongst them. Additionally, the findings from the study have resulted in direct changes on AnswerPro, namely the rating system adopted, alerting mechanism and the addition of leader-boards. An updated version of AnswerPro will be used in a larger-scale study involving several year groups in an attempt to further explore the effect of the motivational features, discussed in this paper, on pupils' motivation to learn from peers.

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REFERENCES

- AlSugair, B., Hopkins, G., FitzGerald, E., Brailsford, T. Designing a mobile academic peer support system. *HCI 2012 - People and Computers XXVI*, British Computer Society (2012), 303-308.
- Corpus, J. H., McClintic-Gilbert, M. S. and Hayenga, A. O. Within-year changes in children's intrinsic and extrinsic motivational orientations: Contextual predictors and academic outcomes. *Contemporary Educational Psychology*, 34 (2009), 154-166.
- Deci, E. L., Ryan, R. M. and Koestner, R. A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin*, 125 (1999), 627-668.
- FitzGerald, E. Creating user-generated content for location-based learning: an authoring framework. *Journal of Computer Assisted Learning*, 28:3 (2012), 195-207.
- Good, T. L., Slavings, R. L., Kathleen Hobson, H. and Emerson, H.. Student Passivity: A Study of Question Asking in K-12 Classrooms. *Sociology of Education*, 60 (1987), 181-199.
- Gottfried, A. E. Academic Intrinsic Motivation in Elementary and Junior High School Students. *Journal of Educational Psychology*, 77 (1985), 631-645.
- Gottfried, A. E., Marcoulides, G. A., Gottfried, A. W. and Oliver, P. H.. A Latent Curve Model of Parental Motivational Practices and Developmental Decline in Math and Science Academic Intrinsic Motivation. *Journal of Educational Psychology*, 101 (2009), 729-739.
- Guay, F., Mageau, G., & Vallerand, R.J.. On the hierarchical structure of self-determined motivation : A test of top-down and bottom-up effects. *Personality and Social Psychology Bulletin*, 29 (2003), 992-1004
- Kelley, J. F. An iterative design methodology for user-friendly natural language office information applications. *ACM Transactions on Information Systems (TOIS)*, 2 (1984), 26-41.
- Lenhart, A., Purcell, K., Smith, A. and Zickuhr, K.. Social Media & Mobile Internet Use Among Teens and Young Adults. (2010) *Pew Internet & American Life Project*.
- Liccardi, I., Ounnas, A., Pau, R., Massey, E., Kinnunen, P., Lewthwaite, S., Midy, M.-A. and Sarkar, C. The role of social networks in students' learning experiences. *SIGCSE Bull.*, 39 (2007), 224-237.
- Manion, V. and Alexander, J. M. The benefits of peer collaboration on strategy use, metacognitive causal attribution and recall. *Journal of Experimental Child Psychology*, 67 (1997), 268-289.
- Morris, M. R., Teevan, J. and Panovich, K. What do people ask their social networks, and why?: a survey study of status message Q&A behavior. *Proc. CHI 2010*, ACM Press (2010), 1739-1748.
- National Literacy Trust. New research reveals more young people own a mobile phone than a book. (2010) http://www.literacytrust.org.uk/campaigns-policy/media/2042_new_research_reveals_more_young_people_own_a_mobile_phone_than_a_book (retrieved 7 June 2012).
- Nelson-Le Gall, S. and Glor-Scheib, S. Help seeking in elementary classrooms: An observational study. *Contemporary Educational Psychology*, 10 (1985), 58-71.
- Read, J. C. and Druin, A. Designing the Future. In Druin, A. (eds), *Mobile Technology for Children: Designing for Interaction and Learning*. Morgan Kaufmann, Burlington, MA, USA., 2009.
- Read, J. C., Mazzone, E. and Hoysniemi, J. Wizard of Oz Evaluations with Children - Deception and Discovery *IDC 2005*, ACM Press (2005), 2.
- Ryan, R. M. and Connell, J. P. Perceived Locus of Causality and Internalization: Examining Reasons for Acting in Two Domains. *Journal of Personality and Social Psychology*, 57 (1989), 749-761.
- Ryan, R. M. and Deci, E. L. Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, 55 (2000a), 68-78.
- Ryan, R. M. and Deci, E. L. Intrinsic and Extrinsic Motivations: Classis Definitions and New Directions. *Contemporary Educational Psychology*, 25 (2000b), 54-67.
- Sporer, N. and Brunstein, J. C. Fostering the reading comprehension of secondary school students through peer-assisted learning: Effects on strategy knowledge, strategy use, and task performance. *Contemporary Educational Psychology*, 34 (2009), 289-297