# AnswerPro: Designing to Motivate Interaction

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# AnswerPro: Designing to Motivate Interaction

## ABSTRACT

This paper describes the design and initial testing of AnswerPro, a mobile academic peer support system for school pupils aged 11-16 years. AnswerPro is a mobile optimised web application that enables pupils to seek support with school work from knowledgeable peers on various subjects. This paper presents research findings from the project, and in particular, details the design elements embedded within AnswerPro that are based upon teacher and pupil interviews examining motivation, and also from research into academic motivation. 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. Our findings highlighted some problems with the embedded motivational features. These findings have resulted in potential solutions for the next version of AnswerPro and design implications for practitioners intending to embed motivational elements in their own mobile learning tools.

### Author Keywords

Motivation, peer learning, peer support, design.

## INTRODUCTION

Mobile phone ownership and use has become widespread among young people and teenagers. As many as 75% of American teenagers (Lenhart et.al, 2010) and 86% of UK children aged 8-16 (National Literacy Trust, 2010) own a mobile phone. 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 teenagers specifically texting friends to discuss school-related activities (Lenhart et.al, 2010). Prior research has shown that teenagers consider their peers as potential sources of academic support (Myers and Paris, 1978; Nelson-Le Gall and Glor-Scheib, 1985), with several studies finding that peer interaction improves academic performance (e.g. Sporer and Brunstein, 2009) and may lead to adopting their peers' problem-solving strategies (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 performance or make their help-seeking behaviour more efficient. However, pupils need to be motivated enough to use such a system frequently if they are to benefit fully (Morris et.al, 2010). This paper reports on work aiming to combine research findings in the field of motivation with data gathered from interviewing pupils and teachers to inform the design of a mobile academic peer support application. The proposed system uniquely translates the literature from the psychology of motivation into the design of a peer support system. The overall aim of this research is to facilitate pupils' peer learning through an academic peer support network presented as a website optimised for mobile access.

## BACKGROUND TO THE RESEARCH

### 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 specific features that would motivate pupils' recurrent use of such systems otherwise it is possible they would not use these tools sufficiently frequently to provide an academic benefit.

## 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 (namely rewards) hinder academic achievement due to them undermining the recipient's intrinsic motivation, self-reported interest and/or free choice of the task being rewarded. Other researchers, on the other hand, 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 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). In the context of motivation, the term 'relatedness' refers to the user's sense of connection with others in a community whilst 'competence' is the skill in a task, and 'autonomy' is the 'feeling of volition that can accompany any act' (Ryan and Deci, 2000b, p.74).

Furthermore, 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 extrinsic rewards on intrinsic motivation depended on the type of reward; the reward's association with task completion and learner anticipation; and the perceived intention behind the reward. This perceived intention of the reward affected intrinsic motivation differently and was dependant on the perception of autonomy and competence. If a reward was perceived as controlling behaviour, thus affecting a learner's autonomy, it had a detrimental effect on the learner's intrinsic motivation towards the task being rewarded. Informational rewards, those intended to inform of competence and not to affect learner's perceived autonomy, were found to increase intrinsic motivation.

Although learning technologies sometimes adopt strategies such as rewards and feedback to encourage interaction (e.g. Tsuei, 2012; Lim et al., 2006), their use is not based on the motivation literature. Rather, these features are often regarded as secondary to the educational theories being supported in the technology. Jones and Issroff noted, in their review of the literature, the lack of a connection between educational interventions and the motivation and emotions of learners (Jones & Issroff, 2005). Thus, this research aims to bring the literature on motivation to the forefront of the design of an educational intervention that supports peer interaction.

Based on these research findings, it was decided that the proposed system should aim to foster intrinsic motivation through encouraging free-choice behaviour and, where appropriate, providing informational rewards to learners. This is of particular relevance as it has been established that children's intrinsic motivation declines linearly 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 (i.e. free-choice behaviour and rewards, respectively.)

### Help Seeking

As this research is focused on providing a system that enables peer support, it is also necessary to examine the factors influencing pupils' help-seeking behaviour. These factors are also considered when designing motivational elements in the proposed system as they closely correlate with factors influencing pupil motivation (as discussed later in the Design and Development section.)

Several studies have attempted to study the effects or impact of pupils' social or academic competence (as perceived by themselves) on their help-seeking behaviours. One such study was Newman's (1990) study on 11 to 13 year old pupils, which found that intrinsically motivated pupils and those with greater perceived academic competence were more likely to seek help when needed. This is due to the low cost those pupils associate with seeking help; they do not believe it reflects their competence, compared to the high benefit they believe they gain from the interaction. Ryan and Pintrich's (1997) finding that perceived social and academic competence was negatively related to help-seeking avoidance further emphasized this. Additionally, Ryan and Shin (2011) extended these findings by identifying a positive correlation between perceived self-efficacy and adaptive help-seeking; asking for help when needed. They also reported a positive correlation between adaptive help-seeking and achievement.

Newman (1990) theorized that pupils who perceived themselves as competent were less affected by the potential costs associated with help seeking, such as appearing inadequate, than those pupils who perceived themselves as less competent. Furthermore, he found that the influence of the cost of seeking help increased as children grew older; the younger children in his study were not affected by the cost when seeking help as opposed to the older ones, who were more aware of it. His theory was later confirmed by Ryan and Pintrich's (1997) study. They found that perceived social and academic competence was negatively related to pupils feeling threatened by peers' potential negative views of help-seekers. More importantly, they found that pupils' perceptions of being threatened resulted in an increased likelihood of help-seeking avoidance. Tanaka et al.'s (2002) study confirmed this by finding that the perception of threats from help seeking was positively related to an avoidance of help seeking and negatively related to adaptive help seeking. Ryan and Shin (2011) also reported that pupils who sought peers' positive views of them showed behaviours of being less adaptive and more avoidant of help seeking.

Technological support for academic help seeking has been largely in the form of discussion forums or public question and answer systems (Q&As.) Forums have been adopted in educational settings as methods to obtain support and encourage discussion amongst pupils (e.g. Helpglobe.com, 2007; Salovaara and Järvelä, 2003.) Yet, pupils seeking help through forums cannot, normally, choose the recipient for their queries; most sought help is publicised to all of the members. This public seeking of help might elevate the cost associated with help-seeking, thereby increasing the likelihood of help-seeking avoidance. Conversely, Q&A websites mostly provide directed help-seeking where the pupil has control over the choice of the helper. However, those helpers are mostly adult "experts" and not peers (e.g. Tute Education, 2011.)

Consequently, the proposed system should provide the directed help-seeking needed to alleviate the cost associated with that behaviour. Moreover, it should provide that through an environment that fosters academic motivation. This can be promoted by encouraging pupils' positive views of their competence through visibly demonstrating that competence on the developed system.

## DESIGN AND DEVELOPMENT

### Aim of the research

This research aims to encourage pupils' peer support through the design of a web-based application that motivates engagement. The overarching research question is whether a peer support system, designed based on user requirements and motivation theories, encourages pupils to seek academic

support from peers. We hypothesise that a system can be designed to motivate academic interaction amongst peers. This hypothesis will be investigated through the examination of the relationship, if present, between the motivational features implemented within AnswerPro and pupils' motivation levels. We also hypothesise that pupils with different levels of motivation (intrinsic and extrinsic) would use such a support system (in terms of asking and answering questions) in different ways.

The research question is addressed through 2 stages; designing the application and testing our hypotheses on the relationship between motivation, design and peer learning. The design stage encompasses 2 main phases: establishing users' needs and understanding motivation. The testing stage also comprises 2 phases: a pilot study and a main study. This paper reports on both phases of the design stage and the pilot study phase of the testing stage. The main study will be carried out in the near future.

## System design

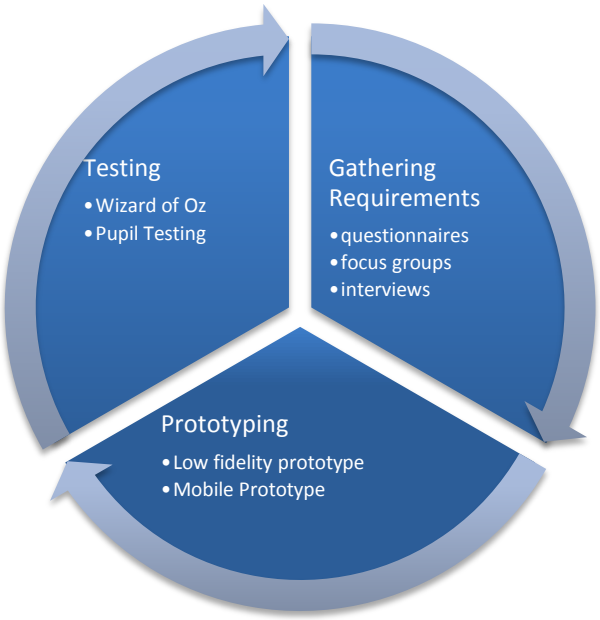


**Figure 1: AnswerPro's Design cycle**

A user-centred design approach was adopted for AnswerPro, the peer support system, in which pupils were involved in eliciting the requirements and evaluating prototypes (refer to **Error! Reference source not found.** for the design cycle). The overarching 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=3) 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 (the questionnaires, interviews and focus groups are discussed further in AlSugair et al., 2012). Further investigation of requirements to motivate interaction with the proposed system was carried out through interviewing main end-user, i.e. pupils and teachers. This was then used to supplement our review of motivation with findings from the literature. These combined findings were the basis of the mobile prototype, which was tested with pupils using a Wizard of Oz approach; a discussion of this study is presented in a later section of this paper.

The analysis of this requirements-gathering exercise, combined with findings from research in motivating interaction and findings from the Wizard of Oz testing of the mobile prototype, has resulted in our design and implementation of AnswerPro. AnswerPro is an HTML5 website, hosted on a Python server, and is optimised for mobile device access. AnswerPro is unique to pupils' currently used communication tools by providing them with a platform that enables them to contact their peers both inside and outside of their current circle of friends. If tied into Virtual Learning Environments (VLEs) used by most schools, this system could enable academic interaction and peer

learning across multiple year groups. Moreover, such a system might encourage pupils from a young age to engage in self-help systems. The following sub-sections discuss the interviews conducted with teachers and pupils as well as the testing of the mobile prototype. This is followed by a description of the motivational features that are implemented in our mobile web-based application, AnswerPro, based on the findings from the interviews, prototype testing and the literature.

## Interviews with Teachers

Teachers' views on pupils' academic motivation are crucial to understanding the factors affecting pupils' academic engagement. These interviews focused on gaining teacher opinions on pupils' engagement with various academic activities such as homework and use of the school's VLE. Additionally, the interviews aimed to understand the strategies those teachers employed to motivate pupils and the success of those strategies.

### *Subjects*

Four members of staff from a local secondary school were interviewed. All four taught 11-14 year old pupils; one taught ICT, one Technology, one Physical Education and one taught English.

### *Procedure*

The teachers were each interviewed individually in a quiet room in the school during a school day. Each interview lasted around 30 minutes and mainly focused on the school's VLE, pupils' use and engagement with the VLE, pupils' general engagement with academic tasks, and the strategies those teachers personally employed to enhance pupils' motivation and engagement with school work. This particular school employs the "VIVO" reward system (Vivo Miles), to encourage pupil academic participation and engagement. VIVO adopts a points system where each point is called a 'mile' and has the equivalent monetary value of £0.01. Each pupil is allocated an account on VIVO and once sufficient points are gathered, purchases can be made from the range of products offered on the website. This reward system was also discussed in the teacher interviews to better understand the effect of such a reward system on pupils' motivation. The discussion on the reward system was around the teachers' use of it and their perceptions of its effectiveness in motivating students' positive behaviour towards academic tasks.

### *Findings*

The interviews were analysed using a content analysis approach, with the transcription coded and grouped into themes. The main finding from the interviews indicated a general lack of academic motivation from pupils towards out-of-school activities both in terms of homework and access of the school's VLE. Furthermore, teachers had mixed feelings towards the effectiveness of the school's reward system with some reporting great success and influence on academic engagement and others reporting the opposite. This disparity suggests deeper causes specific to pupils for the success – or failure – of reward mechanisms as a method to improve academic engagement. These pupil-centred factors affecting the success of school reward mechanisms were investigated through the group interviews with pupils, as discussed below.

## Interviews with Pupils

Interviews were conducted with ten pupils (aged 11-14 years) in order to investigate motivation from their perspective. This was accomplished through the discussion of computer games and social networking sites (SNS) and the features that foster their recurrent use. Computer games and social networking sites were specifically chosen as focal points for the discussion on motivation as they are both reported as popular pastimes for young adolescents (Ofcom, 2013.) Additionally, games are an area in which competence plays a crucial role; we utilised this phenomenon to help gain pupils' views on perceived competence and how that plays a role in motivating recurrent interactions with games. Furthermore, the interviews discussed the school's reward system, VIVO, and what the pupils' perceptions of it were.

The interviews were conducted at a local secondary school in small groups. Group interviews were conducted rather than individual interviews in an attempt to make pupils feel more at ease and less the focus of attention (as found in our previous research, see AlSugair et al., 2012).

### *Subjects*

A total of ten pupils, aged 11-14, took part in three separate interview sessions. Each session involved a group of same aged pupils. Two sessions comprised two males and one female, each, and one session comprised two males and two females.

### *Procedure*

The group interviews were conducted in an empty classroom at the school during the school day. The discussions lasted around 30 minutes and started with an introduction to the purpose of the discussion, which was to identify the features they like most about computer and mobile games and social networking sites. The pupils were taken through the ethics procedure for conducting the interview (i.e. informed consent and withdrawal procedures, permission for audio recording and assurance of anonymity) and the importance of the confidentiality of the discussion and of each other's contribution to it.

The interview focused on the pupils' use of computer or mobile games and what features motivate their frequent use of them. Among the topics discussed were their views and practices on: virtual rewards such as stars or badges; levels; and sharing their achievements. Furthermore, the school's reward system was discussed in terms of whether it motivated certain behaviours, prevented other behaviours and also their general experiences and views of it. Additionally, Social Networking Sites (SNS) and the school's Virtual Learning Environment (VLE) were discussed in terms of usage, frequency and positive and negative features of both.

### *Findings*

This method, a small focus group or a group interview, was found to be successful in sufficiently engaging the pupils in an active and enlightening discussion. Additionally, a number of themes arose from the content analysis of the interview transcriptions. Similar to teachers' views of the reward system, pupils demonstrated different perceptions of it. Some perceived it as a good way for them to 'earn' extra money, with one specifically mentioning using their gathered points to buy a sibling's birthday present every year. Others adopted a neutral stance towards it, claiming it did not have an effect on their behaviour towards academic tasks. Conversely, some pupils showed strong negative feelings towards the reward system. Some of those adopting a negative stance believed it was not used consistently; several mentioned teachers failing to adhere to promises of granting points. This lack of execution of a promised reward, coupled with the delayed gratification nature of the reward system – a teacher has to manually transfer the points to a pupil's account – were issues highlighted at all three interview sessions. Pupils raising this issue, of delayed or reduced gratification, claimed this affected their belief in the rewarding system and were therefore not affected by any rewards being offered. Another group of those adopting a negative view of the reward system considered it a method for teachers to control their behaviour, which they greatly resented. This view correlates with the literature discussed earlier (Deci et al., 1999) on the detrimental effect external rewards have if they are considered to be a means for controlling behaviour.

Furthermore, when discussing computer and mobile games, pupils conveyed the importance of sharing their achievements (e.g. high scores, badges or virtual medals) with friends. This indicates their perception of such rewards as demonstration of their competence to friends. This positive perception of rewards, as discussed earlier (Deci et al., 1999), has a positive effect on their motivation. Furthermore, the pupils claimed this demonstration of competence was a strong factor driving them to frequently play a game in order to excel at it. Once the highest level is completed in a game, they lost interest in it and moved on to another one. Losing motivation for playing a game after reaching its highest level indicates the strong influence of challenge and competition amongst peers as a motivational factor for the continued use of a system.

When discussing type of access, mobile access for games and Social Networking Sites (SNS) was deemed the most frequent and preferred method over other methods, such as desktop computers. Pupils reported the availability of mobile access to games as an important factor influencing their recurrent engagement with those games. However, some issues with mobile access to SNS were mentioned, with some pupils reporting being overwhelmed with multiple modes of alerts for notifications, e.g. receiving an SMS text message, email and on-screen alert upon receiving a single message from a friend. Another issue raised about SNS mobile interfaces was automatic scrolling to the top of the screen upon receiving an on-screen alert: pupils resented the forced interruption of their current activity.

Interestingly, pupils showed minimal enthusiasm for discussing the school's VLE as almost all stated they only accessed it when they were asked to; they did not report free will use of it. When discussing the factors influencing this negativity towards VLE usage, it was found that pupils resented the controlled nature of it. Pupils reported frustration with their inability to contact peers directly and privately through the VLE as all communications on the system follow a forum-style of public posts and responses. Furthermore, pupils complained of the level of control they had over their profiles on the VLE as they were unable to change the profile's picture and changes on the status message were very limited. Unsurprisingly, this highly regulated nature of the VLE had affected pupils' free-choice access and usage of it; the effect of this lack of control on motivation is discussed in the Autonomy section.

### User Requirements for Motivation

The findings from both sets of interviews; with teachers and pupils, resulted in a set of user-requirements that fulfil their motivational needs. The user-requirements for motivation are as follows:

- Rewarding contribution through the demonstration of knowledge levels.
- Calculating knowledge levels immediately after contribution.
- Demonstrating knowledge levels through means visible to other users.
- Enabling private one-to-one communication between peers.
- Providing status messages on users' profiles and placing control with the user.
- Alerting to new content should not control the interface.

As such, the motivation requirements supplemented those established for a peer support system—as obtained through previous work with pupils (refer to AlSugair et al., 2012). The resultant set of requirements was adopted, initially, in the design of the mobile prototype (discussed in the following section) and ultimately in the full-fledged system; AnswerPro.

### Prototype Testing

A mobile prototype was designed, based on the findings from the requirements gathering exercise and the interviews discussed previously, using JustInMind (2012) (images of the prototype can be found in Figure 2). The prototype demonstrated the peer support network by enabling asking and answering questions to and from peers on the system. Moreover, the prototype fulfilled the motivation requirements (discussed previously) through the inclusion of features such as user profiles, points and timely alerts. The main aim of the testing sessions was to determine the appropriateness and suitability of the functionalities being offered. Since this testing phase was conducted early in the research, it was crucial that it yielded the detailed feedback lacking from the more general requirements gathered through previous methods (questionnaire, interviews and focus groups as discussed in AlSugair et al., 2012). However, as this testing occurred within the design stage of this research (refer to **Error! Reference source not found.** for the design cycle), the focus was more on the available functionalities-and the structure of the system, rather than on the underlying implementation. Consequently, a fully functioning prototype was not warranted and an illusion of a functioning system was sufficient to elicit the detailed feedback needed. This illusion was maintained through the adoption of a Wizard of Oz approach to testing the prototype.

The Wizard of Oz method can be traced back to Gould et al. (1983) when they tested their concept of a "listening typewriter", however, the naming of the method as *Wizard of Oz* occurred in Kelley's (1984) paper. The aim of this method is to test a concept without restraining its performance by the available technologies. This aim is fulfilled by misleading participants into thinking the system they are testing is a fully automated one while, in fact, a human simulates the system's responses. The Wizard of Oz method was chosen particularly due to its suitability for testing children's acceptance of future technologies (Read and Druin, 2009.)

### *Subjects*

Three female and three male pupils (aged 11-14) took part in 6 testing sessions. In order to avoid bias towards motivation and motivational features, the pupils recruited for the testing sessions were different from those who participated in the earlier discussed interviews.

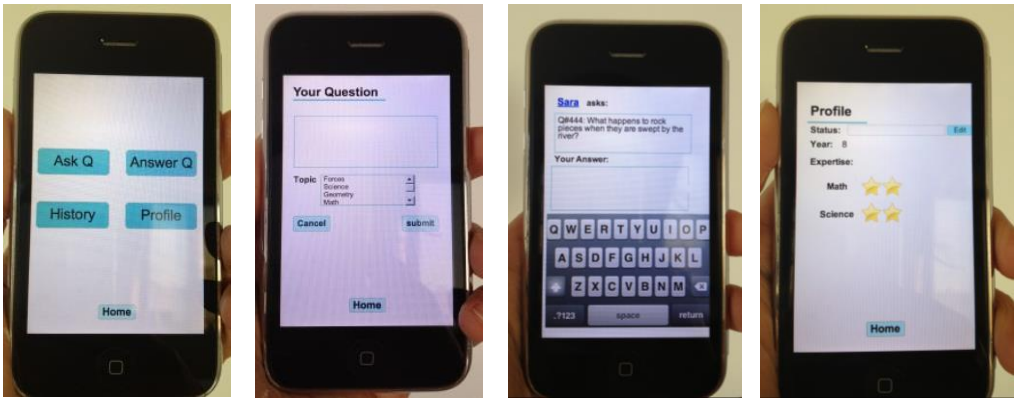


**Figure 2: Images of the prototype used in testing: the home screen, asking a question, answering a question and viewing a user's own profile (L-R)**

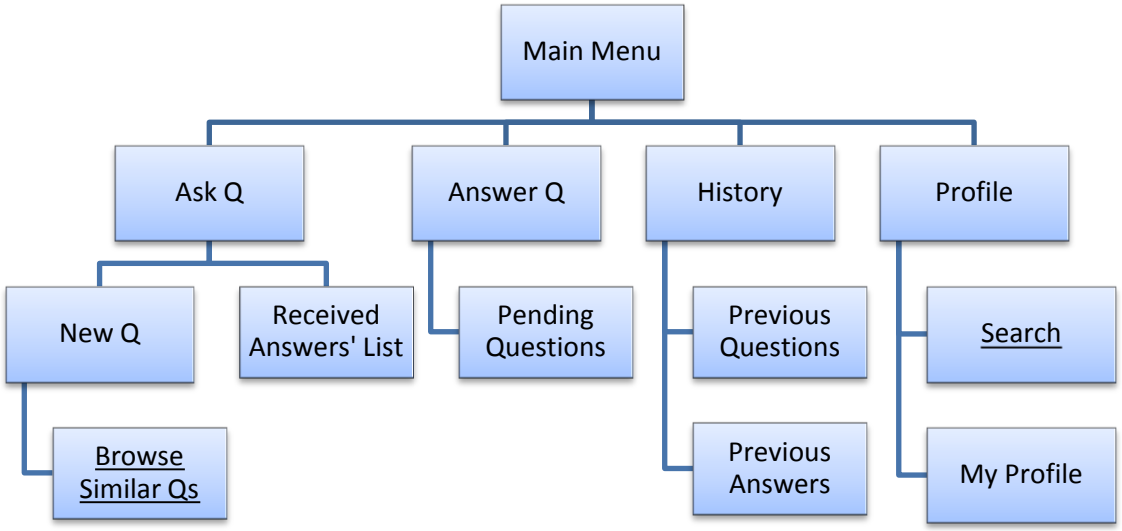


**Figure 3: Simple diagram for the prototype's structure (N.B. underlined functions indicate problematic functionalities/locations)**

### *Procedure*

The prototype (Figure 2) was run on a laptop and a view of it was projected to an iPhone 3GS using LiveView (Zambetti, 2008) which enabled the user to fully manipulate the prototype through the mobile device. Camtasia (TechSmith, 2010), software that produces videos of interactions on the computer running it, was used to record the pupils' interactions with the application. The testing sessions were held in a one-to-one manner with the pupils and took place in a quiet room in their school during the school day. Each pupil, upon beginning the session, was first given a very brief description of the application being tested, was allowed to practice using the mobile's keyboard

through the phone's built-in notepad application and was taken through the ethics procedure for the session (i.e. informed consent and withdrawal procedures, permission for recording their interaction on the application and assurance of anonymity.) After the typing practice session, the pupil was given the task sheet that contained the tasks to be completed using the application and a brief explanation of the tasks was provided. The tasks were designed to utilize the prototype's functionalities (refer to Figure 3 for the prototype's structure) and thus included asking questions as well as basic manipulations of user profiles. Additionally, the pupil was asked to attempt to answer any question he/she received during their testing session and to handle any answers he/she received to his/her posted question. This instruction was provided to enhance the illusion of a fully operating system. Consequently, participants were not informed of the researcher's role in simulating an answer or question being received. Accordingly, all of the participants received a simulated question and an answer to their posted question; however, the timing of those differed slightly between participants as it depended on a pause in their activity. At the end of the session, the pupil was asked some questions on tasks he/she struggled to complete, his/her opinion of the general layout of the controls and his/her willingness to use the actual system if it was introduced.

### *Findings*

It was found, from observing the pupils, that they quickly grasped the application's functionality, despite the brief description of it. It can also be inferred that the layout was intuitive as all of the participants reported completing the tasks within 10 minutes and only one participant sought assistance for completing the task of browsing questions similar to that being posted. However, upon examining the screen recordings, it was found that 2 of the participants did not complete that same task. This indicates an issue with the positioning of the button for browsing, which was located at the bottom of the form. Furthermore, one participant, who successfully completed the browsing task, indicated that the browsing function was too limiting as it only enabled browsing questions similar to the question being composed. Furthermore, he/she suggested enabling general browsing of the system's repository of questions through a button on the main menu (refer to Figure 3 for the mobile prototype's structure). Additionally, the task of searching for a specified user's profile, albeit completed by all participants, proved to cause some difficulty as found through the examination of the screen recordings. This was also mentioned by one participant, as a potential area for improvement in the system, by moving the profile search button to the main menu as opposed to its location within the *Profile* sub-menu.

Additionally, the participants were asked if they might find such an application useful and whether they would be willing to use it once it was introduced in the school. Only two pupils, both 13 years old, indicated that although they thought it would be useful, they would not personally use it. It is worth noting, here, that academic motivation decreases and help-seeking costs increase, as children grow older (refer to the discussion on help seeking and perceived competence in the Background to the Research section). Therefore, as the aforementioned pupils are on the higher end of the age range targeted by this research, this finding of reluctance to use the system is not surprising. These changes in motivation, both towards learning and help-seeking, might have influenced their decision on using the system; their reluctance might be towards the activity the system supports (help-seeking) and not the system itself.

## Integrating Relatedness/Relationships into the system

This is considered to be a crucial element for enhancing and encouraging intrinsic motivation (Ryan and Deci, 2000a, 2000b) as mentioned earlier in this paper, 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, i.e. 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 pseudonyms or their 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.

### Assessing Competence in the system

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) as mentioned previously. During the requirements-gathering phase, 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. Clow and Makriyannis, 2011; 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 to represent 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 learner.

### Designing for Autonomy

Supporting a person's sense of control over the task facilitates the internalization of motivation, 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 most critical 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.)

## EVALUATION OF ANSWERPRO

### Background

Seven pupils aged 14-16 years old, took part in testing the prototype. To avoid any kind of bias, these pupils were recruited from a different school and were not familiar with the AnswerPro system, nor were they involved in the original requirements-gathering phase. 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 data costs incurred by their participation in the user trial.

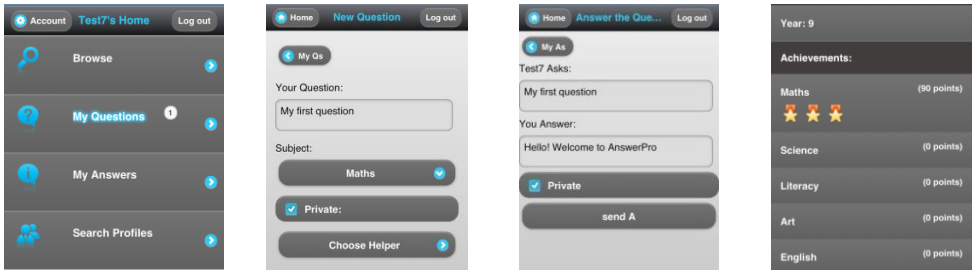


**Figure 4: Screenshots from AnswerPro: the home screen, asking a question, answering a question and a user's profile (L-R)**

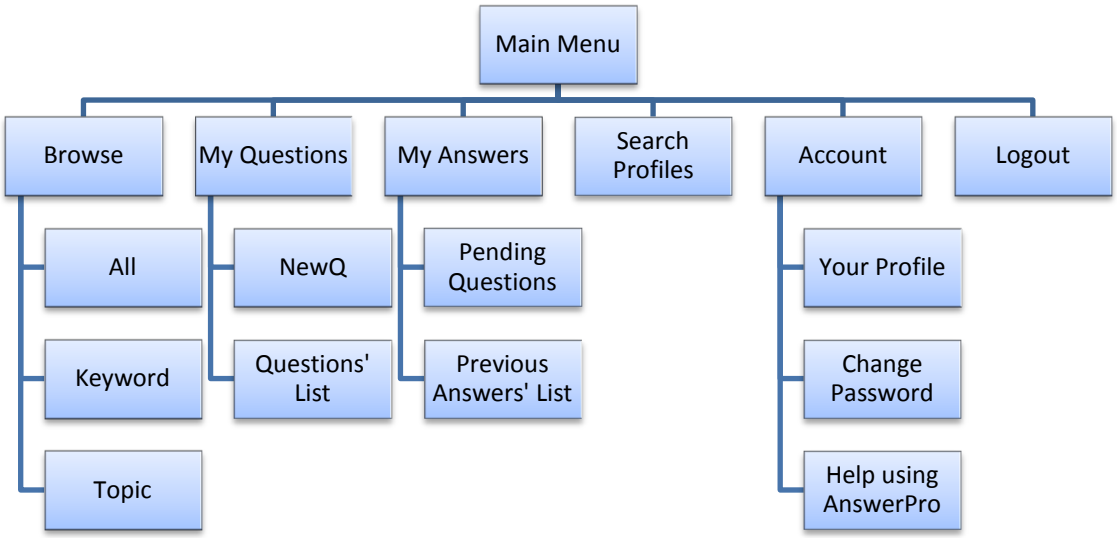


**Figure 5: Simple diagram showing AnswerPro's structure**

## Procedure

On the first day of the study, pupils took part in a briefing session where AnswerPro (Figure 4) was demonstrated to them. They also took part in an informal focus group that discussed their general attitudes and practices towards academic support including the provision and request of such support. The participants were then registered on AnswerPro as members and were asked to use it for their help-seeking activities at school for the next 3 weeks. The structure of the system was changed to reflect the findings from the prototype testing (discussed in a previous section) and evaluations conducted with usability experts (not reported in this paper.)

The resulting structure of AnswerPro is displayed in Figure 5. Upon completion of the study, the participants took part in a focus group session that discussed their experiences in using AnswerPro.

## Findings

During the briefing session it was observed that pupils quickly grasped the application's functionality and were quick to learn how to use the system. At the conclusion of the study, the total number of interactions amongst the participants through AnswerPro was 57, consisting of 20 questions and 37 answers. However, of those 37 answers, only 20 were given a star rating by the participant who asked the question.

### *Volume of Use*

Although the participants' use of AnswerPro is not considered very 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 (e.g. face-to-face or through existing tools such as SMS or Twitter), thus leaving little added benefit in using AnswerPro for academic support. The participants stated that having a wider circle of pupils on AnswerPro, especially those they might not be close to, might provide an incentive to their future use of it. Additionally, AnswerPro lacked a method of alerting its users in real time upon receiving incoming information (e.g. a new question or answer had been posted to a particular user.) 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, it was proposed that the next version of AnswerPro would have an alerting functionality within it – such as SMS text messages – informing users of any activity related to their accounts or use of AnswerPro.

### *Ratings*

The somewhat low number of star ratings awarded to answers provided by academic helpers (carried out by the person asking the original question) was considered as a major limitation for the system in its current state. The star ratings are the main impetus behind helpers earning points, which – as discussed earlier – was implemented as a means to display competence and thus increase motivation in users of AnswerPro. When participants were asked about rating the answers they were given – and the reasons for providing or failing to provide them – they mentioned using these 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, rather than if the answer was merely satisfactory. 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, was to alter the rating's mechanism. We decided that in the next iteration of AnswerPro, 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 unless this setting was overridden by the user. This would provide some reward to people answering questions, thus resulting in points, but without too much of a burden upon the original questioner.

### *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, which could only be done by searching for members or by navigating 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, we decided to implement "leader boards" in the next version of AnswerPro, which will list users and their current number of points in a ranking scheme. These leader boards will bring pupils' competence to the forefront and may also encourage competition between members as both were found as important factors motivating recurrent use of computer games (as mentioned earlier in the findings from pupil interviews.)

## SUMMARY

This research set out to establish a direct connection between findings from the relevant literature and our research into motivation and the design of a mobile academic peer support system, AnswerPro. We report on our requirements gathering activities that were focused on establishing factors influencing motivation; academic support and help-seeking; and to promote recurrent use of a help-seeking system. The investigation into motivation was carried out in three ways: firstly, a review of the literature on motivation, competence and help-seeking; secondly, gaining teachers' perspectives of academic motivation and school learning; and lastly, gaining pupils' perspectives on factors influencing their motivation for using various online systems. These activities directly influenced the design of AnswerPro's main features and functions. The most prominent motivation-

enhancing feature is the informational rewarding mechanism designed to enhance pupils' perceived competence (of their own and others' abilities). This perception aids in enhancing pupils' 'introjected regulation'; a type of extrinsic motivation as discussed by Ryan and Deci (2000b.) Furthermore, the very nature of the system enhances pupils' sense of autonomy, as they are the force driving it; from asking questions to choosing helpers through to rating received answers. This sense of autonomy aids the internalisation of motivation (Ryan and Deci, 2000b) from the extrinsic motivational features available in AnswerPro, to ultimately, internalised motivation for the process of peer support, sought and provided.

AnswerPro was tested by a group of 14-16 year old 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 have well-established methods of communication amongst them or are more reluctant to communicate with peers who are not part of their main friendship groups. Additionally, the findings from the study have enabled iterative development of AnswerPro to occur, namely the rating system adopted, alerting mechanism and the addition of leader boards, that should enable a much better end-user experience and greater usage of the system. 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, as discussed in this paper, on pupils' motivation to learn from peers. The study will adopt a mixed methods approach – similar to the one adopted by the pilot study reported here - in order to provide a coherent understanding of pupils' behaviours on the system. Quantitative data will be gathered in the form of pupils' motivation measurements obtained from an established motivation scale, questions asked, answers provided and system log files. Qualitative data, on the other hand, will be in the form of post-study interviews with teachers and focus group sessions with a sample of the pupils involved in the study.

In conclusion, this research has demonstrated the potential for translating the literature on motivation to features on a system for learning support. Although the findings reported here demonstrate the potential of designing for motivation, this needs to be further investigated. Future work could include comparing measurements of motivation prior to and after using the system. Additionally, examining the effect of individuals' motivation on their interaction within the system could provide insight into the effectiveness of such a design.

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