



The HUB: Designing an Interactive Social Space for Pre-Adolescents' Well-being

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ABSTRACT

Friendships are a fundamental source of support during challenging times, especially among pre-adolescents. The current pandemic situation makes it even harder to rely on support from their peers or strengthen friendships. To accompany and support pre-adolescents outside of school at a moment where most interactions happen online, we propose the HUB, a novel online interactive social space. The HUB is a safeguarded and monitored social space which seeks to improve social well-being and positive reinforcement practices between peers by design. This paper's key contributions derived from designing the HUB are threefold: an online social space which follows an iterative user-centered design approach; it is grounded on a theoretical model of friendship development to scaffold interactions of dyadic relationships that occur on the HUB; and it employs a set of gamification strategies, such as quests, achievements and rewards to keep pre-adolescents motivated, and, particularly, an acknowledgement system that encourages peers to work on, and acknowledge, character strengths and social skills in others, which are fundamental for their development as individuals.

CCS CONCEPTS

• **Human-centered computing** → **Interaction design.**

KEYWORDS

Social Well-being; Pre-adolescence; Scaffolding; Gamification; Peer Support

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1 INTRODUCTION

Supportive relationships are key for the well-being and health of all humans. From making friends and acquaintances, to seeking comfort and everything in between, humans rely on others daily. In the middle childhood and pre-adolescence particularly, friends and peers become central for healthy development and long-term mental health outcomes [4]. Friendships are one of the main sources of support during challenging times, such as puberty [4] or transitioning between schools [17]. Friendships are developed and maintained via peer interactions in schools, but also after school, through social media and apps that allow prolonged interactions.

Now more than ever, friendships are important. The time spent away from school and their peers, aggravated by lockdowns, school closures, pandemic restrictions and lacking support infrastructure for children undergoing these situations hindered peer interactions [6], development of new friendships [10, 14], and social skills [15, 24]. This impacts well-being of children and pre-adolescents. We believe there is a need for online support systems that can leverage interactions between pre-adolescents outside school to help them strengthen their relationships.

We found several digital interventions, tools and apps focused on improving well-being and mental health, some of which employ core aspects of relationship development, like orientation [34] and scaffolding [8]. However, they tend to focus on a single user's experience and independent improvement of well-being. Considering how important and effective friendships are to individuals' mental health and general well-being, we raised the following question: *how to design an interactive social space that leverages the benefits of dyadic relationships to improve pre-adolescents' well-being?*

To address this question, we designed and developed the HUB, a novel interactive social space which makes three key contributions: (i) the HUB follows a user-centered design approach, involving relevant stakeholders; (ii) it is grounded on a theoretical model of friendship development, and scaffolds interactions of dyadic relationships between peers according to the model's relational

phases; (iii) it employs gamification strategies, including quests, achievements and an acknowledgement system based on character strengths and friendship facilitating factors, to address user motivation. The HUB is a safeguarded, closed-access environment where pre-adolescents can safely meet other peers as they work on their social skills and improve well-being.

2 THEORETICAL BACKGROUND

Friendships in pre-adolescence. Dyadic relationships, from acquaintances to best friends, are especially important during pre-adolescence [18, 20] and remain so throughout life [13]. Pre-adolescence can be a challenging developmental period with intense social-emotional changes taking place [39]. Additionally, external factors such as middle school transition can have devastating consequences if children fail to adapt to the new social environment [16, 39]. Yet, supporting structures are lacking in schools [11] and children often connect online - for better or worse [26].

In the past decades, researchers have proposed numerous models [21, 33, 37] that describe how relationships develop from the moment a first contact is established. However, most of these models have been developed with romantic relationships in mind and few focus on adults' friendships. Although these processes have similarities, there are evident differences between them too. Thus, the literature lacks friendship models that focus specifically on pre-adolescence and in school.

In the COVID-19 pandemic, virtual environments became a main channel for communication [40], especially among pre-adolescents [19]. This trend will only continue in the future [3]. As research points to the same friendship qualities in on- and offline friendships [41], we believe a more nuanced understanding of risks and opportunities from the safeguarded online environments is necessary to inform meaningful interventions, especially in the aftermath of the COVID-19 pandemic.

Existing Well-being Interventions and Social Networks. There have been many digital interventions focused on well-being or mental health in the past. A systematic review of mental health mobile apps for pre-adolescents and adolescents identifies 15 apps addressing several areas including mental well-being [9]. Some of these apps offer in-app tracking or training of particular skills [22, 32, 38], or gamification strategies such as rewards, gifting and affirmations [36]. These app-based interventions have become more prevalent in light of the pandemic and its effect on young people's mental health and well-being [8, 34].

We also researched social networks focused on well-being and mental health. Existing social networks such as Facebook and Instagram are taking steps towards improving well-being of their users, such as letting them know for how long they've been using the apps on a daily or weekly basis or whether they've already consumed all new content since their last session. However, these are steps to mitigate the negative effect social networks can have on mental health and well-being; they're not features that promote well-being benefits by design. When researching, we only found one social network that inherently does so, called Quokka[35]. It's a website that allows tracking progress and consulting information on a series of challenges designed to promote healthy habits and well-being. Although it encourages interaction between participants by asking

them to share their experiences with peers in social networks, it leverages existing social communities of college students to do so. It would be interesting to research the impact such digital interventions and social networking sites can have when leveraging the benefits of peer interactions and friendships, existing and new ones, as evident support structures for well-being and mental health.

Gamification. Using gamification concepts to cater to users requires a closer look into motivation. Motivation refers to the psychological processes that affect goal-directed behaviors [31]. Motivation research identifies six perspectives on motivational mechanisms within gamification, such as the self-determination and cognitive perspective, which have been mapped in the literature [30] to different game elements such as points, leaderboards, and quests. Quests are small tasks that show the player the associated rewards and mostly address cognitive perspective mechanisms, such as providing clear goals, and emphasize the importance of a player's action in a given situation. Additionally, avatars and profile development shape a player's virtual identity and address self-determination and interest by (i) fostering autonomy, and (ii) evoking positive feelings and emotional bonds, respectively.

Among several gamification frameworks in the literature [2, 5], Aparicio et al. propose one based on the self-determination theory [28]. To maintain intrinsic motivation, they propose certain game mechanics to match a set of psychological and social needs: autonomy can be achieved through profiles, avatars, and privacy control; competence through positive feedback, points, and leaderboards; and relation via messages, social networks and chat[2].

3 THE HUB

The HUB is a social online space that models the relationship dynamics of a theoretical model of friendship development described in section 3.2. It intends to help pre-adolescents develop social skills by interacting and partaking in activities with their contacts inside the space.

3.1 User-centered Design

To inform the development of the HUB, we conducted questionnaires and focus groups with pre-adolescents. First, we collected answers for a questionnaire on pre-adolescents' favorite functionalities in communication apps. The questionnaire was answered by 41 participants aged 8 to 13 years old (17 girls and 22 boys). When asked whether they preferred photos or avatars on their profile, 39% said photos and 29% said avatars. Since we don't want to compromise users' identities on the HUB, we decided it was best to go with avatars, which is also an effective gamification element for user motivation. When asked about accessory customization on their profiles, 61% of participants said they didn't want it. 88% said that chatting was the most important feature in comparison to following, commenting, reacting with emojis and posting content. Emojis were more important (75.6%) in chat than videos (70.7%) or pictures (65.9%). Participants also value the ability to block others (70.7%) and to decline friend requests (75.6%). Thus, we identify a preference for profile photos, messaging or chatting, the ability to send emojis and the ability to control their contacts and conversations through features like blocking and the possibility of declining friend requests.

An additional questionnaire on preferences in videogame features was answered by the same 41 participants. Some of the findings from this questionnaire are relevant from a gamification standpoint. When asked what kind of rewards they like in videogames in a multiple choice question: 45% of participants selected medals and 20% selected badges; 40% selected money and 37.5% selected gold coins; and 27.5% selected gems and 25% selected points. In short, we identify preferences towards (i) badges, which may relate to in-game achievements and conquests, (ii) a kind of in-game currency or transactions involving real money, and (iii) a scoring system through points.

Since the HUB is a moderated space, there is a commitment to protecting personal information and to not implement any systems that involve real money or micro-transactions. Moderation happens in a separate dashboard where reported conversations and blocked users can be analyzed by select HUB moderators, and user misconduct may ultimately result in a permanent ban. Regarding personal information, only a randomized username generated from a list of animals, colors and adjectives identifies users to their peers on the HUB. It was decided that cartoonish avatars would be more adequate than allowing the upload or usage of real photos to be displayed on user profiles in the HUB. Also, the preference towards an in-game currency, gems and points were translated into a single point-like reward which can be exchanged for additional rewards and which cannot be purchased with real money; the only manner of obtaining them is by completing quests in the HUB. We included some other features based on our findings, such as the ability to report users and to send stickers in conversations which are offered by Whatsapp and other apps pre-adolescents preferred. In the results from the videogame features questionnaire, around 30% of participants expressed a preference towards quests when asked about what a good game should include. We decided that this could be a good way of translating the main findings from the friendship development model to the online space. With these findings, we began developing the HUB, conducting regular play testing sessions with a group featuring UX/UI engineers, psychologists and game designers. During these sessions, we collected valuable feedback as we iterated on the design and features of the HUB, ahead of testing with pre-adolescents in schools.

3.2 Theoretical Model of Friendship Development

As discussed, the literature lacks a contextual understanding of the friendship development processes in the school setting that focus specifically on pre-adolescence. To address this gap, Mitic and colleagues [17] created a model of friendship development (Figure 1) at middle school transition. The model describes the interpersonal processes between unknown peers (i.e., the Self and a Friend) in the new classroom. The friendship development process encompasses three basic phases – the orienting, relating and maintaining phases. Each phase has a corresponding relationship stage – respectively classmates, friends and close friends. The phases/stages are demarcated by security and intimacy thresholds. The security threshold represents a minimum level of security necessary for the Self to transition from the orienting phase to the relating phase. The intimacy threshold represents a minimum level of intimacy necessary

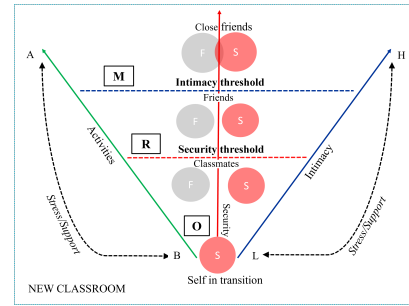


Figure 1: A simplified process model of friendship development at middle school transition. In alphabetic order: A – Advanced; B – Basic; F – Friend; H – High; L – Low; M – Maintaining phase; O – Orienting phase; R – Relating phase; S – Self.

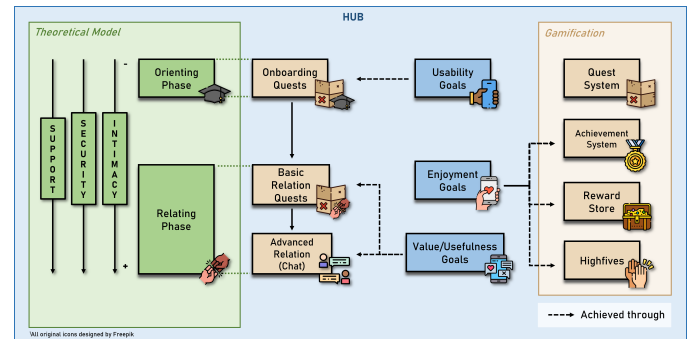


Figure 2: The proposed model for the HUB based on the theoretical model and gamification components.

for the Self (and a Friend) to transition from the relating phase to the maintaining phase.

Although the model was developed for the physical (classroom) environment, it captures the universal interpersonal processes between two unknown peers that lead to friendship development over time and hence it is appropriate for translation and implementation in the online environments. Each of the described phases encompass specific sub-processes associated with psychological functions and skills. In the next section, we describe the process of translating the model sub-processes into the HUB components with the aim of promoting and fostering these functions and skills.

3.3 Scaffolded Interactions

On the HUB, we want to scaffold interactions to gradually introduce the steps necessary to support relationship development processes. We designed a Quest System as a fitting way of translating the friendship model's sub-processes and implementing the gamified scaffolding. As Figure 2 shows, the Quest System accompanies the orienting phase via Onboarding Quests which introduce the user to the new environment's functionalities, empowering them to interact with others. As security develops and the user moves towards the relating phase, Basic Relation Quests are introduced to the user,

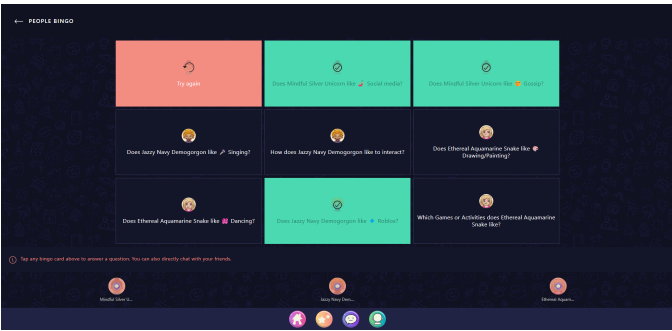


Figure 3: A user completing the People Bingo quest.

sparkling basic interaction with others through ice-breaking activities. Finally, once the user completes the Basic Relation Quests, they can continue to interact with their contacts through free interaction using the chat system, continuing to strengthen ties and spontaneously transitioning to the final maintaining phase - in which the protective function of close friendships is established. These spontaneous relational activities stimulate interaction between peers, which will sustain their development of social skills and contribute to their well-being.

Onboarding Quests. The orienting phase comprises three sub-processes that aim to increase the personal sense of security in the new environment: knowing the environment, knowing oneself and knowing others. Respectively, these sub-processes refer to (i) understanding the rules of a new environment, (ii) understanding personal preferences and (iii) grasping similarities and differences. To model these as quests in the HUB, we designed a set of Onboarding Quests. We looked at every functionality and every action a user can perform in the HUB and created a guidance activity to show how they work. For example, there is an onboarding quest for choosing an avatar. Users are told they have an avatar they can change from their profile at any time, and then are asked to pick theirs, earning points upon completing it. This particular quest (i) introduces users to a rule of the new environment, the personal avatar, and (ii) helps them understand personal preferences, manifesting them through a visual representation of their virtual Self in the HUB.

Basic Relation Quests. In the HUB, the Basic Relation Quests (refer to Figure 2) attempt to tackle another set of sub-processes, that focus on building intimacy, as seen in Table 1. These quests focus on bridging the orienting and relating phases through fun and important ice-breaking activities - the first of the above sub-processes. It would be inadequate to model the remaining ones as structured interactions (like quests) because they occur spontaneously; thus, we mapped the relating phase of the friendship model (i.e. the remaining sub-processes it encompasses) to a phase we call Advanced Relation. We decided that a non-structured environment such as a regular chat system will likely better enable processes such as self-disclosure or providing support to occur.

Once one has gone through all the Onboarding Quests, they are ready to start interacting with their peers. Only then, pre-adolescents are introduced to the Basic Relation Quests. At this

Table 1: Translation of the model’s relating phase sub-processes to HUB components.

Model Process/Component	Sub-	Function/Tasks	HUB Component
Spending valuable time together		Doing activities for collaboration, fun and satisfaction	<ul style="list-style-type: none"> • Basic Relation Quests ("Hi Friend!", "People Bingo")
Developing confidential self-disclosure		Disclosing intimate information, sharing advice	<ul style="list-style-type: none"> • Advanced Relation (Chat)
Providing mutual support		Providing emotional, instrumental and informational support, sharing information useful for self evaluation	<ul style="list-style-type: none"> • Advanced Relation (Chat) • Highfives
Learning conflict management skills		Solving disputes, prioritizing positive outcomes and minimizing negative ones	<ul style="list-style-type: none"> • Advanced Relation (Chat) • Highfives
Learning tolerance and acceptance		Learning to accept and respect others’ needs and personal boundaries	<ul style="list-style-type: none"> • Advanced Relation (Chat) • Highfives

point, they are expected to continue to strengthen security, intimacy and support with others. Unlike Onboarding Quests, these quests can be re-taken for every new contact a user makes on the HUB, and some of them can be re-taken even with peers they’ve already taken those quests with. Thus, if a user experiences a stressful interaction with a peer, they will be able to fall back to earlier quests to rebuild on the foundations of that relationship, or to get a fresh start with other contacts. Basic Relation Quests rely on the concept of structured conversations. For each quest, users are told what is expected of them in these quests from a conversation standpoint, through a quest description. Effectively, users are guided into starting conversations with others, entering Advanced Relation, at which point they can freely interact with their contacts. But these hints for dialogue clarify the intent of the interaction, and motivate users to engage on certain topics. These quests are introduced one at a time, effectively scaffolding interactions between peers so that they don’t feel overwhelmed. For instance, *Hi Friend!*, the first Basic Relation Quest, taps into the importance of reciprocity in communication to build intimacy [17]. It’s a first ice-breaker quest that prompts the user to start a conversation with one of their contacts in a respectful manner, and requires the other user to reply for the

quest to be completed. After completing that quest, the system will assign them the *People Bingo* quest. People Bingo (see Figure 3) is a "fact-hunting" activity where the user completing the quest must uncover three interests each from three of their contacts, in a total of nine facts to find. First, the user selects three contacts from who they want to learn facts about. Then, they're presented with a bingo-like card, each with a question about a fact they must uncover. Questions such as "Which of these sports does John like?" will require the user to talk to John to find out, but other questions like "Who likes reading?" will require the user to potentially talk to all three contacts to discover who's the bookworm. This occurs through structured conversations, as users are encouraged to engage in small-talk with their contacts to uncover these facts, which is a common activity in the orienting stage of the social penetration theory [1] and the friendship model.

3.4 Other Gamification Strategies

Gamification in the HUB goes beyond the Quest System. Rewarding users for their activity is crucial to motivate them. Quests are the main activity in the HUB, and users earn points for completing them. These points can then be exchanged in the Reward Store for sticker packs to use limitlessly in chat, new avatars and Highfives - a set of acknowledgement tokens designed so that (i) users can compliment others based on their interactions, promoting positive reinforcement among peers and (ii) mastering some of the sub-processes the relating phase of the friendship model entails.

Table 2: A list of some of the Highfives available on the HUB, with the VIA character strengths and facilitating factors of peer relationships they're based on.

Name	VIA Character Strengths	Facilitating Factors
Leader	Appreciation of excellence	Outstanding ability
Brave	Bravery	Confidence & openness
Funny	Humour	Humour & fun, shared positive emotions
Creative	Creativity	Creativity & style
Honest	Honesty, integrity	Honesty & loyalty
Nice	Kindness	Kindness
Perspective	Perspective, social intelligence	Empathic actions
Curious	Curiosity	Communication (listening, asking questions)
Twins	-	Similarities

Highfives are inspired by a similar feature from a popular social network¹ from the early 2000s. Highfives can help pre-adolescents self-assess and assess in others certain social competences, and incentivize them to foster more positive interactions with others. The Highfives system consists of a set of badges that a user can

¹<https://hi5.com/>

gift in chat to a peer when they want to acknowledge in a particular trait. They were designed according to an analysis of facilitating/hindering factors of friendships [12] and research of the VIA character strengths [23] - a taxonomy of personal character strengths and virtues. Pre-adolescents consider peers to be supportive under a subjective definition of treating others well. To exemplify, one of the identified facilitating factors is *kindness* which, according to pre-adolescents, is expressed through consoling others, being accepting of boundaries and asking about one's wellbeing. The *Nice* highfive allows a user to acknowledge such expressions of kindness through a badge. Like kindness, the most salient facilitating factors were identified and combined with some of the VIA character strengths that fit within the HUB, summarized in Table 2.

The HUB also features an Achievement System. While quests are designed for user guidance and onboarding, achievements act as a reinforcement component. Like quests, they grant rewards upon completion: a distinctive rosette shown in user profiles. Most of the achievements either ask users to repeat an action they've already done via quests, or that they perform a variation of such an action, for reinforcement purposes. For example, for the quest that asks users to send a highfive to another, there is an achievement for receiving the 'Best Friend' highfive from a user. While quest progress can always be tracked, some achievements are hidden (i.e., they'll make progress towards completing them without knowingly doing so), as some players enjoy the unexpectedness of getting badges in gamified systems [42].

4 CONCLUSIONS

This paper addressed the question: *how to design an interactive social space that leverages the benefits of dyadic relationships to improve pre-adolescents' well-being?*

To attend to this question, we present the HUB, an interactive social space for pre-adolescents grounded in a theoretical friendship model and gamification research. We conducted several questionnaires and focus groups with pre-adolescents in schools in Austria, to assess their favorite online communication tools and videogame features. These informed the first prototype of the HUB, featuring a Quest System that leverages scaffolded interactions to guide users through the orienting and relating phases of friendship development of the theoretical model. This system, as well as an Achievement System, grant users rewards upon completion, such as points users can exchange for exclusive sticker packs and giftable acknowledgements at a Reward Store. The latter, called Highfives, can be gifted to their peers in chat to acknowledge them for relevant character and friendship traits they may demonstrate in interactions.

To assess the HUB's viability, we will conduct interviews, focus groups and questionnaires with pre-adolescents from schools in Austria and the UK, to measure usability, enjoyment and value/usefulness. We will assess usability via an age-appropriate modification [25, 29] of the System Usability Scale. Enjoyment and value/usefulness will be measured with the respective subscales from the Intrinsic Motivation Inventory, widely used for such assessments [7, 27].

The next steps include user testing in schools to design and improve the gamification systems iteratively. Additionally, an intelligent peer matching system could leverage each child's interests social skills as they interact on the HUB to suggest other peers more aligned with their interests and who can help them maximize their social competences.

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