

Children's Participation in a Media Content Creation Community: Israeli Learners in a Scratch Programming Environment

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Abstract

Scratch is a programmable media tool and online community that enables children to create, share, and remix interactive projects, and socially participate in the community by writing comments, giving ratings, adding members as friends and so forth.

This study examined the learning community of Israeli Scratch users. We investigated (1) participation patterns (project creation vs. social participation), (2) the relationship between individual investment and community feedback (both on a user and a project level), and (3) gender differences in participation patterns and project complexity.

The findings support our hypotheses, showing that: (1) different participation patterns are not correlated. Project creators and social participators are different users - suggesting that different participation patterns fulfill different user needs. (2) The community feedback to individual investment on a user level is received as the number of community members that define a user as their friend. However, on a project level the two participation types differ: a project feedback positively correlates with social participation investment, but contrary to the hypothesis - negatively correlates with project creation investment. It seems that the project feedback is influenced by friendship rather than by project quality. (3) No gender differences are found in participation patterns or in project complexity, suggesting that Scratch opens equal possibilities to both genders in programming, learning and participation. In addition, the content contribution level found in the study is higher than usual in adult content creation communities. Possible explanations are participants' age, the nature of interactive media, or features of the Scratch site design.

Keywords: participation patterns, Scratch, programmable media environment, computer animation and game creation, remixing, sharing, online learning community, community feedback, gender differences.

Introduction

The constructionist theory of learning (Papert, 1991) claimed that young people learn best by constructing personally meaningful artifacts. Using constructionist learning environments in a natural way, children can learn complex concepts - such as causal models of dynamic behavior (Zuckerman, Grotzer, & Leahy, 2006). The Scratch constructionist environment¹ was recently designed at the MIT Media Lab to promote creative thinking (Resnick, 2007b). The interactive

¹ <http://scratch.mit.edu/>

media environment emphasizes graphic, video and music – the core of technological interest for youth (Kafai, Peppler, & Chiu, 2007). Unlike well-known non-programmable media platforms such as YouTube or Flickr, Scratch is a programmable media environment (Monroy-Hernández, 2007). Young people use Scratch to create animations, games, simulations, stories and interactive art (Maloney et al., 2004). Scratch fosters creative thinking (Romeike, 2008c) which is essential for student motivation, concentration and achievement (Fasko, 2000). Projects can be easily deconstructed and rebuilt into new ones, a process that contributes to the learning of practical programming (Millner, 2005). The intuitive programming offered by Scratch enables the acquisition of key programming concepts even in the absence of instructional interventions or experienced mentors (Maloney, Peppler, Kafai, Resnick, & Rusk, 2008).

The Scratch online community supports interactions between members, the creation of original or remixed projects, and the sharing of outcomes on the community site (Rosenbaum, 2008). Each original or remixed project is associated with all of its creators. This feature shows respect for authorship and tries to foster collaboration by familiarizing community members with each other's creations (Sylvan, 2007).

Participation patterns in knowledge-building communities are usually concerned with content contribution, community involvement and silent participation, i.e. lurking (Rafaeli & Ariel, 2008). Based on Jenkins's (2006) four participation patterns in fan-fiction communities (passive consumption, active consumption, passive production, and active production), Monroy-Hernández and Resnick (2008) suggested a model of participation in the Scratch context: viewing projects (passive consumption), social participation in the community (active consumption), project creation or remixing without sharing (passive production), project creation or remixing and sharing the project in the community (active production).

The motivation for content contribution in an online community can be examined through users' log analysis, as well as by exploring the relationship between participation and community feedback (Rafaeli & Ariel, 2008; Rafaeli, Raban, & Ravid, 2007). Rubin's users and a gratification model (1994) suggested five generic motivation clusters of needs that media could fulfill: cognitive, affective, personal integrative, social integrative, and diversion needs. Based on Rubin's approach, different participation patterns can fulfill different Scratch users' needs: users with salient social integrative needs may prefer social participation; users with salient cognitive needs for understanding or affective needs for aesthetics, pleasure and entertainment may prefer project creation or remixing.

This study examined the learning community of Israeli Scratch² users. We investigated (1) participation patterns (project creation vs. social participation), (2) the relationship between an individual investment and the community feedback (both on a user and a project level), and (3) gender differences in participation patterns and project complexity. Based on Rubin's (1994) approach we hypothesized that project creation and social participation measures would not correlate, and individual investment in the community would positively correlate with community feedback both on a user and a project level. Although low participation of school-aged female students in computer science lessons is well documented (Romeike, 2008a), based on non gender differences in participation that was found in the Scratch international community (Sylvan, 2007) we hypothesized that there would be no significant gender differences in participation patterns and project complexity in the present study.

² <http://www.scratch.org.il/>

Method

Participants: a group of Israeli Scratch community members: 65 children, 35 (53.8%) of them girls. The participants' age ranged from 9 to 17; mean age was 11.5 years, and the median 11. Most of the participants were Israeli elementary school students who learned how to use the English version of Scratch (the Hebrew version was not available yet) through guided learning in the classrooms with the same teacher. For this reason all the participants were registered community members and content contributors who can be defined as active producers or active consumers.

Instruments and procedure: The data concerning Scratch participation patterns, project complexity and demographic information was collected through the Scratch online community logs in July, 2008. Project creation is measured by the number of original and remixed projects per user; Social participation is calculated as the number of comments, friends, favorites, posting in galleries, and "love-its" rating. Community feedback is measured by the number of participants that defined a user as their friend (at a user level), and by means of user's projects viewed, commented, marked-as-favorite, downloaded, remixed, or marked-as-love-it (in a project level). A project complexity index is calculated as a mean of user projects' scripts and sprites ($r = .83$, $p < .01$; note that project complexity is a technical measurement and does not refer to the project quality).

Results and discussion

Project Creation

Until July 2008 the 65 users of Israeli Scratch community created 6454 projects. Figure 1 shows project distribution. (Range: 5-1592, Mean: 99.29, SD: 232.66, Median: 49).

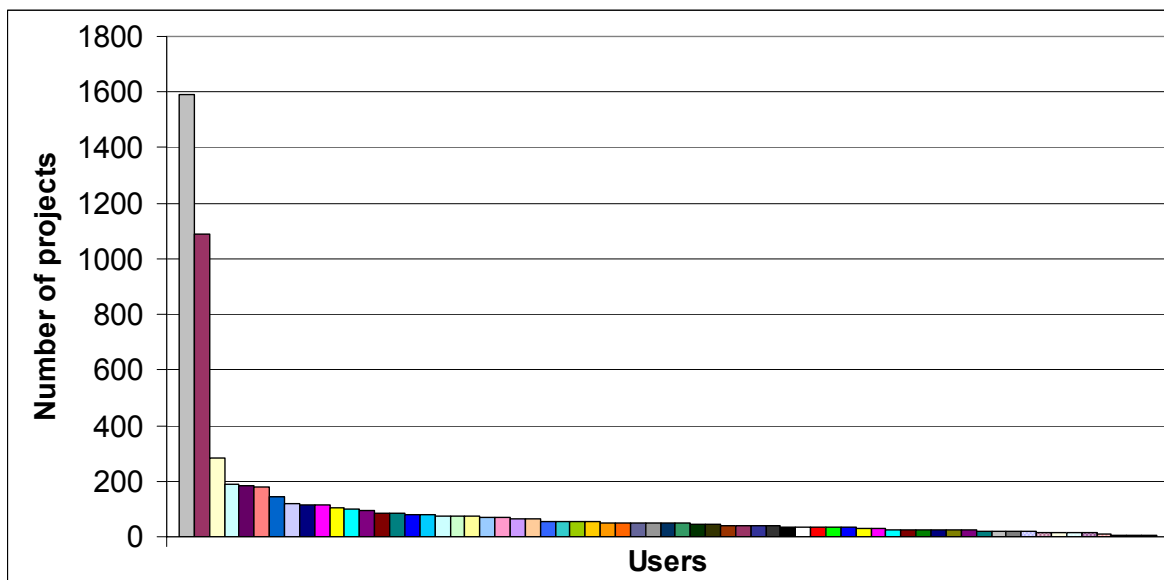


Figure 1: Distribution of projects created by Israeli Scratch community (July 2008)

Such long tail distributions are typical also in adult content creation communities such as Wikipedia (Ravid, 2007) or educational wiki-books (Ravid, Kalman, & Rafaeli, 2008). Our findings show that 17% of Israelis Scratch users are active content contributors (share 100 projects or more) and 3% of the users are very active (share more than 1000 projects). Active

and very active users created 2/3 of the community's projects. This differs from participation in Wikipedia communities where 2.5% of registered users contribute 80% of all the content (Tapscott & Williams, 2007). Possible explanations are that (1) youth might be more active content contributors than adults; (2) programmable medium can increase participations compared to non-programmable tools (such as text in Wikipedia or videos in YouTube); (3) specific design features of the Scratch community site may increase participation (e.g. the "new projects" placement on the home page immediately after uploading). The findings indicate that high frequency of project uploading increases project's views ($r = .32, p < .01$), and the chance of users to befriend ($r = .25, p < .05$). This data indirectly supports the third (site design) explanation for content contribution.

The salient expressions of project-oriented participators' investment in the community are the number of original (Mean: 92, SD: 229.2) or remixed projects created (Mean: 7.29, SD: 14.27) and downloaded by the user (Range: 0-221, Mean: 20.43, SD: 32.3). Different measures of project participation investment significantly correlate to each other (Table 1).

Table 1: Correlations between measures of project investment in the community

	Total Projects	Original Projects	Remixed Projects	Views made
Views made	.356(**)	.352(**)	.149	
Downloads made	.664(**)	.661(**)	.201	.690(**)

** $p < .01$

Social Participation

The most salient expression of social participators' investment in the community is the number of friends a user has added (Range: 0-296, Mean: 11.94, SD: 47.03). Statistically significant correlations are found within different measures of social participation investment (Table 2).

Table 2: Correlations between measures of social investment in the community

	Views	Add favorites	Add friends	Add to galleries	Add comments
Add friends	.390(**)	.385(**)			
Add to galleries	.418(**)	.143	.416(**)		
Add comments	.697(**)	.122	.295(*)	.389(**)	
Add "loveits"	.462(**)	.196	.168	.317(**)	.642(**)

* $p < .05$, ** $p < .01$

As hypothesized, measures of the project creation are not correlated with social participation. These findings differ from Sylvan's (2007) data; it seems that relatively weak correlations between the project creation and social participation in the international Scratch study reached statistical significance because of the large sample size.

Similarly to Ravid et al.'s (2008) study, our findings show that the most active participators in project-oriented and social participation types are different users: when a user is very active in some participation type he or she is relatively passive in other participation types. Ravid et al.

suggested that different participation patterns in wikis require different abilities (subject-matter knowledge vs. writing skills). Scratch project creation however does not require prior knowledge; most of the participants in our study started using the application at the same time, with the same teacher. In addition, the project complexity is not correlated to participation types. Thus, we suggest an explanation based on Rubin's (1994) users and a gratification model. Different participation patterns may fulfill different Scratch users' needs: users with salient social integrative needs prefer social participation, while children with salient cognitive or affective needs tend to choose a project creation (original or remix) participation type. This direction requires further investigation.

Community Feedback

Statistical significant correlations are found within different community feedback measures (Table 3).

Table 3: Correlations between community feedback measures

	Be viewed	Be favorite	Be commented	Be loved
Be commented	.321(**)	.476(**)		
Be loved	.550(**)	.630(**)	.638(**)	
Be downloaded	.541(**)	.389(**)	.280(*)	.326(**)

* $p < .05$, ** $p < .01$

Following multivariate regression analysis showed that four predictors of community feedback (project viewed, loved, commented, and favorited by others) account for the 42.2% of variance in projects download, $F(4, 60) = 10.94$, $p < .001$. It seems that downloading is done mostly for social reasons rather than for remixing. No statistically significant correlations are found between downloading and remixing (in a user and a project level) which indirectly supports this explanation.

Individual Investment and Community Feedback

As hypothesized, in the user level all participators receive the community feedback - in the form of befriended (the number of participants defined a user as their friend). This variable correlates with both project-oriented and social investment measures (Table 4).

Table 4: Correlations between project and social investment and the community feedback - in user level

	Views made	Downloads made	Add favorites	Add friends	Add to galleries	Add comments	Add "loveits"
Befriended	.557(**)	.339(**)	.302(*)	.665(**)	.786(**)	.563(**)	.409(**)

* $p < .05$, ** $p < .01$

In following analysis the community feedback in the user level regressed on the number of views, downloads, user's friends, galleries a user participated in, comments made, favorites and "love-its" added to other projects. Those seven predictors accounted for the 81.1% of variance in community feedback, $F(7, 57) = 35.04$, $p < .001$. A similar group of predictors accounted only for the 37% of variance in friendship network on the international Scratch community study (Sylvan, 2007). This difference can be explained by mixed (online and offline) communication between Israeli users versus online only interactions in the international site. Similarly, in Blau

and Caspi's (2008) study online interactions through wiki technology were affected by classmates' offline relationships.

Community feedback in the project level benefits social participants rather than project creators: project feedback positively correlates with social investment, but opposite to the hypothesis, negatively correlates with the project-oriented investment in the community (Table 5). It seems that social participants give feedback to projects of their friends.

Table 5: Correlations between different forms of project and social investment and the community feedback - in project level

	Total projects	Original projects	Remixed projects	Ad to galleries	Ad comments
Be viewed	-.324(**)	-.310(*)	-.291(*)	.225(*)	.199
Be loved	-.182	-.176	-.137	.080	.214(*)
Be downloaded	-.245(*)	-.238(*)	-.159	.237(*)	.287(*)

* $p < .05$, ** $p < .01$

The participants' age correlates only with a number of project viewed ($r = .34$, $p < .01$) and remixed made by other users ($r = .25$, $p < .05$); no statistically significant correlation are found with project complexity or participation measures.

As hypothesized, similar to the early international Scratch study (Sylvan, 2007), no statistically significant gender differences in participation patterns are found. Moreover, statistically significant gender differences are not found in project complexity, $t(63) = 0.98$, $p = .33$. It seems promising that Scratch opens similar possibilities to both genders in programming, learning and participation.

In summary, our findings show content contribution level which is higher than usual in adult content creation communities. Possible explanations are participants' age, the nature of interactive media, or features of the Scratch site design. Most of the study hypotheses were supported. (1) Different participation patterns are not correlated; the active consumers (social participators through comments, "loveits" etc.) and active producers (original or remixed projects creators) are different users. These findings require further exploration using questionnaires or personal interviews. (2) At the user level, individual investment receives community feedback as the number of participants defined by a user as their friend. However, in a project level the two participation types differ: a project feedback positively correlates with social participation investment, but in contrary to the hypothesis - negatively correlated with project creation investment. It seems that the project feedback is influenced by friendship rather than project quality. (3) No gender differences are found in participation pattern or project complexity, suggesting similar possibilities to both genders in programming, learning and participation using the Scratch environment.

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Scratch International site: <http://scratch.mit.edu>

Scratch Israeli site: <http://www.scratch.org.il/>