

EDUCATIONAL COMPUTER GAMES FOR SOCIAL ADJUSTMENT OF NEWCOMER CHILDREN

Omar Bani-Taha¹, Malek El Kouzi², Ali Arya³, D. R. Fraser Taylor⁴

¹⁻³ *School of Information Technology, Carleton University (CANADA)*

⁴ *Geography and Environmental Studies, Carleton University (CANADA)*

Abstract

The purpose of this study is to investigate the effectiveness of educational computer games as a tool to help newcomer children adjust socially. We have developed an educational game called “New Beginning” that sought to help newcomer tweens (age 9-12 years) learn more about a few selected behavioural issues. The game includes social behaviour advice with a focus on bullying and how to respond to it. The participating children were assigned randomly to do one of the following activities: 1) playing a computer game that contains behavioural advice about social interaction in the context of a space fantasy story, 2) reading a brochure taken from Canadian school material related to the same topics. After analyzing the pre and post questionnaires for both digital game group and brochure group, the data shows that the children’s knowledge of social adjustment in both groups have improved with a significant increase in the numbers of correct answers, with the game group showing even stronger results. While the brochure found to be easy to read, children found the digital game more useful and enjoyable in comparison to the brochure. As such, the study confirmed that educational games could be more effective and preferable in enhancing newcomer children’s understanding of social interaction and behaviour in situations of conflict, compared to other conventional mediums such as educational leaflets.

Keywords: Computer game; Digital technology; Game-based learning; Newcomer children; Social Adjustment.

1 INTRODUCTION

With the growing number of immigrant and refugees, the economic and social adjustment of newcomers is a major issue for many countries. While there has been significant research on various aspects of this phenomenon, there has not been enough attention to the unique problems faced by newcomer children and their social adjustment. This is particularly problematic as this group is highly sensitive, and the failure in their proper adjustment can cause various further health and social problems, and even criminal issues and radicalization.

Despite a well-established history of accepting immigrants and refugees, many newcomers to Canada face difficulties while trying to adapt to Canadian society. Newcomers are individuals (adults and children) who have permanently moved to a new country within the last few years — newcomers, including skilled immigrants and refugees [1]. From 2011 to 2016, Canada had more than a million newcomers (about 3.5% of its total population). In 2016 Census, almost 2.2 million children under the age of 15 were foreign-born or had at least one foreign-born parent which represent 37.5% of all Canadian children. This was an increase from 2011 when this proportion was 34.6%.

Immigrant children are an increasingly growing population group, but their social adjustment is still not sufficiently mentioned in research [2]. Prior research has found that newcomer children have a different level of readiness than their families when trying to adjust to a new context [3]. Newcomer children experience a critical transition period within the broader context of the new cultural background, social interactions, as well as other transition elements [4]. A recent comprehensive study identified some of the needs of newcomer children and looked at the factors contributing to their overall well-being [5]. These needs included the development of social networks, second language acquisition, and home language maintenance. The children were faced with impacts of changes due to migration, experiences of loss, and future employment challenges.

Several attempts have been made to address the newcomer integration needs. However, to the best of our knowledge, these efforts were mainly focused on adult migrants, and there is very scarce work on using advanced digital technology in the context of newcomer children. While game-based learning and digital storytelling have shown strong potential in education [24], there is a lack of research in applying

them in the area of newcomer children social adjustments. The current study aims to investigate the potential of using Game-based learning technology in assisting newcomer children with particular focus on tweens (age 9-12) coming to Canada. By comparing game-based and brochure-based education for social adjustment, we provide evidence for the effectiveness of computer games in this context and investigate some of the design methods that help with this education. In the following section, a brief literature review is provided, followed by our game and research design, and the experimental results and discussion. Our study is only an initial step towards using digital games in this context, and in future work, we seek to integrate the collected feedback of this study to improve the game design in the context of newcomer children social adjustment.

2 RELATED WORK

2.1 Social Adjustment

The term social integration or adjustment refers to the long-term or generational inclusion and acceptance of newcomers in the leading local institutions, systems, and relations within the host society [6] [7]. Ager & Strang mentioned that the term integration is not used systematically and is a quite chaotic concept [8]. Also, Heckmann and Schnappe state that integration is the inclusion of new populations into existing social structures of immigration. Furthermore, social adjustment can be defined as a two-way process that involves adjustments from both newcomers and their host societies while maintaining and utilizing the newcomers' identities, and cultural background can help the host societies [9] [10].

2.2 Newcomer Tween Children Needs

Social adjustment is one of the newcomer children's pressing, particularly for the tweens who are in a transitional phase. Dockett and Perry define social adjustment as "knowing how to interact with a large group of children or responding appropriately to the teacher" [11]. One could ask, "How is social adjustment an issue or challenge for newcomer children?" In previous research by Colbert et al. [12], newcomer children were found to be shy and cautious of strangers potentially. They may find it tough to express their feelings or to show their emotions. Children and in particular, Newcomer children face several issues including experiencing loss, lost connections; language challenges; culture shock; social withdrawal; and Misbehaviour and bullying [13]. As such, newcomer children are subject to a higher risk of bullying and have more acceptance issues than native-born children. They also deal with common micro-aggressions regarding their choices of clothing, food, religion, and other customs even though Canadian schools have a "zero-tolerance" policy toward racism and prejudice. Approximately 34% in 2016 of all newcomers to Canada are under age 25 [14]. While children of all ages may experience some behavioural issues, the focus of this paper is on tween newcomer children group for several reasons: 1) Newcomer tween children have a special situation of experiencing the last chance to learn the social adjustment before they enter the critical teenage group. 2) The Cultural Liaison Officers confirmed that tween newcomer children are experiencing critical transitional period, and they need exceptional help strengthen them in facing stressful situation trying to fit into a new culture and experiencing difficulties in understanding the right behaviour in the new place.

2.3 Non-Technology-Based Approach

Several approaches exist for helping newcomers children without direct emphasis on technology. Examples are Boys and Girls Clubs facilities and programs which help children in academic engagement, employment support, leadership development, skill development, cooking activities, art and multimedia [15] [16], social interaction through storytelling [17] [18], and After-School Program [19]. Other studies focused on Behaviour Guidance [20], the associations between students' behaviours and cultural effects in different nations [21], [22] [23]. While these approaches are helpful and essential, they are not enough and do not take advantage of technology which is shown to be helpful [23][24].

2.4 Digital Game-based Approach for Helping Newcomers Children

Several technological advances could potentially benefit newcomer social adjustment, including social media, blogs, virtual reality (VR), machine learning, game-based learning, digital storytelling, and much more. In this study, we are focusing on exploring the potential of using digital game-based learning approach. In [23] [24], the authors show that the possibility of digital game-play and learning-engagement would occur cohesively as a whole to constitute a highly motivated learning experience of learners. Other researchers argue that gaming is a social construct that may have substantial differences based on culture, gender, social strata, and representations [25]. The power of games refers

primarily to their ability to offer ways of knowing and doing. These permit players to become experts within a given environment or situation [26]. Social skills are integral to human's welfare and are needed to interact and function effectively in society; these skills are learned in early childhood in the form of play. In multiplayer video games, e.g., racing games such as Nintendo's Mario Kart, children learn the value of taking turns, using the controllers to share the game with other players [27]. Nowadays, parental intervention in digital games is complex, and determining what is considered to be 'healthy' behaviour is debatable [28]. Playing digital games have become mainstream among children in several regions and countries [29] [30].

In a 2019 book [31], authors summarize the values of using digital games as "The best way to motivate the student to embrace learning is to make it fun, and hence making learning fun seems the most well-known claim on the educational power of games". Digital games are a growing popular cultural form and the focus of a new field of inquiries that have been empathized on defining games and establishing borders between games and other phenomena. [32]. A study of using digital games in a school environment touched on the linkage between cultural perspectives and school curriculum [33]. Further research shows how educational games can help users to learn about cultural components [34] [35]. These games focus on educational objectives within a cultural context by examining the strong relationship among contexts of use, technological resolutions, and education efficacy. While there are limited websites and other multimedia products that provide information for newcomer children, there are no existing research or project on the use of game-based learning in the context of newcomer children's social adjustment.

2.5 Gap Analysis

The primary research gap identified through the above literature review is on the use and effect of the game-based learning on newcomer's children. This gap guides our study by exploring the following research questions: Will game-based learning assist the newcomer tweens in improving their behavioural adaptation?

3 RESEARCH APPROACH

3.1 Participants

We conducted this study at the Ottawa Chinese Community Service Centre (OCCSC) which actively supports many newcomers from a diverse set of ethnic backgrounds. We recruited newcomer tween children from Arabic speaking countries who have an intermediate level of English. We recruited 30 Children between the age of 9-12 and accompanied by their parents. Also, most participated Children play some sorts of computer games in the past, but their level experience varies. We divided the children randomly into two groups, Group A who played the game and Group B who read a brochure. Each group included 15 participants. Translation from English to Arabic and vice versa was available by researchers.

Our research was approved by Carleton University's Research Ethics Board (protocol #110087).

3.2 Apparatus

3.2.1 Brochure

We designed a comprehensive brochure using some existing brochures taken from the Canadian Ministry of Education that describe how to deal with bullying in schools [36] [37]. An equal number of children were randomly assigned to this or the other group. Children used the brochure as a reading activity and after that answered a post-study questionnaire to measure the impact of these tools in dealing with various social interaction scenarios.

3.2.2 Computer Game

We designed an interactive educational and cultural computer game called "new beginning." This game is created especially for the newcomer tweens (age 9-12), matching their common interests and abilities. It contains some daily life behavioural advice in a fun, educational way, as illustrated in Fig. 1. It is developed using Unity game engine and some of its publicly available assets [38]. The game aims at helping newcomer tweens learn more about selected behaviours issues. The game includes social behaviours advice which the player may not be aware of, and we anticipate that it will improve their understanding of how to deal with the simulated situations. Such advice is derived from real incidents which those tweens are facing in the school environment or their new community. The stories were

collected from multicultural liaisons officers. The themes of the three levels were inspired by the school Multicultural Liaison Officer' [39] and our synthesis literature review on the topic.

Theme One: we were informed from an officer that once a newcomer student arrives at the new school, they will be assigned a friend from the same culture to help them better adapt in the new school environment especially in the first few days. Theme Two: Some newcomer children may face problems when they are trying to socialize with other students. Some of the students are helpful, and others may not be friendly to the newcomer student. The Main Character in the game is called Sarah whose spaceship has landed on C planet. Unfortunately, her spaceship breaks down. Thus, she decides to start figuring out other alternatives by adapting to life on this new planet. She finds herself lonely and needs help and advice on how to start her new life. The game is divided into two Levels, which was inspired by the abovementioned themes.

Level 1: Sarah will meet Adam. Adam is from Sarah's planet who landed before her, and now he knows the C planet very well. Once, he meets with Sarah and decides to support her to adapt to the new environment. Adam will provide Sarah with three devices, as explained in level 1 description. **Level 2:** Sarah will face a dangerous situation. She will see someone who is holding a weapon, and she must move away from him and do as Adam had advised her to tell an adult about the situation. **Level 3:** Sarah will be introduced to two other living groups: Helpers and Disturbances. The Helpers will support Sarah too, while the Disturbances will discourage her. Sarah will meet two helpers and one disturbance.



Figure 1. New Beginning game interface and some given advice.

3.2.3 Game and children learning objectives

While there are several game design methods such as Merrill's five principal [40], SAM module and ADDIE models [41], in this study, we follow the ADDIE instructional design model. As it is similar to the waterfall model, which make it straightforward and easy to learn and use Since requirements are well understood and unlikely to change totally during system development [42]. ADDIE is a basic model that has an organizational style in the procedure of designing education materials and offers a robust framework to ensure that the produced educational products are efficient and effective [43].

We identified few topics related to the social adjustment that we intend to teach in the game as it was justified from the previous researcher and through our interview with multicultural liaison officers who specialized in dealing with newcomer children within selected schools in Ottawa area. After defining the primary target audience, we focused on the learning goals and appropriate teaching activities, as illustrated in Table. 1

Table 1. Study learning objectives(needs) and its associated teaching activities

Learning Objectives (needs)	Brochure Activity	Video Game Activity
respect the rules	Reading some text about how to deal with bullying & respecting rules.	During playing the game, the following devices are given: "Each planet has its own rules, and we have to respect those rules even if it is different from our planet."
Maintain Personal space	Reading about Physical Bullying	Personal space is the area immediately surrounding your body. Personal space can even be different from culture to culture.
No fighting back	Learn about different ways to deal with a bully	"Don't fight back, even if someone wants to hurt you physically. Try to get away from him/her and tell an adult of what is happening to you".
Best way to talk	Read pieces of advice about dealing with: 1- Verbal bullying 2- Written Bullying	"Talk politely and pick your words carefully, make sure not to use expressions which may be understood differently in other cultures."

3.2 Measurement

Our study used a mixed approach to quantitative and qualitative methods. These methods applied to evaluate the difference in children's knowledge of choosing the most suitable behaviour in certain situations before and after using the brochure method compared to the digital game method. As such, we used quantitative statistical analysis to measure and compare participants response of pre-questionnaire for each method separately with their responses to the post-questionnaire. Then we compare the number of correct answers differences among brochure and games, as will be explained in the results section. In additions, we used comparative qualitative analysis to capture participants feedback on each of the study methods individually. Also, we collected and analyzed parents' thoughts and experience as they observe their children during the study sessions.

3.4 Hypothesis

Our main hypothesis in this study was that game-based learning provides a unique learning experience for newcomer tweens trying to adjust to their new place of living. We used a series of objective and subjective measures. Thus, in term of objective measure, we hypothesized that:

- Children will have better scores after reading the brochure compared to before the experience.
- Children will have better scores after playing the game compared to before the experience.
- The score after playing the game will be higher than the score after reading the brochure.
- The score increases after playing the game will be higher than the score increases after reading the brochure

While for the subjective measure, we hypothesized that:

- The game will have a higher rating for usefulness.
- The game will have a higher rating for pleasantness.
- The game will have a higher rating for ease of use.

We observed that reading the brochure is perhaps easier than playing a game, but for the sake of comparison, we kept the hypotheses in the same order. The ease of use is a valid metric in general; it is acceptable for a more pleasant and useful method to be harder to perform. Also, the game usability will be researched in the future work of this project. We also provide children and their parent the ability to enter optional comments describing their opinion and thoughts about the experience.

4 RESULTS

Our study includes 30 participants children in the age range between 9 to 12 years old. The participants were divided into two groups, Group A who played the *New Beginning game*, and group B who read *the Brochure*. We divide the results into five sections, as follows:

4.1 Brochure Group

we propose the following hypotheses for this group:

- H0: Brochure is not an effective way to teach the newcomer children the right behaviour.
- H1: Brochure is an effective way to teach the newcomer children the right behaviour.

We ran one-tailed paired t-test and obtained a p-value for the given data is $p=0.0042$. Since the p-value is $< 5\%$, this means that the probability of getting that difference by chance is low. Thus we have sufficient evidence to support H1 hypotheses which confirmed that the brochure is an effective way to teach the newcomer children about the right behaviour.

As shown in Fig. 2, we summarize the participant's responses before and after reading the brochure. Questions 2, 4, and 6 have no change in the number of correct answers before and after reading the brochure. While in other questions, there is a slight increase in the number of correct answers in Q5 with 6% and Q3 with 13% and 20% for Q1. However, the increase in the number of correct answers for Brochure Group does not improve considerably, and only one question reaches 20% of improvement.

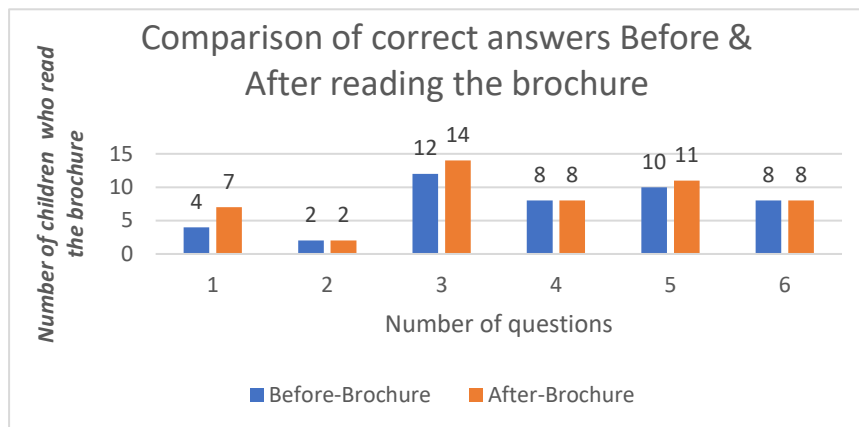


Figure 2 Comparison of the number of correct answers before and after reading the brochure

4.2 Game Group

we propose the following hypotheses for this group:

- H0: The Game is not an effective way to teach the newcomer children the right behaviour.
- H1: The Game is an effective way to teach the newcomer children the right behaviour.

We ran the one-tailed and paired t-test and obtained a p-value for the given data is $P=0.0029$, which is around $0.3\% < 5\%$, meaning that the probability of obtaining that difference by chance is low. This proves that the game is an effective way to teach the newcomer children the right behaviour. Fig. 3 summarizes the before and after results of the participants answering the questionnaires correctly after playing the game. We can notice that we have one question which has no change in the correct answer (Q2). In the other questions, there is an increase in Q1 of 27% and Q3 of 27% and Q4 of 13% and Q5 of 14% and Q6 of 7%. The increase in the correct answers for Group A reaches 27% in two questions.

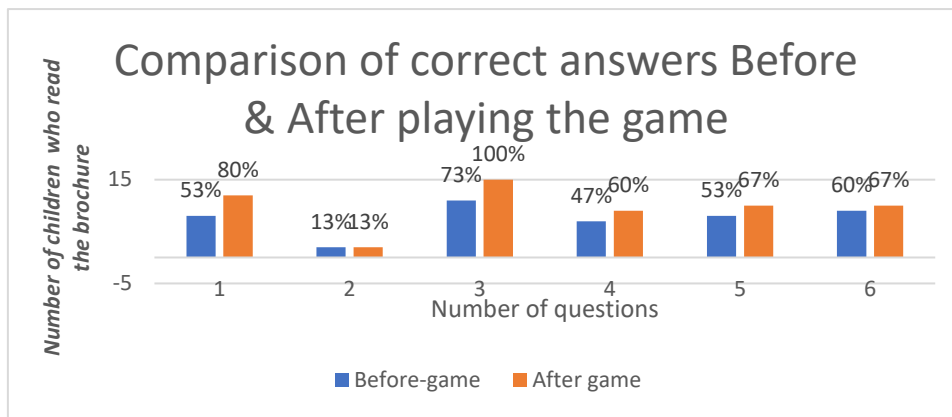


Figure 3. Comparison of children's correct answers before and after playing the game.

4.3 Brochure vs. Game experiment

we propose the following hypotheses for this comparison:

- H0: GBL is not more effective than a brochure
- H1: GBL is more effective than a brochure

Using the data given in Fig.4 ", the obtained p-value for the given data is $P= 0.0447$, which is around 4.4% <5%, meaning that the probability of getting that difference by chance is low. This means that the null hypothesis is rejected, and the alternative hypothesis is true. So, while the absolute correct answers after game and brochure cannot show a significant difference, the increase in correct answers does. "Fig. 1", summarizes the comparison of the difference between before and after the brochure and the game. We can notice that we have one question which has no change in the correct answer (Q2). In the other questions, there is an increase in Q1 of 7% and Q3 of 14% and Q4 of 13% and Q5 of 6% and Q6 of 7%.

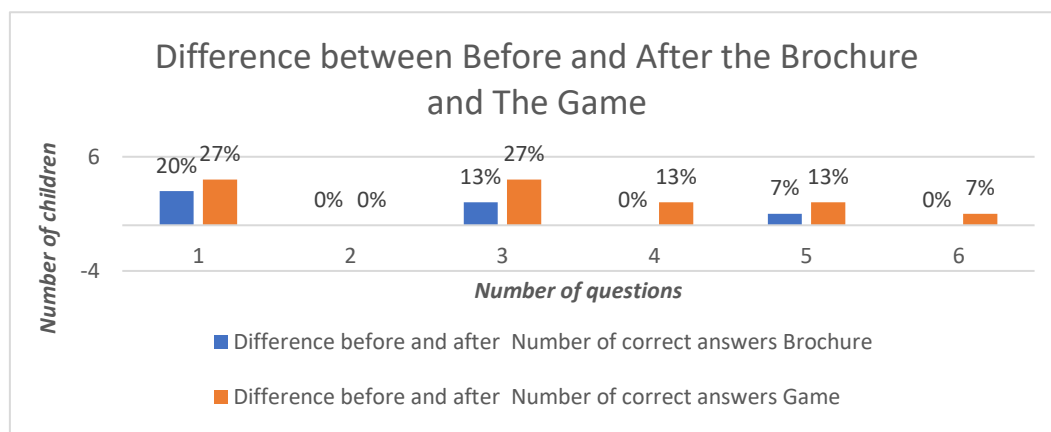


Figure 4. Difference between Before and After the Brochure and The Game

We collect feedback and insight form both children and their parents to measure the level of usefulness, enjoyment, and the ease of use for both brochure and game groups.

4.4 Children experience

4.4.1 Game Group feedback

We asked the participants children to rate their experience with the game using a Likert scale by asking them three questions. When measuring the level of usefulness of the game in question1. The entire participated children either strongly agree or agree on the usefulness of the New Beginning game. More precisely, 53% of the children strongly agreed that the game was useful to learn about good behaviours, and 47 % had agreed too. We asked about the level of enjoyment of the game in question 2, there are

53% of the children strongly agreed that the game was enjoyable to play, 40 % had agreed so, and 7% were neutral.

Also, when analyzed question 3 we found that 27% of the children strongly agreed that the game was easy to play, 33% were neutral, 20 % had agreed so, and 20% strongly disagreed. There was a considerable number of children who found the game, not an easy one, and the children had mentioned this in their comments.

4.4.2 Brochure Group feedback

Comparable to what we have done in the game group, we asked the participants children to rate their experience with the study brochure method using Likert scale by asking them three questions. Then we include some examples of children comments about the study brochure.

When we asked participants in to rate the level of usefulness of the pamphlet in question 1, we found that three-quarters of the children agreed that the brochure was useful to learn about good behaviours. Also, 13 % had strongly agreed. On the other hand, 7% of children disagreed of the usefulness of brochure and another 7% were neutral on their rating to the usefulness of the brochure. While in Q2: which asked about the level of enjoyment of the brochure. We found that 47% of the children agreed that the brochure was enjoyable to read, 20 % had strongly agreed. In contrast, 13% strongly disagreed, and another 7% disagreed about the enjoyment component.

While in question3, there are 67% of the children strongly agreed that the brochure was easy to read and understand, 20 % had strongly agreed. On the other hand, 7% answered neutral, and another 7% disagreed. While Questions 1,2, and 3 responses were generally favourable toward the brochure. More than half of the participants agreed that the brochure is helpful and easy to read. Nonetheless, the number of correct answers in three questions had stayed the same.

4.5 Parents Experience

While children are the leading target group of this study still, we asked their parents who attend as observers for their children to express their thoughts and comment on what they see during the study. In the following, we include a few examples of these quotes:

Computer games are majors in our children's life nowadays. I agree in deep to bring an educational game instead of the criminal games, but we want you to bring the attractive one."

I think using the latest technology such as digital games is more fruitful in helping kids since they can be more engaged. Additionally, integrating educational games with virtual reality an augmented reality can be beneficial in delivering the goals of newcomer adjustment.

5. CONCLUSIONS

This study aimed at investigating the effectiveness of educational computer games as a tool to help newcomer children adjust socially. As such, we developed an educational game named "New Beginning" that sought to help newcomer tweens age 9-12 learn about various social behaviour issues with a focus on social space and bullying. Our research proposed the use of Game-Based Learning (GBL) for behavioural improvement. The overall success of our approach provides a positive answer to the question of effectiveness of GBL in this situation. It is a good indication that technology, in general, can be used more effectively to help newcomer children, not just for behavioural changes but also in other aspects of social adjustment although further research is required to address other technologies and social issues.

Our study suggests that educational video games are efficient and desirable tools in enhancing newcomer children an understanding of social interaction behaviour in comparison to other conventional media. The result aligns with previous studies that confirm the values and benefits of using game-based learning in teaching and solving various social and cultural issues. Our research is the first study that used game-based learning formally in the context of newcomer children social adjustment. While we just scratch the surface of using digital games in this context. In future work, we seek to integrate the collected feedback of this study to improve the game design in the context of newcomer children social adjustment. Also, develop a specific game guideline that takes into considerations various social and cultural perspectives. In particular, we will need to conduct a longitudinal study with newcomer children groups to better understand their growing needs as they progress during their transitional period of migration, and integrate teachers' feedback and opinion towards using a digital game in this context.

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