Teenaged Internet tutors' level of interactivity - by sharing tacit and explicit knowledge with older learners

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Abstract

Younger people, i.e. teenagers without any pedagogical training and work experience play an important role in teaching computer skills to older adults. The present study is based on 14 cases in which a teenager teaches an older adult to use a computer on a topic of the latter's own choice. Both interactive as well as non-interactive techniques used by the teenagers will be analysed, as well as their dependence on the whether the tutor is a user of the chosen website, whether he/she has made preparations for the tutoring session, and the combination of these two attributes. As a result, we saw that any kind of previous experience the tutor had with the content taught (as an everyday user or by independent exploration prior to the tutoring session) decreased interactivity of tutoring process. At the same time, the risk of over-demonstration emerged in such cases. For further research, some hypotheses to test the idea of a reciprocal learning model in which an older learner would be a resource person for the young tutor on interactive tutoring techniques are proposed.

Keywords: interactive techniques; naturalistic tutoring; older learner; tacit knowledge; teenage tutor

Introduction

Intergenerational contacts are nowadays more frequent than ever before (Phillipson, 2013; Laslett, 1996). Despite that, the divide between the young and old in technology-related skills is ever increasing. There is a discussion around 'grey digital divide' (Morris, Goodman, & Brading, 2007). Estonia is a good example: 43% of people aged 55–64 and

72% of those aged 65–74 do not use the Internet on a regular basis Tambaum, 2016), while World Bank (2016) refers to Estonia as one of a handful countries closest to becoming a digital society.

Grey digital divide is related to social digital divide (Millward, 2003), both of which in turn increase the risk of social deprivation among older people (Myck, Najsztub, & Oczkowska, 2015). Providing training courses for older people is not a solution to decrease grey digital divide. As it requires ample resources, formal training is always random and too short to enable the participants to reach a level where they can use Internet intuitively (Sandhu, Damodaran, & Ramondt, 2013). Learners with basic skills tend to ask when they come up with the questions independently, not when there is a scheduled Q&A session (Grief, Murphy, Nijjar, & Taylor, 2002). Using ICT is not 'an one-off exercise but an on-going process' and therefore, learning to use Internet requires broader support than a fixed training programme (Tatnall, 2014). Haywood (1995) sees all the other people as sources of such broader support; Tatnall (2014) advises to use younger relatives for teaching ICT to older people. Strom and Strom (2011; 2012) consider the youth as the part of society which takes the responsibility for teaching new technology in the 21st century; Pyle (2005, p. 40) says that 'It is said that youth are the future, but in today's rapidly changing world, youth really are the present'.

Learning which involves different generations is considered intergenerational learning (IGL). IGL benefits the society through the sharing of societal and professional resources, tacit and explicit knowledge among generations (FIM-NewLearning, 2008); in the IGL process, both the confidence (Wang & Noe, 2010) and self-awareness (FIM-NewLearning, 2008) of the one sharing knowledge increases. The contact between the generations improves as the focus is on similarities rather than differences (FIM-NewLearning, 2008) and the knowledge and skills of both sides increase (Tatnall, 2014). However, a meta-analysis shows that the evidence base for the effectiveness of intergenerational practice is still weak (Springate, Atkinson, & Martin, 2008; Hatton-Yeo, 2010).

According to the definition, IGL is a process, through which individuals of all ages acquire skills and knowledge, but also attitudes and values, from daily experience, from all available resources and from all influences in their own 'life worlds' (FIM-NewLearning, 2008). Studies on IGL, however, report much more on projects where an older person is the main source of knowledge and skills, for example by sharing their memories about the recent past with younger people (Osoian, 2014), helping to improve children's literacy (Walters, 2016), or mentoring 'vulnerable' children in need of support (Ellis, 2004). The knowledge-sharing behaviour of mentors is much less studied (Dong & Deng, 2016); the few existing examples include Strom and Strom (2012) and Baily (2009), who study a process where young people coach senior colleagues on using technology.

Every young person can find him- or herself in a tutor's role, be it in family circle (Kraut, Brynin, & Kiesler, 2006), at school and in the community (Schneider, Tosolini, Iacob, & Collinassi, 2012; Strom & Strom, 2009), or later, in the work environment (Løwendahl, Revang, & Fosstenløkken, 2001) often with inadequate or non-existent preparation (Czaja & Lee, 2007). However, the fact that the younger person has ICT experience and readiness to share his/her skills does not always mean that he/she has the knowledge about the concrete content he/she is going to teach (Tambaum & Normak, 2014; Tambaum, 2017). The reason might be that it is a spontaneous process, in which the content taught takes shape during the process and the younger person does not decline to teach something they have no previous experience with(Tambaum & Normak, 2014). In addition, computer and Internet are parts of a teaching process which in themselves

create spontaneous situations (Tambaum, 2017). The tutor himself creates a spontaneous situation as well when he does not prepare for tutoring and does not learn to know the website they are going to teach. One of the reasons for such behaviour might be a shallow approach to teaching often practiced in schools, which creates the impression that the skills needed are already there or the lack of them can be disguised (Race & Pickford, 2007). Wang and Noe (2010), who have studied knowledge sharing processes in work environment, emphasise that even though knowledge sharing is a learning process for the one sharing the knowledge – because they have to fully understand what they are teaching – only people high in learning goal orientation may perceive knowledge sharing as a learning opportunity.

The factors described above indicate that *naturalistic tutoring* (Chi, Siler, Jeong, Yamauchi, & Hausmann, 2001; Graesser, Person, & Magliano, 1995) may contradict the principles which are considered essential in professional teaching. John Dewey wrote already in 1902 that:

> When engaged in the direct act of teaching, the instructor needs to have the subject matter at his fingers' ends; his attention should be upon the attitude and response of the pupil. /.../ the teacher should be occupied not with subject matter in itself but in its interaction with the pupils' present needs and capacities (Dewey, 1902a, p. 362).

The quality of teaching process is emphasised both in IGL (FIM-NewLearning, 2008) and especially in case of arranging training for older people (Tambaum & Normak, 2014). Wang and Noe (2010) point to the need to study the quality of knowledge sharing in organisations, including in pair work. Thus, it is important to ask about the level of quality of naturalistic tutoring process in different settings and in case of tutors with different knowledge and skills.

Theoretical background

For effective learning and teaching theoretical principles of knowledge development and knowledge transfer have to be taken into account. Below we will describe the principles which underpin the present study.

Formation of Knowledge

Dewey (1902b) has pointed out how humans usually, for example while eating, do not differentiate between the subject matter and the method of an activity. However, if they reflect on the experience, then they create a difference between *what* they experience and *how* they experience it.

According to Polanyi (1967), not perceiving the difference between the subject matter and the method implies the formation of tacit knowledge (Polanyi used the term 'tacit knowing'), which is universal and contains both theoretical as well as practical knowledge. Tacit knowledge is formed in a situation where the environment provides simultaneously two types of knowledge. Human senses receive the information, but the brain does not process all the information in the same way; thus, one part of the information occupies main part of the person's attention (distal term) while overshadowing the other part (proximal term) (Polanyi, 1967). Polanyi brings an example of an experimental situation where a person is being shocked. The shock itself as a result receives the person's full attention and the cause of the shock remains thus concealed. Further examples are speaking without being explicitly aware of grammar and syntax

(Schugurensky, 2006) or sensing the face of a stranger via its parts. "We know the first term only by relying on our awareness of it for attending the second." (Polanyi, 1967, p. 10). Characteristic to such indirectly formed (proximal term) knowledge is that the person is later able to use it, but he/she may not be able to describe it. Polanyi (1967, p. 18) describes this situation as 'a way to know more than we can tell'. Phenomenal aspect of tacit knowledge appears when a person is aware of his/her knowing, but does not know the details (Polanyi, 1967). According to some studies, unconscious thought can form 95% of all thought (Lakoff & Johnson, 1999).

Nonaka (1994) and Nonaka and Takeuchi (1995) describe interpersonal knowledge creation from the continuous interaction of tacit and explicit knowledge. According to Nonaka (1994) tacit knowledge signifies the intangible knowledge embedded in the minds of people and obtained through experience, it is intuitive, ambiguous and nonlinear. Explicit knowledge, on the other hand, is documented, published or formulated knowledge, which is analysed and taught. Nonaka (1994) allows to draw a parallel between categorisation of knowledge into tacit and explicit and the distinction between procedural and declarative knowledge used in cognitive psychology. Procedural knowledge expresses methods or steps towards reaching an answer or result (e.g. steps of dividing one number by the other); whereas declarative knowledge is composed of facts, episodes, generalisations and principles (e.g. periodic table) (Hollingsworth & Ybarra, 2009). Even though this analogy is not quite correct – a person may have a tacit knowledge of a piece of declarative knowledge, e.g. in socialization process, which is both unintentional and unconscious at the time of learning experience (Schugurensky, 2006) – the two classifications do have a large overlap as procedural knowledge is exactly the kind of knowledge that remains unformulated, because it is created through an activity.

Knowledge transfer and interaction

In case of transferring declarative knowledge, the content of what is learnt (*what*) is explained to support the learner in understanding and remembering the information. However, when transferring procedural knowledge, it is shown *how* to do something; whereas it is important to describe how to recognise analogous situations where this procedure can be applied (Hollingsworth & Ybarra, 2009). Formal learning assumes that both declarative as well as procedural knowledge to be shared has been made explicit before it is transferred (Løwendahl, Revang, & Fosstenløkken, 2001).

Knowledge sharing in non-formal environment is described by Nonaka's and Takeuchi's SECI model, which suggests that tacit knowledge possessed by individuals is externalized and transformed into explicit knowledge, so that it can be shared with others, and then enriched by their individual viewpoints to become new knowledge. This is then internalized once again as a new, richer, subjective knowledge, which becomes the basis for starting another cycle of knowledge creation (Nonaka, 1994; Nonaka & Takeuchi, 1995). Socialisation as an unintentional and unconscious form of informal learning represents a total tacit nature and without retrospective recognition will remain hidden (Schugurensky, 2006).

Tacit knowledge, without being made explicit through externalization, is difficult for a person to apply in fields beyond the specific context in which it was created (Nonaka,1994).

According to socio-cultural approach to learning and development the roots of higher psychological functions are in interaction (Arcidiacono, Baucal, & Buđevac, 2011). More specifically, in formal and non-formal learning settings the effectiveness of tutoring

depends on the extent that the tutor allows the learner to be active, constructive and interactive, whereas the last of these three has the largest impact on the effectiveness of tutoring (Chi, 2009). Interactivity provides learners an opportunity to achieve more control over their learning (Chi et al., 2001) and stands in contrast with the instrumental style, against which Harvey (2012) cautions us. Interactivity is defined as "acts to be those comments that elicit a response from the students, such as asking the students either content or comprehension gauging questions, or scaffolding them" (Chi et al., 2001, p. 481).

Interactive style in knowledge sharing can occur without any previous preparation by the participants (Staples & Jarvenpaa, 2001). Thus, it has been confirmed that for example scaffolding can occur in the dyad of an unprepared teenager and an older learner, but it is sporadic and occurs moderately (Tambaum, 2017). However, knowledge sharing should not be based on random occurrences; rather, it should be a process controlled by the participants (Staples & Jarvenpaa, 2001).

In IGL projects, a written guide is compiled for young tutors and a short preparation conducted based on the guide. However, the analysis shows that such guides contain mainly suggestions about *what* to teach (declarative knowledge), plus general principles of communicating with older people and administrative information of the project (e.g. Cyber-Seniors, Generation YES, Grandparents & Grandchildren). What tends to be missing from these guides is information on tutoring techniques, e.g. *how* the tutor should apply the principle of interactivity. Czaja and Lee (2007) point out that in the book 'Designing for Older Adults: Principles and Creative Human Factors Approaches' (Fisk, Rogers, Charness, Czaja, & Sharit, 2009) 'there are general guidelines … that include recommendations such as allowing extra time for training, ensuring that help is available and provide opportunities for the learner to be actively involved in the learning process. However, these guidelines do not indicate what type of training technique is best suited for a particular task, technology or application' (Czaja & Lee, 2007, p. 346). Therefore, IGL projects seem to be targeted to approach interaction with no hints about how to ensure interactivity in this interaction.

Characteristics of teaching webpages

Interactivity in digital skills training means that the tutor introduces the content of the website and how to use it so that the learners are directed to explore what they see on the screen. If the tutor is a daily user of the given website, then he/she has tacit knowledge about its content and usage. There are three possibilities for transferring tacit knowledge: (a) the tutor transforms the tacit knowledge into explicit knowledge beforehand i.e. prepares for the tutoring session, which gives him/her the freedom to be interactive during the session and concentrate on the learner. (b) The tutor transforms tacit knowledge into explicit knowledge during the session through the socialisation with the learner. (c) The tutor demonstrates how to use a website as a tacit skill and the learner can acquire that skill also tacitly, by observing the tutor. In this case, the interactive component is totally missing.

If the tutor is not a daily user of the given website, then he/she can draw on his/her existing procedural tacit knowledge and transfer them into a new, but analogous environment. The tutor can gain experience with the unfamiliar website by preparing for the session (option a). If the tutor, however, does not prepare for the session, then he/she will externalise the transferred tacit knowledge during the session (option b). Nonaka (1994) considers the success of the latter quite unlikely.

Furthermore, the tutoring skills (including knowledge about using interactive techniques) of teenage tutors who have not been prepared for tutor's role are not based on externalised knowledge, but rather on knowledge acquired tacitly, primarily from the teachers at school.

Research goals and research design

The aim of the present analysis is to ascertain:

- Which techniques teenage tutors, including total beginners in tutoring, use when teaching digital skills to older adults.
- How does tutor's previous experience with the given website, or the lack of it, influence the use of interactive tutoring techniques.
- To what extent the interactivity of the tutoring process is influenced by tutor's independent preparation or the lack of preparation for the session.
- Which differences the combinations of these factors produce in the tutoring techniques.

The research design of the study was based on 14 tutoring sessions which were recorded using two video cameras. The full description of the research design can be found in Tambaum (2017) and thus, we will only describe the main points of the research design here. There were two participants involved in each session — a teenaged tutor (hereinafter the *tutor*) and an older learner (hereinafter the *learner*) working together at a single computer (Table 1). No prior Internet skills were required of the learners. The authors identified young volunteer tutors by presenting the project task to classes at three schools. The snowball method was used for finding older learners. It was ensured that the tutors and learners did not know each other previously in order to prevent hidden messages or behaviour that is difficult to interpret on video data. The tutors were not given any prior advice or briefing on teaching Internet skills to older adults. The participants had been assured that they were completely free to decide on their modes of instruction. The tutors and learners were asked to teach/learn one website which was discussed with each learner some days before the session. The tutors were informed of the topic, but any preparation was at their discretion.

Table 1. Profiles of the participants and learning topics

| Learners	14	Tutors	14
men	4	men	2
women	10	women	12
in their 60s	1	14-year-old	5
in their 70s	8	15-year-old	4
in their 80s	5	17-year-old	5
computer users	12		
beginners	2		
higher education	12		
secondary education	2		
Topics: Ticket Office (4), Google; News (2), E-mail (2), Digital authorisation (signature), Download pics, Print screen pics, Public transport, Facebook account			

The video recordings of total 10.2 hours were analysed using ELAN video annotation and analysis software. During the first phase of the analysis, one tutor-learner pair was discarded as the only technique used was demonstration i.e. the tutor did all the moves of the task for the learner. Tacit knowledge was transferred tacitly, interactivity was completely absent.

Coding system and principles of analysis

The data coding was based on the categorisation that was used in a study conducted by Chi and colleagues (2001). Each session was devoted to one *topic* (a particular website, e.g. E-mail or Ticket Office) and the learning-tutoring process was divided into *tasks* (e.g. "type address" for the topic E-mail or "select seats" for the topic Ticket Office), which were usually repeated in different contexts during the tutoring session.

Every task consists of moves, which are described by *statements*. One statement is 'equivalent to a single idea, sometimes sentence length, but not necessarily' (Chi et al., 2001). Often the task involves two *turns* — the beginning and the reaction — but not always (see Example 1). Sawchuk (2003) uses the term 'monotopical interaction' for a single segment of talk with one opening which marks the beginning of a turn (I part of the turn) usually followed by a reaction or reactions (II part(s) of the turn). Cues from the context were used to divide the process into segments.

Example 1. Division of data into tasks, statements and turns
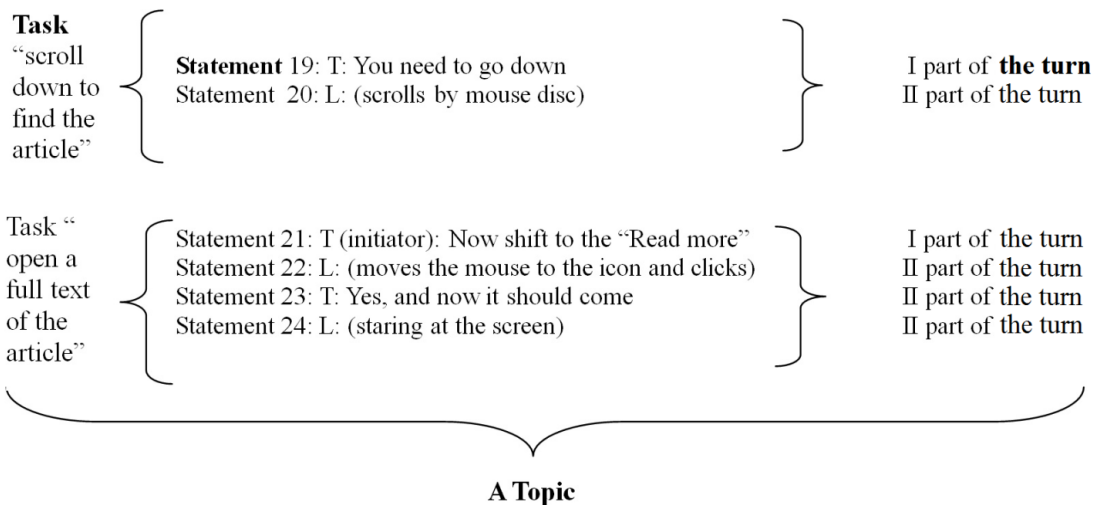
The format of the students' and tutors' comments was captured in the statement coding. Each substantive statement was classified as one of the techniques used by Chi and colleagues (2001), e.g. explanation, feedback, scaffolding, etc. Considering the characteristics of working with a computer, 'demonstration' was added to Chi's categories of techniques. Another category used was 'command' (Wood, Lanuza, Baciu, MacKenzie, & Nosko, 2010) which also had emerged very often in the video data of Tambaum and Normak's study (2014). The initial review of the data revealed a need for four more categories (see Table 2). According to Chi and colleagues (2001) all techniques are divided on the base of interactive and non-interactive nature of the dialogues.

Table 2. Categories of tutoring techniques used in the study

Non-interactive statement or move	Interactive statement or move
According to Chi et al. (2001)	
Giving explanation	Asking content questions a) about screen, b) general
Giving feedback a) short ('mhmh', 'yep'), b) longer	Answering
Reading, scanning what is displayed	(Direct) scaffolding (Chi et al., 2001). Indirect scaffolding* ((Tambaum, 2017)
Making self-monitoring comments Reflecting on what is displayed	Asking reflection or comprehension-gauging questions
Added during data review	
Demonstrating	Asking an advice
Command	
Motivating	
Acting	
Observing / listening	

* Direct scaffolding means using 15 techniques listed by Chi et al. (2001), for example if the tutor does not say what to do next but rather gives a hint. Indirect scaffolding comes in the shape of avoiding all types of tutoring techniques, including scaffolding, while the learner completes the task. It describes the turns in which the tutor is available for the learner but only observes the learner acting independently and does not interfere even when the learner faces a problem, remains thinking, tries to make or makes a wrong move. Indirect scaffolding has been turned out as a separate technique particularly in the process of teenagers' naturalistic tutoring since young tutors tend to offer help before that help is requested (Tambaum, 2017)

In case of six pairs, the learners had chosen a website which the tutors were not using and in two pairs, the tutors were not familiar with one of the topics covered in the session (using city public transport plans turned into a topic of how to find information on coach routes; the tutor started to teach using a mailbox in gmail.com, but later it became necessary to teach the same in hot.ee). In three pairs, the tutors themselves were using the website taught i.e. they had the required tacit knowledge about it.

In addition, there were two pairs where the learners were complete beginners. In these pairs, the tutors' work was not so much about teaching how to use the chosen website, but rather the basic computer skills, such as coordinating hand and eye movements while using a mouse. Thus, the situation was more about the tutor transferring procedural knowledge of computer usage. The initial review of the recordings revealed that in case of teaching complete beginners, the tutors' previous knowledge of the topic (in both cases how to use a news portal) did not play any role, as the focus of teaching was somewhere else.

Altogether five tutors had prepared for the session; four of them in order to learn to know the website that they had not used before. Table 3 shows the division of tutors according to the website usage and preparation.

Table 3. Tutors' profiles by subgroup. Pairs who had sessions with one part of one type and the other part of another type are in brackets.

		Tutor had prepared for the session		Learner is a beginner
		Yes	No	
Tutor is a user of the website	Yes	**YY** M62F17 (F84F15)	**YN** F82F14 F83F14 (F71F17)	
	No	**NY** M76M17 F76M17 F75F15 (F84F15)	**NN** F80F17 M78F14 M73F15 (F71F17)	
Learner is a beginner				**00** F77F14 F81F14
		5 pairs	6 pairs	2 pairs

Explanations of abbreviations:
The code of each pair indicates the learner's and the tutor's gender (F – female, M – male) and age.
YY – The tutor is a user of the website taught and has prepared for the session.

NY – The tutor is not a user of the website taught, but has prepared for the session.

YN – The tutor is a user of the website taught, but has not prepared for the session.

NN – The tutor is not a user of the website taught and has not prepared for the session either.

User of the website means that the tutor has used the given website before in his/her own interest. Having prepared for the session means that the tutor has performed possible tasks on the website taking into account the forthcoming session.

Results

First, we will consider which tutoring techniques listed in Table 2 were used by teenage tutors. Of the 14 techniques analysed, the tutors used only eight techniques in more than 1% of their statements. It appears (see Figures 1 and 2) that most of the techniques that the teenagers used frequently were non-interactive. Giving explanations and commanding were dominating. Of the interactive techniques, only scaffolding and to lesser extent, answering questions in the second part of the turn were used. Asking questions was rarely used by the tutors. The average number of questions about the content was 5.8 questions per hour (60 min) and the same indicator with questions asked about what was displayed on the screen was 9.4 questions per hour. Scaffolding was used in the second part of the turn even more often than in the first part of the turn.

Looking at the activities of the tutor as initiator of the turn according to whether he/she was a user of the website or not (Figure 1) and whether he/she had prepared for the session or not (Figure 2), we can see that the tutors who had not prepared themselves

gave much less explanations than the tutors who had prepared and used somewhat more demonstration and scaffolding. Tutors who had used the website before used much less demonstration than the tutors who had not used the website; whereas the proportion of giving explanations was similarly high in both groups.

Characteristic to the tutors teaching beginners was a high number of commands in the first half of the turn and more explanations in the second half of the turn.
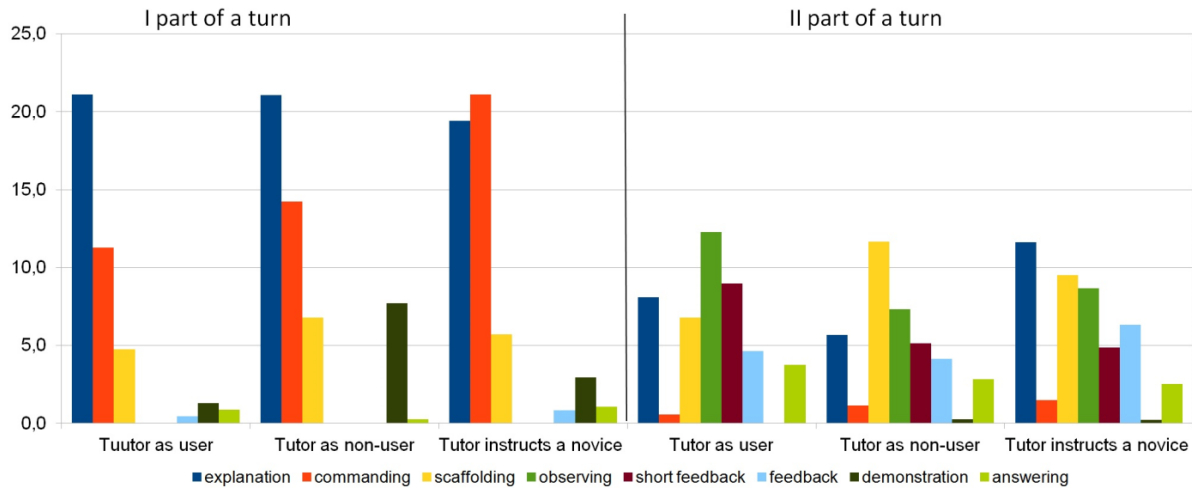

Figure 1. Eight most frequently used techniques in case of tutors with different using experience (proportion of all the statements). The Figure does not include these six techniques whose average frequency of usage was less than in 1% of all the statements
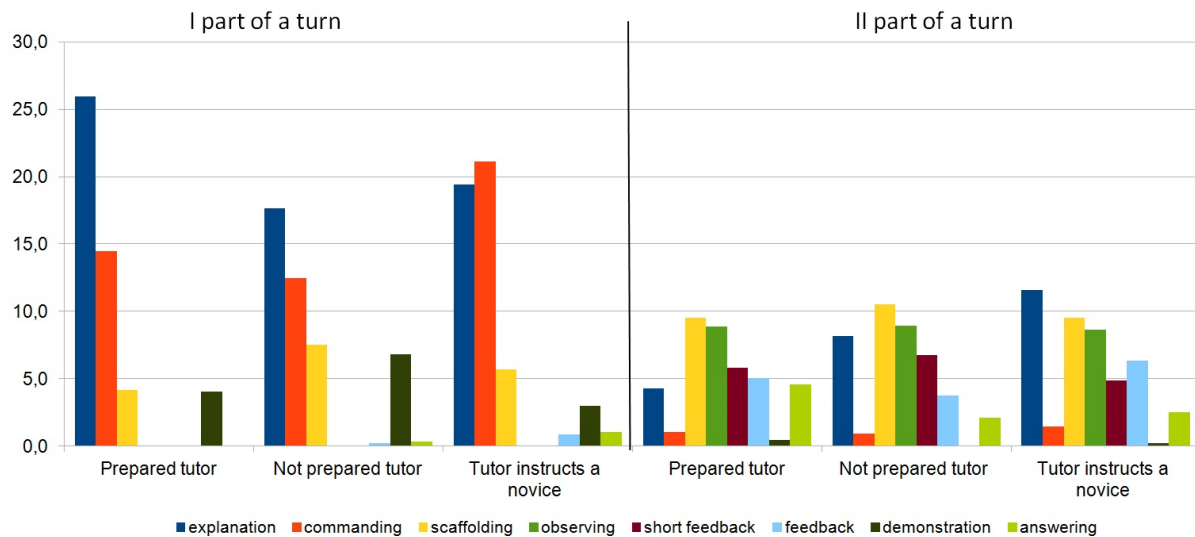

Figure 2. Most frequently used techniques in case of tutors with different level of preparation (proportion of all the statements)

If we focus on the dependence of the usage of interactive techniques on previous using experience and preparation and later, the combination of these two characteristics of tutors (subgroups), then we can see already on the Figures 1 and 2 that the usage of interactive techniques is relatively low. Table 4 contains the subgroups of tutors based

on the usage of interactive techniques during the session. We can see that interactive techniques made up roughly a fifth of all the tutoring instances.

Table 4. Proportion of interactive techniques of all the techniques used in all the turns per tutor subgroup

	% of interactive techniques		% of interactive techniques
Tutor YN	16	Tutor as user	18
Tutor instructs	20	Tutor as non-user	23
Tutor NY	21	Prepared tutor	21
Tutor YY	24	Not prepared	22
Tutor NN	26		

* For explanations of abbreviations YY, NY, YN and NY, see Table 3 above.

It is interesting to note that interactive techniques were used the least by tutors who had previous experience with the website, but had not prepared for the session (YN). The largest difference in interactivity appeared between the tutors who were (YN) and who were not (NN) the users of the given website and had not prepared for the session.

The summary of results of subgroups YY, YN, NY, NN is presented in the Figure 3. It shows that in general, any kind of previous experience with the content to be taught – either by using the website on everyday basis or while preparing for the session – increased the proportion of explanations given during the tutoring session. However, if the tutor had no previous experience with the content (NN), he/she used more demonstration than others. Answering questions occurred almost equally in all the subgroups, group NN excluded.
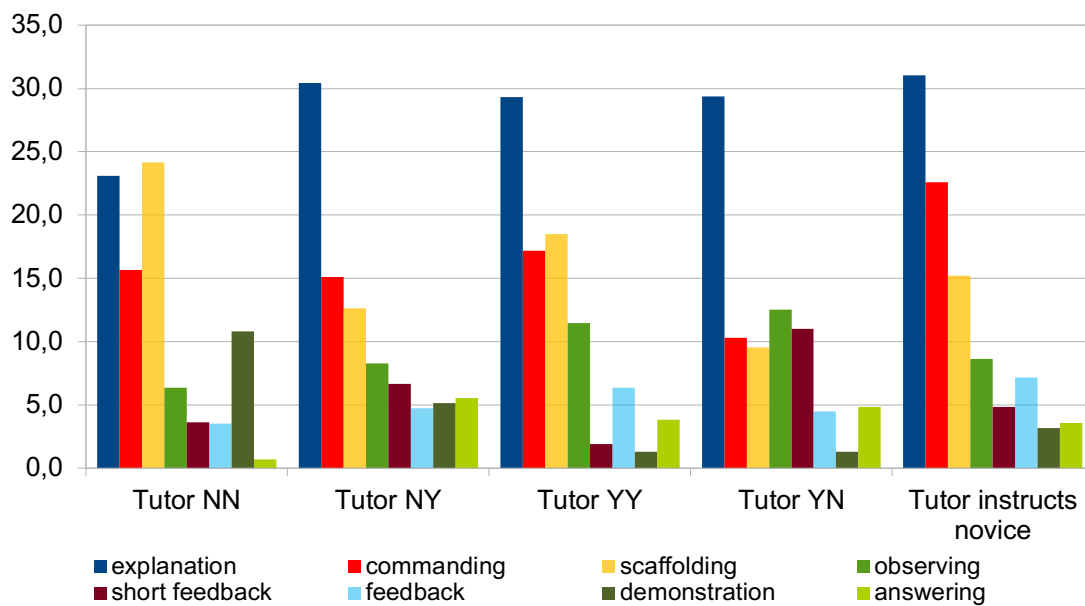
Figure 3. Most frequently used techniques by tutor subgroups

We can see from Table 4 that in case of non-users, the ones who prepared for the session (NY) displayed less interactivity than the ones who did not (NN). Table 4 confirms that NN-type of tutors did use direct scaffolding techniques more frequently both in I and II part of the turn than the NY-type of tutors. The reverse tendency among the users of the website (Yx), where preparation for the session increased interactivity (see Table 4), was also mainly due to more frequent use of scaffolding (Figure 3). At the same time, Figure 5 shows that in case of YY-type of tutors, scaffolding increased mainly in the second part of the turn, i.e. indirect scaffolding was mainly used. However, the YN-type of tutors used moderately both direct scaffolding in the first part of the turn as well as indirect scaffolding in the second part of the turn (Figure 5).
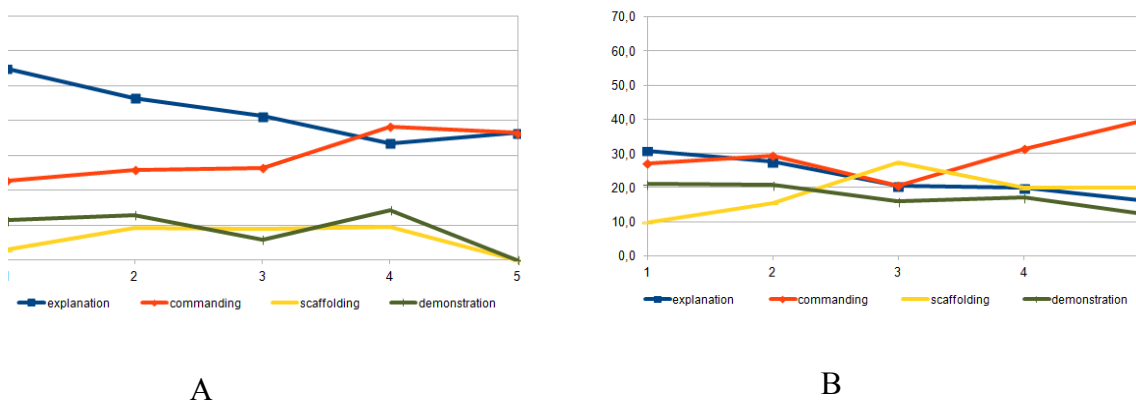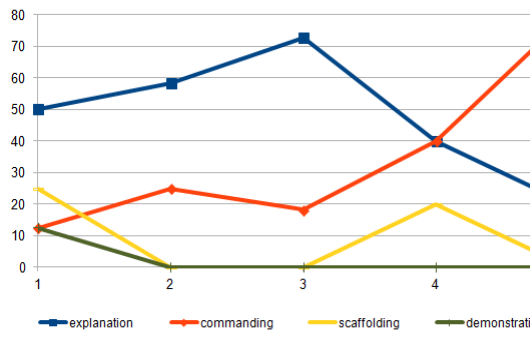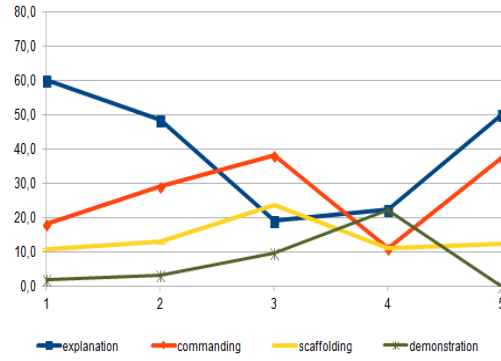

A   B

Figure 4. The most frequent techniques of non-user tutors who had prepared (NY) (Figure A) and who had not prepared (NN) (Figure B) for the session in the first part of the turn during first five repetitions of the topic
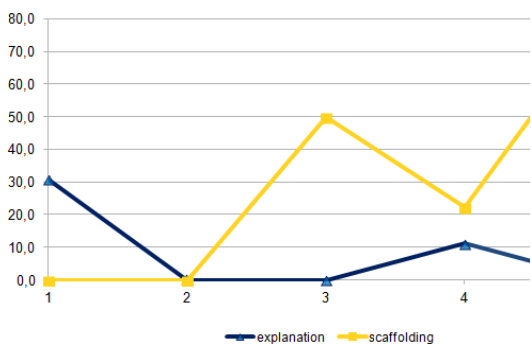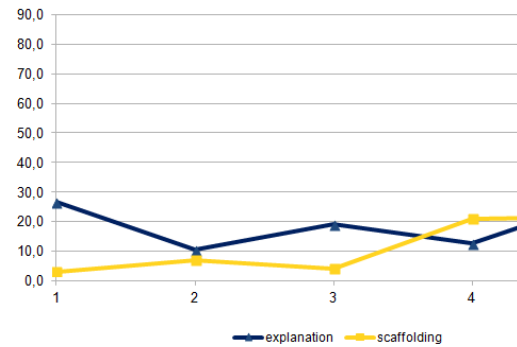
A

B

A

B

Figure 5. The most frequent techniques of tutors who were users of the given website and had prepared (YY) (Figure A) or had not prepared for the session (YN) (Figure B) in the first (above) and second (below) part of the turn

Previously, we saw that in case of instructing a beginner, the most common techniques used by the tutor in the first half of the turn was commanding and in the second part explaining; the

Figure 6, however, shows that a teenager teaching a beginner used a constantly high proportion of commands in the first part of the turn throughout the session, regardless of the number repetitions of the task. In the second half of the turn, also scaffolding were used quite a lot, which in this part of the turn consists primarily of indirect scaffolding.
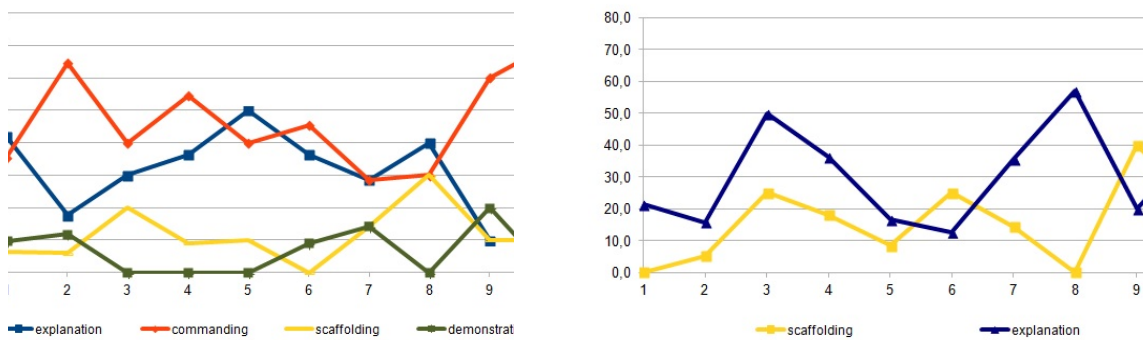
Figure 6. The most frequently used techniques of a tutor instructing a beginner in the first and second part of the turn

General indicators of interactivity were similarly low in case of tutors instructing beginners as well as in the YN-type group; but in case of non-interactive techniques, the tutors instructing beginners used significantly more commands and explanations in the second part of the turn than the YN-group. The characteristics observed during the data analysis indicate differences in the tutoring process in these two groups. The repetitions of a task by a beginner often failed (e.g. taking the cursor to an icon and clicking on it failed and required repetition). The number of failed attempts was relatively big because during the first half of the session the tutors did only present declarative knowledge, e.g. *what* to do (take the cursor there). By the end of the session, both tutors of beginners redirected their focus from the display to the learner and phrased procedural knowledge e.g. *how* to do (how the mouse should be handled to get the cursor there) (F81F14). However, it took a while for the tutors to understand that the explanation *what* to do is not producing any results, and during that time the learners had to experience series of failures without any moments of success.

Similarly, to the tendency of the tutors of beginners to explain *what* needs to be done and skipping the explanation *how* to do it, the tutors of advanced learners gave feedback to failed attempts by commenting on the change that took place on the screen (*what* went wrong – the arrow moved away from the icon), but not by giving feedback to the learner's incorrect activity (*why* it went wrong – e.g. your hand did not stay in place while you clicked on the mouse).

Discussion

The present study showed that teenage tutors use interactive techniques scantily. The main techniques used were explaining and commanding, which corroborates the results of similar studies conducted by Tambaum and Normak (2014) and by Chi and colleagues (2001). Of the interactive methods, the tutors used primarily scaffolding, which may be an intuitive activity (Tambaum, 2017), and to some extent answering questions, which is a natural reaction to learners' questions. Teenage tutors themselves asked very few questions. Thus both types of interactive techniques implemented by tutors may not have been used deliberately. Altogether, the tutoring was relatively authoritarian or prescriptive rather than collaborative, which makes the effectiveness of the training (De Guerrero & Villamil, 2000) questionable.

We saw that the tutors with lesser declarative knowledge were more interactive by drawing on their procedural knowledge and vice versa, having more declarative knowledge drove the tutors to command/explain more, rather than to use scaffolding and ask questions. Nonaka (1994) has indicated that creating direct tacit knowledge on the basis of procedural tacit knowledge without having previously engaged in creating explicit knowledge (group NN in our case) can be problematic in non-formal tutoring. The results of the present study showed the opposite, at least as far as the interactivity of the tutoring process was concerned. Tutors with superficial (NY) or non-existent experience with the content (NN) behaved in a way which can be considered characteristic to collaborative learning – he/she explored the website together with the learner which resulted in more interactive learning and instructing process.

In collaborative learning the tutor and learner hold a rather equal position. As pointed out above, the common learning goal and the feeling of similarities rather than differences forms the prerequisite for improved contact between different generations (FIM-NewLearning, 2008; Tatnall, 2014). Therefore, at least in informal settings, e.g. at home, if the older person asks the younger one to introduce him or her something the younger person is not familiar with, it is probable that they engage into a natural tutoring process with high interactivity rate. However, in case of non-formal learning settings where the younger person has been given the role of a tutor, the older person may expect more than just collaborative learning and co-learners' different pace of cognitive reactions may also affect the result adversely. The latter may be one of the reasons why the effectiveness of formal or non-formal intergenerational practice is still measured to be weak (Springate, et al., 2008; Hatton-Yeo, 2010).

We assume that teenage tutors without any formal training used tutoring techniques that they had acquired tacitly from the adults. What we saw in the study was that tutors' independent preparation before the session, i.e. externalising tacit tutoring knowledge, decreased rather than increased the usage of interactive techniques. Taking into account Polanyi's (1967) theory on the creation of tacit knowledge (in current case the creation of tacit knowledge about how to instruct the learner), this result may indicate that for some reason which affects the consciousness, non-interactive techniques influence students' behaviour more than interactive ones. Several studies have indicated frequent usage of non-interactive techniques at school (cited in Tambaum, 2017) and it may be one of the possible reasons why they dominate teenagers' natural tutoring process. However, future research should focus on other possible reasons of limited use of interactive techniques acquired from school. For example, whether assessment and fear of making mistakes at school can occupy main part of the student's attention (*distal term*) and overshadow the interactive techniques used by the teacher (*proximal term*). In this case, the regular school would not be a suitable environment for students to acquire effective tutoring techniques and other forms of intergenerational cooperation should predominate.

Tutor having tacit knowledge, which Dewey (1902) described as a necessary prerequisite for adequately guiding and reacting to the learner's needs, indeed influenced interactivity, but in the opposite direction to what Dewey had in mind. If tutors had tacit knowledge, but had not prepared for transferring it (YN), then they had the lowest level of interactivity of all the groups considered, i.e. they were less able to turn their existing tacit knowledge into an opportunity to focus on the learner.

In addition, our study showed that the situation of teenage tutors who instructed older people who were totally unexperienced in using a computer, can be regarded as similar to YN-type of tutors. For those tutors, large part of what they teach has most likely been learnt tacitly, without having anyone explicitly describe to them procedural knowledge

involved in the process (e.g. how to handle a mouse). In those pairs the tutor's inability to focus on the learner was literally visible – the first half of the session the tutor's attention was primarily on the display, not on the learner. Tutors of novices, having only tacit knowledge, were easily able to transfer their declarative knowledge (*what* to do on the display) but they had difficulties to transfer their procedural knowledge (*how* to do), which is essential for novice learners. Therefore, it is necessary to prepare the tutors of novices for externalising their tacit procedural knowledge.

Teenage tutors who had not prepared for the session gave less explanations, but used more demonstration than others, especially when the tutor had no previous experience with the website under consideration. In case of demonstration, knowledge is not externalised but rather, the tutor's tacit knowledge will become learner's tacit knowledge. When demonstration is overused, the learner may acquire the skill, but may not be able to use it in another, analogous situation (Nonaka, 1994). Indeed, previously we have identified some implications of older computer users' difficulties to transfer their computer skills to another tool. In combined-age learning groups (Tambaum, 2014), the fact that the computer skills of older learners tended to be related to specific tool, e.g. their personal computer at home, influenced negatively their learning activities in a group. Therefore, demonstration as an easy technique in skill learning may have a negative impact on sustainability of older people's learning. Current study showed that especially tutors with no independent preparation for the session may run the risk of overusing demonstration.

In case of tutors who had tacit knowledge and who also prepared for the session (YY), the level of interactivity increased passively, resulting in increased scaffolding in the second part of the turn, most of such cases being instances of indirect scaffolding (Tambaum, 2017). Thus, YY-tutors, despite of their independent preparation, were mostly unable to lead the learning process in an interactive way; however, they gave the learner opportunities to be active. In case of tutors who had no experience in using the website, independent preparation decreased interactivity, i.e. they (NY) had no skills to lead the learning process in an interactive way and they also tended to restrain the learner from being active.

Our results support the idea that you cannot expect "instant intergenerational magic" just by bringing young and old together (Generations United, 2007). Natural tutoring process in non-formal intergenerational learning settings has certain risks which can be avoided by preparing young and old for this experience. Based on the theory of tacit knowledge formation, we doubt that formal school education could provide preparation for intergenerational learning undertakings. Sanchez and colleagues (2008 cited in Buffel, De Backer, Peeters, Phillipson, Reina, Kindekens, De Donder, & Lombaerts, 2014) have emphasised that the key to the term *intergenerational* in the phrase *intergenerational practice* lies not in the *generational* but in the *inter* – the existence of the *between* in *relationships* between people. Therefore, we propose that acquisition of interactive tutoring skills should be an element of an IGL framework and the source of these skills would be the older learners themselves.

Conclusion

Shaping skills necessary to cope in the modern technology-saturated society in older people takes place with the support of younger family or community members. In most cases, teenagers lack systematic pedagogic knowledge and their choice of tutoring techniques is based primarily on tacit knowledge which they have gained while being in

the role of learner. Previous studies have shown that teenage tutors do not decline to teach content that they are not familiar with (Tambaum and Normak, 2014); in addition, it cannot be assumed that the teenager will prepare for a session of naturalistic tutoring. Therefore, the teenage tutors differ in their declarative knowledge and some teenagers transfer only their tacit knowledge during the tutoring process, while others have beforehand turned it into explicit knowledge.

The goal of the present study was to find out what kind of problems occur in the naturalistic tutoring of older people by teenagers and to develop methodological suggestions to address these issues.

We saw that teenagers as tutors use interactive techniques relatively rarely and tutoring tends to be authoritarian or prescriptive rather than collaborative, which affects negatively the effectiveness of the training (De Guerrero & Villamil, 2000). If the tutor has declarative knowledge about the subject, then this drives him/her to explain and describe rather than to scaffold and ask questions. We also observed that young tutors stand a risk to overuse demonstration.

We saw that in the cases where the tutor had no experience with using the given website, he/she used more interactive techniques. The proportion of interactive techniques was especially high when these non-users had not prepared for the session either. In such cases the session was more about collaborative learning which is rather acceptable in informal settings but does not meet older learner's expectations in more formal settings like an IGL project.

The usage of interactive techniques was the lowest when the tutor was a user of the given website i.e. he/she had tacit knowledge about it and he/she had not prepared for the session i.e. he/she did not have explicit knowledge about the subject taught. As it is known that the effectiveness of instruction depends on the usage of interactive techniques and taking into account that the effectiveness of IGL projects has not found a firm confirmation (Springate, et al., 2008; Hatton-Yeo, 2010), then sharing tacit knowledge without preparation can be one of the reasons for low effectiveness. Tutor's activity plays a key role in older people's learning (Duay & Bryan, 2008); therefore, the tutors should be aware of the threats that emerge when sharing tacit knowledge.

The results show that there is a general need for introducing interactive tutoring techniques among the teenagers. Thus, in IGL projects, where the goal is skills development (e.g. Internet skills), it is not sufficient to describe the principles of communication – the tutors also need knowledge about tutoring techniques. As formal school education normally does not tackle this issue, the problems of improving the quality of naturalistic tutoring could be an element of an IGL framework. In particular, an interesting idea to test would be that of a reciprocal learning model, in which older learner would be a resource person for the young tutor on interactive tutoring techniques.

In addition, we observed that the preparation for teaching beginners should differ from preparation for teaching advanced learners.

On the base of current research we phrase three hypotheses for future research into the process of naturalistic tutoring.

Hypothesis 1. Independent preparation of young tutors to tutoring does not improve their interactivity compared to tutors with no independent preparation.

Hypothesis 2. IGL projects in which older learners are prepared for reflecting on tutoring techniques used by his or her young tutor in the process of learning Internet skills indicate a higher rate of interactive techniques compared to similar IGL projects in which learners are not prepared.

Hypothesis 3. Tutors who have turned their procedural knowledge of computer usage into declarative knowledge before the tutoring session are more effective in teaching beginners i.e. the number of repetitions for achieving success is smaller than in case of tutors who have not brought their computer skills to the declarative level before the tutoring session. (i.e. teaching basic computer skills effectively cannot happen via demonstration only.)

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References

Arcidiacono, F., Baucal, A., & Buđevac, N. (2011). Doing qualitative research: The analysis of talk-in-interaction. In Baucal, A., Arcidiacono, F., & Buđevac, N. (Eds.), *Studying interaction in different contexts: A qualitative view*. Belgrade: Institute of Psychology, 17–45.

Baily, C. (2009). Reverse intergenerational learning: a missed opportunity? *AI & Society, 23*(1), 111–115.

Buffel, T., De Backer, F., Peeters, J., Phillipson, C., Reina, V. R., Kindekens, A., De Donder, L., & Lombaerts, K. (2014). Promoting Sustainable Communities Through Intergenerational Practice. *Social and Behavioral Science*, 116, 1785–1791.

Chi, M. T. H., Siler, S.A., Jeong, H., Yamauchi, T., & Hausmann, R.G. (2001). Learning from Human Tutoring. *Cognitive Science 25*(4), 471–533.

Chi, M. (2009). Active-Constructive-Interactive: A Conceptual Framework for Differentiating Learning Activities. *Topics in Cognitive Science, 1*, 73–105.

Czaja, S., & Lee, C. C. (2007). The Impact of Aging on Access to Technology. *Universal Access in the Information Society, 5*, 341–349.

De Guerrero, M. C. M., & Villamil, O. (2000). Activating the ZPD: Mutual Scaffolding in L2 Peer Revision. *The Modern Language Journal, 84*, 51–68.

Dewey, J. (1902a). The Nature of Subject Matter. In Archambault, R. (Ed.) (1974*). John Dewey on Education: Selected Writings*. Chicago: University of Chicago Press, 359–372.

Dewey, J. (1902b). The Nature of Method. In Archambault, R. (Ed.) (1974). *John Dewey on Education: Selected Writings*. Chicago: University of Chicago Press, 387–403.

Dong, M. & Deng, D. (2016). Effect of Interns' Learning Willingness on Mentors' Knowledge-sharing Behavior. *Social Behavior and Personality, 44*(2), 221–232.

Duay, D., & Bryan, V. C. (2008). Learning in Later Life: What Seniors Want in a Learning Experience. *Educational Gerontology, 34*(12), 1070–1086.

Ellis, S. W. (2004). *Identifying and Supporting Those Children Most at Need: Intergenerational Collaboration and Action in Two Stoke-on-Trent Inner-City School Clusters*. Stoke-on-Trent: Beth Johnson Foundation. Retrieved February 9, 2017, from http://www.leeds.ac.uk/educol/documents/00003836.htm

FIM-NewLearning. (2008). *EAGLE Final Report, Intergenerational Learning in Europe: Policies, Programmes & Practical Guidance*. Retrieved July 12, 2016, from http://www.menon.org/wp-content/uploads/2012/11/final-report.pdf

Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., & Sharit, J. (2009). *Designing for Older Adults: Principles and Creative Human Factors Approaches*. Second Edition. Boka Raton, London, New York: CRC Press.

Generations United (2007). *The Benefits of Intergenerational Programs. Fact Sheet*. Retrieved July 9, 2017, from http://www.gu.org/LinkClick.aspx?fileticket=71wHEwUd0KA%3D&tabid=157&mid=606

Graesser, A. C., Person, N. K., & Magliano, J. P. (1995). Collaborative Dialogue Patterns in Naturalistic One-to-One Tutoring. *Applied Cognitive Psychology, 9*, 495–522.

Grief, S., Murphy, H., Nijjar, B., & Taylor, C. (2002). *Opening Up a New World: a Good Practice Guide for Delivering Basic Skills and ESOL in the Local Community*. Leicester: National Institute of Adult Continuing Education.

Harvey, J. (2012). Managing Organizational Memory with Intergenerational Knowledge Transfer. *Journal of Knowledge Management, 16*(3), 400–417.

Hatton-Yeo, A. (2010). An Introduction to Intergenerational Practice. *Working with Older People*, *14*(2), 4–11.

Haywood, T. (1995). *Info-Rich Info-Poor*. London: Bowker-Saur.

Hollingsworth, J., & Ybarra, S. (2009). *Explicit Direct Instruction: The Power of the Well-Crafted, Well-Taught, Lesson*. London, New Delhi: Sage.

Kraut, R., Brynin, M., & Kiesler, S. (2006). *Computers, Phones, and the Internet: Domestication Information Technology*. New York: Oxford University Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh*. New York: Basic Books.

Laslett, P. (1996). *A Fresh Map of Life*. London: George Weidenfeld and Nicolson Ltd.

Løwendahl, B., Revang, Ø., & Fosstenløkken, S. (2001). Knowledge and Value Creation in Professional Service Firms: A Framework for Analysis. *Human Relations, 54*(7), 911–931.

Millward, P. (2003). The 'Grey Digital Divide': Perception, Exclusion and Barriers of Access to the Internet for Older People. *First Monday 8*(7).

Morris, A., Goodman, J., & Brading, H. (2007). Internet Use and Non-use: Views of Older Adults. *Universal Access in the Information Society, 6*(1), 43–57.

Myck, M., Najsztub, M., & Oczkowska, M. (2015). Measuring Social Deprivation and Social Exclusion. In Börsch-Supan, A., Kneip, T., Litwin, H., Myck, M., & Weber, G. (Eds.) *Ageing in Europe – Supporting Policies for an Inclusive Society*. Berlin, Boston: De Gruyter.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science, 5*(1), 14–37.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford, New York: Oxford University Press.

Osoian, A. (2014). Memories, a Bridge towards Intergenerational Learning! *Procedia – Social And Behavioral Sciences, 142* (The Fourth International Conference on Adult Education, Romania 2014), 499–505.

Phillipson, C. (2013). *Ageing*. (1 ed.) Cambridge: Wiley.

Polanyi, M. (1967). *The Tacit Dimension*. London: Routledge.

Pyle, K. (2005). Youth are the Present. *Telephony*, *246*(5/9), 40.

Race, P., & Pickford, R. (2007). *Making Teaching Work. Teaching Smarter in Post-Compulsory Education*. London, New Delhi: Sage Publications.

Sanchez, M., Butts, D. M., Hatton-Yeo, A., Henkin, N. A., Jarott, S. E., Kaplan, M. S., Marinez, A., Newman, S., Pinazo, S., Sáez, J., & Weintraub, A. P. C. (2008). Intergenerational Programmes: Towards a Society for All Ages. *Journal of Intergenerational Relationships, 6*(4), 485–487.

Sandhu, J., Damodaran, L., & Ramondt, L. (2013). ICT Skills Acquisition by Older People: Motivations for Learning and Barriers to Progression. *International Journal of Education and Ageing*, *3*(1), 25–42.

Sawchuk, P. H. (2003). *Adult Learning and Technology in Working-Class Life*. Cambridge: Cambridge University Press.

Schneider, R., Tosolini, L., Iacob, M., & Collinassi, G. (2012). Grandparents & Grandchildren, Handbook for Tutors, from www.geengee.eu (18.11.2016)

Schugurensky, D. (2006). This is Our School of Citizenship"": Informal Learning in Local Democracy. *The Informal Education Reader,* 249, 163–182.

Springate, I., Atkinson, M., & Martin, K. (2008). *Intergenerational Practice: a Review of the Literature*. LGA Research Report F/SR262. Slough: NFER.

Staples, S. D., & Jarvenpaa, S. L. (2001). Exploring Perceptions of Organizational Ownership of Information and Expertise, *Journal of Management Information Systems*, *18*(1), 151–83.

Strom, P. S., & Strom, R. D. (2009). *Adolescents in the Internet Age*. Charlotte, NC: Information Age Publshing Inc.

Strom, R. D., & Strom, P. S. (2011). A Paradigm for Intergenerational Learning. In London, M. (Ed.), *The Oxford Handbook of Lifelong Learning*, 133–146. Oxford, New York: Oxford University Press.

Strom, R., D., & Strom, P. S. (2012). *Learning Throughout Life. An Intergenerational Perspective*. Charlotte, NC: Information Age Publshing Inc.

Tambaum, T. (2014). Elderly Learners in Combined-age Learning Groups Picking Up on New Professional Skills. *Rocznika Andragogicznego. Yearbook 2014*, 298−314.

Tambaum, T. (2016). 55+ rahvastiku internetikasutus ja sotsiaalne aktiivsus. Sakkeus, L.; Leppik, L. (Toim.). *Pilk hallile alale. SHARE Eesti uuringu esimene ülevaade ja soovitused eakate poliitika*

kujundamiseks. Tallinn: Tallinna Ülikool, 182−205. Retrieved February 15, 2017, from www.tlu.ee/share-esimene

Tambaum, T. (2017). Teenaged Internet Tutors' Use of Scaffolding with Older Learners. *Journal of Adult and Continuing Education*, *23*(1), 97–118.

Tambaum, T. & Normak, P. (2014). Young Tutors Facilitating the Acquisition of Basic E-skills by Older Learners: The Problem of Selecting the Learning Topics. *International Journal of Education and Ageing, 3*(3), 191−210.

Tatnall, A. (2014). ICT, Education and Older People in Australia: A Socio-technical Analysis. *Education and Information Technologies*, *19*, 549–564.

Walters, T. (2016). Learn Together Cymru: Pan-Wales Intergenerational Learning Project. *Journal of Intergenerational Relationships, 14*(2), 146–150..

Wang, S., & Noe, R.A. (2010). Knowledge Sharing: A Review and Directions for Future Research. *Human Resource Management Review, 20*, 115–131.

Wood, E., Lanuza, C., Baciu, I., MacKenzie, M., & Nosko, A. (2010). Instructional Styles, Attitudes and Experiences of Seniors in Computer Workshops. *Educational Gerontology, 36*(10–11), 834–857.

World Bank. (2016). *Digital Dividends.* World Development Report 2016.