

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

Does Informal Peer Learning Stimulate Acquisition and Development of ICT Skills?

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### Abstract

The main objective of this study is to find out from which sources university students obtain their information and communication technology (ICT) skills, and the role of informal peer learning in this process. The results of the survey indicate that peer learning is regarded as the most important source for acquiring ICT skills among the Library and Information Science (LIS) students. Learning with YouTube, manuals, and handbooks was rated next most important, leaving the formal ICT courses of the university in third place. This study makes a contribution by introducing a process model of informal peer learning and describing each stage of the process from the triggers to the effects. The study also reveals the advantages of informal peer learning over other learning sources. Based on the findings, recommendations are made to LIS schools to incorporate peer learning into their courses and to university libraries to facilitate students' informal learning activities.

### Keywords

ICT skills, internet skills, informal learning, peer learning, LIS students, developing countries, Bangladesh

# DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

## Does Informal Peer Learning Stimulate Acquisition and Development of ICT Skills?

### **1 Introduction**

In the age of information and communication technologies (ICTs), students need to have adequate ICT knowledge and skills to grasp the benefits of advanced technologies (Bowler & Nasset, 2013). ICT skills are given high priority in the curricula of primary and secondary education (Claro et al., 2012). Still, the ICT skills of students entering universities vary a lot (Kennedy, Judd, Churchward, & Gray, 2008). Although universities offer courses to guarantee a sufficient level of ICT skills for all graduating students, most students learn their skills without attending any particular ICT classes (Verhoeven, Heerwegh, & De Wit, 2012). Israel and Edesiri (2014) and Rae (2004) found that most students acquire their ICT skills by themselves with manuals and handbooks and through informal learning from peers, friends, and family. However, the role of informal peer learning in the acquisition of students' ICT skills has not been studied, and we do not know how it supplements formal courses that are often neglected or lacking.

Peer learning is regarded as an essential and useful pedagogical practice (Boud and Lee, 2005; Hanson, Trolan, Paulsen, & Pascarella, 2016; Topping, 2005). Developmental and educational psychologists have identified that peers stimulate cognitive processes and contribute to task understanding as well as persistence and motivation to succeed (Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003). Vygotsky (1978) suggested that peers benefit from one another by adopting the cognitive processes embedded in their interactions and communications. He argued that with the help of a More Knowledgeable Other (MKO), students have the potential to accomplish tasks they cannot complete independently. The MKO may be a peer or someone else who has better understanding, knowledge, or skills than the learner in a particular task.

Peer learning can take place at all levels of education (Boud, Cohen, & Sampson, 2014) in both formal and informal ways (Falchikov, 2001; Keppell, Au, Ma, & Chan, 2006). Formal peer learning is organised intentionally by a teacher forming student groups and providing pedagogical instructions for group interactions and communication. Peer learning is informal when students initiate it without teachers' pedagogical instructions. Learning groups and situations are often organised unintentionally. Several studies have examined the effectiveness of peer learning for various groups of learners. However, they typically focus on formal peer learning (e.g., Altintas, Gunes, & Sayan, 2016; Kelly & Katz, 2016).

Library and Information Science (LIS) students are library and information professionals of the future who contribute actively to build a knowledge-based society. They are expected to have advanced skills in ICT (Gerolimos & Konsta, 2008). A recent study found that although LIS students perceive they possess a good level of skills in general computer and internet tasks, they feel less skilled in advanced ICT, in library software, and in the evaluation of internet resources (Hossain & Sormunen, 2019). The findings prompted us to explore how LIS students acquire and develop their ICT skills and investigate if informal peer learning stimulates students' learning of ICT skills. The present study also attempted to increase our knowledge about the process of informal peer learning for ICT skills acquisition and the advantages of informal peer learning over other learning sources.

### **2 Literature review**

In this section, we review the pertinent studies to describe how students in higher education acquire their ICT skills and introduce the concepts of informal and peer learning. No empirical studies were found on informal peer learning for the acquisition of ICT skills. Thus,

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

we reviewed some studies on formal peer learning in higher education for an introduction to understanding peer-learning phenomena.

### **2.1 ICT skills acquisition**

The Programme on Learner Use of Media (PLUM) group conducted the Media Technologies: Access and Use survey 2003 (MTAU2003) of Open University students ( $n = 1753$ ) in the UK through a questionnaire. One of the objectives of this survey was to identify from which sources undergraduate and postgraduate students learn their ICT skills. The study revealed that students mostly learn their ICT skills ‘by themselves with manuals and handbooks’. Learning ‘from friends, family and colleagues’ was also important, but ‘ICT courses in the schools’ had an insignificant influence on students’ ICT skills (Rae, 2004). Israel and Edesiri (2014) surveyed undergraduate students ( $n = 238$ ) at two Library and Information Science (LIS) schools in Nigeria. Amongst others, this study aimed to find out how the LIS students learn their ICT skills. Students reported that they acquire their ICT skills mostly by themselves with manuals and handbooks; with the help of their peers, friends, and family; and from the courses in their universities.

### **2.2 Formal and informal learning**

Formal learning is usually organised by educational institutions and often assessed by the instructors. Informal learning is more unstructured, voluntary, and typically led by the learners themselves (Eshach, 2007). In informal learning situations, learners have two types of control: control over the learning process and control over the learning goals (Vavoula, 2004). Learners’ intrinsic motivation is higher in informal learning than in formal settings because in informal learning, they have the freedom to set their own goals (Jones, Scanlon, & Clough, 2013). Informal learning often complements formal learning—for example, when students need to solve real problems with little instructional support (Ebner, Lienhardt, Rohs, & Meyer, 2010). Informal learning is a process to gather knowledge or develop skills outside the curricula of educational institutions or outside courses or workshops offered by educational or social organisations. It is undertaken on one’s own, either individually or as part of a group, neither following any recognised criteria nor having the presence of an instructor authorised by any institution (Livingstone, 1999; McGivney, 1999). Sometimes it may not even be recognised as learning (McGivney, 1999).

### **2.3 Peer learning**

Peer learning has been defined as the acquisition of knowledge and skills through cooperation and support among learners who have almost equal qualifications. The activity encompasses people from similar social groupings, working together to learn from each other, who are not professional teachers (Topping, 2005). It is an activity where students learn with and from each other, usually within the same class in both formal and informal ways. The outcome of students’ interaction could be the development of cognitive and intellectual skills or increased knowledge and understanding (Falchikov, 2001).

Formal peer learning includes group work or group projects which are explicitly scheduled for courses. On the other hand, informal peer learning encompasses discussion on lectures, assignments, projects, and examinations in casual social settings (Keppel et al., 2006). Boud, Cohen, and Sampson (2014) argued that peer learning is not only a feature of informal learning; it takes place in all courses and at all levels. It is a two-way, reciprocal learning activity which should be mutually beneficial and involves the sharing of ideas, experience, and knowledge among the participants.

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

Falchikov (2001) identified and defined four main categories of peer learning: (a) same-level peer tutoring, where the participants have equal skills or academic achievement, usually within the same class; (b) same-level peer tutoring, where the lecturer or facilitator forms groups with the participants of unequal status. Students with a higher level of skills or academic achievement have the role of tutor; (c) cross-level peer tutoring, where comparatively senior students act as the tutor of the juniors of the same institute; and (d) cross-level peer tutoring, where senior students perform the role of tutor for junior students of other institutes.

### **2.4 Peer learning in higher education**

Peer learning has been introduced at all levels of formal education in both formal and informal settings around the world. Some institutions in advanced countries have employed formal peer learning in higher education to increase collaboration among the students and have found positive results. To the best of our knowledge, no empirical study has been conducted yet to explore whether informal peer learning influences the acquisition and development of skills.

Altintas, Gunes, and Sayan (2016) assessed the effectiveness of formal peer learning in a computer programming language course through an experimental and comparative study. Second-semester students of an undergraduate programme were divided into an experimental group (peer group) and a control group (CG) through a computer programming aptitude test. Relatively good students were given responsibility for the underachieving students. The students worked together throughout the semester on homework and preparation for the examination. In the middle and at the end of the semester, both groups of students were examined to determine whether peer learning was useful for learning the programming language or not. The results showed that the experimental group (EG) was more successful than the CG in both midterm and final examinations.

Two Irish institutes of technology introduced peer learning for their students to determine if it enhances students' learning experiences. The students reported positive learning experiences in the peer-assisted programme (Ginty & Harding, 2014). Likewise, peer learning was introduced in a microbiology module. The students' feedback indicated that they liked the informal, comfortable, and flexible learning environment more than the traditional teaching session. Since students led the learning situation, they were not afraid of asking questions or giving wrong answers (Tariq, 2005).

## **3 Research**

The necessity of ICT skills among university students is recognised widely. Nevertheless, very few studies have been carried out to explore the sources from which university students learn their ICT skills. We also observe that scholars in the fields of education and educational psychology suggest peer learning as an effective pedagogical practice, but no attempt has been made to examine if peer learning is useful for ICT skills development among university students.

### **3.1 Approach to the problem**

The main purpose of this study was to determine from which sources university students learn their ICT skills and how informal peer learning stimulates acquisition and development of these skills. The study adopted a mixed method approach to finding out the answers to the research questions. A web-based questionnaire was employed to collect both quantitative and qualitative data from the students. The study intended to find out the answers to the following research questions:

RQ-1: From which sources do LIS students acquire or develop their ICT skills?

RQ-2: Who are the peers supporting the acquisition and development of their ICT skills?

RQ-3: How does informal peer learning take place in solving ICT-related tasks and problems?

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

RQ-4: What are the advantages of informal peer learning over other learning sources in acquiring ICT skills?

### 3.1.1 Context of the study

The Department (School) of Information Science and Library Management (ISLM) at the University of Rajshahi (RU) and the University of Dhaka (DU) in Bangladesh were purposively selected as the areas of this study. The ISLM schools in DU and RU mainly offer 4-year bachelor's and 1-year master's degrees in library and information science. The graduates from these two schools lead the library and information profession in Bangladesh. For the bachelor's and master's degrees, at least half of the mandatory courses offered by the schools directly or indirectly are intended to develop computer, internet, and information skills among the students. The courses range from 'Basics of Computer and ICT in Libraries' to 'Web Design' and 'Digital Library'. The schools update their curricula on a yearly basis. However, the traditional one-way teaching method is still in effect. The schools usually assign one teacher to conduct a full course. The teacher gives 45-minute lectures in each class, and students are responsible for taking notes for their examinations. Students earn most of their credit from their final exam, but they also get some credit for tutorials. Typically, for tutorials, teachers ask students to take part in short examinations, submit written assignments, or give graphical presentations in the classroom.

### 3.1.2 Participants

All the regular bachelor's and master's degree students in the ISLM schools participated in the study voluntarily. The ISLM school at DU had 302 regular students (239 bachelor's and 63 master's degree students), and the ISLM school at RU had 287 regular students (237 undergraduate and 50 master's degree students). The total population of this study was 589 students (476 undergraduate and 113 master's degree students), and 253 students participated in the study. One hundred forty-five (48%) DU students and 108 (37.6%) RU students participated in the study; the overall response rate was 42.95%. Out of the 253 respondents from the two universities, 58.9% were male, and 41.1% were female. The percentages of male and female participants from DU ( $n = 145$ ) were 46.9 and 53.1 respectively, while among 108 participants from RU, 75% were male and only 25% were female.

## 3.2 Data Collection

The data were collected through a structured web-based questionnaire having both closed- and open-ended questions. The questionnaire was designed by the first author of this paper and reviewed by two experts in education and one in library and information science. An online survey tool, Webropol, was used to collect the data from the regular bachelor's and master's degree students. The link to the Webropol survey was sent to the students' personal and group email addresses, and they were requested to fill out the questionnaire and submit it voluntarily.

The quantitative data were collected with the closed-ended questions of the questionnaire, which surveyed: (1) from which sources do students acquire their ICT skills, (2) how they value peer learning for developing their skills, and (3) who are their peers contributing to their skills. The qualitative data were gathered with the open-ended questions of the same questionnaire about (1) how their peers contribute to the acquisition of their ICT skills and (2) why they prefer informal peer learning over other learning sources (see Appendix 1).

## 3.3 Data Analysis

Quantitative data were analysed with IBM SPSS software. Descriptive statistics were used to explore the sources for acquiring ICT skills by the students, and their peers' contributions in learning or developing the skills. An independent samples *t*-test was carried out to find the

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

differences between different groups of students. The data did not pass the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality. Thus, we explored the skewness, kurtosis, histograms, and Q-Q plots of the data. We found that the data can be regarded as only approximately normally distributed. To be sure, we decided to apply both non-parametric and parametric tests. Because the test results were in line with each other, we report the results of only the parametric tests. Norman (2010) argues that parametric tests (e.g., *t*-test) can be used for Likert-type ordinal data and are robust with respect to violations of normality assumptions.

The inductive content analysis is one of the methods of analysing written, verbal, or visual communication messages, and it was employed to analyse the answers to the open-ended questions (cf. Krippendorff, 2004; Cole, 1988). Elo and Kyngäs (2008) recommended inductive content analysis when there is no or little previous knowledge of the phenomenon. Qualitative data were coded and analysed manually using word processing software. At the first stage, the answers were read and reread thoroughly to create an overall idea of available data. The responses consisted of different types of ICT problems students encountered, the ways their peers assisted, and the benefits and experiences they received in the learning process. Passages containing important thoughts were chosen as units of analysis. The units varied from a few words to several sentences and were coded with the relevant headings to describe all aspects of the content. At the second stage, the coding categories were created based on the research questions and the answers received from the respondents. At the final phase, a general description of the research topic was formulated through the coding categories and subcategories.

### 3.4 Results

#### 3.4.1 From which sources students do acquire or develop their ICT skills?

The students were asked from where or whom they acquired or developed their computer and internet skills. They were requested to rate the contribution of five predefined learning sources (from 1= 'not at all' to 5= 'very high'). The respondents reported that they mostly acquired their computer and internet skills from their peers ( $M = 3.02$ ) followed by themselves with manuals, handbooks and YouTube ( $M = 2.89$ ) and ICT courses in the schools ( $M = 2.87$ ). Their family members and ICT courses outside the university had small contributions in acquiring their skills. Manuals, handbooks and YouTube are more important to males than females for acquiring their ICT skills,  $t(251) = 3.204, p < .05$ . Furthermore, male students valued 'school's ICT courses' more than the female students,  $t(251) = 2.410, p < .05$ . No gender differences were found in the case of other learning sources. The DU students depend on 'manuals, handbooks and YouTube' more than the RU students,  $t(251) = 2.628, p < .05$ . On the other hand, RU students prioritise their 'school's ICT courses' more than the DU students  $t(242.674) = 2.249, p < .05$ . No differences were found between DU and RU students regarding the contributions of other sources in acquiring their ICT skills (Table 1).

#### 3.4.2 Who are the peers supporting the acquisition and development of their ICT skills?

The students were asked to identify which of their peers supported their acquisition and development of computer and internet skills and to select all the peer categories that applied to them. Out of 253 respondents, 233 (92.1%) reported that their peers were 'classmates', followed by 'year mates from other schools' mentioned by 142 (56.1%) and 'senior friends of their school' reported by 97 (38.3%). No differences were found between the students of DU and RU, nor between male and female students, in the case of identifying their 'classmates' and 'year mates from other schools' as their supporting peers. However, male students reported 'senior friends of their school' as their supporting peers more than the female students did. The RU

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

students identified their ‘senior friends in the school’ as supportive peers more than the DU students did (Table 2).

More than eighteen percent of the students reported that they had some peers other than classmates, year mates from other schools, and senior and junior friends in their schools. However, when they were requested to mention who their other peers were, most of them reported ‘family members’ and ‘teachers’ as their other types of peers. Therefore, we excluded the data on the ‘other friends’ category from the analysis.

### 3.4.3 How does informal peer learning take place in solving ICT-related tasks?

The respondents were asked to describe how their peers contributed to their ICT skills. The question was open-ended and mandatory for all. All the respondents answered the question, but some of the responses were not informative: ‘I don’t have any idea’ or simply ‘It is important’. However, most responses provided detailed information about the learning process.

#### 3.4.3.1 *ICT-related tasks and problems requiring peer support*

Informal peer learning is typically connected to a task or problem at hand. Students initiate the peer-learning process when they cannot solve an ICT-related task or problem (called ‘tasks’ from now on) by themselves or when they feel a need to learn some ICT skills. Students reported two main types of ICT-related tasks: (a) computer-related tasks and (b) internet-related tasks. Fatimah (pseudonym), a master’s degree student, stated: ‘My peers taught me the basics of computer and the internet practically.’ Ayman, a second-year student, reported: ‘The contribution of my peers to acquire knowledge on ICT is remarkable. They taught me the basics of computer which was important to me.’

When completing their course assignments, students often need help with word processing, spreadsheet software, and especially in preparing presentation slides. Many respondents echoed Arowsh, a second-year student, who said: ‘My classmates taught me how to make slides on MS PowerPoint.’ Students need advanced ICT skills to install, customise, and use different application software, professional software, and operating systems (OS). They usually go to their peers first when seeking help. Zaman, a third-year student, reported: ‘I learned to install [an] operating system and use library software from my peers.’

Students who do not have adequate internet skills ask their peers for help; some inspire others to use the internet. Abrar, a second-year student, wrote: ‘My peers inspired and helped me to use the internet.’ They also learn from their peers how to solve the problems of internet connections. Sabiha, one of the master’s degree students, stated like many other students: ‘I took help from my friend when I had a problem with my internet connection.’ Some students may need help from their peers to learn about email and social networking tools. Nitu, a third-year student, reported: ‘I got help in using email tools and social networking sites.’ Rahman, a fourth-year student, said: ‘He (my peer) introduced me to the email tools, and blogs’. Some students reported that their peers helped them to learn advanced searching in Google and library databases, evaluate information, and use those tools for their assignments. Ripa, a master’s degree student, wrote: ‘My peer showed me how to conduct advanced searching...evaluate and use information.’

#### 3.4.3.2 *Informal peer-learning activities*

An informal peer-learning activity begins when students go to their peers seeking help on an ICT-related topic. Several respondents reported that their peers introduced them to computers and the internet. Like many other students, Sanzana, a master’s degree student, affirmed thus: ‘My peers taught me the basics of computers and the internet.’ Most of the respondents who got basic training on ICT from their peers reported that they received ‘hands-on training’ from their

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

peers. Khalid, a first-year student, stated: 'When I faced any ICT-related problems...I asked my friends...they always taught me practically.' More knowledgeable and skilled peers introduce other students to new applications and features of ICT. A master's degree student, Jewel, wrote: 'I learned about new and upcoming computer applications from my peers.' Peers with more competences solve others' ICT-related problems by describing the ways and techniques to solve them. For example, Zaman, a master's degree student, said: 'Sometimes, when any problem arises which I cannot solve by myself, my peers help me by explaining the way to solve it.'

The students emphasised the importance of 'sharing knowledge' among their peers. Rakib, a master's degree student, wrote: 'We can learn anything new from our friends...my friends have versatile knowledge of ICT...we can share our knowledge with our friends.' Some of the respondents highlighted the importance of providing manuals, tips and tricks, and inspiration to accomplish their tasks. A master's degree student, Hasna, reported: 'My peers helped me by providing manuals on various topics.' Muntakim, a first-year student, wrote: 'When I was in difficulties...they showed me the paths on how to use and solve the problems...sometimes they helped me to learn tips and tricks.' Sakib, a first-year student, stated: 'My peers are very helpful...they always inspire me'.

### 3.4.3.3 *Informal peer-learning outcomes and experiences*

The students described what they achieved and how they improved with the informal peer-learning process and how their learning experiences were. Their reflections were categorised into learning outcomes and learning experiences. Some of the respondents argued that they have 'learned practically' and 'gathered new knowledge' from their peers. Their peers were able to 'improve their ICT skills' by 'making them understand' and 'clearing up their confusion'. Ahnab, a fourth-year student, noted: 'It is a sort of practical learning which is long lasting...and better comparing to other learning methods.' Nazmul, a master's degree student, wrote: 'My peers helped me to understand the various complex issues of software and internet by sharing their experience.' Reza, a master's degree student, wrote: 'Sometimes when any confusion arises...which I cannot solve by myself, my peer helps me by explaining the way of solving it.'

Several respondents described peer learning as 'the best learning method'. They 'learned the maximum from their peers' and reported that it was 'easy to learn'. Parveen, a master's degree student, wrote: 'It is one of the best learning methods...my peers have contributed a lot to improve my ICT skills.' Farhana, a fourth-year student, reported: 'Easy to learn...available at any time...even can call and get the solution.' Tanvir, a master's degree student, added: 'I have learned the ICT-related skills mostly from my friends and mates.'

Moreover, many students emphasised that they 'feel free to learn' from their peers and it is 'easy to share feelings' with them. Selina, a second-year student, observed: 'I can freely discuss with my peers without any hesitation.' Like others, Rosy, a master's degree student, stated: 'We can easily discuss anything, share knowledge, opinions, and feelings with each other.' The respondents also highlighted the importance of the 'availability' of their peers when they need their assistance. They reported that teachers are not always available for help, but their peers are. Jesmin, a third-year student, described: 'Whenever we face any problem regarding ICT, no matter what time it is, we can call our peers and solve the problem. We cannot call our teachers all the time for help.'

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

### 3.4.4 What are the advantages of informal peer learning over other learning sources for acquiring ICT skills?

The students were asked to select 'yes' or 'no' in response to the question 'Do you think peers' roles are important in acquiring ICT skills?' Out of 253 respondents, 249 (98.41%) reported that 'yes', their peers' roles are important in acquiring ICT skills. No difference was found between the different groups of respondents regarding their opinion about the importance of peers' roles in developing their ICT skills. The respondents who answered 'yes' to the above question were requested to describe the advantages of peer learning that are absent from other learning sources. One hundred seventy-eight respondents answered the question with a few words to several sentences. Thirty units of analysis were selected from the responses and were grouped into eight categories, i.e., real-time assistance, communication, sharing, comfortability, effectiveness, free of cost, practical knowledge, and new knowledge.

*Real-time assistance:* Some of the respondents pointed out that they get 'real-time assistance' from their peers in acquiring or developing their ICT literacy. For example, Pinky, a master's degree student, related: 'Peers are always available for help. I can easily contact them when I need, even at late night.' Zenila, a third-year student, wrote: 'Whenever we face any problem regarding ICT, no matter what time it is, we can call peers and solve the problem.' Atik, a master's degree student, reported: 'We can learn from our peers anytime.'

*Personal Communications:* Many of the respondents directly or indirectly highlighted the importance of 'communication' with their peers in acquiring their ICT literacy. Arif, a fourth-year student, stated: 'Somehow we are linked more with our classmates, elders, and messmates more than others. When we are in certain problems in connection to ICT, we approach them first. Most of the times get help too.' Sheuly, a master's degree student, commented: 'Peer learning is important because we can easily talk to our peers about our problems and can repeatedly ask that is not easy to others because of hesitation or feeling shy.'

*Sharing:* The respondents also emphasized that they can easily 'share' their problems, feelings, knowledge, and ideas with their peers. Aman, a first-year student, wrote: 'Peer learning is important for acquiring ICT skills because...the knowledge of ICT is increasing day by day. Gathering all the knowledge by one is impossible. Through peer learning, we can share our knowledge and ideas regarding new software or technology.' Fardin, a master's degree student, commented: 'I think that sharing of knowledge is essential for developing ICT skills. Cooperation makes everyone learn effectively from each other.'

*Practical knowledge:* Some of the students described that their peers help them to gather practical knowledge of ICT. Lelin, a master's degree student, reported: 'Peers provide practical knowledge about modern technology.' Sharmin, a second-year student, stated: 'I cannot do everything by myself or following manuals...people learn practically more than reading books...so when I have any ICT-related problems, first I ask my friends...if they cannot fix it I take help from a more knowledgeable person.'

*Comfortable:* Most of the respondents reported that they would feel 'comfortable' more with their peers than with any other people, and therefore they would like to learn from their peers. Razib, a fourth-year student, noted: 'We cannot tell our teacher that we don't know the basic computing or simple search on the web. So, we usually ask our friends first who are comparatively skilled in ICT.' Tuli, a second-year student, stated in detail:

In the first term, I was feeling hesitation to go to my ICT course teacher to solve a problem, but I didn't feel shy to ask my peers. If they were good in those matters, they helped me, and I got my solutions easily. In

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

some cases, when they couldn't solve my problems, I did not go to my teacher for my hesitation, and my problems were unsolved.

*Effective:* Some respondents described peer learning as more 'effective' than any other methods of learning. Brishti, a master's degree student, reported: 'Peer learning is very much effective for learning new things, especially about the basics of computer and internet.' Rupam, a fourth-year student, wrote: 'It is some sort of practical learning...I believe it is effective compared to other sources of solutions.'

*Free of cost:* Some of the respondents noted that peer learning is 'free of cost', so they do not like to pay for the ICT-related courses outside the university. Tamanna, a third-year student, wrote: 'Peer learning is vital for poor students who cannot afford ICT courses from outside; the courses of our department are not enough.' Ariyan, a fourth-year student, reported: 'There is no complete course in university which covers all the ICT-related things. Courses outside the university are expensive. So, I tried to learn things by myself, and when needed I requested my friends for help.'

*New knowledge:* The respondents also pointed out that they gather new knowledge from their peers regarding ICT. Shahin, a first-year student, said: 'Peer learning is important to remain up-to-date with the new world.' Tarek, a master's degree student, reported: 'Sometimes we need help from others to develop our knowledge of some new concepts. In this case, I prefer to interact with a peer.'

Out of 253 respondents, only four thought that 'peer learning is not important for acquiring or developing ICT literacy.' Only two of them explained why they thought that. Shams, a master's degree student, claimed: 'Introducing and using ICTs to support teaching and learning is time-consuming for peers.' Nadim, a master's degree student, argued: 'When technological devices are available to one's reach, s/he can be self-educated easily and at least can gather the basic knowledge on ICT. I think institutional learning is much more important to be an expert in ICT.'

### **4 Discussions**

Peer learning was the most important source of ICT skills recognised by the LIS students. However, informal peer learning was not the only source. They also studied manuals and handbooks and participated in ICT courses in their schools. Their classmates and year mates from other schools were the most important peers. They learned more from their year mates in other schools than from the senior and junior friends of their own school. This implies that they trust their class- and year mates and feel they are more comfortable and easier to contact than other peers.

Tsai and Lin (2004) found that male students express more positive attitudes than female and perceive ICT more as a toy. The male students regard ICT as a source of enjoyment, whereas the female students view it more pragmatically. The male participants of our study learned their ICT skills by themselves more than the female participants did. Since male students like to play with and enjoy ICT, they attempted to learn their ICT skills by themselves using manuals, handbooks, and YouTube. Similarly, male students in our study learned more from their 'ICT courses in school' than the female students did. Sølvsberg (2002) found no gender difference in computer skills and computer self-efficacy when both male and female students got similar access to computer and similar training at school. In developing countries, female students have less social support (Cooper, 2006) to have access to the computer and internet than male students have (Antonio & Tuffley, 2014). Thus, we assume that although both the male and female

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

students attended the same ICT courses in their schools, females might not have adequate facilities in their homes to practice.

The DU students acquired their ICT skills by themselves with manuals, handbooks, and YouTube more than the RU students did. On the other hand, the RU students learned their ICT skills from the ICT courses offered by their school more than the DU students did. No differences were found among the DU and RU students in recognising the value of other learning sources. These findings indicate that both the RU and DU students realised the importance of ICT skills for their academic and professional development and were highly motivated. When they learned less from their school, they attempted more to learn by themselves with manuals, handbooks, and YouTube, or vice versa.

Figure 1 presents a visualisation of the key findings of this study: the main components of an informal peer-learning process derived from the empirical data. The box at the top contains two main types of ICT-related tasks that initiate the process. A student encounters a problem either in a computer- or internet-related task. The problem compels the student to begin an informal peer-learning process. The second box refers to the peer selection stage, listing example criteria used in selecting a peer relevant in the problematic situation. The third box presents the activities and supports the student receives from the peer. The last box at the bottom describes the effects of informal peer learning, i.e., outcomes and experiences students obtain from learning activities.

Students acknowledged that they seek help from their peers when they encounter ICT-related problems in their personal or academic tasks and cannot solve those by themselves. They select peers who have better knowledge or skills related to the specific task at hand. They ask their peers for help to whom they rely on and feel comfortable to work with. Peers help them both to learn basic computer skills and complete their assignments for the ICT courses of their school. Students often seek help from their peers for preparing presentation slides, spreadsheet software, video recording, and installing and customising professional software and operating system. They also need peers' help for internet-related tasks, e.g., to learn basic internet skills and resolve problems with internet connections; to acquire skills in using email and social networks; and to learn advanced searching, evaluation, and use of information.

The studied LIS schools organise a couple of courses which require students to have some computer skills, e.g., 'database design and application'. Students have to complete some individual and group assignments for those courses. Advanced and more knowledgeable peers help others complete their course assignments. Some students need assistance to learn the basics of computers and the internet because they might not have had a computer or internet connection in their homes or colleges; some never even used a computer before they came to the university. From the very beginning of their university education, however, students often need to prepare presentation slides for course assignments and work with word processing software for their writing assignments.

Verhoeven, Heerwegh, and De Wit (2012) argued that the educational use of ICT increases substantially when students begin higher education. In our study, we found that LIS students find themselves in a challenging new environment where they are required to have computer and internet skills to pursue their studies. Although the LIS schools incorporated a course on the basics of computer and internet into the first year of their bachelor's programme, the students are expected to have some skills in ICT beforehand. Some of them may have previous experience using a computer and the internet for personal purposes, but most of them

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

lack experience using ICT for academic tasks. Consequently, most of the students come across some problems with ICT during their university studies and seek help from their peers.

Keppel et al. (2006) advocated peer learning as it promotes transferable skills that students can apply to other courses and professional settings. Our findings suggest that peer-learning activities include sharing knowledge and experience and providing manuals, tips, and tricks to accomplish a task or to solve a problem. More knowledgeable or skilled peers inspire others to learn and develop ICT skills. Along with ICT skills, students also develop lifelong skills such as communicating with peers, helping and inspiring each other, and providing and receiving feedback. They may apply these skills for their academic and future professional lives.

Students feel free to learn from their peers because they can share their ideas and feelings easily with their mates with whom they communicate regularly. Likewise, Hilsdon (2014) argued that students do not feel shy about making mistakes during peer learning because they are not being embarrassed publicly. Informal peer learning is free of cost; students do not need to pay their friends for their support. Learning can take place at any time because peers are always available for help; they can ask their peers for help when needed. From more skilled peers, students gather new ICT skills and practical knowledge, which clear up their confusion and help them understand the critical tasks which lead to improved ICT skills. The activities provide students with positive learning experiences; they consider informal peer learning the best learning method which results in maximum learning with minimum efforts.

Students recognised the importance of peers' role in the acquisition of ICT skills. Our study discovered eight distinct characteristics of informal peer learning which were important to students. Students *communicate personally* with their peers and feel *comfortable* to learn from them and *share* ideas which make learning *effective*. They get *real-time assistance* from their peers *free of cost* and obtain *practical* and *new knowledge* about ICT. Likewise, Eisen (2001) characterised peer dynamics by seven qualities which are firmly related to the findings of our study. She argued that peers' *trust in one another* is the essential quality of peer learning; they feel safe if they can trust their peers. The absence of *hierarchy* and *evaluative feedback* along with *voluntary participation* in the learning process ensure the equality between peers which in turn increases trust between them. Trust among students is also enhanced when they *spend time together* and work on *common goals*. Eventually, trust between peers makes them capable of communicating *honestly* and remaining *open* to receiving feedback.

Our study revealed that students perceive they learn ICT skills more from their friends or by themselves than through formal courses. Several reasons may influence students' learning preferences. First, typically only one teacher is responsible for conducting a course for more than sixty LIS students. The duration of each class is only forty-five minutes. Thus, she cannot deal with problems faced by an individual student. Second, students do not enjoy traditional one-way learning in their schools. Third, university courses introduce mostly overall principles rather than applicable practices. Therefore, students learn practices from their peers and by themselves with YouTube, manuals, and handbooks.

### **5 Conclusions**

Peer learning has been widely accepted as an important and useful learning method. In this study, we also found strong evidence that informal peer learning is important for LIS students in acquiring ICT skills. Nevertheless, the LIS schools or the university libraries in Bangladesh did not provide support to their students to participate in peer-learning activities. We recommend promoting peer learning among the students by inspiring them to engage and providing necessary support to foster their learning. Through the analysis of empirical data, we

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

have presented a process model of informal peer learning which describes the stages of the learning method. The model can contribute to the design and implementation of peer learning in higher education.

We recommend that LIS schools incorporate formal peer learning in their existing courses. Changing the pattern of final examination and assessment is a lengthy bureaucratic process. However, teachers can easily include peer learning in tutorials since they do not need approval from the university authority to change or modify the learning approaches in that part. Students learn the maximum with minimum effort from their friends, and that does not require any additional resources. We saw clear indications from our findings that students learn more from their peers than through other sources of learning. We assume that students always help their friends with academic and personal issues. Thus, it is expected that peer learning will also be rewarding for university students in acquiring other knowledge and skills—for example, information literacy.

In Bangladesh, due to limited resources in universities, students cannot hold small group discussions in their classrooms, nor do the university libraries provide support to the students for arranging group discussions. Current infrastructure and facilities in the libraries are not adequate to support peer learning. Libraries should make some space for small group discussions where students can avail themselves of some computers with internet connections and bring printed books and journals from the reading rooms if necessary. We assume that appropriate infrastructural support in the libraries will enhance peer-learning activities, which in turn will improve students' knowledge and skills.

### **6 Acknowledgements**

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## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

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## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

Table 1. The sources of acquiring ICT skills among LIS students

Learning sources	<i>n</i>	<i>M</i>	<i>SD</i>	Difference between females and males					Difference between DU and RU				
				Female ( <i>n</i> = 104)	Male ( <i>n</i> = 149)	<i>t</i>	df	Sig.	DU ( <i>n</i> = 145)	RU ( <i>n</i> = 108)	<i>t</i>	df	Sig.
Taught by peers (e.g. senior/ junior friends, classmates)	253	3.02	.97	2.96	3.05	-.74	251	.458	2.99	3.06	-.58	250.56	.561
By myself with manuals, handbooks and YouTube	253	2.89	1.30	2.58	3.10	-3.20	251	<b>.002</b>	3.07	2.64	2.63	251	<b>.009</b>
Through school's ICT courses	253	2.87	1.07	2.67	3.00	-2.41	251	<b>.017</b>	2.74	3.04	-2.25	242.67	<b>.025</b>
Taught by family members (parents, siblings)	253	2.15	1.20	2.24	2.09	1.00	251	.317	2.18	2.11	.45	251	.655
ICT courses from outside the university	253	2.10	1.20	2.15	2.06	.61	251	.542	2.06	2.15	-.57	251	.572

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

Table 2. Who were the peers supported to develop ICT skills (multiple responses)?

Types of peers	<i>n</i>	<i>M</i>	<i>SD</i>	Difference between female and male					Difference between DU and RU				
				Female ( <i>n</i> = 104)	Male ( <i>n</i> = 149)	<i>t</i>	df	Sig.	DU ( <i>n</i> = 145)	RU ( <i>n</i> = 108)	<i>t</i>	df	Sig.
Classmates	253	.92	.27	.92	.92	.10	251	.917	.94	.90	1.12	199.05	.264
Year mates from other schools	253	.56	.50	.54	.58	-.61	251	.543	.56	.56	-.10	251	.922
Senior friends of the school	253	.38	.49	.31	.44	-2.11	231.16	<b>.036</b>	.30	.50	-3.31	218.43	<b>.001</b>
Junior friends of the school	253	.25	.43	.26	.23	.45	251	.654	.21	.30	-1.61	214.28	.109
Other friends	253	.18	.39	.13	.21	-1.68	243.25	.094	.06	.35	-5.94	143.36	<b>.000</b>

## DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

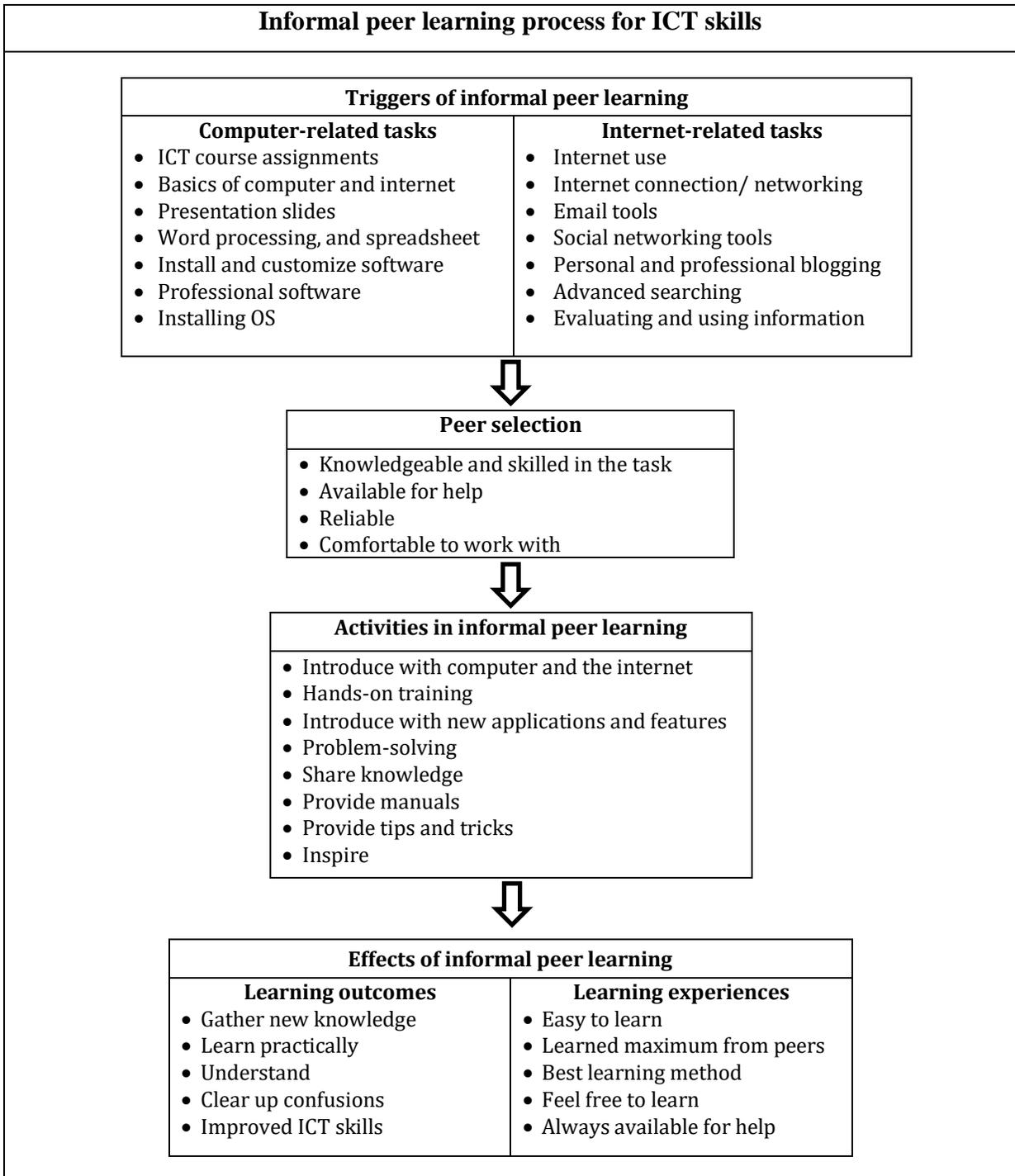


Fig. 1. Informal peer learning process for ICT skills development

# DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

## Appendix 1: Questionnaire

1. Name (optional, pseudonym can be used): \_\_\_\_\_

2. University

- University of Dhaka     University of Rajshahi

3. Level of education

- Bachelor 1st year  
 Bachelor 2nd year  
 Bachelor 3rd year  
 Bachelor 4th year  
 Master

4. Gender

- Female     Male

5. Age:

Please specify full years (Numbers only) \_\_\_\_\_

6. How did you learn your skills in computers and the internet? (Multiple responses)

(1= 'not at all' to 5= 'very high')

	1	2	3	4	5
Through department's courses	<input type="radio"/>				
ICT courses from outside the university	<input type="radio"/>				
By myself with manuals or handbooks	<input type="radio"/>				
Taught by family members (parents, siblings)	<input type="radio"/>				
Taught by peers (e.g. senior/ junior friends, classmates)	<input type="radio"/>				
Others (please specify) _____	<input type="radio"/>				

DOES INFORMAL PEER LEARNING STIMULATE ICT SKILLS?

7. Who are/ were your peers supporting your ICT skills? (Multiple responses)

- Classmates
- Year mates from other departments
- Senior friends of my department
- Junior friends of my department
- Others (please specify) \_\_\_\_\_

8. Describe how your peers have contributed to your ICT skills?

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9. Do you think the roles of peers are important in acquiring ICT skills?

- Yes     No

10. If you answer 'Yes' to the question 11, please describe why peer learning is important for ICT skills?

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11. If you answer 'No' to the question 11, please describe why peer learning is not important for ICT skills?

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