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ADVANTAGES AND DISADVANTAGES OF PEER LEARNING IN ADULT EDUCATION USING DISTANCE LEARNING FOR LEARNING PROGRAMMING

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Abstract

Through the utilization of distance learning, peer learning in adult programming for the purpose of education can be an opportunity for these students to have a learning outcome that is both high, and to further build an online community where they can feel a sense of belonging. The present work talks about benefits and challenges of peer learning in this regard, also allowing to bring into play useful strategies that help increase the opportunities and avoid possible dangers at the same time. Advantages include working together as a team, full involvement in programming activities, and outside-the-class current topic discussions. On the one side there are the good points, as it has the peer-dependence, misinformation spreads, social development, and dealing with time management issues, but on the other, there are difficulties that should be considered before adopting the teaching strategies for online learning. Maximizing the outcome of the activities requires the implementation of the strategies of varied composition of the group, a baseline of the group's skills set, and self-examination. Research papers are shaping the benefits of peer relationships on adult education course outcomes by stressing the role of the instructor, effective communications, and sourcing as tools to spur course involvement. Via the execution of multiple such techniques and the resolution of the issues that may arise, the teachers for adult projects can effectively draw on the connections that could be created among the learners to reach the desired learning result and to develop a community atmosphere for adults that are in an online environment.

Keywords: *Peer learning, extended learning, distance learning, adult education, advantages.*

INTRODUCTION

Studies have shown that the number of peer sessions has grown noticeably in adult education over the last decade or so. The aforementioned offers a perfect example of social, motivational, and cognitive benefits adult learners might acquire when learning programming, as it stands out among others in the peer learning field (Corner, A., & Perrotta, M., 2012). To sum it up, there exist some essential details that still need to be understood in terms of how peer teaching is used for adult learning in the best way possible (Boud *et al.,* 2014). This essay describes the importance of peer learning in adult training as a whole and then goes deep into its meaning in the framework of programming learning for adult learners. Peer learning is a means of performing tasks that involves the learning of knowledge and development of skills through a process where status level peers work together (Popov *et al.,* 2012). The form of instruction is its core difference from the traditional teacher-centered approach where students learn the content mostly from the teacher. Instead, the learner-centered approach is whereby the students learn from and with their peers (Boylan, M. 2016). Peer learning has tremendous advantages that make students achieve better grades, have greater motivation, and higher confidence than they would from a teacher-centered environment. This in turn brings about a reduction in anxiety (De Smet *et al.,* 2008). These advantages are of crucial importance, especially for adult learners who are traditionally prone to be highly self-reliant and exhibit a better output in such environments.

When the learning of the programming language is considered, adult learners can find it easier to deal with the complexity of the problems in programming through group discussions or dialogues between peers (Moore *et al.,* 2011). Through presentation of their knowledge and method being elucidated, students provide themselves with the means to acquire theoretical as well as skill-related proficiency. Social interactions, such as peer collaborations, are also the means of mutual bringing together multifarious views, searching for the errors in others' reasoning and finding the truth in a group (Govender, D.W. and Basak, S.K., 2015). This is indispensable in computer programming where often it is about moving from structured, clearly defined, end-of-table problems to unstructured, troublesome, open-ended problems. Besides, peer-to-peer learning also provides social and academic support which is often a source of motivation that helps in the decline in the rate of dropouts amongst adult learners, who might find coding complex (Copeland *et al.,* 2004).

Traditional literature, involving formal peer learning arrangements among adult learners with programming skills primarily does not investigate informal ones (Vihavainen *et al.,* 2011). This is the most important role of adult education at the time when the number of those who need retraining and implementation of computer science bootcamps among mid-career adults and job transitionalists is constantly growing (Köppe, C., 2021). Moreover, the peer groups often lack explicit best practices for team composition in a programming learning context, as many studies have given contradictory opinions on the desirable size age or ability range within a peer learning group. Developing the resolution of these design dimensions, the program may become more efficient.

Theoretical Framework

Peer learning may be understood as the gatherment of knowledge and the development of skills through various interactive modes (e.g. support and participation) between people of the same status (Topping, 2005). There is a case of people from the same cultural environments as well as experts creating opportunities to teach each other and also learn by simply instructing. As a result, (Boud et al., 2001). Since such structure makes it appropriate for adult education where adults' experiences and peers' interactions are key resources, it becomes very relevant in learning.

Some of the theories explain why group learning is such a strong mechanism for adult education. Humanize the sentence: In Knowles' (1980) adult learning theory, he proposes principles which discuss key points about adult learners that are closely related to peer learning. It is the same pattern with the adults. They are self-directed; they have a need to know 'why' they are learning something; they exploit the experience gained in their lives for studying. Other benefits of peer learning such as self-directedness, self-management, and peer support, achieve learning goals through their intrinsic motivation to learn from peers (McLuckie, J., & Topping, K.J., 2004). Adults see real-life examples and find a possibility to drive their learning in order to satisfy emerging needs.

Social learning theory refers to Bandura's (1977) discoveries that people learn new patterns by directly experiencing the situation or watching someone else do it. Peer learning provides the learners a chance to learn using the direct presentation of examples and by identifying the effective study strategies from one another. The result of the social interaction is that the social cohesion and the assertion of the ability (Falchikov, 2001) as peers acquire skills together.

In the scenery of distance education for programming, Siemens' (2005) connectivism theory identifies the principle of engagement as the key role of your peer connections. Learners are equipped to manipulate the concepts and the sources of knowledge by making many connections between various ideas (Lu, X., & Bol, W., 007). Since the confines of a single brain cannot possibly hold all the truths there are, the sharing of multiple opinions that comes from peer relationships is what makes you acquire the competencies. Using technology, there are new links that are created which can deepen peer learning in the virtual sphere (Rajagopal et al., 2012).

At the end, these theories highlight the fact that learners are at the center of the process, that they have to produce the necessary social connection, that scaffolding serves the same purpose, and that they are the ones who must co-create the understanding (Koh *et al.,* 2019). In essence, this is in accordance with the recommendation made in the adult learning principles and the engagement simulations and the activities lead to motivation and self-direction.

Advantages of Peer Learning in Adult Programming Education

Peer learning has indeed multiple advantages for adult learners in a programming education, and together with this these are the most prevailing ones, especially in distance learning. Online courses or remote based learning can be a boon to working professionals who want to upskill themselves (Brezina *et al.,* 2012). Learning alongside other learners can add to the experience and the chances of success multi-fold. Contribution to peer learning is in fostering collaborative efforts, active involvement, and complex ideas assimilation.

Peer collaboration in the programming context assists in developing collaborative teamwork skills that are necessary in solving programming tasks of different complexities (Kritikos *et al.,* 2011). The online discussion forums, study groups, project teams, and other peer interactions give an adult learner room to bounce and exchange ideas, provide feedback, and work as a team (Topping, K.J., 2005). This shared experience can be seen as an epitome of real-world software engineering that is typical of software developers working remotely. Through practice of collaborative teams, the adults learn the practical skills of the workplace while putting their fellow colleague's growth into consideration. Moreover, their cohesion is also developed (Almazroui, K.M., 2023).

As well as this, peer relations are better at increasing active involvement and therefore, better understanding and recall of programming languages and tools are possible (Laal *et al.,* 2012). By the manner of peer interaction in an adult class, the participants take more responsibility for their learning in ways that are not only by absorbing, but also by giving back to the teacher (Roberts, T., S., & McInnerney, J., M., 2007). It is through the act of explaining ideas to others, answering questions jointly, and choosing the right public policies that learners become more critical thinkers and become technically better (Stump *et al.,* 2011). This degree of interaction cannot be realized between an adult and a single computer screen; it processes information when someone is willing to exchange views or ask questions. It involves true human interactions with dialogue and knowledge created by the people.

Peer learning involves adults sharing through partitioning and integrating programming concepts by displaying distinct ways of thinking. With multifaceted experience and learning from peers, they share unlimited views to deconstruct, understand concepts and apply techniques in the learning environment (Prince, M. 2004). This practice cultivates mental acuity on varied programming frameworks and paradigms, hence giving a deeper and more extensive comprehension. By the same token, the process of correction of misconceptions is accelerated since the peers' exchange ideas, before they get deeply rooted (Weyrich *et al.,* 2009). The learning community not only becomes a site that aggregates numerous perspectives but also is a platform to deepen the utmost comprehension through interaction connecting more dots.

Interacting with peers is a crucial factor for building such vital communication skills that are of the highest necessity for today's programmers as they are involved in both large-scale and complex software projects developed (Lumpkin *et al.,* 2015). Conveying technical details to the team members precisely and unequivocally is a crucial ability for a programmer on a complex task to manage. Peer learning provides the development of interpersonal skills such as being able to articulate computational logic, functions in codes, issues that need resolution and other relevant details (Panitz, T. 1999). Furthermore, peer mentoring and working together with adults who are not technical-minded enable programmers to learn how to interpret and communicate concepts with other stakeholders in different industries – this is a core capability for a programmer to be effective within a diverse industry.

Challenges of Peer Learning in Adult Programming Education

Dependence on Peers

The peer dependency of the learning process may be a consolation in the case of peer learning. Of adults who heavily involve themselves in social gatherings with other students, they might not be able to face the task of self-directed individual learning (Ara Jafari, J. 2016). It may be the case that this is true for those undertaking distance learning and, in this undertaking, it is possible that access to peers becomes limited (Baker, M.J. 2015). Facilitators may be called upon to devise the strategy for independent learning of the concepts so that the adults could have an attempt at applying these ideas before seeking help from their peers.

Misinformation Spread

Peers, being on the same level in the learning process, may spread misconceptions and inaccurate information as a result of the discussions in the informal learning setting which isn't handled by the content experts. In programming education where typos or buggy code can produce serious negative effects on the code development process (Boud *et al.,* 1999), the dispersal of rumors among adult learners can also affect their skill acquisition adversely. Both moderation and the participation from individuals with professional programming backgrounds should be considered to identify and correct misinformation that may be spread during peer-to-peer interaction.

Social Dynamics

Wikipedia group collaboration can in some instances be hampered by some interpersonal social dynamics that are inherent in group settings (Capdeferro, N., E., & Romero, M., 2012). The situation may turn into two extreme cases. First, extremities of conformity, social comparison, competition, or interpersonal challenges among the classmates may hinder collaborative group work (Secomb, J. 2020). Some may argue that an additional level of inequality experienced by adults of different backgrounds in virtual interaction would be a secondary dimension of such inequality. Setting out clear standards, expectations and processes that are open to approving positive social effects can be a mechanism to avoid negative social effects.

Time Management

Time-consuming peer learning engagements such as study groups, peer feedback, and discussions may be different to self-study or study alone. It is often a challenge to balance the extra load of studying duties that are on top of the preexisting professional and personal agenda of working adult learners (Nielsen *et al.,* 2012). Instructors will have to add time management guidance on top of adjusting the demands to peer interaction that might distract learners using distance technologies. By providing tailored choices, the study could support adults with their busy work and family schedules. The big issues that manifest are a dependence syndrome , a false information spread , peer amidst the difficulties, and demanding time though (Chang, R., & Brickman, P., 2018). By doing so the adult education should be guided by a thoughtful program structure, field experts' involvement and the expectations of the learners. This way one can be able to maximize the benefits that are associated with peer learning in this situation.

Strategies for Maximizing the Benefits and Minimizing the Challenges

Peer education is one of the keys that unlocks valuable advantages in the adult distance learning context, but it could also make some difficulties. During the classes, instructors could utilize diverse strategies to enhance the effectiveness of the process. The well-structured ideas and expectations make the quality of the peer interaction more productive (Boud, Cohen, and Sampson, 2014). Teachers should give the students the learning outcome thus guiding them on sources of materials, evaluation criteria, and feedback. Students should also be trained to provide useful feedback and the monitors should monitor the discussions while group rules are set (Nicol *et al.,* 2014).

From the fact that the groups will not be homogenous, the students will learn from various viewpoints. The whole process of deliberately picking up the classmates who differ from each other in terms of working styles and academic levels also facilitate the learning process (Boud. et. Al., 2014). Nevertheless, in a mixed-level environment, a differentiating level of experience between peers is as well a key element. Top students can get involved in mentoring of the struggling students. However, they may not be able to collaborate with the smaller gaps in the skills (Topping, 2005). Instructors simply need to redraw group lines across activities to ensure that people remain to be surprised by fresh ideas.

Introductory materials help in the formation of students´ baseline competencies which serve as a base for peer discussions. They should be in a position to grasp the major concepts individually through the readings, lectures or tutorials despite being allowed to work as a group (Boud et al., 2014). This confers them with a capacity to participate in full in exchange of ideas as well as absorbing information. If it is possible, resources should be parallel to those in class, to help students in advancing their knowledge.

A teaching that supports effectively the peer learning is critical in the remote learning process. Facial expressions, gestures, and other visual and contextual clues that are vital for effective communication are absent in online communication (Kauffman, 2015). Educators need to design discussion topics, raise questions to engage thinking processes, redirect the conversations that are irrelevant to the topic, and if necessary, mediate conflicts that arise among classmates. It is suggested that they should use these measures like initialing assignment goals, giving examples of constructive feedback and giving guidelines for participation (Brindley *et al.,* 2009).

Gaining a deeper understanding is dependent on the ongoing self-reflection which you can get from your classmates (Boud et al., 2014). Instructors should incorporate reflecting exercises, both before and after group work to be effective. Pre-reflection allows to activate prior knowledge and after-reflection helps to lay on consolidated learning objects, to reflect thinking about learning processes in a metacognitive way and to point unanswered questions (Topping, 2005). The process of self-reflection may also be more successful by drawing upon journaling, discussion boards, blogs, and self- assessment (Tai *et al.,* 2019). With proper implementation, peer learning exercises embraced in distance context can provide enrichment to programming education for adult learners. Education providers facilitate healthy peer relations through structuring, supplying the materials, and guiding in addition to fostering reflective practice. Not taking into account these decisions will limit the gains of students on the non-physical aspect of peer interactions, leading to suboptimal benefits (Goel, A.,K., & Joyner, D.,A., 2016).

Case Studies and Best Practices

Case Study 1: The Peer Assessment in an Asynchronous Programming Course is Demonstrably Effective.

As top *et al.,* (2000) did, they tested peer assessment in a programming course specialized for master's level students based on asynchronous learners. The students submitted their code by the deadline and then each of them assessed 3 randomly assigned peer submissions based on the rubric and that involved disclosing marks and comments. A group project was graded using not only the instructor's, but also the fellow classmates' rating. The fact anonymity curbed bias made the board machine, while calibration exercises improved assessors' overall accuracy. They enjoyed the fact that they were able to consider their skills and competencies in relation to their peers; faculties liked the fact that the tool could be applied to multiple students. However, students said the process took a long time, meaning differently-staged feedback from peers. For instance, several of them could be that, students should be trained to provide constructive feedback and faculty should be monitoring completion rates of students with incentives for participation. To enhance the pace of screening, we could limit the number of rounds and the group size.

Case Study 2: Co-Learning Peer Groups that is part-time distance learning.

The pervasiveness of peer learning groups in a non-traditional part-time distance computing degree program in Ireland was highlighted in Sullivan et al.'s study published in 2020. Students were administered to groups of 5-8 members with asynchronous forums and video meetings that enabled them to discuss class material, assignments, resource sharing, and provide each other with support. The results were evident: groups learning was no longer limited to class instruction, they

shared the experience, and built teamwork to form an online community which was enjoyed by all the students. The things that stood in our way included professional fluctuation, operational issues, and faculty involvement. Two key considerations are to regularly communicate goals, prepare facilitating questions, coordinate groups with the curriculum, and faculty moderation of the dynamics with timely intervention if needed. Not only does the implementation of a framework for measuring participation provide a basis for incentivizing effort, but it is also very likely to spur organizational success.

These case studies illustrate the positive impact of peer connections on enriching adult distance learning within the information technology sector, while effective teaching requires incorporation of the relevant logistics, training, incentives and faculty support to maximize the impact. Further research should be given more priority in order for the community to be able to develop the most effective strategies.

Conclusion

In summary, distance learning as a peer learning process in adult education for college teaching has both positive sides and difficult aspects. The advantages of teamwork like working together, active involvement, and in-depth understanding of programs are offset by dependency on other team members which tend to spread incorrect information and consequently slow down an individual's learning progress. Social and skill limitations too can be challenging for the instructors trying to put everything in a structured group activity and control the negative effects. Strategies like diverse group composition, foundation building in basic competencies, and exercises for individual introspection are the ones that would allow for prominent peer learning. The case study will show how student connections have helped adult distance learning programming to achieve positive outcomes. Also there will be an emphasis on faculty involvement, communication and incentives. Ultimately, the purpose of providing peer learning with the help of a well-thought-out program structure, facilitator guidance, and learner engagement is to create an environment that ensures challenge minimization and benefit maximization. The outlined strategies including overcoming potential issues will enable adult education programming to unleash the power of peer interactions to boost the learning experience and create an online platform that fosters an inclusive and collaborative group of learners.

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