Self-directed Learning in Distance Education

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***Abstract*—This full research paper studies the significance of self-directed learning (SDL) in distance education. A literature review revealed many characteristics related to SDL that are important to success in distance education. The self-directed learning readiness (SDLR) levels of 124 students were gathered for this research, and the results were compared between contact and distance learners. The effect of gender on SDLR and the relationship between SDLR and preference for distance education were examined. There was no statistical difference in SDLR levels between women and men but indicators of self-directed learners' preferences for distance learning were found. In addition, the SDLR scale scores between students' degree levels were compared. The results support the notion that SDLR is related to maturity.**

***Index Terms*—self-directed learning, distance learning, online learning**

I. Introduction

The COVID-19 pandemic has caused sudden changes in education. Students and teachers have been forced to shift to distance and online learning and to adjust to the introduction of new teaching and learning methods. However, the pandemic period has caused more challenges for some students than for others. The challenges associated with distance learning can be institutional, pedagogical, or personal [1]. Given that distance learning is typically highly autonomous and self-directed [2], a key personal characteristic for distance learning is so-called "self-directed learning readiness" (SDLR). Self-directed learning (SDL) is a process in which the learner takes an active role. Self-directed learners have high motivation, can set their own goals, and take responsibility for their own learning. This requires strong personal characteristics, such as independence, persistence, and self-confidence, as well as practical skills, such as good organizational capability and the ability to use diverse resources. These characteristics and skills have been found to predict success in the SDL context (e.g., [3], [4]). In addition, a high SDLR level may help students adapt to changing study conditions during a pandemic given that SLDR is considered an essential feature in a rapidly developing society.

Although research has been conducted on self-direction, there are still many open questions about its role in distance learning. It is also known to be context-specific (e.g., [5]). This study explored the association between SDLR and distance learning. The distribution of SDLR scores was evaluated, and the impact of study preference and gender on the scores was examined. In particular, this research examined whether students who possess high SDLR levels have a stronger tendency to gravitate toward distance learning. As the SDLR level is assumed to rise with maturity, bachelor's and master's students were compared, and the significance of previous degrees and working life were considered.

The research questions of this paper are as follows:

- Do students with a high SDLR level adopt a positive attitude toward distance education?
- Does gender affect students' preference for distance education or SDLR level?
- Does students' degree level affect their SDLR level?

The paper is organized as follows: Section II introduces the SDL concept and the SDLR scale used to assess students' SDLR levels in this study; Section III considers the relationship between SDLR and distance education; the experiment setup is introduced in section IV; the results are presented in section V and discussed in Section VI; and Section VII concludes the paper.

II. Self-directed Learning

Malcolm Knowles (known for his work on SDL and adult education) defined SDL as "a process in which an individual takes the initiative, with or without the help of others, in diagnosing their learning needs, formulating and implementing appropriate learning strategies, and evaluating learning outcomes" [6]. He argued that learners with initiative learn more and better than passive "reactive" learners. Self-directed learners have greater motivation and tend to retain and make use of what they learn. Knowles considered SDL to be part of the natural process of human psychological development.

Adapting the definition by Knowles [6], Guglielmino and Guglielmino [7] defined SDL as "a process in which the learner is responsible for identifying what is to be learned, when it is to be learned, and how it is to be learned. The learner is also responsible for evaluating not only if the learning occurs but if it is relevant to the objective." When developing her SDLR scale using the Delphi technique, Guglielmino [8] connected a highly self-directed learner with qualities like initiative, independence, persistence, self-discipline, curiosity, responsibility, self-confidence, a strong desire for learning, goal orientation, and organizing skills.

Fisher et al. [9] distilled SDLR to consider personality characteristics that define an individual's degree of self-management (SM), desire to learn (DL), and self-control (SC). These three dimensions resulted from an intercorrelation analysis between Likert-type items that they used when developing their own SDLR scale. The scale was developed to correct issues regarding the validity and reliability of Guglielmino's scale and to make it available at no cost. Fisher's SDLR scale was used in the current study. The scale includes 40 5-point Likert-type questions. Thus, the score can vary between 40 and 200. A score higher than 150 is considered to indicate SDLR.

The DL subscale in Fisher's scale includes items relating to one's motivation for and attitude toward studying. The SM subscale includes items associated with a person's development of appropriate external conditions and skills for the learning process, such as time management and resource handling. The SC subscale includes items about a person's ability to set goals and evaluate their own learning.

III. The Connection Between Distance Learning and Self-directed Learning Readiness

Several studies have found no significant difference in learning outcomes between distance learning courses and face-to-face courses, although dropout rates have been reported to be significantly higher for distance courses [10]. El Rafae et al. [1] stated that opportunities and challenges in distance learning are either institutional, pedagogical, or personal. One of the personal characteristics is students' SDLR. Academically successful distance learners have been described as self-motivated, self-directed, having internal control, executive, interactive, and technologically literate [3]. However, not all students are naturally this way; therefore, the education provider should be aware of these differences in students' characteristics.

Distance learning is highly autonomous in nature, with self-direction playing a major role [2]. In an online environment, where learning can be highly flexible and, for example, asynchronous, the learner is typically autonomous in the learning process. Self-direction is required for distance learners to make decisions about when to learn, how to pace their learning, and how many other distance learning courses they might take at the same time [5]. Some researchers have even considered self-directed learning to be a critical factor in distance education because it explicitly separates learners and teachers, both physically and socially [11].

Indeed, Bernard et al. [4] found good self-direction to be a positive predictor of distance learning course grades. One of the key skills related to SDL is time management (e.g., [12], [13], [14]). Studies have found that learners who were successful in distance learning, for example, managed their time well and set goals for course completion [15]. Selim [16] also found that learners need time management skills to succeed in an e-learning context. Similarly, Li et al. [17] found that students who were not good at time management received, on average, lower grades in courses. Conversely, Aragon and Johnson [18] found no significant difference in academic ability or SDL when examining success in distance learning.

Özbek [19] identified 19 metacognitive skills that are important for distance learners in his literature review. Many of these are closely related to SDL, such as self-discipline, effective time management, taking responsibility for one's own learning, and being able to make decisions alone, determine learning needs and objectives, create a learning plan and apply it, evaluate learning and the learning process, and generate reflections.

Kerr et al.'s [20] three-year follow-up study found that a high level of independent learning predicted success in distance learning. Their concept of independent learning is, in many respects, close to the concept of SDL, including the student's ability to manage time, balance multiple tasks, and set goals, as well as the student's attitude toward self-discipline and personal responsibility.

IV. Research Setting

Fisher's SDLR scale was offered to a group of bachelor's students and master's studies applicants in information technology. The bachelor's students studied at Lapland University of Applied Sciences in an education program that allowed them to choose either the contact or the distance teaching mode. They completed Fisher's questionnaire during the spring 2021 semester. The master's studies applicants were applying to an adult education program in Kokkola University Consortium Chydienius that was completely distance learning. Their SDLR levels were gathered between the spring 2020 and fall 2021 semesters. Only students who were approved for the adult education program and who accepted the placement were included in this research. Here, they are referred to as master's students. The data are depicted in Tables I and II.

There were 64 bachelor's students and 60 master's students. Of the bachelor's students, 24 were contact learners; the other

TABLE I
STUDENTS' DISTRIBUTION BETWEEN DEGREE LEVELS BY GENDER.

Gender	Bachelor's students N (%)	Master's students N (%)	Total N (%)
Women	30 (46.9 %)	16 (26.7 %)	46 (37.1 %)
Men	33 (51.6 %)	44 (73.3 %)	77 (62.1 %)
Unknown	1 (1.6 %)	0 (0.0 %)	1 (0.8 %)
Total	64 (100.0%)	60 (100.0 %)	124 (100.0 %)

TABLE II
STUDENTS' DISTRIBUTION BETWEEN TEACHING MODE GROUPS BY GENDER.

Gender	Contact learners N (%)	Distance learners N (%)	Total N (%)
Women	11 (45.8 %)	35 (35.0 %)	46 (37.1 %)
Men	13 (54.2 %)	64 (64.0 %)	77 (62.1 %)
Unknown	0 (0.0 %)	1 (1.0 %)	1 (0.8 %)
Total	24 (100.0 %)	100 (100.0 %)	124 (100.0 %)

100 students were distance learners. Regarding gender, 46 students were women, 77 were men, and 1 student chose not to reveal their gender.

V. Results

The mean of the SDLR results for 124 students was 160.9, with a standard deviation of 19.4. The median was 164.5. The 150-point score limit indicating a self-directed learner was exceeded by 93 (75%) students. Fig. 1 shows the distributions of the mean item scores in total and for each SDLR dimension: SC, SM, and DL. The averages of the Likert scores on the dimensions were 4.1, 3.8, and 4.2 for SC, SM, and DL, respectively. The order of dimension means (DL highest and SM lowest) was typical. The highest mean for an individual item was 4.8 for the argument *I want to learn new information*, which measured DL. The lowest item mean was 3.0 for the argument *I set strict time frames*, which measured SM.

We also looked for any differences between genders in choosing the study mode. In total, 11 (23.9%) women and 13 (16.9%) men chose contact education. The chi-square test found no statistical difference between genders ($\chi^2(1,\ N = 123) = 0.91,\ p = 0.341$).

A. SDLR Between Genders

We compared the students' SDLR scores between genders. Fig. 2 shows the distributions of the scores. Women had higher scores on average (163.4 vs. 159.3, with standard deviations of 21.5 and 18.1, respectively), but the difference was not statistically significant (two-sided, independent samples t-test, $t(121) = 1.121,\ p = 0.264$). We also checked for any differences between genders in the SDLR dimensions. The distribution of the dimensions by gender is depicted in Fig. 3.

The biggest difference in means lies in the SM dimension. The independent samples Mann–Whitney U test showed the difference to be statistically significant ($U = 1327.5,\ Z = -2.321,\ p = 0.020$). Nonparametric common language effect size statistics CL gives the value of $CL = U/(N_1N_2) = 1327.5/(46 \cdot 77) = 0.375$, which means that for a randomly selected female-male pair in the data, there is a 37.5% probability that the male's SM score is higher than the female's (or 62.5% change that the females SM score is higher than the male's). It should be noted the null value for the CL is 0.5 or 50%. For individual items, the biggest difference was with the argument *I am systematic in my learning*, which measured SM. The women scored 4.02, and the men scored 3.60, on average.

The difference between genders was larger for the bachelor's group than for the master's group. The mean values

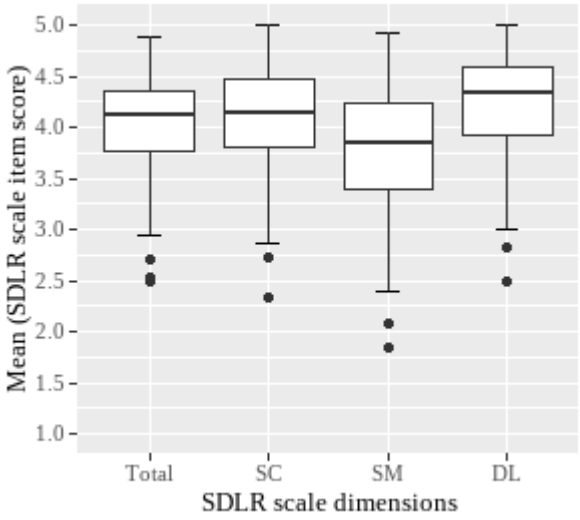

Fig. 1. The boxplot figure of students' mean SDLR scale item scores (N=124).

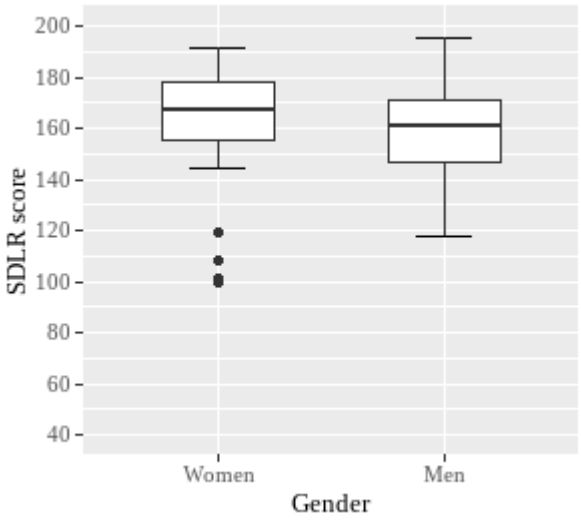

Fig. 2. The boxplot figure of students' SDLR scale scores by gender (N=123).

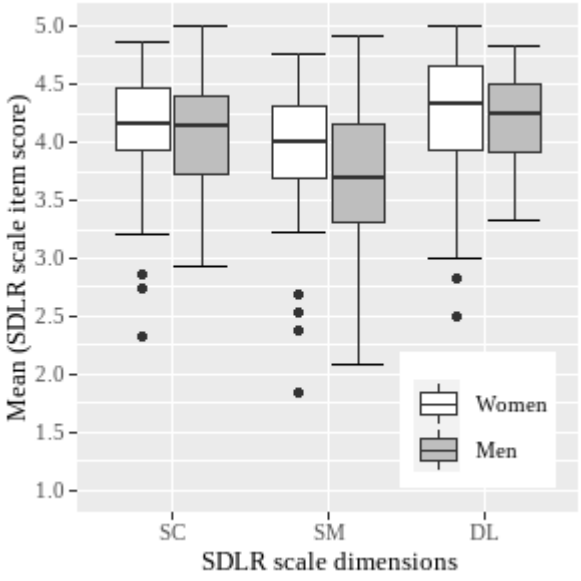

Fig. 3. The boxplot figure of students' mean SDLR scale item scores by gender (N=123).

for the master's students were 166.5 for the women and 164.7 for the men. In the bachelor's group, the difference was also statistically significant. The women scored 161.7, and the men 152.2 on average. (Mann-Whitney U test, $U = 333.0$, $Z = -2.230, p = 0.026$, $CL = 0.336$). Women's SDLR scores in bachelor's group also includes potential outliers. Removing three potential outliers leads to statistically significant difference with larger effect size (Mann-Whitney U test, $U = 234$, $Z = -3.144$, $p = 0.002$, $CL = 0.263$). This means that for a randomly selected female-male pair, there is a 74% possibility that the female has higher score.

B. SDLR Between Study Method Groups

There were 24 contact learners and 100 distance learners in this study. The SDLR score distributions are shown in Fig. 4. The mean score was 149.4 for the contact learners and 163.6 for the distance learners, with medians of 146.5 and 165.0, respectively. The difference between the study method groups was statistically significant (Mann–Whitney U test, $U = 809.0$, $Z = -2.474$, $p = 0.013$, $CL = 0.337$). Although the difference is clear, the effect size is not very large.

Fig. 5 shows the distributions of the dimensions between the study method groups. The Mann–Whitney U test indicated differences in the SC and DL dimensions (p-values of 0.013 and 0.005, respectively). The effect sizes $CL_{SC} = 0.336$ and $CL_{DL} = 0.316$ showed that the differences, although statistically significant, may not bear wider relevance to practice. The biggest difference in the mean scores of individual items was with the argument *I have high beliefs in my abilities*, which measured SC, with 2.96 for contact learners and 3.88 for distance learners.

C. SDLR Between Degree Levels

SDLR is known to be related to maturity. Most of the students in the master's adult education program were already working and all had previous degrees. Some of them had previous degrees in a completely different field. Fig. 6 shows the SDLR levels of the students by degree level groups. The means of the groups were 156.8 for bachelor's students and 165.2 for master's students. The standard deviations were 22.1 and 14.9, respectively. The difference between the study level groups was statistically significant. For the Welch's t-test, equal variances were not assumed: $t(110.9) = 2.474$, $p = 0.015$, $d = 0.442$. Cohen's d indicated a small effect size ($0.2 < d < 0.5$) [21] which meas that practical significance of the difference is quite small.

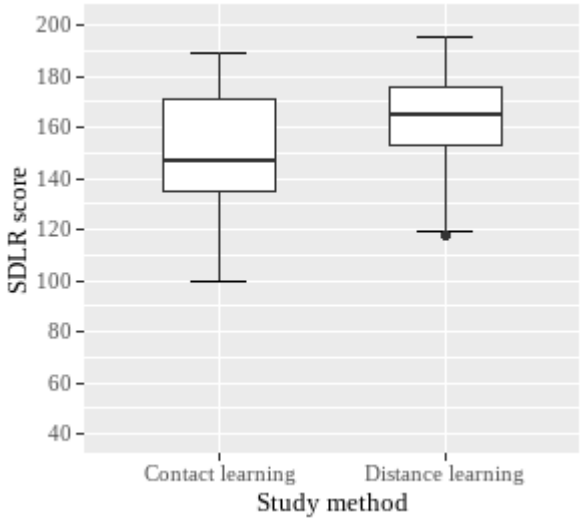

Fig. 4. The boxplot figure of students' SDLR scale scores by study method (N=124).

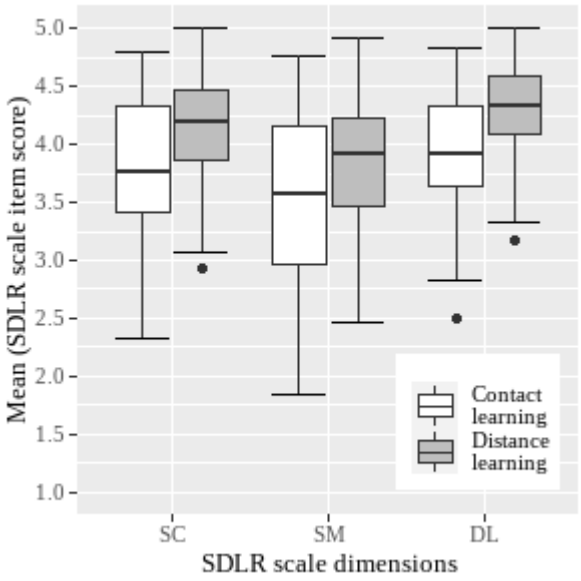

Fig. 5. The boxplot figure of students' mean SDLR scale item scores by study method (N=124).

Differences manifested in DL and SC dimensions (Welch's t-test: p-values of 0.012 and 0.006, respectively, with effects sizes $d_{DL} = 0.457$ and $d_{SC} = 0.496$). The distribution of dimensions on degree level groups is depicted in Fig. 7. The individual item with the highest difference was, again, *I have high beliefs in my abilities*.

VI. Discussion

The mean of the 124 students' SDLR scale scores was 160.9, which can be considered rather high. The students can be divided in multiple ways. One of the research goals was to discover whether students with a high SDLR level adopt a positive attitude toward distance education. Of the 124 students, 100 chose to earn their degree via distance learning, and 24 chose a contact education program. There was no difference in study method preferences between genders. The distance learners had higher average and median SDLR scores. The difference between the groups, which was tested with the Mann–Whitney U-test, was significant at 0.05 level. However, the effect size was not very large. Thus, the practical significance of the difference remains minor. The data should be improved by adding more contact learners (if possible, to

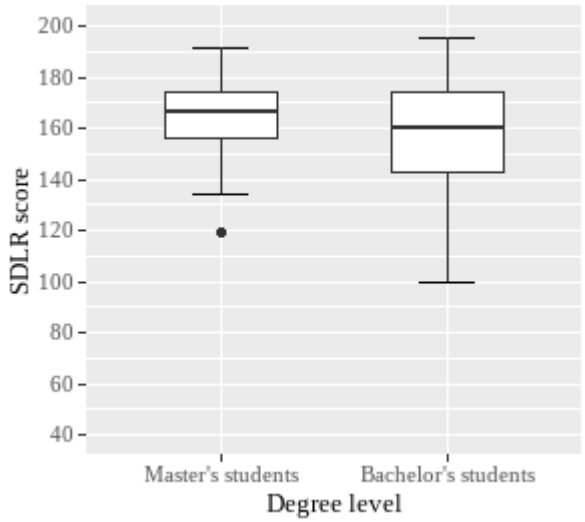

Fig. 6. The boxplot figure of students' SDLR scale scores by degree level (N=124).

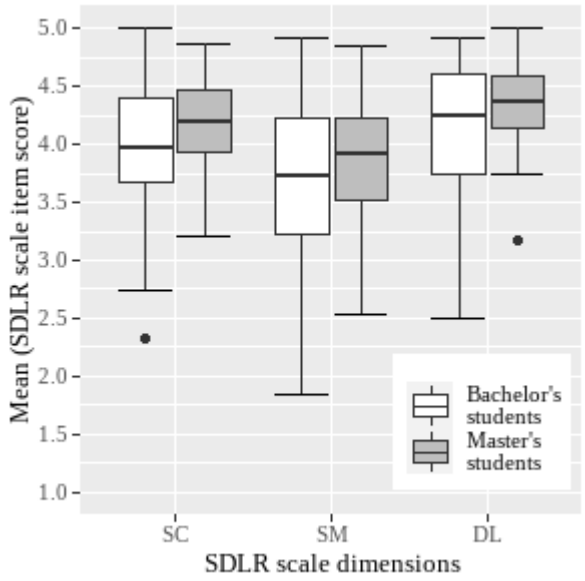

Fig. 7. The boxplot figure of students' mean SDLR scale item scores by degree level (N=124).

the master's student group, which included none). This would allow the use of more powerful parametric tests, and possibly decrease standard deviation. In addition, the SDLR is only one of many factors that affect students' decision to choose distance education.

In these data, women had slightly higher SDLR scale results but without statistical significance. However, when examining the dimensions individually, a statistically significant difference was found in the SM dimension. This could indicate that the women in this study were better at organizing their learning. Because of the small effect size, better performance in that dimension has little practical relevance. When gender differences were examined separately in bachelor's and master's students group, more difference was observed in bachelor's students group. By removing few potential outliers, also the effect size turned out to be large.

SDLR is known to be related to maturity, which grows with age and life experiences. The master's students in this research were in an adult education program. It is probable that their working lives and previous studies had increased their maturity. In addition, they may have higher motivation and determination to return to their studies, which are also features of SDLR. Thus, the SDLR scores of bachelor's and master's students were compared. The master's students scored higher, on average. The difference between the groups was statistically significant and could also be seen in dimensions measuring SC and DL.

VII. Conclusion

This research showed that SDLR clearly includes multiple characteristics that are beneficial in distance learning. We also found that students with higher SDLR skills may have a more positive attitude toward distance learning, which leads them toward distance education. The true practical difference in SDLR levels between distance and contact learners was unproven. The small number of contact learners may have affected this result. Nowadays, especially in computer science, it may be challenging to find students fully studying in the contact learning mode. The majority of education programs are arranged, at least partially, with a distance education approach.

Differences were also found between degree levels. In the future, this research could be extended by one degree level by adding vocational students' SDLR results to the data. In addition, more background information, such as age, could be collected.

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