INTELLECTUAL OUTPUT 7:

Analysis of trialling user data and application of learning analytics

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1. Introduction

Intellectual output 7 applied learning analytics methods on the data gathered during the large-scale trialling phase of the project (IO6). The trialling phase has provided the project consortium with a large dataset on empirical data of user interaction with the online LSP teacher training course.

In this intellectual output, typical groups of users were identified with the aim to develop individualised pathways through the online course.

2. Methodology

As part of Intellectual Outcome 7, survey data from the moodle course were collected from the participants. The data included, in particular:

- the users' nationality,
- age,
- affiliation,
- place of pursuing a profession or studying,
- status and professional experience (e.g. student, early career, experienced practitioner),
- discipline taught,
- specialised language taught,
- motivation for taking the course,
- choice of the learning content,
- the dedication time to the different course contents,
- the correctness of the quizzes.

In addition, the system allowed the recording of participants' behaviour during the course completion (log-in data). This data made it possible to examine the approximate time spent working with the course, or the order in which modules or individual tasks were performed.

As a result of the consultation, the consortium agreed that the variables that may affect the different way the course is conducted by the participants and the different course results are:

- the experience of the course participants,
- their motivation,
- their country of origin and the language taught.

Differences in the course outcomes achieved by different groups of participants will relate to aspects such as:

- the number of modules selected,
- the content of the selected modules,
- time spent on individual activities and whole modules,
- completion of optional materials (including both activities in sections 1, 2 and 3 and activities and quizzes from the "optional materials" section).

3. Results

The following section presents the results of statistical analysis of the collected data to answer the research question.

A. What are the differences between the participants who finished 8 modules (P8) and those who finished 4 (P4) in terms of their characteristics and achievement?

There were 183 participants who completed at least one module, but only 50.82% of them obtained the certificate (successfully completed at least four modules). In this population of the participants three groups can be additionally distinguished:

- M4: participants who completed exactly four courses;
- M5+: participants who completed at least five modules and its subgroup
- M8: participants who completed all eight modules.

The ratio between M4 and M5+ is approximately 1:2 (34.41% and 65.59%, respectively). The M8 subgroup constitutes about a quarter of all certificate holders (23.66%). As shown in Figure 1, the M4 group is overrepresented in Italy (75%), France (50%), Turkey (36.84%), Germany (40%), while the percentage of M5+ group is above average in Poland (80%), Spain (74.19%), Croatia (70%), and Slovenia (66.67%). The M8 group is most distinct in Slovenia and France (both 50%), Spain (35.48%), Italy (25%).
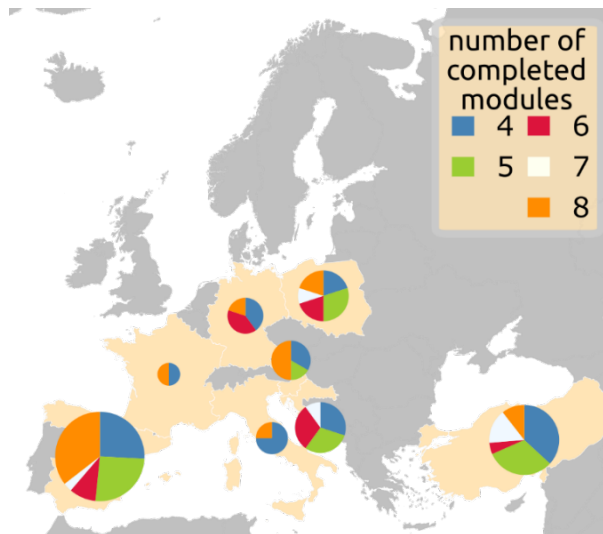

Figure 1. Number of completed modules by participants who obtained certificate of the course according to the country of live/work/study. The areas of the pie charts are proportional to the number of participants.

Another important differentiating factor in the users' population is the work experience (Figure 2). However, the data do not support the assumption that there is a correlation between work experience in the LSP field and belonging to the M4 or M5+ group. Since, the percentage of participants with up-to-5-year experience (pre-service teachers) completing four (34.69%) and more than four (65.31%) modules are almost indistinguishable from the data concerning more experienced teachers (34.04%, 65.91%, respectively). However, there is a visible shift in the belonging to the M8 group, as 26.53% of preservice teachers fall into this category as opposed to 20.45% of experienced teachers. On the other hand, the participants of age up to 30 years old are less likely to complete more than four modules (61.11% of them) than elder participants (68.42%).
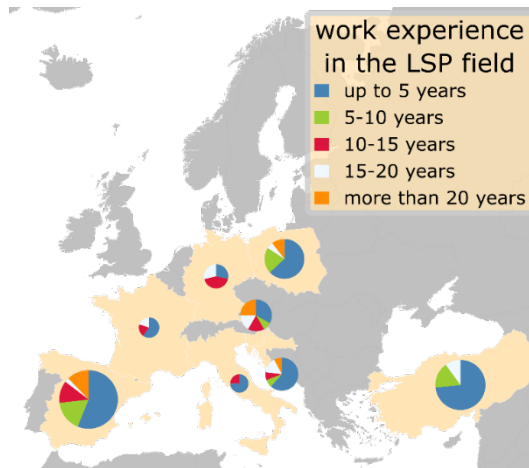

Figure 2. Work experience in the LSP field according to the country of live/work/study. Only participants with at least one complete module were included. The areas of the pie charts are proportional to the number of participants.

Table 1. Percentage of participants belonging to M4, M5+, and M8 groups according to their experience in LSP and age.[1]

	M4 (minimum for certificate)	M5+ (more than minimum for certificate)	M8 (all modules)
pre-service teachers	34.69%	65.31%	26.53%
experienced teachers	34.04%	65.91%	20.45%
up to 30 years old	38.89%	61.11%	22.22%
over 30 years old	31.58%	68.42%	24.56%

In the case of pedagogical background, the shift in the percentage of Foreign Language students at Bachelor and Master degree level in M4 and M5+ group is the most worth highlighting.

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[1] M8 is subgroup of M5+, therefore some percentage may sum up to over 100%

Table 2. Pedagogical background of the participants [2]

	M4 (minimum for certificate)	M5+ (more than minimum for certificate)	M8 (all modules)
FL student at BA degree level	33.33%	66.67%	22.22%
FL student at MA degree level	69.23%	30.77%	22.22%
FL teacher, in primary education	75.00%	25.00%	25.00%
FL teacher, in secondary education grammar school	50.00%	50.00%	30.00%
FL or LSP teacher, in secondary education professional school	25.00%	75.00%	50.00%
FL teacher in private higher educational institutions	60.00%	40.00%	30.00%
FL teacher at MA degree level	33.33%	66.67%	25.00%
LSP teacher at MA degree level	24.00%	76.00%	20.00%
LSP teacher in private higher educational institutions	50.00%	50.00%	20.00%
Other	21.74%	78.26%	26.09%

When it comes to motivation to participate in the course for M4 the overrepesented reasons are: "*reciving a certificate*" and "*improving teaching skills*", while in M5+ group the percentage is especialy high for participants who wanted to satisfy their curiosity.

Table 3 Motivation to take the course. Answers with less than 10 selections were added to the 'Other' category.[3]

	M4 (minimum for certificate)	M5+ (more than minimum for certificate)	M8 (all modules)
I WOULD LIKE TO IMPROVE MY CURRENT LSP TEACHING SKILLS.	38.10%	61.90%	25.40%
I WOULD LIKE TO RECEIVE A CERTIFICATE IN LSP TEACHING.	40.43%	59.57%	10.64%
I WOULD LIKE TO SATISFY MY CURIOSITY ABOUT LSP TEACHING.	32.61%	67.39%	17.39%
I WOULD LIKE TO START TEACHING LSP.	33.33%	66.67%	27.78%
OTHER	25.00%	75.00%	33.33%

B. What are the differences between the participants in terms of selection of different modules?

The analysis in this part includes participants who completed at least one module.
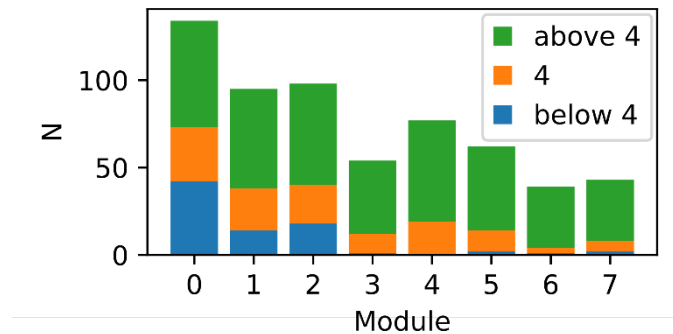

Figure 3. Number of participants who completed a specific module according to the overall number of modules completed.

Module 0 was the most popular among all modules. It was completed by 134 participants, and only 54.48% of them successfully completed at least 3 other modules (**Figure 3**). The interest in this module is visibly higher for pre-service teachers compared to experienced ones; it was completed by 79.59% of participants with up-to-5-year experience and only by 65.88% of those with more experience. Module 0 seems to be the most appealing for participants who were motivated by receiving a certificate and the least attractive for those looking to improve their LSP skills.

Module 1 was the third most popular module (**Figure 3**). As for module 0, the highest percentage of participants completed this module is among those motivated by receiving certificate, nevertheless, the distinction between different motivations are much slimmer.

Module 2 was completed by more than half of experienced teachers (second most common among them), it was also the third most popular module in the group of preservice teachers and second most popular among all modules. Module 2 was also the second most commonly chosen in the group of participants motivated by curiosity. Similarly, to two previously analysed modules, module 2 has a high percentage of participants who are not eligible for receiving a certificate (module 0: 31.34%; module 1: 14.74%; module 2: 18.37%), furthermore, all modules 0-2 were chosen by the majority (over 55%) of the pre-service teacher.

Module 3 is one of the least popular, especially in the group of experienced teachers (second lowest percentage). Furthermore, there is no leading motivation to complete the course among participants who finished module 3. However, the main reason to pick this module may be willingness to complete the entire course, since over 40% of all participants who successfully finished this module are users who completed all the modules.

In the group of modules 3-7 (distinct from 0-2 due to the low percentage of participants who finished the module, but did not receive a certificate), **module 4** is the most popular, both in the group of pre-service and experienced teachers and in general. However, module 4 was chosen by almost half of the users with five-plus years of experience in the field of LSP, almost ten percentage points higher than for the other users. The related conclusion can be drawn

from, since in the group of participants willing to improve teaching skills the percentage of users who finished module 4 is 11.88 pp higher than for those willing to start teaching.

Module 5 was completed by 34.69% of all preservice teachers, and 32.94% of all experienced teachers, giving the lowest absolute difference of 1.75% for all modules. This indicates that there is no correlation between experience in the LSP field and choosing this module. Furthermore, as shown in, among users who chose this course, there is no dominant motivation for taking this course.

Module 6 was the least common among experienced teachers and all participants in total. Moreover, this module has highest percentage of being finished by users who completed entire course 56.41%. **Module 7** was the second least frequently chosen module, and the least frequent among pre-service teachers (Figure 3). Additionally, 51.16% of the participants who completed module 7 also completed the other seven modules.

Another important issue to note is the order in which the course users performed the different modules.

Analysis of module sequence (based on Self-assessment tests) revealed that ordered sequence is preferred by participants who completed all modules and participants who dropped out. In other groups, a non-ordered sequence is preferred. Also, teachers with 5-10 years teaching experience completed significantly more often the modules in non-ordered sequence. A stronger tendency to deviate from the pre-imposed order of module performance is also seen among younger participants and among participants whose language of instruction is English.

Table 4. Preferred sequence of modules among participants with at least 2 completed modules (minimum of modules necessary to consider sequence)

	Number of completed modules					
	M3- (dropouts)	M4&M5+ (certificate)	M8 (all modules)	-	-	-
Ordered	63.64%	33.33%	59.09%	-	-	-
Non-ordered	36.36%	66.67%	40.91%	-	-	-
	Teaching experience					
	up to 5 years	5-10 years	10-15 years	15-20 years	more than 20 years	-
Ordered	41.94%	15.00%	41.67%	50.00%	55.56%	-
Non-ordered	58.06%	85.00%	58.33%	50.00%	44.44%	-
	Age					
	20 years and below	21-30 years	31-40 years	41-50 years	51-60 years	61 years and older
Ordered	40.00%	32.43%	40.00%	39.39%	50.00%	100.00%

Non-ordered	60.00%	67.57%	60.00%	60.61%	50.00%	0.00%
Language of teaching						
	English	non-English	-	-	-	-
Ordered	34.92%	44.23%	-	-	-	-
Non-ordered	65.08%	55.77%	-	-	-	-

C. Which modules were chosen by experienced teachers?

The three modules most frequently chosen by experienced teachers (5+ years of experience) were modules:

1 Module 0:   65.88%;
2 Module 2:   50.59%;
3 Module 4:   47.06%

D. Which modules were chosen by pre-service teachers?

The three modules most frequently chosen by pre-service teachers (up to 5 years of experience) were modules:

1 Module 0:   79.59%;
2 Module 1:   57.14%;
3 Module 2:   56.12%

E. Which optional materials were chosen and who did them?

In general, participants who completed the course were more likely to also complete activities. Only 27.98% of the users who obtained a certificate did not complete any additional activities; for participants who dropped out this percentage is 82.22%. The most commonly chosen optional materials were those included in Module 3. In general, the participants chose the optional materials with the goal of completing the entire course, and there is no strong correlation with teaching experience.

F.   What is the average time spent on each selected module / one the whole course?

The module requiring the most time to complete was module 3 followed by modules 4 and 2. The modules that took the least time on average to complete were modules 7, 5 and 0.
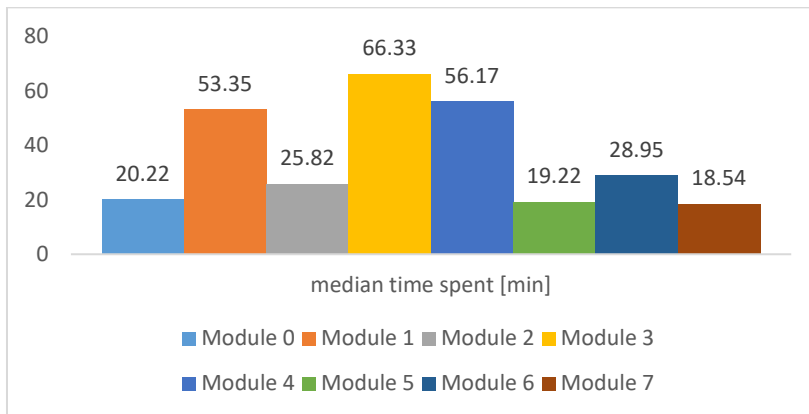
Figure 4 Median time spent on selected modules in minutes

Table 5. Time spent on selected modules and the entire course.[4]

	Total time [min]	Users	Average time [min]	Median [min]
LSP IO6-M0	99395.03	145	685.48	20.22
LSP IO6-M1	130221.58	113	1152.40	53.35
LSP IO6-M2	39026.20	101	386.40	25.82
LSP IO6-M3	83969.55	72	1166.24	66.33
LSP IO6-M4	29679.17	81	366.41	56.17
LSP IO6-M5	1507.18	67	22.50	19.22
LSP IO6-M6	2806.77	43	65.27	28.95
LSP IO6-M7	25946.93	46	564.06	18.54
The whole course	412552.42		2678.91	152.43

These data are only indicative and no categorical conclusions can be drawn from them, as the Moodle system only recorded the time the user was on the Moodle-page. On the one hand, therefore, the data may be falsely inflated by noting the time when the user was indeed on the course website, but was doing something else in the meantime; on the other hand, the data may be falsely underestimated if the user, after downloading the exercise materials, worked on the activity outside the Moodle website (e.g. on his or her own computer).

G. How many times did the participants attempt different quizzes?

The absolute number of approaches to quizzes obviously correlates with the number of course participants who have chosen a particular module. Consequently, quizzes from the first modules (of the modules most frequently taken) have the highest number of absolute approaches. However, if we consider the average number of approaches, the three quizzes that have the highest average approaches per person are the following:

1   LSP IO6-M3.2 QUIZ 6

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[4] Keep in mind that the average time of attempt is highly affected by outliers (i.e. extremely long attempts), preferred indicator of representative time of attempt should be median.

2   LSP IO6-M3.2 QUIZ 4

3   LSP IO6-M0 QUIZ 3

There is no strong correlation between attempts per user and average score in quiz (R^2=0.011)

H. How much time did they spend on each quiz?

Interestingly, the quizzes that are repeated most often do not overlap with the quizzes that take the longest time to complete

1   LSP IO6-M3.2 QUIZ 1

2   LSP IO6-M4 QUIZ 5

3   LSP IO6-M1 QUIZ 4

There is no strong correlation between the **median attempt time** and the average score in the quiz (R^2=0.0641)

I. Which quiz items were more problematic than others (i.e. the success rate was lower)?

The lowest average scores are recorded for quizzes
1	LSP IO6-M3.2 QUIZ 5:	71.328,
2	LSP IO6-M6 QUIZ 1:	76.667,
3	LSP IO6-M7 QUIZ 1:	77.776.

On the other hand, quizzes with the highest attempts per user coefficient are
1	LSP IO6-M3.2 QUIZ 6:	1.548,
2	LSP IO6-M3.2 QUIZ 4:	1.547,
3	LSP IO6-M0 QUIZ 3:	1.463.

J. Which quizzes scored the highest and lowest points?

The quizzes where users scored the fewest points are

1   LSP IO6-M3.2 QUIZ 5

2   LSP IO6-M7 QUIZ 1

3   LSP IO6-M6 QUIZ 1

K. What are typical user profiles in terms of the time spent on the quizzes and success rates?

The analysis of the data collected showed that several types of learners could be distinguished. Four distinct groups of users have been analysed with at least one completed quiz:
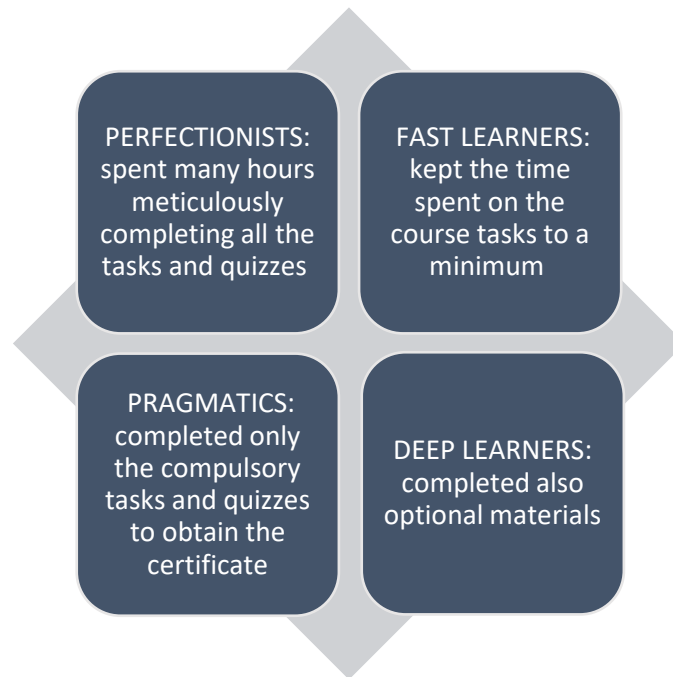
Figure 5 Most commonly identified learning paths among course participants

Perfectionists: users with an average score above 95%; there are 32 representatives in this group (including 14 with 4+ completed courses)

Fast learners: Participants with an average percentile of time spent on each module ($\bar{p}$) below 15%. This group includes 23 users (including 6 who obtained a certificate).

Two complementary groups can be discus jointly:

Pragmatics: 105 users who did not complete any of the optional materials (78 of them completed the course), and

Deep Learners: 63 users (including 62 who obtained a certificate), who completed also the optional materials.

The participants often could not be assigned to only one of the groups above. Usually, the groups overlap and so the participants can be divided into:

- ✓ pragmatists-perfectionists,
- ✓ pragmatists-fast learners,
- ✓ deep learners-perfectionists, and
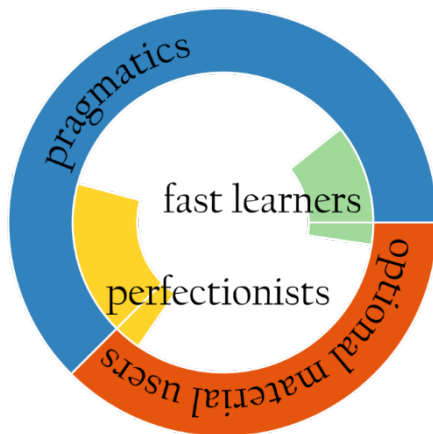- ✓ deep learners-fast learners.

Figure 6. Pie chart showing proportion in number of users of specific learner profile (Fast learners 13.69%, Perfectionists 19.05%, Pragmatists 62.50%, Optional material users 37.50%).

L. Do success rates (course complete on; results obtained; total quiz scores) vary with the learner profile? Does the course participation time vary with the learner profile?

There is no strong distinction between users of different learning profiles. Furthermore, perception of any group strongly depends on the threshold used to define it. Moreover, there is some overlapping between profiles. However, the general profile of any of those groups is described in previous questions.

However, noteworthy at this point is the slight difference in success related to course completion between participants who teach English and those who teach other languages. The percentage of English and non-English teachers in terms of the successful completion of the course is 53.13% and 48.28% respectively.

M. Who did not complete the course (what learner profile) and in which parts of the course learners did drop out?

As a next step, the consortium attempted to investigate whether the relatively high drop-out rate is correlated with a specific part of the course (e.g. due to a quiz that is too difficult, not enough attractive course material or technical problems) or with a specific learner profile.

The users who took at least one quiz and did not complete the course most frequently stopped their activities in the course at quiz:

1. M0 QUIZ 4: 12.12%;
2. M0 QUIZ 2: 10.61%;
3. M2 QUIZ 1: 7.58%;
4. M1 QUIZ 5: 7.58%;
5. M0 QUIZ 1: 6.06%;
6. M1 QUIZ 7: 6.06%.

The profile study of users who did not complete the course did not provide clear answers. However, it is noticeable that the highest drop-out rate was recorded among students

4. Conclusion

Taking into account the relatively high percentage of participants who did not complete at least four modules and therefore did not obtain a certificate (50%), the time allowed for completing the course may have been insufficient. In future, the course will be opened without a time limit, which may reflect positively on the success rate.

With regard to the evaluation of the individual modules and quizzes, the following should be noted. The research showed that a large proportion of learners completed the modules according to their order of appearance. Thus, following this pattern, the largest number of learners who received the certificate should have completed modules 1 to 3, followed by modules 4, 5, 6 and 7. This pattern was distorted as learners often skipped module 3 and chose module 4. This could indicate an existing problem with Module 3. After further analysis, the consortium concluded that the differences are not significant and thus there is no need to make far-reaching changes to the course structure.

A similar conclusion applies to individual quizzes. Although there are some quizzes in the pool which caused more problems for the participants, for which statistically the participants received fewer percentage points or which were repeated more often, these differences compared to other quizzes are not significant. The consortium decided, after extensive analysis, that these quizzes, although perhaps a little more difficult and engaging, do not disrupt the completion of the course and will not be removed. In one case there is a technical problem which will be eliminated with the moodle update.

Finally, the third most important issue from the point of view of the intellectual output 7 concerns learning styles. In line with previous scientific observations, in our study we could observe success-oriented learners, motivated by extrinsic factors (e.g. a certificate), who went through all compulsory course tasks quite pragmatically and quickly in order to achieve the goal and also a second group, intrinsically motivated deep-learners, who scrupulously and accurately completed all tasks (also optional).