



The Online Learning Resources Definition and Students' Use in Higher Education Across Disciplines

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Abstract. The definitions of online learning resources are discussed within two approaches for classifying existing learning technology, the pedagogical and the functional approach. The findings of a survey about online learning resources use among 1667 students are presented with a focus on differences among study disciplines. Average mean for a total sample and the differences according to disciplines are presented in five subsections: The Online learning content, Interactive technology, Social network sites, Communication and collaboration technology, Information organising technology.

Keywords: Higher education · Educational technology
Online learning resources · Slovenia · E-learning
Information communication technology

1 Introduction

In the literature review, we discovered two approaches for classifying existing learning technology, the pedagogical and the functional approach. Within the first authors highlight the pedagogical component, which is learning experience or educational function or learning technology. Examples of such classifications are the classification of educational media by Laurillard [1], the classification of learning objects by Churchill [2], and the classification of social software tools by Dabbagh and Reo [3]. The second group of authors classifies learning technology on the basis of a similar functionality [4–6]. In recent times authors have developed numerous taxonomies of Web 2.0 learning technology [4].

The classification by Laurillard [1], which is among most established classifications, differentiates between five different forms, depending on different kinds of learning experiences they represent for the learner. Their rating is the classification of learning media, and so includes also other devices (e.g. television), not purely information communication technology (ICT). Descriptions of classes are based on Conole and Fill [7] and Laurillard [1]: the narrative media, the interactive media, the communicative media, the adaptive media and the productive media. Churchill [2] developed the

classification of learning objects. Learning objects are digital resources, designed for use in different educational contexts. Churchill's grouping consists of presentation objects, practice objects, simulation objects, conceptual models, information objects, contextual representations [2]. The classification of social tools by Dabbagh and Kitsantas [8] (and its earlier version by [3]) is based on the level of interactivity that social media usage enables [8].

In this study, we examine the online learning content, Interactive technologies, Communicative and collaborative technologies, and Information organisation technology.

Class I: Online learning content

This class can be found in different classifications under different names such as narrative media, presentation and information learning objects, multimedia [1, 2, 6], Online learning content can be delivered through different presentation modes (verbal, pictorial), sensory modalities (auditory, visual), and delivery media (text, video, simulations) [6]. It can be found in media repositories [5], on learning websites and portals, educational blogs or integrated into online learning courses and in learning management systems. Consuming online learning resources (reading, listening, viewing) is considered as a passive [9], 'sit back' [1] learning activity. Regarding technology, the underpinning technology for a presentation of diverse learning content consists of media players, web browsers, etc.

Class II: Interactive technologies

This class includes the usage of interactive tools to interact with online learning content (search engines, databases search tools, hypertext and hypermedia, inquiry-based information retrieval etc.) and the usage of simple interactive tools such as tutorials, online quizzes.

Class III: Communicative and collaborative technologies

Communicative media facilitates exchanges between people. This class includes tools for synchronous communication (chats/instant messaging, video or audio conference) and asynchronous communication (e.g. online forums). The connection can be video, audio or text-based. Tools, allowing communication, are standalone tools or integrated into more complex technologies such as social network sites, learning management systems, online courses, games etc. Also features allowing comments on websites, blogs and online learning environments can be classified under communicative technologies. Thompson [10] discovered that communication through social network sites, texting, making voice calls and computer chatting belong to the same latent factor of ICT use. A study by Arkilic et al. [11] found out that among most preferred communication tools are instant messaging, followed by video/audio conference, private discussion groups and least preferred voice mail.

Cooperative technologies allow a learner to produce joint digital products with others and to exchange ideas with others [1]. Class, therefore, includes technologies for producing joint digital products as well as tools and features for sharing thoughts. Both types of devices belong to the same latent factor of the technology use [10]. Cooperative technologies are derived from several authors [8, 11–13].

Class VI: Information organisation technology

In this class are tools used to organise online (learning) information and content. An online user is today exposed to a significant amount of data, whether looking actively

for it (visiting websites) or being just a recipient of it through various channels (social network sites, e-mail etc.). For a more optimal flow of information, related to learning content, a learner can use multiple tools such as: republishing, aggregators, social feed aggregators, (social) bookmarking tools, digital pinboards [4]. A learner can subscribe to a digital content (e.g. subscribing to channels and people on social networking sites, digital newsletters etc.). Computer recommendation systems integrated into online platforms filter and suggest information for the user.

The survey was conducted to examine how students use OLR and engage in online formal and informal learning. In this paper, we present the OLR use.

Hypothesis: There is the difference how university students of different disciplines use online learning resources.

2 Methods

The survey was conducted to examine university students in Slovenia about the use of online learning resources. For the study, we developed an original questionnaire. The initial version of an instrument was tested in 2015 [14]. In this paper, we discuss if there are any significant differences between students' OLR use across study disciplines.

In the survey participated 2325 students of the University of Ljubljana, which decided to fill in the online survey received at their e-mail address. Data collection took place in June and early July 2017. The number of students, in total 292 students filled in only the demographic data and were therefore not included in the statistical analysis presented in this report. The size of the sample analyzed is 1667 participants who filled in the question about online learning resources. The sample is heterogeneous according to study program. Participants are students of all study degrees and study fields according to the KLASIUS classification. Most students from the field of Natural sciences, mathematics and computer science (N = 404) followed by students from the fields of Social sciences, business, administrative and legal sciences (N = 315), technology, production technology and construction (N = 255) Arts and Humanities (N = 232) and Health and Social Affairs (N = 196). There are fewest participants in the field of Education and Teacher Education (N = 170). For the analysis Agriculture, Forestry, Fisheries and Veterinary and Services (N = 95) were merged.

For the purpose of this study, the OLR scale was developed. Students were asked to indicate how often they perform each of 31 ICT activities, related to their formal or informal learning. Items are assessed on 5 point scale (1 – never, 2 – rarely, 3 – sometimes, 4 – often, 5 – very often). Cronbach's alpha of the total scale with 31 items is 0.926, indicating high reliability of the scale.

For comparison between the study disciplines, a one-way analysis of variance was applied, previously verified the assumption of the normal distribution with Shapiro-Wilk's test and histograms, and the assumption of the homogeneity of the variance with the Leven test. In the case of violation of the assumptions, a nonparametric form of a one-way variance analysis - Kruskal-Wallis test was used. For significant p-values, the Games-Howell test, otherwise the Tukey test was applied. Tables with statistical results are available on a request to authors' emails.

3 Findings and Discussion

Presented are findings about OLR use and specifically in activities outside the classroom for formal or informal learning connected with study field. Results are presented in five sections:

- Online learning content
- Interactive technology
- Social network sites
- Communication and collaboration technology
- Information organizing technology

In the paper, the acronyms for KLASIUS study field will be applied:

- Education – Education science and teacher education
- AH - Arts and Humanities
- SS - Social sciences, business, administrative and legal sciences
- NS - Natural sciences, mathematics and computer science
- TP - Technology, production technology and construction
- AFVS - Agriculture, Forestry, Fisheries and Veterinary and Services
- HS - Health and Social Affairs

3.1 Online Learning Content

The set Online learning content provides an insight into the use of different forms of digital learning materials and content (e-books, web portals, educational videos, online guides, images) and identifies the sources of educational material/content (e.g. web portals, social media, home university, foreign university, asynchronous communication tools, online courses).

As can be seen from Fig. 1, the students most frequently mention resources of their home faculty ($M = 3.88$; $SD = 1.17$), followed by social media ($M = 3.22$; $SD = 1.23$), while the most commonly reported are participation in online courses ($M = 1.58$; $SD = 0.92$).

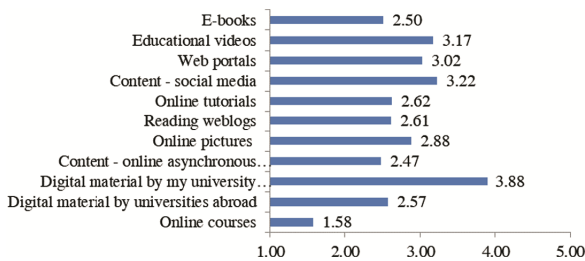


Fig. 1. Online learning contents – average mean.

The differences among KLASIUS fields are the following:

Social media (e.g. YouTube, Slideshare, etc.) as the source of educational materials mostly indicate NS, TP and HS students. Significantly less than the listed ones, social media as a source of educational materials is mentioned by students in education. The difference between NS and AH students is also essential.

Similarly to social media, asynchronous online communication (e.g. forum posts, questioning websites, comments) as a source of learning content are mainly indicated by SS and NS students as students of education, HS and AH.

Students SS, NRM and AFVS significantly more use material from their faculty as their peers from the fields of Education and AH. TP students also use materials from their home faculties more often than AH students.

Students of NS and TP mostly use materials from foreign faculties as AH students. SS students use foreign materials to a lesser degree than NRM.

SS students participate more often in online courses than students of Education and HS. NRM students also participate more frequently in online courses than HS students.

Of the various forms of materials and content, students are on average the most frequently used educational videos. This applies for the whole sample ($M = 3.17$, $SD = 1.20$), as for all subgroups. At least on average, e-books ($M = 2.50$; $SD = 1.23$), weblogs (blogs, social network announcements) ($M = 2.61$; $SD = 1.17$) and online guides ($M = 2.62$; $SD = 1.32$) are used on average less frequently. Here we mention that all other subgroups, with the exception of TP and NS students, use online guides as often or less often as e-books.

When analysing the differences between KLASIUS groups, we found differences in the items:

Students of NS, SS and HS report on reading e-books to a greater extent than students of TP and AFVS.

Learners considerably less often watch educational videos than their colleagues in the field of NS, SS and TP.

NS and TP students are more likely to use online tutorials than others in learning.

Web-based materials in the image format (for example, thought patterns, diagrams) are mostly used by NS and HS students than AH students.

SS and AH students have the highest average when reading online records from the field of study. The differences between SS and TP, AFVS and HS, are essential. The least often webcasts are read by AFVS, but this group differs significantly only from SS and AH.

Students the most commonly used materials for learning are from their home faculties, followed by contents that they access through social media, Less often students use materials from foreign faculties and universities. Scarce students participate in online courses. The students of the Education and the AH are most reserved for social media materials. Part of the differences in the use of online learning resources can undoubtedly be attributed to the nature of the various study programs (for example, NRM and TP students use web guides to a greater extent than their peers, HS and NS students are increasingly using the use of diagrams and mind maps as AH students). The results of the survey showed the importance of educational videos compared to some other online resources, such as onscreen text-based web feeds (e-books, online records).

3.2 Interactive Technology

The interactive technology contains items on the use of interactive tools and search tools. As shown in Fig. 2, the most commonly used are web search engines ($M = 4.19$; $SD = 0.96$) and the least used web tools for self-assessment ($M = 1.71$; $SD = 0.97$).

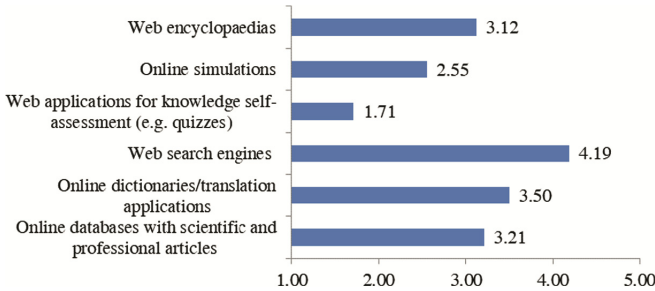


Fig. 2. Interactive technology – average mean.

The specific differences between KLASIUS groups are as follows:

Online encyclopedias are less by students of AFVS. The frequency of their use differs significantly from NS, SS, AH and HS students. NS students use online encyclopedias to a greater extent than students of TP and TP students.

Web simulations are more commonly used by students of NS, TP and HS, and to lesser extent students of education. The use of students from AH, AFVS and SS. NS significantly differs from all four of the subgroups above, HS is different from the three subgroups, and TP differs from AH students.

SS students are more likely to use the application for self-assessment of knowledge compared to students of education, TGTP and AFVS.

There are fewer differences between students when using search engines. Significantly more frequently use of search engines students from NS in comparison with students of education.

Web dictionaries are most commonly used by AH students, much more frequently than NS, TP, AFVS and HS students.

The databases with professional and scientific articles are mostly used by HS and SS students. These students use bases significantly more often than students of Education, NS and TP. The least commonly used databases are TP students, differences are essential in all peers except with Education and AFVS.

Throughout the sample, interactive technologies are among the most commonly used, with the exception of online self-assessment applications and web simulations. The downward deviation was evident in the case of the use of online encyclopaedias in students of the AFVS and the use of databases in TP students. The more common use of specific tools in specific groups is consistent with the nature of the study (for example, AH students use web dictionaries more often; students of HS, NS and TP use web simulations to a greater extent).

3.3 Social Network Sites

This section presents the items describing individual engagement in social network sites. The two issues are included in other subsections, “access to learning content via social network sites” is contained in a subsection Online learning content, “searching for help and discussion through online networks” is included in Communication and collaboration technology.

All of the above activities are relatively widespread among students ($M < 3$); the exception is participation in the online community, where students know the majority of participants (e.g. class FB communities) ($M = 3.49$; $SD = 1.36$) (Fig. 3).

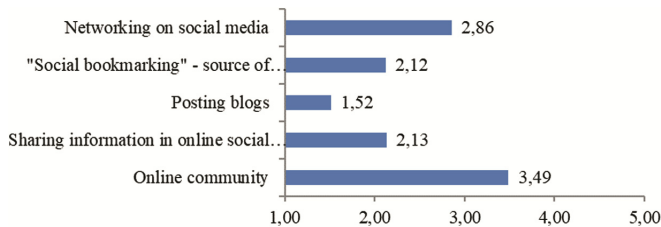


Fig. 3. Social network sites – average mean.

We have identified the following differences between the study fields:

AH, students considerably refer to the creation of social networks as students of Education, NS, TP and AFVS.

Students of education and AH report the much more frequent use of “social bookmarking pages” (e.g. reddit.com, pinterest.com, del.icio.us) through which of the others they find for exciting web sources as their peers on SS, AFVS and HS.

The smallest differences occur when participating in a narrower online community, where the student knows most of the participants (for example, the class group Facebook, etc.). Significantly more frequently, such activities are carried out by HS students compared to SS students.

The differences between students in the use of social network sites are not numerous. Creating networks and using social bookmarking sites is more common in the students of Education and AH. Significant differences occur only at the level of networking (networks, others are a source of information of web resources, participating in the web community). There is no significant difference in a more active form of engagement in social network sites (for example, sharing information, writing records).

3.4 Communication and Collaboration Technology

When using ICT for communication and collaboration, the most common use of tools for synchronous communication between students (e.g. Skype, Facebook Messages, gTalk, Viber, etc.) ($M = 3.44$; $SD = 1.36$), and less frequently students use tools to participate in online discussions (e.g. on social network sites, on-line forums and chat rooms) related to their field of study ($M = 2.20$; $SD = 1.23$) (Fig. 4).

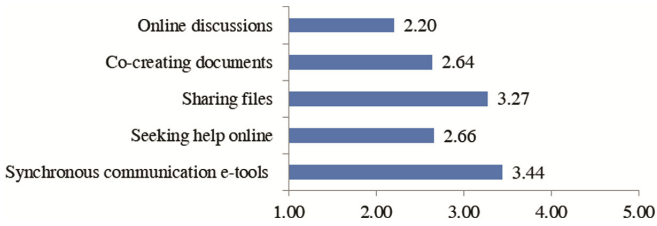


Fig. 4. Communication and collaboration technology – average mean.

Significant differences between KLASIUS fields are identified only with the “I co-create collaborative documents with others for study purposes (e.g. in Google Docs, wikis, brainstorming tools)”. For this subject, AFVS students report a statistically significantly lower frequency than SS, NS and HS students. SS students have the highest average for this item, considerably higher than their peers with education, AFVS, TP and NS.

3.5 Information Organising Technology

All of the above activities are relatively low among students ($M < 3$), indicating that on average students are less likely to use ICT for organising information (Fig. 5).

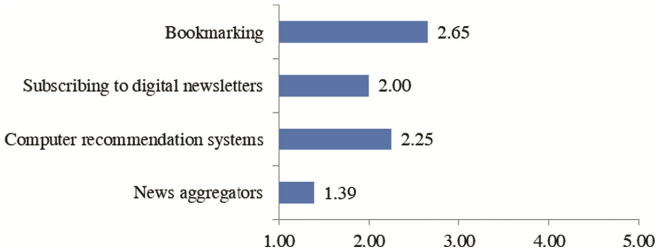


Fig. 5. Information organising technology – average mean.

Differences between study fields are as follows:

AH, students use bookmarks more often than other subgroups.

When subscribing to electronic newsletters and updates, AH and SS students report higher activity than TP students.

Among students, ICT is the most widely used method for organizing information by creating bookmarks $M = 2.65$; $SD = 1.38$), followed by the use of computer recommendation systems ($M = 2.25$; $SD = 1.11$). AH, students, in this case, stand out by using bookmarks and subscribing to electronic newsletters.

4 Conclusions

From the trends, the authors would point out social media as they are indicated as an important online learning resource. Given the frequency of using social media contents, students need to be encouraged to critically evaluate the use of such materials.

The survey showed low usage of online courses, which should be further verified.

Based on the findings it was established, that students should be encouraged and educated towards the use of online tools and resources also for the purpose of organising information and planning and monitoring their learning process.

Among the KLASIUS fields, there are differences in the use of ICT in teaching and learning. Although, due to the nature of the study programs and the differences between them, differences are also expected in the actual use of ICT in teaching and learning, however, this fact needs to be studied in detail.

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